Annual Report 2017-18

AICRP "National Seed Project (Crops)"

ICAR- Indian Institute of Seed Science
(Indian Council of Agricultural Research)
Kushmaur, Mau 275103 (UP)

AICRP

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Annual Report

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(Formerly ICAR-Directorate of Seed Research)

(Indian Council of Agricultural Research)

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Preface

Quality seed is a vital input in agriculture and farmers' access to quality seed of superior varieties is key in increasing agricultural productivity and production. The pace of progress in food production is largely depend upon the progress of seed programme with which a country is able to multiply and market good quality seed of high yielding varieties with superior genetics. Role of quality seed is documented and acknowledged across farming systems and ICAR duly acknowledged this fact by the launch of mile stone project*viz*. AICRP- NSP (Crops) during 1979-80. To operate quality seed programme, it is essential to produce sufficient quantity of breeder seed. Similarly, to organize well orchestered seed production programmes, research back up on various aspects of seed production technology, quality maintenance and its fine tuning, storage, seed health care and seed processing *etc*. are vital and found to be indispensable. In order to address issues such as Seed Replacement Rate (SRR) and Varietal Replacement Rate (VRR) and to develop need based technological interventions in seed domain, launching of network project viz. AICRP-NSP (Crops) has been a significant stride under ICAR. AICRP-NSP (Crops) under aegis of ICAR is guiding, coordinating and promoting seed technology research and breeder seed production very systematically with an appropriate research backdrop.

Annual Report 2017-18 is a compilation of progress made by varied co-operating centers under AICRP-National Seed Project (crops) under its two components *viz*., Breeder Seed Production and Seed Technology Research. It is my immense pleasure to gratefully acknowledge the dynamic leadership and path illuminating guidance received from Dr. T. Mohapatra, Hon'ble Secretary, DARE & Director General, ICAR and I hope that under his able stewardship, Indian seed production and research fraternity would excel in the arena of quality seed production and research. I acknowledge gratefully Dr. A.K. Singh, DDG (CS & HS), who is the mission leader of this project, for his kind support, guidance and encouragement. I thank Dr. D.K. Yadava, ADG (Seed) for his tireless help and active co-operation rendered. I also thank Seed Section, DAC&FW, MoA&FW for their cooperation in implementation of BSP programme. I also place on record my sincere thanks to all nodal officers and scientists from various co-operating centers, who did commendable job in successful implementation of the project. I gratefully acknowledge the immense support of Principal Investigators; Dr. G.K. Koutu, Dr. S.K. Yadav, Dr. M.S. Bhale and Dr. Amit Bera, who have done meticulous compilation of various reports, technical programme and for providing technical guidance to scientists. I also take this opportunity to acknowledge all scientistsand staff of IISS primarily Dr. Vijaykumar H.P. and Dr. Sripathy K.V. for their efforts in successful co-ordination of this massive project across the country. I firmly believe that this project, down the line would tread us towards attaining seed sufficiency with adept technological backup for quality seed driven agricultural growth.

(Dinesh K. Agarwal)
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Director's Report

Seed is prime input encompassing the capacity to ensure food security *i.e.* seed security can play a crucial role in ensuring food security. Desired growth rates in agriculture can only be made possible, if the prime input “seed” gets its rightful importance. The pace of progress in food production is largely depend upon innate vibrancy of seed programme upon which it is able to multiply and market quality seed of high yielding varieties with superior genetics. The ICAR, on its part has also taken various initiatives to augment the breeder seed production and seed technology research along with other crop improvement programmes. With the commitment of national seed security, ICAR launched All India Coordinated Research Project on seed i.e. ‘National Seed Project- (Crops)’ in 1979-80, which in due course became one of the flagship projects of ICAR itself. The AICRP-NSP (Crops) has been strengthened very well over the years and during XII plan the horizons of the project were extended to N-E states, which in turn developed state of art facilities both in respect of infrastructure and capacity building in seed realm. At present, the Breeder Seed Production (BSP) programme is operating at 41 centres and Seed Technology Research (STR) at 24 centres under AICRP-NSP (Crops) at various SAUs and ICAR institutes across the country.

Launch of AICRP – NSP (Crops) was instrumental in strengthening the Indian seed sector, as witnessed by multifold increase in breeder seed production from a meager quantity of 3914 quintals during 1981–82 to a level of **116799.03q** against the indent of **98048.37q** during 2017-18, surpassing the indents received both from DAC&FW and state governments. The NARES system continues to facilitate enhanced availability of breeder seed that constitutes the backbone of quality seed availability of notified varieties and parental lines of hybrids, which in turn multiplied to produce foundation and certified / quality seeds through downstream seed multiplication. Success of quality seed production programme depends upon production of sufficient quantity of seed with appropriate technological back up on various aspects of seed technology *viz*. production research, maintenance, quality assurance, processing, storage, seed protection and seed quality enhancement. Seed Technology Research (STR) component of AICRP –NSP (crops) provides apt platform in this endeavor to devise and standardize varied region specific seed based technologies across the country.

Continuous technological breakthroughs in seed research are vital to meet the demands of global seed market and at the same time for assurance of uninterrupted availability of quality seed at domestic level. Indian Seed Industry is one of the vibrant domains in the world seed market with compound annual growth rate of 17.6% compared to global growth of 6-7%. AICRP-NSP (Crops) aims to address crucial areas in quality seed production and seed research *viz*. Seed Production & Certification; Seed Physiology, Storage & Testing; Seed Pathology and Seed Entomology through nationwide network of cooperating centres. Futuristic strategies should be focused on appropriate maintenance breeding, climate resilient seed production through identification of non-traditional provenances for offseason seed production and inclusion of novel approaches *viz*. DNA based profiling for genetic purity testing, seed bio-priming for effective seed health management and nanotechnology for external & internal designing of seeds. Efforts mounted in streamlining of National Seed Research and Extension System will pay dividends by adjusting skewed anomalies *viz*. SRR and VRR and making Indian seed market, a force to reckon with in international seed domain.

Mission of AICRP-NSP (Crops)

To ameliorate Seed Replacement Rate (SRR) and Varietal Replacement Rate (VRR) through production of adequate quantity of breeder seed and to develop region specific seed technologies for improved yield and production.

Mandate of AICRP-NSP (Crops)

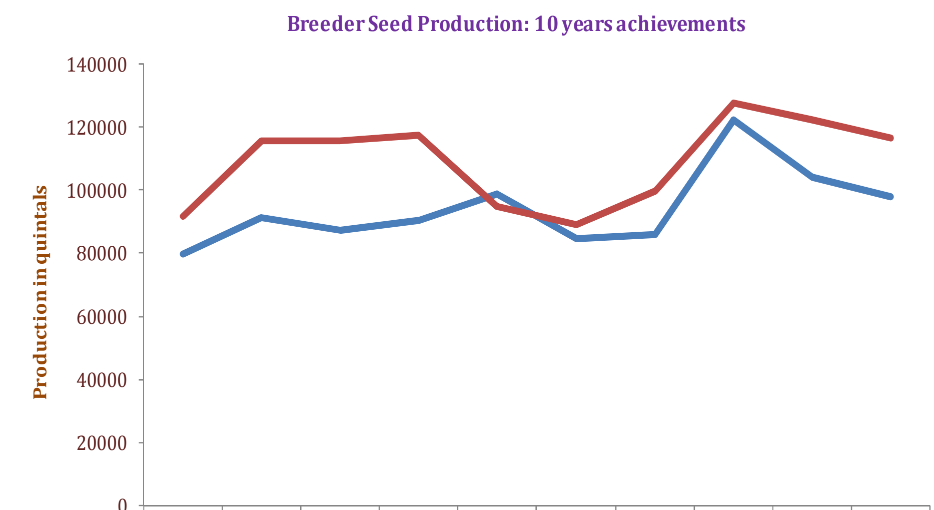
1. To produce adequate quantity of nucleus and breeder seed as per national requirements.
2. To conduct, coordinate and monitor research on different aspects of seed science and technology.
3. To generate basic information on seed certification standards including seed health.
4. To disseminate information and impart training on seed production, processing, storage & packaging, quality control and seed health.
5. To make linkages with crop improvement projects, seed industries, seed certification agencies, NGOs / KGK / KVK *etc*.

Breeder seed production

During the year 2017-18, total breeder seed production in various field crops was 116799.03q against the indent of 98048.37q (Fig. 1). Production comprises of 73304.88q against the GoI indent of 65307.55q, 25781.83q against the state indent of 23900.65q, 7136.16q under pulses seed hub against the target of 3679.52q and 10576.16q under ICAR Seed Project against the target of 5160.65q, apart from marginal shortfall in few varieties due to climate vagaries the major requirement has been met as per indents in varied crops. Whereas, with respect to *Rabi* 2017-18, expected breeder seed production figures were used for aforementioned compilation. Perusal of statistics clearly suggests that the present level of breeder seed production is exceeding the national requirement and is sufficient to produce required amount of certified seed for realizing the targeted SRR in varied crops.

Thrust areas in Breeder Seed Production

- Production of adequate quantities of breeder seed as per national requirement.
- Quality maintenance of nucleus and breeder seeds by employing dynamic maintenance breeding and rapid genetic purity testing tools.
- Identification of suitable provenance for offseason seed production to compensate the effects of changing climate.
- Networking for development of national database of DNA profiles for varietal identification.
- Effectively ensure and monitor generation system of seed multiplication at national level through bar code and QR coding module.
- Harnessing the potential of rice fallows for seed production of oilseed and pulses.
- Identification of suitable seed provenance for institution of 'National Seed Reserves'
    a. Soybean- Maharashtra and Madhya Pradesh
    b. Groundnut- Gujarat and Andhra Pradesh
    c. Chickpea- Madhya Pradesh, Maharashtra and Andhra Pradesh
    d. Pigeonpea- Karnataka and Andhra Pradesh and
    e. Lentil- Madhya Pradesh



	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Indent	79913	91410	87215	90577	98799	84789	86292	122160	104046	98048
Production	91883	115867	115696	117827	95012	89266	100075	127823	122617	116799

Fig. 1: Breeder Seed of field crops produced during 2008-09 to 2017-18

Thrust areas in Seed Technology Research

a. Seed Production and certification

- Identification of suitable alternative areas/ provenances for seed production in a bid to counter the effects of climate change.
- Development and optimization of climate resilient seed production technology.
- Harmonization of seed standards in tune to the needs of global seed certification standards.
- Optimization of micro-nutrients and growth regulators in relation to reproductive behaviour to augment the seed yield.
- Developing alternative methods (self-incompatibility & apomixes systems) for hybrid seed production in a bid to exploit heterosis.
- Standardization of sieve sizes and processing methodology for different crop varieties / parental lines.
- Bringing mechanization in seed production to march towards precision farming.

b. Seed Physiology, Testing and Storage

- Validation/up-gradation of field and seed standards/protocols, isolation distance, sample size, physical purity and ODV's in varied crops.
- Standardization of seed testing procedures in field, vegetable, medicinal and green manure crops.
- Standardization of DNA finger printing/molecular markers tools to supplement GOT.
- Use of second and third generation tools for seed quality enhancement.
- Identification of seed vigour traits as a sensitive measure of seed quality in major crops.
- Identification of suitable seed treatments / materials / methods for safe storage of seed.

c. Seed Pathology

- Identification of disease free zones for quality seed production.
- Development of rapid and reliable techniques for detection, identification and screening of seed materials for different seed borne diseases.
- Development of integrated strategies for management of seed borne diseases.
- Development of field and seed standards for seed borne diseases and strengthening of work on biological control of seed borne diseases.
- Revisiting of field and seed standards for seed-borne diseases.
- Monitoring, detection, and management of new seed borne diseases.

d. Seed Entomology

- Pest risk analysis for efficient management of insect pests under seed storage.
- Evaluation of new insecticide molecules for management of storage insects.
- Development of integrated management strategies for management of storage insects.
- Management of insect pollinators for increasing pollination efficiency and seed set.
- Determining the efficacy of novel packaging material with new chemistry for management of storage insects.

Impact

- Surplus availability of breeder seed with appropriate technological framework
- Availability of quality seed at farmers doorstep
- Increased Seed Replacement Rate (SRR) & Varietal Replacement Rate (VRR) for varied crops
- Enhanced crop productivity
- In raising availability and access of food grains and providing food and nutritional security through seed security
- Increased monetary returns to the farmers *vis-a-vis* farm income.

Linkages:

Linkages of AICRP-NSP (Crops) with other esteemed organizations/ institutes engaged in seed research both in public and private sectors has helped to address the quality seed production, availability and research issues at local, regional, zonal and national level, which in turn facilitated strong and meaningful basic, applied and anticipatory research to support the national strategic seed research plans.

- AICRPs of Field/ Horticultural Crops
- State Agricultural Universities
- ICAR Institutes
- Seed Division of DAC&FW, GOI
- Seed industries of both public and private sector
- National & State Seed Corporations
- Seed Certification Agencies
- PPV and FR Authority

Seed Technology Research Highlights during 2017-18

Research Highlights of experiments conducted in different disciplines / divisions *viz.,* Seed Production & Certification; Seed Physiology, Storage and Testing; Seed Pathology and Seed Entomology under AICRP-NSP (Crops) STR component during 2017-18 at varied cooperating centers are given below:

A. Seed Production and Certification

- Investigations on standardization of isolation distance for hybrid seed production in wheat was undertaken by JNKVV, Jabalpur. It was recorded that pollen flow from contaminator line (red glumed) resulting in seed set on tester line (white glumed) was up to 8m on west and north side and up to 6 m on east side. Hence, eight meters of isolation distance is recommended for wheat hybrid seed production.
- The effect of various pre-sowing treatments on seed quality, health, yield and storability was studied in three crops *viz*., kabuli chickpea, peas and lentil.
    1. In chickpea, the experiment was conducted in six locations, among all seed priming treatments, T_6 (Seed priming with sodium molybdate @ 500 ppm + seed coating with T. harzianum @ 15g/kg seed) was found superior. Pooled analysis suggest that, in T_6 there was significant enhancement in seed yield (q/ha) (32%), germination (9.6%) and vigour index I (44%) over control. The average superiority *w.r.t.* seed yield (q/ha) ranged from 19.3% to 53.4%.
    2. In fieldpea, the experiment was conducted at three locations (JNKVV, Jabalpur; NDUAT, Faizabad & CSAUAT, Kanpur), among all the seed priming treatment combinations, seed priming with sodium molybdate @ 500 ppm + seed coating with *T. harzianum* @ 15 g/kg seed found statistically superior for germination (96.0%), no. of nodules/plant (46.7), vigour index I (5421), no. of pods/plant (24.5) and seed yield (15.0 q/ha) as compared to check and other treatments recording respective increase of 4.3, 49.9, 22.7, 55.8 and 58.9% over control.
    3. In Lentil, pooled analysis of three locations indicated that among all the seed priming treatment combinations, seed priming with sodium molybdate @ 500 ppm + seed coating with *T. harzianum* @ 15 g/kg seed found superior for germination (90.6%), no. of nodules/plant (16), vigour index I (2029), no of pods/plant (82.2) and seed yield (17.1 q/ha) as compared to check and other treatments, enhancement of 11.1, 99.2, 28.4, 62.7 and 36.9% *w.r.t.* referred traits, was noticed over control. The average superiority over locations for the treatment ranged 30.04% to 41.9% *w.r.t* to seed yield (q/ha).
- Experiment on standardization of seed production technology in green manure crops revealed that
    1. In Dhaincha (*Sesbania aculeata*), experiment was conducted at 11 locations, pooled analysis revealed that pinching of terminal buds at 60 DAS along with foliar spray of DAP 2% + MN Mixture (Zn+B) + NAA @ 40ppm at initiation of flowering and at the end of flowering was found superior across 08 locations. Statistically superior enhancement in seed yield (kg/ha) (10%), no. of pods per plant (13.5%), no. of seeds per pod (15.7%) and germination (3.6%) was observed in referred treatment over control.

2. In sunhemp (*Crotolaria juncea*), average of six locations showed that, pinching of terminal buds during attainment of a plant height of 90 cm along with foliar spray of DAP 2% + MN Mixture (Zn+B) + NAA @ 40ppm at initiation of flowering was found to be statistically superior for no. of pods/plant (148.7), seed yield (14.9q/ha) and germination (90.5%), registering 34.3, 42.8 and 5.4 % increase, respectively in referred characters over control.
3. In Pillipesara (*Vigna trilobata*), experiment was carried out at 05 locations, among three locations, foliar application of DAP 2% + MN Mixture (Zn+B) + NAA @ 40ppm at flowering with pinching (at 40 and 60 DAS) was found superior. Pooled analysis of the data over locations revealed that above referred treatment leads to enhancement in seed yield (q/ha) (24.9%), germination (8.9%), no. of pods per plant (12.1%) and no. of seeds per pod (31.0%) over control.

- Experimentation on integrated approach for enhancing seed yield and quality in various millets elucidated:
  1. In Foxtail millet (*Sataria italica*), the experiment was conducted at three locations. Among all the treatment combinations, seed priming with 20 % liquid *Pseudomonas fluoresces* and application of 125 kg Neem + 1250 kg Vermicompost (or) 12.5 tons FYM/ha + 50 kg urea + 50 kg super phosphate and 50 kg muriate of potash per ha + top dressing urea at 3-4 weeks after transplanting + 2% Borax spray was found superior and uniformly better in all the three locations. Pooled analysis of data over the locations revealed that the applying the treatment resulted in increase of 13.7% increase in seed yield/ha, 3% increase in seed germination & 20.2% increase in vigour index over control. The range of increase in seed yield/ha due to better treatment was 12% in ANGRAU, Guntur and 43.2% in TNAU, Coimbatore over control.
  2. In Kodomillet (*Paspalum scrobiculatum*), the experiment was conducted at three centers. seed priming with 20 % liquid *Pseudomonas fluoresces* and application of 125 kg Neem + 1250 kg Vermicompost (or) 12.5 tons FYM/ha + 50 kg urea + 50 kg super phosphate and 50 kg muriate of potash per ha + top dressing urea at 3-4 weeks after transplanting + 2% Borax spray was found superior and uniformly better, among all the treatment combinations, in all the three locations. Pooled analysis of data over the locations revealed that the treatment has produced 28.6% increase in seed yield/ha, 7.2% increase in germination percentage and 12.4% increase in vigour index over control. The range of increase in seed yield/ha due to better treatment was 32% in TNAU, Coimbatore and 68.4% in JNKVV, Jabalpur over control.
  3. In Prosomillet *(Panicum miliaceum),* the experiment was conducted in one location. Among all the treatment combinations seed priming with 20 % liquid *Pseudomonas fluoresces* and application of 125 kg Neem + 1250 kg Vermicompost (or) 12.5 tons FYM/ha + 50 kg urea + 50 kg super phosphate and 50 kg muriate of potash per ha + Top dressing urea at 3-4 weeks after transplanting + 2% Borax spray was found better as compared to other treatments. The increase in seed yield/ha, germination and vigour index was 133.5, 14.6 and 64.2%, respectively over control.
- Experiment to identify the best planting date for off season soybean seed production was conducted at six locations/centres of the country and best planting dates for different varieties in their location were as follows.

Centre	Varieties used	Window Period	Best window Period/ planting date

		(Months)	(weeks)
UAS, Dharwad	DB 21	Oct. to Jan.	November 1st -4th weeks
UAS, Bangalore	JS 335	Nov. to Jan.	December Ist week
MAU, Parbhani	MAUS 162	Oct. to Jan.	November 1st -4th weeks
PJTSAU, Hyderabad	JS 335	Oct. to Jan.	September 3rd -4th weeks
JNKVV, Jabalpur	JS 20-34, JS 95-60, JS 20-29	Nov. to Jan.	December 3rd -4th weeks
MPKV, Rahuri	JS 335	Sept. to Jan.	January 3rd week

- Efficacy of hydrogels on seed yield and quality in wheat was studied in two centres and found that hydrogels (Herbal and Pusa hydrogel) were not effective for enhancing plant establishment, plant growth and yield under restricted moisture and skip irrigation conditions.
- Studies have been initiated on reduction of seed requirement in soybean with an aim to reduce the infestation of insect & disease and to study the effect of less plant population on yield. The experiment was conducted at eight centres. The study includes characterization of yield and yield related traits by reducing the seed rate in early and medium maturing soybean varieties. The study conducted reveals that with the reduced seed rate of 50-60kg/ha, there is a reduction in seed yield. In medium maturing varieties, number of pods/plant increased by 7.2% by the application of seed rate at 50 kg/ha as compared to recommended seed rate (70 kg/ha) but there is decrease in yield up to 13.7%. Even though there is decrease in plant population, it is compensated by the increase in number of pods/plant. In case of early maturing varieties, the number of pods per plant increased by 17.9% and there was a decrease in yield up to 13.8% as compared to recommended seed rate (70 kg/ha).

Parameters	Early maturity varieties	Medium maturity varieties
Seed yield/ ha	13.83% decrease	13.74% decrease
100 seed weight	0.3% increase	1.9% decrease
No. of pods/plant	17.92% increase	7.23% increase

Under seed processing, optimum sieve size and type of screen for grading seeds of different crop varieties and hybrids including their parents were investigated.

- Seeds of rice variety Co51 retained with BSS 8 and BSS 9 sieves put together resulted in the seed recovery of 91.7 percent (BSS 8 – 13.1 percent and BSS 9 - 78.6 percent) processed seeds of the taken seed lot. Hence, BSS 8 sieve can be used as top sieve and BSS 9 sieve can be used as bottom screen. For manual sieving with single screen, BSS 9 sieve can be used.
- Seeds of pigeon pea variety BRG-5 could be graded by using sieve size of 5.00mm (r) in order to get satisfactory seed recovery (90.31%) and quality parameters.
- Seeds of field bean cv. HA-4 could be graded by using sieve size 6.5 mm (r) in order to get satisfactory seed recovery (90.87%) and quality parameters.
- Sieve size of 3.2 (s) mm was effective for soybean variety JS 93-05 since it recorded highest seed recovery (94.57%) against recommended sieve size (4.00 mm) (s).
- Optimum sieve size for seed grading for mustard varieties *viz.,* Varuna, Maya, Rohini and Kanti was found to be 1.2 mm (r) with maximum seed recovery of 93.75 to 97.13% of processed seed than against recommended 1.7 mm (r) sieve size (88 to 90%).

B. Seed Physiology, Storage and Testing

- Investigation was conducted in 07 crops viz., wheat, rice, maize, sorghum, cotton, soybean and chickpea to discern the suitability of leftover seeds for revalidation under seed certification system
  1. In wheat, experiment was conducted at 08 locations revealed that; fresh and 9 months old (RVD I) seed lots maintained germination in the range of 95.3% to 96.0% & 88.5% to 90.6% (above IMSCS) respectively, while 12 months old seed lot (RVD II) exhibited lower germination (81.8% to 82.3%, below IMSCS). Similarly significant reduction in vigour index II was observed in RVD II seed lots in comparison to fresh seed lots (reduction of 32.7% as compared to fresh seed lot).
  2. Investigation carried out at 08 locations in paddy suggested that; fresh, RVD I & RVD II seed lots successfully maintained germination above IMSCS (mean germination of fresh- 95.8%, RVD I- 92.0% & RVD II- 90.8%). Mean radicle emergence at 72 h ($25^{O}C$) among fresh, RVD I & RVD II ranged from 83.5% to 93.5% (10.7% reduction observed in RVD II lots compared to fresh seed lots).
  3. Revalidation studies in maize conducted at three centres revealed, germination of fresh and RVD I seed lots were in the range of 97.0% to 99.0% & 90.0% to 92.0%, respectively. However, RVD II seed lots failed to maintain germination above IMSCS. Field emergence was also significantly reduced in RVD II seed lots as compared to control (reduction of 18.4% was observed over fresh seed lots).
  4. In sorghum, perusal of experimental details revealed that, germination among fresh, RVD I and RVD II seed lots were well above IMSCS (fresh- 97.0%, RVD I- 86.0%, RVD II- 76.0%). However there was a significant reduction in germination percentage of RVD II seed lots (21.6% reduction over fresh seed lot). Similarly field emergence of RVD II was also significantly reduced as compared to fresh seed lots suggesting loss of seed vigour during storage (30.5% reduction).
- Investigations on identification and validation of cultivar specific SSR markers among field crops revealed that, in rice, SSR marker RM 228 exhibited unique banding pattern for DRRH 3 hybrid from rest of 23 major paddy hybrids and its parental lines in seed chain. RM 70 was found to be unique for CTH 3 and RM 6696, RM 1912 & RM 3323 presented specific allelic pattern for CTH 1. SSR marker RM 9a3 was identified as molecular ID for MAS 26. In addition, RM 55, RM 433, RM 472, RM 525 & RM 3805 were found to be unique to varieties PTB 44 (Resmi), PTB 54 (Karuna), PTB 43 (Swarnaprabha), PTB 30 (Chuvannamodan) and PTB 43 (Swarnaprabha), respectively.
- In an attempt to develop seed priming technology in pigeonpea, chickpea and rice, preliminary investigations suggest that;
  1. At ICAR-IARI, New Delhi, soaking of pigeonpea seeds (cv. Pusa 991) for 11 h at $25^{0}C$ under 60% available water exhibited significantly superior germination (84.2%) and vigour index II (1.96), enhancement of 2.04% and 12.8% in germination and VI II, respectively was observed over control (100% water availability). While halo-primed seeds (NaCl + $CaCl_2$ @ 6 dSm^{-1} for 8 h at $25^{0}C$) presented significantly superior vigour indices (VI I- 1654 & VI II- 6.7) under various salt stress conditions (2, 4, 6, 8, 9, 10 & 12 dSm^{-1}), superiority was observed in seed halo-priming with NaCl + $CaCl_2$ @ 6 dSm^{-1} for 8 h at $25^{0}C$ over other treatments and durations.

2. In AAU, Jorhat, among eight seed priming treatments in paddy, seed hydration for 8 h exhibited significantly superior field emergence compared to check (6.62% higher emergence observed), while rest of seed quality parameters (root & shoot length), yield & yield attributing traits (no. of tillers/plant, plant height, no. of panicle/plant, seed yield) showed non-significant responses. Seed priming with *T. harzianum* @ 1.5% with 10% reduced seed rate (T_2), exhibited superiority *w.r.t.* harvest index (0.38) in comparison to control (5.26% increase over control) and also exhibited numerical superiority among other traits over rest of the treatments.

- Experiment initiated to investigate the effect of nanoparticles (NPs) in enhancing seed quality and storability in pigeonpea at two locations (TNAU, Coimbatore & UAS, Bengaluru) revealed that;

1. At TNAU, Coimbatore; among various dosage levels of ZnO, Ag and SiO_2 NPs, seed treatment with ZnO NPs @ 500 ppm and 750 ppm exhibited superiority. Significant enhancement of germination & vigour index I was observed in seed treatment with ZnO NPs @ 500 ppm over control i.e. 92.0% (6.5% increase) and 1943 (11.2% increase), respectively. Similarly, ZnO NPs @ 750 ppm also exhibited significantly superior results over control (5.5% & 8.1% enhancement in germination & VI I, respectively).
2. In pigeonpea cv. BRG 2 at UAS, Bengaluru; among various dosages of ZnO, Ag and SiO_2 NPs, seed treatment with SiO_2 NPs @ 100 ppm and 250 ppm recorded superiority. Storage study suggested that, SiO_2 NPs @ 100 ppm and 250 ppm maintained germination at 91.0% and 92.0%, respectively up to 7 months, while control recorded only 84.0% (superiority in the range of 7.7 to 8.7% over control). Similar results were observed *w.r.t.* other seed quality parameters and electrical conductivity (11.9 µS/cm/g seed lesser than control).

- Investigations conducted to study the effect of terminal heat stress on seed set, yield & quality and its mitigation through foliar sprays of plant growth promoting hormones at anthesis suggested that;

1. In wheat, experiment was conducted at nine locations; pooled analysis suggested that, mean pollen viability (%), seed set (%), seed yield (q/ha) and germination (%) during 2nd DOS (elevated temperature upto 4-5^{O}C increase at anthesis stage i.e. first fortnight of December); mean pollen viability (%), seed set (%), seed yield (q/ha) and germination (%) in treatment (foliar spray of glycine betaine @ 600 ppm at anthesis) were 91.3%, 83.5%, 41.3 q/ha and 91.7%; which were 4.6%, 7.2%, 11.6% and 8.0% higher than control, respectively suggesting that glycine betaine @ 600 ppm may be used for mitigating the terminal heat stress in wheat.
2. Investigation conducted in sorghum cv. CSH 14 at PDKV, Akola revealed that; during 1st DOS (first fortnight of July), foliar spray of salicylic acid @ 400 ppm at anthesis stage significantly enhanced seed set (84.9%), seed yield (23.1 q/ha) and germination (87.2%); which was 3.5%, 13.2% and 4.2% higher over control, respectively.
3. Studies in paddy at TNAU, Coimbatore revealed that, foliar spray of ascorbic acid @ 10 ppm at anthesis stage recorded significant difference over control *w.r.t.* total no. of spikelet per panicle (298.0), seed filling (96.0%) & 1000 seed weight (16.9 g) exhibiting superiority of 4.7%, 12.5% & 5.3% in referred characters over control respectively under normal sowing conditions. Similarly under sowing at elevated temperature of 4 ^{O}C (elevated temperature chamber), foliar spray of ascorbic acid @ 10 ppm at anthesis stage

presented statistical superiority for total no. of spikelet per panicle (274.0), seed filling (90.0%) & 1000 seed weight (17.1 g) exhibiting 5.8%, 13.3% & 9.7% superiority over control, respectively.

- Seed priming techniques in crops *viz*. wheat, pearlmillet, sorghum and chickpea were demonstrated at famers' field during 2017-18. In *toto*, 16 demonstrations of seed priming technology were organized and farmers were convinced upon low cost technological intervention for maximizing grain yield. The average increment in grain yield through seed priming was 5.8% (wheat), 5.3% (pearlmillet) and 18.3% (sorghum) achieved over control.

C. Seed Pathology

- Monitoring of false smut disease was made in 1241 farmer's fields and 411 seed production plots in different districts spread across 15 states & 02 UT's of India indicated that the disease was present in varying degree of infection on scale of 1-3 in almost all the places. Incidence of false smut was quite low in seed production plots due to prophylactic measures adopted therein. In Haryana, HKR 127 and Govind varieties have shown the resistant reaction. Whereas, at Faizabad, disease was noticed in the scale of 1- 7 (BPT 5204 variety exhibited the highest intensity in Scale 7).
- Under the experiment on 'monitoring of emerging new diseases of seed borne nature', TNAU, Coimbatore has identified rice bunt pathogen associated with rice seeds of Co50 and ADT(R) 46 collected during 2015-16 and 2016-17, as *Telletia sumatii*, based upon the morphological characteristics.
- Seed health tests on tomato hybrids, purchased by the farmers from different private sector companies revealed the association of a bacterial pathogen, *Clavibacter michiganense* pv. *michiganense*. The bacterial pathogen has also been noticed and isolated from the infected fruits of the badly infected fields in Uttarakhand state.
- Investigations on analysis of seed health status of farmers-saved-seeds in wheat (2329 samples tested) in seven centres/states covering 54 districts re-indicated the alarming association of Karnal bunt (*Tilletia indica*) of wheat in Punjab (62.7% samples infected in the range of 0.1- 0.25%), Haryana (59.1% samples infected in the range of 0.05-1.2% resulted in rejection of 17.4% seed samples, which are above the prescribed limit of 0.25%) and Himachal Pradesh (30.4% seed samples were infected & 21.7% samples were infected more than the prescribed limit). Whereas, in Uttarakhand, 4% of the 982 samples tested had infection and only 5 samples had infection more than limit. However, Ear cockle has not been reported from any region.
- Standardization of detection methods for important seed borne pathogens were undertaken in 15 centres. Need based innovative modifications in standard blotter method (wetting of blotters with NaOH solution 0.6%) has been found superior for the detection of Mungbean and Urdbean seed associated *Macrophomina phaseolina, Fusarium oxysporum* and *Alternaria alternata.*
- PCR based detection technique using the specific primers with known sequence, developed by earlier workers were used and validated for the detection of chilli seed associated anthracnose fungus, *Colletotrichum truncatum* (Ccap F; Ccap R.); *Colletotrichum*

gloeosporioides (Cboncoll F; Cboncoll R.); *Colletotrichum coccodes* (Cco 1NF1; Cco2NR1) at HPKV, Palampur.

- Standardization of bio priming technique for management of fusarium wilt of safflower was done in MPKV, Rahuri. It was found that bio priming of safflower seeds with *Trichoderma harzianum* + *Pseudomonas fluorescens* @ 5 g each/kg of seed resulted in least association (11.0%) of *Fusarium carthamii* with enhanced seed germination (94.0%), emergence (89.0%), reduced wilt incidence (11.0%) and disease control over check (76.60%) as compared to 39.0% association, 78.0% germination , 75.0% emergence and 47.0% wilt incidence in control. Yield enhancement of 16.77% over check is recorded.
- Standardization of bio priming technique for management of *Alternaria helianthi* associated with sunflower seeds was undertaken in MPKV, Rahuri. It was observed that bio priming of sunflower seeds with *Trichoderma harzianum* + *Pseudomonas fluorescens* @ 5 g each/kg of seed resulted in least association (14.0%) of *Alternaria helianthi* with enhanced seed germination (81.0%), emergence (67.0%), reduced incidence of blight (44.0%) and disease control over check (45.0%) as compared to 46.33% association, 70.0% germination, 67.0% emergence and 80.0% incidence of blight. Yield enhancement of 22.42% over check is recorded, after two applications of Mancozeb (0.25%).
- Management of *Alternaria solani* in tomato crop through seed treatment and foliar application of new fungicides was taken up in 6 centres, basic seed treatment with Thiram @ 0.25% and later subsequent 2/3 foliar application of Azoxystrobin (a.i.-18.2%) + Difenconazole (a.i.-11.4%) @ 0.03% after first appearance of disease has been found most effective in two centres *viz.,* AAU, Anand and PAU, Ludhiana. While, the experiment is in progress in other centres. In AAU, Anand, minimum disease intensity (13.7%) was observed with the application of Azoxystrobin (18.2%) + Difenconazole (11.4%) @0.03%), as compared to check (41.2%). Maximum fruit yield (34612 Kg/ha) was also noticed in the same treatment as compared to untreated (20534 Kg/ha). While, in PAU, Ludhiana, minimum disease intensity of 9.7% was observed in Azoxystrobin (18.2%) + Difenconazole (11.4%) @0.03%) as compared to untreated check (21.2%).

D. Seed Entomology

- The survey was conducted in ten states and one union territory across the country and about 1954 farmers' saved seed samples were collected and analyzed for seed quality. The survey revealed that about 45.5% seed samples were infested with various storage pests, 40% seed samples possessed germination below IMSCS and about 33.2% samples exhibited insect damage beyond permissible limit, intensity of seed damage varied from 0.25-5.0%.
- Investigation conducted for development of modified atmospheric technique for seed storage at TNAU, Coimbatore, revealed that 50% CO_2 treatment provided effective protection against *Sitophilus sp*. in sorghum up to 12 months of storage. Insect damage in 12 months stored seeds was 0.46% in 50% CO_2 treatment (within the prescribed limit), while seed stored under ambient condition recorded 44.1% insect damage.
- Various botanicals *viz*. karanj oil @ 5 ml/kg seed, citronella oil @ 5 ml/kg seed and neem formulation (neemazal 10000ppm) @ 5 ml/kg seed were tested along with *Acorus calamus* TNAU formulation @ 10 ml/kg seed to evaluate the efficacy against major storage insect-

pests damaging seeds in wheat, paddy, chickpea, blackgram, field pea and cowpea. In most of the crops, *Acorus calamus* formulation recorded least insect damage and was on par with neem formulation. Hence, *Acorus calamus* formulation @ 10 ml/kg seed can be used for management of storage insects up to 3 months (range: 3-12 months) without affecting seed germination.

- Experiment conducted at 4 locations on management of groundnut pod borer during storage suggested that; emamectin benzoate @ 2 ppm (40mg/kg pod), spinosad @ 2 ppm (4.4mg/kg pod) and deltamethrin @ 1 ppm (0.04 ml/kg pod) were highly effective as they provided better protection up to 6-12 months of storage and maintained seed germination above IMSCS.
- Investigation to identify suitable insecticide for pre-harvest spraying for management of pulse beetle among pulses *viz*. greengram, blackgram, chickpea and pigeonpea revealed that; spraying of profenofos (50EC) @ 1ml/L and emamectin benzoate (5 SG) @ 0.3ml/L at 50% pod maturity and maturity stage were effective in controlling infestation at both field and storage conditions.
- New types of packaging material (insecticide incorporated polypropylene bag) i.e. 'Zerofly' bags were tested for storability of paddy, wheat, sunflower, greengram and chickpea seed. 'Zerofly' bags exhibited superiority in management of storage insect as compared to other packaging materials (insect damage-nil or within permissible limit as per IMSCS) up to 4 months (range: 4-12 months).

Capacity Building, Awards and Publications

During 2017-18, *in toto* 46 training programmes were organized for varied stakeholders of seed industry. Similarly, 40 exhibitions/ *kisan melas*, 27 seed day/ field day/ demonstration were organized on diverse themes related to seed by different cooperating centres across the country. Scientific staffs of AICRP-NSP (Crops) published 116 research papers in the varied journals of national and international repute and also received 33 awards/ recognitions for the contributions made in the seed domain.

S. No.	Centres	Training (No's)	Exhibition/ *kisan mela* (No's)	Seed day/ Field day/ FLD's (No's)	Research paper (No's)	Awards (No's)
1	SKUAST, Srinagar	8	2	4	18	2
2	HPKVV, Palampur	-	-	-	8	1
3	CCSHAU, Hisar	1	3	-	10	-
4	PAU, Ludhiana	-	14	-	8	-
5	GBPUAT, Pantnagar	3	2	-	5	3
6	NDUA&T, Faizabad	-	1	-	4	4
9	RPCAU, Pusa	-	1	-	3	-
11	SKNAU, Jobner	3	-	-	3	1
14	JAU, Jamnagar	-	6	-	5	-
17	JNKVV, Jabalpur	7	2	1	7	3

18	MPKV, Rahuri	1	1	1	-	-
19	VNMKV, Parbhani	-	-	-	5	-
20	PDKV, Akola	-	1	-	5	-
21	UAS, Bengaluru	3	1	6	16	5
22	UAS, Dharwad	5	2	2	6	1
25	TNAU, Coimbatore	5	2	10	11	9
27	BCKV, Mohanpur	-	-	-	-	2
29	PAJANCOA, Karaikal	1	1	2	1	-
31	ICAR-IARI, RS, Karnal	1	-	-	-	1
32	ICAR-CRIJAF, Barrackpore	2	1	1	1	1
33	ICAR-CICR, Nagpur	6	-	-	-	-
	Total	**46**	**40**	**27**	**116**	**33**

Monitoring

Monitoring Teams for different zones (Northern Zone I, Northern Zone II, Western Zone I, Western Zone II, Eastern Zone I, Eastern Zone II, Central Zone I, Central Zone II, North Eastern Zone, Southern Zone I and Southern Zone II) were constituted during the last workshop have visited different centres and the observations made by different monitoring teams have been presented (monitoring report section). Director, ICAR-IISS, Mau has also monitored the progress of BSP and conduct of the STR research activities by various centres during 2017-18.

Breeder Seed Production during 2017-18

During the year 2017-18, total breeder seed production in various field crops was 116799.03q against the indent of 98048.37q. Production comprises of 73304.88q against the GoI indent of 65307.55q, 25781.83q against the state indent of 23900.65q, 7136.16q under pulses seed hub against the target of 3679.52q and 10576.16q under ICAR Seed Project against the target of 5160.65q, apart from marginal shortfall in few varieties due to climate vagaries the major requirement has been met as per indents in varied crops. Whereas, with respect to *Rabi* 2017-18, expected breeder seed production figures were used for aforementioned compilation. Perusal of statistics clearly suggests that the present level of breeder seed production is exceeding the national requirement and is sufficient to produce required amount of certified seed for realizing the targeted SRR in varied crops.

Crop-wise Breeder Seed Production during 2017-18

Out of the total breeder seed produced, the major share belongs to cereal crops i.e., 60030.74q in which maximum breeder seed was produced for wheat (42573.05q) followed by paddy (15714.85q). Under pulse crops a total of 26011.04q breeder seed was produced out of which 15982.57q was alone contributed by chickpea followed by pigeonpea (5341.67q), mungbean (1834.58q), and urdbean (1170.53q). In oilseeds, total breeder seed production was 29302.45q; soybean and groundnut together have contributed to 28099.93q out of total breeder seed produced in oilseeds. Breeder seed produced in case of fiber crops was 162.65q against the indent of 110.36q in which, cotton had the major share of 130.88q. In case of forage crops, breeder seed production was 1292.15q against the indent of 1118.27q, out of which 642.55q alone was contributed from forage oats.

Conclusion

After reviewing the progress of breeder seed production of different centres, following conclusions were made;

1. Over the years, there has been significant improvement in production of breeder seed, execution of GOT to ensure purity and regarding utilization of revolving fund. Most of the centers are using molecular markers in addition to GOT to ensure genetic purity.
2. The value of total breeder seed production at the existing sale price is more than Rs.100 crore and is exceedingly adequate to produce sufficient quantity of quality seed through downstream seed multiplication chain to achieve the delineated SRR in field crops.
3. GBPUAT, Pantnagar; JNKVV, Jabalpur; UAS, Dharwad; IGKV, Raipur; VNMKV, Parbhani; UAS. Bengaluru and ICAR-NRRI, Cuttack were rated as very good performing centres. Special mention need to be made of GBPUAT, Pantnagar which has recorded highest cumulative profit.
4. All the centres have refunded the revolving fund amount. Few centres have invested the profit obtained through the operation of revolving funds for infrastructure development in their respective centres.

Table -1: Centre-wise and crop-wise information on breeder seed production during 2017-18

(in quintals)

Sl. No. Centre	Crop/Variety	GOI		State		Pulses Seed Hub		ICAR Seed Project		Total	
		Indent	Production	Indent	Production	Target	Production	Indent	Production	Indent	Production
State Agricultural Universities											
1. SKUA &T, Srinagar											
Cereal Crops	**Rice**										
	Jehlum	0.00	0.00	10.00	11.00	0.00	0.00	0.00	0.00	10.00	11.00
	Chenab	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
	Shalimar rice 3	0.00	0.00	3.95	6.85	0.00	0.00	0.00	0.00	3.95	6.85
	Total	**1.00**	**0.00**	**13.95**	**17.85**	**0.00**	**0.00**	**0.00**	**0.00**	**14.95**	**17.85**
	Wheat										
	Shalimar Wheat-1	0.00	0.00	4.00	4.00	0.00	0.00	0.00	0.00	4.00	4.00
	Shalimar Wheat-2	0.00	0.00	10.00	10.00	0.00	0.00	0.00	0.00	10.00	10.00
	Total	**0.00**	**0.00**	**14.00**	**14.00**	**0.00**	**0.00**	**0.00**	**0.00**	**14.00**	**14.00**
	Maize										
	Shalimar Maize Composite 4	0.00	0.00	5.00	5.25	0.00	0.00	0.00	0.00	5.00	5.25
	Shalimar Maize Composite 7	0.00	0.00	0.72	1.00	0.00	0.00	0.00	0.00	0.72	1.00
	Total	**0.00**	**0.00**	**5.72**	**6.25**	**0.00**	**0.00**	**0.00**	**0.00**	**5.72**	**6.25**
	Total Cereal Crops	**1.00**	**0.00**	**33.67**	**38.10**	**0.00**	**0.00**	**0.00**	**0.00**	**34.67**	**38.10**
Pulse Crops	**Cowpea**										
	Shalimar Cowpea 1	0.00	0.00	0.14	0.14	0.00	0.00	0.00	0.00	0.14	0.14
	Total	**0.00**	**0.00**	**0.14**	**0.14**	**0.00**	**0.00**	**0.00**	**0.00**	**0.14**	**0.14**
	Mung										
	Shalimar Mung 1	0.00	0.00	1.45	1.45	0.00	0.00	0.00	0.00	1.45	1.45
	Total	**0.00**	**0.00**	**1.45**	**1.45**	**0.00**	**0.00**	**0.00**	**0.00**	**1.45**	**1.45**
	Field Pea										
	Shalimar Pea-1	0.00	0.00	0.96	0.96	0.00	0.00	0.00	0.00	0.96	0.96
	Total	**0.00**	**0.00**	**0.96**	**0.96**	**0.00**	**0.00**	**0.00**	**0.00**	**0.96**	**0.96**
	Lentil										
	Shalimar Masoor-1	0.00	0.00	0.78	0.78	0.00	0.00	0.00	0.00	0.78	0.78
	Shalimar Masoor-2	0.00	0.00	0.26	0.26	0.00	0.00	0.00	0.00	0.26	0.26
	Total	**0.00**	**0.00**	**1.04**	**1.04**	**0.00**	**0.00**	**0.00**	**0.00**	**1.04**	**1.04**
	Total pulse crops	**0.00**	**0.00**	**3.59**	**3.59**	**0.00**	**0.00**	**0.00**	**0.00**	**3.59**	**3.59**
Oilseed Crops	**Brown Sarson**										

	KOS-1	0.00	0.00	1.35	1.35	0.00	0.00	0.00	0.00	1.35	1.35
	Shalimar Brown Sarson-1	0.00	0.00	0.25	0.25	0.00	0.00	0.00	0.00	0.25	0.25
	Total	**0.00**	**0.00**	**1.60**	**1.60**	**0.00**	**0.00**	**0.00**	**0.00**	**1.60**	**1.60**
	Total Oilseed Crops	**0.00**	**0.00**	**1.60**	**1.60**	**0.00**	**0.00**	**0.00**	**0.00**	**1.60**	**1.60**
Forage Crops	**Oat**										
	Sabzar	0.00	0.00	40.00	40.05	0.00	0.00	0.00	0.00	40.00	40.05
	Shalimar Fodder Oats-1	0.00	0.00	10.00	10.00	0.00	0.00	0.00	0.00	10.00	10.00
	Total	**0.00**	**0.00**	**50.00**	**50.05**	**0.00**	**0.00**	**0.00**	**0.00**	**50.00**	**50.05**
	Total Forage Crops	**0.00**	**0.00**	**50.00**	**50.05**	**0.00**	**0.00**	**0.00**	**0.00**	**50.00**	**50.05**
Grand Total (Srinagar)		**1.00**	**0.00**	**88.86**	**93.34**	**0.00**	**0.00**	**0.00**	**0.00**	**89.86**	**93.34**
2. SKUA &T, Jammu											
Cereal Crops	**Rice**										
	K448	0.00	0.00	1.00	1.65	0.00	0.00	0.00	0.00	1.00	1.65
	PR 113	0.00	0.00	1.00	1.50	0.00	0.00	0.00	0.00	1.00	1.50
	SJR 5	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.50
	Pusa 1612	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.60
	SJR 129	0.00	0.00	1.00	1.15	0.00	0.00	0.00	0.00	1.00	1.15
	Basmati 370	0.00	0.00	2.00	2.75	0.00	0.00	0.00	0.00	2.00	2.75
	Pusa 1121	0.00	0.00	1.00	1.25	0.00	0.00	0.00	0.00	1.00	1.25
	K 343	0.00	0.00	1.00	0.90	0.00	0.00	0.00	0.00	1.00	0.90
	K 39	0.00	0.00	0.50	0.45	0.00	0.00	0.00	0.00	0.50	0.45
	Total	**0.50**	**0.50**	**7.50**	**9.65**	**0.00**	**0.00**	**0.00**	**0.60**	**8.00**	**10.75**
	Wheat										
	WH 1105	0.00	0.00	18.00	25.00	0.00	0.00	0.00	0.00	18.00	25.00
	WH 1080	10.00	10.00	25.00	25.00	0.00	0.00	0.00	0.00	35.00	35.00
	VL 907	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	10.00
	HD 3086	0.00	0.00	25.00	40.00	0.00	0.00	0.00	0.00	25.00	40.00
	HPW 349	0.00	0.00	10.00	10.00	0.00	0.00	0.00	0.00	10.00	10.00
	HD 2967	100.00	0.00	25.00	0.00	0.00	0.00	0.00	0.00	125.00	0.00
	Total	**110.00**	**10.00**	**103.00**	**100.00**	**0.00**	**0.00**	**0.00**	**10.00**	**213.00**	**120.00**
	Total Cereal Crops	**110.50**	**10.50**	**110.50**	**109.65**	**0.00**	**0.00**	**0.00**	**10.60**	**221.00**	**130.75**
Oilseed Crops	**Toria**										
	RSPT 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.10
	RSPT 2	0.00	0.00	0.03	0.10	0.00	0.00	0.00	0.00	0.03	0.10
	RSPT 6	0.00	0.00	0.06	0.20	0.00	0.00	0.00	0.00	0.06	0.20

	Total	**0.00**	**0.00**	**0.09**	**0.30**	**0.00**	**0.00**	**0.00**	**0.10**	**0.09**	**0.40**
	Mustard										
	RSPR 01	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.40
	RSPR 03	0.00	0.00	0.03	0.50	0.00	0.00	0.00	0.00	0.03	0.50
	Total	**0.00**	**0.00**	**0.03**	**0.90**	**0.00**	**0.00**	**0.00**	**0.00**	**0.03**	**0.90**
	Gobhi Sarson										
	RSPR 03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.40
	DGS 1	0.00	0.00	0.05	0.40	0.00	0.00	0.00	0.00	0.05	0.40
	RSPN 25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.30
	Total	**0.00**	**0.00**	**0.05**	**0.40**	**0.00**	**0.00**	**0.00**	**0.70**	**0.05**	**1.10**
	Total Oilseed Crops	**0.00**	**0.00**	**0.17**	**1.60**	**0.00**	**0.00**	**0.00**	**0.80**	**0.17**	**2.40**
	Grand Total (Jammu)	**110.50**	**10.50**	**110.67**	**111.25**	**0.00**	**0.00**	**0.00**	**11.40**	**221.17**	**133.15**
3. CSKHPKV, Palampur											
Cereal Crops	**Rice**										
	HPR 2143	8.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	8.00
	HPR 1068	8.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	8.00
	HPR 1156	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00
	RP 2421	0.00	0.00	0.00	0.00	0.00	0.00	3.00	3.50	3.00	3.50
	Kasturi	0.00	0.00	0.00	0.00	0.00	0.00	10.00	12.90	10.00	12.90
	HPR 2720	0.00	0.00	2.00	2.00	0.00	0.00	0.00	0.00	2.00	2.00
	HPR 2612	2.00	2.00	0.00	0.00	0.00	0.00	5.00	4.90	7.00	6.90
	Pusa 1121	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.35	1.00	1.35
	HPR 2795	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.25	1.00	1.25
	HPR 2880	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.20	2.00	2.20
	Total	**23.00**	**23.00**	**2.00**	**2.00**	**0.00**	**0.00**	**22.00**	**26.10**	**47.00**	**51.10**
	Wheat										
	HPW 155	0.00	0.00	0.00	0.00	0.00	0.00	10.00	15.00	10.00	15.00
	HPW 236	0.00	0.00	0.00	0.00	0.00	0.00	50.00	75.00	50.00	75.00
	HPW 249	30.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	40.00
	VL 892	0.00	0.00	20.00	30.00	0.00	0.00	0.00	0.00	20.00	30.00
	HPW 349	65.00	75.00	0.00	0.00	0.00	0.00	0.00	0.00	65.00	75.00
	HPW 360	40.00	45.00	0.00	0.00	0.00	0.00	0.00	0.00	40.00	45.00
	HPW 368	0.00	0.00	40.00	40.00	0.00	0.00	25.00	30.00	65.00	70.00
	HS 507	0.00	0.00	30.00	35.00	0.00	0.00	0.00	0.00	30.00	35.00
	HS 542	0.00	0.00	30.00	35.00	0.00	0.00	0.00	0.00	30.00	35.00

	WH 1080	40.00	50.00	0.00	0.00	0.00	0.00	15.00	20.00	55.00	70.00
	DBW 88	0.00	0.00	0.00	0.00	0.00	0.00	30.00	40.00	30.00	40.00
	Total	**175.00**	**210.00**	**120.00**	**140.00**	**0.00**	**0.00**	**130.00**	**180.00**	**425.00**	**530.00**
	Barley										
	HBL 713	0.00	0.00	0.00	0.00	0.00	0.00	3.00	5.00	3.00	5.00
	HBL 113	0.00	0.00	0.00	0.00	0.00	0.00	1.00	2.00	1.00	2.00
	BHS 380	0.00	0.00	0.50	1.00	0.00	0.00	0.50	1.00	1.00	2.00
	HBL316	0.00	0.00	0.00	0.00	0.00	0.00	1.00	2.00	1.00	2.00
	HBL276	0.00	0.00	0.00	0.00	0.00	0.00	1.00	2.00	1.00	2.00
	HBL391	0.00	0.00	0.00	0.00	0.00	0.00	1.00	2.00	1.00	2.00
	BHS 400	0.00	0.00	0.50	1.00	0.00	0.00	0.50	1.00	1.00	2.00
	Total	**0.00**	**0.00**	**1.00**	**2.00**	**0.00**	**0.00**	**8.00**	**15.00**	**9.00**	**17.00**
	Maize										
	BajMakka	0.00	0.00	0.00	0.00	0.00	0.00	2.00	1.80	2.00	1.80
	Girija	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.50	2.00	2.50
	E. Comp	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.30	2.00	2.30
	BajPopcorn	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.50	0.40	0.50
	Baby Corn	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.25	0.40	0.25
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**6.80**	**7.35**	**6.80**	**7.35**
	Total Cereal Crops	**198.00**	**233.00**	**123.00**	**144.00**	**0.00**	**0.00**	**166.80**	**228.45**	**487.80**	**605.45**
Pulse Crops	**Urd**										
	Palam 93	2.00	2.00	0.00	0.00	0.00	0.00	3.00	2.92	5.00	4.92
	Him Mash1	0.00	0.00	0.00	0.00	0.00	0.00	15.00	16.00	15.00	16.00
	UG 218	0.00	0.00	0.00	0.00	0.00	0.00	3.00	3.68	3.00	3.68
	Uttera	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.23	0.10	0.23
	Kullu 4	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.40	0.50	0.40
	Pant U 19	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.06	0.10	0.06
	Total	**2.00**	**2.00**	**0.00**	**0.00**	**0.00**	**0.00**	**21.70**	**23.29**	**23.70**	**25.29**
	Mung										
	Suketi	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.50
	Total	**0.50**	**0.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.50**	**0.50**
	Rajmash										
	Him 1	0.00	0.00	2.00	2.52	0.00	0.00	0.00	0.00	2.00	2.52
	Kanchan	0.00	0.00	1.00	1.31	0.00	0.00	0.00	0.00	1.00	1.31
	Jwala	0.00	0.00	2.00	1.80	0.00	0.00	0.00	0.00	2.00	1.80

	Baspa	0.00	0.00	7.00	7.00	0.00	0.00	2.00	2.00	9.00	9.00
	Kailash	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.20	0.15	0.20
	Triloki	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.30	0.15	0.30
	Total	**0.00**	**0.00**	**12.00**	**12.63**	**0.00**	**0.00**	**2.30**	**2.50**	**14.30**	**15.13**
	Cowpea										
	C475	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.2	0.15	0.20
	C519	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.12	0.15	0.12
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.30**	**0.32**	**0.30**	**0.32**
	Kulthi										
	HPK 4	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.70	0.50	0.70
	VLG 1	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.06	0.15	0.06
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.65**	**0.76**	**0.65**	**0.76**
	Chickpea										
	HC 2	0.00	0.00	10.00	12.00	0.00	0.00	0.00	0.00	10.00	12.00
	HC 1	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.20	0.20	0.20
	GPF 2	0.00	0.00	10.00	12.00	0.00	0.00	0.00	0.00	10.00	12.00
	HPG 17	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.50	1.00	1.50
	Total	**0.00**	**0.00**	**20.00**	**24.00**	**0.00**	**0.00**	**1.20**	**1.70**	**21.20**	**25.70**
	Lentil										
	Vipasha	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.50	2.00	2.50
	Markandey	0.00	0.00	1.00	1.50	0.00	0.00	0.00	0.00	1.00	1.50
	Total	**0.00**	**0.00**	**1.00**	**1.50**	**0.00**	**0.00**	**2.00**	**2.50**	**3.00**	**4.00**
	Total Pulse Crops	**2.50**	**2.50**	**33.00**	**38.13**	**0.00**	**0.00**	**28.15**	**31.07**	**63.65**	**71.70**
Oilseed Crops	**Soybean**										
	Himso 1588	0.00	0.00	0.00	0.00	0.00	0.00	5.00	6.00	5.00	6.00
	Shivalik	0.00	0.00	2.00	2.80	0.00	0.00	12.00	15.00	14.00	17.80
	Palam	0.00	0.00	1.00	1.00	0.00	0.00	5.00	6.00	6.00	7.00
	Hara Soya	2.00	2.00	0.00	0.00	0.00	0.00	1.00	1.35	3.00	3.35
	Total	**2.00**	**2.00**	**3.00**	**3.80**	**0.00**	**0.00**	**23.00**	**28.35**	**28.00**	**34.15**
	Sesamum										
	LTK 4	0.05	0.10	0.00	0.00	0.00	0.00	3.00	2.90	3.05	3.00
	Total	**0.05**	**0.10**	**0.00**	**0.00**	**0.00**	**0.00**	**3.00**	**2.90**	**3.05**	**3.00**
	Linseed										
	Nagarkot	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.20	0.10	0.20
	Binwa	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.50	0.40	0.50

	Baner	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.60	0.40	0.60
	Himani	0.00	0.00	0.10	0.20	0.00	0.00	0.20	0.25	0.30	0.45
	Him Alsi 1	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.50	0.40	0.50
	Him Alsi 2	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.50	0.40	0.50
	Bhagsu	0.00	0.00	0.10	0.20	0.00	0.00	0.00	0.00	0.10	0.20
	Surbhi (KL1)	1.50	2.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	2.00
	Total	**1.50**	**2.00**	**0.20**	**0.40**	**0.00**	**0.00**	**1.90**	**2.55**	**3.60**	**4.95**
	B Sarson										
	KBS 3	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.15	0.10	0.15
	HPBS 1	0.00	0.00	0.15	0.30	0.00	0.00	0.00	0.00	0.15	0.30
	BSH 1	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.15	0.10	0.15
	Total	**0.00**	**0.00**	**0.15**	**0.30**	**0.00**	**0.00**	**0.20**	**0.30**	**0.35**	**0.60**
	G Sarson										
	ONK 1	0.00	0.00	0.10	0.20	0.00	0.00	0.00	0.00	0.10	0.20
	Neelam	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.20	0.15	0.20
	Him Sarson1	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.20	0.15	0.20
	GSC7	0.00	0.00	0.10	0.20	0.00	0.00	0.00	0.00	0.10	0.20
	Total	**0.00**	**0.00**	**0.20**	**0.40**	**0.00**	**0.00**	**0.30**	**0.40**	**0.50**	**0.80**
	Toria										
	Bhawani	0.00	0.00	0.50	1.00	0.00	0.00	0.00	0.00	0.50	1.00
	Total	**0.00**	**0.00**	**0.50**	**1.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.50**	**1.00**
	Karan Rai										
	Jayanti	0.00	0.00	0.05	0.10	0.00	0.00	0.00	0.00	0.05	0.10
	Total	**0.00**	**0.00**	**0.05**	**0.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.05**	**0.10**
	Raya										
	RCC 4	0.00	0.00	0.05	0.10	0.00	0.00	0.00	0.00	0.05	0.10
	Total	**0.00**	**0.00**	**0.05**	**0.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.05**	**0.10**
	Total Oilseed Crops	**3.55**	**4.10**	**4.15**	**6.10**	**0.00**	**0.00**	**28.40**	**34.50**	**36.10**	**44.70**
Forage Crops	**Oats**										
	Plp1	0.00	0.00	0.00	0.00	0.00	0.00	20.00	30.00	20.00	30.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**20.00**	**30.00**	**20.00**	**30.00**
	W. Clover										
	Plp.Comp.	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.20	0.10	0.20
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.20**	**0.10**	**0.20**
	Total Fodder Crops	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**20.10**	**30.20**	**20.10**	**30.20**

Grand Total (Palampur)		**204.05**	**239.60**	**160.15**	**188.23**	**0.00**	**0.00**	**243.45**	**324.22**	**607.65**	**752.05**
4. PAU, Ludhiana											
Cereal Crops	**Rice**										
	PR 111	8.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	15.00
	PR 113	10.00	11.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	11.00
	PR 114	24.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	24.00	40.00
	PR 116	3.50	5.00	0.00	0.00	0.00	0.00	0.00	0.00	3.50	5.00
	PR 118	18.00	26.00	0.00	0.00	0.00	0.00	0.00	0.00	18.00	26.00
	PR 121	38.00	56.00	0.00	0.00	0.00	0.00	0.00	0.00	38.00	56.00
	PR 122	21.00	30.00	0.00	0.00	0.00	0.00	0.00	0.00	21.00	30.00
	PR 123	3.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	5.00
	PR 124	18.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00	18.00	25.00
	PAU 201	5.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	7.00
	PR 126	40.00	60.00	0.00	0.00	0.00	0.00	0.00	0.00	40.00	60.00
	Pb Bas 2	0.10	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	1.00
	Pb Bas 4	0.05	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	1.00
	Pb Bas 5	0.05	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	1.00
	Pusa 1121	0.00	0.00	10.00	10.00	0.00	0.00	0.00	0.00	10.00	10.00
	Pb Bas 3	0.20	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	1.00
	Total	**188.90**	**284.00**	**10.00**	**10.00**	**0.00**	**0.00**	**0.00**	**0.00**	**198.90**	**294.00**
	Maize										
	CM 139	0.12	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	1.00
	CM 140	0.20	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.20	1.50
	LM 13	4.00	6.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	6.00
	LM 14	2.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	3.00
	LM 15	0.12	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.30
	LM 16	0.06	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.25
	LM 17	0.06	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.40
	LM 18	0.12	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.40
	LM 19	0.06	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.30
	LM 20	0.06	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.24
	LM 23	3.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	4.00
	LM 24	1.50	2.50	0.00	0.00	0.00	0.00	0.00	0.00	1.50	2.50
	Total	**11.30**	**19.89**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**11.30**	**19.89**
	Wheat										

	PBW 343	242.28	70.00	0.00	0.00	0.00	0.00	0.00	0.00	242.28	70.00
	PBW 373	22.00	23.00	0.00	0.00	0.00	0.00	0.00	0.00	22.00	23.00
	PBW 443	47.60	48.00	0.00	0.00	0.00	0.00	0.00	0.00	47.60	48.00
	DBW 17	89.20	90.00	0.00	0.00	0.00	0.00	0.00	0.00	89.20	90.00
	PBW 502	156.36	210.00	0.00	0.00	0.00	0.00	0.00	0.00	156.36	210.00
	PBW 550	155.50	340.00	0.00	0.00	0.00	0.00	0.00	0.00	155.50	340.00
	PBW 590	45.80	70.00	0.00	0.00	0.00	0.00	0.00	0.00	45.80	70.00
	PBW 621 (DPW 621-50)	100.00	110.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	110.00
	PBW 644	94.00	110.00	0.00	0.00	0.00	0.00	0.00	0.00	94.00	110.00
	PBW 658	27.20	28.00	0.00	0.00	0.00	0.00	0.00	0.00	27.20	28.00
	PBW 660	41.40	42.00	0.00	0.00	0.00	0.00	0.00	0.00	41.40	42.00
	PBW 677	237.00	250.00	0.00	0.00	0.00	0.00	0.00	0.00	237.00	250.00
	PBW 725	557.20	700.00	0.00	0.00	0.00	0.00	0.00	0.00	557.20	700.00
	Unnat PBW 343 (PBW 723)	468.00	1000.00	0.00	0.00	0.00	0.00	0.00	0.00	468.00	1000.00
	PBW 1 Zn (HPBW 01)	75.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	75.00	100.00
	HD 3086	0.00	0.00	30.00	110.00	0.00	0.00	0.00	0.00	30.00	110.00
	PDW 291	0.00	0.00	5.00	12.00	0.00	0.00	0.00	0.00	5.00	12.00
	WH 1105	0.00	0.00	30.00	110.00	0.00	0.00	0.00	0.00	30.00	110.00
	HD 2967	73.00	170.00	0.00	0.00	0.00	0.00	0.00	0.00	73.00	170.00
	Total	**2431.54**	**3361.00**	**65.00**	**232.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2496.54**	**3593.00**
	Barley										
	PL 172	8.20	8.50	0.00	0.00	0.00	0.00	0.00	0.00	8.20	8.50
	PL 426	102.75	105.00	0.00	0.00	0.00	0.00	0.00	0.00	102.75	105.00
	PL 751	4.95	5.00	0.00	0.00	0.00	0.00	0.00	0.00	4.95	5.00
	PL 807	20.35	21.00	0.00	0.00	0.00	0.00	0.00	0.00	20.35	21.00
	Total	**136.25**	**139.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**136.25**	**139.50**
	Total Cereal Crops	**2767.99**	**3804.39**	**75.00**	**242.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2842.99**	**4046.39**
Pulse Crops	**Arhar**										
	PAU 881	1.88	2.50	0.00	0.00	0.00	0.00	0.00	0.00	1.88	2.50
	AL 201	0.00	0.00	0.20	1.00	0.00	0.00	0.00	0.00	0.20	1.00
	Total	**1.88**	**2.50**	**0.20**	**1.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.08**	**3.50**
	Mung										
	SML 668	63.00	70.00	0.00	0.00	0.00	0.00	0.00	0.00	63.00	70.00
	SML 832	79.00	90.00	0.00	0.00	0.00	0.00	0.00	0.00	79.00	90.00
	ML 818	0.08	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.50

	ML 2056	2.00	2.50	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.50
	SML 668	0.00	30.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00
	SML 832	0.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.00
	Total	**144.08**	**233.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**144.08**	**233.00**
	Urd										
	Mash 1008	7.60	9.00	0.00	0.00	0.00	0.00	0.00	0.00	7.60	9.00
	Mash 114	1.20	3.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20	3.00
	Mash 338	0.20	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	1.00
	Mash 479	9.50	11.00	0.00	0.00	0.00	0.00	0.00	0.00	9.50	11.00
	Total	**18.50**	**24.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**18.50**	**24.00**
	Chickpea										
	GPF 2	11.73	13.00	0.00	0.00	0.00	0.00	0.00	0.00	11.73	13.00
	PBG 5	0.60	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	3.00
	PBG 7	3.22	11.00	0.00	0.00	0.00	0.00	0.00	0.00	3.22	11.00
	L 555	0.46	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.46	1.00
	Total	**16.01**	**28.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**16.01**	**28.00**
	Lentil										
	LL 699	0.35	2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.35	2.50
	LL 931	0.95	2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.95	2.50
	Total	**1.30**	**5.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.30**	**5.00**
	Total Pulse Crops	**181.77**	**292.50**	**0.20**	**1.00**	**0.00**	**0.00**	**0.00**	**0.00**	**181.97**	**293.50**
Oilseed Crops	**Groundnut**										
	SG 99	1.05	1.50	0.00	0.00	0.00	0.00	0.00	0.00	1.05	1.50
	Total	**1.05**	**1.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.05**	**1.50**
	Soybean										
	SL 958	0.35	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	4.00
	Total	**0.35**	**4.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.35**	**4.00**
	Sesamum										
	Pb. Til no. 2	0.02	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.08
	Total	**0.02**	**0.08**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.02**	**0.08**
	Gobhi Sarson										
	GSC 6	0.01	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.80
	GSC 7	0.04	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	8.00
	Total	**0.05**	**8.80**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.05**	**8.80**
	Linseed										

	LC 2063	0.00	0.00	0.50	0.60	0.00	0.00	0.00	0.00	0.50	0.60
	Total	**0.00**	**0.00**	**0.50**	**0.60**	**0.00**	**0.00**	**0.00**	**0.00**	**0.50**	**0.60**
	Raya										
	PBR 91	0.01	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.90
	PBR 357	0.23	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.80
	RLC 3	0.03	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	4.00
	RLM 619	0.03	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.80
	Total	**0.30**	**6.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.30**	**6.50**
	Toria										
	TL 15	0.07	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.50
	TL 17	0.05	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.50
	Total	**0.12**	**1.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.12**	**1.00**
	Total Oilseed Crops	**1.89**	**21.88**	**0.50**	**0.60**	**0.00**	**0.00**	**0.00**	**0.00**	**2.39**	**22.48**
Fibre Crops	**Cotton**										
	LD 327	0.10	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.50
	LD 949	0.30	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.50
	FDK 124	0.22	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	1.00
	LH 2076	0.10	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.50
	LH 2108	0.10	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.50
	PIL 8	0.00	0.00	0.20	0.20	0.00	0.00	0.00	0.00	0.20	0.20
	PIL 43	0.00	0.00	0.50	0.50	0.00	0.00	0.00	0.00	0.50	0.50
	F 1378	1.47	2.00	0.00	0.00	0.00	0.00	0.00	0.00	1.47	2.00
	F 2228	0.20	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	5.00
	F 2383	1.36	1.40	0.00	0.00	0.00	0.00	0.00	0.00	1.36	1.40
	Total	**3.85**	**11.40**	**0.70**	**0.70**	**0.00**	**0.00**	**0.00**	**0.00**	**4.55**	**12.10**
	Total Fibre Crops	**3.85**	**11.40**	**0.70**	**0.70**	**0.00**	**0.00**	**0.00**	**0.00**	**4.55**	**12.10**
Forage Crops	**Maize**										
	J 1006	57.00	60.00	0.00	0.00	0.00	0.00	0.00	0.00	57.00	60.00
	Total	**57.00**	**60.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**57.00**	**60.00**
	Sorghum										
	Pb. Sudex Chari 1										
	2077A (A Line)	0.32	0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.32	0.35
	2077B (B Line)	0.16	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.20
	SGL 87 (R Line)	0.15	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.20
	Total	**0.63**	**0.75**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.63**	**0.75**

	Guar										
	G 80	0.20	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.50
	HG 365	0.00	0.00	0.50	0.50	0.00	0.00	0.00	0.00	0.50	0.50
	Total	**0.20**	**0.50**	**0.50**	**0.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.70**	**1.00**
	Cowpea										
	CL 367	0.40	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.50
	Total	**0.40**	**0.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.40**	**0.50**
	Berseem										
	BL 1	3.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	3.00
	BL 10	12.28	21.00	0.00	0.00	0.00	0.00	0.00	0.00	12.28	21.00
	BL 42	11.06	16.00	0.00	0.00	0.00	0.00	0.00	0.00	11.06	16.00
	BL 180	1.90	2.00	0.00	0.00	0.00	0.00	0.00	0.00	1.90	2.00
	Total	**28.24**	**42.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**28.24**	**42.00**
	Metha										
	M 150	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	1.00	1.00
	Total	**0.00**	**0.00**	**1.00**	**1.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.00**	**1.00**
	Oat										
	Kent	75.00	80.00	0.00	0.00	0.00	0.00	0.00	0.00	75.00	80.00
	OL 10	35.05	36.00	0.00	0.00	0.00	0.00	0.00	0.00	35.05	36.00
	Total	**110.05**	**116.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**110.05**	**116.00**
	Total Forage Crops	**196.52**	**219.75**	**1.50**	**1.50**	**0.00**	**0.00**	**0.00**	**0.00**	**198.02**	**221.25**
Grand Total (Ludhiana)		**3152.02**	**4349.92**	**77.90**	**245.80**	**0.00**	**0.00**	**0.00**	**0.00**	**3229.92**	**4595.72**
	* Due to high susceptibility to YMV, this variety has been withdrawn from cultivation in Punjab.										
	** Less production due to less/non availability of nucleus seed.										
5. CCSHAU, Hisar											
Cereal Crops	**Rice**										
	HKR-127	7.00	15.60	0.00	0.00	0.00	0.00	0.00	0.00	7.00	15.60
	HRK-128	1.50	0.00	12.00	13.04	0.00	0.00	0.00	0.00	13.50	13.04
	HKR 47	5.00	12.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	12.00
	HKR-49	0.00	0.00	8.50	12.00	0.00	0.00	0.00	0.00	8.50	12.00
	HKR-48	0.00	0.00	0.50	8.16	0.00	0.00	0.00	0.00	0.50	8.16
	Basmati 370	2.00	8.40	0.00	0.00	0.00	0.00	0.00	0.00	2.00	8.40
	PB-1	0.00	0.00	3.00	2.96	0.00	0.00	0.00	0.00	3.00	2.96
	T. Basmati	0.00	0.00	1.50	4.08	0.00	0.00	0.00	0.00	1.50	4.08
	Basmati CSR30	0.00	0.00	10.00	10.24	0.00	0.00	0.00	0.00	10.00	10.24

	Pusa-1121	0.00	0.00	11.00	10.80	0.00	0.00	0.00	0.00	11.00	10.80
	HB-2	0.00	0.00	9.00	9.92	0.00	0.00	0.00	0.00	9.00	9.92
	Total	**15.50**	**36.00**	**55.50**	**71.20**	**0.00**	**0.00**	**0.00**	**0.00**	**71.00**	**107.20**
	Maize										
	HKI 193-1	1.87	0.99	0.00	0.00	0.00	0.00	0.00	0.00	1.87	0.99
	HKI 193-2	2.20	1.55	0.00	0.00	0.00	0.00	0.00	0.00	2.20	1.55
	HKI 161	1.29	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.29	1.00
	HKI 1105	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00
	HKI 323	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
	HKI 193-2	0.35	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.40
	HKI 1128	0.15	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.30
	HKI 193-1	1.25	1.40	0.00	0.00	0.00	0.00	0.00	0.00	1.25	1.40
	HKI 163	1.53	1.70	0.00	0.00	0.00	0.00	0.00	0.00	1.53	1.70
	HKI 161	0.64	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.64	0.80
	Total	**9.40**	**8.14**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**9.40**	**8.14**
	Wheat										
	C 306	68.50	80.00	8.00	10.00	0.00	0.00	0.00	0.00	76.50	90.00
	WH 283	29.20	45.00	12.00	15.00	0.00	0.00	0.00	0.00	41.20	60.00
	WH 711	97.40	120.00	18.00	20.00	0.00	0.00	0.00	0.00	115.40	140.00
	WH 1021	16.00	16.00	0.00	0.00	0.00	0.00	0.00	0.00	16.00	16.00
	WH 1105	847.90	850.00	0.00	0.00	0.00	0.00	0.00	0.00	847.90	850.00
	WH 1025	65.00	65.00	0.00	0.00	0.00	0.00	0.00	0.00	65.00	65.00
	WH 1124	102.80	120.00	12.00	15.00	0.00	0.00	0.00	0.00	114.80	135.00
	WHD 943	40.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	40.00	40.00
	WH 1142	63.20	75.00	8.00	10.00	0.00	0.00	0.00	0.00	71.20	85.00
	WH1184	0.00	0.00	40.00	45.00	0.00	0.00	0.00	0.00	40.00	45.00
	WB 2	0.00	0.00	15.00	20.00	0.00	0.00	0.00	0.00	15.00	20.00
	Total	**1330.00**	**1411.00**	**113.00**	**135.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1443.00**	**1546.00**
	Barley										
	BH 393	73.80	80.00	4.00	5.00	0.00	0.00	0.00	0.00	77.80	85.00
	BH 902	38.00	40.00	0.00	0.00	0.00	0.00	0.08	0.04	38.08	40.04
	BH 959	12.00	15.00	0.00	0.00	0.00	0.00	0.02	0.02	12.02	15.02
	BH 946	13.50	15.00	0.00	0.00	0.00	0.00	0.01	0.15	13.51	15.15
	BH 885	3.80	5.00	0.80	1.00	0.00	0.00	0.00	0.00	4.60	6.00
	Total	**141.10**	**155.00**	**4.80**	**6.00**	**0.00**	**0.00**	**0.11**	**0.20**	**146.01**	**161.20**

	Bajra										
	HBL-11 R	0.04	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.80
	HMS-37A	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.04	0.08	0.04
	HMS-37B	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.02
	HTP-3/13	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.15	0.01	0.15
	HMS-47A	0.08	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.18
	HMS-47B	0.02	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.12
	AC-04/13	0.00	0.00	0.00	0.00	0.00	0.00	0.22	1.13	0.22	1.13
	H77/833-2-202	0.10	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.50
	HC-20	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.05	0.02	0.05
	Total	**0.24**	**1.60**	**0.00**	**0.00**	**0.00**	**0.00**	**0.35**	**1.38**	**0.59**	**2.98**
	Total Cereal Crops	**1496.24**	**1611.74**	**173.30**	**212.20**	**0.00**	**0.00**	**0.46**	**1.58**	**1670.00**	**1825.52**
Pulse Crops	**Arhar**										
	Manak	7.96	6.00	0.00	0.00	0.00	0.00	0.00	0.00	7.96	6.00
	Paras	0.06	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.80
	Total	**8.02**	**6.80**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**8.02**	**6.80**
	Mung										
	Basanti (MH-125)	1.06	2.00	0.00	0.00	0.00	0.00	0.00	0.00	1.06	2.00
	MH-421	43.00	37.00	0.00	0.00	0.00	0.00	0.00	0.00	43.00	37.00
	MH 318	1.20	3.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20	3.00
	Sattya (MH-2-15)	1.49	2.00	0.00	0.00	0.00	0.00	0.00	0.00	1.49	2.00
	MH-421	0.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00
	Total	**46.75**	**94.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**46.75**	**94.00**
	Field pea										
	HFP 529	24.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	24.00	10.00
	Total	**24.00**	**10.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**24.00**	**10.00**
	Chickpea										
	HC-1	0.46	0.50	0.00	0.00	200.00	200.00	0.00	0.00	200.46	200.50
	HC 5	6.67	10.00	3.00	4.00	100.00	125.00	0.00	0.00	109.67	139.00
	HK 2	36.80	40.00	0.00	0.00	15.00	20.00	0.00	0.00	51.80	60.00
	Total	**43.93**	**50.50**	**3.00**	**4.00**	**315.00**	**345.00**	**0.00**	**0.00**	**361.93**	**399.50**
	Lentil										
	HM 1	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.50
	Sapna	0.40	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.40
	Grima	0.50	1.27	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.27

	Total	**1.40**	**2.17**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.40**	**2.17**
	Cowpea										
	HC 46	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00
	Total	**2.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.00**	**0.00**
	Urd										
	UH 1	1.06	2.00	0.00	0.00	0.00	0.00	0.00	0.00	1.06	2.00
	Total	**1.06**	**2.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	1.06	2.00
	Total Pulse Crops	**127.16**	**165.47**	**3.00**	**4.00**	**315.00**	**345.00**	**0.00**	**0.00**	**445.16**	**514.47**
Oilseed Crops	**Sesmum**										
	HT-1	0.02	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.05
	HT-2	0.44	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.44	0.10
	Total	**0.46**	**0.15**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.46**	**0.15**
	Mustard										
	RH 725	0.00	0.00	14.00	15.00	0.00	0.00	0.00	0.00	14.00	15.00
	RH 30	3.16	8.00	4.00	5.00	0.00	0.00	0.00	0.00	7.16	13.00
	RH-0406	0.45	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.45	0.50
	RH-0749	1.50	2.78	1.00	1.30	0.00	0.00	0.00	0.00	2.50	4.08
	RH-8812 (laxmi)	2.96	9.77	6.00	6.50	0.00	0.00	0.00	0.00	8.96	16.27
	YSH-0401	0.85	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.85	1.00
	Total	**8.92**	**22.05**	**25.00**	**27.80**	**0.00**	**0.00**	**0.00**	**0.00**	33.92	49.85
	Total Oilseed Crops	**9.38**	**22.20**	**25.00**	**27.80**	**0.00**	**0.00**	**0.00**	**0.00**	**34.38**	**50.00**
Fibre Crops	**Cotton**										
	H-1098/H-1098-i	1.25	1.45	2.00	3.00	0.00	0.00	0.00	0.00	3.25	4.45
	H-1117	0.00	0.00	0.20	0.25	0.00	0.00	0.00	0.00	0.20	0.25
	H-1226	0.00	0.00	0.05	0.05	0.00	0.00	0.00	0.00	0.05	0.05
	H-1236	0.00	0.00	0.50	0.60	0.00	0.00	0.00	0.00	0.50	0.60
	H-1300	0.00	0.00	0.40	0.40	0.00	0.00	0.00	0.00	0.40	0.40
	HD-123	2.55	3.00	7.00	7.63	0.00	0.00	0.00	0.00	9.55	10.63
	HD-324	0.00	0.00	2.00	2.00	0.00	0.00	0.00	0.00	2.00	2.00
	HD-432	0.35	0.50	10.00	10.50	0.00	0.00	0.00	0.00	10.35	11.00
	Female HHH 223	0.00	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.10	0.10
	Male HHH223	0.00	0.00	0.05	0.05	0.00	0.00	0.00	0.00	0.05	0.05
	Female HHH287	0.00	0.00	0.05	0.06	0.00	0.00	0.00	0.00	0.05	0.06
	Male HHH 287	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.02	0.02
	Female AAH 1	0.12	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.12

	Male AAH 1	0.06	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.05
	Total	**4.33**	**5.12**	**22.37**	**24.66**	**0.00**	**0.00**	**0.00**	**0.00**	**26.70**	**29.78**
	Total Fibre Crops	**4.33**	**5.12**	**22.37**	**24.66**	**0.00**	**0.00**	**0.00**	**0.00**	**26.70**	**29.78**
Forage Crops	**Sorghum**										
	HC-136	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.50	0.30	0.50
	HJ-513	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00
	SSG 59-3	0.05	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.10
	Total	**2.05**	**2.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.30**	**0.50**	**2.35**	**2.60**
	Guar										
	HG-365	17.69	20.00	3.00	3.70	0.00	0.00	0.00	0.00	20.69	23.70
	HG-563	12.55	15.00	5.00	5.40	0.00	0.00	0.00	0.00	17.55	20.40
	HG 870	0.66	0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.66	0.35
	HG 2-20	75.00	40.00	15.00	16.50	0.00	0.00	0.00	0.00	90.00	56.50
	HG-884	0.20	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.25
	Total	**106.10**	**75.60**	**23.00**	**25.60**	**0.00**	**0.00**	**0.00**	**0.00**	**129.10**	**101.20**
	Oat										
	OS 6	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00
	OS 377	25.00	30.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	30.00
	HJ 8	7.60	8.00	0.00	0.00	0.00	0.00	0.00	0.00	7.60	8.00
	Total	**37.60**	**43.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**37.60**	**43.00**
	Berseem										
	HB-2	1.40	1.50	0.00	0.00	0.00	0.00	0.00	0.00	1.40	1.50
	Mascavi	0.80	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80	1.00
	Total	**2.20**	**2.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.20**	**2.50**
	Total Forage Crops	**147.95**	**123.20**	**23.00**	**25.60**	**0.00**	**0.00**	**0.30**	**0.50**	**171.25**	**149.30**
	Grand Total (Hisar)	**1785.06**	**1927.73**	**246.67**	**294.26**	**315.00**	**345.00**	**0.76**	**2.08**	**2347.49**	**2569.07**
6. GBPUA&T, Pantnagar											
Cereal Crops	**Rice**										
	Pant Dhan 10	1.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	8.00
	Pant Dhan 18	2.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	15.00
	Pant Dhan 12	1.50	5.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	5.00
	Pant Dhan 19	0.50	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	20.00
	Govind	1.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	15.00
	Pusa 44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.00	0.00	40.00
	PR 113	0.00	0.00	0.00	0.00	0.00	0.00	0.00	180.00	0.00	180.00

	NDR 359	0.00	0.00	0.00	0.00	0.00	0.00	0.00	65.00	0.00	65.00
	Pant Basmati 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	0.00	25.00
	Pant Dhan 26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00	0.00	12.00
	Pant Basmati 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.00	0.00	40.00
	Pant Sugandh Dhan 27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	10.00
	Pant Sugandh Dhan 17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	10.00
	Pant Dhan 24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	100.00
	Pusa Basmati 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	0.00	25.00
	Pusa Sugandh 4 (Pusa 1121)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	130.00	0.00	130.00
	PR 114	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	0.00	25.00
	PR 121	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00	0.00	50.00
	HKR 47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	150.00	0.00	150.00
	Pant Dhan 11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	0.00	30.00
	Pusa Basmati 1509	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00	0.00	50.00
	Pusa Sugandh 5 (Pusa 2511)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00	0.00	12.00
	PR 124	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	0.00	25.00
	MTU 7029	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	0.00	20.00
	BPT 5204	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	0.00	30.00
	Total	**6.00**	**63.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1029.00**	**6.00**	**1092.00**
	Wheat										
	CBW 38	22.40	120.00	0.00	0.00	0.00	0.00	0.00	0.00	22.40	120.00
	DPW 621-50	51.60	77.00	0.00	0.00	0.00	0.00	0.00	0.00	51.60	77.00
	PBW 154	235.79	685.00	0.00	0.00	0.00	0.00	0.00	0.00	235.79	685.00
	PBW 226	80.52	435.00	0.00	0.00	0.00	0.00	0.00	0.00	80.52	435.00
	PBW 343	23.20	525.00	0.00	0.00	0.00	0.00	0.00	0.00	23.20	525.00
	PBW 373	88.26	280.00	0.00	0.00	0.00	0.00	0.00	0.00	88.26	280.00
	PBW 502	37.00	285.00	0.00	0.00	0.00	0.00	0.00	0.00	37.00	285.00
	PBW 550	61.00	115.00	0.00	0.00	0.00	0.00	0.00	0.00	61.00	115.00
	UP 262	24.51	155.00	0.00	0.00	0.00	0.00	0.00	0.00	24.51	155.00
	UP 2338	19.20	70.00	0.00	0.00	0.00	0.00	0.00	0.00	19.20	70.00
	UP 2572	10.80	50.00	0.00	0.00	0.00	0.00	0.00	0.00	10.80	50.00
	UP 2628	61.00	80.00	0.00	0.00	0.00	0.00	0.00	0.00	61.00	80.00
	HD 2894	6.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	40.00
	DBW 17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	255.00	0.00	255.00
	DBW 88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	120.00	0.00	120.00

	HD 2329	0.00	0.00	0.00	0.00	0.00	0.00	0.00	78.00	0.00	78.00
	HD 2733	0.00	0.00	0.00	0.00	0.00	0.00	0.00	125.00	0.00	125.00
	HD 2967	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1200.00	0.00	1200.00
	HD 3086	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	100.00
	UP 2425	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.00	0.00	18.00
	UP 2526	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.00	0.00	40.00
	UP 2554	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.00	0.00	40.00
	UP 2565	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00	15.00
	WH 1105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	520.00	0.00	520.00
	WH 711	0.00	0.00	0.00	0.00	0.00	0.00	0.00	220.00	0.00	220.00
	WH 1021	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	0.00	25.00
	UP 2784	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.00	0.00	14.00
	DBW 16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00	15.00
	HD 2851	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.00	0.00	13.00
	Total	**721.28**	**2917.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2798.00**	**721.28**	**5715.00**
	Maize										
	CM 300	0.04	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.12
	CM 400	0.04	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.10
	CM 600	0.10	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.30
	Total	**0.18**	**0.52**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.18**	**0.52**
	Barnyardmillet										
	PRJ 1	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00
	Total	**0.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.50**	**0.00**
	Total Cereal Crops	**727.96**	**2980.52**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3827.00**	**727.96**	**6807.52**
Pulse Crops	**Pigeonpea**										
	UPAS 120	12.23	15.30	0.00	0.00	0.00	5.00	0.00	0.00	12.23	20.30
	PA 291	15.95	19.95	0.00	0.00	0.00	70.00	0.00	85.00	15.95	174.95
	Total	**28.18**	**35.25**	**0.00**	**0.00**	**0.00**	**75.00**	**0.00**	**85.00**	**28.18**	**195.25**
	Urd										
	Pant Urd 30	2.70	3.00	0.00	0.00	0.00	0.00	0.00	0.00	2.70	3.00
	Pant Urd 31	28.85	35.00	0.00	0.00	0.00	140.00	0.00	0.00	28.85	175.00
	Pant Urd 35	19.93	8.00	0.00	0.00	0.00	0.00	0.00	0.00	19.93	8.00
	Pant Urd 40	6.00	20.00	0.00	0.00	0.00	100.00	0.00	0.00	6.00	120.00
	Total	**57.48**	**66.00**	**0.00**	**0.00**	**0.00**	**240.00**	**0.00**	**0.00**	**57.48**	**306.00**
	Cowpea										

	Pant Lobia 1	0.20	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	5.00
	Pant Lobia 2	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60
	Pant Lobia 3	0.00	4.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.65
	Pant Lobia 4	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00
	Total	**0.20**	**12.25**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.20**	**12.25**
	Moong										
	Pant Moong 3	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.00
	Pant Moong 5	20.60	25.00	0.00	0.00	0.00	120.00	0.00	0.00	20.60	145.00
	Pant Moong 6	2.60	6.00	0.00	0.00	0.00	18.00	0.00	0.00	2.60	24.00
	Total	**23.36**	**31.00**	**0.00**	**0.00**	**0.00**	**138.00**	**0.00**	**0.00**	**23.36**	**169.00**
	Chickpea										
	Pant Kabuli Chana 1	1.00	5.00	0.00	0.00	100.00	100.00	0.00	0.00	101.00	105.00
	PG 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00	4.00
	PG 4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	0.00	6.00
	PG 5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00
	PG 186	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27.00	0.00	27.00
	Total	**1.00**	**5.00**	**0.00**	**0.00**	**100.00**	**100.00**	**0.00**	**39.00**	**101.00**	**144.00**
	Lentil										
	PL 6	7.50	25.00	0.00	0.00	60.00	100.00	0.00	0.00	67.50	125.00
	PL 7	10.00	28.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	28.00
	PL 8	23.00	32.00	0.00	0.00	0.00	0.00	0.00	0.00	23.00	32.00
	PL 9	3.00	12.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	12.00
	Total	**43.50**	**97.00**	**0.00**	**0.00**	**60.00**	**100.00**	**0.00**	**0.00**	**103.50**	**197.00**
	Pea										
	Pant Pea 155	10.00	3.00	0.00	0.00	40.00	40.00	0.00	0.00	50.00	43.00
	Pant Pea 14	3.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	7.00
	Pant Pea 42	11.80	20.00	0.00	0.00	0.00	0.00	0.00	0.00	11.80	20.00
	PSM 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	0.00	25.00
	Total	**24.80**	**30.00**	**0.00**	**0.00**	**40.00**	**40.00**	**0.00**	**25.00**	**64.80**	**95.00**
	Total Pulse Crops	**178.52**	**276.50**	**0.00**	**0.00**	**200.00**	**693.00**	**0.00**	**149.00**	**378.52**	**1118.50**
Oilseed Crops	**Soybean**										
	PS 1347	12.00	16.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00	16.00
	PS 1042	1.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.50
	PS 1225	23.00	42.00	0.00	0.00	0.00	0.00	0.00	0.00	23.00	42.00
	Total	**36.00**	**58.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**36.00**	**58.50**

	Rai/Sarson										
	PR 15 (Kranti)	0.10	6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	6.00
	PR 21	0.25	2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.25	2.50
	Pant Pili Sarson 1	2.22	20.00	0.00	0.00	0.00	0.00	0.00	0.00	2.22	20.00
	PR 19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
	PR 20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00	4.00
	Shweta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	5.00
	Total	**2.57**	**28.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**10.00**	**2.57**	**38.50**
	Toria										
	PT 303	0.37	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37	3.00
	PT 508	0.05	6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	6.00
	Uttara	5.15	18.00	0.00	0.00	0.00	0.00	0.00	0.00	5.15	18.00
	Pant Hill Toria 1	0.05	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	4.00
	Total	**5.62**	**31.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**5.62**	**31.00**
	Total Oilseed Crops	**44.19**	**118.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**10.00**	**44.19**	**128.00**
Forage Crops	**Sorghum**										
	Pant Chari 5	2.50	7.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	7.00
	Pant Chari 6 (UPMC 503)	5.70	6.00	0.00	0.00	0.00	0.00	0.00	0.00	5.70	6.00
	467A	3.30	5.28	0.00	0.00	0.00	0.00	0.00	0.00	3.30	5.28
	467B	1.65	2.29	0.00	0.00	0.00	0.00	0.00	0.00	1.65	2.29
	Total	**13.15**	**20.57**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**13.15**	**20.57**
	Forage Cowpea										
	UPC 8705	8.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	7.00
	Total	**8.00**	**7.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**8.00**	**7.00**
	Total Forage Crops	**21.15**	**27.57**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**21.15**	**27.57**
Grand Total (Pantnagar)		**971.82**	**3402.59**	**0.00**	**0.00**	**200.00**	**693.00**	**0.00**	**3986.00**	**1171.82**	**8081.59**
7. NDUA&T, Faizabad											
Cereal Crops	**Rice**										
	NDR 3112-1	3.00	42.38	0.00	0.00	0.00	0.00	0.00	0.00	3.00	42.38
	N. Lalmati	1.50	5.24	0.00	0.00	0.00	0.00	0.00	0.00	1.50	5.24
	NDR 8002	5.00	63.89	0.00	0.00	0.00	0.00	0.00	0.00	5.00	63.89
	NDR 97	1.50	5.85	0.00	0.00	0.00	0.00	0.00	0.00	1.50	5.85
	NDR 2064	5.00	6.60	0.00	0.00	0.00	0.00	0.00	0.00	5.00	6.60
	NDR 359	7.50	50.86	0.00	0.00	0.00	0.00	0.00	0.00	7.50	50.86
	Sarjoo 52	10.00	33.88	0.00	0.00	0.00	0.00	0.00	0.00	10.00	33.88

	NDR 2065	20.50	73.35	0.00	0.00	0.00	0.00	0.00	0.00	20.50	73.35
	Samba Sub 1	4.10	92.75	0.00	0.00	0.00	0.00	0.00	0.00	4.10	92.75
	Shusk Smrat	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00
	Narendra Usar Dhan 2008	12.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00	0.00
	NDR 357	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00
	BPT 5204	0.00	0.00	0.00	0.00	0.00	0.00	50.00	63.32	50.00	63.32
	MTU 7029	0.00	0.00	0.00	0.00	0.00	0.00	30.00	38.50	30.00	38.50
	PB 1	0.00	0.00	0.00	0.00	0.00	0.00	15.00	26.80	15.00	26.80
	IPB 1	0.00	0.00	0.00	0.00	0.00	0.00	7.50	11.00	7.50	11.00
	Swarna Sub 1	0.00	0.00	0.00	0.00	0.00	0.00	20.00	27.72	20.00	27.72
	Total	**74.60**	**374.80**	**0.00**	**0.00**	**0.00**	**0.00**	**122.50**	**167.34**	**197.10**	**542.14**
	Wheat										
	PBW 373	160.26	161.00	0.00	0.00	0.00	0.00	0.00	0.00	160.26	161.00
	NW 4018	50.00	52.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00	52.00
	NW 5054	8.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	40.00
	DBW 107	178.45	180.00	0.00	0.00	0.00	0.00	0.00	0.00	178.45	180.00
	PBW 550	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00
	NW 1067	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00
	HD 2967	0.00	85.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	85.00
	K 7903	0.00	93.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	93.00
	PBW 154	0.00	62.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	62.00
	NW 1014	0.00	7.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.50
	Total	**396.71**	**720.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**396.71**	**720.50**
	Barley										
	NB 2	1.20	2.50	0.00	0.00	0.00	0.00	0.00	0.00	1.20	2.50
	NDB1445	40.00	41.00	0.00	0.00	0.00	0.00	0.00	0.00	40.00	41.00
	Total	**41.20**	**43.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**41.20**	**43.50**
	Total Cereal Crops	**512.51**	**1138.80**	**0.00**	**0.00**	**0.00**	**0.00**	**122.50**	**167.34**	**635.01**	**1306.14**
Pulse Crops	**Pigeonpea**										
	NDA-1	31.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	31.00	40.00
	NDA-2	3.25	10.00	0.00	0.00	0.00	0.00	0.00	0.00	3.25	10.00
	Total	**34.25**	**50.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**34.25**	**50.00**
	Lentil										
	NDL 1	0.00	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.50
	HUL 57	0.00	4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.50

	Total	**0.00**	**8.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**8.00**
	Pea										
	HUDP 15	0.00	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65
	Total	**0.00**	**0.65**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.65**
	Total Pulse Crops	**34.25**	**58.65**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**34.25**	**58.65**
Oilseed Crops	**Mustard**										
	NDR 8501	0.00	6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00
	NDRE 4	0.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75
	Pitambari	0.00	4.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.25
	Total	**0.00**	**11.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**11.00**
	Total Oilseed Crops	**0.00**	**11.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**11.00**
Fibre Crops	**Jute**										
	Ankit	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
	Total	**0.04**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.04**	**0.00**
	Total Fibre Crops	**0.04**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.04**	**0.00**
	Grand Total (Faizabad)	**546.80**	**1208.45**	**0.00**	**0.00**	**0.00**	**0.00**	**122.50**	**167.34**	**669.30**	**1375.79**
8. CSAUA&T, Kanpur											
Cereal Crops	**Wheat**										
	DBW 39	56.40	71.00	0.00	0.00	0.00	0.00	0.00	0.00	56.40	71.00
	K 307	16.38	38.00	0.00	0.00	0.00	0.00	0.00	0.00	16.38	38.00
	K 402	55.00	75.00	0.00	0.00	0.00	0.00	0.00	0.00	55.00	75.00
	K 1006	58.00	77.00	0.00	0.00	0.00	0.00	0.00	0.00	58.00	77.00
	K 7903	12.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00	25.00
	K 607	0.00	85.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	85.00
	K 9107	10.04	19.00	0.00	0.00	0.00	0.00	0.00	0.00	10.04	19.00
	K 9423	19.80	25.00	0.00	0.00	0.00	0.00	0.00	0.00	19.80	25.00
	DBW 107	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
	PBW 343	39.38	125.00	0.00	0.00	0.00	0.00	0.00	0.00	39.38	125.00
	Total	**267.00**	**640.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**267.00**	**640.00**
	Barley										
	K 409	5.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	7.00
	K 508	6.87	8.00	0.00	0.00	0.00	0.00	0.00	0.00	6.87	8.00
	K 560	5.43	8.00	0.00	0.00	0.00	0.00	0.00	0.00	5.43	8.00
	Total	**17.30**	**23.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**17.30**	**23.00**
	Sorghum										

	Bundela	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.80	0.50	0.80
	CSV - 15	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.40	1.00	1.40
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.50**	**2.20**	**1.50**	**2.20**
	Maize										
	Azad Uttam	0.00	0.00	0.00	0.00	0.00	0.00	3.00	5.00	3.00	5.00
	Azad Kamal	4.20	4.50	0.00	0.00	0.00	0.00	0.00	0.00	4.20	4.50
	Total	**4.20**	**4.50**	**0.00**	**0.00**	**0.00**	**0.00**	**3.00**	**5.00**	**7.20**	**9.50**
	Total Cereal Crops	**288.50**	**667.50**	**0.00**	**0.00**	**0.00**	**0.00**	**4.50**	**7.20**	**293.00**	**674.70**
Pulse Crops	**Mung**										
	IPM 2-3	0.00	0.00	0.00	0.00	0.00	0.00	40.00	50.00	40.00	50.00
	Swati	5.10	4.47	0.00	0.00	0.00	0.00	0.00	0.00	5.10	4.47
	Sweta	2.00	4.00	0.00	0.00	0.00	0.00	3.00	4.16	5.00	8.16
	K 851	1.52	0.24	0.00	0.00	0.00	0.00	0.00	0.00	1.52	0.24
	Total	**8.62**	**8.71**	**0.00**	**0.00**	**0.00**	**0.00**	**43.00**	**54.16**	**51.62**	**62.87**
	Urd										
	Shekhar 1 (KU 301)	6.00	7.40	0.00	0.00	0.00	0.00	2.00	3.15	8.00	10.55
	Shekhar 2 (KU 300)	26.36	30.00	0.00	0.00	0.00	0.00	13.64	24.60	40.00	54.60
	Shekhar 3 (KU 309)	5.55	0.50	0.00	0.00	0.00	0.00	0.00	0.00	5.55	0.50
	Azad 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.24
	Azad 2 (KU 91)	0.20	2.00	0.00	0.00	0.00	0.00	2.00	3.20	2.20	5.20
	Azad 3 (KU 96-3)	10.32	14.12	0.00	0.00	0.00	0.00	8.00	10.00	18.32	24.12
	T. 9	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
	Total	**53.43**	**54.02**	**0.00**	**0.00**	**0.00**	**0.00**	**25.64**	**41.19**	**79.07**	**95.21**
	Chickpea										
	KPG 59	8.34	16.00	0.00	0.00	0.00	0.00	0.00	0.00	8.34	16.00
	KWR 108	24.53	26.00	0.00	0.00	0.00	0.00	0.00	0.00	24.53	26.00
	Radhey	0.50	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.00
	Total	**33.37**	**43.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**33.37**	**43.00**
	Field pea										
	KPMR 522	2.00	12.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	12.00
	Total	**2.00**	**12.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.00**	**12.00**
	Lentil										
	Azad Masoor 1 (KLS 218)	20.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	25.00
	K 75	7.43	10.00	0.00	0.00	0.00	0.00	0.00	0.00	7.43	10.00
	KLB 303 (Shekhar 2)	5.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	10.00

	KL 320 (Shekhar 3)	10.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	15.00
	KLS 9-3 (Krash)	5.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	10.00
	KLB 2008 (Kriti)	5.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	7.00
	Total	**52.43**	**77.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**52.43**	**77.00**
	Total Pulse Crops	**149.85**	**194.73**	**0.00**	**0.00**	**0.00**	**0.00**	**68.64**	**95.35**	**218.49**	**290.08**
Oilseed Crops	**Groundnut**										
	Divya	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00
	Total	**5.00**	**5.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**5.00**	**5.00**
	Semamum										
	Shekhar	0.01	0.10	0.00	0.00	0.00	0.00	0.50	0.74	0.51	0.84
	Pragati	0.00	0.00	0.00	0.00	0.00	0.00	2.00	3.20	2.00	3.20
	Total	**0.01**	**0.10**	**0.00**	**0.00**	**0.00**	**0.00**	**2.50**	**3.94**	**2.51**	**4.04**
	Mustard										
	Varuna T. 59	2.64	7.00	0.00	0.00	0.00	0.00	0.00	0.00	2.64	7.00
	Rohini	1.68	5.00	0.00	0.00	0.00	0.00	0.00	0.00	1.68	5.00
	Vaibhav	0.50	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.75
	Urvashi	0.50	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.00
	Maya	0.50	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.00
	Kanti	0.50	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.00
	Ashirvad	0.50	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.00
	Pitambari	1.01	2.00	0.00	0.00	0.00	0.00	0.00	0.00	1.01	2.00
	Basanti	0.50	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.00
	Total	**8.33**	**19.75**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**8.33**	**19.75**
	Toria										
	T 9	0.50	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.00
	Bhawani	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.50
	Tapeswari	0.50	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.60
	Total	**1.50**	**2.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.50**	**2.10**
	Linseed										
	Shekhar	1.80	3.00	0.00	0.00	0.00	0.00	0.00	0.00	1.80	3.00
	T. 397	1.57	3.00	0.00	0.00	0.00	0.00	0.00	0.00	1.57	3.00
	Ruchi	3.66	4.00	0.00	0.00	0.00	0.00	0.00	0.00	3.66	4.00
	Uma	0.60	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.60
	Garima	1.20	0.80	0.00	0.00	0.00	0.00	0.00	0.00	1.20	0.80
	Subhra	1.20	0.80	0.00	0.00	0.00	0.00	0.00	0.00	1.20	0.80

	Total	**10.03**	**12.20**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**10.03**	**12.20**
	Total Oilseed Crops	**24.87**	**39.15**	**0.00**	**0.00**	**0.00**	**0.00**	**2.50**	**3.94**	**27.37**	**43.09**
	Grand Total (Kanpur)	**463.22**	**901.38**	**0.00**	**0.00**	**0.00**	**0.00**	**75.64**	**106.49**	**538.86**	**1007.87**
9. BHU, Varanasi											
Cereal Crops	**Rice**										
	HUBR 2-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.10	0.00	5.10
	HUR 4-3	5.00	8.50	0.00	0.00	0.00	0.00	0.00	0.00	5.00	8.50
	HUR 3022	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.90	0.00	3.90
	Shabhagi Dhan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.40	0.00	6.40
	Sawarna Sub-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	41.00	0.00	41.00
	Imp. Shambha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36.00	0.00	36.00
	HUR 917	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28.00	0.00	28.00
	HUR 105	3.00	14.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	14.00
	HUBR 10-9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	3.00
	Total	**8.00**	**22.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**123.40**	**8.00**	**145.90**
	Wheat										
	HUW 234	30.93	34.50	20.00	21.50	0.00	0.00	0.00	0.00	50.93	56.00
	Total	**30.93**	**34.50**	**20.00**	**21.50**	**0.00**	**0.00**	**0.00**	**0.00**	**50.93**	**56.00**
	Barley										
	HUB 113	40.00	40.70	4.50	5.00	0.00	0.00	0.00	0.00	44.50	45.70
	Total	**40.00**	**40.70**	**4.50**	**5.00**	**0.00**	**0.00**	**0.00**	**0.00**	**44.50**	**45.70**
	Total Cereal Crops	**78.93**	**97.70**	**24.50**	**26.50**	**0.00**	**0.00**	**0.00**	**123.40**	**103.43**	**247.60**
Pulse Crops	**Pigeonpea**										
	MAL 13	16.83	17.00	0.00	0.00	0.00	0.00	0.00	0.00	16.83	17.00
	Malviya Vikalp	0.20	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.50
	Malviya Vikas	0.10	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.30
	Total	**17.13**	**17.80**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**17.13**	**17.80**
	Mung										
	HUM 16	20.22	20.00	0.00	0.00	0.00	0.00	0.00	0.00	20.22	20.00
	HUM 12	7.20	10.50	0.00	0.00	0.00	0.00	0.00	0.00	7.20	10.50
	Total	**27.42**	**30.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**27.42**	**30.50**
	Pea										
	HUDP 15	5.00	5.40	1.00	1.50	0.00	0.00	0.00	0.00	6.00	6.90
	Total	**5.00**	**5.40**	**1.00**	**1.50**	**0.00**	**0.00**	**0.00**	**0.00**	**6.00**	**6.90**
	Lentil										

	HUL 57	10.00	14.50	9.00	15.00	0.00	0.00	0.00	0.00	19.00	29.50
	Total	**10.00**	**14.50**	**9.00**	**15.00**	**0.00**	**0.00**	**0.00**	**0.00**	**19.00**	**29.50**
	Total Pulse Crops	**59.55**	**68.20**	**10.00**	**16.50**	**0.00**	**0.00**	**0.00**	**0.00**	**69.55**	**84.70**
Grand Total (Varanasi)		**138.48**	**165.90**	**34.50**	**43.00**	**0.00**	**0.00**	**0.00**	**123.40**	**172.98**	**332.30**
10. AAU, Jorhat											
Cereal Crops	**Rice**										
	Ranjit	17.00	19.00	0.00	202.40	0.00	0.00	0.00	0.00	17.00	221.40
	Ranjit Sub 1	0.00	0.00	0.00	19.00	0.00	0.00	0.00	0.00	0.00	19.00
	Aghoni	0.00	0.00	0.00	1.35	0.00	0.00	0.00	0.00	0.00	1.35
	Bahadur	0.00	0.00	0.00	40.10	0.00	0.00	0.00	0.00	0.00	40.10
	Bahadur Sub 1	0.00	0.00	0.00	18.00	0.00	0.00	0.00	0.00	0.00	18.00
	Gitesh	0.00	0.00	0.00	20.65	0.00	0.00	0.00	0.00	0.00	20.65
	Ketekijoha	0.00	0.00	0.00	18.30	0.00	0.00	0.00	0.00	0.00	18.30
	Lachit	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.60
	Luit	0.00	0.00	0.00	24.45	0.00	0.00	0.00	0.00	0.00	24.45
	Mahsuri	0.00	0.00	0.00	3.55	0.00	0.00	0.00	0.00	0.00	3.55
	Manoharsali	0.00	0.00	0.00	2.65	0.00	0.00	0.00	0.00	0.00	2.65
	Swarna	0.00	0.00	0.00	4.95	0.00	0.00	0.00	0.00	0.00	4.95
	Swarna Sub 1	0.00	0.00	0.00	32.80	0.00	0.00	0.00	0.00	0.00	32.80
	Total	**17.00**	**19.00**	**0.00**	**388.80**	**0.00**	**0.00**	**0.00**	**0.00**	**17.00**	**407.80**
	Total Cereal Crops	**17.00**	**19.00**	**0.00**	**388.80**	**0.00**	**0.00**	**0.00**	**0.00**	**17.00**	**407.80**
Pulse Crops	**Urd**										
	AU-1	0.20	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.20
	SBC 40	2.00	4.50	0.00	0.00	0.00	15.00	0.00	0.00	2.00	19.50
	SBC 47	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	5.00
	PU 31	0.00	0.00	0.00	0.00	0.00	60.00	0.00	0.00	0.00	60.00
	Total	**2.20**	**4.70**	**0.00**	**0.00**	**0.00**	**80.00**	**0.00**	**0.00**	**2.20**	**84.70**
	Mung										
	SGC 16	0.00	0.00	0.00	0.00	0.00	25.00	0.00	0.00	0.00	25.00
	SGC 20	0.00	0.00	0.00	0.00	0.00	15.00	0.00	0.00	0.00	15.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**40.00**	**0.00**	**0.00**	**0.00**	**40.00**
	Lentil										
	KLS 218	0.00	0.00	0.00	0.00	0.00	30.00	0.00	0.00	0.00	30.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**30.00**	**0.00**	**0.00**	**0.00**	**30.00**
	Total Pulse Crops	**2.20**	**4.70**	**0.00**	**0.00**	**0.00**	**150.00**	**0.00**	**0.00**	**2.20**	**154.70**

Oilseed Crops	**Rapeseed/Mustard**										
	TS 36	5.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	2.00
	M 27	0.20	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.20	1.50
	TS 38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	0.00	2.50
	TS 46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.50
	TS 67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
	Total	**5.20**	**3.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**4.00**	**5.20**	**7.50**
	Total Oilseed Crops	**5.20**	**3.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**4.00**	**5.20**	**7.50**
Grand Total (Jorhat)		**24.40**	**27.20**	**0.00**	**388.80**	**0.00**	**150.00**	**0.00**	**4.00**	**24.40**	**570.00**
11. BAU, Ranchi											
Cereal Crops	**Rice**										
	Birsa Vikas Dhan-109	15.00	14.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	14.00
	Birsa Vikas Dhan-110	3.50	3.90	0.00	0.00	0.00	0.00	0.00	0.00	3.50	3.90
	Birsamati	1.50	2.70	0.00	0.00	0.00	0.00	0.00	0.00	1.50	2.70
	Birsa Vikas Dhan-111	0.00	0.00	1.00	1.50	0.00	0.00	0.00	0.00	1.00	1.50
	Birsa Vikas Dhan-203	0.00	0.00	1.00	3.00	0.00	0.00	0.00	1.50	1.00	4.50
	Birsa Vikas Sughanda-1	0.00	0.00	1.00	3.00	0.00	0.00	0.00	0.00	1.00	3.00
	Lalat (IET 9947)	0.00	0.00	8.00	20.00	0.00	0.00	0.00	0.00	8.00	20.00
	Naveen	0.00	0.00	7.00	12.00	0.00	0.00	0.00	0.00	7.00	12.00
	Sahbhagi	0.00	0.00	20.00	26.00	0.00	0.00	0.00	0.00	20.00	26.00
	MTU-1010	0.00	0.00	8.00	30.00	0.00	0.00	0.00	0.00	8.00	30.00
	Rajendera Mansuri	0.00	0.00	4.00	6.00	0.00	0.00	0.00	0.00	4.00	6.00
	Swarna(MTU-7029)	0.00	0.00	8.00	17.00	0.00	0.00	0.00	0.00	8.00	17.00
	Abhishek	0.00	0.00	5.00	10.00	0.00	0.00	0.00	0.00	5.00	10.00
	IR64 Drt-1	0.00	0.00	7.00	15.00	0.00	0.00	0.00	0.00	7.00	15.00
	CR Dhan 202	0.00	0.00	0.60	1.00	0.00	0.00	0.00	0.00	0.60	1.00
	CR Dhan 305	0.00	0.00	0.60	1.00	0.00	0.00	0.00	0.00	0.60	1.00
	Total	**20.00**	**20.60**	**71.20**	**145.50**	**0.00**	**0.00**	**0.00**	**1.50**	**91.20**	**167.60**
	Wheat										
	K 1006	0.00	0.00	6.00	15.00	0.00	0.00	0.00	0.00	6.00	15.00
	K 307	0.00	0.00	6.00	6.00	0.00	0.00	0.00	0.00	6.00	6.00
	Total	**0.00**	**0.00**	**12.00**	**21.00**	**0.00**	**0.00**	**0.00**	**0.00**	**12.00**	**21.00**
	Ragi										
	A-404	0.01	0.05	0.20	0.20	0.00	0.00	0.00	0.00	0.21	0.25
	Birsa Marua-2	0.02	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.05

	Total	**0.03**	**0.10**	**0.20**	**0.20**	**0.00**	**0.00**	**0.00**	**0.00**	**0.23**	**0.30**
	Total Cereal Crops	**20.03**	**20.70**	**83.40**	**166.70**	**0.00**	**0.00**	**0.00**	**1.50**	**103.43**	**188.90**
Pulse Crops	**Urd**										
	Birsa Urd-1	0.25	1.10	0.00	0.00	0.00	0.00	0.00	0.00	0.25	1.10
	Shekhar-2	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	1.00	1.00
	Total	**0.25**	**1.10**	**1.00**	**1.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.25**	**2.10**
	Pigeonpea										
	Birsa Arhar 1	0.00	0.00	0.30	0.30	0.00	0.00	0.00	0.00	0.30	0.30
	Total	**0.00**	**0.00**	**0.30**	**0.30**	**0.00**	**0.00**	**0.00**	**0.00**	**0.30**	**0.30**
	Mung										
	Pusa Vishal	0.00	0.00	0.30	0.40	0.00	0.00	0.00	0.00	0.30	0.40
	Pant Mung-5	0.00	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.10	0.10
	Pant Mung-6	0.00	0.00	0.30	0.35	0.00	0.00	0.00	0.00	0.30	0.35
	HUM-16	0.00	0.00	0.20	0.35	0.00	0.00	0.00	0.00	0.20	0.35
	Total	**0.00**	**0.00**	**0.90**	**1.20**	**0.00**	**0.00**	**0.00**	**0.00**	**0.90**	**1.20**
	Lentil										
	KLS 218	0.00	0.00	0.60	0.85	0.00	0.00	0.00	0.00	0.60	0.85
	Total	**0.00**	**0.00**	**0.60**	**0.85**	**0.00**	**0.00**	**0.00**	**0.00**	**0.60**	**0.85**
	Horse Gram										
	Birsa Kulthi-1	0.42	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.30
	Total	**0.42**	**0.30**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.42**	**0.30**
	Total Pulse Crops	**0.67**	**1.40**	**2.80**	**3.35**	**0.00**	**0.00**	**0.00**	**0.00**	**3.47**	**4.75**
Oilseed Crops	**Groundnut**										
	Birsa Bold	9.95	1.76	0.00	0.00	0.00	0.00	0.00	0.00	9.95	1.76
	Total	**9.95**	**1.76**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**9.95**	**1.76**
	Soybean										
	JS 97-52	10.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	8.00
	Total	**10.00**	**8.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**10.00**	**8.00**
	Niger										
	Birsa Niger -3	6.03	4.00	0.00	0.00	0.00	0.00	0.00	0.00	6.03	4.00
	Pooja (BNS-10)	1.02	1.50	0.00	0.00	0.00	0.00	0.00	0.00	1.02	1.50
	BNS 9	1.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.02	0.00
	Total	**8.07**	**5.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**8.07**	**5.50**
	Mustard										
	Shivani	0.05	0.10	0.30	0.30	0.00	0.00	0.00	0.00	0.35	0.40

	Pusa Mahak	0.00	0.00	0.10	0.40	0.00	0.00	0.00	0.00	0.10	0.40
	Pusa Mustard 30	0.00	0.00	0.10	0.05	0.00	0.00	0.00	0.00	0.10	0.05
	Total	**0.05**	**0.10**	**0.50**	**0.75**	**0.00**	**0.00**	**0.00**	**0.00**	**0.55**	**0.85**
	Linseed										
	T 397	0.00	0.00	0.30	0.30	0.00	0.00	0.00	0.00	0.30	0.30
	BAU 06-03	0.00	0.00	0.10	0.15	0.00	0.00	0.00	0.00	0.10	0.15
	Surbhi	0.00	0.00	0.10	0.20	0.00	0.00	0.00	0.00	0.10	0.20
	Total	**0.00**	**0.00**	**0.50**	**0.65**	**0.00**	**0.00**	**0.00**	**0.00**	**0.50**	**0.65**
	Sesamum										
	Kanke White	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	Shekhar-2	0.00	0.00	0.05	0.10	0.00	0.00	0.00	0.00	0.05	0.10
	Total	**0.01**	**0.00**	**0.05**	**0.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.06**	**0.10**
	Total Oilseed Crops	**28.08**	**15.36**	**1.05**	**1.50**	**0.00**	**0.00**	**0.00**	**0.00**	**29.13**	**16.86**
	Grand Total (Ranchi)	**48.78**	**37.46**	**87.25**	**171.55**	**0.00**	**0.00**	**0.00**	**1.50**	**136.03**	**210.51**
12. RPCAU, Pusa Dholi											
Cereal Crops	**Rice**										
	R. Sweta	35.00	40.00	8.00	62.30	0.00	0.00	0.00	0.00	43.00	102.30
	Sita	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00
	Rajshree	0.20	0.90	9.10	32.10	0.00	0.00	0.00	0.00	9.30	33.00
	Prabhat	32.50	35.00	14.00	20.45	0.00	0.00	0.00	0.00	46.50	55.45
	CSR-36	0.00	0.00	1.00	7.00	0.00	0.00	0.00	0.00	1.00	7.00
	Sahbhagi Dhan	0.00	0.00	3.00	6.65	0.00	0.00	0.00	0.00	3.00	6.65
	R. Bhagwati	55.10	90.00	0.00	0.00	0.00	0.00	0.00	0.00	55.10	90.00
	R. Kasturi	2.20	3.00	4.50	3.00	0.00	0.00	0.00	0.00	6.70	6.00
	R. Suwasini	1.55	7.20	2.50	0.00	0.00	0.00	0.00	0.00	4.05	7.20
	Swarna Sub1	0.00	0.00	2.00	2.00	0.00	0.00	0.00	0.00	2.00	2.00
	R. Mahsuri 1	58.00	80.00	27.00	67.65	0.00	0.00	0.00	0.00	85.00	147.65
	Sudha	0.00	0.00	1.00	0.60	0.00	0.00	0.00	0.00	1.00	0.60
	Vaidehi	0.00	0.00	1.00	0.40	0.00	0.00	0.00	0.00	1.00	0.40
	R. Neelam	0.00	0.00	1.00	5.40	0.00	0.00	0.00	0.00	1.00	5.40
	Total	**187.55**	**256.10**	**74.10**	**207.55**	**0.00**	**0.00**	**0.00**	**0.00**	**261.65**	**463.65**
	Wheat										
	DBW-39	100.00	100.00	40.00	40.00	0.00	0.00	0.00	0.00	140.00	140.00
	HD-2733	42.69	42.69	172.31	172.31	0.00	0.00	0.00	0.00	215.00	215.00
	HD-2967	547.25	547.25	102.75	102.75	0.00	0.00	0.00	0.00	650.00	650.00

	HI-1563	62.00	62.00	13.00	13.00	0.00	0.00	0.00	0.00	75.00	75.00
	DBW-107	0.00	0.00	75.00	75.00	0.00	0.00	0.00	0.00	75.00	75.00
	K-307	0.00	0.00	13.00	13.00	0.00	0.00	0.00	0.00	13.00	13.00
	Total	**751.94**	**751.94**	**416.06**	**416.06**	**0.00**	**0.00**	**0.00**	**0.00**	**1168.00**	**1168.00**
	Ragi										
	RAU 8	0.25	1.00	4.00	4.00	0.00	0.00	0.00	0.00	4.25	5.00
	Total	**0.25**	**1.00**	**4.00**	**4.00**	**0.00**	**0.00**	**0.00**	**0.00**	**4.25**	**5.00**
	Prosomillet										
	BR 7	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00
	Total	**0.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.50**	**0.00**
	Total Cereal Crops	**940.24**	**1009.04**	**494.16**	**627.61**	**0.00**	**0.00**	**0.00**	**0.00**	**1434.40**	**1636.65**
Pulse Crops	**Pigeonpea**										
	Bahar	2.78	10.00	0.00	0.00	0.00	0.00	0.00	0.00	2.78	10.00
	NDA-1	0.00	0.00	16.00	3.25	0.00	0.00	0.00	0.00	16.00	3.25
	Total	**2.78**	**10.00**	**16.00**	**3.25**	**0.00**	**0.00**	**0.00**	**0.00**	**18.78**	**13.25**
	Urd										
	Pant-31	0.00	0.00	3.50	3.50	0.00	0.00	0.00	0.00	3.50	3.50
	Toal	**0.00**	**0.00**	**3.50**	**3.50**	**0.00**	**0.00**	**0.00**	**0.00**	**3.50**	**3.50**
	Chickpea										
	BG – 372	0.00	0.00	20.00	20.00	0.00	0.00	0.00	0.00	20.00	20.00
	Subhara	0.00	0.00	2.16	2.16	0.00	0.00	0.00	0.00	2.16	2.16
	Total	**0.00**	**0.00**	**22.16**	**22.16**	**0.00**	**0.00**	**0.00**	**0.00**	**22.16**	**22.16**
	Mung										
	IPM 2-3	0.00	0.00	18.00	20.00	0.00	0.00	0.00	0.00	18.00	20.00
	PDM – 139	0.00	0.00	6.00	8.00	84.00	90.00	0.00	0.00	90.00	98.00
	Total	**0.00**	**0.00**	**24.00**	**28.00**	**84.00**	**90.00**	**0.00**	**0.00**	**108.00**	**118.00**
	Field Pea										
	HUDP – 15	14.00	14.00	0.00	0.00	0.00	0.00	0.00	0.00	14.00	14.00
	HFP – 4	10.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	10.00
	Kashinandini	0.00	0.00	1.62	1.62	0.00	0.00	0.00	0.00	1.62	1.62
	GDF-PI	0.00	0.00	1.68	1.68	0.00	0.00	0.00	0.00	1.68	1.68
	Swarnmukti	0.00	0.00	1.87	1.87	0.00	0.00	0.00	0.00	1.87	1.87
	Total	**24.00**	**24.00**	**5.17**	**5.17**	**0.00**	**0.00**	**0.00**	**0.00**	**29.17**	**29.17**
	Lentil										
	KLS - 218	34.39	34.39	0.00	0.00	0.00	0.00	0.00	0.00	34.39	34.39

	HUL-57	16.00	16.00	0.00	0.00	0.00	0.00	0.00	0.00	16.00	16.00
	IPL - 406	3.60	3.60	0.00	0.00	0.00	0.00	0.00	0.00	3.60	3.60
	IPL - 316	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00
	Total	**55.99**	**55.99**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**55.99**	**55.99**
	Rajmash										
	Utkarsh	0.00	0.00	1.73	1.73	0.00	0.00	0.00	0.00	1.73	1.73
	Total	**0.00**	**0.00**	**1.73**	**1.73**	**0.00**	**0.00**	**0.00**	**0.00**	**1.73**	**1.73**
	Total Pulse Crops	**82.77**	**89.99**	**72.56**	**63.81**	**84.00**	**90.00**	**0.00**	**0.00**	**239.33**	**243.80**
Oilseed Crops	**Sesame**										
	Krishna	0.50	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.60
	Pragati	0.00	0.00	1.60	1.60	0.00	0.00	0.00	0.00	1.60	1.60
	Total	**0.50**	**0.60**	**1.60**	**1.60**	**0.00**	**0.00**	**0.00**	**0.00**	**2.10**	**2.20**
	Yellow Sarso										
	NRCYS-05-02	0.00	0.00	0.96	0.96	0.00	0.00	0.00	0.00	0.96	0.96
	Total	**0.00**	**0.00**	**0.96**	**0.96**	**0.00**	**0.00**	**0.00**	**0.00**	**0.96**	**0.96**
	Total Oilseed Crops	**0.50**	**0.60**	**2.56**	**2.56**	**0.00**	**0.00**	**0.00**	**0.00**	**3.06**	**3.16**
	Grand Total (Dholi)	**1023.51**	**1099.63**	**569.28**	**693.98**	**84.00**	**90.00**	**0.00**	**0.00**	**1676.79**	**1883.61**
13. OUA&T, Bhubaneswar											
Cereal Crops	**Rice**										
	Parijat	5.50	7.20	0.00	0.00	0.00	0.00	0.00	0.00	5.50	7.20
	Mandakini	2.50	11.40	0.00	0.00	0.00	0.00	0.00	0.00	2.50	11.40
	Khandagiri	21.50	24.00	0.00	0.00	0.00	0.00	0.00	0.00	21.50	24.00
	Lalat	48.00	40.30	0.00	0.00	0.00	0.00	0.00	0.00	48.00	40.30
	Manaswini	2.50	4.60	0.00	0.00	0.00	0.00	0.00	0.00	2.50	4.60
	Surendra	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00
	Hiranmayee	1.50	1.50	0.00	0.00	0.00	0.00	0.00	0.00	1.50	1.50
	Tejaswini	0.10	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.12
	Bhubana	1.00	7.50	0.00	0.00	0.00	0.00	0.00	0.00	1.00	7.50
	Mrunalini	15.50	21.00	0.00	0.00	0.00	0.00	0.00	0.00	15.50	21.00
	Gajapati	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00
	Pratikshya	39.00	70.00	0.00	0.00	0.00	0.00	0.00	0.00	39.00	70.00
	Ranidhan	3.10	11.60	0.00	0.00	0.00	0.00	0.00	0.00	3.10	11.60
	Improved Lalat	2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	0.00
	Moudamani	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00
	Udayagiri	0.00	0.00	0.00	0.00	0.00	0.00	3.80	3.80	3.80	3.80

	Upahar	0.00	0.00	0.00	0.00	0.00	0.00	10.00	10.00	10.00	10.00
	Total	**147.20**	**200.22**	**0.00**	**0.00**	**0.00**	**0.00**	**13.80**	**13.80**	**161.00**	**214.02**
	Total Cereal Crops	**147.20**	**200.22**	**0.00**	**0.00**	**0.00**	**0.00**	**13.80**	**13.80**	**161.00**	**214.02**
Pulse Crops	**Mung**										
	IPM 2-14	20.00	24.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	24.00
	IPM 2-3	20.00	24.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	24.00
	Total	**40.00**	**48.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**40.00**	**48.00**
	Urdbean										
	PU 31	12.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00	25.00
	Total	**12.00**	**25.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**12.00**	**25.00**
	Total Pulse Crops	**52.00**	**73.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**52.00**	**73.00**
Oilseed Crops	**Sesamum**										
	Smarak	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.25	0.25	0.25
	Amrit	0.95	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.95	0.25
	Total	**0.95**	**0.25**	**0.00**	**0.00**	**0.00**	**0.00**	**0.25**	**0.25**	**1.20**	**0.50**
	Niger										
	ONS 150	2.85	3.30	0.00	0.00	0.00	0.00	0.00	0.00	2.85	3.30
	Total	**2.85**	**3.30**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.85**	**3.30**
	Total Oilseed Crops	**3.80**	**3.55**	**0.00**	**0.00**	**0.00**	**0.00**	**0.25**	**0.25**	**4.05**	**3.80**
Grand Total (Bhubaneswar)		**203.00**	**276.77**	**0.00**	**0.00**	**0.00**	**0.00**	**14.05**	**14.05**	**217.05**	**290.82**
14. MAF, Kota											
Cereal Crops	**Rice**										
	Pratap 1	0.01	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.10
	Total	**0.01**	**0.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.01**	**0.10**
	Wheat										
	C 306	60.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	60.00	100.00
	HI 1544	345.00	350.00	0.00	0.00	0.00	0.00	0.00	0.00	345.00	350.00
	HI 8498	75.50	150.00	0.00	0.00	0.00	0.00	0.00	0.00	75.50	150.00
	HI 8737	154.00	125.00	0.00	0.00	0.00	0.00	0.00	0.00	154.00	125.00
	HI 8713	188.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00	188.00	200.00
	Raj 3077	207.00	250.00	0.00	0.00	0.00	0.00	0.00	0.00	207.00	250.00
	Raj 4120	109.80	220.00	0.00	0.00	0.00	0.00	0.00	0.00	109.80	220.00
	Raj 3765	127.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00	127.00	200.00
	Total	**1266.30**	**1595.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1266.30**	**1595.00**
	Total Cereal Crops	**1266.31**	**1595.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1266.31**	**1595.10**

Pulse Crops	**Mung**										
	IPM 02-03	50.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00	50.00
	Shikha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.20	0.00	3.20
	Virat	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.80	5.00	0.80
	Mung (Summer 2018)										
	IPM 02-03	0.00	20.00	0.00	0.00	25.00	40.00	0.00	0.00	25.00	60.00
	Shikha	0.00	0.00	0.00	0.00	5.00	20.00	0.00	0.00	5.00	20.00
	Virat	0.00	0.00	0.00	0.00	5.00	8.00	0.00	0.00	5.00	8.00
	IPM 02-14	0.00	0.00	0.00	0.00	5.00	5.00	0.00	0.00	5.00	5.00
	Total	**50.00**	**70.00**	**0.00**	**0.00**	**40.00**	**73.00**	**5.00**	**4.00**	**95.00**	**147.00**
	Urd										
	KPU 405	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00
	Pratap U 1	28.00	50.00	0.00	0.00	0.00	0.00	20.00	40.00	48.00	90.00
	Total	**31.00**	**50.00**	**0.00**	**0.00**	**0.00**	**0.00**	**20.00**	**40.00**	**51.00**	**90.00**
	Pigeonpea										
	ICPL 88039	0.00	0.00	0.00	0.00	0.00	0.00	20.00	30.00	20.00	30.00
	PA-291	0.00	0.00	0.00	0.00	0.00	0.00	20.00	40.00	20.00	40.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**40.00**	**70.00**	**40.00**	**70.00**
	Chickpea										
	JG 14	200.00	240.00	0.00	0.00	100.00	120.00	0.00	0.00	300.00	360.00
	GNG 1958	100.00	150.00	0.00	0.00	75.00	75.00	0.00	0.00	175.00	225.00
	CSJ 515	50.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00	50.00
	RSG 974	50.00	60.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00	60.00
	GNG 1581	0.00	0.00	0.00	0.00	100.00	130.00	0.00	0.00	100.00	130.00
	GNG 469	0.00	0.00	0.00	0.00	75.00	75.00	0.00	0.00	75.00	75.00
	Total	**400.00**	**500.00**	**0.00**	**0.00**	**350.00**	**400.00**	**0.00**	**0.00**	**750.00**	**900.00**
	Field Pea										
	IPFD 10-12	20.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	15.00
	Aman	20.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	20.00
	RFP 4	10.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	10.00
	Total	**50.00**	**45.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**50.00**	**45.00**
	Lentil										
	IPL 316	15.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	15.00
	Kota Masoor 1	25.00	30.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	30.00
	Total	**40.00**	**45.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**40.00**	**45.00**

	Total Pulse Crops	**571.00**	**710.00**	**0.00**	**0.00**	**390.00**	**473.00**	**65.00**	**114.00**	**1026.00**	**1297.00**
Oilseed Crops	**Soybean**										
	RKS-24	320.00	290.00	0.00	0.00	0.00	0.00	0.00	0.00	320.00	290.00
	RKS-45	510.00	97.00	0.00	0.00	0.00	0.00	0.00	0.00	510.00	97.00
	JS 20-34	200.00	192.00	0.00	0.00	0.00	0.00	0.00	0.00	200.00	192.00
	JS 20-29	50.00	35.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00	35.00
	JS 93-05	200.00	193.00	0.00	0.00	0.00	0.00	0.00	0.00	200.00	193.00
	JS 95-60	120.00	54.00	0.00	0.00	0.00	0.00	0.00	0.00	120.00	54.00
	RKS 18	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
	RKS-113	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.00	0.00	18.00
	Total	**1401.00**	**861.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**18.00**	**1401.00**	**879.00**
	Linseed										
	Pratap Alsi 2	6.00	12.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	12.00
	KBA-4	0.84	6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.84	6.00
	KBA-3	0.12	6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	6.00
	Total	**6.96**	**24.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**6.96**	**24.00**
	Total Oilseed Crops	**1407.96**	**885.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**18.00**	**1407.96**	**903.00**
	Grand Total (Kota)	**3245.27**	**3190.10**	**0.00**	**0.00**	**390.00**	**473.00**	**65.00**	**132.00**	**3700.27**	**3795.10**
15. RAU, Bikaner											
Cereal Crops	**Wheat**										
	Raj-1482	120.00	140.00	0.00	0.00	0.00	0.00	0.00	0.00	120.00	140.00
	Raj-4037	40.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	40.00	50.00
	Raj-4079	200.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00	200.00	200.00
	Raj-4120	80.00	90.00	0.00	0.00	0.00	0.00	0.00	0.00	80.00	90.00
	Raj-4238	200.00	225.00	0.00	0.00	0.00	0.00	0.00	0.00	200.00	225.00
	Total	**640.00**	**705.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**640.00**	**705.00**
	Total Cereal Crops	**640.00**	**705.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**640.00**	**705.00**
Pulse Crops	**Mung**										
	Ganga-1	0.70	1.20	0.00	0.00	0.00	0.00	0.00	0.15	0.70	1.35
	Ganga-8	1.20	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20	1.00
	Total	**1.90**	**2.20**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.15**	**1.90**	**2.35**
	Mothbean										
	RMO-257	6.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	15.00
	RMO 40	6.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.60	0.00
	RMO-435	6.50	20.00	0.00	0.00	0.00	0.00	0.00	0.00	6.50	20.00

	Total	**19.10**	**35.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**19.10**	**35.00**
	Chickpea										
	GNG-1581	127.70	155.00	0.00	0.00	250.00	400.00	0.00	0.00	377.70	555.00
	GNG-1958	200.00	170.00	0.00	0.00	200.00	250.00	0.00	0.00	400.00	420.00
	GNG-2144	140.74	140.00	0.00	0.00	50.00	27.00	0.00	0.00	190.74	167.00
	GNG-663	9.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.20	0.00
	GNG-2171	248.00	240.00	0.00	0.00	0.00	12.00	0.00	0.00	248.00	252.00
	GNG-1488	5.75	8.00	0.00	0.00	0.00	0.00	0.00	0.00	5.75	8.00
	Total	**731.39**	**713.00**	**0.00**	**0.00**	**500.00**	**689.00**	**0.00**	**0.00**	**1231.39**	**1402.00**
	Total Pulse Crops	**752.39**	**750.20**	**0.00**	**0.00**	**500.00**	**689.00**	**0.00**	**0.15**	**1252.39**	**1439.35**
Oilseed Crops	**Groundnut**										
	HNG-123	56.00	60.00	0.00	0.00	0.00	0.00	0.00	0.00	56.00	60.00
	HNG-69	10.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	10.00
	Mallika	4.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00
	HNG-10	0.40	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	4.00
	Total	**70.40**	**78.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**70.40**	**78.00**
	Mustard										
	RGN-48	0.21	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.90
	RGN-73	0.29	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.90
	RGN-229	0.40	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.80
	RGN-236	0.35	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.80
	RGN-298	0.55	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55	1.00
	Total	**1.80**	**4.40**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.80**	**4.40**
	Total Oilseed Crops	**72.20**	**82.40**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**72.20**	**82.40**
Forage crop	**Guar**										
	RGC-1033	20.00	30.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	30.00
	HG 2-20	40.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	40.00	40.00
	RGC-936	8.50	12.00	0.00	0.00	0.00	0.00	0.00	0.00	8.50	12.00
	Total	**68.50**	**82.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**68.50**	**82.00**
	Total Forage crops	**68.50**	**82.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**68.50**	**82.00**
Fibre Crops	**Cotton**										
	RG-542	12.00	13.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00	13.00
	Total	**12.00**	**13.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**12.00**	**13.00**
	Total Fibre Crops	**12.00**	**13.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**12.00**	**13.00**
Grand Total (Bikaner)		**1545.09**	**1632.60**	**0.00**	**0.00**	**500.00**	**689.00**	**0.00**	**0.15**	**2045.09**	**2321.75**

16. MPUAT, Udaipur											
Cereal Crops	**Sorghum**										
	CSV 17	0.20	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.30
	CSV 23	3.41	3.66	0.00	0.00	0.00	0.00	0.00	0.00	3.41	3.66
	Total	**3.61**	**3.96**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.61**	**3.96**
	Wheat										
	Raj 4079	60.26	65.00	0.00	0.00	0.00	0.00	0.00	0.00	60.26	65.00
	Raj 4238	10.00	11.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	11.00
	Raj 4037	5.00	5.50	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.50
	Total	**75.26**	**81.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**75.26**	**81.50**
	Maize										
	EI-586-2 (Fimale line PMH-3)	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00
	EI-670-2 (Male line PMH-3)	4.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00
	Pratap Kanchan-2	0.40	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.40
	PM 3	2.00	2.30	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.30
	PM 5	10.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	5.00
	Total	**18.40**	**13.70**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**18.40**	**13.70**
	Barley										
	RD-2794	5.00	5.50	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.50
	RD-2786	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00
	RD-2715	0.00	0.00	230.00	160.00	0.00	0.00	0.00	0.00	230.00	160.00
	Total	**10.00**	**10.50**	**230.00**	**160.00**	**0.00**	**0.00**	**0.00**	**0.00**	**240.00**	**170.50**
	Total Cereal Crops	**107.27**	**109.66**	**230.00**	**160.00**	**0.00**	**0.00**	**0.00**	**0.00**	**337.27**	**269.66**
Pulse Crops	**Chickpea**										
	Pratap Chana-1	28.75	30.00	0.00	0.00	12.00	8.00	0.00	0.00	40.75	38.00
	GNG-1581	55.00	55.00	0.00	0.00	0.00	0.00	0.00	0.00	55.00	55.00
	GNG-1958	10.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	10.00
	Total	**93.75**	**95.00**	**0.00**	**0.00**	**12.00**	**8.00**	**0.00**	**0.00**	**105.75**	**103.00**
	Horse Gram										
	AK 42	3.00	1.10	0.00	0.00	0.00	0.00	0.00	0.00	3.00	1.10
	Total	**3.00**	**1.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.00**	**1.10**
	Total Pulse Crops	**96.75**	**96.10**	**0.00**	**0.00**	**12.00**	**8.00**	**0.00**	**0.00**	**108.75**	**104.10**
Forage Crop	**Sorghum**										
	Pratap Chari 1080	3.00	4.35	0.00	0.00	0.00	0.00	0.00	0.00	3.00	4.35
	Total	**3.00**	**4.35**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.00**	**4.35**

	Maize										
	Pratap Makka Chari 6	10.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	10.00
	Total	**10.00**	**10.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**10.00**	**10.00**
	Total Forage crops	**13.00**	**14.35**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**13.00**	**14.35**
	Grand Total Udaipur	**217.02**	**220.11**	**230.00**	**160.00**	**12.00**	**8.00**	**0.00**	**0.00**	**459.02**	**388.11**
17. SKNAU, Jobner											
Cereal Crops	**Pearlmillet**										
	RIB 494 (R Line)	0.09	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.30
	RAJ 171	0.20	7.80	0.00	0.00	0.00	0.00	0.00	0.00	0.20	7.80
	RIB 192 S 99	0.09	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.20
	Total	**0.38**	**8.30**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.38**	**8.30**
	Total Cereal Crops	**0.38**	**8.30**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.38**	**8.30**
Pulse Crops	**Mung**										
	IPM 02-3	22.50	27.00	0.00	0.00	0.00	0.00	0.00	0.00	22.50	27.00
	MSJ 118	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Ganga 8	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00
	Ganga 1	0.50	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.00
	RMG 975	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	SML 668	13.71	9.20	0.00	0.00	0.00	0.00	0.00	0.00	13.71	9.20
	MH 421	50.00	8.80	0.00	0.00	0.00	0.00	0.00	0.00	50.00	8.80
	Total	**87.71**	**47.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**87.71**	**47.00**
	Cowpea										
	RC 19	2.00	2.20	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.20
	RC 19	2.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	8.00
	Total	**4.00**	**10.20**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**4.00**	**10.20**
	Urd										
	IPU 94-1	0.00	0.00	0.00	0.00	5.00	32.00	0.00	0.00	5.00	32.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**5.00**	**32.00**	**0.00**	**0.00**	**5.00**	**32.00**
	Total Pulse Crops	**91.71**	**57.20**	**0.00**	**0.00**	**5.00**	**32.00**	**0.00**	**0.00**	**96.71**	**89.20**
Oilseed Crops	**Groundnut**										
	RG 510 (Raj Mungfali 1)	55.00	32.90	0.00	0.00	0.00	0.00	0.00	0.00	55.00	32.90
	RG 425 (Raj Durga)	10.00	11.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	11.00
	RG 578 (Raj Munfali 2)	60.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	60.00	50.00
	Total	**125.00**	**93.90**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**125.00**	**93.90**
	Total Oilseed Crops	**125.00**	**93.90**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**125.00**	**93.90**

Forage Crops	**Guar**										
	RGC 1033	30.00	45.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	45.00
	RGC 1066	2.25	6.00	0.00	0.00	0.00	0.00	0.00	0.00	2.25	6.00
	RGC 1055	2.80	18.50	0.00	0.00	0.00	0.00	0.00	0.00	2.80	18.50
	RGC 1038	38.50	60.00	0.00	0.00	0.00	0.00	0.00	0.00	38.50	60.00
	RGC 197	1.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.20
	RGC 936	7.70	16.00	0.00	0.00	0.00	0.00	0.00	0.00	7.70	16.00
	RGC 1003	1.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.50
	RGC 1002	0.40	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.50
	M 83	0.20	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.25
	RGC 1017	0.30	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.20
	Total	**84.15**	**148.15**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**84.15**	**148.15**
	Cowpea										
	RC 19	0.00	0.00	0.00	0.00	0.00	0.00	1.50	3.30	1.50	3.30
	RC 101	0.00	0.00	0.00	0.00	0.00	0.00	1.50	4.60	1.50	4.60
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.00**	**7.90**	**3.00**	**7.90**
	Total Forage Crops	**84.15**	**148.15**	**0.00**	**0.00**	**0.00**	**0.00**	**3.00**	**7.90**	**87.15**	**156.05**
	Grand Total (Jobner)	**301.24**	**307.55**	**0.00**	**0.00**	**5.00**	**32.00**	**3.00**	**7.90**	**309.24**	**347.45**
18. SDAU, S.K.Nagar											
Cereal Crops	**Wheat**										
	GW 496	250.00	250.00	780.00	780.00	0.00	0.00	0.00	0.00	1030.00	1030.00
	GW 451	37.50	37.50	425.00	425.00	0.00	0.00	0.00	0.00	462.50	462.50
	GW 322	275.00	275.00	25.00	25.00	0.00	0.00	0.00	0.00	300.00	300.00
	GW 173	50.00	50.00	200.00	200.00	0.00	0.00	0.00	0.00	250.00	250.00
	LOK 1	0.00	0.00	500.00	500.00	0.00	0.00	0.00	0.00	500.00	500.00
	GDW 1255	0.00	0.00	105.00	105.00	0.00	0.00	0.00	0.00	105.00	105.00
	GW 273	0.00	0.00	165.00	165.00	0.00	0.00	0.00	0.00	165.00	165.00
	GW 503	0.00	0.00	3.30	3.30	0.00	0.00	0.00	0.00	3.30	3.30
	GW 11	0.00	0.00	50.00	50.00	0.00	0.00	0.00	0.00	50.00	50.00
	Total	**612.50**	**612.50**	**2253.30**	**2253.30**	**0.00**	**0.00**	**0.00**	**0.00**	**2865.80**	**2865.80**
	Total Cereal Crops	**612.50**	**612.50**	**2253.30**	**2253.30**	**0.00**	**0.00**	**0.00**	**0.00**	**2865.80**	**2865.80**
Pulse Crops	**Pigeonpea**										
	BDN 2	0.00	0.00	15.35	16.00	0.00	0.00	0.00	0.00	15.35	16.00
	ICPL 87	0.00	0.00	3.28	4.00	0.00	0.00	0.00	0.00	3.28	4.00
	GT 101	0.00	0.00	0.40	0.50	0.00	0.00	0.00	0.00	0.40	0.50

	GT 102	0.10	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	1.00
	Total	**0.10**	**1.00**	**19.03**	**20.50**	**0.00**	**0.00**	**0.00**	**0.00**	**19.13**	**21.50**
	Mung										
	GM 4	6.50	10.50	69.41	4.50	250.00	7.50	0.00	0.00	325.91	22.50
	K 851	0.00	0.00	3.62	0.00	0.00	0.00	0.00	0.00	3.62	0.00
	Total	**6.50**	**10.50**	**73.03**	**4.50**	**250.00**	**7.50**	**0.00**	**0.00**	**329.53**	**22.50**
	Urd										
	T 9	0.00	0.00	44.45	34.66	0.00	0.00	0.00	0.00	44.45	34.66
	GU 1	5.00	10.00	39.83	40.00	200.00	10.00	0.00	0.00	244.83	60.00
	Total	**5.00**	**10.00**	**84.28**	**74.66**	**200.00**	**10.00**	**0.00**	**0.00**	**289.28**	**94.66**
	Guar										
	GG 1	0.00	0.00	2.53	2.40	0.00	0.00	0.00	0.00	2.53	2.40
	GG 2	0.00	0.00	3.08	3.20	0.00	0.00	0.00	0.00	3.08	3.20
	Total	**0.00**	**0.00**	**5.61**	**5.60**	**0.00**	**0.00**	**0.00**	**0.00**	**5.61**	**5.60**
	Horse Gram										
	GHG 5	0.85	6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.85	6.00
	Total	**0.85**	**6.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.85**	**6.00**
	Cowpea										
	GC 4	3.75	5.61	0.00	0.00	0.00	0.00	0.00	0.00	3.75	5.61
	Total	**3.75**	**5.61**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.75**	**5.61**
	Mothbean										
	GMO 2	0.00	0.00	0.40	0.46	0.00	0.00	0.00	0.00	0.40	0.46
	Total	**0.00**	**0.00**	**0.40**	**0.46**	**0.00**	**0.00**	**0.00**	**0.00**	**0.40**	**0.46**
	Total Pulse Crops	**16.20**	**33.11**	**182.35**	**105.72**	**450.00**	**17.50**	**0.00**	**0.00**	**648.55**	**156.33**
Oilseed Crops	**Castor**										
	SKP 84	0.78	1.00	7.41	10.56	0.00	0.00	0.00	0.00	8.19	11.56
	SKI 215	0.39	0.50	3.22	5.64	0.00	0.00	0.00	0.00	3.61	6.14
	VP 1 (C)	0.00	0.00	0.28	0.00	0.00	0.00	0.00	0.00	0.28	0.00
	VI 9	0.00	0.00	0.94	0.68	0.00	0.00	0.00	0.00	0.94	0.68
	48-1	0.00	0.00	1.96	2.86	0.00	0.00	0.00	0.00	1.96	2.86
	JI 35	0.00	0.00	2.59	4.64	0.00	0.00	0.00	0.00	2.59	4.64
	Gaeta	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.12	0.00
	SH 72	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.04	0.00
	JP 65	0.00	0.00	0.28	0.00	0.00	0.00	0.00	0.00	0.28	0.00
	JI 96	0.00	0.00	0.04	0.78	0.00	0.00	0.00	0.00	0.04	0.78

	VP 1 (M)	0.00	0.00	8.37	12.00	0.00	0.00	0.00	0.00	8.37	12.00
	GC 3	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.04	0.00
	Total	**1.17**	**1.50**	**25.29**	**37.16**	**0.00**	**0.00**	**0.00**	**0.00**	**26.46**	**38.66**
	Mustard										
	GM 1	0.00	0.00	0.40	0.40	0.00	0.00	0.00	0.00	0.40	0.40
	GM 2	0.10	0.10	0.50	0.50	0.00	0.00	0.00	0.00	0.60	0.60
	GM 3	0.05	0.05	0.55	0.55	0.00	0.00	0.00	0.00	0.60	0.60
	GDM 4	0.00	0.00	0.80	0.80	0.00	0.00	0.00	0.00	0.80	0.80
	Total	**0.15**	**0.15**	**2.25**	**2.25**	**0.00**	**0.00**	**0.00**	**0.00**	**2.40**	**2.40**
	Total Oilseed Crops	**1.32**	**1.65**	**27.54**	**39.41**	**0.00**	**0.00**	**0.00**	**0.00**	**28.86**	**41.06**
	Grand Total (S. K. Nagar)	**630.02**	**647.26**	**2463.19**	**2398.43**	**450.00**	**17.50**	**0.00**	**0.00**	**3543.21**	**3063.19**
19. AAU, Anand											
Cereal Crops	**Rice**										
	GR-3	0.00	0.00	2.05	5.00	0.00	0.00	0.00	0.00	2.05	5.00
	GR-4	0.00	0.00	6.55	10.00	0.00	0.00	0.00	0.00	6.55	10.00
	GR-7	0.00	0.00	1.30	8.00	0.00	0.00	0.00	0.00	1.30	8.00
	GR-11	0.00	0.00	8.60	22.00	0.00	0.00	0.00	0.00	8.60	22.00
	Jaya	0.00	0.00	7.60	35.00	0.00	0.00	0.00	0.00	7.60	35.00
	Masuri	0.00	0.00	2.50	20.00	0.00	0.00	0.00	0.00	2.50	20.00
	Gurjari	0.00	0.00	32.50	71.00	0.00	0.00	0.00	0.00	32.50	71.00
	IR-28	0.00	0.00	1.55	4.00	0.00	0.00	0.00	0.00	1.55	4.00
	GAR-13	0.00	0.00	22.20	70.00	0.00	0.00	0.00	0.00	22.20	70.00
	Mahisagar	0.00	0.00	1.00	25.00	0.00	0.00	0.00	0.00	1.00	25.00
	GR-12	0.00	0.00	0.05	2.00	0.00	0.00	0.00	0.00	0.05	2.00
	GAR-1	0.00	0.00	0.05	11.00	0.00	0.00	0.00	0.00	0.05	11.00
	GAR-2	0.00	0.00	0.05	10.00	0.00	0.00	0.00	0.00	0.05	10.00
	GR-5	0.00	0.00	0.50	1.00	0.00	0.00	0.00	0.00	0.50	1.00
	GAR-3	0.00	0.00	0.30	0.50	0.00	0.00	0.00	0.00	0.30	0.50
	Dandi	0.00	0.00	0.05	0.50	0.00	0.00	0.00	0.00	0.05	0.50
	Total	**0.00**	**0.00**	**86.85**	**295.00**	**0.00**	**0.00**	**0.00**	**0.00**	**86.85**	**295.00**
	Maize										
	GM-6	0.00	0.00	0.00	0.00	0.00	0.00	17.00	17.00	17.00	17.00
	GM-3	0.00	0.00	0.00	0.00	0.00	0.00	14.50	14.50	14.50	14.50
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**31.50**	**31.50**	**31.50**	**31.50**
	Total Cereal Crops	**0.00**	**0.00**	**86.85**	**295.00**	**0.00**	**0.00**	**31.50**	**31.50**	**118.35**	**326.50**

Pulse Crops	**Greengram**										
	GAM 5	0.00	0.00	0.00	0.00	0.00	0.00	1.34	1.34	1.34	1.34
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.34**	**1.34**	**1.34**	**1.34**
	Pigeonpea										
	AGT 2	1.00	2.50	0.00	0.00	0.00	0.00	6.00	6.00	7.00	8.50
	Total	**1.00**	**2.50**	**0.00**	**0.00**	**0.00**	**0.00**	**6.00**	**6.00**	**7.00**	**8.50**
	Total Pulse Crops	**1.00**	**2.50**	**0.00**	**0.00**	**0.00**	**0.00**	**7.34**	**7.34**	**8.34**	**9.84**
Oilseed Crops	**Soybean**										
	NRC 37	0.00	0.00	0.00	0.00	0.00	0.00	13.00	13.60	13.00	13.60
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**13.00**	**13.60**	**13.00**	**13.60**
	Groundnut #										
	GG 20	0.00	0.00	45.00	45.00	0.00	0.00	0.00	0.00	45.00	45.00
	GG 22	0.00	0.00	45.00	45.00	0.00	0.00	0.00	0.00	45.00	45.00
	Total	**0.00**	**0.00**	**90.00**	**90.00**	**0.00**	**0.00**	**0.00**	**0.00**	**90.00**	**90.00**
	Total Oilseed Crops	**0.00**	**0.00**	**90.00**	**90.00**	**0.00**	**0.00**	**13.00**	**13.60**	**103.00**	**103.60**
Fibre Crops	**Cotton ***										
	V-797	0.02	4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.02	4.50
	G.Cot.13	0.02	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.50
	G.Cot.21	0.02	0.20	0.00	25.60	0.00	0.00	0.00	0.00	0.02	25.80
	ADC 1	0.02	0.20	0.02	0.00	0.00	0.00	0.00	0.00	0.04	0.20
	GADC 2	0.00	0.00	0.00	6.93	0.00	0.00	5.00	0.00	5.00	6.93
	Total	**0.08**	**5.40**	**0.02**	**32.53**	**0.00**	**0.00**	**5.00**	**0.00**	**5.10**	**37.93**
	Total Fibre Crops	**0.08**	**5.40**	**0.02**	**32.53**	**0.00**	**0.00**	**5.00**	**0.00**	**5.10**	**37.93**
Forage Crops	**Lucerne**										
	Anand-2	3.40	5.00	1.00	2.00	0.00	0.00	0.00	0.00	4.40	7.00
	AL-3	1.30	2.00	0.30	0.30	0.00	0.00	0.00	0.00	1.60	2.30
	Total	**4.70**	**7.00**	**1.30**	**2.30**	**0.00**	**0.00**	**0.00**	**0.00**	**6.00**	**9.30**
	Oat										
	Kent	60.00	65.00	10.00	10.00	0.00	0.00	0.00	0.00	70.00	75.00
	Total	**60.00**	**65.00**	**10.00**	**10.00**	**0.00**	**0.00**	**0.00**	**0.00**	**70.00**	**75.00**
	Total Forage Crops	**64.70**	**72.00**	**11.30**	**12.30**	**0.00**	**0.00**	**0.00**	**0.00**	**76.00**	**84.30**
	Grand Total (AAU, Anand)	**65.78**	**79.90**	**188.17**	**429.83**	**0.00**	**0.00**	**56.84**	**52.44**	**310.79**	**562.17**
	* Cumulative expected production# by RS(Oilseeds), JAU, Junagadh										
20. JAU, Junagadh											
Cereal Crops	**Wheat**										

	GW 366	204.00	150.00	16.30	10.00	0.00	0.00	0.00	0.00	220.30	160.00
	GJW 463	0.00	0.00	30.00	20.00	0.00	0.00	0.00	0.00	30.00	20.00
	Total	**204.00**	**150.00**	**46.30**	**30.00**	**0.00**	**0.00**	**0.00**	**0.00**	**250.30**	**180.00**
	Pearlmillet										
	J 2454	0.05	1.41	0.00	0.00	0.00	0.00	0.00	0.00	0.05	1.41
	J 2290	0.02	1.06	0.00	0.00	0.00	0.00	0.00	0.00	0.02	1.06
	Total	**0.07**	**2.47**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.07**	**2.47**
	Total Cereal Crops	**204.07**	**152.47**	**46.30**	**30.00**	**0.00**	**0.00**	**0.00**	**0.00**	**250.37**	**182.47**
Pulse Crops	**Pigeonpea**										
	GJP 1	1.10	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.10	4.00
		1.10	**4.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.10**	**4.00**
	Chickpea										
	GG1	0.00	0.00	14.00	16.50	0.00	0.00	0.00	0.00	14.00	16.50
	GG 2	0.00	0.00	32.25	36.50	0.00	0.00	0.00	0.00	32.25	36.50
	GJG 3	35.00	32.00	53.60	56.50	0.00	0.00	0.00	0.00	88.60	88.50
	GG 4	9.00	8.50	0.00	0.00	0.00	0.00	0.00	0.00	9.00	8.50
	GG 5	0.00	0.00	51.50	54.00	0.00	0.00	0.00	0.00	51.50	54.00
	GG 6	0.00	0.00	0.00	8.00	0.00	0.00	0.00	0.00	0.00	8.00
	Total	**44.00**	**40.50**	**151.35**	**171.50**	**0.00**	**0.00**	**0.00**	**0.00**	**195.35**	**212.00**
	Total Pulses Crops	**45.10**	**44.50**	**151.35**	**171.50**	**0.00**	**0.00**	**0.00**	**0.00**	**196.45**	**216.00**
Oilseed Crops	**Groundnut**										
	GG-2	5.00	5.00	38.40	35.00	0.00	0.00	0.00	0.00	43.40	40.00
	GG-4	0.00	0.00	3.00	3.00	0.00	0.00	0.00	0.00	3.00	3.00
	GG-5	0.00	0.00	32.90	35.00	0.00	0.00	0.00	0.00	32.90	35.00
	GG-6	0.00	0.00	2.00	4.00	0.00	0.00	0.00	0.00	2.00	4.00
	GG-7	0.00	0.00	32.50	35.00	0.00	0.00	0.00	0.00	32.50	35.00
	GG-11	0.00	0.00	111.60	90.00	0.00	0.00	0.00	0.00	111.60	90.00
	GG-20	70.00	70.00	1034.80	1230.00	0.00	0.00	0.00	0.00	1104.80	1300.00
	GG-21	4.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00
	GAUG-10	5.00	5.00	62.50	45.00	0.00	0.00	0.00	0.00	67.50	50.00
	GJG-9	40.00	30.00	31.10	35.00	0.00	0.00	0.00	0.00	71.10	65.00
	GJG-17	10.00	10.00	71.70	60.00	0.00	0.00	0.00	0.00	81.70	70.00
	GJG-22	0.00	0.00	400.10	350.00	0.00	0.00	0.00	0.00	400.10	350.00
	GJG-31	30.00	20.00	4.10	5.00	0.00	0.00	0.00	0.00	34.10	25.00
	GJGHPS-1	0.00	0.00	2.10	5.00	0.00	0.00	0.00	0.00	2.10	5.00

	Total	**164.00**	**144.00**	**1826.80**	**1932.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1990.80**	**2076.00**
	Sesame										
	G. Til 1	1.06	0.10	1.62	0.10	0.00	0.00	0.00	0.00	2.68	0.20
	G. Til 2	1.68	2.00	8.43	10.00	0.00	0.00	0.00	0.00	10.11	12.00
	G. Til 3	1.29	1.50	4.05	3.00	0.00	0.00	0.00	0.00	5.34	4.50
	G. Til 4	0.25	0.50	3.15	1.40	0.00	0.00	0.00	0.00	3.40	1.90
	GJT 5	0.00	0.00	2.00	2.00	0.00	0.00	0.00	0.00	2.00	2.00
	G. Til 10	0.60	1.00	2.27	3.00	0.00	0.00	0.00	0.00	2.87	4.00
	Total	**4.88**	**5.10**	**21.52**	**19.50**	**0.00**	**0.00**	**0.00**	**0.00**	**26.40**	**24.60**
	Total Oilseed Crops	**168.88**	**149.10**	**1848.32**	**1951.50**	**0.00**	**0.00**	**0.00**	**0.00**	**2017.20**	**2100.60**
	Grand Total (Jamnagar)	**418.05**	**346.07**	**2045.97**	**2153.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2464.02**	**2499.07**
21. IGKV, Raipur											
Cereal Crops	**Rice**										
	IGKV R 1	85.00	86.40	0.00	0.00	0.00	0.00	0.00	0.00	85.00	86.40
	IGKV R 2	52.50	48.60	0.00	0.00	0.00	0.00	0.00	0.00	52.50	48.60
	IGRKV R 1244	58.00	50.40	0.00	0.00	0.00	0.00	0.00	0.00	58.00	50.40
	Jaldubi	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00
	Indira Arobic 1	16.00	18.00	0.00	0.00	0.00	0.00	0.00	0.00	16.00	18.00
	Karma Mahsuri	20.10	30.00	0.00	0.00	0.00	0.00	0.00	0.00	20.10	30.00
	Indira Barani Dhan 1	35.00	35.00	0.00	0.00	0.00	0.00	0.00	0.80	35.00	35.80
	Poornima	6.00	2.70	0.00	0.00	0.00	0.00	0.00	0.00	6.00	2.70
	IR- 36	25.00	20.40	0.00	0.00	0.00	0.00	0.00	0.00	25.00	20.40
	IR-64	52.00	67.50	0.00	0.00	0.00	0.00	0.00	0.00	52.00	67.50
	Danteshwari	35.00	31.80	0.00	0.00	0.00	0.00	0.00	0.00	35.00	31.80
	Samleshwari	90.10	63.00	0.00	0.00	0.00	0.00	0.00	0.00	90.10	63.00
	DRR Dhan -42 (IR 64 D)	50.00	79.20	0.00	0.00	0.00	0.00	0.00	0.00	50.00	79.20
	Chandrahasini	68.00	48.00	0.00	0.00	0.00	0.00	0.00	0.00	68.00	48.00
	Mahamaya	32.50	81.90	0.00	0.00	0.00	0.00	0.00	6.60	32.50	88.50
	CGZR 1	10.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	10.00
	Dubraj Selection 1	3.00	9.90	0.00	0.00	0.00	0.00	0.00	0.00	3.00	9.90
	Badshabhog Selection1	3.00	6.90	0.00	0.00	0.00	0.00	0.00	0.00	3.00	6.90
	Tarunbhog Selection 1	3.00	4.80	0.00	0.00	0.00	0.00	0.00	0.00	3.00	4.80
	Vishnubhog Selection1	3.00	4.80	0.00	0.00	0.00	0.00	0.00	0.00	3.00	4.80
	CG Sugandhit Bhog	0.00	0.00	3.00	8.10	0.00	0.00	0.00	0.00	3.00	8.10
	MTU 1010	0.00	0.00	8.00	9.00	0.00	0.00	0.00	0.00	8.00	9.00

	Shyamla	0.10	2.40	0.00	0.00	0.00	0.00	0.00	4.40	0.10	6.80
	Bamleshwari	20.00	22.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	22.00
	Organic Breeder Seed										
	Dubraj Selection 1	0.00	0.00	2.00	2.10	0.00	0.00	0.00	0.00	2.00	2.10
	Badshabhog Selection1	0.00	0.00	2.00	2.20	0.00	0.00	0.00	0.00	2.00	2.20
	Tarunbhog Selection 1	0.00	0.00	2.00	2.00	0.00	0.00	0.00	0.00	2.00	2.00
	Vishnubhog Selection1	0.00	0.00	0.20	0.40	0.00	0.00	0.00	0.00	0.20	0.40
	CG Sugandhit Bhog	0.00	0.00	2.00	2.50	0.00	0.00	0.00	0.00	2.00	2.50
	Total	**668.30**	**724.70**	**19.20**	**26.30**	**0.00**	**0.00**	**0.00**	**11.80**	**687.50**	**762.80**
	Wheat										
	DBW 110	155.0	260.0	0.00	0.00	0.00	0.00	0.00	0.00	155.00	260.00
	MP 1203	40.0	90.0	0.00	0.00	0.00	0.00	0.00	0.00	40.00	90.00
	Ratan	180.0	300.0	0.00	0.00	0.00	0.00	0.00	0.00	180.00	300.00
	GW 366	50.0	55.0	0.00	0.00	0.00	0.00	0.00	0.00	50.00	55.00
	Sujata	30.0	75.0	0.00	0.00	0.00	0.00	0.00	0.00	30.00	75.00
	CG Gehu 4	20.0	20.0	0.00	0.00	0.00	0.00	0.00	0.00	20.00	20.00
	Total	**475.00**	**800.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**475.00**	**800.00**
	Kodo										
	BK – 1	2.25	2.00	0.00	0.00	0.00	0.00	0.00	0.00	2.25	2.00
	Total	**2.25**	**2.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.25**	**2.00**
	Fingar millet										
	Indira Ragi 1	1.50	1.30	0.00	0.00	0.00	0.00	0.00	0.00	1.50	1.30
	CG Ragi 2	1.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.50
	Total	**2.50**	**2.80**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.50**	**2.80**
	Total Cereal Crops	**1148.05**	**1529.50**	**19.20**	**26.30**	**0.00**	**0.00**	**0.00**	**11.80**	**1167.25**	**1567.60**
Pulse Crops	**Urd**										
	Indira Urd 1	10.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	10.00
	Total	**10.00**	**10.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**10.00**	**10.00**
	Mung										
	Pairy Moong	2.30	2.30	0.00	0.00	0.00	0.00	0.00	0.00	2.30	2.30
	Pairy Moong	2.30	3.00	0.00	0.00	0.00	0.00	0.00	0.00	2.30	3.00
	Total	**4.60**	**5.30**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**4.60**	**5.30**
	Arhar										
	Asha	5.00	6.80	0.00	0.00	0.00	0.00	0.00	0.00	5.00	6.80
	Rajeev Lochan	27.20	28.00	0.00	0.00	0.00	0.00	0.00	0.00	27.20	28.00

	Total	**32.20**	**34.80**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**32.20**	**34.80**
	Horse Gram										
	Indira Kulthi 1	5.50	4.00	0.00	0.00	0.00	0.00	0.00	0.00	5.50	4.00
	CG Kulthi 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.40
	CG Kulthi 3	5.00	0.50	0.00	0.00	0.00	0.00	0.50	0.60	5.50	1.10
	Total	**10.50**	**4.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.50**	**1.00**	**11.00**	**5.50**
	Chickpea										
	JG 14	0.00	0.00	5.00	12.00	0.00	0.00	0.00	0.00	5.00	12.00
	Vaibhav	45.00	55.00	0.00	0.00	0.00	0.00	0.00	0.00	45.00	55.00
	Indira Chana 1	20.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	20.00
	Total	**65.00**	**75.00**	**5.00**	**12.00**	**0.00**	**0.00**	**0.00**	**0.00**	**70.00**	**87.00**
	Field pea										
	Indira Matar 1	11.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	11.00	15.00
	Paras	25.00	30.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	30.00
	Total	**36.00**	**45.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**36.00**	**45.00**
	Lathyrus										
	Prateek	0.00	0.00	5.00	10.00	0.00	0.00	0.00	0.00	5.00	10.00
	Mahateora	103.00	116.00	0.00	0.00	0.00	0.00	0.00	0.00	103.00	116.00
	Total	**103.00**	**116.00**	**5.00**	**10.00**	**0.00**	**0.00**	**0.00**	**0.00**	**108.00**	**126.00**
	Total Pulse Crops	**261.30**	**290.60**	**10.00**	**22.00**	**0.00**	**0.00**	**0.50**	**1.00**	**271.80**	**313.60**
Oilseed Crops	**Soybean**										
	CG Soya 1	20.00	9.80	0.00	0.00	0.00	0.00	0.00	0.00	20.00	9.80
	JS 93-05	300.00	52.00	0.00	0.00	0.00	0.00	0.00	0.00	300.00	52.00
	JS 97-52	300.00	81.80	0.00	0.00	0.00	0.00	0.00	0.00	300.00	81.80
	CG Soya 1	0.00	6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00
	JS 97-52	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00
	Total	**620.00**	**153.60**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**620.00**	**153.60**
	Linseed										
	Deepika	2.40	7.50	0.00	0.00	0.00	0.00	0.00	0.00	2.40	7.50
	RLC 133	0.00	0.00	1.00	1.50	0.00	0.00	0.00	0.00	1.00	1.50
	RLC 92	4.86	10.50	0.00	0.00	0.00	0.00	0.00	0.00	4.86	10.50
	Kartika	6.60	10.00	0.00	0.00	0.00	0.00	0.00	0.00	6.60	10.00
	Indira Alsi 32	12.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00	20.00
	Total	**25.86**	**48.00**	**1.00**	**1.50**	**0.00**	**0.00**	**0.00**	**0.00**	**26.86**	**49.50**
	Mustard										

	CG Sarson	2.50	4.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	4.00
	Total	**2.50**	**4.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.50**	**4.00**
	Total Oilseed Crops	**648.36**	**205.60**	**1.00**	**1.50**	**0.00**	**0.00**	**0.00**	**0.00**	**649.36**	**207.10**
Grand Total (Raipur)		**2057.71**	**2025.70**	**30.20**	**49.80**	**0.00**	**0.00**	**0.50**	**12.80**	**2088.41**	**2088.30**
22. JNKVV, Jabalpur											
Cereal Crops	**Rice**										
	MTU- 1010	0.00	0.00	2032.59	2032.59	0.00	0.00	0.00	0.00	2032.59	2032.59
	Kranti	14.50	1420.20	0.00	0.00	0.00	0.00	0.00	0.00	14.50	1420.20
	IR-64	40.00	599.36	0.00	0.00	0.00	0.00	0.00	0.00	40.00	599.36
	IR-36	25.00	16.79	0.00	0.00	0.00	0.00	0.00	0.00	25.00	16.79
	Improved Chinor	0.00	0.00	12.60	12.60	0.00	0.00	0.00	0.00	12.60	12.60
	Improved Jeera Shanker	0.00	0.00	18.90	18.90	0.00	0.00	0.00	0.00	18.90	18.90
	JR- 767	0.00	0.00	27.00	27.00	0.00	0.00	0.00	0.00	27.00	27.00
	JR-503	1.00	1.00	0.35	0.35	0.00	0.00	0.00	0.00	1.35	1.35
	JR-201	45.00	2.70	0.00	0.00	0.00	0.00	0.00	0.00	45.00	2.70
	JRV-1	0.00	0.00	18.00	18.00	0.00	0.00	0.00	0.00	18.00	18.00
	JRH-19 (Hybrid)	0.00	0.00	0.45	0.45	0.00	0.00	0.00	0.00	0.45	0.45
	JRH-5(Hybrid)	0.00	0.00	2.70	2.70	0.00	0.00	0.00	0.00	2.70	2.70
	PS-1460	0.00	0.00	82.80	82.80	0.00	0.00	0.00	0.00	82.80	82.80
	PS-5	0.00	0.00	36.49	36.49	0.00	0.00	0.00	0.00	36.49	36.49
	PS- 4	0.00	0.00	51.71	51.71	0.00	0.00	0.00	0.00	51.71	51.71
	PS-3	0.00	0.00	9.64	9.64	0.00	0.00	0.00	0.00	9.64	9.64
	Pusa-1460	0.00	0.00	38.50	38.50	0.00	0.00	0.00	0.00	38.50	38.50
	Sahbhagi	0.00	0.00	12.18	12.18	0.00	0.00	0.00	0.00	12.18	12.18
	Danteshwari	0.00	0.00	26.01	26.01	0.00	0.00	0.00	0.00	26.01	26.01
	MR-219	0.00	0.00	4.50	4.50	0.00	0.00	0.00	0.00	4.50	4.50
	WGL-32183	0.00	0.00	9.00	9.00	0.00	0.00	0.00	0.00	9.00	9.00
	WGL-32100	0.00	0.00	8.47	8.47	0.00	0.00	0.00	0.00	8.47	8.47
	JR-81	0.00	0.00	7.82	7.82	0.00	0.00	0.00	0.00	7.82	7.82
	Total	**125.50**	**2040.05**	**2399.71**	**2399.71**	**0.00**	**0.00**	**0.00**	**0.00**	**2525.21**	**4439.76**
	Wheat										
	GW-366	202.00	202.00	374.00	374.00	0.00	0.00	0.00	0.00	576.00	576.00
	GW-322	69.00	69.00	2297.00	2297.00	0.00	0.00	0.00	0.00	2366.00	2366.00
	GW 273	65.95	65.95	589.05	589.05	0.00	0.00	0.00	0.00	655.00	655.00
	JW- 3336	225.00	225.00	534.00	534.00	0.00	0.00	0.00	0.00	759.00	759.00

	JW 3211	330.00	330.00	1538.00	1538.00	0.00	0.00	0.00	0.00	1868.00	1868.00
	JW 3288	345.00	345.00	1193.00	1193.00	0.00	0.00	0.00	0.00	1538.00	1538.00
	Lok-1	0.00	0.00	72.00	72.00	0.00	0.00	0.00	0.00	72.00	72.00
	C-306	0.00	0.00	159.00	159.00	0.00	0.00	0.00	0.00	159.00	159.00
	Sujata	0.00	0.00	8.75	8.75	0.00	0.00	0.00	0.00	8.75	8.75
	JW 3382	70.00	70.00	630.00	630.00	0.00	0.00	0.00	0.00	700.00	700.00
	JW 3020	45.00	45.00	3.00	3.00	0.00	0.00	0.00	0.00	48.00	48.00
	JW-3173	70.00	70.00	76.00	76.00	0.00	0.00	0.00	0.00	146.00	146.00
	JW-1142	15.00	15.00	60.00	60.00	0.00	0.00	0.00	0.00	75.00	75.00
	MP-1215	180.00	180.00	70.00	70.00	0.00	0.00	0.00	0.00	250.00	250.00
	JW-1202	230.00	230.00	10.00	10.00	0.00	0.00	0.00	0.00	240.00	240.00
	JW-1203	225.00	225.00	275.00	275.00	0.00	0.00	0.00	0.00	500.00	500.00
	JW 1201	190.00	190.00	60.00	60.00	0.00	0.00	0.00	0.00	250.00	250.00
	MP-1106	10.00	10.00	30.00	30.00	0.00	0.00	0.00	0.00	40.00	40.00
	MP-1255	10.00	10.00	10.00	10.00	0.00	0.00	0.00	0.00	20.00	20.00
	Total	**2281.95**	**2281.95**	**7988.80**	**7988.80**	**0.00**	**0.00**	**0.00**	**0.00**	**10270.75**	**10270.75**
	Barley										
	JB-58	0.00	0.00	100.00	100.00	0.00	0.00	0.00	0.00	100.00	100.00
	JB-1	0.00	0.00	100.00	100.00	0.00	0.00	0.00	0.00	100.00	100.00
	Total	**0.00**	**0.00**	**200.00**	**200.00**	**0.00**	**0.00**	**0.00**	**0.00**	**200.00**	**200.00**
	Kodo										
	JK-48	0.00	0.00	1.35	1.35	0.00	0.00	0.00	0.00	1.35	1.35
	JK 8	0.00	0.00	3.96	3.96	0.00	0.00	0.00	0.00	3.96	3.96
	JK 36	0.20	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.20
	JK-41	0.00	0.00	4.05	4.05	0.00	0.00	0.00	0.00	4.05	4.05
	JK-439	1.45	1.45	1.70	1.70	0.00	0.00	0.00	0.00	3.15	3.15
	JK-137	0.00	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.10	0.10
	JK-155	0.75	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.09
	JK-13	1.50	0.10	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.10
	JK-106	0.90	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.90	0.09
	Total	**4.80**	**1.93**	**11.16**	**11.16**	**0.00**	**0.00**	**0.00**	**0.00**	**15.96**	**13.09**
	Maize										
	Jawahar Makai 216	0.00	0.00	67.50	67.50	0.00	0.00	0.00	0.00	67.50	67.50
	Total	**0.00**	**0.00**	**67.50**	**67.50**	**0.00**	**0.00**	**0.00**	**0.00**	**67.50**	**67.50**
	Total Cereal Crops	**2412.25**	**4323.93**	**10667.17**	**10667.17**	**0.00**	**0.00**	**0.00**	**0.00**	**13079.42**	**14991.10**

Pulse Crops	**Pigeonpea**										
	TJT-501	27.12	35.20	317.40	317.40	20.00	20.00	0.00	0.00	364.52	372.60
	ICPL- 151	0.00	0.00	20.00	20.00	0.00	7.00	0.00	0.00	20.00	27.00
	ICPL-87	8.00	3.60	0.00	0.00	0.00	0.00	0.00	0.00	8.00	3.60
	ICPL-87119 (Asha)	8.00	13.50	0.00	0.00	0.00	5.50	0.00	0.00	8.00	19.00
	Total	**43.12**	**52.30**	**337.40**	**337.40**	**20.00**	**32.50**	**0.00**	**0.00**	**400.52**	**422.20**
	Mung										
	TM 96-2	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
	TJM 3	5.30	6.00	0.00	0.00	0.00	0.00	0.00	0.00	5.30	6.00
	PDM 139	0.00	30.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00
	TMB 37	1.30	23.45	0.00	0.00	0.00	0.00	0.00	0.00	1.30	23.45
	PDM-139	0.00	0.00	10.00	10.00	0.00	0.00	0.00	0.00	10.00	10.00
	TJM-3	0.00	0.00	5.00	5.00	0.00	0.00	0.00	0.00	5.00	5.00
	TMB-37	0.00	0.00	0.00	0.00	25.00	25.00	0.00	0.00	25.00	25.00
	Sikha	0.00	0.00	0.00	0.00	10.00	17.00	0.00	0.00	10.00	17.00
	Virat	0.00	0.00	0.00	0.00	0.00	14.00	0.00	0.00	0.00	14.00
	Total	**7.60**	**59.45**	**15.00**	**15.00**	**35.00**	**56.00**	**0.00**	**0.00**	**57.60**	**130.45**
	Urdbean										
	TU-94-2	0.50	22.83	0.00	0.00	0.00	0.00	0.00	0.00	0.50	22.83
	Jawahar Urd 3	23.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	23.00	8.00
	PU-19	0.00	4.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.90
	PU-35	0.00	2.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.49
	T-9	0.00	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.34
	LBG 20	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
	TU 98-14	0.00	1.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.36
	IPU-2-43	0.00	0.00	0.00	0.00	10.00	18.00	0.00	0.00	10.00	18.00
	Total	**23.50**	**40.92**	**0.00**	**0.00**	**10.00**	**18.00**	**0.00**	**0.00**	**33.50**	**58.92**
	Chickpea										
	JG 63	241.55	241.55	484.45	484.45	0.00	0.00	0.00	0.00	726.00	726.00
	JG 315	63.25	63.25	143.75	143.75	0.00	0.00	0.00	0.00	207.00	207.00
	JG-16	0.00	0.00	35.25	35.25	0.00	0.00	0.00	0.00	35.25	35.25
	JG-14	281.62	281.62	302.18	302.18	225.00	225.00	0.00	0.00	808.80	808.80
	JG-322	175.95	175.95	214.05	214.05	0.00	0.00	0.00	0.00	390.00	390.00
	JG-130	100.00	100.00	62.75	62.75	0.00	0.00	0.00	0.00	162.75	162.75
	JG-12	303.72	303.72	228.78	228.78	90.00	90.00	0.00	0.00	622.50	622.50

	JG 11	100.00	100.00	86.75	86.75	0.00	0.00	0.00	0.00	186.75	186.75
	JG 74	4.60	4.60	6.65	6.65	0.00	0.00	0.00	0.00	11.25	11.25
	JAKI 92-18	100.00	100.00	194.00	194.00	0.00	0.00	0.00	0.00	294.00	294.00
	JG 36	15.00	15.00	6.00	6.00	0.00	0.00	0.00	0.00	21.00	21.00
	JKG 2	0.00	0.00	2.25	2.25	0.00	0.00	0.00	0.00	2.25	2.25
	JKG 5	0.00	0.00	0.00	0.00	75.00	15.00	0.00	0.00	75.00	15.00
	JKG 1	0.00	0.00	2.25	2.25	0.00	0.00	0.00	0.00	2.25	2.25
	Total	**1385.69**	**1385.69**	**1769.11**	**1769.11**	**390.00**	**330.00**	**0.00**	**0.00**	**3544.80**	**3484.80**
	Field Pea										
	IPF 99-25 (Adarsh)	54.00	54.00	0.00	0.00	0.00	0.00	0.00	0.00	54.00	54.00
	JM-6	5.25	5.25	0.00	0.00	0.00	0.00	0.00	0.00	5.25	5.25
	JP 885	5.25	5.25	0.00	0.00	0.00	0.00	0.00	0.00	5.25	5.25
	Aman	15.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	15.00
	Total	**79.50**	**79.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**79.50**	**79.50**
	Lentil										
	JL-3	50.00	50.00	100.00	100.00	0.00	0.00	0.00	0.00	150.00	150.00
	RVL 31	11.00	11.00	0.00	0.00	10.00	10.00	0.00	0.00	21.00	21.00
	RVL 11-6	42.25	42.25	0.00	0.00	20.00	20.00	0.00	0.00	62.25	62.25
	IPL 316	30.00	30.00	0.00	0.00	10.00	10.00	0.00	0.00	40.00	40.00
	Total	**133.25**	**133.25**	**100.00**	**100.00**	**40.00**	**40.00**	**0.00**	**0.00**	**273.25**	**273.25**
	Total Pulse Crop	**1672.66**	**1751.11**	**2221.51**	**2221.51**	**495.00**	**476.50**	**0.00**	**0.00**	**4389.17**	**4449.12**
Oilseed Crops	**Soybean**										
	JS 20-29	3000.00	402.00	102.00	102.00	0.00	0.00	0.00	0.00	3102.00	504.00
	JS 20-34	700.00	325.70	0.00	0.00	0.00	0.00	0.00	0.00	700.00	325.70
	JS 20-69	1000.00	354.00	0.00	0.00	0.00	0.00	0.00	0.00	1000.00	354.00
	JS 97-52	300.00	1.40	0.00	0.00	0.00	0.00	0.00	0.00	300.00	1.40
	JS 95-60	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
	JS 20-29	0.00	120.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	120.00
	JS 20-34	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00
	JS 20-69	0.00	123.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	123.00
	JS-2098	0.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00
	Total	**5100.00**	**1354.10**	**102.00**	**102.00**	**0.00**	**0.00**	**0.00**	**0.00**	**5202.00**	**1456.10**
	Groundnut										
	TG 37 A	0.00	0.00	0.90	0.90	0.00	0.00	0.00	0.00	0.90	0.90
	TG-27	0.00	0.00	0.90	0.90	0.00	0.00	0.00	0.00	0.90	0.90

	Total	**0.00**	**0.00**	**1.80**	**1.80**	**0.00**	**0.00**	**0.00**	**0.00**	**1.80**	**1.80**
	Niger										
	JNC- 1	1.50	0.27	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.27
	JNC- 6	1.00	1.00	3.19	3.19	0.00	0.00	0.00	0.00	4.19	4.19
	JNS -9	3.10	3.10	0.95	0.95	0.00	0.00	0.00	0.00	4.05	4.05
	JNS- 28	0.00	0.00	1.35	1.35	0.00	0.00	0.00	0.00	1.35	1.35
	JNC-6	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	1.00	1.00
	JNC-30	0.00	0.00	5.00	5.00	0.00	0.00	0.00	0.00	5.00	5.00
	Total	**5.60**	**4.37**	**11.49**	**11.49**	**0.00**	**0.00**	**0.00**	**0.00**	**17.09**	**15.86**
	Sesame										
	TKG 22	1.25	1.25	0.00	0.00	0.00	0.00	0.00	0.00	1.25	1.25
	JT 21	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.00
	JT 11	2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	0.00
	JT 14	0.20	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.30
	TKG 306	1.60	1.60	0.04	0.04	0.00	0.00	0.00	0.00	1.64	1.64
	TKG 308	0.60	0.60	2.81	2.81	0.00	0.00	0.00	0.00	3.41	3.41
	Total	**6.90**	**3.75**	**2.85**	**2.85**	**0.00**	**0.00**	**0.00**	**0.00**	**9.75**	**6.60**
	Mustard										
	Pusa Tarak	0.00	0.00	63.00	63.00	0.00	0.00	0.00	0.00	63.00	63.00
	Pusa Jaikisan	0.00	0.00	32.00	32.00	0.00	0.00	0.00	0.00	32.00	32.00
	Total	**0.00**	**0.00**	**95.00**	**95.00**	**0.00**	**0.00**	**0.00**	**0.00**	**95.00**	**95.00**
	Linseed										
	JLS 27	0.00	0.00	61.60	61.60	0.00	0.00	0.00	0.00	61.60	61.60
	JLS-67	0.00	0.00	11.90	11.90	0.00	0.00	0.00	0.00	11.90	11.90
	PKDL 41	4.92	4.92	5.08	5.08	0.00	0.00	0.00	0.00	10.00	10.00
	JLS-66	4.80	4.80	76.90	76.90	0.00	0.00	0.00	0.00	81.70	81.70
	JLS 79	0.20	0.20	2.30	2.30	0.00	0.00	0.00	0.00	2.50	2.50
	JLS-73	5.46	5.46	81.54	81.54	0.00	0.00	0.00	0.00	87.00	87.00
	Total	**15.38**	**15.38**	**239.32**	**239.32**	**0.00**	**0.00**	**0.00**	**0.00**	**254.70**	**254.70**
	Total Oilseed Crop	**5127.88**	**1377.60**	**452.46**	**452.46**	**0.00**	**0.00**	**0.00**	**0.00**	**5580.34**	**1830.06**
Fibre Crops	**Sunhemp**										
	K 12	0.00	0.00	18.00	18.00	0.00	0.00	0.00	0.00	18.00	18.00
	Total	**0.00**	**0.00**	**18.00**	**18.00**	**0.00**	**0.00**	**0.00**	**0.00**	**18.00**	**18.00**
	Total Fibre Crops	**0.00**	**0.00**	**18.00**	**18.00**	**0.00**	**0.00**	**0.00**	**0.00**	**18.00**	**18.00**
Forage Crops	**Sorghum**										

	MP Chari	2.30	6.00	0.00	0.00	0.00	0.00	0.00	0.00	2.30	6.00
	Total	**2.30**	**6.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.30**	**6.00**
	Berseem										
	JB-1	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	1.00	1.00
	JB 5	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	1.00	1.00
	Total	**0.00**	**0.00**	**2.00**	**2.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.00**	**2.00**
	Oat										
	Kent	75.00	75.00	45.00	45.00	0.00	0.00	0.00	0.00	120.00	120.00
	JO-03-93	25.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	10.00
	JO-1	0.00	0.00	20.00	20.00	0.00	0.00	0.00	0.00	20.00	20.00
	Total	**100.00**	**85.00**	**65.00**	**65.00**	**0.00**	**0.00**	**0.00**	**0.00**	**165.00**	**150.00**
	Total Forage Crops	**102.30**	**91.00**	**67.00**	**67.00**	**0.00**	**0.00**	**0.00**	**0.00**	**169.30**	**158.00**
Grant Total (Jabalpur)		**9315.09**	**7543.64**	**13426.14**	**13426.14**	**495.00**	**476.50**	**0.00**	**0.00**	**23236.23**	**21446.28**
23. MPKV, Rahuri											
Cereal Crops	**Rice**										
	Indrayani	15.50	23.00	0.00	0.00	0.00	0.00	0.00	12.00	15.50	35.00
	P. Radha	0.00	0.00	0.00	0.00	0.00	0.00	3.00	5.00	3.00	5.00
	Bhogawati	1.50	10.25	0.00	0.00	0.00	0.00	0.00	0.00	1.50	10.25
	P. Samrudhi	6.50	26.00	0.00	0.00	0.00	0.00	0.00	0.00	6.50	26.00
	Total	**23.50**	**59.25**	**0.00**	**0.00**	**0.00**	**0.00**	**3.00**	**17.00**	**26.50**	**76.25**
	Sorghum (Rabi)										
	P. Amruta	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
	P. Anuradha	1.50	0.02	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.02
	P. Panchami	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.05	0.05
	P. Revati	5.20	5.50	0.00	0.00	0.00	0.00	0.00	0.00	5.20	5.50
	P. Vasudha	1.80	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.80	1.00
	P. Godhan	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10
	P. Suchitra	4.70	4.00	0.00	0.00	0.00	0.00	0.00	0.00	4.70	4.00
	P. Rohini	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	185 A	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.06	0.10	0.06
	185 B	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.02	0.03
	RSSV-260 (R)	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.05	0.02	0.05
	P. Yashoda	0.05	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.10
	Total	**13.45**	**10.62**	**0.00**	**0.00**	**0.00**	**0.00**	**0.29**	**0.29**	**13.74**	**10.91**
	Bajra										

	DHLR- 967	0.01	0.25	0.01	0.02	0.00	0.00	0.02	0.00	0.04	0.27
	DHLB-8A	0.03	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.25
	DHLB-8B	0.01	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.12
	RHRBI 138	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
	Dhanshakti	0.00	0.00	0.00	0.00	0.00	0.00	2.11	2.50	2.11	2.50
	Total	**0.10**	**0.62**	**0.01**	**0.02**	**0.00**	**0.00**	**2.13**	**2.50**	**2.24**	**3.14**
	Wheat										
	HD-2189	0.00	0.00	5.00	8.00	0.00	0.00	2.00	2.00	7.00	10.00
	Trimbak	14.00	30.00	0.00	0.00	0.00	0.00	10.00	15.00	24.00	45.00
	Tapowan	8.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	10.00
	NIAW-34	0.00	0.00	0.00	0.00	0.00	0.00	8.00	15.00	8.00	15.00
	Netrawati	39.50	50.00	0.00	0.00	0.00	0.00	0.00	0.00	39.50	50.00
	P. Samadhan	20.00	70.00	2.00	30.00	0.00	0.00	100.00	250.00	122.00	350.00
	Total	**81.50**	**160.00**	**7.00**	**38.00**	**0.00**	**0.00**	**120.00**	**282.00**	**208.50**	**480.00**
	Finger Millet										
	P Nachani	0.03	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.50
	Total	**0.03**	**0.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.03**	**0.50**
	Little millet										
	P. Ekadashi	0.02	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.50
	Total	**0.02**	**0.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.02**	**0.50**
	Total Cereal Crops	**118.60**	**231.49**	**7.01**	**38.02**	**0.00**	**0.00**	**125.42**	**301.79**	**251.03**	**571.30**
Pulse Crops	**Urd**										
	TAU 1	0.00	0.00	0.00	0.00	0.00	0.00	12.50	23.00	12.50	23.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**12.50**	**23.00**	**12.50**	**23.00**
	Mung										
	Vaibhav	2.00	2.50	0.00	0.00	0.00	0.00	25.00	35.00	27.00	37.50
	Kop 1	0.00	0.00	0.00	0.00	0.10	0.20	0.00	0.00	0.10	0.20
	Total	**2.00**	**2.50**	**0.00**	**0.00**	**0.10**	**0.20**	**25.00**	**35.00**	**27.10**	**37.70**
	Pigeonpea										
	ICPL 87	3.50	1.25	0.00	0.00	0.00	0.00	0.00	0.00	3.50	1.25
	Vipula	13.54	0.00	0.00	0.00	0.00	0.00	10.00	10.00	23.54	10.00
	Rajeshwari	0.00	0.00	0.00	0.00	0.00	0.00	20.00	0.00	20.00	0.00
	Total	**17.04**	**1.25**	**0.00**	**0.00**	**0.00**	**0.00**	**30.00**	**10.00**	**47.04**	**11.25**
	Chickpea										
	Vijay	150.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00	150.00	200.00

	Vishal	79.81	50.00	0.00	0.00	0.00	0.00	0.00	0.00	79.81	50.00
	Virat	16.80	20.00	0.00	0.00	0.00	0.00	0.00	0.00	16.80	20.00
	Digvijay	278.69	280.00	0.00	0.00	2.00	5.00	350.00	410.00	630.69	695.00
	Kripa	20.13	4.00	0.00	0.00	0.00	0.00	0.00	0.00	20.13	4.00
	Vikram	200.00	80.00	50.00	0.00	0.00	0.00	0.00	0.00	250.00	80.00
	Total	**745.43**	**634.00**	**50.00**	**0.00**	**2.00**	**5.00**	**350.00**	**410.00**	**1147.43**	**1049.00**
	Rajmash										
	Varun	0.00	0.00	0.00	0.00	3.00	10.00	0.00	0.00	3.00	10.00
	P. Rajama	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**4.00**	**11.00**	**0.00**	**0.00**	**4.00**	**11.00**
	Total Pulse Crops	**764.47**	**637.75**	**50.00**	**0.00**	**6.10**	**16.20**	**417.50**	**478.00**	**1238.07**	**1131.95**
Oilseed Crops	**Soybean**										
	JS-335	500.00	500.00	100.00	130.00	0.00	0.00	70.00	70.00	670.00	700.00
	JS-9305	0.00	0.00	50.00	15.00	0.00	0.00	0.00	0.00	50.00	15.00
	Phule Kalyani	350.00	350.00	10.00	20.00	0.00	0.00	0.00	0.00	360.00	370.00
	Phule Agarni	380.00	380.00	0.00	0.00	0.00	0.00	80.00	100.00	460.00	480.00
	KDS 726 (P. Sangam)	0.00	0.00	0.00	0.00	0.00	0.00	60.00	83.00	60.00	83.00
	KDS-753	0.00	0.00	0.00	0.00	0.00	0.00	20.00	4.00	20.00	4.00
	JS-9305	0.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00
	Total	**1230.00**	**1245.00**	**160.00**	**165.00**	**0.00**	**0.00**	**230.00**	**257.00**	**1620.00**	**1667.00**
	Groundnut										
	SB-XI	0.00	0.00	50.00	43.00	0.00	0.00	0.00	0.00	50.00	43.00
	P. Bharti	0.00	0.00	0.00	0.00	0.00	0.00	2.00	4.00	2.00	4.00
	P.Morana	0.00	0.00	0.00	0.00	0.00	0.00	7.00	12.00	7.00	12.00
	Phule Unnati	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00
	P.Warana	0.00	0.00	0.00	0.00	0.00	0.00	10.00	20.00	10.00	20.00
	JL-501	50.00	30.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00	30.00
	Total	**55.00**	**35.00**	**50.00**	**43.00**	**0.00**	**0.00**	**19.00**	**36.00**	**124.00**	**114.00**
	Niger										
	P. Karala	0.00	0.00	0.05	0.25	0.00	0.00	0.00	0.00	0.05	0.25
	P. Vaitarna	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.60	0.10	0.60
	Total	**0.00**	**0.00**	**0.05**	**0.25**	**0.00**	**0.00**	**0.10**	**0.60**	**0.15**	**0.85**
	Sesamum										
	PT 1	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.20	0.10	0.20
	JLT 408	0.02	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.20

	Total	**0.02**	**0.20**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.20**	**0.12**	**0.40**
	Safflower										
	P. Kusuma	1.30	0.40	0.00	0.00	0.00	0.00	0.00	0.00	1.30	0.40
	SSF-708	0.40	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.40
	Chandrabhaga	0.10	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.20	0.20
	Bhima	1.50	1.20	0.00	0.00	0.00	0.00	0.00	0.00	1.50	1.20
	Total	**3.30**	**2.10**	**0.10**	**0.10**	**0.00**	**0.00**	**0.00**	**0.00**	**3.40**	**2.20**
	Total Oilseed Crops	**1288.32**	**1282.30**	**210.15**	**208.35**	**0.00**	**0.00**	**249.20**	**293.80**	**1747.67**	**1784.45**
Forage Crops	**Cowpea**										
	Sweta	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.50	0.10	0.50
	P. Vitkai	0.00	0.00	0.00	0.00	0.00	0.00	0.50	5.00	0.50	5.00
	EC-4216	5.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	7.00
	P. Rukhmai	0.00	0.00	0.00	0.00	0.00	0.00	0.20	2.00	0.20	2.00
	Total	**5.00**	**7.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.80**	**7.50**	**5.80**	**14.50**
	Maize										
	African Tall	24.07	35.00	0.00	0.00	0.00	0.00	0.00	0.00	24.07	35.00
	Total	**24.07**	**35.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**24.07**	**35.00**
	Bajra										
	Giant bajra	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.50	0.10	0.50
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.50**	**0.10**	**0.50**
	Stylo										
	P. Kranti	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.10	0.05	0.10
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.05**	**0.10**	**0.05**	**0.10**
	Lucerne										
	RL-88	0.20	2.00	0.00	0.00	0.00	0.00	0.40	1.00	0.60	3.00
	Total	**0.20**	**2.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.40**	**1.00**	**0.60**	**3.00**
	Oat										
	Harita	5.00	5.50	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.50
	Kent	30.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	25.00
	P. Surabhi	0.00	0.00	0.00	0.00	0.00	0.00	2.00	3.00	2.00	3.00
	Total	**35.00**	**30.50**	**0.00**	**0.00**	**0.00**	**0.00**	**2.00**	**3.00**	**37.00**	**33.50**
	Total Forage Crops	**64.27**	**74.50**	**0.00**	**0.00**	**0.00**	**0.00**	**3.35**	**12.10**	**67.62**	**86.60**
Fibre Crops	**Cotton**										
	JLA-794	0.50	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.50
	JLA-505	1.04	1.50	0.00	0.00	0.00	0.00	0.00	0.00	1.04	1.50

	P. Dhanvantary	0.03	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.10
	Phule 688	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.10	0.05	0.10
	P.Anmol	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
	RHC-717	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.10	0.05	0.10
	Total	**1.59**	**3.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.20**	**1.69**	**3.30**
	Total Fiber Crops	**1.59**	**3.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.20**	**1.69**	**3.30**
	Grand Total (Rahuri)	**2237.25**	**2229.14**	**267.16**	**246.37**	**6.10**	**16.20**	**795.57**	**1085.89**	**3306.08**	**3577.60**
24. PDKV, Akola											
Cereal Crops	**Rice**										
	PKV-HMT	0.00	0.00	169.00	260.00	0.00	0.00	0.00	0.00	169.00	260.00
	PKV Kisan	0.00	0.00	0.60	0.60	0.00	0.00	0.00	0.00	0.60	0.60
	Total	**0.00**	**0.00**	**169.60**	**260.60**	**0.00**	**0.00**	**0.00**	**0.00**	**169.60**	**260.60**
	Wheat										
	AKW 4210-6	1.00	3.00	2.00	5.00	0.00	0.00	0.00	0.00	3.00	8.00
	AKW 4627(PDKV Sardar)	17.80	40.00	0.00	0.00	0.00	0.00	0.00	0.00	17.80	40.00
	WSM 1472 (PDKV Washim)	35.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	35.00	20.00
	Total	**53.80**	**63.00**	**2.00**	**5.00**	**0.00**	**0.00**	**0.00**	**0.00**	**55.80**	**68.00**
	Pearlmillet										
	BMS 5-23A	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02
	BMS5-23B	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02
	BR 333	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
	Total	**0.04**	**0.05**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.04**	**0.05**
	Sorghum										
	MS-14 A	0.16	1.09	0.00	0.00	0.00	0.00	0.00	0.00	0.16	1.09
	MS-14 B	0.09	0.56	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.56
	AKR-150 R	0.09	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.13
	PKV Ashwini	2.03	0.35	0.00	0.00	0.00	0.00	0.00	0.00	2.03	0.35
	MS-30A	0.10	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.17
	MS-30B	0.06	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.12
	PKV Kranti	0.10	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.48
	AKR 504	0.03	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.11
	AKR-456	0.03	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.09
	Total	**2.69**	**3.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.69**	**3.10**
	Total Cereal Crops	**56.53**	**66.15**	**171.60**	**265.60**	**0.00**	**0.00**	**0.00**	**0.00**	**228.13**	**331.75**
Pulse Crops	**Mung**										

	TARM 1	0.50	1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.60
	TARM 2	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.50	0.00
	PKVAKM 4	2.50	3.20	0.00	0.00	0.00	0.00	0.00	0.00	2.50	3.20
	PKVM-8802	1.05	2.50	0.00	0.00	0.00	0.00	0.00	0.00	1.05	2.50
	Total	**7.55**	**7.30**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**7.55**	**7.30**
	Tur										
	PKV Tara	13.15	17.40	0.00	0.00	0.00	0.00	0.00	0.00	13.15	17.40
	ICPL 87119	3.00	4.25	0.00	0.00	0.00	0.00	0.00	0.00	3.00	4.25
	TT 401	1.95	2.00	0.00	0.00	0.00	0.00	0.00	0.00	1.95	2.00
	Total	**18.10**	**23.65**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**18.10**	**23.65**
	Urd										
	TAU-1	19.40	11.40	0.00	0.00	0.00	0.00	0.00	0.00	19.40	11.40
	AKU-10-1	0.00	0.00	3.00	3.00	0.00	0.00	0.00	0.00	3.00	3.00
	AKU-15	16.15	16.69	0.00	0.00	0.00	0.00	0.00	0.00	16.15	16.69
	Total	**35.55**	**28.09**	**3.00**	**3.00**	**0.00**	**0.00**	**0.00**	**0.00**	**38.55**	**31.09**
	Chickpea										
	JAKI 9218	452.00	452.00	150.00	180.60	0.00	0.00	0.00	0.00	602.00	632.60
	PKV Kabuli 2	45.81	36.32	0.00	0.00	0.00	0.00	0.00	0.00	45.81	36.32
	PKV Kabuli 4	13.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.80	0.00
	GULAK 1	2.30	1.60	0.00	0.00	0.00	0.00	0.00	0.00	2.30	1.60
	AKG 1109	0.00	0.00	10.00	11.12	0.00	0.00	0.00	0.00	10.00	11.12
	Total	**513.91**	**489.92**	**160.00**	**191.72**	**0.00**	**0.00**	**0.00**	**0.00**	**673.91**	**681.64**
	Total Pulse Crops	**575.11**	**548.96**	**163.00**	**194.72**	**0.00**	**0.00**	**0.00**	**0.00**	**738.11**	**743.68**
Oilseed Crops	**Soybean**										
	JS-335	500.00	500.00	0.00	0.00	0.00	0.00	0.00	0.00	500.00	500.00
	JS-9305	200.00	65.00	0.00	0.00	0.00	0.00	0.00	0.00	200.00	65.00
	Total	**700.00**	**565.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**700.00**	**565.00**
	Groundnut										
	TAG-24	0.00	0.00	10.00	3.50	0.00	0.00	0.00	0.00	10.00	3.50
	Total	**0.00**	**0.00**	**10.00**	**3.50**	**0.00**	**0.00**	**0.00**	**0.00**	**10.00**	**3.50**
	Sesamum										
	PKV-NT-11	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02
	AKT 101	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02
	Total	**0.04**	**0.04**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.04**	**0.04**
	Safflower										

	AKS 207	5.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00	5.00	1.50
	PKV PINK	0.20	9.23	0.00	0.00	0.00	0.00	0.00	0.00	0.20	9.23
	Total	**5.20**	**10.73**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**5.20**	**10.73**
	Linseed										
	NL 260	0.18	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.84
	NL 97	0.12	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.26
	Total	**0.30**	**1.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.30**	**1.10**
	Total Oilseed Crops	**705.54**	**576.87**	**10.00**	**3.50**	**0.00**	**0.00**	**0.00**	**0.00**	**715.54**	**580.37**
Fiber Crops	**Cotton**										
	Improved cotton										
	AKA-7	0.00	0.00	0.50	0.50	0.00	0.00	0.00	0.00	0.50	0.50
	AKA-8	0.75	0.75	0.15	0.15	0.00	0.00	0.00	0.00	0.90	0.90
	PKV HY- 4 A Line	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.06
	PKV HY- 4 B Line	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02
	PKV HY- 4 R Line	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04
	PKV HY- 2- AK- 32 (A) F	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02
	PKV HY- 2- AK- 32 (B) F	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02
	DHY - 286- Male - R	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02
	Total	**0.93**	**0.93**	**0.65**	**0.65**	**0.00**	**0.00**	**0.00**	**0.00**	**1.58**	**1.58**
	Total Fiber Crops	**0.93**	**0.93**	**0.65**	**0.65**	**0.00**	**0.00**	**0.00**	**0.00**	**1.58**	**1.58**
	Grand Total (Akola)	**1338.11**	**1192.91**	**345.25**	**464.47**	**0.00**	**0.00**	**0.00**	**0.00**	**1683.36**	**1657.38**
25. MAU, Parbhani											
Cereal Crops	**Sorghum**										
	PVK 801	0.00	0.00	0.00	0.00	0.00	0.00	72.00	51.40	72.00	51.40
	Parbhani Moti	1.34	5.00	0.00	0.00	0.00	0.00	10.00	15.00	11.34	20.00
	CSV 18	1.02	4.00	0.00	0.00	0.00	0.00	5.00	6.00	6.02	10.00
	PVK 809	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
	PMS 28 A	0.05	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.48
	PMS 28 B	0.03	0.44	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.44
	PMS 71 A	0.05	1.72	0.00	0.00	0.00	0.00	0.00	0.00	0.05	1.72
	PMS 71 B	0.03	0.92	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.92
	CR 196	0.03	3.52	0.00	0.00	0.00	0.00	4.77	4.95	4.80	8.47
	Total	**2.59**	**16.08**	**0.00**	**0.00**	**0.00**	**0.00**	**91.77**	**77.35**	**94.36**	**93.43**
	Padddy										
	TJP 48	0.00	0.00	0.00	0.00	0.00	0.00	10.00	4.00	10.00	4.00

	Terna	0.00	0.00	0.00	0.00	0.00	0.00	17.00	2.00	17.00	2.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**27.00**	**6.00**	**27.00**	**6.00**
	Pearlmillet										
	ABPC 4 3	0.79	1.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.79**	**1.00**
	Total	**0.79**	**1.00**	**0.00**	**0.00**	0.00	0.00	**0.00**	**0.00**	**0.79**	**1.00**
	Total Cereal Crops	**3.38**	**17.08**	**0.00**	**0.00**	**0.00**	**0.00**	**118.77**	**83.35**	**122.15**	**100.43**
Pulse Crops	**Urd**										
	BDU 1	0.00	0.00	0.00	0.00	0.00	0.00	6.00	0.80	6.00	0.80
	TAU 1	0.00	0.00	0.00	0.00	0.00	0.00	5.00	1.10	5.00	1.10
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**11.00**	**1.90**	**11.00**	**1.90**
	Pigeonpea										
	BDN 716	0.00	0.00	0.50	1.00	20.00	20.00	119.00	113.35	139.50	134.35
	BDN 711	20.67	22.00	0.00	0.00	40.00	40.00	81.33	9.00	142.00	71.00
	BDN 708	5.15	20.00	0.00	0.00	0.00	0.00	0.00	0.00	5.15	20.00
	BSMR 736	11.06	190.00	0.00	0.00	0.00	0.00	0.00	0.00	11.06	190.00
	BSMR 853	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00
	Total	**37.05**	**232.00**	**0.50**	**1.00**	**60.00**	**60.00**	**200.33**	**122.35**	**297.88**	**415.35**
	Mung										
	BM 2003-2	14.12	17.00	0.00	0.00	30.00	30.00	134.68	50.82	178.80	97.82
	BM 2002-1	1.70	16.00	0.00	0.00	0.00	0.00	46.30	21.00	48.00	37.00
	BM 4	0.00	0.00	0.00	0.00	0.00	0.00	12.00	5.00	12.00	5.00
	BPMR 145	0.00	0.00	0.00	0.00	0.00	0.00	2.40	0.28	2.40	0.28
	Total	**15.82**	**33.00**	**0.00**	**0.00**	**30.00**	**30.00**	**195.38**	**77.10**	**241.20**	**140.10**
	Chickpea										
	BDNG 797	287.00	290.00	0.00	0.00	0.00	0.00	25.00	25.00	312.00	315.00
	BDNGK 798	250.00	100.00	0.00	0.00	0.00	0.00	20.00	20.00	270.00	120.00
	Total	**537.00**	**390.00**	**0.00**	**0.00**	**0.00**	**0.00**	**45.00**	**45.00**	**582.00**	**435.00**
	Total Pulse Crops	**589.87**	**655.00**	**0.50**	**1.00**	**90.00**	**90.00**	**451.71**	**246.35**	**1132.08**	**992.35**
Oilseed Crops	**Soybean**										
	MAUS 612	200.00	272.00	0.00	0.00	0.00	0.00	0.00	264.14	200.00	536.14
	MAUS 162	650.00	276.00	0.00	0.00	0.00	0.00	0.00	0.00	650.00	276.00
	MAUS 158	665.00	617.00	0.00	0.00	0.00	0.00	0.00	0.00	665.00	617.00
	MAUS 81	0.00	0.00	0.00	0.00	0.00	0.00	15.00	11.58	15.00	11.58
	MAUS 71	660.00	790.00	0.00	0.00	0.00	0.00	150.00	139.97	810.00	929.97
	JS 335	0.00	0.00	0.00	0.00	0.00	0.00	110.00	80.00	110.00	80.00

	JS 93-05	300.00	33.00	0.00	0.00	0.00	0.00	0.00	0.00	300.00	33.00
	Total	**2475.00**	**1988.00**	**0.00**	**0.00**	**0.00**	**0.00**	**275.00**	**495.69**	**2750.00**	**2483.69**
	Groundnut										
	TLG 45	5.00	1.75	0.00	0.00	0.00	0.00	0.00	0.00	5.00	1.75
	LGN 1	0.00	0.00	0.00	0.00	0.00	0.00	8.00	6.00	8.00	6.00
	Total	**5.00**	**1.75**	**0.00**	**0.00**	**0.00**	**0.00**	**8.00**	**6.00**	**13.00**	**7.75**
	Safflower										
	Parbhani Kusum PBNS- 12	4.450	50.000	0.00	0.00	0.00	0.00	200.000	200.000	204.45	250.00
	PBNS- 40	1.000	20.000	0.00	0.00	0.00	0.00	30.000	38.000	31.00	58.00
	Purna (PBNS-86)	0.00	0.00	0.00	0.00	0.00	0.00	2.000	3.000	2.00	3.00
	Total	**5.45**	**70.00**	**0.00**	**0.00**	**0.00**	**0.00**	**232.00**	**241.00**	**237.45**	**311.00**
	Total Oilseed Crops	**2485.45**	**2059.75**	**0.00**	**0.00**	**0.00**	**0.00**	**515.00**	**742.69**	**3000.45**	**2802.44**
Fibre Crops	**Cotton**										
	NH 615	0.28	4.20	0.00	0.00	0.00	0.00	0.00	0.00	0.28	4.20
	NH 402	0.00	0.00	0.00	0.00	0.00	0.00	5.70	0.50	5.70	0.50
	NH 255	0.02	0.00	0.00	0.00	0.00	0.00	0.00	3.95	0.02	3.95
	PA 08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.10
	PA 528	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.10
	PH 348	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
	AC 738	0.00	0.00	0.00	0.00	0.00	0.00	1.20	0.15	1.20	0.15
	BN 1	0.00	0.00	0.00	0.00	0.00	0.00	1.20	0.15	1.20	0.15
	Total	**0.32**	**4.20**	**0.00**	**0.00**	**0.00**	**0.00**	**8.10**	**4.95**	**8.42**	**9.15**
	Total Fibre Crops	**0.32**	**4.20**	**0.00**	**0.00**	**0.00**	**0.00**	**8.10**	**4.95**	**8.42**	**9.15**
Grand Total (Parbhani)		**3079.02**	**2736.03**	**0.50**	**1.00**	**90.00**	**90.00**	**1093.58**	**1077.34**	**4263.10**	**3904.37**
26. UAS, Bangalore											
Cereal Crops	**Rice**										
	Thanu	3.00	3.00	0.00	0.00	0.00	0.00	1.00	1.00	4.00	4.00
	KHP 10	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00
	BR-2655	3.00	3.00	0.00	0.00	0.00	0.00	1.00	1.00	4.00	4.00
	Aerobic Rice									0.00	0.00
	Onasiri (MAS-26)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	3.00
	Sharada (MAS 946-1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	3.00
	Paustic-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	3.00
	Paustic-7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	3.00
	Paustic-9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	3.00

	Total	**6.50**	**6.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.00**	**17.00**	**8.50**	**23.00**
	Maize										
	MAI-105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00	4.00
	NAI-137	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00	4.00
	SKV-50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	African Tall	0.00	0.00	20.00	20.00	0.00	0.00	0.00	0.00	20.00	20.00
	Total	**0.00**	**0.00**	**20.00**	**20.00**	**0.00**	**0.00**	**0.00**	**8.00**	**20.00**	**28.00**
	Finger Millet										
	L-5	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
	MR-1	0.15	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	1.00
	MR-6	0.60	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.60	1.50
	KMR-301	0.10	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.10	1.20
	KMR-204	0.08	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	1.00
	KMR-340	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
	GPU-28	2.32	4.00	0.00	0.00	0.00	0.00	0.00	0.00	2.32	4.00
	GPU-48	0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.00
	GPU-67	5.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.12	0.00
	Indaf-5	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
	Indaf-7	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
	Indaf-8	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
	Indaf-9	0.00	0.01	0.20	0.45	0.00	0.00	0.00	0.00	0.20	0.46
	ML-365	3.75	18.00	0.00	0.00	0.00	0.00	0.00	0.00	3.75	18.00
	Total	**12.52**	**28.44**	**0.20**	**0.45**	**0.00**	**0.00**	**0.00**	**0.00**	**12.72**	**28.89**
	Total Cereal Crops	**19.02**	**34.44**	**20.20**	**20.45**	**0.00**	**0.00**	**2.00**	**25.00**	**41.22**	**79.89**
Pulse Crops	**Pigeonpea**										
	BRG-1	1.30	4.75	0.00	0.00	350.00	130.00	0.00	0.00	351.30	134.75
	BRG-2	3.30	11.50	0.00	0.00	132.42	3000.00	0.00	0.00	135.72	3011.50
	BRG-4	1.87	9.25	0.00	0.00	0.00	435.00	0.00	0.00	1.87	444.25
	BRG-5	1.00	6.30	0.00	0.00	0.00	8.70	0.00	0.00	1.00	15.00
	Total	**7.47**	**31.80**	**0.00**	**0.00**	**482.42**	**3573.70**	**0.00**	**0.00**	**489.89**	**3605.50**
	Cowpea										
	KBC 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00	15.00
	Pusa 152	7.40	0.00	2.00	0.00	0.00	0.00	0.00	7.00	9.40	7.00
	IT 38956-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.20	0.00	2.20
	PKB-6	0.20	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.25

	Total	**7.60**	**0.25**	**2.00**	**0.00**	**0.00**	**0.00**	**0.00**	**24.20**	**9.60**	**24.45**
	Mung										
	KKM 3	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00
	Total	**0.00**	**4.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**4.00**
	Chickpea										
	JG 11	0.00	120.00	0.00	0.00	300.00	209.90	0.00	**0.00**	300.00	329.90
	Total	**0.00**	**120.00**	**0.00**	**0.00**	**300.00**	**209.90**	**0.00**	**0.00**	**300.00**	**329.90**
	Fieldbean										
	HA 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00	4.00
	HA 4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00	4.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**8.00**	**0.00**	**8.00**
	Horsegram										
	PHG 9	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00
	Total	**0.00**	**3.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.00**
	Total Pulse Crops	**15.07**	**159.05**	**2.00**	**0.00**	**782.42**	**3783.60**	**0.00**	**32.20**	**799.49**	**3974.85**
Oilseed Crops	**Soybean**										
	JS 335	200.00	100.00	0.00	0.00	0.00	0.00	0.00	104.00	200.00	204.00
	JS 9560	100.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	50.00
	Total	**300.00**	**150.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**104.00**	**300.00**	**254.00**
	Sunflower										
	CMS-234A	0.26	0.50	2.00	2.50	0.00	0.00	1.50	2.00	3.76	5.00
	CMS-234B	0.14	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.20
	CMS-17A	0.04	0.10	1.00	1.50	0.00	0.00	1.00	1.40	2.04	3.00
	CMS-17B	0.02	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.05
	CMS-335A	0.22	0.50	1.00	1.25	0.00	0.00	1.00	1.25	2.22	3.00
	CMS-335B	0.11	0.25	0.00	1.25	0.00	0.00	0.00	0.00	0.11	1.50
	RHA 95C-1	0.28	0.50	1.00	0.75	0.00	0.00	1.00	1.25	2.28	2.50
	RHA-6D-1	0.00	0.00	0.50	0.00	0.00	0.00	0.50	0.75	1.00	0.75
	Total	**1.07**	**2.10**	**5.50**	**7.25**	**0.00**	**0.00**	**5.00**	**6.65**	**11.57**	**16.00**
	Groundnut										
	KCG-6	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	10.00
	GKVK-5	0.00	0.00	0.00	5.00	0.00	0.00	0.00	20.00	0.00	25.00
	Total	**0.00**	**0.00**	**0.00**	**15.00**	**0.00**	**0.00**	**0.00**	**20.00**	**0.00**	**35.00**
	Total Oilseed Crops	**301.07**	**152.10**	**5.50**	**22.25**	**0.00**	**0.00**	**5.00**	**130.65**	**311.57**	**305.00**
Grand Total (Bangalore)		**335.16**	**345.59**	**27.70**	**42.70**	**782.42**	**3783.60**	**7.00**	**187.85**	**1152.28**	**4359.74**

27. UAS, Dharwad											
Cereal Crops	**Paddy**										
	Abhilash	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.00
	Jaya	0.00	0.00	2.50	0.00	0.00	0.00	0.00	0.00	2.50	0.00
	Intan	2.00	0.00	2.50	0.00	0.00	0.00	0.00	0.00	4.50	0.00
	Total	**3.50**	**0.00**	**5.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**8.50**	**0.00**
	Wheat										
	DWR-162	12.00	12.00	10.00	10.00	0.00	0.00	0.00	0.00	22.00	22.00
	UAS 304	24.00	13.00	10.00	7.00	0.00	0.00	0.00	0.00	34.00	20.00
	UAS 415	0.00	0.00	10.00	10.00	0.00	0.00	0.00	0.00	10.00	10.00
	UAS 428	20.00	16.00	5.00	4.00	0.00	0.00	0.00	0.00	25.00	20.00
	DWR 2006	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	1.00	1.00
	UAS 446	0.00	0.00	2.00	2.00	0.00	0.00	0.00	0.00	2.00	2.00
	DDK 1025	0.00	0.00	10.00	10.00	0.00	0.00	0.00	0.00	10.00	10.00
	DDK 1029	0.00	0.00	15.00	15.00	0.00	0.00	0.00	0.00	15.00	15.00
	UAS 334	0.00	0.00	5.00	2.50	0.00	0.00	0.00	0.00	5.00	2.50
	UAS 347	0.00	0.00	2.00	2.00	0.00	0.00	0.00	0.00	2.00	2.00
	Total	**56.00**	**41.00**	**70.00**	**63.50**	**0.00**	**0.00**	**0.00**	**0.00**	**126.00**	**104.50**
	Sorghum										
	M35-1	5.50	4.00	1.00	1.00	0.00	0.00	0.00	0.00	6.50	5.00
	CSV 29R	0.80	0.70	0.50	0.30	0.00	0.00	0.00	0.00	1.30	1.00
	SPV 2217	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	1.00	1.00
	Total	**6.30**	**4.70**	**2.50**	**2.30**	**0.00**	**0.00**	**0.00**	**0.00**	**8.80**	**7.00**
	Maize										
	CI-4	0.00	0.00	0.30	0.30	0.00	0.00	0.00	0.00	0.30	0.30
	CI-5	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.15	0.00
	KDMI 15	0.00	0.00	0.20	0.20	0.00	0.00	0.00	0.00	0.20	0.20
	KDMI 16	0.00	0.00	0.20	0.20	0.00	0.00	0.00	0.00	0.20	0.20
	AfricanTall	0.00	0.00	5.00	5.00	0.00	0.00	0.00	0.00	5.00	5.00
	Total	**0.00**	**0.00**	**5.85**	**5.70**	**0.00**	**0.00**	**0.00**	**0.00**	**5.85**	**5.70**
	Foxtail millet										
	DHFT-109-3	3.00	3.00	2.00	2.00	0.00	0.00	0.00	0.00	5.00	5.00
	Total	**3.00**	**3.00**	**2.00**	**2.00**	**0.00**	**0.00**	**0.00**	**0.00**	**5.00**	**5.00**
	Little millet										
	(DHLM-36-3)	3.00	3.00	2.00	2.00	0.00	0.00	0.00	0.00	5.00	5.00

	Total	**3.00**	**3.00**	**2.00**	**2.00**	**0.00**	**0.00**	**0.00**	**0.00**	**5.00**	**5.00**
	Proso millet										
	DHPM-2769	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00
	Total	**3.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.00**	**0.00**
	Barnyard Millet										
	DHBM-93-2	3.00	3.00	2.00	2.00	0.00	0.00	0.00	0.00	5.00	5.00
	Total	**3.00**	**3.00**	**2.00**	**2.00**	**0.00**	**0.00**	**0.00**	**0.00**	**5.00**	**5.00**
	Finger millet										
	DHFM-78-3	0.00	0.00	2.00	2.00	0.00	0.00	0.00	0.00	2.00	2.00
	Total	**0.00**	**0.00**	**2.00**	**2.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.00**	**2.00**
	Total Cereal Crops	**77.80**	**54.70**	**91.35**	**79.50**	**0.00**	**0.00**	**0.00**	**0.00**	**169.15**	**134.20**
Pulse Crops	**Mung**										
	DGGV-2	1.50	1.15	0.00	0.00	0.00	0.00	0.00	0.00	1.50	1.15
	IPM 2-14	15.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.12	0.00
	Virat	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	5.00	0.00
	Total	**16.62**	**1.15**	**0.00**	**0.00**	**5.00**	**0.00**	**0.00**	**0.00**	**21.62**	**1.15**
	Urd										
	DBGV-5	1.00	0.50	0.00	0.00	20.00	1.50	0.00	0.00	21.00	2.00
	DU-1	0.00	0.00	0.00	0.00	10.00	12.00	0.00	0.00	10.00	12.00
	IPU-2-43	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	10.00	0.00
	Total	**1.00**	**0.50**	**0.00**	**0.00**	**40.00**	**13.50**	**0.00**	**0.00**	**41.00**	**14.00**
	Cowpea										
	DC 15	1.50	3.00	2.00	3.00	0.00	0.00	0.00	0.00	3.50	6.00
	Total	**1.50**	**3.00**	**2.00**	**3.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.50**	**6.00**
	Pigeonpea										
	TS-3R	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	10.00	0.00
	BRG-2	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	10.00	0.00
	BRG-4	0.00	0.00	0.00	0.00	20.00	0.00	0.00	0.00	20.00	0.00
	BRG-5	0.00	0.00	0.00	0.00	20.00	0.00	0.00	0.00	20.00	0.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**60.00**	**0.00**	**0.00**	**0.00**	**60.00**	**0.00**
	Chickpea										
	JG-11	412.00	350.00	60.00	30.00	0.00	0.00	0.00	0.00	472.00	380.00
	JAKI-9218	460.00	270.00	70.00	30.00	0.00	0.00	0.00	0.00	530.00	300.00
	BGD-103	1.00	0.50	0.25	0.00	0.00	0.00	0.00	0.00	1.25	0.50
	BG-1105	0.00	0.00	1.00	0.30	0.00	0.00	0.00	0.00	1.00	0.30

	GBM-2	0.00	0.00	0.00	0.00	75.00	40.00	0.00	0.00	75.00	40.00
	Total	**873.00**	**620.50**	**131.25**	**60.30**	**75.00**	**40.00**	**0.00**	**0.00**	**1079.25**	**720.80**
	Total Pulse Crops	**892.12**	**625.15**	**133.25**	**63.30**	**180.00**	**53.50**	**0.00**	**0.00**	**1205.37**	**741.95**
Oilseed Crops	**Soybean**										
	JS-335	1500.00	500.00	250.00	100.00	0.00	0.00	0.00	0.00	1750.00	600.00
	JS-9305	1200.00	800.00	100.00	50.00	0.00	0.00	0.00	0.00	1300.00	850.00
	Dsb 1	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00
	DSb-21	625.00	300.00	100.00	50.00	0.00	0.00	0.00	0.00	725.00	350.00
	JS-9305	0.00	150.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	150.00
	Total	**3335.00**	**1750.00**	**450.00**	**200.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3785.00**	**1950.00**
	Groundnut										
	GPBD-4 (Vikas)	525.00	600.00	100.00	100.00	0.00	0.00	0.00	0.00	625.00	700.00
	Dh-86	0.00	0.00	5.00	6.00	0.00	0.00	0.00	0.00	5.00	6.00
	GPBD 5	68.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	68.00	100.00
	TG-39 (Trombay Bikaner)	30.00	57.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	57.00
	TG-37A	103.00	140.00	0.00	0.00	0.00	0.00	0.00	0.00	103.00	140.00
	TAG-24	265.00	494.00	0.00	0.00	0.00	0.00	0.00	0.00	265.00	494.00
	Vasundhara (DH-101)	4.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	8.00
	G-2-52	800.00	1000.00	0.00	0.00	0.00	0.00	0.00	0.00	800.00	1000.00
	Total	**1795.00**	**2399.00**	**105.00**	**106.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1900.00**	**2505.00**
	Sesamum										
	DS-5	0.00	0.00	0.20	0.20	0.00	0.00	0.10	0.10	0.30	0.30
	Total	**0.00**	**0.00**	**0.20**	**0.20**	**0.00**	**0.00**	**0.10**	**0.10**	**0.30**	**0.30**
	Niger										
	DNS-4	1.00	0.50	0.10	0.10	0.00	0.00	0.00	0.00	1.10	0.60
	Total	**1.00**	**0.50**	**0.10**	**0.10**	**0.00**	**0.00**	**0.00**	**0.00**	**1.10**	**0.60**
	Safflower										
	A-1	0.00	0.00	0.20	0.30	0.00	0.00	0.00	0.00	0.20	0.30
	Total	**0.00**	**0.00**	**0.20**	**0.30**	**0.00**	**0.00**	**0.00**	**0.00**	**0.20**	**0.30**
	Total Oilseed Crops	**5131.00**	**4149.50**	**555.50**	**306.60**	**0.00**	**0.00**	**0.10**	**0.10**	**5686.60**	**4456.20**
Grand Total (Dharwad)		**6100.92**	**4829.35**	**780.10**	**449.40**	**180.00**	**53.50**	**0.10**	**0.10**	**7061.12**	**5332.35**
28. PJTSAU, Hyderabad											
Cereal Crops	**Rice**										
	JGL-11118	0.00	0.00	0.60	0.60	0.00	0.00	0.00	0.00	0.60	0.60
	JGL-11470	0.10	0.10	1.80	1.80	0.00	0.00	0.00	0.00	1.90	1.90

	JGL 3855	0.10	0.10	1.60	1.60	0.00	0.00	0.00	0.00	1.70	1.70
	JGL-11727	0.00	0.00	0.60	0.60	0.00	0.00	0.00	0.00	0.60	0.60
	JGL-17004	0.00	0.00	1.01	1.01	0.00	0.00	0.00	0.00	1.01	1.01
	JGL-1798	5.00	5.00	56.95	56.95	0.00	0.00	0.00	0.00	61.95	61.95
	JGL-18047	4.00	4.00	103.00	103.00	0.00	0.00	0.00	0.00	107.00	107.00
	JGL-384	0.00	0.00	20.05	21.00	0.00	0.00	0.00	0.00	20.05	21.00
	KNM-118	0.00	0.00	60.71	62.00	0.00	0.00	0.00	0.00	60.71	62.00
	MTU-1001	0.00	0.00	31.70	40.00	0.00	0.00	0.00	0.00	31.70	40.00
	MTU-1010	0.00	0.00	167.95	170.00	0.00	0.00	0.00	0.00	167.95	170.00
	MTU-7029	0.00	0.00	33.85	40.00	0.00	0.00	0.00	0.00	33.85	40.00
	RNR-12392	0.00	0.00	2.11	2.20	0.00	0.00	0.00	0.00	2.11	2.20
	RNR-10754	0.00	0.00	24.60	25.00	0.00	0.00	3.00	3.00	27.60	28.00
	RNR-1446	0.00	0.00	7.31	7.50	0.00	0.00	0.00	0.00	7.31	7.50
	RNR-15048	51.00	51.00	81.21	85.00	0.00	0.00	0.00	0.00	132.21	136.00
	RNR-2458	0.00	0.00	0.01	0.10	0.00	0.00	0.00	0.00	0.01	0.10
	RNR-2465	1.00	1.00	1.61	1.70	0.00	0.00	0.00	0.00	2.61	2.70
	Shobini	0.00	0.00	0.90	1.00	0.00	0.00	0.00	0.00	0.90	1.00
	WGL-14	0.50	0.50	17.41	17.50	0.00	0.00	0.00	0.00	17.91	18.00
	WGL-20471	8.00	8.00	14.10	14.50	0.00	0.00	0.00	0.00	22.10	22.50
	WGL 32100	45.50	45.50	8.01	8.10	0.00	0.00	0.00	0.00	53.51	53.60
	Telahamsa	3.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	3.00
	Chandan	11.50	18.00	0.00	0.00	0.00	0.00	0.00	0.00	11.50	18.00
	WGL-347	0.00	0.00	1.51	1.60	0.00	0.00	0.00	0.00	1.51	1.60
	WGL-3825	0.00	0.00	2.10	2.10	0.00	0.00	0.00	0.00	2.10	2.10
	WGL-44	0.00	0.00	3.60	3.60	0.00	0.00	0.00	0.00	3.60	3.60
	JGL-3844	0.00	0.00	2.40	2.50	0.00	0.00	0.00	0.00	2.40	2.50
	RDR-763	0.00	0.00	0.31	0.50	0.00	0.00	0.00	0.00	0.31	0.50
	WGL-13400	0.00	0.00	2.10	2.10	0.00	0.00	0.00	0.00	2.10	2.10
	WGL-14377	0.00	0.00	1.50	1.50	0.00	0.00	0.00	0.00	1.50	1.50
	WGL-283	0.00	0.00	0.60	0.60	0.00	0.00	0.00	0.00	0.60	0.60
	WGL-3962	0.00	0.00	3.60	3.60	0.00	0.00	0.00	0.00	3.60	3.60
	WGL-48684	0.00	0.00	0.91	0.95	0.00	0.00	0.00	0.00	0.91	0.95
	IR-64	0.00	0.00	14.00	18.00	0.00	0.00	0.00	0.00	14.00	18.00
	Total	**129.70**	**136.20**	**669.72**	**698.21**	**0.00**	**0.00**	**3.00**	**3.00**	**802.42**	**837.41**

	Maize										
	Madhuri	0.00	0.00	0.13	0.13	0.00	0.00	0.00	0.00	0.13	0.13
	Amber Popcorn	0.00	0.00	0.05	0.05	0.00	0.00	0.00	0.00	0.05	0.05
	Priya	0.00	0.00	0.13	0.13	0.00	0.00	0.00	0.00	0.13	0.13
	Total	**0.00**	**0.00**	**0.31**	**0.31**	**0.00**	**0.00**	**0.00**	**0.00**	**0.31**	**0.31**
	Sorghum										
	PSV-56	0.00	0.00	0.05	0.05	0.00	0.00	0.00	0.00	0.05	0.05
	MJ-278	0.00	0.00	0.05	0.05	0.00	0.00	0.00	0.00	0.05	0.05
	Total	**0.00**	**0.00**	**0.10**	**0.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.10**
	Total Cereal Crops	**129.70**	**136.20**	**670.13**	**698.62**	**0.00**	**0.00**	**3.00**	**3.00**	**802.83**	**837.82**
Pulse Crops	**Mung**										
	MGG-295	10.00	20.00	2.38	2.40	0.00	0.00	0.00	0.00	12.38	22.40
	MGG-347	0.00	0.00	0.12	0.15	0.00	0.00	0.00	0.00	0.12	0.15
	MGG-351	0.00	0.00	0.67	0.70	0.00	0.00	0.00	0.00	0.67	0.70
	WGG-2	3.00	3.00	0.48	0.50	0.00	0.00	0.00	0.00	3.48	3.50
	WGG-42	0.00	0.00	1.01	1.05	0.00	0.00	0.00	0.00	1.01	1.05
	MGG-348	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.02	0.02
	WGG-37	0.00	0.00	0.30	0.30	0.00	0.00	0.00	0.00	0.30	0.30
	Total	**13.00**	**23.00**	**4.98**	**5.12**	**0.00**	**0.00**	**0.00**	**0.00**	**17.98**	**28.12**
	Urd										
	PU-31	10.00	10.00	4.43	4.43	0.00	0.00	0.00	0.00	14.43	14.43
	LBG 752	3.00	11.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	11.00
	LBG 787	3.00	11.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	11.00
	MBG-207	0.00	0.00	0.46	0.46	0.00	0.00	0.00	0.00	0.46	0.46
	WBG-26	0.00	0.00	0.11	0.11	0.00	0.00	0.00	0.00	0.11	0.11
	Total	**16.00**	**32.00**	**5.00**	**5.00**	**0.00**	**0.00**	**0.00**	**0.00**	**21.00**	**37.00**
	Pigeonpea										
	ICPL-87119	3.00	14.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	14.00
	ICPL-8863	0.00	0.00	0.20	0.20	0.00	0.00	0.00	0.00	0.20	0.20
	ICPL 84031	0.50	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.00
	MRG-66	0.00	0.00	0.07	0.07	0.00	0.00	0.00	0.00	0.07	0.07
	PRG-100	0.00	0.00	0.07	0.07	0.00	0.00	0.00	0.00	0.07	0.07
	PRG-158	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00
	PRG-176	0.50	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	10.00
	TDRG-4	0.50	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.00

	WRG-53	2.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	3.00
	WRG-65	2.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	7.00
	Total	**10.50**	**36.00**	**0.34**	**0.34**	**0.00**	**0.00**	**0.00**	**0.00**	**10.84**	**36.34**
	Total Pulse Crops	**39.50**	**91.00**	**10.32**	**10.46**	**0.00**	**0.00**	**0.00**	**0.00**	**49.82**	**101.46**
Oilseed Crops	**Soybean**										
	Basara (ADB-22)	90.00	89.00	100.55	101.00	0.00	0.00	0.00	0.00	190.55	190.00
	JS-335	300.00	180.00	155.30	155.00	0.00	0.00	0.00	0.00	455.30	335.00
	Total	**390.00**	**269.00**	**255.85**	**256.00**	**0.00**	**0.00**	**0.00**	**0.00**	**645.85**	**525.00**
	Sesamum										
	Sweta Til	0.25	1.17	0.00	0.00	0.00	0.00	0.00	0.00	0.25	1.17
	Hima	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.02	0.02
	Rajeshwari	0.00	0.00	0.17	0.17	0.00	0.00	0.00	0.00	0.17	0.17
	Total	**0.25**	**1.17**	**0.19**	**0.19**	**0.00**	**0.00**	**0.00**	**0.00**	**0.44**	**1.36**
	Safflower										
	Tandur Kusuma-1	0.00	0.00	0.05	0.10	0.00	0.00	0.00	0.00	0.05	0.10
	Sagaramutyalu	0.00	0.00	0.05	0.10	0.00	0.00	0.00	0.00	0.05	0.10
	Manjeera	0.00	0.00	0.05	0.10	0.00	0.00	0.00	0.00	0.05	0.10
	Total	**0.00**	**0.00**	**0.15**	**0.30**	**0.00**	**0.00**	**0.00**	**0.00**	**0.15**	**0.30**
	Castor										
	PCS-124 (Haritha)	0.00	0.00	0.15	0.15	0.00	0.00	0.00	0.00	0.15	0.15
	PCS-136 (Kiran)	0.00	0.00	0.15	0.15	0.00	0.00	0.00	0.00	0.15	0.15
	PCS-4 (Kranti)	0.20	0.20	0.35	0.35	0.00	0.00	0.00	0.00	0.55	0.55
	PCS-262 (Pragati)	0.00	0.00	0.17	0.17	0.00	0.00	0.00	0.00	0.17	0.17
	Total	**0.20**	**0.20**	**0.82**	**0.82**	**0.00**	**0.00**	**0.00**	**0.00**	**1.02**	**1.02**
	Total Oilseed Crops	**390.45**	**270.37**	**257.01**	**257.31**	**0.00**	**0.00**	**0.00**	**0.00**	**647.46**	**527.68**
Forage Crops	**Cowpea**										
	APFC-01-1 (Vijaya)	0.00	0.00	0.20	0.20	0.00	0.00	0.00	0.00	0.20	0.20
	Total	**0.00**	**0.00**	**0.20**	**0.20**	**0.00**	**0.00**	**0.00**	**0.00**	**0.20**	**0.20**
	Pearl Millet										
	APFB-09-01 (Moti bajra)	0.00	0.00	0.22	0.22	0.00	0.00	0.00	0.00	0.22	0.22
	Total	**0.00**	**0.00**	**0.22**	**0.22**	**0.00**	**0.00**	**0.00**	**0.00**	**0.22**	**0.22**
	Total Forage Crops	**0.00**	**0.00**	**0.42**	**0.42**	**0.00**	**0.00**	**0.00**	**0.00**	**0.42**	**0.42**
	Grand Total (PJTSAU)	**559.65**	**497.57**	**937.88**	**966.81**	**0.00**	**0.00**	**3.00**	**3.00**	**1500.53**	**1467.38**
29. ANGRAU, Guntur											
Cereal Crops	**Rice**										

	Tarangini (MTU 1156)	0.00	0.00	45.10	47.50	0.00	0.00	0.00	0.00	45.10	47.50
	Amara (MTU 1064)	9.60	10.00	23.90	52.04	0.00	0.00	0.00	0.00	33.50	62.04
	Sri Druthi (MTU 1121)	0.00	0.00	22.70	38.00	0.00	0.00	0.00	0.00	22.70	38.00
	Krishanveni (MTU 2077)	0.00	0.00	4.30	2.78	0.00	0.00	0.00	0.00	4.30	2.78
	Swarna (MTU 7029)	271.80	272.00	165.20	164.69	0.00	0.00	0.00	0.00	437.00	436.69
	Tholakari (MTU 1031)	0.60	0.60	0.70	0.75	0.00	0.00	0.00	0.00	1.30	1.35
	Godavari (MTU 1032)	1.20	0.70	0.70	0.50	0.00	0.00	0.00	0.00	1.90	1.20
	Chandra (MTU 1153)	0.00	0.00	2.30	24.77	0.00	0.00	0.00	0.00	2.30	24.77
	Deepthi (MTU 4870)	0.60	0.30	0.70	0.30	0.00	0.00	0.00	0.00	1.30	0.60
	Badava mahsuri (PLA 1100)	0.00	0.00	46.90	46.01	0.00	0.00	0.00	0.00	46.90	46.01
	Pushaymi (MTU 1075)	24.00	24.00	27.70	29.99	0.00	0.00	0.00	0.00	51.70	53.99
	Indra (MTU 1061)	12.72	13.00	54.10	56.35	0.00	0.00	0.00	0.00	66.82	69.35
	Cotton dora sannalu (MTU 1010)	480.00	500.00	194.05	226.81	0.00	0.00	0.00	0.00	674.05	726.81
	Vijetha (MTU1001)	145.20	120.00	68.30	77.10	0.00	0.00	0.00	0.00	213.50	197.10
	Prabhath (MTU 3626)	0.00	0.00	12.95	28.00	0.00	0.00	0.00	0.00	12.95	28.00
	Maruteru sannalu (MTU1006)	3.60	3.00	2.75	3.00	0.00	0.00	0.00	0.00	6.35	6.00
	Bheema (MTU 1140)	0.00	0.00	1.70	8.58	0.00	0.00	0.00	0.00	1.70	8.58
	IR 64	0.00	0.00	91.80	92.00	0.00	0.00	0.00	0.00	91.80	92.00
	Total	**949.32**	**943.60**	**765.85**	**899.17**	**0.00**	**0.00**	**0.00**	**0.00**	**1715.17**	**1842.77**
	Foxtail millet										
	Srikrishnadevaraya	0.00	0.00	0.15	0.15	0.00	0.00	0.00	0.00	0.15	0.15
	Narasimharaya	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.02	0.02
	Suryanandi	0.00	0.00	0.25	0.25	0.00	0.00	0.00	0.00	0.25	0.25
	SiA 3156	0.00	0.00	0.12	0.12	0.00	0.00	0.00	0.00	0.12	0.12
	SiA 3085	3.50	7.35	0.00	0.00	0.00	0.00	0.00	0.00	3.50	7.35
	Prasad	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.02	0.02
	Srilakshmi	0.00	0.00	0.15	0.05	0.00	0.00	0.00	0.00	0.15	0.05
	Total	**3.50**	**7.35**	**0.71**	**0.61**	**0.00**	**0.00**	**0.00**	**0.00**	**4.21**	**7.96**
	Sorghum										
	NTJ 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.07
	NTJ 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.09
	NTJ 4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.09
	N 13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.05
	N 14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.07

	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.37**	**0.00**	**0.37**
	Fingermillet										
	VR 847	0.00	0.00	0.00	0.00	0.00	0.00	0.00	58.09	0.00	58.09
	Godavari	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.68	0.00	3.68
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**61.77**	**0.00**	**61.77**
	Total Cereal Crops	**952.82**	**950.95**	**766.56**	**899.78**	**0.00**	**0.00**	**0.00**	**62.14**	**1719.38**	**1912.87**
Pulse Crops	**Pigeonpea**										
	LRG 52	2.00	20.00	40.00	50.00	0.00	0.00	0.00	0.00	42.00	70.00
	LRG 41	18.90	40.00	61.65	100.00	0.00	0.00	0.00	0.00	80.55	140.00
	LRG 30	0.00	0.00	0.00	0.00	0.00	0.00	0.25	1.00	0.25	1.00
	ICPL 87119	0.00	0.00	3.20	4.00	0.00	0.00	0.00	0.00	3.20	4.00
	Laxmi (ICPL - 85063)	3.50	0.90	5.50	9.10	0.00	0.00	0.00	0.00	9.00	10.00
	Total	**24.40**	**60.90**	**110.35**	**163.10**	**0.00**	**0.00**	**0.25**	**1.00**	**135.00**	**225.00**
	Mung										
	LGG 407	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.50	0.00
	LGG 460	15.60	15.60	3.80	0.00	0.00	0.00	0.00	0.00	19.40	15.60
	TM 96-2	0.00	0.00	0.65	2.20	0.00	0.00	0.00	0.00	0.65	2.20
	IPM 2-14	0.00	0.00	3.10	0.00	0.00	0.00	0.00	0.00	3.10	0.00
	WGG - 42	0.00	0.00	1.85	0.00	0.00	0.00	0.00	0.00	1.85	0.00
	Total	**15.60**	**15.60**	**9.90**	**2.20**	**0.00**	**0.00**	**0.00**	**0.00**	**25.50**	**17.80**
	Urd										
	LBG 623	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.30	0.00
	LBG 645	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.60	0.00
	LBG 648	0.00	0.00	1.20	0.00	0.00	0.00	0.00	0.00	1.20	0.00
	LBG 752	18.00	18.00	3.20	0.00	0.00	0.00	0.00	0.00	21.20	18.00
	LBG 787	14.40	14.40	2.35	0.00	0.00	0.00	0.00	0.00	16.75	14.40
	PU 31	16.80	16.80	11.20	0.00	0.00	0.00	0.00	0.00	28.00	16.80
	TBG 104	6.00	6.00	6.55	0.00	0.00	0.00	0.00	0.00	12.55	6.00
	T 9	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.60	0.00
	Total	**55.20**	**55.20**	**26.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**81.20**	**55.20**
	Chickpea										
	NBeG 3	28.75	28.75	2.55	21.25	0.00	0.00	0.00	0.00	31.30	50.00
	NBeG 47	195.50	195.50	2.40	29.50	0.00	0.00	0.00	0.00	197.90	225.00
	NBeG119	460.00	198.00	1.60	2.00	0.00	0.00	0.00	0.00	461.60	200.00
	NBeG 49	287.50	290.00	2.60	30.00	0.00	0.00	0.00	0.00	290.10	320.00

	JG 11	0.00	0.00	4.95	4.95	0.00	0.00	0.00	0.00	4.95	4.95
	KAK - 2	0.00	0.00	0.45	0.00	0.00	0.00	0.00	0.00	0.45	0.00
	JAKI 9218	0.00	0.00	1.80	2.50	0.00	0.00	0.00	0.00	1.80	2.50
	Total	**971.75**	**712.25**	**16.35**	**90.20**	**0.00**	**0.00**	**0.00**	**0.00**	988.10	802.45
	Total Pulse Crops	**1066.95**	**843.95**	**162.60**	**255.50**	**0.00**	**0.00**	**0.25**	**1.00**	**1229.80**	**1100.45**
Oilseed Crops	**Groundnut**										
	Kadiri 6	3798.00	5120.00	7.90	10.00	0.00	0.00	0.00	0.00	3805.90	5130.00
	Kadiri 7 Bold	10.00	30.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	30.00
	Kadiri 9	720.00	2550.00	0.15	10.00	0.00	0.00	0.00	0.00	720.15	2560.00
	Kadiri 8	0.00	0.00	0.30	10.00	0.00	0.00	0.00	0.00	0.30	10.00
	Kadiri Haritandra (K1319)	340.00	410.00	0.15	305.00	0.00	0.00	0.00	0.00	340.15	715.00
	Kadiri Amaravati	0.00	0.00	0.40	70.00	0.00	0.00	0.00	0.00	0.40	70.00
	Dharani (TCGS 1043)	847.00	1020.00	0.10	422.23	0.00	0.00	0.00	0.00	847.10	1442.23
	Narayani (TCGS 29)	170.00	204.50	0.00	0.00	0.00	0.00	0.00	0.00	170.00	204.50
	Total	**5885.00**	**9334.50**	**9.00**	**827.23**	**0.00**	**0.00**	**0.00**	**0.00**	**5894.00**	**10161.73**
	Sesamum										
	Gouri	0.00	0.00	1.05	1.05	0.00	0.00	0.00	0.00	1.05	1.05
	YLM 11	0.00	0.00	0.12	0.12	0.00	0.00	0.00	0.00	0.12	0.12
	YLM 17	0.00	0.00	0.95	0.95	0.00	0.00	0.00	0.00	0.95	0.95
	YLM 66	0.00	0.00	0.80	0.80	0.00	0.00	0.00	0.00	0.80	0.80
	Madhavi	0.00	0.00	0.18	0.18	0.00	0.00	0.00	0.00	0.18	0.18
	Total	**0.00**	**0.00**	**3.10**	**3.10**	**0.00**	**0.00**	**0.00**	**0.00**	**3.10**	**3.10**
	Total Oilseed Crops	**5885.00**	**9334.50**	**12.10**	**830.33**	**0.00**	**0.00**	**0.00**	**0.00**	**5897.10**	**10164.83**
Fibre Crops	**Cotton**										
	L 603	0.02	0.02	2.38	2.38	0.00	0.00	0.00	0.00	2.40	2.40
	L 604	0.02	0.03	2.98	2.97	0.00	0.00	0.00	0.00	3.00	3.00
	L 389	0.04	0.04	3.56	3.56	0.00	0.00	0.00	0.00	3.60	3.60
	NDLH 1755 (Sivandandi)	0.00	0.00	0.60	0.60	0.00	0.00	0.00	0.00	0.60	0.60
	NDLH 1938 (Srirama)	0.00	0.00	0.60	0.60	0.00	0.00	0.00	0.00	0.60	0.60
	Lam Cotton Hy. 5 (F)	0.00	0.00	0.60	0.60	0.00	0.00	0.00	0.00	0.60	0.60
	Lam Cotton Hy. 5 (M)	0.00	0.00	0.78	0.78	0.00	0.00	0.00	0.00	0.78	0.78
	Lam Cotton Hy. 7 (F)	0.00	0.00	0.42	0.42	0.00	0.00	0.00	0.00	0.42	0.42
	Lam Cotton Hy. 7 (M)	0.00	0.00	0.78	0.78	0.00	0.00	0.00	0.00	0.78	0.78
	NDLH 240 (Female)	0.00	0.00	0.42	0.42	0.00	0.00	0.00	0.00	0.42	0.42
	NDLH 240 (Male)	0.00	0.00	0.78	0.78	0.00	0.00	0.00	0.00	0.78	0.78

	Srinidhi	0.00	0.00	1.20	1.20	0.00	0.00	0.00	0.00	1.20	1.20
	Aravinda	0.00	0.00	1.20	1.20	0.00	0.00	0.00	0.00	1.20	1.20
	Yaganti	0.00	0.00	1.20	1.20	0.00	0.00	0.00	0.00	1.20	1.20
	Total	**0.08**	**0.09**	**17.50**	**17.49**	**0.00**	**0.00**	**0.00**	**0.00**	**17.58**	**17.58**
	Total Fibre Crops	**0.08**	**0.09**	**17.50**	**17.49**	**0.00**	**0.00**	**0.00**	**0.00**	**17.58**	**17.58**
	Grand Total (ANGRAU)	**7904.85**	**11129.49**	**958.76**	**2003.10**	**0.00**	**0.00**	**0.25**	**63.14**	**8863.86**	**13195.73**
30. TNAU, Coimbatore											
Cereal Crops	**Rice**										
	ADT 36	0.00	0.00	0.00	0.00	0.00	0.00	41.70	42.48	41.70	42.48
	ADT 38	0.00	0.00	0.00	0.00	0.00	0.00	50.40	33.76	50.40	33.76
	ADT 42	0.00	0.00	0.00	0.00	0.00	0.00	7.50	2.00	7.50	2.00
	ADT 43	2.30	0.30	0.00	0.00	0.00	0.00	135.65	143.76	137.95	144.06
	ADT (R) 50	0.00	0.00	5.00	9.00	0.00	0.00	6.50	5.45	11.50	14.45
	CO 43	0.00	0.00	0.00	0.00	0.00	0.00	22.30	0.00	22.30	0.00
	IR 20	22.50	0.00	0.00	0.00	0.00	0.00	29.60	90.00	52.10	90.00
	IR 36	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.10	1.00	1.10
	IR 50	0.00	0.00	0.00	0.00	0.00	0.00	17.00	34.40	17.00	34.40
	ASD 18	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.50	0.50	0.50
	ASD 19	0.00	0.00	0.00	0.00	0.00	0.00	8.00	6.50	8.00	6.50
	TRY 1	0.00	0.00	0.00	0.00	0.00	0.00	19.00	10.50	19.00	10.50
	TRY 3	0.00	0.05	10.00	8.65	0.00	0.00	0.50	0.00	10.50	8.70
	TPS 5	0.00	0.00	3.00	3.00	0.00	0.00	0.00	0.00	3.00	3.00
	TKM 13	0.00	0.10	15.00	24.00	0.00	0.00	15.50	25.96	30.50	50.06
	TKM 14	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00
	Anna (R) 4	0.00	0.00	6.00	6.00	0.00	0.00	0.00	0.00	6.00	6.00
	ADT 37	10.10	8.10	0.00	0.00	0.00	0.00	107.70	155.05	117.80	163.15
	ADT 39	5.00	5.00	0.00	0.00	0.00	0.00	74.65	46.30	79.65	51.30
	ADT (R) 45	0.10	0.10	0.00	5.00	0.00	0.00	145.75	171.80	145.85	176.90
	ADT (R) 46	0.00	0.00	0.00	0.00	0.00	0.00	45.15	35.60	45.15	35.60
	ADT (R) 47	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.00	1.50	0.00
	ADT (R) 49	0.00	0.00	3.00	0.00	0.00	0.00	20.55	0.00	23.55	0.00
	CO (R) 49	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00	0.00
	CO (R) 50	0.00	0.00	25.00	35.01	0.00	0.00	46.90	33.39	71.90	68.40
	CO (R) 51	6.60	1.20	45.00	48.20	0.00	0.00	113.25	162.67	164.85	212.07
	CR 1009	0.00	0.00	0.00	0.00	0.00	0.00	101.95	10.07	101.95	10.07

	CR 1009 SUB 1	45.25	0.00	20.00	24.00	0.00	0.00	4.50	51.81	69.75	75.81
	MDU 6	0.00	0.40	8.00	8.00	0.00	0.00	0.00	0.00	8.00	8.40
	ASD 16	0.00	0.00	0.00	0.00	0.00	0.00	95.05	77.28	95.05	77.28
	I. W. Ponni	0.00	0.00	0.00	0.00	0.00	0.00	47.75	5.50	47.75	5.50
	TKM 9	0.00	0.00	0.00	0.00	0.00	0.00	43.40	27.50	43.40	27.50
	Total	**93.85**	**15.25**	**140.00**	**170.86**	**0.00**	**0.00**	**1204.25**	**1173.38**	**1438.10**	**1359.49**
	Sorghum										
	CO (S) 30	0.00	0.00	0.25	0.25	0.00	0.00	0.00	0.00	0.25	0.25
	K 12	0.00	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.10	0.10
	K 8	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.30	0.30	0.30
	Rabi										
	CO (S) 30	0.00	0.00	0.15	0.15	0.00	0.00	0.00	0.00	0.15	0.15
	K 12	0.00	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.10	0.10
	Total	**0.00**	**0.00**	**0.60**	**0.60**	**0.00**	**0.00**	**0.30**	**0.30**	**0.90**	**0.90**
	Maize										
	COH (M) 6 Parental Line										
	A line	3.00	3.05	4.20	6.21	0.00	0.00	0.00	0.65	7.20	9.91
	R line	1.50	1.53	2.00	3.83	0.00	0.00	0.00	0.03	3.50	5.39
	COH (M) 8 Parental Line										
	A line	3.05	3.02	0.00	0.00	0.00	0.00	0.00	0.08	3.05	3.10
	R line	1.53	1.53	0.00	0.03	0.00	0.00	0.00	0.46	1.53	2.02
	COH (M) 9 Parental Line										
	A line	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.05
	R line	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03
	Total	**9.16**	**9.21**	**6.20**	**10.07**	**0.00**	**0.00**	**0.00**	**1.22**	**15.36**	**20.50**
	Finger Millet / Ragi										
	CO (Ra) 14	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.10	0.00
	CO (Ra) 15	0.00	0.00	0.85	0.50	0.00	0.00	0.10	0.00	0.95	0.50
	Total	**0.00**	**0.00**	**0.85**	**0.50**	**0.00**	**0.00**	**0.20**	**0.00**	**1.05**	**0.50**
	Cumbu										
	CO (Cu) 9	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.30	0.35	0.30
	CO (Cu) 10	0.10	0.00	0.20	0.75	0.00	0.00	0.40	0.00	0.70	0.75
	Total	**0.10**	**0.00**	**0.20**	**0.75**	**0.00**	**0.00**	**0.75**	**0.30**	**1.05**	**1.05**
	Barnyard Millet/Kudiraivali										
	CO (Kv) 2	0.00	0.00	1.00	0.23	0.00	0.00	0.00	0.00	1.00	0.23

	Total	**0.00**	**0.00**	**1.00**	**0.23**	**0.00**	**0.00**	**0.00**	**0.00**	**1.00**	**0.23**
	Samai/ Kutki										
	CO4	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.25	0.00
	Total	**0.00**	**0.00**	**0.25**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.25**	**0.00**
	Foxtail Millet/ Tenai										
	CO (Te) 7	0.00	0.00	0.25	0.54	0.00	0.00	0.00	0.00	0.25	0.54
	Total	**0.00**	**0.00**	**0.25**	**0.54**	**0.00**	**0.00**	**0.00**	**0.00**	**0.25**	**0.54**
	Proso Miller										
	CO (PV) 5	0.00	0.00	10.00	0.20	0.00	0.00	0.00	0.00	10.00	0.20
	Total	**0.00**	**0.00**	**10.00**	**0.20**	**0.00**	**0.00**	**0.00**	**0.00**	**10.00**	**0.20**
	Kodo millet										
	CO 3	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.10
	Total	**0.00**	**0.00**	**0.00**	**0.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**
	Total Cereal Crops	**103.11**	**24.46**	**159.35**	**183.85**	**0.00**	**0.00**	**1205.50**	**1175.20**	**1467.96**	**1383.51**
Pulse Crops	**Pigeon Pea**										
	VBN 3	0.00	0.00	1.30	1.30	0.00	0.00	0.00	0.00	1.30	1.30
	CO (Rg) 7	2.40	2.40	0.00	0.00	0.00	0.00	0.40	0.20	2.80	2.60
	Total	**2.40**	**2.40**	**1.30**	**1.30**	**0.00**	**0.00**	**0.40**	**0.20**	**4.10**	**3.90**
	Urd										
	ADT 5	0.00	0.00	0.00	0.00	0.00	0.00	18.41	9.82	18.41	9.82
	VBN 3	0.00	0.00	0.00	0.00	0.00	0.00	3.80	6.48	3.80	6.48
	VBN (Bg) 4	0.20	0.50	0.00	0.00	0.00	0.00	5.80	0.00	6.00	0.50
	VBN (Bg) 5	6.00	6.50	12.00	17.74	0.00	0.00	4.90	1.75	22.90	25.99
	VBN (Bg) 6	6.00	6.00	12.00	11.60	0.00	0.00	5.38	2.24	23.38	19.84
	VBN (Bg) 7	6.00	2.52	0.00	0.00	0.00	0.00	0.00	0.00	6.00	2.52
	CO 6	4.00	5.96	1.00	0.96	0.00	0.00	0.00	0.63	5.00	7.55
	VBN (BG) 8	1.00	0.00	4.00	0.00	0.00	0.00	0.00	0.24	5.00	0.24
	ADT 3	0.00	0.00	0.00	0.00	0.00	0.00	7.40	5.55	7.40	5.55
	Total	**23.20**	**21.48**	**29.00**	**30.30**	**0.00**	**0.00**	**45.69**	**26.71**	**97.89**	**78.49**
	Mung										
	ADT 3	0.00	0.00	0.00	0.00	0.00	0.00	2.00	1.00	2.00	1.00
	VBN 2	0.00	0.00	0.00	0.00	0.00	0.00	10.20	3.00	10.20	3.00
	VBN 3	0.00	0.00	10.00	10.00	0.00	0.00	0.00	0.00	10.00	10.00
	CO 6	0.00	0.00	0.00	0.00	0.00	0.00	1.13	0.00	1.13	0.00
	CO (Gg) 912 (CO7)	0.30	1.50	5.00	5.00	0.00	0.00	1.30	1.90	6.60	8.40

	CO (Gg) 8	0.00	0.00	13.00	11.50	0.00	0.00	0.00	0.32	13.00	11.82
	Total	**0.30**	**1.50**	**28.00**	**26.50**	**0.00**	**0.00**	**14.63**	**6.22**	**42.93**	**34.22**
	Cowpea										
	CO (CP) 7	0.00	0.00	3.00	3.20	0.00	0.00	0.40	0.46	3.40	3.66
	Total	**0.00**	**0.00**	**3.00**	**3.20**	**0.00**	**0.00**	**0.40**	**0.46**	**3.40**	**3.66**
	Horsgram										
	Priyur 2	0.00	0.00	5.00	5.00	0.00	0.00	0.00	0.00	5.00	5.00
	Total	**0.00**	**0.00**	**5.00**	**5.00**	**0.00**	**0.00**	**0.00**	**0.00**	**5.00**	**5.00**
	Total Pulses Crops	**25.90**	**25.38**	**66.30**	**66.30**	**0.00**	**0.00**	**61.12**	**33.59**	**153.32**	**125.27**
Oilseed Crops	**Groundnut**										
	VRI (Gn) 6	0.00	0.00	40.00	5.90	0.00	0.00	0.00	0.00	40.00	5.90
	VRI (Gn) 7	0.00	0.00	35.00	23.70	0.00	0.00	0.00	0.00	35.00	23.70
	CO 6	0.00	0.00	120.00	131.10	0.00	0.00	0.00	22.20	120.00	153.30
	CO 7	10.00	0.00	40.00	20.60	0.00	0.00	0.00	0.00	50.00	20.60
	TMV (Gn) 13	0.00	0.00	220.00	165.70	0.00	0.00	0.00	0.00	220.00	165.70
	VRI 8	0.00	0.00	20.00	6.00	0.00	0.00	0.00	0.00	20.00	6.00
	Total	**10.00**	**0.00**	**475.00**	**353.00**	**0.00**	**0.00**	**0.00**	**22.20**	**485.00**	**375.20**
	Sunflower										
	CO (SFV) 5	0.00	0.00	0.30	0.30	0.00	0.00	0.00	0.70	0.30	1.00
	Total	**0.00**	**0.00**	**0.30**	**0.30**	**0.00**	**0.00**	**0.00**	**0.70**	**0.30**	**1.00**
	Castor										
	TMV 6	0.00	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.10	0.10
	Total	**0.00**	**0.00**	**0.10**	**0.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.10**
	Sesamum										
	SVPR1	0.00	0.00	0.00	0.00	0.00	0.00	1.40	0.20	1.40	0.20
	TMV 7	0.00	0.00	3.00	3.00	0.00	0.00	0.30	0.13	3.30	3.13
	VRI Sv.1	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.10	0.00
	VRI Sv.2	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	1.00	1.00
	TMV3	0.00	0.00	0.00	0.30	0.00	0.00	2.60	0.16	2.60	0.46
	TMV4	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.20	3.00	0.20
	Total	**0.00**	**0.00**	**4.00**	**4.30**	**0.00**	**0.00**	**7.40**	**0.69**	**11.40**	**4.99**
	Total Oilseed crops	**10.00**	**0.00**	**479.40**	**357.70**	**0.00**	**0.00**	**7.40**	**23.59**	**496.80**	**381.29**
Fibre Crops	**Cotton**										
	MCU 5	0.10	0.00	0.00	0.00	0.00	0.00	0.40	0.40	0.50	0.40
	MCU 7	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.46	0.46	0.46

	SVPR 2	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00	0.00
	SVPR 4	0.00	0.00	0.35	0.00	0.00	0.00	0.00	0.00	0.35	0.00
	Total	**0.10**	**0.00**	**0.35**	**0.00**	**0.00**	**0.00**	**1.86**	**0.86**	**2.31**	**0.86**
	Total Fibre Crops	**0.10**	**0.00**	**0.35**	**0.00**	**0.00**	**0.00**	**1.86**	**0.86**	**2.31**	**0.86**
Forage Crops	**Sorghum**										
	CO (FS) 29	1.46	1.74	0.00	0.02	0.00	0.00	0.80	0.55	2.26	2.31
	CO (FS) 31	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
	SPV 2242	5.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.20	0.00
	Total	**7.66**	**1.74**	**0.00**	**0.02**	**0.00**	**0.00**	**0.80**	**0.55**	**8.46**	**2.31**
	Cowpea										
	CO 9	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00
	Total	**0.00**	**0.00**	**3.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.00**	**0.00**
	Total Forage Crops	**7.66**	**1.74**	**3.00**	**0.02**	**0.00**	**0.00**	**0.80**	**0.55**	**11.46**	**2.31**
Grand Total (Coimbatore)		**146.77**	**51.58**	**708.40**	**607.87**	**0.00**	**0.00**	**1276.68**	**1233.79**	**2131.85**	**1893.24**
31. KAU, Pattambi											
Cereal Crops	**Rice**										
	Jyothi	8.00	35.00	1.20	1.50	0.00	0.00	0.50	0.50	9.70	37.00
	Uma	9.00	11.56	0.00	0.00	0.00	0.00	2.00	2.50	11.00	14.06
	Bhadra	3.50	4.05	0.00	0.00	0.00	0.00	0.00	0.00	3.50	4.05
	Harsha	0.00	0.00	0.02	0.50	0.00	0.00	0.00	1.00	0.02	1.50
	MattaTriveni	1.10	5.00	0.40	1.00	0.00	0.00	1.00	1.50	2.50	7.50
	Varsha	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.50	0.50	0.50
	Aiswarya	0.00	0.00	0.80	1.00	0.00	0.00	0.00	1.50	0.80	2.50
	K.K.Varna	0.00	0.00	0.04	1.00	0.00	0.00	0.00	1.50	0.04	2.50
	Annapoorna	0.00	0.00	0.04	1.00	0.00	0.00	0.00	0.00	0.04	1.00
	Kanchana	0.00	0.00	0.80	1.50	0.00	0.00	0.00	1.50	0.80	3.00
	Vaishak	0.00	0.00	0.00	0.00	0.00	0.00	1.00	3.60	1.00	3.60
	Swarnaprabha	0.00	0.00	0.10	1.00	0.00	0.00	0.00	1.00	0.10	2.00
	Samyuktha	0.00	0.00	0.02	0.50	0.00	0.00	0.00	0.00	0.02	0.50
	Aathira	0.50	2.50	0.45	1.00	0.00	0.00	0.00	2.20	0.95	5.70
	Anaswara	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20	0.00	1.20
	Karuna	0.00	0.00	0.00	0.00	0.00	0.00	1.70	1.70	1.70	1.70
	Neeraja	0.00	0.00	0.04	1.00	0.00	0.00	0.00	1.20	0.04	2.20
	Jaya	0.00	0.00	0.30	1.00	0.00	0.00	1.00	1.00	1.30	2.00
	Ponmani	0.00	0.00	0.20	1.00	0.00	0.00	0.00	1.50	0.20	2.50

	Red Mahsuri	0.00	0.00	0.04	0.30	0.00	0.00	0.00	1.50	0.04	1.80
	Prathyasa	0.10	5.03	0.00	0.00	0.00	0.00	0.00	2.20	0.10	7.23
	Sampada	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.80	0.00	1.80
	Jeerakasala	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.50
	Makaram	0.00	0.00	0.00	0.00	0.00	0.00	2.50	2.70	2.50	2.70
	Swetha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
	Shreyas	0.00	0.00	0.00	0.00	0.00	0.00	1.00	2.50	1.00	2.50
	Supriya	0.00	0.00	0.00	0.00	0.00	0.00	2.00	3.50	2.00	3.50
	Akshaya	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	2.00
	Total	**22.20**	**63.14**	**4.45**	**13.30**	**0.00**	**0.00**	**15.20**	**41.60**	**41.85**	**118.04**
	Total Cereal Crops	**22.20**	**63.14**	**4.45**	**13.30**	**0.00**	**0.00**	**15.20**	**41.60**	**41.85**	**118.04**
Grand TotalPattambi		**22.20**	**63.14**	**4.45**	**13.30**	**0.00**	**0.00**	**15.20**	**41.60**	**41.85**	**118.04**
32. PAJANCOA&RI, Karaikal											
Cereal Crops	**Rice**										
	CR1009	0.00	0.00	2.10	7.15	0.00	0.00	0.00	0.00	2.10	7.15
	Imp.White Ponni	0.00	0.00	2.70	5.00	0.00	0.00	0.00	0.00	2.70	5.00
	ADT 39	0.00	0.00	0.30	5.25	0.00	0.00	0.00	0.00	0.30	5.25
	ADT (R) 46	0.00	0.00	0.50	5.75	0.00	0.00	0.00	0.00	0.50	5.75
	ADT (R) 49	0.00	0.00	0.50	7.00	0.00	0.00	0.00	0.00	0.50	7.00
	ADT 37	0.00	0.00	0.80	5.00	0.00	0.00	0.00	0.00	0.80	5.00
	ADT 43	0.00	0.00	0.60	5.00	0.00	0.00	0.00	0.00	0.60	5.00
	ADT 45	0.00	0.00	0.40	5.00	0.00	0.00	0.00	0.00	0.40	5.00
	Total	**0.00**	**0.00**	**7.90**	**45.15**	**0.00**	**0.00**	**0.00**	**0.00**	**7.90**	**45.15**
	Total Cereal Crops	**0.00**	**0.00**	**7.90**	**45.15**	**0.00**	**0.00**	**0.00**	**0.00**	**7.90**	**45.15**
Grand Total (Karaikal)		**0.00**	**0.00**	**7.90**	**45.15**	**0.00**	**0.00**	**0.00**	**0.00**	**7.90**	**45.15**
33. DBSKKV, Dapoli											
Cereal Crops	**Rice**										
	RTN-1	0.60	2.00	0.00	0.00	0.00	0.00	17.40	19.00	18.00	21.00
	RTN- 2	0.00	0.00	0.00	0.00	0.00	0.00	0.60	3.00	0.60	3.00
	RTN- 3	0.00	0.00	0.00	0.00	0.00	0.00	1.50	1.50	1.50	1.50
	RTN-4	0.00	0.00	0.00	0.00	0.00	0.00	6.00	11.00	6.00	11.00
	RTN-5	0.60	2.00	0.00	0.00	0.00	0.00	3.90	7.50	4.50	9.50
	RTN-6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.50	0.00	9.50
	RTN-7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.60	0.00	1.60
	RTN- 73	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.70	1.50	0.70

	RTN-24	3.80	5.00	0.00	0.00	0.00	0.00	14.20	10.00	18.00	15.00
	RTN-711	0.00	0.00	0.00	0.00	0.00	0.00	12.00	8.50	12.00	8.50
	KJT- 2	2.00	3.00	0.00	0.00	0.00	0.00	8.80	7.15	10.80	10.15
	KJT-3	3.80	5.00	0.00	0.00	0.00	0.00	13.30	4.25	17.10	9.25
	KJT- 4	0.00	0.00	0.00	0.00	0.00	0.00	6.60	2.03	6.60	2.03
	KJT- 5	2.20	3.50	0.00	0.00	0.00	0.00	3.80	1.67	6.00	5.17
	KJT- 6	1.50	2.50	0.00	0.00	0.00	0.00	4.50	1.87	6.00	4.37
	KJT- 7	6.70	8.50	0.00	0.00	0.00	0.00	5.30	1.87	12.00	10.37
	KJT- 8	0.20	0.40	0.00	0.00	0.00	0.00	7.90	6.03	8.10	6.43
	KJT- 9	0.00	0.00	0.00	0.00	0.00	0.00	10.50	7.14	10.50	7.14
	KJT 10	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.50	0.50	0.50
	KJT-184	2.00	2.50	0.00	0.00	0.00	0.00	4.00	0.45	6.00	2.95
	PLG-1	0.00	0.00	0.00	0.00	0.00	0.00	1.50	1.00	1.50	1.00
	PLG-2	0.00	0.00	0.00	0.00	0.00	0.00	1.50	1.00	1.50	1.00
	PND-1	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.20	1.50	0.20
	PNL-1	0.00	0.00	0.00	0.00	0.00	0.00	3.00	4.00	3.00	4.00
	PNL-2	0.00	0.00	0.00	0.00	0.00	0.00	3.00	4.00	3.00	4.00
	PNL-3	0.00	0.00	0.00	0.00	0.00	0.00	3.00	4.00	3.00	4.00
	Ratnagiri- 1	0.00	0.00	0.00	0.00	0.00	0.00	15.00	18.00	15.00	18.00
	Ratnagiri- 5	0.00	0.00	0.00	0.00	0.00	0.00	15.00	12.00	15.00	12.00
	Ratnagiri- 6	0.00	0.00	0.00	0.00	0.00	0.00	6.00	6.00	6.00	6.00
	Ratnagiri- 7	0.00	0.00	0.00	0.00	0.00	0.00	6.00	6.00	6.00	6.00
	Ratnagiri- 24	0.00	0.00	0.00	0.00	0.00	0.00	15.00	18.00	15.00	18.00
	Ratnagiri- 711	0.00	0.00	0.00	0.00	0.00	0.00	6.00	7.00	6.00	7.00
	Total	**23.40**	**34.40**	**0.00**	**0.00**	**0.00**	**0.00**	**198.80**	**186.46**	**222.20**	**220.86**
	Hybrid Paddy										
	Sahyadri										
	IR 58025 A Line	0.10	0.20	0.00	0.00	0.00	0.00	1.65	0.90	1.75	1.10
	IR 58025 B Line	0.05	0.15	0.00	0.00	0.00	0.00	1.20	1.00	1.25	1.15
	KJTR-1 R Line	0.05	0.10	0.00	0.00	0.00	0.00	0.50	0.35	0.55	0.45
	Total	**0.20**	**0.45**	**0.00**	**0.00**	**0.00**	**0.00**	**3.35**	**2.25**	**3.55**	**2.70**
	Sahyadri 2										
	IR 58025 A Line	0.15	0.45	0.00	0.00	0.00	0.00	1.65	0.80	1.80	1.25
	IR 58025 B Line	0.05	0.15	0.00	0.00	0.00	0.00	0.65	0.45	0.70	0.60
	KJTR-2 R Line	0.05	0.10	0.00	0.00	0.00	0.00	0.25	0.15	0.30	0.25

	Total	**0.25**	**0.70**	**0.00**	**0.00**	**0.00**	**0.00**	**2.55**	**1.40**	**2.80**	**2.10**
	Sahyadri 3										
	IR 58025 A Line	0.15	0.45	0.00	0.00	0.00	0.00	1.65	0.95	1.80	1.40
	IR 58025 B Line	0.05	0.15	0.00	0.00	0.00	0.00	0.65	0.45	0.70	0.60
	KJTR-3 R Line	0.05	0.10	0.00	0.00	0.00	0.00	0.25	0.15	0.30	0.25
	Total	**0.25**	**0.70**	**0.00**	**0.00**	**0.00**	**0.00**	**2.55**	**1.55**	**2.80**	**2.25**
	Sahyadri 4										
	IR 58025 A Line	0.15	0.45	0.00	0.00	0.00	0.00	1.85	1.10	2.00	1.55
	IR 58025 B Line	0.05	0.15	0.00	0.00	0.00	0.00	0.65	0.55	0.70	0.70
	KJTR-4 R Line	0.80	1.50	0.00	0.00	0.00	0.00	1.90	1.10	2.70	2.60
	Total	**1.00**	**2.10**	**0.00**	**0.00**	**0.00**	**0.00**	**4.40**	**2.75**	**5.40**	**4.85**
	Sahyadri 5										
	RTN 13 A Line	0.15	0.20	0.00	0.00	0.00	0.00	1.85	0.65	2.00	0.85
	RTN 13 B Line	0.05	0.20	0.00	0.00	0.00	0.00	0.95	0.80	1.00	1.00
	SSR 5 R Line	0.05	0.20	0.00	0.00	0.00	0.00	0.95	1.00	1.00	1.20
	Total	**0.25**	**0.60**	**0.00**	**0.00**	**0.00**	**0.00**	**3.75**	**2.45**	**4.00**	**3.05**
	Total Rice + H. Rice	**25.35**	**38.95**	**0.00**	**0.00**	**0.00**	**0.00**	**215.40**	**196.86**	**240.75**	**235.81**
	Finger Millet										
	Dapoli 1	0.02	0.15	0.00	0.00	0.00	0.00	2.98	2.85	3.00	3.00
	Dapoli Safed 1	0.00	0.00	0.00	0.00	0.00	0.00	2.00	1.00	2.00	1.00
	Dapoli-2	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.50	1.00	0.50
	Total	**0.02**	**0.15**	**0.00**	**0.00**	**0.00**	**0.00**	**5.98**	**4.35**	**6.00**	**4.50**
	Total Cereal Crops	**25.37**	**39.10**	**0.00**	**0.00**	**0.00**	**0.00**	**221.38**	**201.21**	**246.75**	**240.31**
Pulse Crops	**Pigeonpea**										
	Konkan Ture	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.03	0.50	0.03
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.50**	**0.03**	**0.50**	**0.03**
	Cowpea										
	Konkan Sadabahar	0.00	0.00	0.00	0.00	0.00	0.00	15.00	18.00	15.00	18.00
	Konkan Safed	0.00	0.00	0.00	0.00	0.00	0.00	7.00	9.00	7.00	9.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**22.00**	**27.00**	**22.00**	**27.00**
	Horse gram										
	Kulthi Dapoli-1	0.00	0.00	0.00	0.00	0.00	0.00	10.00	12.00	10.00	12.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**10.00**	**12.00**	**10.00**	**12.00**
	Lablab bean										
	Konkan Wal-2	0.00	0.00	0.00	0.00	0.00	0.00	12.00	15.00	12.00	15.00

	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**12.00**	**15.00**	**12.00**	**15.00**
	Total Pulse Crops	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**44.50**	**54.03**	**44.50**	**54.03**
Oilseed Crops	**Groundnut**										
	TKG Bold	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.50	5.00	5.50
	Konkan Gaurav	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.90	3.00	0.90
	Konkan Bhuratn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.50	0.00	3.50
	TKG Bold	0.00	0.00	0.00	0.00	0.00	0.00	26.00	30.00	26.00	30.00
	Konkan Gaurav	0.00	0.00	0.00	0.00	0.00	0.00	7.00	8.00	7.00	8.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**41.00**	**47.90**	**41.00**	**47.90**
	Total Oilseed Crops	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**41.00**	**47.90**	**41.00**	**47.90**
	Grand Total (Dapoli)	**25.37**	**39.10**	**0.00**	**0.00**	**0.00**	**0.00**	**306.88**	**303.14**	**332.25**	**342.24**
34. BCKV, West Bengal											
Cereal Crops	**Rice**										
	Gontra Bidhan 1	66.50	66.70	10.00	10.00	0.00	0.00	5.00	5.00	81.50	81.70
	Gontra Bidhan 3	17.50	36.00	10.00	10.00	0.00	0.00	0.00	0.00	27.50	46.00
	Total	**84.00**	**102.70**	**20.00**	**20.00**	**0.00**	**0.00**	**5.00**	**5.00**	**109.00**	**127.70**
	Total Cereal Crops	**84.00**	**102.70**	**20.00**	**20.00**	**0.00**	**0.00**	**5.00**	**5.00**	**109.00**	**127.70**
Pulse Crops	**Chickpea**										
	Bidisha (WBG 29)	0.00	0.00	2.00	0.40	0.00	0.00	0.00	0.00	2.00	0.40
	Total	**0.00**	**0.00**	**2.00**	**0.40**	**0.00**	**0.00**	**0.00**	**0.00**	**2.00**	**0.40**
	Lentil										
	HUL 57	0.00	0.00	2.00	2.00	0.00	0.00	1.00	1.25	3.00	3.25
	Total	**0.00**	**0.00**	**2.00**	**2.00**	**0.00**	**0.00**	**1.00**	**1.25**	**3.00**	**3.25**
	Total Pulse Crops	**0.00**	**0.00**	**4.00**	**2.40**	**0.00**	**0.00**	**1.00**	**1.25**	**5.00**	**3.65**
	Grand Total (West Bengal)	**84.00**	**102.70**	**24.00**	**22.40**	**0.00**	**0.00**	**6.00**	**6.25**	**114.00**	**131.35**
35. UAS, Raichur											
Cereal Crops	**Sorghum**										
	M 35-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	0.00	6.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**6.00**	**0.00**	**6.00**
	Total Cereal Crops	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**6.00**	**0.00**	**6.00**
Pulse Crops	**Pigeonpea**										
	TS3R	5.05	20.50	0.00	0.00	0.00	0.00	0.00	0.00	5.05	20.50
	Maruthi (ICP 8863)	17.10	26.40	0.00	0.00	0.00	0.00	0.00	0.00	17.10	26.40
	Asha (ICPL 87119)	5.20	15.00	0.00	0.00	0.00	0.00	0.00	0.00	5.20	15.00
	Total	**27.35**	**61.90**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**27.35**	**61.90**

	Mung										
	BGS-9	8.00	13.26	0.00	0.00	0.00	0.00	0.00	0.00	8.00	13.26
	Total	**8.00**	**13.26**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**8.00**	**13.26**
	Chickpea										
	JG 11	410.00	460.00	0.00	0.00	0.00	0.00	0.00	0.00	410.00	460.00
	MNK 1	2.30	7.00	0.00	0.00	0.00	0.00	0.00	0.00	2.30	7.00
	GBM 2	260.00	252.00	0.00	0.00	0.00	0.00	0.00	0.00	260.00	252.00
	BGD 103	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26.00	0.00	26.00
	A 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	0.00	8.00
	Total	**672.30**	**719.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**34.00**	**672.30**	**753.00**
	Total Pulse Crops	**707.65**	**794.16**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**34.00**	**707.65**	**828.16**
Oilseed Crops	**Soybean**										
	JS 335	200.00	192.00	0.00	0.00	0.00	0.00	150.00	250.00	350.00	442.00
	Total	**200.00**	**192.00**	**0.00**	**0.00**	**0.00**	**0.00**	**150.00**	**250.00**	**350.00**	**442.00**
	Sunflower										
	RSFH-1887(Aline-CMS-38A)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.60
	RSFH-1887 (R line-R-127-1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.30
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.90**	**0.00**	**0.90**
	Total Oilseed Crops	**200.00**	**192.00**	**0.00**	**0.00**	**0.00**	**0.00**	**150.00**	**250.90**	**350.00**	**442.90**
Grand Total (Raichur)		**907.65**	**986.16**	**0.00**	**0.00**	**0.00**	**0.00**	**150.00**	**290.90**	**1057.65**	**1277.06**
36. RVSKVV, Gwalior											
Cereal Crops	**Wheat**										
	LOK-1	0.00	735.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	735.00
	MP1203	265.00	380.00	0.00	0.00	0.00	0.00	0.00	0.00	265.00	380.00
	GW 366	406.00	300.00	0.00	0.00	0.00	0.00	0.00	0.00	406.00	300.00
	RVW4106	202.00	460.00	0.00	0.00	0.00	0.00	0.00	0.00	202.00	460.00
	GW322	0.00	800.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	800.00
	HI1544	0.00	70.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	70.00
	HI1531	0.00	80.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	80.00
	HI8713	0.00	70.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	70.00
	Sujata	0.00	45.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	45.00
	Total	**873.00**	**2940.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**873.00**	**2940.00**
	Pearlmillet										
	JBB 4	0.52	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.52	0.04
	JBB 2	0.55	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55	1.00

	Total	**1.07**	**1.04**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.07**	**1.04**
	Total Cereal Crops	**874.07**	**2941.04**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**874.07**	**2941.04**
Pulse Crops	**Mung**										
	TJM 3	100.00	100.00	0.00	0.00	15.00	20.00	0.00	0.00	115.00	120.00
	Total	**100.00**	**100.00**	**0.00**	**0.00**	**15.00**	**20.00**	**0.00**	**0.00**	**115.00**	**120.00**
	Pegeonpea										
	JKM 189	5.45	20.00	0.00	0.00	0.00	0.00	0.00	0.00	5.45	20.00
	TJT 501	0.00	19.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.50
	Total	**5.45**	**39.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**5.45**	**39.50**
	Urd										
	PU 31	0.00	3.50	0.00	0.00	20.00	21.00	0.00	0.00	20.00	24.50
	Total	**0.00**	**3.50**	**0.00**	**0.00**	**20.00**	**21.00**	**0.00**	**0.00**	**20.00**	**24.50**
	Chickpea										
	JAKI9218	460.00	1450.00	0.00	0.00	0.00	0.00	0.00	0.00	460.00	1450.00
	RVG201	138.00	360.00	0.00	0.00	0.00	0.00	0.00	0.00	138.00	360.00
	RVG202	348.45	1300.00	0.00	0.00	0.00	0.00	0.00	0.00	348.45	1300.00
	RVG203	467.25	280.00	0.00	0.00	0.00	0.00	0.00	0.00	467.25	280.00
	JG130	248.00	400.00	0.00	0.00	0.00	0.00	0.00	0.00	248.00	400.00
	JG 16	34.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00	34.00	200.00
	JG 11	412.00	140.00	0.00	0.00	0.00	0.00	0.00	0.00	412.00	140.00
	JG6	233.45	30.00	0.00	0.00	0.00	0.00	0.00	0.00	233.45	30.00
	RVKG 101	5.75	70.00	0.00	0.00	0.00	0.00	0.00	0.00	5.75	70.00
	RVSJKG102	0.00	45.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	45.00
		2346.90	**4275.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2346.90**	**4275.00**
	Lentil										
	RVL 31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28.00	0.00	28.00
	JL 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	0.00	8.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**36.00**	**0.00**	**36.00**
	Total Pulse Crops	**2452.35**	**4418.00**	**0.00**	**0.00**	**35.00**	**41.00**	**0.00**	**36.00**	**2487.35**	**4495.00**
Oilseed Crops	**Soybean**										
	JS 95-60	2500.00	741.00	0.00	0.00	0.00	0.00	0.00	0.00	2500.00	741.00
	JS93-05	500.00	172.00	0.00	0.00	0.00	0.00	0.00	0.00	500.00	172.00
	RVS2001-4	1000.00	740.00	0.00	0.00	0.00	0.00	0.00	0.00	1000.00	740.00
	JS 335	200.00	173.00	0.00	0.00	0.00	0.00	0.00	0.00	200.00	173.00
	JS20-29	200.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	200.00	40.00

	Total	**4400.00**	**1866.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**4400.00**	**1866.00**
	Groundnut										
	GJN 23	1.00	0.45	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.45
	Total	**1.00**	**0.45**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.00**	**0.45**
	Mustard										
	JM 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.00	1.50
	JM 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	0.00	6.00
	RVM 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	0.00	30.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**37.50**	**0.00**	**37.50**
	Safflower										
	JSF97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80	0.00	0.80
	JSF1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70	0.00	0.70
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.50**	**0.00**	**1.50**
	Total Oilseed Crops	**4401.00**	**1866.45**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**39.00**	**4401.00**	**1905.45**
	Grand Total (Gwalior)	**7727.42**	**9225.49**	**0.00**	**0.00**	**35.00**	**41.00**	**0.00**	**75.00**	**7762.42**	**9341.49**
37. SVPUAT, Meerut											
Cereal Crops	**Paddy**										
	Vallabh Basmati- 24	9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.00	0.00
	Vallabh Basmati- 22	3.00	4.25	0.00	0.00	0.00	0.00	0.00	0.00	3.00	4.25
	Total	**12.00**	**4.25**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**12.00**	**4.25**
	Wheat										
	DPW 621-50	100.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	100.00
	DBW 90	50.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00	40.00
	DBW 71	20.00	75.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	75.00
	DBW 88	196.60	150.00	0.00	0.00	0.00	0.00	0.00	0.00	196.60	150.00
	DBW 17	52.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	52.00	40.00
	Total	**418.60**	**405.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**418.60**	**405.00**
	Total Cereal Crops	**430.60**	**409.25**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**430.60**	**409.25**
Pulse Crops	**Mung**										
	MUM 2	0.60	0.60	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	0.60	0.60
	Total	**0.60**	**0.60**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.60**	**0.60**
	Total Pulse Crops	**0.60**	**0.60**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.60**	**0.60**
	Grand Total (Meerut)	**431.20**	**409.85**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**431.20**	**409.85**
38. UAHS, Shimoga											
Cereal Crops	**Paddy**										

	Tunga	0.00	0.00	15.00	14.00	0.00	0.00	0.00	0.00	15.00	14.00
	Intan	0.00	0.00	7.00	5.00	0.00	0.00	0.00	0.00	7.00	5.00
	KHP-9	0.00	0.00	7.00	5.00	0.00	0.00	0.00	0.00	7.00	5.00
	KHP-5	0.00	0.00	7.00	5.00	0.00	0.00	0.00	0.00	7.00	5.00
	KHP-10	0.00	0.00	7.00	5.00	0.00	0.00	0.00	0.00	7.00	5.00
	IET-7191	0.00	0.00	7.00	5.00	0.00	0.00	0.00	0.00	7.00	5.00
	KPR-1	0.00	0.00	5.00	6.00	0.00	0.00	0.00	0.00	5.00	6.00
	JGL-1798	0.00	0.00	5.00	5.00	0.00	0.00	0.00	0.00	5.00	5.00
	KKP-5	0.00	0.00	4.00	3.00	0.00	0.00	0.00	0.00	4.00	3.00
	Total	**0.00**	**0.00**	**64.00**	**53.00**	**0.00**	**0.00**	**0.00**	**0.00**	**64.00**	**53.00**
	Total Cereal Crops	**0.00**	**0.00**	**64.00**	**53.00**	**0.00**	**0.00**	**0.00**	**0.00**	**64.00**	**53.00**
Pulse Crops	**Pigeonpea**										
	BRG-2	0.00	0.00	4.00	3.00	0.00	0.00	0.00	0.00	4.00	3.00
	BRG-4	0.00	0.00	5.00	4.00	0.00	0.00	0.00	0.00	5.00	4.00
	Total	**0.00**	**0.00**	**9.00**	**7.00**	**0.00**	**0.00**	**0.00**	**0.00**	**9.00**	**7.00**
	Urd										
	Rashmi (LBG-625)	0.00	0.00	1.00	0.50	0.00	0.00	0.00	0.00	1.00	0.50
	Total	**0.00**	**0.00**	**1.00**	**0.50**	**0.00**	**0.00**	**0.00**	**0.00**	**1.00**	**0.50**
	Mung										
	KKM-3	0.00	0.00	1.00	0.50	0.00	0.00	0.00	0.00	1.00	0.50
	Total	**0.00**	**0.00**	**1.00**	**0.50**	**0.00**	**0.00**	**0.00**	**0.00**	**1.00**	**0.50**
	Total Pulse Crops	**0.00**	**0.00**	**11.00**	**8.00**	**0.00**	**0.00**	**0.00**	**0.00**	**11.00**	**8.00**
	Grand Total (Shimoga)	**0.00**	**0.00**	**75.00**	**61.00**	**0.00**	**0.00**	**0.00**	**0.00**	**75.00**	**61.00**
39. NAU, Navsari											
Cereal Crops	**Wheat**										
	Lok-1	0.00	0.00	0.00	0.00	0.00	0.00	80.00	79.00	80.00	79.00
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**80.00**	**79.00**	**80.00**	**79.00**
	Total Cereal Crops	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**80.00**	**79.00**	**80.00**	**79.00**
Pulse Crops	**Pigeonpea**										
	GT 102	0.00	0.00	0.00	0.00	0.00	0.00	2.00	1.50	2.00	1.50
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.00**	**1.50**	**2.00**	**1.50**
	Total Pulse Crops	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.00**	**1.50**	**2.00**	**1.50**
	Grand Total (Navsari)	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**82.00**	**80.50**	**82.00**	**80.50**
ICAR Institute											
40. VPKAS, Almora											

Cereal Crops	**Rice**										
	VL Dhan 157*	1.50	0.45	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.45
	VL Dhan 68*	5.00	1.55	0.00	0.00	0.00	0.00	0.00	0.00	5.00	1.55
	VL Dhan 208	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.50
	VL Dhan 157	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10
	Total	**7.00**	**2.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.10**	**7.10**	**2.60**
	Wheat										
	VL Gehun 829	0.00	6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00
	VL Gehun 892	25.00	35.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	35.00
	VL Gehun 907	27.00	35.00	0.00	0.00	0.00	0.00	0.00	0.00	27.00	35.00
	VL Gehun 953	25.00	45.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	45.00
	Total	**77.00**	**121.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**77.00**	**121.00**
	Maize										
	Vivek Sankul Makka 31	1.20	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20	4.00
	VQL 1 (VQPM 9 F)	0.40	1.15	0.00	0.00	0.00	0.00	0.00	0.00	0.40	1.15
	VQL 2 (VQPM 9 M)	0.20	0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.45
	VL Amber Popcorn	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00
	V 390 (VMH 45 M)	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.85	0.50	0.85
	V 335 (CMVLBC2 F)	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.30	0.20	0.30
	Total	**1.80**	**5.60**	**0.00**	**0.00**	**0.00**	**0.00**	**1.70**	**2.15**	**3.50**	**7.75**
	Finger Millet										
	VL Mandua 352**	0.84	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.84	0.60
	VL Mandua 347**	0.75	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.60
	VL Mandua 315	0.25	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.40
	VL Mandua 348	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.50
	Total	**2.34**	**2.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.34**	**2.10**
	Barnyard millet										
	VL Madira 207	1.50	2.30	0.00	0.00	0.00	0.00	0.00	0.00	1.50	2.30
	Total	**1.50**	**2.30**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.50**	**2.30**
	Amaranth										
	VL Chua 44	0.05	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.20
	Total	**0.05**	**0.20**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.05**	**0.20**
	Buckwheat										
	VL Ugal 7	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.10**	**0.10**	**0.10**

	Total Cereal Crops	**89.69**	**133.70**	**0.00**	**0.00**	**0.00**	**0.00**	**1.90**	**2.35**	**91.59**	**136.05**
Pulse Crops	**Pigeonpea**										
	VL Arhar 1	7.00	3.85	0.00	0.00	0.00	0.00	0.00	0.00	7.00	3.85
	Total	**7.00**	**3.85**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**7.00**	**3.85**
	Rajmash										
	VL Rajmash 63	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.14	0.10	0.14
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.14**	**0.10**	**0.14**
	Horsegram										
	VL Gahat 19#	2.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00	2.00	1.50
	Total	**2.00**	**1.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.00**	**1.50**
	Beans										
	VRB 3 (Him Shakti)	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.10**	**0.10**	**0.10**
	Lentil										
	VL Masoor 126	2.20	2.60	0.00	0.00	0.00	0.00	0.00	0.00	2.20	2.60
	VL Masoor 129	1.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	2.00
	VL Masoor 133	3.20	3.50	0.00	0.00	0.00	0.00	0.00	0.00	3.20	3.50
	VL Masoor 514	1.00	1.70	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.70
	Total	**7.40**	**9.80**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**7.40**	**9.80**
	Total Pulse Crops	**16.40**	**15.15**	**0.00**	**0.00**	**0.00**	**0.00**	**0.20**	**0.24**	**16.60**	**15.39**
Oilseed Crops	**Soybean**										
	VL Soya 65**	6.00	5.50	0.00	0.00	0.00	0.00	0.00	0.00	6.00	5.50
	VL Soya 63	4.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00
	Total	**10.00**	**9.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**10.00**	**9.50**
	Toria										
	VL Toria 3	0.00	0.00	0.10	0.10	0.00	0.00	0.00	0.00	0.10	0.10
	Total	**0.00**	**0.00**	**0.10**	**0.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.10**
	Total Oilseed Crops	**10.00**	**9.50**	**0.10**	**0.10**	**0.00**	**0.00**	**0.00**	**0.00**	**10.10**	**9.60**
	Grand Total (Almora)	**116.09**	**158.35**	**0.10**	**0.10**	**0.00**	**0.00**	**2.10**	**2.59**	**118.29**	**161.04**
	*Crop severely damaged by wild boars; compensatory seed production will be taken during *rabi* 2017-18										
	**Crop damaged by wild boars; carryover stock available to meet DAC indent										
	#Crop damaged by wild boars										
41. IIPR, Kanpur											
Pulse Crops	**Mung**										
	Samrat	13.20	13.70	0.00	0.00	0.00	0.00	0.00	0.00	13.20	13.70

	Meha	10.85	11.15	0.00	0.00	0.00	0.00	0.00	0.00	10.85	11.15
	IPM 2-3	15.00	16.00	0.00	0.00	5.00	5.00	0.00	0.00	20.00	21.00
	IPM 2-14	10.00	12.00	0.00	0.00	7.00	10.00	0.00	0.00	17.00	22.00
	Virat	7.00	8.00	0.00	0.00	7.00	10.00	0.00	0.00	14.00	18.00
	Shikha	5.50	5.50	0.00	0.00	7.00	10.00	0.00	0.00	12.50	15.50
	Total	**61.55**	**66.35**	**0.00**	**0.00**	**26.00**	**35.00**	**0.00**	**0.00**	**87.55**	**101.35**
	Urd										
	Uttara	11.00	15.40	0.00	0.00	0.00	0.00	0.00	0.00	11.00	15.40
	IPU 2-43	10.00	14.80	0.00	0.00	17.00	21.00	0.00	0.00	27.00	35.80
	Total	**21.00**	**30.20**	**0.00**	**0.00**	**17.00**	**21.00**	**0.00**	**0.00**	**38.00**	**51.20**
	Pigeonpea										
	IPA 203	10.00	10.00	0.00	0.00	5.00	10.00	0.00	0.00	15.00	20.00
	UPAS 120	0.00	0.00	0.00	0.00	10.00	10.00	0.00	0.00	10.00	10.00
	Total	**10.00**	**10.00**	**0.00**	**0.00**	**15.00**	**20.00**	**0.00**	**0.00**	**25.00**	**30.00**
	Chickpea										
	Subhra	0.00	0.00	0.00	0.00	5.00	5.00	0.00	0.00	5.00	5.00
	Ujjawal	5.00	5.00	0.00	0.00	5.00	5.00	0.00	0.00	10.00	10.00
	JG 14	0.00	0.00	0.00	0.00	10.00	10.00	0.00	0.00	10.00	10.00
	RVG 202	0.00	0.00	0.00	0.00	10.00	20.00	0.00	0.00	10.00	20.00
	RVG 203	0.00	0.00	0.00	0.00	10.00	20.00	0.00	0.00	10.00	20.00
	Total	**5.00**	**5.00**	**0.00**	**0.00**	**40.00**	**60.00**	**0.00**	**0.00**	**45.00**	**65.00**
	Fieldpea										
	Prakash	20.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	20.00
	Vikash	19.00	19.00	0.00	0.00	5.00	6.00	0.00	0.00	24.00	25.00
	IPFD 10-12	10.00	10.00	0.00	0.00	5.00	5.00	0.00	0.00	15.00	15.00
	Aman	15.00	15.00	0.00	0.00	5.00	5.00	0.00	0.00	20.00	20.00
	Adarsh	1.00	1.25	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.25
	IPFD 4-9	15.00	15.00	0.00	0.00	10.00	10.00	0.00	0.00	25.00	25.00
	IPFD 6-2	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.50
	IPFD 11-5	0.00	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.00	0.70
	IPFD 12-2	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	1.00	1.00
	Total	**80.00**	**80.25**	**0.00**	**0.00**	**26.00**	**28.20**	**0.00**	**0.00**	**106.00**	**108.45**
	Lentil										
	IPL 316	25.00	25.00	0.00	0.00	10.00	12.36	0.00	0.00	35.00	37.36
	IPL 406	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00

	IPL 526	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.30
	Total	**27.00**	**27.00**	**0.00**	**0.00**	**10.00**	**12.66**	**0.00**	**0.00**	**37.00**	**39.66**
	Total Pulse Crops	**204.55**	**218.80**	**0.00**	**0.00**	**134.00**	**176.86**	**0.00**	**0.00**	**338.55**	**395.66**
Grand Total (Kanpur)		**204.55**	**218.80**	**0.00**	**0.00**	**134.00**	**176.86**	**0.00**	**0.00**	**338.55**	**395.66**
42. IGFRI , Jhansi											
Forage crops	**Maize**										
	Africal Tall	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
	Total	**0.00**	**10.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**10.00**
	Cowpea										
	EC 4216	4.55	5.80	0.00	0.00	0.00	0.00	0.00	0.00	4.55	5.80
	Total	**4.55**	**5.80**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**4.55**	**5.80**
	Pearlmillet										
	Avika Bajra chari 19	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00
	Total	**0.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.00**
	Oat										
	JHO 2000-4	5.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	10.00
	JHO 99-2	5.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	10.00
	JHO 822	20.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	25.00
	JHO 2009-1	25.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	10.00
	JHO 2010-1	20.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	20.00
	Kent	50.00	70.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00	70.00
	Total	**125.00**	**145.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**125.00**	**145.00**
	Berseem										
	BB-3	9.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	9.00	15.00
	BB-2	0.20	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	10.00
	Wardan	5.40	15.00	0.00	0.00	0.00	0.00	0.00	0.00	5.40	15.00
	Total	**14.60**	**40.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**14.60**	**40.00**
	Total Forage Crops	**144.25**	**200.80**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**144.25**	**200.80**
Grand Total (Jhansi)		**144.25**	**200.80**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**144.25**	**200.80**
43. CRIJAF, Barrackpore											
Fibre Crops	**Jute**										
	JRO 2407 (Samapti)	0.36	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.22
	JROG 1	0.22	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.50
	JRCM 2	0.10	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.20
	CO 58 (Sourav)	0.66	0.53	0.00	0.00	0.00	0.00	0.00	0.00	0.66	0.53

	JRC 532	0.24	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.24
	JBO 2003H (IRA)	0.95	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.95	0.66
	JRO 204 (Suren)	2.32	2.32	0.00	0.00	0.00	0.00	0.00	0.00	2.32	2.32
	S 19 (Subala)	0.21	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.50
	JRO 128 (Surya)	1.06	1.50	0.00	0.00	0.00	0.00	0.00	0.00	1.06	1.50
	JRO 524 (Navin)	2.45	2.50	0.00	0.00	0.00	0.00	0.00	0.00	2.45	2.50
	JRC 321	0.30	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.60
	JROM 1	0.20	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.20
	JRO 8432 (Shakti Tossa)	0.04	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.11
	JRO 878 (Chaitali Tossa)	0.04	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.06
	JRC 212	0.10	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.38
	JRC 517	0.04	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.25
	Total	**9.29**	**10.77**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**9.29**	**10.77**
	Sunnhemp										
	SUIN 053	1.50	1.50	0.00	0.00	0.00	0.00	0.00	0.00	1.50	1.50
	JRJ 610	1.50	1.50	0.00	0.00	0.00	0.00	0.00	0.00	1.50	1.50
	Total	**3.00**	**3.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**3.00**	**3.00**
	Total Fibre Crops	**12.29**	**13.77**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**12.29**	**13.77**
Grand Total (Barrackpore)		**12.29**	**13.77**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**12.29**	**13.77**
44.CAZRI, Jodhpur											
Pulse Crops	**Mothbean**										
	CAZRI Moth 2	5.80	7.00	0.00	0.00	1.00	1.00	0.00	0.00	6.80	8.00
	Total	**5.80**	**7.00**	**0.00**	**0.00**	**1.00**	**1.00**	**0.00**	**0.00**	**6.80**	**8.00**
	Total Cereal Crops	**5.80**	**7.00**	**0.00**	**0.00**	**1.00**	**1.00**	**0.00**	**0.00**	**6.80**	**8.00**
Grand Total (Jodhpur)		**5.80**	**7.00**	**0.00**	**0.00**	**1.00**	**1.00**	**0.00**	**0.00**	**6.80**	**8.00**
45.CRRI, Cuttack											
Cereal Crops	**Rice**										
	CR 1009 Sub 1	6.10	1.20	0.00	0.00	0.00	0.00	0.00	0.00	6.10	1.20
	CR 1014	0.50	1.40	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.40
	CR Dhan 10	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00
	CR Dhan 203	0.50	1.65	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.65
	CR Dhan 300	3.00	2.30	0.00	0.00	0.00	0.00	0.00	0.00	3.00	2.30
	CR Dhan 307	3.00	4.80	0.00	0.00	0.00	0.00	0.00	0.00	3.00	4.80
	CR Dhan 401	1.50	2.20	0.00	0.00	0.00	0.00	0.00	0.00	1.50	2.20
	CR Dhan 500	55.00	27.80	0.00	0.00	0.00	0.00	0.00	0.00	55.00	27.80

	CR Sugandh Dhan 907	2.50	1.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	1.00
	Luna Sampad	1.50	0.40	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.40
	Luna Suvarna	1.50	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	1.00
	Lunishree	1.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.50
	Nua Chinikamini	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00
	Pooja	38.00	70.20	0.00	0.00	0.00	0.00	0.00	40.00	38.00	110.20
	Sarala	1.00	22.00	0.00	0.00	0.00	0.00	0.00	12.00	1.00	34.00
	Savitri	3.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	2.00
	Swarna Sub 1	252.00	190.00	0.00	0.00	0.00	0.00	0.00	0.00	252.00	190.00
	Varshadhan	5.00	4.50	0.00	0.00	0.00	0.00	0.00	0.00	5.00	4.50
	CR Dhan 70	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.50	0.50	0.50
	CR Dhan 310	0.00	2.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.20
	CR Dhan 502	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
	CR Dhan 505	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.50	0.50	0.50
	CR Sugandha Dhan 3	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40
	Dharitri	0.00	3.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.60
	Durga	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
	Gayatri	0.00	7.50	0.00	0.00	0.00	0.00	4.00	5.00	4.00	12.50
	Ketekijoha	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
	Moti	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50
	Nua Kalajeera	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
	Padmini	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
	Ranjit	0.00	5.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.70
	Sahabhagidhan	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00
	Utkalprava	0.00	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70
	Ajay 'A'line	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.35	0.30	0.35
	Ajay 'B'line	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.20	0.20	0.20
	Ajay 'R'line	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.20	0.20	0.20
	Rajalaxmi 'A' line	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.60	0.60	0.60
	Rajalaxmi 'B' line	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.20	0.20	0.20
	Rajalaxmi 'R' line	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.20	0.20	0.20
	CR Dhan 701 'A' line	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.30	0.30	0.30
	CR Dhan 701 'B' line	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.25	0.20	0.25
	CR Dhan 701 'R' line	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.25	0.20	0.25
	Annada	11.00	12.00	0.00	0.00	0.00	0.00	0.00	0.00	11.00	12.00

	Chandrama (IET 9354, 10419)	30.00	30.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	30.00
	CR Boro Dhan 2 (IET 17612)	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00
	CR Dhan 303 (IET 21589)	13.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	13.00	8.00
	CR Dhan 304 (IET 2117)	4.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00
	CR Dhan 305 (IET 21287)	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00
	CR Dhan 40 (IET 19253)	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00
	CR Dhan 501 (IET 19189)	3.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.10	0.00
	CR Dhan 601 (IET 18558)	6.50	2.50	0.00	0.00	0.00	0.00	0.00	0.00	6.50	2.50
	CR Dhan 201 (Aerobic)	44.00	44.00	0.00	0.00	0.00	0.00	0.00	0.00	44.00	44.00
	CR Dhan 301	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00
	CR Dhan 311	1.50	2.20	0.00	0.00	0.00	0.00	0.00	0.00	1.50	2.20
	Geetanjali (IET (17276)	4.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.75
	Khitish (IET 4094)	10.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	8.00
	Naveen (IET 14461)	36.50	20.00	0.00	0.00	0.00	0.00	0.00	0.00	36.50	20.00
	Pankaj	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
	Phalguni (IET 18720)	2.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.75
	Ratna	0.10	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.50
	Reeta (IET 19969)	1.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.10	0.00
	Luna Sankhi	1.50	1.50	0.00	0.00	0.00	0.00	0.00	0.00	1.50	1.50
	Satabdi (IET 4786)	44.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	44.00	15.00
	Sonamani (IET 11365)	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00
	CRURRS, Hazaribagh										
	Abhishek	40.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	40.00	40.00
	Anjali	2.00	5.70	0.00	0.00	0.00	0.00	0.00	0.00	2.00	5.70
	Hazaridhan	3.50	5.40	0.00	0.00	0.00	0.00	0.00	0.00	3.50	5.40
	Sadabhahar	1.00	1.60	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.60
	Sahabagidhan	206.00	280.00	0.00	0.00	0.00	0.00	0.00	0.00	206.00	280.00
	Vandana	8.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	8.00
	Total	**856.95**	**851.15**	**0.00**	**0.00**	**0.00**	**0.00**	**7.40**	**60.55**	**864.35**	**911.70**
	Total Cereal Crops	**856.95**	**851.15**	**0.00**	**0.00**	**0.00**	**0.00**	**7.40**	**60.55**	**864.35**	**911.70**
	Grand Total (Cuttack)	**856.95**	**851.15**	**0.00**	**0.00**	**0.00**	**0.00**	**7.40**	**60.55**	**864.35**	**911.70**
46. IIMR, Hyderabad											
Cereal Crops	**Sorghum**										
	296A	0.55	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55	1.00
	296B	0.35	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.50

	CS 3541	0.25	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.50
	MS 27A	0.03	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	1.00
	MS 27B	0.02	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.50
	C 43	0.15	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	5.00
	MR 750	0.05	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.10
	CSV 15	14.00	30.00	0.00	0.00	0.00	0.00	0.00	0.00	14.00	30.00
	CSV 20	3.20	10.00	0.00	0.00	0.00	0.00	0.00	0.00	3.20	10.00
	CSV 24SS	0.10	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	5.00
	CSV 27	4.70	15.00	0.00	0.00	0.00	0.00	0.00	0.00	4.70	15.00
	CSV 26	0.12	1.15	0.00	0.00	0.00	0.00	0.00	0.00	0.12	1.15
	415A	0.16	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	3.00
	415B	0.06	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.30
	CB 33	0.05	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.10
	Total	**23.79**	**73.15**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**23.79**	**73.15**
	Total Cereal Crops	**23.79**	**73.15**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**23.79**	**73.15**
Forage Crops	**Sorghum Fooder**										
	467 A	3.30	5.28	0.00	0.50	0.00	0.00	0.00	0.00	3.30	5.78
	467 B	1.65	2.29	0.00	2.00	0.00	0.00	0.00	0.00	1.65	4.29
	MP Chari	2.30	6.00	0.00	4.00	0.00	0.00	0.00	0.00	2.30	10.00
	Total	**7.25**	**13.57**	**0.00**	**6.50**	**0.00**	**0.00**	**0.00**	**0.00**	7.25	20.07
	Total Forage Crops	**7.25**	**13.57**	**0.00**	**6.50**	**0.00**	**0.00**	**0.00**	**0.00**	7.25	20.07
	Grand Total (IIMR, Hyd.)	**31.04**	**86.72**	**0.00**	**6.50**	**0.00**	**0.00**	**0.00**	**0.00**	**31.04**	**93.22**
47. ICAR-IIRR, Hyderabad											
Cereal Crops	**Rice**										
	DRR Dhan 44	71.00	30.00	0.00	0.00	0.00	0.00	0.00	0.00	71.00	30.00
	IR-64 (Drought)	45.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	45.00	40.00
	Dhanrasi (IET 15358)	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.50
	Improved Samba Mahsuri	15.50	35.50	0.00	0.00	0.00	0.00	0.00	0.00	15.50	35.50
	Jarava(IET 15420)	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00
	Jaya	16.00	14.00	0.00	0.00	0.00	0.00	0.00	0.00	16.00	14.00
	Masuri	2.50	1.80	0.00	0.00	0.00	0.00	0.00	0.00	2.50	1.80
	Rasi (IET 1444)	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00
	Sampada (IET 19424)	55.10	16.00	0.00	0.00	0.00	0.00	0.00	0.00	55.10	16.00
	DRR Dhan 45	1.00	1.80	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.80
	DRR Dhan 39	12.50	4.00	0.00	0.00	0.00	0.00	0.00	0.00	12.50	4.00

	DRR Dhan 43	4.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00
	DRR Dhan 46	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.50
	BINA Dhan 10	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.00
	BINA Dhan 12	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.90	0.00
	BINA Dhan 8	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00
	IET 5656(Swarndhan)	1.50	1.50	0.00	0.00	0.00	0.00	0.00	0.00	1.50	1.50
	Ciherang Sub-1(Binaadhan 11)	15.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	10.00
	Moti Gold (NP 1024)	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
	Sukhadhan 5	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80	0.00
	Sukhadhan 6	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.00
	Krishna Hamsa	0.50	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.20
	Total	**245.85**	**162.80**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**245.85**	**162.80**
	Total Cereal Crops	**245.85**	**162.80**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**245.85**	**162.80**
	Grand Total (IIRR, Hyd.)	**245.85**	**162.80**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**245.85**	**162.80**
48. ICAR-IIOR, Hyderabad											
Oilseed Crops	**Castor**										
	DCS-107 (Variety)	0.50	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.70
	Total	**0.50**	**0.70**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.50**	**0.70**
	Sunflower										
	DRSF-113 (Variety)	0.82	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.82	1.00
	DRSF-108 (V)	0.01	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.10
	RHA-6D-1 (Male DRSH-1)	0.00	0.00	0.50	0.75	0.00	0.00	0.00	0.00	0.50	0.75
	Total	**0.83**	**1.10**	**0.50**	**0.75**	**0.00**	**0.00**	**0.00**	**0.00**	**1.33**	**1.85**
	Total Oilseed Crops	**1.33**	**1.80**	**0.50**	**0.75**	**0.00**	**0.00**	**0.00**	**0.00**	**1.83**	**2.55**
	Grand Total (IIOR, Hyd.)	**1.33**	**1.80**	**0.50**	**0.75**	**0.00**	**0.00**	**0.00**	**0.00**	**1.83**	**2.55**
49. CICR, Nagpur (Coimbatore)											
Fiber Crops	**Cotton**										
	ANJALI (LRK-516)*	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
	MCU-5 VT	0.02	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.50
	LRA-5166	0.02	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.30
	SUVIN	0.02	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.30
	Savita M-12R#	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	Savita T-7B#	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	Variety CISA 614	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00

	Variety CISA 310	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
	Variety CSH 3075	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
	Variety CSH 3129	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
	Female parent of Hy CICR 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.30
	Male parent of Hy CICR 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.20
	Total	**0.10**	**1.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**4.50**	**0.10**	**5.60**
	Totoal Fiber Crops	**0.10**	**1.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**4.50**	**0.10**	**5.60**
	Grand Total (Nagpur)	**0.10**	**1.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**4.50**	**0.10**	**5.60**
	*Anjali (LRK 516) – Requirement will be met with carry forward stock										
	#Savita (both male and female) – No seed production could be organized for the want of isolation										
50. IARI, Karnal											
Cereal Crops	**Rice**										
	Pusa Basmati 1121	80.00	90.00	0.00	0.00	0.00	0.00	0.00	0.00	80.00	90.00
	Pusa Basmati 6	8.50	15.00	0.00	0.00	0.00	0.00	0.00	14.00	8.50	29.00
	Pusa Basmati 1509	32.00	45.00	0.00	0.00	0.00	0.00	0.00	11.00	32.00	56.00
	Pusa Basmati 1	15.00	20.00	0.00	0.00	0.00	0.00	0.00	9.00	15.00	29.00
	PB 1637	3.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	5.00
	Pusa 44	43.10	50.00	0.00	0.00	0.00	0.00	0.00	0.00	43.10	50.00
	Improved PB 1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00
	PB 1609	0.60	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.60
	Total	**183.20**	**226.60**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**34.00**	**183.20**	**260.60**
	Pearlmillet										
	PC-612	0.70	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.70	0.70
	PC-701	0.10	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.25
	Total	**0.80**	**0.95**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.80**	**0.95**
	Wheat										
	HD 2851	137.40	145.00	0.00	0.00	0.00	0.00	0.00	0.00	137.40	145.00
	HD 2967	660.00	720.00	0.00	0.00	0.00	0.00	0.00	0.00	660.00	720.00
	HD 3086	336.60	340.00	0.00	0.00	0.00	0.00	0.00	0.00	336.60	340.00
	HS 542	39.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	39.00	40.00
	HS 562	9.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	9.00	15.00
	HS 507	38.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	38.00	40.00
	WR 544	7.60	15.00	0.00	0.00	0.00	0.00	0.00	0.00	7.60	15.00
	Total	**1227.60**	**1315.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1227.60**	**1315.00**
	Barley										

	BHS 400	0.50	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.00
	BHS 380	0.50	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.00
	Total	**1.00**	**2.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.00**	**2.00**
	Total Cereal Crops	**1412.60**	**1544.55**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**34.00**	**1412.60**	**1578.55**
Pulse Crops	**Pigeon pea**										
	Pusa 2001	0.45	1.45	0.00	0.00	0.00	0.00	0.00	0.00	0.45	1.45
	Pusa 2002	4.05	0.75	0.00	0.00	0.00	0.00	0.00	0.00	4.05	0.75
	Total	**4.50**	**2.20**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**4.50**	**2.20**
	Field Pea										
	DDR 55	4.10	4.10	0.00	0.00	0.00	0.00	0.00	0.00	4.10	4.10
	DDR 23	17.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.50	0.00
	Total	**21.60**	**4.10**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**21.60**	**4.10**
	Lathyrus										
	Rattan (Bio L 212)	28.50	28.50	0.00	0.00	0.00	0.00	0.00	0.00	28.50	28.50
	Total	**28.50**	**28.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**28.50**	**28.50**
	Total Pulse Crops	**54.60**	**34.80**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**54.60**	**34.80**
Forage Corps	**Sorghum**										
	PC 23	11.00	5.98	0.00	0.00	0.00	0.00	0.00	0.00	11.00	5.98
	PC 9	1.80	2.90	0.00	0.00	0.00	0.00	0.00	0.00	1.80	2.90
	Total	**12.80**	**8.88**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**12.80**	**8.88**
	Mustard										
	P.M.-24	1.50	2.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	2.00
	P.Vijay	2.12	5.95	0.00	0.00	0.00	0.00	0.00	0.00	2.12	5.95
	P.Bold	4.53	6.00	0.00	0.00	0.00	0.00	0.00	0.00	4.53	6.00
	P.M.-22	0.02	0.98	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.98
	P.Mahak	1.85	2.85	0.00	0.00	0.00	0.00	0.00	0.00	1.85	2.85
	P.Agrani	0.65	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	2.00
	P.Jaikisan	0.77	2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.77	2.60
	Total	**11.44**	**22.38**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**11.44**	**22.38**
	Total Forage Crops	**24.24**	**31.26**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**24.24**	**31.26**
	Grand Total (Karnal)	**1491.44**	**1610.61**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**34.00**	**1491.44**	**1644.61**
51. IARI, New Delhi											
Cereal Crops	**Rice**										
	Pusa Sugandh 5	57.00	60.00	0.00	0.00	0.00	0.00	0.25	0.25	57.25	60.25
	Pusa 1592	2.50	3.00	0.00	0.00	0.00	0.00	0.25	0.25	2.75	3.25

	Pusa 6	6.00	6.00	0.00	0.00	0.00	0.00	5.00	3.00	11.00	9.00
	Total	**65.50**	**69.00**	**0.00**	**0.00**	**0.00**	**0.00**	**5.50**	**3.50**	**71.00**	**72.50**
	Wheat										
	HD-3043	91.80	100.00	0.00	0.00	0.00	0.00	0.00	0.00	91.80	100.00
	HD-2967	343.99	500.00	0.00	0.00	0.00	0.00	0.00	0.00	343.99	500.00
	HD-3086	991.00	1000.00	0.00	0.00	0.00	0.00	0.00	0.00	991.00	1000.00
	HD-3059	106.60	120.00	0.00	0.00	0.00	0.00	0.00	0.00	106.60	120.00
	HD3090	12.20	15.00	0.00	0.00	0.00	0.00	0.00	0.00	12.20	15.00
	HDCSW-18	40.50	50.00	0.00	0.00	0.00	0.00	0.00	0.00	40.50	50.00
	HD-3117	40.50	50.00	0.00	0.00	0.00	0.00	0.00	0.00	40.50	50.00
	Total	**1626.59**	**1835.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1626.59**	**1835.00**
	Total Cereal Crops	**1692.09**	**1904.00**	**0.00**	**0.00**	**0.00**	**0.00**	**5.50**	**3.50**	**1697.59**	**1907.50**
Pulse Crops	**Pigeonpea**										
	Pusa 991	4.50	7.80	0.00	0.00	0.00	0.00	0.00	0.00	4.50	7.80
	Pusa 9	5.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	7.00
	Pusa 992	4.22	12.00	0.00	0.00	0.00	0.00	0.00	0.00	4.22	12.00
	Total	**13.72**	**26.80**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**13.72**	**26.80**
	Mung										
	Pusa 0672	1.70	24.80	0.00	0.00	0.00	0.00	0.00	0.00	1.70	24.80
	Pusa Vishal	8.30	83.50	0.00	0.00	0.00	0.00	0.00	0.00	8.30	83.50
	Pusa 1371	20.00	16.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	16.00
	Pusa 9072	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02
	Pusa 9531	1.00	12.50	0.00	0.00	0.00	0.00	0.00	0.00	1.00	12.50
	Total	**31.02**	**136.82**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**31.02**	**136.82**
	Chickpea										
	P 547	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00
	P-1053	10.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	4.00
	P-372	0.00	0.00	0.00	0.00	0.00	0.00	3.00	3.00	3.00	3.00
	P-3022	0.00	0.00	0.00	0.00	0.00	0.00	7.00	7.00	7.00	7.00
	Total	**15.00**	**9.00**	**0.00**	**0.00**	**0.00**	**0.00**	**10.00**	**10.00**	**25.00**	**19.00**
	Lentil										
	Pusa Vaibhav	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00
	Pusa Shivalik	5.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	7.00
	L-4594	1.50	2.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	2.00
	L-4717	10.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	10.00

	Total	**21.50**	**24.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**21.50**	**24.00**
	Total Pulse Crops	**81.24**	**196.62**	**0.00**	**0.00**	**0.00**	**0.00**	**10.00**	**10.00**	**91.24**	**206.62**
Oilseed Crops	**Indian Mustard**										
	PM-25	4.80	6.00	0.00	0.00	0.00	0.00	0.00	0.00	4.80	6.00
	PM-26	1.42	3.00	0.00	0.00	0.00	0.00	0.00	0.00	1.42	3.00
	PM-27	1.81	3.00	0.00	0.00	0.00	0.00	0.00	0.00	1.81	3.00
	PM-28	4.27	8.00	0.00	0.00	0.00	0.00	0.00	0.00	4.27	8.00
	PM-30	2.50	5.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	5.00
	PM-31	0.40	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	1.00
	Pusa Vijay	2.12	3.00	0.00	0.00	0.00	0.00	0.00	0.00	2.12	3.00
	Total	**17.32**	**29.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**17.32**	**29.00**
	Total Oilseed Crops	**17.32**	**29.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**17.32**	**29.00**
	Grand Total (New Delhi)	**1790.65**	**2129.62**	**0.00**	**0.00**	**0.00**	**0.00**	**15.50**	**13.50**	**1806.15**	**2143.12**
	# Expected Production as crop is under harvesting and final data will be available only after seed processing										
52. IARI, Indore											
Cereal Crops	**Wheat**										
	HI 1605	25.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	50.00
	HI 1544	345.00	450.00	0.00	0.00	0.00	0.00	0.00	0.00	345.00	450.00
	HI 1531	45.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	45.00	100.00
	HD 2932	111.20	160.00	0.00	0.00	0.00	0.00	0.00	0.00	111.20	160.00
	HI 1612	0.00	0.00	0.00	0.00	0.00	0.00	30.00	30.00	30.00	30.00
	HD 2987	11.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	11.00	15.00
	HI 8663	88.00	140.00	0.00	0.00	0.00	0.00	0.00	0.00	88.00	140.00
	HI 8713	100.00	160.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	160.00
	HI 8737	100.00	180.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	180.00
	HD 4728	32.00	32.00	0.00	0.00	0.00	0.00	0.00	0.00	32.00	32.00
	HI 8759	252.00	320.00	0.00	0.00	0.00	0.00	0.00	0.00	252.00	320.00
	HI 8777	0.00	0.00	0.00	0.00	0.00	0.00	40.00	40.00	40.00	40.00
	Total	**1109.20**	**1607.00**	**0.00**	**0.00**	**0.00**	**0.00**	**70.00**	**70.00**	**1179.20**	**1677.00**
	Total Cereal Crops	**1109.20**	**1607.00**	**0.00**	**0.00**	**0.00**	**0.00**	**70.00**	**70.00**	**1179.20**	**1677.00**
	Grand Total (IISR, Indore)	**1109.20**	**1607.00**	**0.00**	**0.00**	**0.00**	**0.00**	**70.00**	**70.00**	**1179.20**	**1677.00**
53. ICAR-IARI, RS, Pusa Bihar											
Cereal Crops	**Wheat**										
	HD2967	150.00	260.00	0.00	0.00	0.00	0.00	0.00	0.00	150.00	260.00
	HD 2733	50.00	155.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00	155.00

	HD 2985	103.40	115.00	0.00	0.00	0.00	0.00	0.00	0.00	103.40	115.00
	HI 1563	100.00	50.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00	50.00
	HD 3118	119.18	132.00	0.00	0.00	0.00	0.00	0.00	0.00	119.18	132.00
	HD 3171	73.00	35.00	0.00	0.00	0.00	0.00	0.00	0.00	73.00	35.00
	Total	**595.58**	**747.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**595.58**	**747.00**
	Total Cereal Crops	**595.58**	**747.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**595.58**	**747.00**
Grand Total (IARI, RS, Pusa)		**595.58**	**747.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**595.58**	**747.00**
54. ICAR RC NEH, Tripura											
Cereal Crops	**Paddy**										
	Gomatidhan	0.00	0.00	0.00	0.00	0.00	0.00	80.00	104.00	80.00	104.00
	TK 1	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.30	2.00	2.30
	TK 2	0.00	0.00	0.00	0.00	0.00	0.00	2.00	1.40	2.00	1.40
	TJ 1	0.00	0.00	0.00	0.00	0.00	0.00	2.00	1.80	2.00	1.80
	Tripura Chikan Dhan	0.00	0.00	0.00	0.00	0.00	0.00	40.00	72.40	40.00	72.40
	Tripura Sarat	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.20	1.00	1.20
	Tripura Nirog	0.00	0.00	0.00	0.00	0.00	0.00	50.00	74.60	50.00	74.60
	Tripura Hakachuk 1	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.20	1.00	1.20
	Tripura Hakachuk 2	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.30	2.00	2.30
	Tripura Aush	0.00	0.00	0.00	0.00	0.00	0.00	2.00	3.20	2.00	3.20
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**182.00**	**264.40**	**182.00**	**264.40**
	Total Cereal Crops	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**182.00**	**264.40**	**182.00**	**264.40**
Pulse Crops	**Mungbean**										
	Tripura Maskolai	0.00	0.00	0.00	0.00	0.00	0.00	20.00	24.00	20.00	24.00
	Tripura Mung 1	0.00	0.00	0.00	0.00	0.00	0.00	10.00	13.20	10.00	13.20
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**30.00**	**37.20**	**30.00**	**37.20**
	Fieldpea										
	TRCP 8	20.00	22.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	22.00
	Total	**20.00**	**22.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**20.00**	**22.00**
	Total pulse Crops	**20.00**	**22.00**	**0.00**	**0.00**	**0.00**	**0.00**	**30.00**	**37.20**	**50.00**	**59.20**
	Grand Total (Tripura)	**20.00**	**22.00**	**0.00**	**0.00**	**0.00**	**0.00**	**212.00**	**301.60**	**232.00**	**323.60**
55. ICAR RC NEH, Manipur											
Cereal Crops	**Paddy**										
	RC Maniphou-4	0.00	0.00	0.00	0.00	0.00	0.00	0.70	0.80	0.70	0.80
	RC Maniphou-5	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.60	0.50	0.60
	RC Maniphou-6	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.60	0.50	0.60

	RC Maniphou-7	0.00	0.00	0.00	0.00	0.00	0.00	10.00	10.00	10.00	10.00
	RC Maniphou-10	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10
	RC Maniphou-11	0.00	0.00	0.00	0.00	0.00	0.00	0.70	0.80	0.70	0.80
	RC Maniphou-12	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.10	1.00	1.10
	RC Maniphou-13	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.50	4.00	4.50
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**17.50**	**18.50**	**17.50**	**18.50**
	Maize										
	Pusa Composite 3	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.15	0.10	0.15
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.15**	**0.10**	**0.15**
	Total Cereal Crops	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**17.60**	**18.65**	**17.60**	**18.65**
Oilseed Crops	**Soybean**										
	JS-335	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.30	0.20	0.30
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.20**	**0.30**	**0.20**	**0.30**
	Groundnut										
	ICGS 76	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.60	0.50	0.60
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.50**	**0.60**	**0.50**	**0.60**
	Total Oilseed Crops	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.70**	**0.90**	**0.70**	**0.90**
Grand Total (ICAR RC, Manipur)		**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**18.30**	**19.55**	**18.30**	**19.55**
56. ICAR-IISR, Indore											
Oilseed Crops	**Soybean**										
	NRC 86	225.00	38.00	0.00	0.00	0.00	0.00	0.00	0.00	225.00	38.00
	NRC 7	20.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	2.00
	JS 20-29	20.00	12.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	12.00
	JS 20-34	15.00	6.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	6.00
	NRC 37	40.00	1.60	0.00	0.00	0.00	0.00	0.00	0.00	40.00	1.60
	Total	**320.00**	**59.60**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**320.00**	**59.60**
	Total Oilseed Crops	**320.00**	**59.60**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**320.00**	**59.60**
	Grand Total (IISR, Indore)	**320.00**	**59.60**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**320.00**	**59.60**
57. CAU, Impphal											
Cereal Crops	**Rice**										
	CAU-R1	0.00	0.00	0.00	0.00	0.00	0.00	10.00	12.00	10.00	12.00
	CAU-R2	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	2.00
	CAU-R3	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.73	2.00	2.73
	CAU-R4	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.38	2.00	2.38
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**16.00**	**19.11**	**16.00**	**19.11**

	Total Cereal Crops	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**16.00**	**19.11**	**16.00**	**19.11**
	Grand Total (Imphal)	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**16.00**	**19.11**	**16.00**	**19.11**
58. DGR, Junagadh											
Oilseed Crops	**Groundnut**										
	Girnar-2	100.00	26.80	0.00	0.00	0.00	0.00	0.00	0.00	100.00	26.80
	Girnar-3	70.00	45.00	0.00	0.00	0.00	0.00	0.00	0.00	70.00	45.00
	Total	**170.00**	**71.80**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**170.00**	**71.80**
	Total Oilseed Crops	**170.00**	**71.80**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**170.00**	**71.80**
Grand Total (DGR, Junagadh)		**170.00**	**71.80**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**170.00**	**71.80**
59. IIMR, New Delhi											
Cereal Crops	**Maize**										
	BML-6	0.00	0.00	0.00	0.00	0.00	0.00	40.00	42.00	40.00	42.00
	IML-418-1	0.00	0.00	0.00	0.00	0.00	0.00	8.00	10.00	8.00	10.00
	BML-7	0.00	0.00	0.00	0.00	0.00	0.00	8.00	5.00	8.00	5.00
	HKI-193-1	0.00	0.00	0.00	0.00	0.00	0.00	3.00	3.00	3.00	3.00
	HKI-163	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.85	1.50	0.85
	WOSC	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.15	0.15	0.15
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**60.65**	**61.00**	**60.65**	**61.00**
	Total Cereal Crops	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**60.65**	**61.00**	**60.65**	**61.00**
	Grand Total (IIMR, N. Delhi)	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**60.65**	**61.00**	**60.65**	**61.00**
60. IIWBR, Karnal											
Cereal crops	**Wheat**										
	CBW 38	50.00	110.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00	110.00
	DBW 17	6.00	130.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	130.00
	DBW 71	25.00	65.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	65.00
	DBW 88	30.00	220.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	220.00
	DBW 90	59.40	90.00	0.00	0.00	0.00	0.00	0.00	0.00	59.40	90.00
	DBW 107	171.60	100.00	0.00	0.00	0.00	0.00	0.00	0.00	171.60	100.00
	DBW 110	24.40	125.00	0.00	0.00	0.00	0.00	0.00	0.00	24.40	125.00
	HD 2967	310.00	550.00	0.00	0.00	0.00	0.00	0.00	0.00	310.00	550.00
	WB 2	7.00	225.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00	225.00
	DBW 39	0.00	0.00	0.00	0.00	0.00	0.00	20.00	25.00	20.00	25.00
	DBW 168	0.00	0.00	0.00	0.00	0.00	0.00	50.00	65.00	50.00	65.00
	DBW 173	0.00	0.00	0.00	0.00	0.00	0.00	75.00	100.00	75.00	100.00
	HD 3086	0.00	0.00	0.00	0.00	0.00	0.00	250.00	350.00	250.00	350.00

	PBW 723	0.00	0.00	0.00	0.00	0.00	0.00	25.00	25.00	25.00	25.00
	Total	**683.40**	**1615.00**	**0.00**	**0.00**	**0.00**	**0.00**	**420.00**	**565.00**	**1103.40**	**2180.00**
	Barley										
	DWRUB 52	55.00	85.00	0.00	0.00	0.00	0.00	0.00	0.00	55.00	85.00
	DWRUB 64	46.50	85.00	0.00	0.00	0.00	0.00	0.00	0.00	46.50	85.00
	DWRB 73	20.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	40.00
	DWRB 101	15.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	40.00
	DWRB 123	0.00	0.00	0.00	0.00	0.00	0.00	10.00	15.00	10.00	15.00
	DWRB 137	0.00	0.00	0.00	0.00	0.00	0.00	10.00	15.00	10.00	15.00
	Total	**136.50**	**250.00**	**0.00**	**0.00**	**0.00**	**0.00**	**20.00**	**30.00**	**156.50**	**280.00**
	Total Cereal Crops	**819.90**	**1865.00**	**0.00**	**0.00**	**0.00**	**0.00**	**440.00**	**595.00**	**1259.90**	**2460.00**
Grand Total (IIWBR, Karnal)		**819.90**	**1865.00**	**0.00**	**0.00**	**0.00**	**0.00**	**440.00**	**595.00**	**1259.90**	**2460.00**
61. ICAR-CCARI, Goa											
Cereal Crops	**Rice**										
	Goa dhan 1	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	1.00	1.00
	Goa dhan 2	0.00	0.00	1.00	0.50	0.00	0.00	0.00	0.00	1.00	0.50
	Total	**0.00**	**0.00**	**2.00**	**1.50**	**0.00**	**0.00**	**0.00**	**0.00**	**2.00**	**1.50**
	Total Cereal Crops	**0.00**	**0.00**	**2.00**	**1.50**	**0.00**	**0.00**	**0.00**	**0.00**	**2.00**	**1.50**
Pulse Crops	**Cowpea**										
	Goa cowpea 3	0.00	0.00	2.00	2.00	0.00	0.00	0.00	0.00	2.00	2.00
	Total	**0.00**	**0.00**	**2.00**	**2.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.00**	**2.00**
	Total Pulse Crops	**0.00**	**0.00**	**2.00**	**2.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.00**	**2.00**
	Grand Total (Goa)	**0.00**	**0.00**	**4.00**	**3.50**	**0.00**	**0.00**	**0.00**	**0.00**	**4.00**	**3.50**
62. ICAR-DRMR, Bharatpur											
Oilseed Crops	**Indian mustard**										
	Giriraj (DRMRIJ 31)	0.80	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80	3.00
	NRCDR 2	0.10	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.10	1.50
	NRCHB 101	3.95	7.00	0.00	0.00	0.00	0.00	0.00	0.00	3.95	7.00
	Total	**4.85**	**11.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**4.85**	**11.50**
	Yellow sarson										
	NRCYS 05-02	0.20	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.30
	Total	**0.20**	**0.30**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.20**	**0.30**
	Total Oilseed Crops	**5.05**	**11.80**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**5.05**	**11.80**
	Grand Total (Bharatpur)	**5.05**	**11.80**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**5.05**	**11.80**
63. CIARI, Andaman											

Pulse Crops	**Chickpea**										
	CIARI Mung 1	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.05	0.10	0.05
	CIARI Mung 2	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.07	0.10	0.07
	CIARI Mung 3	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.03	0.10	0.03
	CIARI Mung 4	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.05	0.10	0.05
	CIARI Mung 5	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.02	0.10	0.02
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.50**	**0.22**	**0.50**	**0.22**
	Urd										
	CIARI Urd 1	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.12	0.10	0.12
	CIARI Urd 2	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.15	0.10	0.15
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.20**	**0.27**	**0.20**	**0.27**
	Total Pulse Crops	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.20**	**0.27**	**0.20**	**0.27**
	Grand Total (Andaman)	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.70**	**0.49**	**0.70**	**0.49**
Total Grand Total		**65307.55**	**73304.88**	**23900.65**	**25781.83**	**3679.52**	**7136.16**	**5160.65**	**10576.16**	**98048.37**	**116799.03**

Note: For *Rabi* 2017-18, expected breeder seed production figures were used in compilation.

Table -2: Crop-wise and centre-wise breeder seed production during 2017-18

(in quintals)

Centre	GOI		State		Pulses Seed Hub		ICAR Seed Project		Total	
	Indent	Production	Indent	Production	Indent	Production	Target	Production	Indent	Production
Cereal Crops										
Rice										
Srinagar	1.00	0.00	13.95	17.85	-	-	0.00	0.00	14.95	17.85
Jammu	0.50	0.50	7.50	9.65	-	-	0.00	0.60	8.00	10.75
Palampur	23.00	23.00	2.00	2.00	-	-	22.00	26.10	47.00	51.10
Ludhiana	188.90	284.00	10.00	10.00	-	-	0.00	0.00	198.90	294.00
Hisar	15.50	36.00	55.50	71.20	-	-	0.00	0.00	71.00	107.20
Pantnagar	6.00	63.00	0.00	0.00	-	-	0.00	1029.00	6.00	1092.00
Faizabad	74.60	374.80	0.00	0.00	-	-	122.50	167.34	197.10	542.14
Varanasi	8.00	22.50	0.00	0.00	-	-	0.00	123.40	8.00	145.90
Jorhat	17.00	19.00	0.00	388.80	-	-	0.00	0.00	17.00	407.80
Ranchi	20.00	20.60	71.20	145.50	-	-	0.00	1.50	91.20	167.60
Dholi	187.55	256.10	74.10	207.55	-	-	0.00	0.00	261.65	463.65
Bhubaneswar	147.20	200.22	0.00	0.00	-	-	13.80	13.80	161.00	214.02
Kota	0.01	0.10	0.00	0.00	-	-	0.00	0.00	0.01	0.10
Anand	0.00	0.00	86.85	295.00	-	-	0.00	0.00	86.85	295.00
Raipur	668.30	724.70	19.20	26.30	-	-	0.00	11.80	687.50	762.80
Jabalpur	125.50	2040.05	2399.71	2399.71	-	-	0.00	0.00	2525.21	4439.76
Rahuri	23.50	59.25	0.00	0.00	-	-	3.00	17.00	26.50	76.25
Akola	0.00	0.00	169.60	260.60	-	-	0.00	0.00	169.60	260.60
Parbhani	0.00	0.00	0.00	0.00	-	-	27.00	6.00	27.00	6.00
Bangalore	6.50	6.00	0.00	0.00	-	-	2.00	17.00	8.50	23.00
Dharwad	3.50	0.00	5.00	0.00	-	-	0.00	0.00	8.50	0.00
PJTSAU, Hyderabad	129.70	136.20	669.72	698.21	-	-	3.00	3.00	802.42	837.41
ANGRAU, Guntur	949.32	943.60	765.85	899.17	-	-	0.00	0.00	1715.17	1842.77
Coimbatore	93.85	15.25	140.00	170.86	-	-	1204.25	1173.38	1438.10	1359.49
KAU, Pattambi	22.20	63.14	4.45	13.30	-	-	15.20	41.60	41.85	118.04
Karaikal	0.00	0.00	7.90	45.15	-	-	0.00	0.00	7.90	45.15
Dapoli	25.35	38.95	0.00	0.00	-	-	215.40	196.86	240.75	235.81

BCKV, West Bengal	84.00	102.70	20.00	20.00	-	-	5.00	5.00	109.00	127.70
Meerut	12.00	4.25	0.00	0.00	-	-	0.00	0.00	12.00	4.25
Shimoga	0.00	0.00	64.00	53.00	-	-	0.00	0.00	64.00	53.00
Almora	7.00	2.50	0.00	0.00	-	-	0.10	0.10	7.10	2.60
Cuttack	856.95	851.15	0.00	0.00	-	-	7.40	60.55	864.35	911.70
IIRR, Hyderabad	245.85	162.80	0.00	0.00	-	-	0.00	0.00	245.85	162.80
IARI, RS, Karnal	183.20	226.60	0.00	0.00	-	-	0.00	34.00	183.20	260.60
IARI, New Delhi	65.50	69.00	0.00	0.00	-	-	5.50	3.50	71.00	72.50
Manipur	0.00	0.00	0.00	0.00	-	-	17.50	18.50	17.50	18.50
Tripura	0.00	0.00	0.00	0.00	-	-	182.00	264.40	182.00	264.40
CAU, Imphal	0.00	0.00	0.00	0.00	-	-	16.00	19.11	16.00	19.11
CCARI, Goa	0.00	0.00	2.00	1.50	-	-	0.00	0.00	2.00	1.50
Total	**4191.48**	**6745.96**	**4588.53**	**5735.35**	**-**	**-**	**1861.65**	**3233.54**	**10641.66**	**15714.85**
Wheat										
Srinagar	0.00	0.00	14.00	14.00	-	-	0.00	0.00	14.00	14.00
Jammu	110.00	10.00	103.00	100.00	-	-	0.00	10.00	213.00	120.00
Palampur	175.00	210.00	120.00	140.00	-	-	130.00	180.00	425.00	530.00
Ludhiana	2431.54	3361.00	65.00	232.00	-	-	0.00	0.00	2496.54	3593.00
Hisar	1330.00	1411.00	113.00	135.00	-	-	0.00	0.00	1443.00	1546.00
Pantnagar	721.28	2917.00	0.00	0.00	-	-	0.00	2798.00	721.28	5715.00
Faizabad	396.71	720.50	0.00	0.00	-	-	0.00	0.00	396.71	720.50
Kanpur	267.00	640.00	0.00	0.00	-	-	0.00	0.00	267.00	640.00
Varanasi	30.93	34.50	20.00	21.50	-	-	0.00	0.00	50.93	56.00
Ranchi	0.00	0.00	12.00	21.00	-	-	0.00	0.00	12.00	21.00
Dholi	751.94	751.94	416.06	416.06	-	-	0.00	0.00	1168.00	1168.00
Kota	1266.30	1595.00	0.00	0.00	-	-	0.00	0.00	1266.30	1595.00
Bikaner	640.00	705.00	0.00	0.00	-	-	0.00	0.00	640.00	705.00
Udaipur	75.26	81.50	0.00	0.00	-	-	0.00	0.00	75.26	81.50
S.K. Nagar	612.50	612.50	2253.30	2253.30	-	-	0.00	0.00	2865.80	2865.80
Jamnagar	204.00	150.00	46.30	30.00	-	-	0.00	0.00	250.30	180.00
Raipur	475.00	800.00	0.00	0.00	-	-	0.00	0.00	475.00	800.00
Jabalpur	2281.95	2281.95	7988.80	7988.80	-	-	0.00	0.00	10270.75	10270.75
Rahuri	81.50	160.00	7.00	38.00	-	-	120.00	282.00	208.50	480.00

Akola	53.80	63.00	2.00	5.00	-	-	0.00	0.00	55.80	68.00
Dharwad	56.00	41.00	70.00	63.50	-	-	0.00	0.00	126.00	104.50
Gwalior	873.00	2940.00	0.00	0.00	-	-	0.00	0.00	873.00	2940.00
Meerut	418.60	405.00	0.00	0.00	-	-	0.00	0.00	418.60	405.00
Navsari	0.00	0.00	0.00	0.00	-	-	80.00	79.00	80.00	79.00
Almora	77.00	121.00	0.00	0.00	-	-	0.00	0.00	77.00	121.00
IARI, RS, Karnal	1227.60	1315.00	0.00	0.00	-	-	0.00	0.00	1227.60	1315.00
IARI, New Delhi	1626.59	1835.00	0.00	0.00	-	-	0.00	0.00	1626.59	1835.00
IARI, Indore	1109.20	1607.00	0.00	0.00	-	-	70.00	70.00	1179.20	1677.00
IARI, RS, Pusa Bihar	595.58	747.00	0.00	0.00	-	-	0.00	0.00	595.58	747.00
IIWBR, Karnal	683.40	1615.00	0.00	0.00	-	-	420.00	565.00	1103.40	2180.00
Total	**18571.68**	**27130.89**	**11230.46**	**11458.16**	**-**	**-**	**820.00**	**3984.00**	**30622.14**	**42573.05**
Barley										
Palampur	0.00	0.00	1.00	2.00	-	-	8.00	15.00	9.00	17.00
Ludhiana	136.25	139.50	0.00	0.00	-	-	0.00	0.00	136.25	139.50
Hisar	141.10	155.00	4.80	6.00	-	-	0.11	0.20	146.01	161.20
Faizabad	41.20	43.50	0.00	0.00	-	-	0.00	0.00	41.20	43.50
Kanpur	17.30	23.00	0.00	0.00	-	-	0.00	0.00	17.30	23.00
Varanasi	40.00	40.70	4.50	5.00	-	-	0.00	0.00	44.50	45.70
Udaipur	10.00	10.50	230.00	160.00	-	-	0.00	0.00	240.00	170.50
Jabalpur	0.00	0.00	200.00	200.00	-	-	0.00	0.00	200.00	200.00
IARI, RS, Karnal	1.00	2.00	0.00	0.00	-	-	0.00	0.00	1.00	2.00
IIWBR, Karnal	136.50	250.00	0.00	0.00	-	-	20.00	30.00	156.50	280.00
Total	**523.35**	**664.20**	**440.30**	**373.00**	**-**	**-**	**28.11**	**45.20**	**991.76**	**1082.40**
Maize										
Srinagar	0.00	0.00	5.72	6.25	-	-	0.00	0.00	5.72	6.25
Palampur	0.00	0.00	0.00	0.00	-	-	6.80	7.35	6.80	7.35
Hisar	9.40	8.14	0.00	0.00	-	-	0.00	0.00	9.40	8.14
Ludhiana	11.30	19.89	0.00	0.00	-	-	0.00	0.00	11.30	19.89
Pantnagar	0.18	0.52	0.00	0.00	-	-	0.00	0.00	0.18	0.52
Kanpur	4.20	4.50	0.00	0.00	-	-	3.00	5.00	7.20	9.50
Udaipur	18.40	13.70	0.00	0.00	-	-	0.00	0.00	18.40	13.70
Anand	0.00	0.00	0.00	0.00	-	-	31.50	31.50	31.50	31.50

Jabalpur	0.00	0.00	67.50	67.50	-	-	0.00	0.00	67.50	67.50
Bangalore	0.00	0.00	20.00	20.00	-	-	0.00	8.00	20.00	28.00
Dharwad	0.00	0.00	5.85	5.70	-	-	0.00	0.00	5.85	5.70
PJTSAU, Hyderabad	0.00	0.00	0.31	0.31	-	-	0.00	0.00	0.31	0.31
Coimbatore	9.16	9.21	6.20	10.07	-	-	0.00	1.22	15.36	20.50
Almora	1.80	5.60	0.00	0.00	-	-	1.70	2.15	3.50	7.75
Manipur	0.00	0.00	0.00	0.00	-	-	0.10	0.15	0.10	0.15
IIMR, New Delhi	0.00	0.00	0.00	0.00	-	-	60.65	61.00	60.65	61.00
Total	**54.44**	**61.56**	**105.58**	**109.83**	**-**	**-**	**103.75**	**116.37**	**263.77**	**287.76**
Sorghum										
Kanpur	0.00	0.00	0.00	0.00	-	-	1.50	2.20	1.50	2.20
Udaipur	3.61	3.96	0.00	0.00	-	-	0.00	0.00	3.61	3.96
Rahuri	13.45	10.62	0.00	0.00	-	-	0.29	0.29	13.74	10.91
Akola	2.69	3.10	0.00	0.00	-	-	0.00	0.00	2.69	3.10
Parbhani	2.59	16.08	0.00	0.00	-	-	91.77	77.35	94.36	93.43
Dharwad	6.30	4.70	2.50	2.30	-	-	0.00	0.00	8.80	7.00
PJTSAU, Hyderabad	0.00	0.00	0.10	0.10	-	-	0.00	0.00	0.10	0.10
ANGRAU, Guntur	0.00	0.00	0.00	0.00	-	-	0.00	0.37	0.00	0.37
Coimbatore	0.00	0.00	0.60	0.60	-	-	0.30	0.30	0.90	0.90
Raichur	0.00	0.00	0.00	0.00	-	-	0.00	6.00	0.00	6.00
IIMR, Hyderabad	23.79	73.15	0.00	0.00	-	-	0.00	0.00	23.79	73.15
Total	**52.43**	**111.61**	**3.20**	**3.00**	**-**	**-**	**93.86**	**86.51**	**149.49**	**201.12**
Fingermillet										
Ranchi	0.03	0.10	0.20	0.20	-	-	0.00	0.00	0.23	0.30
Dholi	0.25	1.00	4.00	4.00	-	-	0.00	0.00	4.25	5.00
Raipur	2.50	2.80	0.00	0.00	-	-	0.00	0.00	2.50	2.80
Rahuri	0.03	0.50	0.00	0.00	-	-	0.00	0.00	0.03	0.50
Bangalore	12.52	28.44	0.20	0.45	-	-	0.00	0.00	12.72	28.89
Dharwad	0.00	0.00	2.00	2.00	-	-	0.00	0.00	2.00	2.00
ANGRAU, Guntur	0.00	0.00	0.00	0.00	-	-	0.00	61.77	0.00	61.77
Coimbatore	0.00	0.00	0.85	0.50	-	-	0.20	0.00	1.05	0.50
KKV, Dapoli	0.02	0.15	0.00	0.00	-	-	5.98	4.35	6.00	4.50
Almora	2.34	2.10	0.00	0.00	-	-	0.00	0.00	2.34	2.10

Total	**17.69**	**35.09**	**7.25**	**7.15**	**-**	**-**	**6.18**	**66.12**	**31.12**	**108.36**
Pearlmillet										
Hisar	0.24	1.60	0.00	0.00	-	-	0.35	1.38	0.59	2.98
Jobner	0.38	8.30	0.00	0.00	-	-	0.00	0.00	0.38	8.30
Jamnagar	0.07	2.47	0.00	0.00	-	-	0.00	0.00	0.07	2.47
Rahuri	0.10	0.62	0.01	0.02	-	-	2.13	2.50	2.24	3.14
Parbhani	0.79	1.00	0.00	0.00	-	-	0.00	0.00	0.79	1.00
Akola	0.04	0.05	0.00	0.00	-	-	0.00	0.00	0.04	0.05
Coimbatore	0.10	0.00	0.20	0.75	-	-	0.75	0.30	1.05	1.05
Gwalior	1.07	1.04	0.00	0.00	-	-	0.00	0.00	1.07	1.04
IARI, RS, Karnal	0.80	0.95	0.00	0.00	-	-	0.00	0.00	0.80	0.95
Total	**3.59**	**16.03**	**0.21**	**0.77**	**-**	**-**	**3.23**	**4.18**	**7.03**	**20.98**
Littlemillet										
Rahuri	0.02	0.50	0.00	0.00	-	-	0.00	0.00	0.02	0.50
Dharwad	3.00	3.00	2.00	2.00	-	-	0.00	0.00	5.00	5.00
Coimbatore	0.00	0.00	0.25	0.00	-	-	0.00	0.00	0.25	0.00
Total	**3.02**	**3.50**	**2.25**	**2.00**	**-**	**-**	**0.00**	**0.00**	**5.27**	**5.50**
Kodomillet										
Raipur	2.25	2.00	0.00	0.00	-	-	0.00	0.00	2.25	2.00
Jabalpur	4.80	1.93	11.16	11.16	-	-	0.00	0.00	15.96	13.09
Coimbatore	0.00	0.00	0.00	0.10	-	-	0.00	0.00	0.00	0.10
Total	**7.05**	**3.93**	**11.16**	**11.26**	**-**	**-**	**0.00**	**0.00**	**18.21**	**15.19**
Foxtailmillet										
ANGRAU, Guntur	3.50	7.35	0.71	0.61	-	-	0.00	0.00	4.21	7.96
Dharwad	3.00	3.00	2.00	2.00	-	-	0.00	0.00	5.00	5.00
Coimbatore	0.00	0.00	0.25	0.54	-	-	0.00	0.00	0.25	0.54
Total	**6.50**	**10.35**	**2.96**	**3.15**	**-**	**-**	**0.00**	**0.00**	**9.46**	**13.50**
Barnyardmillet										
Coimbatore	0.00	0.00	1.00	0.23	-	-	0.00	0.00	1.00	0.23
Pantnagar	0.50	0.00	0.00	0.00	-	-	0.00	0.00	0.50	0.00
Dharwad	3.00	3.00	2.00	2.00	-	-	0.00	0.00	5.00	5.00
Almora	1.50	2.30	0.00	0.00	-	-	0.00	0.00	1.50	2.30
Total	**5.00**	**5.30**	**3.00**	**2.23**	**-**	**-**	**0.00**	**0.00**	**8.00**	**7.53**

Buckwheat										
Almora	0.00	0.00	0.00	0.00	-	-	0.10	0.10	0.10	0.10
Total	**0.00**	**0.00**	**0.00**	**0.00**	**-**	**-**	**0.10**	**0.10**	**0.10**	**0.10**
Grain Amaranth										
Almora	0.05	0.20	0.00	0.00	-	-	0.00	0.00	0.05	0.20
Total	**0.05**	**0.20**	**0.00**	**0.00**	**-**	**-**	**0.00**	**0.00**	**0.05**	**0.20**
Prosomillet										
Dharwad	3.00	0.00	0.00	0.00	-	-	0.00	0.00	3.00	0.00
Dholi	0.50	0.00	0.00	0.00	-	-	0.00	0.00	0.50	0.00
Coimbatore	0.00	0.00	10.00	0.20	-	-	0.00	0.00	10.00	0.20
Total	**3.50**	**0.00**	**10.00**	**0.20**	**-**	**-**	**0.00**	**0.00**	**13.50**	**0.20**
Total Cereal Crops	**23439.78**	**34788.62**	**16404.90**	**17706.10**	**-**	**-**	**2916.88**	**7536.02**	**42761.56**	**60030.74**
Pulse crops										
Chick Pea										
Palampur	0.00	0.00	20.00	24.00	0.00	0.00	1.20	1.70	21.20	25.70
Ludhiana	16.01	28.00	0.00	0.00	0.00	0.00	0.00	0.00	16.01	28.00
Hisar	43.93	50.50	3.00	4.00	315.00	345.00	0.00	0.00	361.93	399.50
Pantnagar	1.00	5.00	0.00	0.00	100.00	100.00	0.00	39.00	101.00	144.00
Kanpur	33.37	43.00	0.00	0.00	0.00	0.00	0.00	0.00	33.37	43.00
Dholi	0.00	0.00	22.16	22.16	0.00	0.00	0.00	0.00	22.16	22.16
Kota	400.00	500.00	0.00	0.00	350.00	400.00	0.00	0.00	750.00	900.00
Bikaner	731.39	713.00	0.00	0.00	500.00	689.00	0.00	0.00	1231.39	1402.00
Udaipur	93.75	95.00	0.00	0.00	12.00	8.00	0.00	0.00	105.75	103.00
Jamnagar	44.00	40.50	151.35	171.50	0.00	0.00	0.00	0.00	195.35	212.00
Raipur	65.00	75.00	5.00	12.00	0.00	0.00	0.00	0.00	70.00	87.00
Jabalpur	1385.69	1385.69	1769.11	1769.11	390.00	330.00	0.00	0.00	3544.80	3484.80
Rahuri	745.43	634.00	50.00	0.00	2.00	5.00	350.00	410.00	1147.43	1049.00
Akola	513.91	489.92	160.00	191.72	0.00	0.00	0.00	0.00	673.91	681.64
Parbhani	537.00	390.00	0.00	0.00	0.00	0.00	45.00	45.00	582.00	435.00
Bangalore	0.00	120.00	0.00	0.00	300.00	209.90	0.00	0.00	300.00	329.90
Dharwad	873.00	620.50	131.25	60.30	75.00	40.00	0.00	0.00	1079.25	720.80
ANGRAU, Guntur	971.75	712.25	16.35	90.20	0.00	0.00	0.00	0.00	988.10	802.45
West Bengal	0.00	0.00	2.00	0.40	0.00	0.00	0.00	0.00	2.00	0.40

Raichur	672.30	719.00	0.00	0.00	0.00	0.00	0.00	34.00	672.30	753.00
Gwalior	2346.90	4275.00	0.00	0.00	0.00	0.00	0.00	0.00	2346.90	4275.00
IIPR, Kanpur	5.00	5.00	0.00	0.00	40.00	60.00	0.00	0.00	45.00	65.00
IARI, New Delhi	15.00	9.00	0.00	0.00	0.00	0.00	10.00	10.00	25.00	19.00
CIARI, Andaman	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.22	0.50	0.22
Total	**9494.43**	**10910.36**	**2330.22**	**2345.39**	**2084.00**	**2186.90**	**406.70**	**539.92**	**14315.35**	**15982.57**
Pigeon Pea										
Ludhiana	1.88	2.50	0.20	1.00	0.00	0.00	0.00	0.00	2.08	3.50
Hisar	8.02	6.80	0.00	0.00	0.00	0.00	0.00	0.00	8.02	6.80
Pantnagar	28.18	35.25	0.00	0.00	0.00	75.00	0.00	85.00	28.18	195.25
Faizabad	34.25	50.00	0.00	0.00	0.00	0.00	0.00	0.00	34.25	50.00
Varanasi	17.13	17.80	0.00	0.00	0.00	0.00	0.00	0.00	17.13	17.80
Ranchi	0.00	0.00	0.30	0.30	0.00	0.00	0.00	0.00	0.30	0.30
Dholi	2.78	10.00	16.00	3.25	0.00	0.00	0.00	0.00	18.78	13.25
Kota	0.00	0.00	0.00	0.00	0.00	0.00	40.00	70.00	40.00	70.00
S.K. Nagar	0.10	1.00	19.03	20.50	0.00	0.00	0.00	0.00	19.13	21.50
Anand	1.00	2.50	0.00	0.00	0.00	0.00	6.00	6.00	7.00	8.50
Raipur	32.20	34.80	0.00	0.00	0.00	0.00	0.00	0.00	32.20	34.80
Jabalpur	43.12	52.30	337.40	337.40	20.00	32.50	0.00	0.00	400.52	422.20
Rahuri	17.04	1.25	0.00	0.00	0.00	0.00	30.00	10.00	47.04	11.25
Parbhani	37.05	232.00	0.50	1.00	60.00	60.00	200.33	122.35	297.88	415.35
Akola	18.10	23.65	0.00	0.00	0.00	0.00	0.00	0.00	18.10	23.65
Bangalore	7.47	31.80	0.00	0.00	482.42	3573.70	0.00	0.00	489.89	3605.50
Dharwad	0.00	0.00	0.00	0.00	60.00	0.00	0.00	0.00	60.00	0.00
PJTSAU, Hyderabad	10.50	36.00	0.34	0.34	0.00	0.00	0.00	0.00	10.84	36.34
ANGRAU, Guntur	24.40	60.90	110.35	163.10	0.00	0.00	0.25	1.00	135.00	225.00
Coimbatore	2.40	2.40	1.30	1.30	0.00	0.00	0.40	0.20	4.10	3.90
KKV, Dapoli	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.03	0.50	0.03
Raichur	27.35	61.90	0.00	0.00	0.00	0.00	0.00	0.00	27.35	61.90
Gwalior	5.45	39.50	0.00	0.00	0.00	0.00	0.00	0.00	5.45	39.50
Jamnagar	1.10	4.00	0.00	0.00	0.00	0.00	0.00	0.00	1.10	4.00
Shimoga	0.00	0.00	9.00	7.00	0.00	0.00	0.00	0.00	9.00	7.00
Navsari	0.00	0.00	0.00	0.00	0.00	0.00	2.00	1.50	2.00	1.50

Almora	7.00	3.85	0.00	0.00	0.00	0.00	0.00	0.00	7.00	3.85
IIPR, Kanpur	10.00	10.00	0.00	0.00	15.00	20.00	0.00	0.00	25.00	30.00
IARI, RS, Karnal	4.50	2.20	0.00	0.00	0.00	0.00	0.00	0.00	4.50	2.20
IARI, New Delhi	13.72	26.80	0.00	0.00	0.00	0.00	0.00	0.00	13.72	26.80
Total	**354.74**	**749.20**	**494.42**	**535.19**	**637.42**	**3761.20**	**279.48**	**296.08**	**1766.06**	**5341.67**
Mungbean										
Srinagar	0.00	0.00	1.45	1.45	0.00	0.00	0.00	0.00	1.45	1.45
Palampur	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.50
Ludhiana	144.08	233.00	0.00	0.00	0.00	0.00	0.00	0.00	144.08	233.00
Hisar	46.75	94.00	0.00	0.00	0.00	0.00	0.00	0.00	46.75	94.00
Pantnagar	23.36	31.00	0.00	0.00	0.00	138.00	0.00	0.00	23.36	169.00
Kanpur	8.62	8.71	0.00	0.00	0.00	0.00	43.00	54.16	51.62	62.87
Jorhat	0.00	0.00	0.00	0.00	0.00	40.00	0.00	0.00	0.00	40.00
Ranchi	0.00	0.00	0.90	1.20	0.00	0.00	0.00	0.00	0.90	1.20
Dholi	0.00	0.00	24.00	28.00	84.00	90.00	0.00	0.00	108.00	118.00
Bhubaneswar	40.00	48.00	0.00	0.00	0.00	0.00	0.00	0.00	40.00	48.00
Kota	50.00	70.00	0.00	0.00	40.00	73.00	5.00	4.00	95.00	147.00
Bikaner	1.90	2.20	0.00	0.00	0.00	0.00	0.00	0.15	1.90	2.35
Jobner	87.71	47.00	0.00	0.00	0.00	0.00	0.00	0.00	87.71	47.00
S.K. Nagar	6.50	10.50	73.03	4.50	250.00	7.50	0.00	0.00	329.53	22.50
Anand	0.00	0.00	0.00	0.00	0.00	0.00	1.34	1.34	1.34	1.34
Raipur	4.60	5.30	0.00	0.00	0.00	0.00	0.00	0.00	4.60	5.30
Jabalpur	7.60	59.45	15.00	15.00	35.00	56.00	0.00	0.00	57.60	130.45
Rahuri	2.00	2.50	0.00	0.00	0.10	0.20	25.00	35.00	27.10	37.70
Akola	7.55	7.30	0.00	0.00	0.00	0.00	0.00	0.00	7.55	7.30
Parbhani	15.82	33.00	0.00	0.00	30.00	30.00	195.38	77.10	241.20	140.10
Bangalore	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00
Dharwad	16.62	1.15	0.00	0.00	5.00	0.00	0.00	0.00	21.62	1.15
PJTSAU, Hyderabad	13.00	23.00	4.98	5.12	0.00	0.00	0.00	0.00	17.98	28.12
ANGRAU, Guntur	15.60	15.60	9.90	2.20	0.00	0.00	0.00	0.00	25.50	17.80
Coimbatore	0.30	1.50	28.00	26.50	0.00	0.00	14.63	6.22	42.93	34.22
Raichur	8.00	13.26	0.00	0.00	0.00	0.00	0.00	0.00	8.00	13.26
Varanasi	27.42	30.50	0.00	0.00	0.00	0.00	0.00	0.00	27.42	30.50

Meerut	0.60	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.60
Gwalior	100.00	100.00	0.00	0.00	15.00	20.00	0.00	0.00	115.00	120.00
Shimoga	0.00	0.00	1.00	0.50	0.00	0.00	0.00	0.00	1.00	0.50
IIPR, Kanpur	61.55	66.35	0.00	0.00	26.00	35.00	0.00	0.00	87.55	101.35
Tripura	0.00	0.00	0.00	0.00	0.00	0.00	30.00	37.20	30.00	37.20
IARI, New Delhi	31.02	136.82	0.00	0.00	0.00	0.00	0.00	0.00	31.02	136.82
Total	**721.10**	**1045.24**	**158.26**	**84.47**	**485.10**	**489.70**	**314.35**	**215.17**	**1678.81**	**1834.58**
Urdbean										
Palampur	2.00	2.00	0.00	0.00	0.00	0.00	21.70	23.29	23.70	25.29
Jorhat	2.20	4.70	0.00	0.00	0.00	80.00	0.00	0.00	2.20	84.70
Ludhiana	18.50	24.00	0.00	0.00	0.00	0.00	0.00	0.00	18.50	24.00
Hisar	1.06	2.00	0.00	0.00	0.00	0.00	0.00	0.00	1.06	2.00
Pantnagar	57.48	66.00	0.00	0.00	0.00	240.00	0.00	0.00	57.48	306.00
Kanpur	53.43	54.02	0.00	0.00	0.00	0.00	25.64	41.19	79.07	95.21
Ranchi	0.25	1.10	1.00	1.00	0.00	0.00	0.00	0.00	1.25	2.10
Dholi	0.00	0.00	3.50	3.50	0.00	0.00	0.00	0.00	3.50	3.50
Bhubaneswar	12.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00	25.00
Kota	31.00	50.00	0.00	0.00	0.00	0.00	20.00	40.00	51.00	90.00
Jobner	0.00	0.00	0.00	0.00	5.00	32.00	0.00	0.00	5.00	32.00
S.K. Nagar	5.00	10.00	84.28	74.66	200.00	10.00	0.00	0.00	289.28	94.66
Raipur	10.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	10.00
Jabalpur	23.50	40.92	0.00	0.00	10.00	18.00	0.00	0.00	33.50	58.92
Rahuri	0.00	0.00	0.00	0.00	0.00	0.00	12.50	23.00	12.50	23.00
Akola	35.55	28.09	3.00	3.00	0.00	0.00	0.00	0.00	38.55	31.09
Parbhani	0.00	0.00	0.00	0.00	0.00	0.00	11.00	1.90	11.00	1.90
Dharwad	1.00	0.50	0.00	0.00	40.00	13.50	0.00	0.00	41.00	14.00
PJTSAU, Hyderabad	16.00	32.00	5.00	5.00	0.00	0.00	0.00	0.00	21.00	37.00
ANGRAU, Guntur	55.20	55.20	26.00	0.00	0.00	0.00	0.00	0.00	81.20	55.20
Coimbatore	23.20	21.48	29.00	30.30	0.00	0.00	45.69	26.71	97.89	78.49
Gwalior	0.00	3.50	0.00	0.00	20.00	21.00	0.00	0.00	20.00	24.50
Shimoga	0.00	0.00	1.00	0.50	0.00	0.00	0.00	0.00	1.00	0.50
IIPR, Kanpur	21.00	30.20	0.00	0.00	17.00	21.00	0.00	0.00	38.00	51.20
CIARI, Andaman	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.27	0.20	0.27

Total	**368.37**	**460.71**	**152.78**	**117.96**	**292.00**	**435.50**	**136.73**	**156.36**	**949.88**	**1170.53**
Field Pea										
Srinagar	0.00	0.00	0.96	0.96	0.00	0.00	0.00	0.00	0.96	0.96
Hisar	24.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	24.00	10.00
Pantnagar	24.80	30.00	0.00	0.00	40.00	40.00	0.00	25.00	64.80	95.00
Faizabad	0.00	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65
Kanpur	2.00	12.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	12.00
Varanasi	5.00	5.40	1.00	1.50	0.00	0.00	0.00	0.00	6.00	6.90
Dholi	24.00	24.00	5.17	5.17	0.00	0.00	0.00	0.00	29.17	29.17
Kota	50.00	45.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00	45.00
Raipur	36.00	45.00	0.00	0.00	0.00	0.00	0.00	0.00	36.00	45.00
Jabalpur	79.50	79.50	0.00	0.00	0.00	0.00	0.00	0.00	79.50	79.50
IIPR, Kanpur	80.00	80.25	0.00	0.00	26.00	28.20	0.00	0.00	106.00	108.45
IARI, RS, Karnal	21.60	4.10	0.00	0.00	0.00	0.00	0.00	0.00	21.60	4.10
Tripura	20.00	22.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	22.00
Total	**366.90**	**357.90**	**7.13**	**7.63**	**66.00**	**68.20**	**0.00**	**25.00**	**440.03**	**458.73**
Lentil										
Srinagar	0.00	0.00	1.04	1.04	0.00	0.00	0.00	0.00	1.04	1.04
Palampur	0.00	0.00	1.00	1.50	0.00	0.00	2.00	2.50	3.00	4.00
Ludhiana	1.30	5.00	0.00	0.00	0.00	0.00	0.00	0.00	1.30	5.00
Hisar	1.40	2.17	0.00	0.00	0.00	0.00	0.00	0.00	1.40	2.17
Pantnagar	43.50	97.00	0.00	0.00	60.00	100.00	0.00	0.00	103.50	197.00
Faizabad	0.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00
Kanpur	52.43	77.00	0.00	0.00	0.00	0.00	0.00	0.00	52.43	77.00
Varanasi	10.00	14.50	9.00	15.00	0.00	0.00	0.00	0.00	19.00	29.50
Jorhat	0.00	0.00	0.00	0.00	0.00	30.00	0.00	0.00	0.00	30.00
Ranchi	0.00	0.00	0.60	0.85	0.00	0.00	0.00	0.00	0.60	0.85
Dholi	55.99	55.99	0.00	0.00	0.00	0.00	0.00	0.00	55.99	55.99
Kota	40.00	45.00	0.00	0.00	0.00	0.00	0.00	0.00	40.00	45.00
Jabalpur	133.25	133.25	100.00	100.00	40.00	40.00	0.00	0.00	273.25	273.25
BCKV, West Bengal	0.00	0.00	2.00	2.00	0.00	0.00	1.00	1.25	3.00	3.25
Gwalior	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36.00	0.00	36.00
Almora	7.40	9.80	0.00	0.00	0.00	0.00	0.00	0.00	7.40	9.80

IIPR, Kanpur	27.00	27.00	0.00	0.00	10.00	12.66	0.00	0.00	37.00	39.66
IARI, New Delhi	21.50	24.00	0.00	0.00	0.00	0.00	0.00	0.00	21.50	24.00
Total	**393.77**	**498.71**	**113.64**	**120.39**	**110.00**	**182.66**	**3.00**	**39.75**	**620.41**	**841.51**
Rajmah										
Palampur	0.00	0.00	12.00	12.63	0.00	0.00	2.30	2.50	14.30	15.13
Dholi	0.00	0.00	1.73	1.73	0.00	0.00	0.00	0.00	1.73	1.73
Rahuri	0.00	0.00	0.00	0.00	4.00	11.00	0.00	0.00	4.00	11.00
Almora	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.14	0.10	0.14
Total	**0.00**	**0.00**	**13.73**	**14.36**	**4.00**	**11.00**	**2.40**	**2.64**	**20.13**	**28.00**
Horse Gram										
Ranchi	0.42	0.30	0.00	0.00	-	-	0.00	0.00	0.42	0.30
Udaipur	3.00	1.10	0.00	0.00	-	-	0.00	0.00	3.00	1.10
Raipur	10.50	4.50	0.00	0.00	-	-	0.50	1.00	11.00	5.50
Bangalore	0.00	3.00	0.00	0.00	-	-	0.00	0.00	0.00	3.00
SK Nagar	0.85	6.00	0.00	0.00	-	-	0.00	0.00	0.85	6.00
Coimbatore	0.00	0.00	5.00	5.00	-	-	0.00	0.00	5.00	5.00
KKV, Dapoli	0.00	0.00	0.00	0.00	-	-	10.00	12.00	10.00	12.00
Almora	2.00	1.50	0.00	0.00	-	-	0.00	0.00	2.00	1.50
Total	**16.77**	**16.40**	**5.00**	**5.00**	**-**	**-**	**10.50**	**13.00**	**32.27**	**34.40**
Indian Bean										
Bangalore	0.00	0.00	0.00	0.00	-	-	0.00	8.00	0.00	8.00
KKV, Dapoli	0.00	0.00	0.00	0.00	-	-	12.00	15.00	12.00	15.00
Almora	0.00	0.00	0.00	0.00	-	-	0.10	0.10	0.10	0.10
Total	**0.00**	**0.00**	**0.00**	**0.00**	**-**	**-**	**12.10**	**23.10**	**12.10**	**23.10**
Cowpea										
Srinagar	0.00	0.00	0.14	0.14	-	-	0.00	0.00	0.14	0.14
Palampur	0.00	0.00	0.00	0.00	-	-	0.30	0.32	0.30	0.32
S.K. Nagar	3.75	5.61	0.00	0.00	-	-	0.00	0.00	3.75	5.61
Hisar	2.00	0.00	0.00	0.00	-	-	0.00	0.00	2.00	0.00
Jobner	4.00	10.20	0.00	0.00	-	-	0.00	0.00	4.00	10.20
Pantnagar	0.20	12.25	0.00	0.00	-	-	0.00	0.00	0.20	12.25
Dharwad	1.50	3.00	2.00	3.00	-	-	0.00	0.00	3.50	6.00
Bangalore	7.60	0.25	2.00	0.00	-	-	0.00	24.20	9.60	24.45

Coimbatore	0.00	0.00	3.00	3.20	-	-	0.40	0.46	3.40	3.66
KKV, Dapoli	0.00	0.00	0.00	0.00	-	-	22.00	27.00	22.00	27.00
CCARI, Goa	0.00	0.00	2.00	2.00	-	-	0.00	0.00	2.00	2.00
Total	**19.05**	**31.31**	**9.14**	**8.34**	**-**	**-**	**22.70**	**51.98**	**50.89**	**91.63**
Mothbean										
Bikaner	19.10	35.00	0.00	0.00	0.00	0.00	0.00	0.00	19.10	35.00
S.K. Nagar	0.00	0.00	0.40	0.46	0.00	0.00	0.00	0.00	0.40	0.46
Jodhpur	5.80	7.00	0.00	0.00	1.00	1.00	0.00	0.00	6.80	8.00
Total	**24.90**	**42.00**	**0.40**	**0.46**	**1.00**	**1.00**	**0.00**	**0.00**	**26.30**	**43.46**
Lathyrus										
Raipur	103.00	116.00	5.00	10.00	-	-	0.00	0.00	108.00	126.00
IARI, RS, Karnal	28.50	28.50	0.00	0.00	-	-	0.00	0.00	28.50	28.50
Total	**131.50**	**144.50**	**5.00**	**10.00**	**-**	**-**	**0.00**	**0.00**	**136.50**	**154.50**
Kulthi										
Palampur	0.00	0.00	0.00	0.00	-	-	0.65	0.76	0.65	0.76
Total	**0.00**	**0.00**	**0.00**	**0.00**	**-**	**-**	**0.65**	**0.76**	**0.65**	**0.76**
Guar										
S.K. Nagar	0.00	0.00	5.61	5.60	-	-	0.00	0.00	5.61	5.60
Total	**0.00**	**0.00**	**5.61**	**5.60**	**-**	**-**	**0.00**	**0.00**	**5.61**	**5.60**
Total Pulse Crops	**11891.53**	**14256.33**	**3295.33**	**3254.79**	**3679.52**	**7136.16**	**1188.61**	**1363.76**	**20054.99**	**26011.04**
Oilseed Crops										
Soybean										
Palampur	2.00	2.00	3.00	3.80	-	-	23.00	28.35	28.00	34.15
Ludhiana	0.35	4.00	0.00	0.00	-	-	0.00	0.00	0.35	4.00
Pantnagar	36.00	58.50	0.00	0.00	-	-	0.00	0.00	36.00	58.50
Ranchi	10.00	8.00	0.00	0.00	-	-	0.00	0.00	10.00	8.00
Kota	1401.00	861.00	0.00	0.00	-	-	0.00	18.00	1401.00	879.00
Anand	0.00	0.00	0.00	0.00	-	-	13.00	13.60	13.00	13.60
Raipur	620.00	153.60	0.00	0.00	-	-	0.00	0.00	620.00	153.60
Jabalpur	5100.00	1354.10	102.00	102.00	-	-	0.00	0.00	5202.00	1456.10
Rahuri	1230.00	1245.00	160.00	165.00	-	-	230.00	257.00	1620.00	1667.00
Akola	700.00	565.00	0.00	0.00	-	-	0.00	0.00	700.00	565.00
Parbhani	2475.00	1988.00	0.00	0.00	-	-	275.00	495.69	2750.00	2483.69

Bangalore	300.00	150.00	0.00	0.00	-	-	0.00	104.00	300.00	254.00
Dharwad	3335.00	1750.00	450.00	200.00	-	-	0.00	0.00	3785.00	1950.00
PJTSAU, Hyderabad	390.00	269.00	255.85	256.00	-	-	0.00	0.00	645.85	525.00
Raichur	200.00	192.00	0.00	0.00	-	-	150.00	250.00	350.00	442.00
Gwalior	4400.00	1866.00	0.00	0.00	-	-	0.00	0.00	4400.00	1866.00
Almora	10.00	9.50	0.00	0.00	-	-	0.00	0.00	10.00	9.50
IISR, Indore	320.00	59.60	0.00	0.00	-	-	0.00	0.00	320.00	59.60
Manipur	0.00	0.00	0.00	0.00	-	-	0.20	0.30	0.20	0.30
Total	**20529.35**	**10535.30**	**970.85**	**726.80**	**-**	**-**	**691.20**	**1166.94**	**22191.40**	**12429.04**
Sunflower										
Bangalore	1.07	2.10	5.50	7.25	-	-	5.00	6.65	11.57	16.00
Coimbatore	0.00	0.00	0.30	0.30	-	-	0.00	0.70	0.30	1.00
Raichur	0.00	0.00	0.00	0.00	-	-	0.00	0.90	0.00	0.90
IIOR, Hyderabad	0.83	1.10	0.50	0.75	-	-	0.00	0.00	1.33	1.85
Total	**1.90**	**3.20**	**6.30**	**8.30**	**-**	**-**	**5.00**	**8.25**	**13.20**	**19.75**
Groundnut										
Ludhiana	1.05	1.50	0.00	0.00	-	-	0.00	0.00	1.05	1.50
Kanpur	5.00	5.00	0.00	0.00	-	-	0.00	0.00	5.00	5.00
Ranchi	9.95	1.76	0.00	0.00	-	-	0.00	0.00	9.95	1.76
Bikaner	70.40	78.00	0.00	0.00	-	-	0.00	0.00	70.40	78.00
Anand	0.00	0.00	90.00	90.00	-	-	0.00	0.00	90.00	90.00
Jamnagar	164.00	144.00	1826.80	1932.00	-	-	0.00	0.00	1990.80	2076.00
Jabalpur	0.00	0.00	1.80	1.80	-	-	0.00	0.00	1.80	1.80
Rahuri	55.00	35.00	50.00	43.00	-	-	19.00	36.00	124.00	114.00
Akola	0.00	0.00	10.00	3.50	-	-	0.00	0.00	10.00	3.50
Parbhani	5.00	1.75	0.00	0.00	-	-	8.00	6.00	13.00	7.75
Bangalore	0.00	0.00	0.00	15.00	-	-	0.00	20.00	0.00	35.00
Dharwad	1795.00	2399.00	105.00	106.00	-	-	0.00	0.00	1900.00	2505.00
ANGRAU, Guntur	5885.00	9334.50	9.00	827.23	-	-	0.00	0.00	5894.00	10161.73
Coimbatore	10.00	0.00	475.00	353.00	-	-	0.00	22.20	485.00	375.20
Gwalior	1.00	0.45	0.00	0.00	-	-	0.00	0.00	1.00	0.45
KKV, Dapoli	0.00	0.00	0.00	0.00	-	-	41.00	47.90	41.00	47.90
Jobner	125.00	93.90	0.00	0.00	-	-	0.00	0.00	125.00	93.90

Manipur	0.00	0.00	0.00	0.00	-	-	0.50	0.60	0.50	0.60
DGR, Junagadh	170.00	71.80	0.00	0.00	-	-	0.00	0.00	170.00	71.80
Total	**8296.40**	**12166.66**	**2567.60**	**3371.53**	**-**	**-**	**68.50**	**132.70**	**10932.50**	**15670.89**
Linseed										
Palampur	1.50	2.00	0.20	0.40	-	-	1.90	2.55	3.60	4.95
Ludhiana	0.00	0.00	0.50	0.60	-	-	0.00	0.00	0.50	0.60
CSAUAT, Kanpur	10.03	12.20	0.00	0.00	-	-	0.00	0.00	10.03	12.20
Ranchi	0.00	0.00	0.50	0.65	-	-	0.00	0.00	0.50	0.65
Kota	6.96	24.00	0.00	0.00	-	-	0.00	0.00	6.96	24.00
Raipur	25.86	48.00	1.00	1.50	-	-	0.00	0.00	26.86	49.50
Jabalpur	15.38	15.38	239.32	239.32	-	-	0.00	0.00	254.70	254.70
Akola	0.30	1.10	0.00	0.00	-	-	0.00	0.00	0.30	1.10
Total	**60.03**	**102.68**	**241.52**	**242.47**	**-**	**-**	**1.90**	**2.55**	**303.45**	**347.70**
Safflower										
Rahuri	3.30	2.10	0.10	0.10	-	-	0.00	0.00	3.40	2.20
Akola	5.20	10.73	0.00	0.00	-	-	0.00	0.00	5.20	10.73
Parbhani	5.45	70.00	0.00	0.00	-	-	232.00	241.00	237.45	311.00
Dharwad	0.00	0.00	0.20	0.30	-	-	0.00	0.00	0.20	0.30
PJTSAU, Hyderabad	0.00	0.00	0.15	0.30	-	-	0.00	0.00	0.15	0.30
Gwalior	0.00	0.00	0.00	0.00	-	-	0.00	1.50	0.00	1.50
Total	**13.95**	**82.83**	**0.45**	**0.70**	**-**	**-**	**232.00**	**242.50**	**246.40**	**326.03**
Sesame										
Palampur	0.05	0.10	0.00	0.00	-	-	3.00	2.90	3.05	3.00
Ludhiana	0.02	0.08	0.00	0.00	-	-	0.00	0.00	0.02	0.08
Hisar	0.46	0.15	0.00	0.00	-	-	0.00	0.00	0.46	0.15
Kanpur	0.01	0.10	0.00	0.00	-	-	2.50	3.94	2.51	4.04
Ranchi	0.01	0.00	0.05	0.10	-	-	0.00	0.00	0.06	0.10
Bhubaneswar	0.95	0.25	0.00	0.00	-	-	0.25	0.25	1.20	0.50
Jamnagar	4.88	5.10	21.52	19.50	-	-	0.00	0.00	26.40	24.60
Jabalpur	6.90	3.75	2.85	2.85	-	-	0.00	0.00	9.75	6.60
Rahuri	0.02	0.20	0.00	0.00	-	-	0.10	0.20	0.12	0.40
PJTSAU, Hyderabad	0.25	1.17	0.19	0.19	-	-	0.00	0.00	0.44	1.36
ANGRAU, Guntur	0.00	0.00	3.10	3.10	-	-	0.00	0.00	3.10	3.10

Akola	0.04	0.04	0.00	0.00	-	-	0.00	0.00	0.04	0.04
Dholi	0.50	0.60	1.60	1.60	-	-	0.00	0.00	2.10	2.20
Dharwad	0.00	0.00	0.20	0.20	-	-	0.10	0.10	0.30	0.30
Coimbatore	0.00	0.00	4.00	4.30	-	-	7.40	0.69	11.40	4.99
Total	**14.09**	**11.54**	**33.51**	**31.84**	**-**	**-**	**13.35**	**8.08**	**60.95**	**51.46**
Niger										
Ranchi	8.07	5.50	0.00	0.00	-	-	0.00	0.00	8.07	5.50
Bhubaneswar	2.85	3.30	0.00	0.00	-	-	0.00	0.00	2.85	3.30
Jabalpur	5.60	4.37	11.49	11.49	-	-	0.00	0.00	17.09	15.86
Rahuri	0.00	0.00	0.05	0.25	-	-	0.10	0.60	0.15	0.85
Dharwad	1.00	0.50	0.10	0.10	-	-	0.00	0.00	1.10	0.60
Total	**17.52**	**13.67**	**11.64**	**11.84**	**-**	**-**	**0.10**	**0.60**	**29.26**	**26.11**
Castor										
S.K. Nagar	1.17	1.50	25.29	37.16	-	-	0.00	0.00	26.46	38.66
PJTSAU, Hyderabad	0.20	0.20	0.82	0.82	-	-	0.00	0.00	1.02	1.02
Coimbatore	0.00	0.00	0.10	0.10	-	-	0.00	0.00	0.10	0.10
IIOR, Hyderabad	0.50	0.70	0.00	0.00	-	-	0.00	0.00	0.50	0.70
Total	**1.87**	**2.40**	**26.21**	**38.08**	**-**	**-**	**0.00**	**0.00**	**28.08**	**40.48**
Indian Mustard										
Jammu	0.00	0.00	0.03	0.90	-	-	0.00	0.00	0.03	0.90
Hisar	8.92	22.05	25.00	27.80	-	-	0.00	0.00	33.92	49.85
Faizabad	0.00	11.00	0.00	0.00	-	-	0.00	0.00	0.00	11.00
Kanpur	8.33	19.75	0.00	0.00	-	-	0.00	0.00	8.33	19.75
Jorhat	5.20	3.50	0.00	0.00	-	-	0.00	4.00	5.20	7.50
Ranchi	0.05	0.10	0.50	0.75	-	-	0.00	0.00	0.55	0.85
Bikaner	1.80	4.40	0.00	0.00	-	-	0.00	0.00	1.80	4.40
S.K. Nagar	0.15	0.15	2.25	2.25	-	-	0.00	0.00	2.40	2.40
Raipur	2.50	4.00	0.00	0.00	-	-	0.00	0.00	2.50	4.00
Jabalpur	0.00	0.00	95.00	95.00	-	-	0.00	0.00	95.00	95.00
Gwalior	0.00	0.00	0.00	0.00	-	-	0.00	37.50	0.00	37.50
IARI, RS, Karnal	11.44	22.38	0.00	0.00	-	-	0.00	0.00	11.44	22.38
IARI, New Delhi	17.32	29.00	0.00	0.00	-	-	0.00	0.00	17.32	29.00
DRMR, Bharatpur	4.85	11.50	0.00	0.00	-	-	0.00	0.00	4.85	11.50

Total	**60.56**	**127.83**	**122.78**	**126.70**	**-**	**-**	**0.00**	**41.50**	**183.34**	**296.03**
Toria										
Jammu	0.00	0.00	0.09	0.30	-	-	0.00	0.10	0.09	0.40
Palampur	0.00	0.00	0.50	1.00	-	-	0.00	0.00	0.50	1.00
Ludhiana	0.12	1.00	0.00	0.00	-	-	0.00	0.00	0.12	1.00
Pantnagar	5.62	31.00	0.00	0.00	-	-	0.00	0.00	5.62	31.00
Kanpur	1.50	2.10	0.00	0.00	-	-	0.00	0.00	1.50	2.10
Almora	0.00	0.00	0.10	0.10	-	-	0.00	0.00	0.10	0.10
Total	**7.24**	**34.10**	**0.69**	**1.40**	**-**	**-**	**0.00**	**0.10**	**7.93**	**35.60**
Ghobi Sarson										
Jammu	0.00	0.00	0.05	0.40	-	-	0.00	0.70	0.05	1.10
Palampur	0.00	0.00	0.20	0.40	-	-	0.30	0.40	0.50	0.80
Ludhiana	0.05	8.80	0.00	0.00	-	-	0.00	0.00	0.05	8.80
Total	**0.05**	**8.80**	**0.25**	**0.80**	**-**	**-**	**0.30**	**1.10**	**0.60**	**10.70**
Brown Sarson										
Srinagar	0.00	0.00	1.60	1.60	-	-	0.00	0.00	1.60	1.60
Palampur	0.00	0.00	0.15	0.30	-	-	0.20	0.30	0.35	0.60
Total	**0.00**	**0.00**	**1.75**	**1.90**	**-**	**-**	**0.20**	**0.30**	**1.95**	**2.20**
Yellow Sarson										
Dholi	0.00	0.00	0.96	0.96	-	-	0.00	0.00	0.96	0.96
DRMR, Bharatpur	0.20	0.30	0.00	0.00	-	-	0.00	0.00	0.20	0.30
Total	**0.20**	**0.30**	**0.96**	**0.96**	**-**	**-**	**0.00**	**0.00**	**1.16**	**1.26**
Karan Rai										
Palampur	0.00	0.00	0.05	0.10	-	-	0.00	0.00	0.05	0.10
Total	**0.00**	**0.00**	**0.05**	**0.10**	**-**	**-**	**0.00**	**0.00**	**0.05**	**0.10**
Rai/ Sarson										
Pantnagar	2.57	28.50	0.00	0.00	-	-	0.00	10.00	2.57	38.50
Total	**2.57**	**28.50**	**0.00**	**0.00**	**-**	**-**	**0.00**	**10.00**	**2.57**	**38.50**
Raya										
Palampur	0.00	0.00	0.05	0.10	-	-	0.00	0.00	0.05	0.10
Ludhiana	0.30	6.50	0.00	0.00	-	-	0.00	0.00	0.30	6.50
Total	**0.30**	**6.50**	**0.05**	**0.10**	**-**	**-**	**0.00**	**0.00**	**0.35**	**6.60**
Total Oilseed Crops	**29006.03**	**23124.31**	**3984.61**	**4563.52**	**-**	**-**	**1012.55**	**1614.62**	**34003.19**	**29302.45**

Fibre Crops										
Cotton										
Ludhiana	3.85	11.40	0.70	0.70	-	-	0.00	0.00	4.55	12.10
Hisar	4.33	5.12	22.37	24.66	-	-	0.00	0.00	26.70	29.78
Bikaner	12.00	13.00	0.00	0.00	-	-	0.00	0.00	12.00	13.00
Anand	0.08	5.40	0.02	32.53	-	-	5.00	0.00	5.10	37.93
Rahuri	1.59	3.10	0.00	0.00	-	-	0.10	0.20	1.69	3.30
Akola	0.93	0.93	0.65	0.65	-	-	0.00	0.00	1.58	1.58
ANGRAU, Guntur	0.08	0.09	17.50	17.49	-	-	0.00	0.00	17.58	17.58
Parbhani	0.32	4.20	0.00	0.00	-	-	8.10	4.95	8.42	9.15
Coimbatore	0.10	0.00	0.35	0.00	-	-	1.86	0.86	2.31	0.86
CICR, Nagpur	0.10	1.10	0.00	0.00	-	-	0.00	4.50	0.10	5.60
Total	**23.38**	**44.34**	**41.59**	**76.03**	**-**	**-**	**15.06**	**10.51**	**80.03**	**130.88**
Jute										
Faizabad	0.04	0.00	0.00	0.00	-	-	0.00	0.00	0.04	0.00
Barrackpore	9.29	10.77	0.00	0.00	-	-	0.00	0.00	9.29	10.77
Total	**9.33**	**10.77**	**0.00**	**0.00**	**-**	**-**	**0.00**	**0.00**	**9.33**	**10.77**
Sunhemp										
Jabalpur	0.00	0.00	18.00	18.00	-	-	0.00	0.00	18.00	18.00
Barrackpore	3.00	3.00	0.00	0.00	-	-	0.00	0.00	3.00	3.00
Total	**3.00**	**3.00**	**18.00**	**18.00**	**-**	**-**	**0.00**	**0.00**	**21.00**	**21.00**
Total Fibre Crops	**35.71**	**58.11**	**59.59**	**94.03**	**-**	**-**	**15.06**	**10.51**	**110.36**	**162.65**
Forage Crops										
Maize										
Ludhiana	57.00	60.00	0.00	0.00	-	-	0.00	0.00	57.00	60.00
Udaipur	10.00	10.00	0.00	0.00	-	-	0.00	0.00	10.00	10.00
Rahuri	24.07	35.00	0.00	0.00	-	-	0.00	0.00	24.07	35.00
Jhansi	0.00	10.00	0.00	0.00	-	-	0.00	0.00	0.00	10.00
Total	**91.07**	**115.00**	**0.00**	**0.00**	**-**	**-**	**0.00**	**0.00**	**91.07**	**115.00**
Oats										
Srinagar	0.00	0.00	50.00	50.05	-	-	0.00	0.00	50.00	50.05
Palampur	0.00	0.00	0.00	0.00	-	-	20.00	30.00	20.00	30.00
Ludhiana	110.05	116.00	0.00	0.00	-	-	0.00	0.00	110.05	116.00

Hisar	37.60	43.00	0.00	0.00	-	-	0.00	0.00	37.60	43.00
Anand	60.00	65.00	10.00	10.00	-	-	0.00	0.00	70.00	75.00
Jabalpur	100.00	85.00	65.00	65.00	-	-	0.00	0.00	165.00	150.00
Rahuri	35.00	30.50	0.00	0.00	-	-	2.00	3.00	37.00	33.50
Jhansi	125.00	145.00	0.00	0.00	-	-	0.00	0.00	125.00	145.00
Total	**467.65**	**484.50**	**125.00**	**125.05**	**-**	**-**	**22.00**	**33.00**	**614.65**	**642.55**
Sorghum										
Ludhiana	0.63	0.75	0.00	0.00	-	-	0.00	0.00	0.63	0.75
Hisar	2.05	2.10	0.00	0.00	-	-	0.30	0.50	2.35	2.60
Pantnagar	13.15	20.57	0.00	0.00	-	-	0.00	0.00	13.15	20.57
Jabalpur	2.30	6.00	0.00	0.00	-	-	0.00	0.00	2.30	6.00
Udaipur	3.00	4.35	0.00	0.00	-	-	0.00	0.00	3.00	4.35
Coimbatore	7.66	1.74	0.00	0.02	-	-	0.80	0.55	8.46	2.31
IIMR, Hyderabad	7.25	13.57	0.00	6.50	-	-	0.00	0.00	7.25	20.07
IARI, RS, Karnal	12.80	8.88	0.00	0.00	-	-	0.00	0.00	12.80	8.88
Total	**48.84**	**57.96**	**0.00**	**6.52**	**-**	**-**	**1.10**	**1.05**	**49.94**	**65.53**
Cowpea										
Pantnagar	8.00	7.00	0.00	0.00	-	-	0.00	0.00	8.00	7.00
Ludhiana	0.40	0.50	0.00	0.00	-	-	0.00	0.00	0.40	0.50
Jobner	0.00	0.00	0.00	0.00	-	-	3.00	7.90	3.00	7.90
Jhansi	4.55	5.80	0.00	0.00	-	-	0.00	0.00	4.55	5.80
Rahuri	5.00	7.00	0.00	0.00	-	-	0.80	7.50	5.80	14.50
PJTSAU, Hyderabad	0.00	0.00	0.20	0.20	-	-	0.00	0.00	0.20	0.20
Coimbatore	0.00	0.00	3.00	0.00	-	-	0.00	0.00	3.00	0.00
Total	**17.95**	**20.30**	**3.20**	**0.20**	**-**	**-**	**3.80**	**15.40**	**24.95**	**35.90**
Metha										
Ludhiana	0.00	0.00	1.00	1.00	-	-	0.00	0.00	1.00	1.00
Total	**0.00**	**0.00**	**1.00**	**1.00**	**-**	**-**	**0.00**	**0.00**	**1.00**	**1.00**
Berseem										
Ludhiana	28.24	42.00	0.00	0.00	-	-	0.00	0.00	28.24	42.00
Hisar	2.20	2.50	0.00	0.00	-	-	0.00	0.00	2.20	2.50
Jabalpur	0.00	0.00	2.00	2.00	-	-	0.00	0.00	2.00	2.00
Jhansi	14.60	40.00	0.00	0.00	-	-	0.00	0.00	14.60	40.00

Total	**45.04**	**84.50**	**2.00**	**2.00**	**-**	**-**	**0.00**	**0.00**	**47.04**	**86.50**
Guar										
Hisar	106.10	75.60	23.00	25.60	-	-	0.00	0.00	129.10	101.20
Ludhiana	0.20	0.50	0.50	0.50	-	-	0.00	0.00	0.70	1.00
Bikaner	68.50	82.00	0.00	0.00	-	-	0.00	0.00	68.50	82.00
Jobner	84.15	148.15	0.00	0.00	-	-	0.00	0.00	84.15	148.15
Total	**258.95**	**306.25**	**23.50**	**26.10**	**-**	**-**	**0.00**	**0.00**	**282.45**	**332.35**
Pearlmillet										
Rahuri	0.00	0.00	0.00	0.00	-	-	0.10	0.50	0.10	0.50
PJTSAU, Hyderabad	0.00	0.00	0.22	0.22	-	-	0.00	0.00	0.22	0.22
Jhansi	0.10	0.00	0.00	0.00	-	-	0.00	0.00	0.10	0.00
Total	**0.10**	**0.00**	**0.22**	**0.22**	**-**	**-**	**0.10**	**0.50**	**0.42**	**0.72**
Lucerne										
Anand	4.70	7.00	1.30	2.30	-	-	0.00	0.00	6.00	9.30
Rahuri	0.20	2.00	0.00	0.00	-	-	0.40	1.00	0.60	3.00
Total	**4.90**	**9.00**	**1.30**	**2.30**	**-**	**-**	**0.40**	**1.00**	**6.60**	**12.30**
Stylo										
Rahuri	0.00	0.00	0.00	0.00	-	-	0.05	0.10	0.05	0.10
Total	**0.00**	**0.00**	**0.00**	**0.00**	**-**	**-**	**0.05**	**0.10**	**0.05**	**0.10**
White Clover										
Palampur	0.00	0.00	0.00	0.00	-	-	0.10	0.20	0.10	0.20
Total	**0.00**	**0.00**	**0.00**	**0.00**	**-**	**-**	**0.10**	**0.20**	**0.10**	**0.20**
Total Forage Crops	**934.50**	**1077.51**	**156.22**	**163.39**	**-**	**-**	**27.55**	**51.25**	**1118.27**	**1292.15**
Grand Total	**65307.55**	**73304.88**	**23900.65**	**25781.83**	**3679.52**	**7136.16**	**5160.65**	**10576.16**	**98048.37**	**116799.03**

Note: For *Rabi* 2017-18, expected breeder seed production figures were used in compilation.

Table – 3: Centre-wise breeder seed production during 2017-18

(in quintals)

Sl. No	Centre	GOI		State		Pulses Seed Hub		ICAR Seed Project		Total	
		Indent	Production	Indent	Production	Indent	Production	Target	Production	Indent	Production
	State Agricultural Universities										
1	SKUAS &T, Srinagar	1.00	0.00	88.86	93.34	-	-	0.00	0.00	89.86	93.34
2	SKUAS &T, Jammu	110.50	10.50	110.67	111.25	-	-	0.00	11.40	221.17	133.15
3	CSKHPKV, Palampur	204.05	239.60	160.15	188.23	-	-	243.45	324.22	607.65	752.05
4	PAU, Ludhiana	3152.02	4349.92	77.90	245.80	-	-	0.00	0.00	3229.92	4595.72
5	CCSHAU, Hisar	1785.06	1927.73	246.67	294.26	315.00	345.00	0.76	2.08	2347.49	2569.07
6	GBPUAT, Pantnagar	971.82	3402.59	0.00	0.00	200.00	693.00	0.00	3986.00	1171.82	8081.59
7	NDUA&T, Faizabad	546.80	1208.45	0.00	0.00	-	-	122.50	167.34	669.30	1375.79
8	CSAUA&T, Kanpur	463.22	901.38	0.00	0.00	-	-	75.64	106.49	538.86	1007.87
9	BHU, Varanasi	138.48	165.90	34.50	43.00	-	-	0.00	123.40	172.98	332.30
10	AAU, Jorhat	24.40	27.20	0.00	388.80	0.00	150.00	0.00	4.00	24.40	570.00
11	BAU, Ranchi	48.78	37.46	87.25	171.55	-	-	0.00	1.50	136.03	210.51
12	RPCAU, Dholi	1023.51	1099.63	569.28	693.98	84.00	90.00	0.00	0.00	1676.79	1883.61
13	OUA&T, Bhubaneswar	203.00	276.77	0.00	0.00	-	-	14.05	14.05	217.05	290.82
14	AU, Kota	3245.27	3190.10	0.00	0.00	390.00	473.00	65.00	132.00	3700.27	3795.10
15	SKRAU, Bikaner	1545.09	1632.60	0.00	0.00	500.00	689.00	0.00	0.15	2045.09	2321.75
16	MPUAT, Udaipur	217.02	220.11	230.00	160.00	12.00	8.00	0.00	0.00	459.02	388.11
17	SKNAU, Jobner	301.24	307.55	0.00	0.00	5.00	32.00	3.00	7.90	309.24	347.45
18	SDAU, S.K.Nagar	630.02	647.26	2463.19	2398.43	450.00	17.50	0.00	0.00	3543.21	3063.19
19	AAU, Anand	65.78	79.90	188.17	429.83	-	-	56.84	52.44	310.79	562.17
20	JAU, Jamnagar	418.05	346.07	2045.97	2153.00	-	-	0.00	0.00	2464.02	2499.07
21	IGKV, Raipur	2057.71	2025.70	30.20	49.80	-	-	0.50	12.80	2088.41	2088.30
22	JNKVV, Jabalpur	9315.09	7543.64	13426.14	13426.14	495.00	476.50	0.00	0.00	23236.23	21446.28
23	MPKV, Rahuri	2237.25	2229.14	267.16	246.37	6.10	16.20	795.57	1085.89	3306.08	3577.60
24	PDKV, Akola	1338.11	1192.91	345.25	464.47	-	-	0.00	0.00	1683.36	1657.38
25	MAU, Parbhani	3079.02	2736.03	0.50	1.00	90.00	90.00	1093.58	1077.34	4263.10	3904.37
26	UAS, Bangalore	335.16	345.59	27.70	42.70	782.42	3783.60	7.00	187.85	1152.28	4359.74
27	UAS, Dharwad	6100.92	4829.35	780.10	449.40	180.00	53.50	0.10	0.10	7061.12	5332.35
28	PJTSAU, Hyderabad	559.65	497.57	937.88	966.81	0.00	0.00	3.00	3.00	1500.53	1467.38
29	ANGRAU, Guntur	7904.85	11129.49	958.76	2003.10	-	-	0.25	63.14	8863.86	13195.73

30	TNAU, Coimbatore	146.77	51.58	708.40	607.87	-	-	1276.68	1233.79	2131.85	1893.24
31	KAU, Pattambi	22.20	63.14	4.45	13.30	-	-	15.20	41.60	41.85	118.04
32	PAJANCOA&RI, Karaikal	0.00	0.00	7.90	45.15	-	-	0.00	0.00	7.90	45.15
33	KKV, Dapoli	25.37	39.10	0.00	0.00	-	-	306.88	303.14	332.25	342.24
34	BCKV, West Bengal	84.00	102.70	24.00	22.40	-	-	6.00	6.25	114.00	131.35
35	UAS, Raichur	907.65	986.16	0.00	0.00	-	-	150.00	290.90	1057.65	1277.06
36	RVSKVV, Gwalior	7727.42	9225.49	0.00	0.00	35.00	41.00	0.00	75.00	7762.42	9341.49
37	SVPUAT, Meerut	431.20	409.85	0.00	0.00	-	-	0.00	0.00	431.20	409.85
38	UAHS, Shimoga	0.00	0.00	75.00	61.00	-	-	0.00	0.00	75.00	61.00
39	NAU, Navsari	0.00	0.00	0.00	0.00	-	-	82.00	80.50	82.00	80.50
	Total SAUs	**57367.48**	**63478.16**	**23896.05**	**25770.98**	**3544.52**	**6958.30**	**4318.00**	**9394.27**	**89126.05**	**105601.71**
	ICAR, Institute										
40	VPKAS, Almora	116.09	158.35	0.10	0.10	-	-	2.10	2.59	118.29	161.04
41	IIPR, Kanpur	204.55	218.80	0.00	0.00	134.00	176.86	0.00	0.00	338.55	395.66
42	IGFRI, Jhansi	144.25	200.80	0.00	0.00	-	-	0.00	0.00	144.25	200.80
43	CRIJAF, Barrackpore	12.29	13.77	0.00	0.00	-	-	0.00	0.00	12.29	13.77
44	CAZRI, Jodhpur	5.80	7.00	0.00	0.00	1.00	1.00	0.00	0.00	6.80	8.00
45	CRRI, Cuttack	856.95	851.15	0.00	0.00	-	-	7.40	60.55	864.35	911.70
46	IIMR, Hyderabad	31.04	86.72	0.00	6.50	-	-	0.00	0.00	31.04	93.22
47	IIRR, Hyderabad	245.85	162.80	0.00	0.00	-	-	0.00	0.00	245.85	162.80
48	IIOR, Hyderabad	1.33	1.80	0.50	0.75	-	-	0.00	0.00	1.83	2.55
49	CICR, Nagpur	0.10	1.10	0.00	0.00	-	-	0.00	4.50	0.10	5.60
50	IARI,RS, Karnal	1491.44	1610.61	0.00	0.00	-	-	0.00	34.00	1491.44	1644.61
51	IARI, New Delhi	1790.65	2129.62	0.00	0.00	-	-	15.50	13.50	1806.15	2143.12
52	IARI, Indore	1109.20	1607.00	0.00	0.00	-	-	70.00	70.00	1179.20	1677.00
53	IARI, RS, Pusa Bihar	595.58	747.00	0.00	0.00	-	-	0.00	0.00	595.58	747.00
54	ICAR RC NEH, Tripura	20.00	22.00	0.00	0.00	-	-	212.00	301.60	232.00	323.60
55	ICAR RC NEH, Manipur	0.00	0.00	0.00	0.00	-	-	18.30	19.55	18.30	19.55
56	IISR, Indore	320.00	59.60	0.00	0.00	-	-	0.00	0.00	320.00	59.60
57	CAU, Imphal	0.00	0.00	0.00	0.00	-	-	16.00	19.11	16.00	19.11
58	DGR, Junagadh	170.00	71.80	0.00	0.00	-	-	0.00	0.00	170.00	71.80
59	IIMR, New Delhi	0.00	0.00	0.00	0.00	-	-	60.65	61.00	60.65	61.00
60	IIWBR, Karnal	819.90	1865.00	0.00	0.00	-	-	440.00	595.00	1259.90	2460.00
61	CCARI, Goa	0.00	0.00	4.00	3.50	-	-	0.00	0.00	4.00	3.50

62	DRMR, Bharatpur	5.05	11.80	0.00	0.00	-	-	0.00	0.00	5.05	11.80
63	CIARI, Andaman	0.00	0.00	0.00	0.00	-	-	0.70	0.49	0.70	0.49
	Total ICAR Institute	**7940.07**	**9826.72**	**4.60**	**10.85**	**135.00**	**177.86**	**842.65**	**1181.89**	**8922.32**	**11197.32**
	Total (SAU + ICAR)	**65307.55**	**73304.88**	**23900.65**	**25781.83**	**3679.52**	**7136.16**	**5160.65**	**10576.16**	**98048.37**	**116799.03**

Table 4: Crop- Wise (total) breeder seed production during 2017-18

(in quintals)

Crop	GOI		State		Pulses Seed Hub		ICAR Seed Project		Total	
	Indent	Production	Indent	Production	Indent	Production	Indent	Production	Indent	Production
Cereal Crops										
Rice	4191.48	6745.96	4588.53	5735.35	-	-	1861.65	3233.54	10641.66	15714.85
Wheat	18571.68	27130.89	11230.46	11458.16	-	-	820.00	3984.00	30622.14	42573.05
Barley	523.35	664.20	440.30	373.00	-	-	28.11	45.20	991.76	1082.40
Maize	54.44	61.56	105.58	109.83	-	-	103.75	116.37	263.77	287.76
Pearlmillet	3.59	16.03	0.21	0.77	-	-	3.23	4.18	7.03	20.98
Sorghum	52.43	111.61	3.20	3.00	-	-	93.86	86.51	149.49	201.12
Fingermillet	17.69	35.09	7.25	7.15	-	-	6.18	66.12	31.12	108.36
Foxtailmillet	6.50	10.35	2.96	3.15	-	-	0.00	0.00	9.46	13.50
Barnyard millet	5.00	5.30	3.00	2.23	-	-	0.00	0.00	8.00	7.53
Kodomillet	7.05	3.93	11.16	11.26	-	-	0.00	0.00	18.21	15.19
Prosomillet	3.50	0.00	10.00	0.20	-	-	0.00	0.00	13.50	0.20
Littlemillet	3.02	3.50	2.25	2.00	-	-	0.00	0.00	5.27	5.50
Buckwheat	0.00	0.00	0.00	0.00	-	-	0.10	0.10	0.10	0.10
Grain Amaranth	0.05	0.20	0.00	0.00	-	-	0.00	0.00	0.05	0.20
Total Cereal Crops	**23439.78**	**34788.62**	**16404.90**	**17706.10**	**-**	**-**	**2916.88**	**7536.02**	**42761.56**	**60030.74**
Pulse Crops										
Chickpea	9494.43	10910.36	2330.22	2345.39	2084.00	2186.90	406.70	539.92	14315.35	15982.57
Pigeonpea	354.74	749.20	494.42	535.19	637.42	3761.20	279.48	296.08	1766.06	5341.67
Mungbean	721.10	1045.24	158.26	84.47	485.10	489.70	314.35	215.17	1678.81	1834.58
Urdbean	368.37	460.71	152.78	117.96	292.00	435.50	136.73	156.36	949.88	1170.53
Field Pea	366.90	357.90	7.13	7.63	66.00	68.20	0.00	25.00	440.03	458.73
Lentil	393.77	498.71	113.64	120.39	110.00	182.66	3.00	39.75	620.41	841.51
Rajmah	0.00	0.00	13.73	14.36	4.00	11.00	2.40	2.64	20.13	28.00
Horse Gram	16.77	16.40	5.00	5.00	-	-	10.50	13.00	32.27	34.40
Indian Bean	0.00	0.00	0.00	0.00	-	-	12.10	23.10	12.10	23.10
Cowpea	19.05	31.31	9.14	8.34	-	-	22.70	51.98	50.89	91.63
Moth Bean	24.90	42.00	0.40	0.46	1.00	1.00	0.00	0.00	26.30	43.46
Lathyrus	131.50	144.50	5.00	10.00	-	-	0.00	0.00	136.50	154.50

Kulthi	0.00	0.00	0.00	0.00	-	-	0.65	0.76	0.65	0.76
Guar	0.00	0.00	5.61	5.60	-	-	0.00	0.00	5.61	5.60
Total Pulse Crops	**11891.53**	**14256.33**	**3295.33**	**3254.79**	**3679.52**	**7136.16**	**1188.61**	**1363.76**	**20054.99**	**26011.04**
Oilseed crops										
Soybean	20529.35	10535.30	970.85	726.80	-	-	691.20	1166.94	22191.40	12429.04
Sunflower	1.90	3.20	6.30	8.30	-	-	5.00	8.25	13.20	19.75
Groundnut	8296.40	12166.66	2567.60	3371.53	-	-	68.50	132.70	10932.50	15670.89
Linseed	60.03	102.68	241.52	242.47	-	-	1.90	2.55	303.45	347.70
Safflower	13.95	82.83	0.45	0.70	-	-	232.00	242.50	246.40	326.03
Sesame	14.09	11.54	33.51	31.84	-	-	13.35	8.08	60.95	51.46
Niger	17.52	13.67	11.64	11.84	-	-	0.10	0.60	29.26	26.11
Castor	1.87	2.40	26.21	38.08	-	-	0.00	0.00	28.08	40.48
Rapeseed & Mustard										
Indian Mustard	60.56	127.83	122.78	126.70	-	-	0.00	41.50	183.34	296.03
Toria	7.24	34.10	0.69	1.40	-	-	0.00	0.10	7.93	35.60
Ghobi Sarson	0.05	8.80	0.25	0.80	-	-	0.30	1.10	0.60	10.70
Brown Sarson	0.00	0.00	1.75	1.90	-	-	0.20	0.30	1.95	2.20
Yellow Sarson	0.20	0.30	0.96	0.96	-	-	0.00	0.00	1.16	1.26
Karan Rai	0.00	0.00	0.05	0.10	-	-	0.00	0.00	0.05	0.10
Rai/ Sarson	2.57	28.50	0.00	0.00	-	-	0.00	10.00	2.57	38.50
Raya	0.30	6.50	0.05	0.10	-	-	0.00	0.00	0.35	6.60
Total Oilseed Crops	**29006.03**	**23124.31**	**3984.61**	**4563.52**	**-**	**-**	**1012.55**	**1614.62**	**34003.19**	**29302.45**
Fibre Crops										
Cotton	23.38	44.34	41.59	76.03	-	-	15.06	10.51	80.03	130.88
Jute	9.33	10.77	0.00	0.00	-	-	0.00	0.00	9.33	10.77
Sunhemp	3.00	3.00	18.00	18.00	-	-	0.00	0.00	21.00	21.00
Total Fibre Crops	**35.71**	**58.11**	**59.59**	**94.03**	**-**	**-**	**15.06**	**10.51**	**110.36**	**162.65**
Forage crops										
Maize	91.07	115.00	0.00	0.00	-	-	0.00	0.00	91.07	115.00
Oats	467.65	484.50	125.00	125.05	-	-	22.00	33.00	614.65	642.55
Sorghum	48.84	57.96	0.00	6.52	-	-	1.10	1.05	49.94	65.53
Pearlmillet	0.10	0.00	0.22	0.22	-	-	0.10	0.50	0.42	0.72
Lucerne	4.90	9.00	1.30	2.30	-	-	0.40	1.00	6.60	12.30

Cowpea	17.95	20.30	3.20	0.20	-	-	3.80	15.40	24.95	35.90
Berseem	45.04	84.50	2.00	2.00	-	-	0.00	0.00	47.04	86.50
Metha	0.00	0.00	1.00	1.00	-	-	0.00	0.00	1.00	1.00
Guar	258.95	306.25	23.50	26.10	-	-	0.00	0.00	282.45	332.35
Stylo	0.00	0.00	0.00	0.00	-	-	0.05	0.10	0.05	0.10
White Clover	0.00	0.00	0.00	0.00	-	-	0.10	0.20	0.10	0.20
Total Forage Crops	**934.50**	**1077.51**	**156.22**	**163.39**	**-**	**-**	**27.55**	**51.25**	**1118.27**	**1292.15**
Grand Total	**65307.55**	**73304.88**	**23900.65**	**25781.83**	**3679.52**	**7136.16**	**5160.65**	**10576.16**	**98048.37**	**116799.03**

Note: For *Rabi* 2017-18, expected breeder seed production figures were used in compilation.

AICRP-NSP (Crops) - Revolving Fund

Indian Council of Agricultural Research (ICAR) took firm steps as early as 1979-80 by launching AICRP–National Seed Project (Crops) and created as many as 41 Breeder Seed Production (BSP) units in almost all State Agricultural Universities and crop based ICAR institutes to cater to the requirement of breeder seeds in different crops. To support and strengthen breeder seed production programme, ICAR during VIII Plan has made provision of revolving fund with a policy of single window system for stringent compliance to avoid operational problem of recurring fund in the BSP centres. To make the system more efficient, vibrant, accountable and sustainable, fund provided under various heads of revolving funds were clubbed together and the centres were directed to make single account. Centres were instructed to operate single account of the fund and the Nodal Officers were entrusted with the responsibility of fund operation. The centres are instructed to undertake breeder seed production of the field crops. It is mentionable that profits earned by the centres were ploughed back in the system for creation of infrastructure facilities to enhance the capability of BSP units.

Highlights

1. Revolving fund has made significant impact in enhancing breeder seed production in the country as a whole and subsequently strengthened the infrastructure facilities for breeder seed production.
2. JNKVV, Jabalpur; MPKV, Rahuri; GBPUAT, Pantnagar; IGKV, Raipur; VNMKV, Parbhani; UAS. Bengaluru and ICAR-NRRI, Cuttack were rated as very good performing centres.
3. All the centres have refunded the revolving fund amount. Few centres have invested the profit obtained through the operation of revolving funds for infrastructure development in their respective centres.

Table: Utilization of revolving fund under AICRP-NSP (Crops) upto December 2017

(Rs. in lakhs)

S. No.	Centre	Amount sanctioned	Revenue generated in 2016-17 & 2017-18 (upto Dec. 2017)	Profit utilized during 2016-17 & 2017-18	Remarks (profit utilized for)
1	SKUAT, Srinagar	4.00	0.72 (13.99)	1.28	Seed production activity
2	CSKHPKV, Palampur	6.00	9.51 (128.44)	7.13	Repair of farm machinery, processing plant, seed store etc.
3	PAU, Ludhiana	15.00	2.86 (127.37)	2.86	Purchase of inputs
4	CCSHAU, Hisar	15.00	51.40	28.60	-
5	GBPUAT, Pantnagar	18.00	667.5	500.38	-
6	NDUAT, Faizabad	10.00	50.33 (78.33)	55.10	Maintenance of seed godown

7	BHU, Varanasi	10.00	9.57	10.52	Profit used for BSP
8	CSAUAT, Kanpur	17.00	0.41 (5.99)	0.29	Profits transferred to University RF
9	AAU, Jorhat	5.00	1.40 (27.12)	3.56	Strengthening of BSP
10	BAU, Ranchi	9.00	-	-	Seed purchase, labour payment
11	RPCAU, Dholi	10.00	26.67 (103.95)	35.97	Profit utilized for BSP programme.
12	OUAT, Bhubaneswar	13.00	14.26	Nil	Rs. 3.35 profit will be utilized for contingency, T.A.
13	SKRAU, Bikaner	40.00	85.76	40.77	-
14	SDAU, S K Nagar	20.00	59.48	Nil	-
15	IGKV, Raipur	8.50	50.30 (321.36)	2.33	Field leveling, bund repairing, etc.
16	PDKV, Akola	13.75	Nil	Nil	-
17	JNKVV, Jabalpur	16.00	275.50	66.08	Remittance to University
18	MPKV, Rahuri	14.00	377.64	321.21	Strengthening of irrigation facilities.
19	VNMKV, Parbhani	55.00	312.27	196.71	-
20	UAS, Bengaluru	13.00	4.65 (350.79)	10.25	Purchase of farm equipments
21	UAS, Dharwad	18.00	25.94 (433.13)	127.46	Farm development, electrification, borewell etc.
22	PJTSAU, Hyderabad	18.00	5.93 (113.91)	-	Farm development
23	TNAU, Coimbatore	15.00	73.58 (173.27)	59.08	Strengthening of seed production activity
24	KAU, Thrissur	4.00	48.89	44.40	Development of seed infrastructure
25	DBSKKV, Dapoli	4.00	13.46 (9.00)	8.46	Seed production activity
26	VPKAS, Almora	4.50	5.41	4.16	Strengthening of seed production activity
27	IIPR, Kanpur	5.00	18.08 (37.54)	13.68	-
28	IGFRI, Jhansi	3.00	4.04 (3.93)	6.08	-
29	CRIJAF, Barrackpore	2.00	3.17	1.99	Purchase of seed Germinator
30	CAZRI, Jodhpur	3.00	2.38	1.23	-
31	NRRI, Cuttack	15.00	115.00	98.02	-

			(359.58)		
32	IIRR, Hyderabad	4.82	15.15 (77.18)	59.89	-
33	IIMR, Hyderabad	10.5	12.70 (32.00)	5.00	Seed production activity, farm machinery purchase, monitoring etc.
	Total	**419.07**	**2343.96**	**1712.49**	

Note:

1. The values given in parenthesis represent cumulative profit made over the years.
2. All centres have returned the sanctioned amount to council
3. All centres are using single window system

A. Seed Production and Certification

Experiment 1: Standardization of isolation distance for hybrid seed production of wheat and mustard

Year of start: 2013-14 2017-18 (Mustard)

Crops	Centers
Wheat	IARI, New Delhi and JNKVV, Jabalpur
Mustard	IARI, New Delhi, PAU, Ludhiana; JNKVV, Jabalpur; GBPUAT, Pantnagar and NDUAT, Faizabad

Experiments allotted, conducted and number of centers having Uniform better results

Name of crop	Allotted centers	Centers conducted experiment	Number of centers having Uniform better results
Wheat	2	1	1
Mustard	5	2	0 (Experiment in progress)

Objectives:

1. To determine isolation distance for hybrid seed production in wheat and Mustard
2. To verify isolation distance of male parent for Foundation Seed Production

Methodology

- Restorer line/pollen parent to be surrounded in all the four sides by CMS line (female parent) at different distances viz. 50, 75, 125 and 150 meters.
- Pollen parent: plot size of 3m × 3m with spacing of 45 cm × 15 cm to be grown in the center;
- Pollen parent to be surrounded by the CMS line at different distances mentioned above. Two rows of female line

Observations

- Recording pollen flow at different distances by hanging slides smeared with glycerin and estimating pollen at 10x magnification.
- Seed setting percentage in CMS line to be recorded from all four directions at all distances.
- Per cent seed set in the CMS line should be recorded and submitted in the format given Below

Wheat (*Triticum aestivum* L.)

Direction	% Seed Set				
	50 m	**75 m**	**100 m**	**125 m**	**150 m**
West					
East					
North					
South					

Mustard (*Brassica*)

Direction	**% Seed Set**											
	50 m	**75 m**	**100 m**	**125 m**	**150 m**	**200m**	**250m**	**300m**	**350m**	**400m**	**450 m**	**500 m**
West												
East												

North												
South												

Treatments:

Restorer line/Pollen parent : MJR -1
CMS Line : MJA -5
Plot size of pollen parent : 5 m × 5 m
Plot size of CMS line : 3 m × 3 m
Spacing : 45 cm × 15 cm

Methodology

1. Pollen parent plot size of 5 m × 5 m with spacing of 45 cm × 15 cm grown at one side.
2. Restorer line/ pollen parent grown surrounded in all four direction or at one direction by CMS line (female parent).
3. CMS line grown at different distance viz., 50, 75, 100, 150, 200, 250, 300, 350, 400, 450 and 500 m with 3 m × 3 m plot size (spacing: 45 × 15 cm) from the pollen parent.

Observations of PI

Illustrations of Unified observations in different crop species

Wheat	The isolation distance is recommended for wheat hybrid seed production as eight meters. This will be forwarded through concerned crop coordinator.
Mustard	The experiment on standardization of isolation distance for hybrid seed production in mustard was proposed for five centers namely IARI, New Delhi; PAU, Ludhiana; JNKVV, Jabalpur; GBPUAT, Pantnagar; and NDUAT, Faizabad during rabi 2017-18. Compilation of data is in progress. The results will be presented during 2018-19.

Significant observation

In wheat the investigation exhibit contamination on west and North side up to 8 m and East side up to 6 m.

Wheat (*Triticum aestivum* L.)

Individual centre wise observations

JNKVV, Jabalpur

Results:

Evaluation of pollen flow during rabi 2016-17

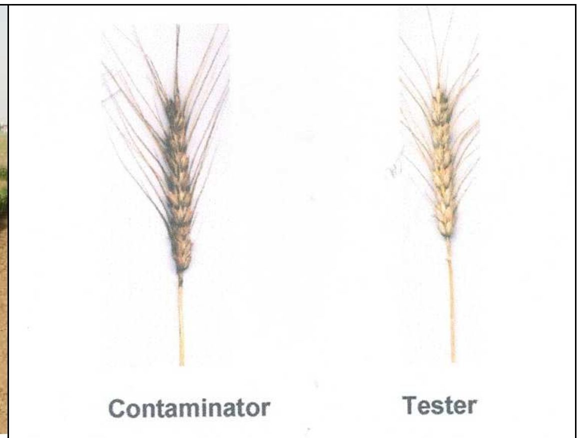
The seed of tester (HD 2932, white glume) harvested from 1, 2, 4, 6, 8 and 10 m distances from contaminator (PBW 154, Red glume) at all the four directions (North, East, West and South) grown during *rabi* 2016-17, were sown to observe out-crossing by counting the plants of red glume. The investigation exhibit contamination on west and North side up to 8 m and East side up to 6 m.

Conclusion

The investigation exhibit contamination on west and North side up to 8 m and East side up to 6 m.

Table 1.1: Evaluation of pollen flow at six distances at JNKVV, Jabalpur (2016-17)

Direction	Distance of tester from contaminator					
	1m	2m	4m	6m	8m	10m
West	√	√	√	√	√	-
East	√	√	√	√	-	-
North	√	√	√	√	√	-
South	-	-	-	-	-	-



Field view evaluation of pollen flow and isolation distances in wheat	(PBW 154) (Red glume)	(HD 2932) (White glume)

Evaluation of pollen flow during rabi 2016-17

Mustard (*Brassica*)

JNKVV, Jabalpur

Results: The experiment was conducted as per technical programme of 2017-18 during rabi. The sowing was done on 14.11.17. The experiment is in field & observations as per technical programme are in progress.

Faizabad

Results: The experiment was conducted as per technical programme. Pollen parent has grown at one side as per suitability of land and site at Research farm, Masodha. Pollen flow is being recorded at different distances by hanging slides smeared with glycerin and estimating pollen at 10x magnification. Siliqua and seed setting percentage will be recorded in each CMS plot based on five random plants.

Experiment 2: Seed quality, health, yield, storability as affected by pre sowing seed priming treatments in kabuli chickpea, vegetable pea and lentil

Year of start: 2014-15

Crops	Centers
Kabuli Chickpea	PAU, Ludhiana; JNKVV, Jabalpur; UAS, Raichur; MPKV, Rahuri; SKNAU, Jobner (Durgapura);PDKV, Akola and CCS HAU, Hisar.
Field pea	CSAUAT, Kanpur; JNKVV, Jabalpur; ICAR-IISS, Mau
Lentil	JNKVV, Jabalpur; NDUAT, Faizabad and CSAUAT, Kanpur

Objective: Standardization of seed priming technique for assured field emergence iin kabuli chickpea

Treatments	Treatment details
T1	Seed Priming with *Trichoderma harzianum*@ 1.5 %
T2	Seed Priming with Vitavax Power @ 0.25 %
T3	Seed Priming with Gibberellic Acid @ 50 ppm
T4	Seed Priming with Gibberellic Acid @ 50 ppm + Seed coating with *T. harzianum*@15 g/kg seed
T5	Seed Priming with Sodium Molybdate @ 500 ppm
T6	Seed Priming with Sodium Molybdate @ 500 ppm + Seed coating with *T. harzianum*@ 15g/kg seed
T7	Seed priming with leaf extract of *Lantana camara*@ 10 %
T8	Seed hydration for 8 hrs.
T9	Chemical check – seed treatment with Bavistin @ 3g/ kg seed
T10	Control

Duration of Soaking: Eight hours

Observations to be recorded:

(A) Seed physiology

I. Root nodulation (No's)
II. Seed quality parameters (Germination % and SVI-I&II)
III. Root and shoot length (cm)

(B) Seed pathology

I. Incidence of wilt / root rot (%)
II. Incidence and severity of Ascochyta blight (%)
III. Seed mycoflora

(C) Seed production

I. Plant biomass (40 DAS) (t/ha)
II. No. of pods / plant
III. 100 seed weight (g)
IV. Seeds / pod (No's)
V. Seed yield (kg/ha)
VI. Harvest Index

Unified Observations

Uniformly better treatment details: T6 (Seed Priming with Sodium Molybdate @ 500 ppm + Seed coating with *T. harzianum* @ 15g/kg seed) is uniformly better treatment over the locations in all the three crops followed by T4 (Seed Priming with Gibberellic Acid @ 50 ppm + Seed coating with *T. harzianum* @ 15 g/kg seed).

Kabuli Chickpea *(Cicer arietinum L.)*

Unified Observations:

- In chickpea, the experiment was conducted at six centres namely PAU Ludhiana, JNKVV, Jabalpur, UAS Raichur, MPKV Rahuri, SKNAU Jobner (Durgapura) and PDKV Akola. Among all the seed priming treatment combinations, T_6 (seed priming with Sodium Molybdate @ 500 ppm + Seed coating with *T. harzianum*@ 15g/kg seed) was found superior and uniformly better in three locations. Pooled analysis of data over the locations revealed that treatment T_6 contributed for 32% increase in seed yield/ha, 9.6% increase in germination percentage and 44% increase in vigour index, respectively over control.

Individual Centre wise observations

JNKVV, Jabalpur

Results: For assured field emergence the seed of kabuli chickpea variety JGK 2 was sown on 11.11.2016 @ 100 kg/ha after application of proposed 10 seed priming treatments as per recommended plot size, replication and design at JNKVV, Jabalpur. The observed analyzed data revealed significantly higher root length, shoot length, vigour index and plant population in T_8 *(*Seed hydration for 8 hours) closely followed by seed priming with T_6(Sodium Molybdate + *T. hargianum*).

Among all the treatment combinations, seed treated with T_6 *(*Sodium Molybdate + *T. harzianum)* found superior for major yield attributing traits viz., no. of pods/ plant, seeds/pod, seed yield/ plant and harvest index followed by seed treated with T_5(Sodium Molybdate @ 500ppm).

Conclusion: Among all the treatment combinations, seed treated with T_6 *(*Sodium Molybdate + *T. harzianum)* found superior for germination percentage and major yield attributing traits viz., no. of pods/ plant, seeds/pod, seed yield/ plant and harvest index followed by seed treated with T_5(Sodium Molybdate @ 500ppm).

Untreated Control (no priming)

Leaf Extract of *Lantana camera* @10%

Seed hydration for 8 hours

Effect of pre-sowing seed priming treatments on chickpea at JNKVV, Jabalpur during Rabi 2016-17

2017-18

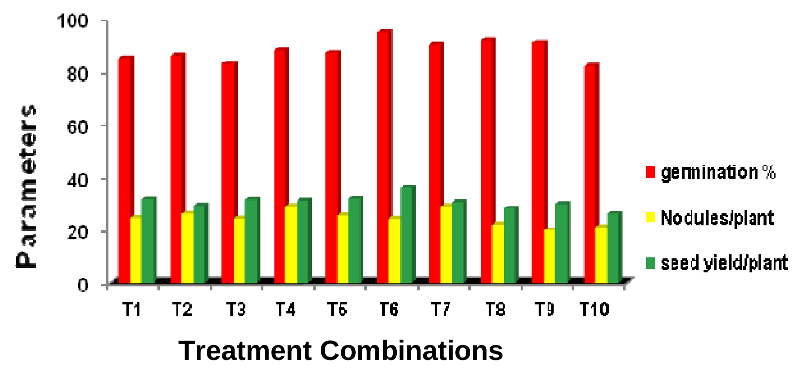
For assured field emergence, the seed of kabuli chickpea variety JGK 2 was sown on 11.11.2017 @ 100 kg/ha after application of proposed 10 seed priming treatments as per recommended plot size, replication and design at JNKVV, Jabalpur. The experiment is in field.

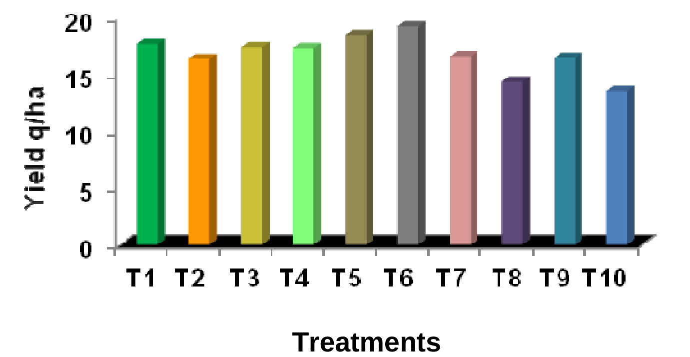
Table 2.1: Effect of pre sowing seed priming treatments on seed quality and health of kabuli chickpea at JNKVV, Jabalpur during *Rabi* 2016-17

Treatment	Germination (%)	Root length (cm)	Shoot length (cm)	Vigour index (length)	Plant pop. m^2	Nodules /plant	Incidence of root rot
T_1 *(Seed Priming with Trichoderma harzianum@* 1.5 %)	85.00	9.83	26.51	3095.98	27.89	24.56	-
T_2 *(Seed Priming with Vitavax Power @ 0.25 %*)	86.00	9.54	27.41	3176.87	26.73	26.00	-
T_3 (Seed Priming with Gibberellic Acid @ 50 ppm)	83.00	10.60	26.00	3037.80	25.44	24.33	-
T_4 (Seed Priming with Gibberellic Acid @ 50 ppm + Seed coating with *T. harzianum@* 15 g/kg seed)	88.00	10.63	26.23	3246.29	21.55	29.00	-
T_5 *(*Seed Priming with Sodium Molybdate @ 500 ppm)	87.00	10.04	26.78	3203.93	27.82	25.44	-
T_6 *(*Seed Priming with Sodium Molybdate @ 500 ppm + Seed coating with *T. harzianum@* 15g/kg seed)	95.00	10.96	27.80	3560.40	20.37	24.22	-
T_7 *(*Seed priming with leaf extract of *Lantana camara@* 10 %*)*	90.00	10.96	27.11	3429.27	26.56	29.00	-
T_8(Seed hydration for 8 hrs.)	92.00	11.28	28.42	3776.73	34.69	22.00	-
T_9 *(*Chemical check – seed treatment with Bavistin @ 3g/ kg seed)	91.00	9.70	24.62	3125.02	25.29	20.00	-
T_{10} *(*Control)	82.00	9.30	24.51	2772.42	14.57	21.11	-
SEm ±	**3.02**	**1.25**	**1.81**	**201.015**	**0.35**	**4.06**	**-**
CD at 5%	**6.35**	**2.64**	**3.81**	**517.246**	**0.74**	**8.53**	**-**

Table 2.2: Effect of pre sowing seed priming treatments on seed quality and health of kabuli chickpea at JNKVV, Jabalpur during *Rabi* 2016-17

Treatments	Biomass/plant (g)	Pods/ plant	100 seed wt.(g)	Seeds/pod	Seed yield/ plant (g)	Seed yield (q/ha)	Harvest index	Biological yield (kg/plot)
T_1(*Trichoderma harzianum*@ 1.5%)	86.67	54.47	21.75	1.03	31.63	17.61	39.53	3.40
T_2 (Vitavax Power @0.25%)	70.33	45.87	22.58	0.91	29.26	16.29	39.89	3.23
T_3 (GA_3 50 ppm)	78.60	55.13	21.18	0.91	31.50	17.31	40.38	3.40
T_4(GA_3+*Trichoderma harzianum*@1.5%)	80.00	55.80	22.39	0.92	31.17	17.23	38.96	2.77
T_5 *(Sodium Molybdate @500ppm)*	80.00	56.27	23.44	0.96	31.88	18.43	41.80	3.50
T_6 *(Sodium Molybdate + T. harzianum)*	77.33	76.60	20.79	1.03	35.98	19.17	46.52	3.10
T_7 (Leaf Extract of *Lantana camara* @10%)	78.00	54.53	20.75	0.91	30.52	16.54	39.12	3.10
T_8 *(*Seed hydration for 8 hours)	75.33	38.93	23.06	0.90	28.08	14.30	40.11	2.50
T_9 *(*Bavistin @3 g/kg seed)	76.00	50.93	21.83	0.92	29.97	16.41	39.08	2.60
T_{10} *(*Control)	70.00	36.47	19.88	0.86	25.99	13.47	31.50	3.00
SEm ±	**1.25**	**6.65**	**0.64**	**0.07**	**1.96**	**1.50**	**1.28**	**0.35**
CD at 5%	**3.72**	**19.77**	**1.90**	**0.19**	**6.73**	**4.47**	**3.83**	**1.06**





Effect of seed priming on traits of kabuli Chickpea Var. JGK 2 during Rabi 2016-17

Hisar

Year of start: 2017-18

Results: The experiment is in progress.

UAS, Raichur

Results: It was observed among the different seed priming treatments that, kabuli chickpea variety MNK-1 primed with GA_3 @ 50ppm+Seed coating with *Trichoderma harzianum* @15g/kg recorded highest seed quality parameters *viz.,* germination percentage (97.33%), root length (12.13cm), shoot length (12.43cm) and vigour index (2391) during 2017-18, however pooled data over the year also recorded highest seed quality parameters in seed primed with GA_3 @ 50ppm+Seed coating with *Trichoderma harzianum* @15g/kg [Germination percentage (96.75%), root length (14.53cm), shoot length (10.21cm) and vigour index (2681)]. Significantly highest seed mycoflora was recorded in control but T4 treatment recorded less percentage of *Aspergillus niger* in pooled data (absent during 2017-18). But *Aspergillus flavus* were present in all treatments.

In the field study highest seed yield (23.05q/ha) was recorded in seeds treated with sprint (Carbendazim 25%+ Mancozeb 50%) 3g/kg which is on par with Seed Priming with Gibberellic Acid @ 50 ppm, Gibberellic Acid @ 50 ppm + Seed coating with *T. harzianum* @ 15 g/kg seed, Sodium Molybdate @ 500 ppm and Sodium Molybdate @ 500 ppm + Seed coating with *T. harzianum*@ 15 g/kg seed.

Further seed yield for rabi 2017 will be submitted after the harvest of the crop.

Table 2.3: Effect of pre sowing seed priming treatments on seed germination (%), root length (cm), shoot length (cm), vigour index and seed mycoflora (%)at UAS, Raichur during *Rabi* 2016-17

Treatments	Germination (%)				Mean	Root length (cm)				Mean	Shoot length (cm)				Mean
	2014-15	2015-16	2016-17	2017-18		2014-15	2015-16	2016-17	2017-18		2014-15	2015-16	2016-17	2017-18	
T_1(Seed Priming with *Trichoderma harzianum* @ 1.5 %)	96.00	94.00	92.67	91.33	93.50	11.67	15.50	13.51	13.19	13.47	3.67	8.40	11.83	12.84	9.19
T_2(Seed Priming with Vitavax Power @ 0.25 %)	97.33	96.00	88.00	90.67	93.00	11.83	15.78	13.12	11.07	12.95	3.60	8.30	12.04	12.61	9.14
T_3(Seed Priming with Gibberellic Acid @ 50 ppm)	95.33	95.33	89.67	88.67	92.25	11.90	16.05	14.63	11.79	13.59	3.60	8.05	13.31	13.25	9.55
T_4 (Seed Priming with Gibberellic Acid @ 50 ppm + Seed coating with *T. harzianum* @ 15 g/kg seed)	**98.00**	**97.00**	**94.67**	**97.33**	**96.75**	**14.03**	**16.34**	**15.60**	**12.13**	**14.53**	**4.30**	**9.80**	**14.31**	**12.43**	**10.21**
T_5 (Seed Priming with Sodium Molybdate @ 500 ppm)	94.33	95.00	88.00	88.67	91.50	11.13	15.80	12.11	12.63	12.92	3.40	8.05	11.21	13.94	9.15
T_6 (Seed Priming with Sodium Molybdate @ 500 ppm + Seed coating with *T. harzianum* @ 15 g/kg seed)	97.33	96.50	93.33	86.00	93.29	13.73	16.14	14.91	11.05	13.96	4.17	8.90	13.13	12.22	9.61
T_7 (Seed Priming with leaf extract of *Lantana camara* @ 10 %)	96.67	94.33	89.33	90.00	92.58	12.13	16.00	13.91	11.63	13.42	4.10	8.07	12.91	12.87	9.49
T_8 (Seed hydration for 8 hrs)	96.00	94.33	88.00	85.33	90.92	11.40	15.38	13.64	11.78	13.05	3.60	8.02	12.54	12.77	9.23
T_9 (Chemical check – seed treatment with Bavistin @ 3g/kg seed)	94.67	94.00	87.33	94.67	92.67	12.83	16.07	14.28	11.28	13.62	3.67	8.52	12.60	13.00	9.45
T_{10} (Seed treatment with sprint* @ 3g/kg seed (Mancozeb 50%+Carbendazium 25%)	97.33	96.67	90.00	87.33	92.83	13.17	16.32	13.67	11.57	13.68	4.10	8.63	12.99	13.85	9.89
T_{11} (Control)	94.00	93.00	86.67	88.67	90.59	10.87	15.28	9.79	11.48	11.86	3.40	8.00	9.10	13.96	8.62
Mean	**96.09**	**95.11**	**89.79**	**89.88**	**92.72**	**12.25**	**16**	**13.56**	**11.78**	**13.40**	**3.78**	**8.00**	**12.36**	**13.07**	**9.30**
SEm±	**0.93**	**0.18**	**1.16**	**0.78**		**0.36**	**0.07**	**0.9**	**0.68**		**0.16**	**0.41**	**0.75**	**0.87**	
CD (0.01)	**3.69**	**0.53**	**3.38**	**3.10**		**1.42**	**0.22**	**2.62**	**2.71**		**0.64**	**1.24**	**2.19**	**3.48**	

Table:2.3 conti….

Treatments	Vigour index				Mean	*Aspergillus niger*(%)				Mean	*Aspergillus flavus*(%)				Mean
	2014-15	2015-16	2016-17	2017-18		2014-15	2015-16	2016-17	2017-18		2014-15	2015-16	2016-17	2017-18	
T_1 (Seed Priming with *Trichoderma harzianum* @ 1.5 %)	1471	2247	3607	2377	2426	2.00	2.00	1.47	0.00	1.37	1.67	1.67	1.37	3.33	2.01
T_2 (Seed Priming with Vitavax Power @ 0.25 %)	1502	2312	3370	2147	2333	1.00	1.20	1.33	0.67	1.05	0.00	0.62	0.67	1.33	0.66
T_3(Seed Priming with Gibberellic Acid @ 50 ppm)	1477	2297	3840	2220	2459	0.33	2.03	2.37	2.00	1.68	0.00	1.45	1.63	1.33	1.10
T_4 (Seed Priming with Gibberellic Acid @ 50 ppm + Seed coating with *T. harzianum* @ 15 g / kg seed)	1796	2536	3999	2391	2681	0.00	1.78	1.50	0.00	0.82	0.00	1.28	1.27	0.67	0.81
T_5 (Seed Priming with Sodium Molybdate @ 500 ppm)	1371	2266	3114	2356	2277	3.00	4.20	4.20	0.00	2.85	1.33	1.33	1.21	3.00	1.72
T_6 (Seed Priming with Sodium Molybdate @ 500 ppm + Seed coating with *T. harzianum* @ 15 g/kg seed)	1742	2416	3841	2002	2500	1.00	3.50	3.33	0.00	1.96	0.00	1.50	1.27	2.00	1.19
T_7 (Seed Priming with leaf extract of *Lantana camara* @ 10 %)	1569	2271	3638	2205	2421	2.33	2.33	2.21	2.33	2.30	0.00	1.82	1.43	2.33	1.40
T_8 (Seed hydration for 8 hrs)	1440	2207	3592	2095	2334	2.33	2.33	2.00	1.00	1.92	0.67	0.67	0.60	2.67	1.15
T_9 (Chemical check – seed treatment with Bavistin @ 3g/ kg seed)	1562	2311	3749	2299	2480	2.67	0.97	0.93	1.33	1.48	0.00	0.50	0.37	3.67	1.14
T_{10} (Seed treatment with sprint* @ 3g/kg seed (Mancozeb 50%+Carbendaizum 25%)	1681	2412	3814	2220	2532	3.67	0.65	0.67	0.00	1.25	0.00	0.30	0.30	1.00	0.40
T_{11} (Control)	1341	2165	2487	2256	2062	**7.67**	**7.67**	**6.67**	**6.00**	**7.00**	**2.33**	**2.33**	**1.80**	**4.67**	2.78
Mean	**1541**	**2313**	**3550**	**2233**	**2409**	**2.36**	**2.61**	**2.43**	**1.21**	**2.15**	**0.55**	**1.22**	**1.08**	**2.36**	**1.30**
SEm±	**37.07**	**42**	**190**	**122.10**		**0.97**	**0.17**	**0.40**	**0.65**		**0.56**	**0.11**	**0.15**	**0.28**	
CD (0.01)	**108.21**	**126**	**555**	**486.74**		**3.86**	**0.57**	**1.59**	**2.60**		**NS**	**0.34**	**0.59**	**1.13**	

Table 2.4: Effect of pre-sowing seed priming treatments on number of root nodules/plant, wilt incidence, number of pods/plant, test weight and seed yield/ha at UAS, Raichur during *Rabi* 2016-17

Treatments	No. of root nodules/plant				Mean	Wilt incidence (%)				Mean	No. of pods/plant				Mean
	2014-15	2015-16	2016-17	2017-18		2014-15	2015-16	2016-17	2017-18		2014-15	2015-16	2016-17	2017-18*	
T_1(Seed Priming with *Trichoderma harzianum* @ 1.5 %)	11.67	10.67	11.00	8.67	10.50	3.00	3.20	0.67	0.67	1.89	30.67	30.33	27.30		29.43
T_2(Seed Priming with Vitavax Power @ 0.25 %)	10.67	11.67	9.00	7.60	9.74	4.33	4.33	0.33	0.67	2.42	30.00	30.00	27.53		29.18
T_3(Seed Priming with Gibberellic Acid @ 50 ppm)	13.00	13.00	8.00	8.40	10.60	5.33	5.33	0.67	0.33	2.92	32.00	30.51	28.70		30.40
T_4 (Seed Priming with Gibberellic Acid @ 50 ppm + Seed coating with *T. harzianum* @ 15 g/kg seed)	14.17	13.67	11.00	7.13	11.49	5.00	5.00	2.00	1.33	3.33	**33.33**	**33.00**	**30.13**		32.15
T_5 (Seed Priming with Sodium Molybdate @ 500 ppm)	12.33	12.67	14.00	8.20	11.80	6.00	6.00	4.33	3.33	4.92	29.33	29.33	28.13		28.93
T_6 (Seed Priming with Sodium Molybdate @ 500 ppm + Seed coating with *T. harzianum* @ 15 g/kg seed)	16.33	15.33	16.33	10.00	**14.50**	4.33	4.33	1.00	0.67	2.58	32.33	31.82	29.00		31.05
T_7 (Seed Priming with leaf extract of *Lantana camara* @ 10 %)	10.00	10.33	7.00	7.93	8.82	8.33	8.33	1.33	1.00	4.75	29.00	30.33	27.67		29.00
T_8 (Seed hydration for 8 hrs.)	10.67	10.00	9.67	8.00	9.59	6.33	6.33	2.67	2.00	4.33	30.00	30.00	27.10		29.03
T_9 (Chemical check – seed treatment with Bavistin @ 3g/kg seed)	11.00	10.33	9.00	9.87	10.05	3.00	3.00	1.00	3.67	2.67	30.67	31.33	27.33		29.78
T_{10} (Seed treatment with sprint* @ 3g/kg seed (Mancozeb 50%+Carbendazium 25%)	12.67	11.67	13.00	8.40	11.44	1.67	1.67	0.33	1.67	1.34	31.67	31.93	28.27		30.62
T_{11} (Control)	9.00	9.33	7.00	7.60	8.23	**9.33**	**9.33**	**5.67**	**5.33**	7.42	27.33	28.67	26.27		27.42
Mean	**11.95**	**11.70**	**10.45**	**8.35**	**10.61**	**5.15**	**5.17**	**1.82**	**1.88**	**3.50**	**30.58**	**30.66**	**27.95**		**29.73**
SEm±	**0.55**	**0.59**	**0.82**	**0.61**		**0.92**	**0.45**	**0.92**	**0.56**		**0.67**	**0.44**	**1.26**		
CD (0.05)	**1.61**	**1.74**	**2.39**	**1.79**		**2.68**	**1.35**	**2.69**	**1.64**		**1.96**	**1.31**	**3.72**		

Table 2.4 Cont…

Treatments	Test weight (g)				Mean	Seed yield (q/ha)				Mean
	2014-15	2015-16	2016-17	2017-18*		2014-15	2015-16	2016-17	2017-18*	
T_1(Seed Priming with *Trichoderma harzianum* @ 1.5 %)	52.83	52.50	49.30		51.54	23.74	17.35	17.44		19.51
T_2(Seed Priming with Vitavax Power @ 0.25 %)	52.27	52.83	50.32		51.81	20.97	16.75	17.47		18.40
T_3(Seed Priming with Gibberellic Acid @ 50 ppm)	53.00	53.50	51.45		52.65[a]	25.76	17.77	18.27		20.60[a]
T_4 (Seed Priming with Gibberellic Acid @ 50 ppm + Seed coating with *T. harzianum* @ 15 g/kg seed)	55.57	54.67	51.97		**54.07**[a]	30.44	18.59	18.43		22.49[a]
T_5 (Seed Priming with Sodium Molybdate @ 500 ppm)	54.10	53.00	50.45		52.52[a]	21.74	16.54	17.99		18.76
T_6 (Seed Priming with Sodium Molybdate @ 500 ppm + Seed coating with *T. harzianum* @ 15 g/kg seed)	55.07	54.00	51.66		53.58[a]	29.56	18.39	18.40		22.12[a]
T_7 (Seed Priming with leaf extract of *Lantana camara* @ 10 %)	51.03	52.33	48.95		50.77	20.10	17.56	17.56		18.41
T_8 (Seed hydration for 8 hrs.)	52.08	50.17	47.75		50.00	21.21	17.10	17.38		18.56
T_9 (Chemical check – seed treatment with Bavistin @ 3g/kg seed)	53.73	50.67	48.90		51.10	22.68	17.97	17.44		19.36[a]
T_{10} (Seed treatment with sprint* @ 3g/kg seed (Mancozeb 50%+Carbendazium 25%)	54.40	53.17	50.91		52.83[a]	**31.90**	**18.69**	**18.55**		**23.05**[a]
T_{11} (Control)	46.97	50.33	48.37		48.56	16.53	16.11	17.28		16.64
Mean	**52.82**	**52.47**	**50.00**		**51.76**	**24.06**	**17.53**	**17.84**		**19.81**
SEm±	**0.59**	**0.40**	**0.46**		**0.59**	**2.67**	**25**	**0.38**		**1.42**
CD (0.05)	**2.35**	**0.60**	**1.36**		**1.73**	**7.79**	**75**	**1.11**		**4.09**

*Crop is in maturity and yield data will be submitted after the harvest of the crop

General view of the experimental plot at Seed unit, UAS, Raichur

MPKV, Rahuri

Results: The data on effect of presowing seed priming treatment on seed yield and seed quality of kabuli chickpea are presented in table 2.6 to 2.7. From the data, it is revealed that the seed yield and seed quality of kabuli chickpea influenced significantly due to presowing seed priming treatments.

A) Physiological Study

The pre-sowing seed priming treatment had significant effect on field emergence, root nodulation, seed quality parameters of kabuli chickpea. Seed priming with Vitavax power @ 0.25% (T_2) recorded significantly higher field emergence (94.58 %), higher number of root nodules per plant (32.67).

Seed quality parameters *viz;* germination%, root & shoot length and vigour index (I) were significantly influenced due to presowing seed priming. Seed priming with Vitavax power @ 0.25% (T_2) recorded significantly higher germination (90.33%), root shoot length (31.88 cm), dry matter content (2.92 g), vigour index I (2880.69) and vigour index II (264.30)

B) Pathological study:

The wilt incidence was significantly influenced due to presowing seed priming treatments. Seed priming with Vitavax power @ 0.25% (T_2) recorded significantly lower incidence of wilt (5.00%).

C) Yield contributing parameters:

Yield contributing parameters *viz;* number of pods plant^{-1}, seed yield (kg plot^{-1}), seed yield (kgha^{-1}) and biomass yield (kgha^{-1}) were significantly influenced due to pre-sowing seed treatment. Seed priming with Vitavax power @ 0.25% (T_2) recorded significantly higher number of pods/ plant (132.20), seed yield (2.31 kg plot^{-1}), seed yield (1926.10 kg ha^{-1}), and biomass yield (2482.21 kg ha^{-1})

Table 2.5: Effect of pre-sowing seed priming treatments on seed yield and yield contributing characters of kabuli Chickpea at MPKV, Rahuri during *Rabi* 2016-17

Treatments / Traits	Field emergence (%)	Incidence of wilt (%)	No. of root nodules	No. of pods plant^{-1}	Seed yield kg plot^{-1}	Seed yield kg ha^{-1}	Biomass yield kg ha^{-1}
Seed priming with *Trichoderma harzianum*@1.5%(T_1)	85.75 (68.73)	6.00	28.00	92.67	1.55	1294.44	1955.27
Seed priming with Vitavax powder @0.25% (T_2)	94.58 (77.39)	5.00	32.67	132.20	2.31	1926.10	2482.21
Seed priming with Gibberellic acid @ 500 ppm (T_3)	86.25 (68.70)	9.33	24.67	96.67	1.58	1316.94	2121.66
Seed priming with Gibberellic acid @ 50 ppm + seed coating with *Trichoderma harzianum*@15g/kg (T_4)	82.83 (65.63)	7.33	30.33	102.33	1.83	1524.44	1927.58
Seed priming with Sodium Molybdate @ 500 ppm(T_5)	79.92 (63.44)	8.67	26.00	98.33	1.61	1341.66	2291.66
Seed priming with Sodium Molybdate @ 500 ppm+ seed coating with *Trichoderma harzianum*@15g/kg (T_6)	90.67 (72.42)	6.33	31.00	110.67	2.17	1805.83	2410.55
Seed priming with leaf extract of *Lantana camara* @ 10% (T_7)	82.58 (65.37)	7.33	21.00	96.00	1.57	1309.72	2188.96
Seed hydration for 8 hrs and dried up to original M.C. (12%) (T_8)	75.75 (60.50)	8.33	21.44	78.67	1.45	1207.50	2110.82
Seed treatment with Bavistin @ 3g/kg seed (T_9)	80.25 (63.69)	7.33	26.67	101.33	1.63	1361.94	2184.16
Control (T_{10})	75.42 (60.32)	11.67	20.67	77.33	1.43	1190.83	1697.49
SE ±	**2.261**	**1.202**	**2.333**	**6.957**	**0.093**	**77.093**	**147.018**
CD at 5%	**6.717**	**3.573**	**6.931**	**20.672**	**0.275**	**229.064**	**436.828**

(Figures in parenthesis are arc sin transformed values)

Table2.6: Effect of pre-sowing seed priming treatment on seed quality in kabuli chickpea at MPKV, Rahuri during *Rabi* 2016-17

Treatments \ Traits	100 seed weight (g)	Germination (%)	Root shoot length (cm)	Dry matter content (g)	Vigour index I	Vigour index II
Seed priming with *Trichoderma harzianum*@1.5% (T_1)	27.19	89.33 (70.94)	25.93	2.70	2317.87	241.41
Seed priming with Vitavax powder @0.25% (T_2)	30.29	90.33 (71.92)	31.88	2.92	2880.69	264.30
Seed priming with Gibberellic acid @ 500 ppm (T_3)	28.40	88.67 (70.35)	23.47	2.86	2086.13	253.63
Seed priming with Gibberellic acid @ 50 ppm + seed coating with *Trichoderma harzianum*@15g/kg (T_4)	29.04	89.00 (70.65)	30.54	2.46	2720.06	218.55
Seed priming with Sodium Molybdate @ 500 ppm (T_5)	29.18	86.67 (68.58)	26.96	2.54	2335.88	220.16
Seed priming with Sodium Molybdate @ 500 ppm+ seed coating with *Trichoderma harzianum*@15g/kg T_6)	29.87	88.67 (70.35)	28.77	2.74	2551.57	242.61
Seed priming with leaf extract of *Lantana camara* @ 10%(T_7)	28.70	88.67 (70.42)	24.07	2.30	2124.73	203.47
Seed hydration for 8 hrs and dried upto original M.C. (12%)(T_8)	27.11	87.00 (68.87)	22.80	2.55	1983.80	221.40
Seed treatment with Bavistin @ 3g/kg seed (T_9)	26.44	88.33 (70.03)	23.50	2.45	2076.13	215.95
Control (T_{10})	25.90	75.00 (60.00)	22.63	2.01	1698.27	150.31
SE ±	**1.368**	**1.222**	**1.823**	**0.131**	**163.531**	**11.347**
CD at 5%	**NS**	**3.630**	**5.416**	**0.389**	**485.894**	**33.714**

(Figures in parenthesis are arc sine transformed values)

PAU, Ludhiana

Results:

Table 2.7: Effect of pre-sowing seed priming treatments on seed quality parameters of *kabuli*chickpea at PAU, Ludhiana during *Rabi* 2016-17

Treatment	Germination (%)	Seedling Length (cm)	Seedling dry weight (g)	Moisture content (%)	Vigor index I
T1 (*Trichoderma harzianum*@ 1.5%)	88.7	20.7	0.434	8.3	1836.1
T2 (Vitavax Power @ 0.25%)	89.5	21.5	0.471	8.1	1924.3
T3 (GA_3 @ 50 ppm)	86.0	17.7	0.423	8.5	1522.2
T4 (GA_3 @ 50 ppm + *T. harzianum*@ 15 g/kg)	88.0	19.9	0.442	8.8	1751.2
T5 (Sodium Molybdate @ 500 ppm)	87.0	15.9	0.405	8.4	1383.3
T6 (S. M @ 500 ppm + *T. harzianum*@ 15 g/kg)	87.5	19.6	0.426	8.3	1715.0
T7 (*Lantana camara*@ 10%)	86.0	18.2	0.429	8.2	1565.2
T8 (Hydration 8 hrs)	85.6	18.1	0.393	8.3	1549.4
T9 (Bavistin @ 3g/kg)	93.0	22.9	0.477	8.9	2129.7
T10 (Control: no treatment)	85.0	14.7	0.411	8.6	1249.5
SE ±	**1.02**	**1.2**	**0.02**	**0.11**	**91.3**
CD (5%)	**2.5**	**2.6**	**NS**	**NS**	**35.7**

Table 2.8: Effect of pre-sowing seed priming treatments on yield and yield attributes of *kabuli*chickpea at PAU, Ludhiana during *Rabi* 2016-17

Treatment	Number of root nodules/plant	Number of pods per plant	Number of seeds per pod	100 seed weight (g)	Biological yield (kg/plot)	Seed yield (Kg/plot)	Seed yield (q/acre	Harvest index
T1 (*Trichoderma harzianum*@ 1.5%)	19.0	52.3	1.3	33.5	14.5	2.8	7.9	19.3
T2 (Vitavax Power @ 0.25%)	18.3	53.0	1.5	34.2	12.8	3.0	8.4	23.4
T3 (GA_3 @ 50 ppm)	17.1	43.1	1.2	32.7	8.7	2.3	6.5	26.4
T4 (GA_3 @ 50 ppm + *T. harzianum*@ 15 g/kg)	17.7	51.7	1.3	33.0	9.7	2.7	7.6	27.8
T5 (Sodium Molybdate @ 500 ppm)	19.6	45.3	1.2	32.6	10.1	2.5	7.0	24.8
T6 (S. M @ 500 ppm + *T. harzianum*@ 15 g/kg)	18.7	48.9	1.3	32.9	11.5	2.4	6.7	20.9
T7 (*Lantana camara*@ 10%)	15.0	48.7	1.2	31.1	8.8	2.1	5.9	23.9
T8 (Hydration 8 hrs)	14.8	47.2	1.2	32.0	8.4	2.2	6.2	26.2
T9 (Bavistin @ 3g/kg)	16.7	56.5	1.5	33.6	12.4	3.2	9.0	25.8
T10 (Control: no treatment)	13.2	37.5	1.1	30.3	7.7	2.0	5.6	26.0
SE ±	**0.9**	**5.9**	**0.08**	**1.1**	**1.9**	**0.8**	**1.4**	**1.4**
CD (5%)	**2.2**	**5.6**	**0.08**	**2.5**	**4.1**	**0.8**	**1.9**	**3.4**

Table 2.9: Effect of pre-sowing seed priming treatments on seed health of *kabuli* chickpea at PAU, Ludhiana during *Rabi* 2016-17

Treatment	% Incidence of wilt	% Incidence of Ascochyta blight	% Incidence of Root rot
T1 (*Trichoderma harzianum*@ 1.5%)	10.2	-	2.0
T2 (Vitavax Power @ 0.25%)	8.6	-	1.1
T3 (GA_3 @ 50 ppm)	14.5	-	3.6
T4 (GA_3 @ 50 ppm + *T. harzianum*@ 15 g/kg)	15.4	-	2.0
T5 (Sodium Molybdate @ 500 ppm)	8.9	-	1.5
T6 (S. M @ 500 ppm + *T. harzianum*@ 15 g/kg)	10.5	-	1.3
T7 (*Lantana camara*@ 10%)	9.5	-	1.3
T8 (Hydration 8 hrs)	14.9	-	3.1
T9 (Bavistin @ 3g/kg)	6.5	-	0.8

T10 (Control: no treatment)	20.2	-	4.0
SE ±	**1.57**	-	**1.03**
CD (5%)	**NS**	**-**	**NS**

Conclusion: The seeds of recommended *kabuli* chickpea variety L552 were subjected to different seed priming treatments before sowing. Observations were recorded in the laboratory on seed quality parameters and then the seed was sown in the first week of November in three replicates. The highest germination percentage was found for Bavistin treated seeds (93%) followed by Vitavax power (89.5 %) and *T. harzianum* (88.7 %). Seed treated with Bavistin also exhibited higher seed quality parameters viz*.,* seedling length, seedling dry weight and moisture per cent (Table 2.8). The number of root nodules per plant were at par with each other, however, the highest number were found on plants of seed treated with Sodium Molybdate (19.6) followed by *T. harzianum*(19.0). Number of pods per plant was highest for seed primed with Bavistin (56.5) followed by seed primed with Vitavax power (53.0) and seed primed with *T. harzianum* (52.3). The mean seed yield was highest for seed primed with Bavistin (9 q/acre) followed by Vitavax power(8.4 q/acre) and *T. harzianum* (7.9 q/acre). The seeds primed with Vitavax power had the highest test weight (34.2 g) followed by Bavistin (33.6 g) and *T. harzianum* (27.4 g). The incidence of Ascochyta blight was not observed at all during the current season but wilt and root rot incidence was minimum (6.5 % and 0.8 % respectively) in plots where seed was treated with Bavistin followed by those where seed priming was done with Vitavax power (8.6 % and 1.1 % respectively). Seed priming with leaf extract of *L. camara* also reduced wilt and root rot incidence significantly which was statistically at par with seed priming treatment of Vitavax power.

PDKV, Akola

Results: The seed of chickpea (PKV Kabuli-2) were subjected to different seed priming treatments before sowing. The observations were recorded in laboratory on seed quality parameters and the same treated seed was grown in field during Rabi 2017. The crop condition is good and observations are in progress.

The data on field and seed quality of 2016-17 trial were recorded and presented in table 2.11, 2.12 and 2.13. Seed priming treatments were significantly superior than the rest of the treatments for major yield attributing traits and seed quality parameters. Among all the treatments T_6 (Seed Primed with Sodium Molybdate and coated with *Trichoderma harzianum*) was significantly superior in initial plant stand (85.33), root nodulation/plant (25.33), no. of pods/plant (38.67), seed yield (20.25 q/ha). In post-harvest observation, the significantly highest seed germination (88 %) and vigour index (31.78) was recorded in same treatment.

Table 2.10: Effect of seed priming on seed quality parameters before sowing at PDKV, Akola during *Rabi 2016-17*

Treatments	Seed Germination (%)	Seedling length (cm)	Seedling dry weight (g)	Vigour Index(GP X SDW)
T_1	84.00(66.42)	16.8	0.35	29.94
T_2	84.66(66.94)	16.3	0.33	27.93
T_3	82.00(64.90)	17.7	0.33	27.93
T_4	84.33(66.68)	19.1	0.32	27.55

T_5	82.00(64.90)	17.3	0.33	27.06
T_6	86.00(68.03)	19.3	0.36	30.97
T_7	80.33(63.67)	17.5	0.31	25.17
T_8	83.66(66.16)	18.3	0.32	27.32
T_9	81.00(64.16)	16.3	0.33	27.00
T_{10}	79.33(62.96)	15.5	0.27	21.95
SE(m)±	**0.82**	**0.38**	**0.007**	**0.66**
CD@5%	**2.43**	**1.31**	**0.02**	**1.98**

*Figures in parenthesis are arc sin values.

Table 2.11: Effect of seed priming on seed yield and seed quality parameters of chickpea at PDKV, Akola during *Rabi* 2016-17

Treatments	Initial Plant Stand	No. of root nodules/Plant	Days to maturity	No. of pods/ plant	100 seed weight (g)	Seed Yield/plot (g)	Seed yield/ ha (q/ha)
T_1	77.33	19.66	98.00	28.67	41.50	718.30	15.96
T_2	83.00	19.00	98.33	33.67	40.30	845.39	18.79
T_3	76.00	17.33	100.00	33.33	40.80	755.27	16.78
T_4	75.66	22.66	99.33	38.00	41.40	865.50	19.23
T_5	83.00	20.33	97.33	33.67	42.80	827.32	18.38
T_6	85.33	25.33	97.67	38.67	43.40	911.22	20.25
T_7	85.33	15.66	98.33	30.67	39.50	734.31	16.32
T_8	78.66	17.00	97.00	32.33	40.80	814.28	18.09
T_9	84.00	21.00	102.33	31.00	39.80	832.46	18.50
T_{10}	73.33	14.66	103.00	25.33	39.10	598.37	13.29
SE(m)±	**2.25**	**0.66**	**0.54**	**0.47**	**0.53**	**0.49**	**0.01**
CD@5%	**6.70**	**1.98**	**1.59**	**1.40**	**1.58**	**1.47**	**0.03**

Table 2.12: Effect of seed priming on seed quality parameters of chickpea at PDKV, Akola during *Rabi* 2016-17

Treatments	Seed Germination (%)	Seedling length (cm)	Seedling dry weight (g)	Moisture content (%)	Vigour Index (GP X SDW)
T_1	86.00(68.03)	18.33	0.36	9.4	30.74
T_2	86.67(68.59)	18.30	0.33	9.8	28.68
T_3	84.00(66.42)	19.70	0.34	9.5	28.38
T_4	86.33(68.30)	21.10	0.33	9.9	28.29
T_5	84.00(66.42)	19.30	0.33	9.6	27.81
T_6	88.00(69.73)	21.30	0.36	9.8	31.78
T_7	82.33(65.14)	19.53	0.31	9.7	25.88
T_8	85.67(67.76)	20.30	0.33	9.9	28.06
T_9	83.00(65.65)	18.30	0.33	9.7	27.75
T_{10}	81.33(64.40)	17.50	0.28	9.7	22.58
SE(m)±	**0.82**	**0.38**	**0.01**	**0.11**	**0.68**

CD@5%	2.43	0.13	0.02	0.33	2.03

*Figures in parenthesis are arc sine values.

Durgapura, Jaipur

Results: To study effect of pre-sowing seed priming treatments on seed yield and other ancillary characters in Kabuli chickpea an experiment was conducted at Rajasthan Agricultural Research Institute (RARI), Durgapura, Jaipur in *Rabi* 2017-18. The experiment was laid down in a randomized block design with four replications under irrigated conditions. Results showed treatments T_6-seed priming with Sodium Molybdate@ 500ppm + Seed coating with *T. harzianum* @ 15g/kg seed was most effective to enhance seed yield of chickpea (14.55 q/ha; Table 2.14). Perusal of data reveals that this increase in yield was mainly due to increase in number of pods per plant and 100 seed weight (Table 2.14). Effect of pre-sowing seed priming treatments on quality parameter such as root length, shoot length and seedling vigour index was significant, whereas for root nodulation and germination percentage it was non-significant (Table 2.14).

Table 2.13: Effect of pre-sowing seed priming treatments on seed yield and other ancillary characters in Kabuli chickpea during *Rabi* 2017-18 at RARI, Durgapura Jaipur

Treatments	No. of pods/ plant	No of seeds/ pod	100-seed wt. (g)	Seed yield (q/ha)	Biomass (q/ha)	Harvest Index	Disease incidence	
							Wilt	Root Rot
T_1	61.00	1.50	19.08	12.71	36.65	34.43	-	Traces
T_2	63.33	1.37	19.00	12.84	36.00	33.27	-	-
T_3	64.33	1.33	17.82	13.96	40.11	34.97	-	-
T_4	61.00	1.37	17.15	13.61	39.28	33.10	-	-
T_5	59.67	1.40	19.00	14.49	44.77	33.03	-	-
T_6	67.33	1.47	19.95	14.55	41.34	35.97	-	-
T_7	61.67	1.43	18.08	12.01	34.75	34.47	-	-
T_8	63.00	1.40	18.50	13.65	39.36	33.50	-	-
T_9	61.33	1.47	18.68	13.91	39.68	33.23	-	-
T_{10}	59.00	1.37	18.55	12.2	35.90	33.60	-	Traces
C.D. at 5%	**5.3**	**NS**	**1.6**	**1.11**	**4.3**	**NS**	**-**	**-**

Table 2.14: Effect of pre-sowing seed priming treatments on seed quality parameters in Kabuli chickpea during *Rabi* 2017-18 at RARI, Durgapura Jaipur

Treatments	Root nodulation (nodules/plant	Root length (cm)	Shoot length (cm)	Germination (%)	Seedling Vigour Index
T_1	15.0	9.27	17.63	69.77 (88.00)	2371
T_2	10.0	9.40	18.07	73.59 (92.00)	2528
T_3	13.0	11.97	23.60	73.93 (92.33)	3285
T_4	13.0	13.53	25.5	70.95 (89.33)	3378
T_5	12.0	12.53	22.27	73.26 (91.67)	3191
T_6	12.0	12.63	22.37	72.31 (90.67)	3172
T_7	12.3	9.93	18.8	70.99 (89.67)	2567
T_8	12.7	10.83	20.20	73.26 (91.67)	2846
T_9	11.7	10.63	20.37	72.56 (91.00)	2819
T_{10}	13.0	8.33	16.77	72.23 (90.67)	2274
S. Em ±	**-**	**0.522**	**0.740**	**-**	**125.3**
C. D. at 5%	**NS**	**1.550**	**2.198**	**NS**	**372.5**

Field Pea (*Pisum sativum L.*)

Unified observations

- In field pea, the experiment was conducted at three centers namely JNKVV, Jabalpur; NDUAT, Faizabad and CSAUAT Kanpur. In field pea, among all the seed priming treatment combinations, seed priming with Sodium Molybdate@ 500 ppm + Seed coating with T. harzianum @ 15 g/kg seed found statistically superior and uniformly better in one location but in other two locations treatment T6 found to be second most superior in terms of seed yield/ha. Pooled analysis of the data over locations reveals that treatment T6 contributed for 58.89% increase of seed yield/ha, 4.43% increase in germination percentage & 22.70% increase in vigour index, respectively over control.

Individual Centre wise observations

JNKVV, Jabalpur

Results: For assured field emergence of vegetable pea, the seed of variety Arkel was sown on 11.11.2016 @ 80 kg/ha after application of 10 proposed seed priming treatments as per recommended plot size, replication and design at JNKVV, Jabalpur.

The observed analyzed data revealed significantly higher germination % in T_7 (Leaf Extract of *Lantana camera* @ 10%) closely followed by seed priming with T_6 (Sodium Molybdate + *T. harzianum)*, while higher root length and vigour index in T_2 *(*Vitavax Power @ 0.25%). Maximum plant population exhibited by the seed treated with Sodium Molybdate +*T. harzianum* (T_6), whereas maximum nodules per plant observed in T_1 *(Tricoderma harzianum* @ 1.5%).

Among all the treatment combinations, seed treated with T_6 (Sodium molybdate + *Trichoderma harzianum*) perform superior for germination and major yield attributing traits followed by T_4 (GA_3 + *Trichoderma harzianum* @1.5%).

Conclusion

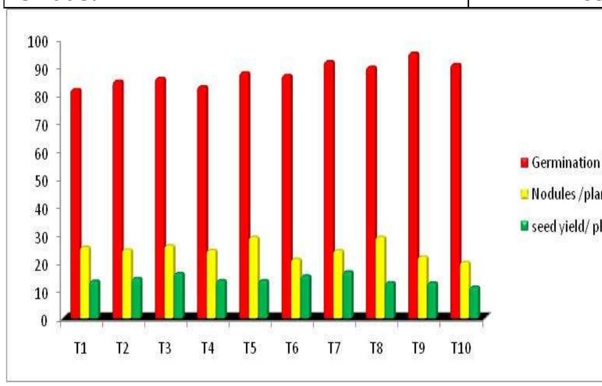
Among all the treatment combinations, seed treated with T_6 (Sodium molybdate + *Trichoderma harzianum*) followed by T_4 (GA_3 + *Trichoderma harzianum* @ 1.5%) found superior for seed yield/ plant.

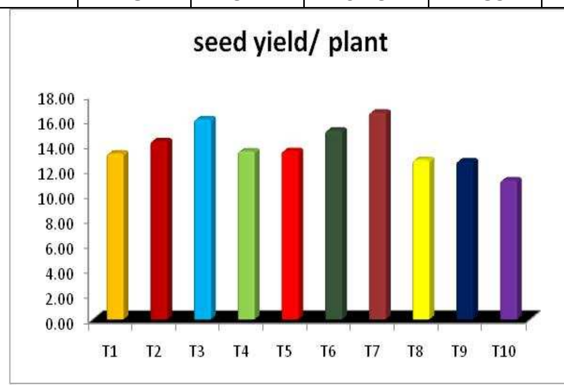
Table 2.15: Effect of pre sowing seed priming treatments on seed quality and health of field pea at JNKVV, Jabalpur during *Rabi* 2016-17

Treatment after priming of 8hrs	Germination (%)	Root length (cm)	Shoot length (cm)	Vigour index (length)	Plant population /m^2	Nodules /plant	Incidence of root rot
T_1 *(Tricoderma harzianum @ 1.5%)*	93.31	9.31	44.91	5060	16.75	58.56	NIL
T_2 (Vitavax Power @ 0.25%)	92.23	11.90	48.33	5546	10.61	48.89	NIL
T_3 (GA_3 50 ppm)	91.46	9.88	49.44	5421	14.00	48.11	NIL
T_4 *(*GA_3 + *Trichoderma harzianum @* 1.5%)	93.07	9.80	41.83	4992	14.57	51.67	NIL
T_5 *(*Sodium Molybdate @ 500ppm)	91.80	9.21	46.00	5068	17.75	36.00	NIL
T_6 *(*Sodium Molybdate + *T. harzianum)*	95.10	9.56	47.33	5409	23.42	47.33	NIL
T_7 (Leaf Extract of *lantana camera* @10%)	95.60	9.00	46.00	5057	15.66	35.11	NIL
T_8 *(*Seed hydration for 8 hours)	93.32	9.33	43.28	4854	22.33	43.56	NIL
T_9 *(*Bavistin @ 3g /kg seed)	89.88	9.61	46.89	5078	13.53	35.67	NIL
T_{10} *(*Control)	90.10	8.72	37.44	4184	8.45	32.33	NIL
SEm ±	**0.80**	**0.67**	**3.75**	**346.45**	**0.75**	**11.92**	**NIL**
CD at 5%	**1.69**	**1.42**	**7.87**	**727.87**	**1.58**	**25.04**	**NIL**

Table 2.16: Effect of pre sowing seed priming treatments on seed quality and health of field pea at JNKVV, Jabalpur during *Rabi* 2016-17

Treatments	Biomass/ plant (g)	Pods/ plant	100 seed wt(g)	Seeds /pod	Seed yield/ plant (g)	Harvest index
T_1 *(Trichoderma harzianum* @ 1.5%)	27.27	20.33	19.17	3.13	14.31	51.71
T_2 (Vitavax Power @0.25%)	33.00	22.33	18.97	3.26	13.51	48.68
T_3 (GA_3 50 ppm)	29.00	25.33	17.60	3.47	13.49	46.53
T_4 (GA_3 + *Trichoderma harzianum* @1.5%)	31.00	22.00	20.67	3.36	16.07	43.58
T_5 (Sodium Molybdate @ 500ppm)	29.33	24.33	18.70	4.01	15.17	52.49
T_6 (Sodium Molybdate + *T. harzianum)*	28.37	28.33	17.60	4.53	16.61	58.85
T_7 (Leaf Extract of *Lantana camera* @10%)	32.00	18.43	18.30	4.60	12.80	45.18
T_8 (Seed hydration for 8 hours)	26.67	25.33	17.47	5.34	12.71	47.65
T_9 (Bavistin @ 3 g/kg seed)	23.67	20.33	18.33	6.11	13.32	47.17
T_{10} (Control)	22.47	15.33	17.43	3.33	8.06	35.87
SEm ±	**3.91**	**2.62**	**1.14**	**0.14**	**1.54**	**4.36**
CD at 5%	**11.63**	**7.87**	**3.4**	**0.43**	**4.59**	**12.95**





Effect of Seed priming on seed yield & yield attributes of field pea variety Arkel (2016-17)

Untreated Control (no priming)

Vitavax Power @0.25%

Leaf Extract of *lantana camera* @ 10%

Effect of pre-sowing seed priming treatments on Field pea at JNKVV, Jabalpur

2017-18

For assured field emergence of vegetable pea, the seed of variety Arkel was sown 12.11.2017 @ 80 kg/ha after application of 10 proposed seed priming treatments as per recommended plot size, replication and design at JNKVV, Jabalpur. The experiment is in field.

CSAUAT, Kanpur

Year of start: 2017-18

Results: Experiment has been sown in end of November 2017 with the variety KPMR-522 and following observation has been recorded till now.

Table 2.17: Field Emergence (%) at CSAUAT, Kanpur during *Rabi* 2016-17

Treatments	Field emergence (%)
T_0 (Control)	85.00
T_1 (Seed priming with *Trichoderma harzianum* @ 1.5%)	88.00
T_2 (Seed priming with GA_3 @ 50 ppm.)	89.33
T_3 (Seed priming with Vitavax @ 0.25%)	91.33
T_4 (Seed priming with GA_3 50 ppm + seed coating with *T. harzianum* @ 15 g/kg)	92.00
T_5 (Chemical check: Seed treatment with Bavistin @ 3 g/kg.)	89.00
T_6 (Seed priming with Sodium molybdate @ 500 ppm)	93.00
T_7 (Seed priming with Sodium molybdate @ 500 ppm + Seed Coating with *T. harzianum* @ 15 g/kg)	90.00
T_8 (Seed hydration for 8 hrs.)	87.00
T_9 (Seed priming with leaf extract of *Lantana camara* @ 10%.)	91.00

Experiment is in progress on both the crops.

ICAR-IISS, Mau

Results:

Table 2.18: **Effect of pre sowing seed priming treatments on seed quality and health of field pea at ICAR-IISS, Mau during Rabi 2016-17**

Treatment	Germination %	Seedling Dry weight.(gm)	Root length (cm)	Shoot length (cm)	Vigour Index-I	Vigour Index-II	Nodules/ plant	Incidence of wilt/ root rot
T1	94.00	0.82	39.02	15.60	5134.28	77.13	32.00	Nil
T2	95.00	0.75	33.99	15.54	4705.35	71.03	16.50	Nil
T3	94.00	0.82	35.02	30.86	6192.72	76.70	27.25	Nil
T4	93.00	0.78	31.19	27.33	5442.36	72.54	34.21	Nil
T5	**98.00**	**0.80**	**40.02**	**14.41**	**5388.57**	**79.03**	**51.66**	**Nil**
T6	**97.00**	**0.89**	**41.11**	**13.78**	**5434.11**	**87.95**	**46.12**	**Nil**
T7	48.00	0.79	35.48	20.84	2703.36	38.09	19.22	Nil
T8	94.00	0.82	35.80	15.23	4796.82	76.98	51.35	Nil
T9	97.00	0.76	33.14	13.34	4508.56	73.72	19.33	Nil
T10	94.00	0.65	32.24	13.45	4656.21	70.15	30.00	Nil
SEm ±	**2.80**	**0.12**	**2.14**	**3.24**	**182.56**	**3.14**	**1.92**	**Nil**
CD at 5%	**2.92**	**0.13**	**2.22**	**3.34**	**191.45**	**3.22**	**3.65**	**Nil**

Table 2.19: **Effect of pre sowing seed priming treatments on seed quality and health of field pea at ICAR-IISS, Mau during *Rabi* 2016-17**

Treatment	No. of pods/ plant	No. of seeds/ pod	Plant biomass (g)	100 seed weight (g)	Seed yield/ plant (g)	Seed yield/ plot (kg)	Harvest Index
T1	18.27	22.40	29.07	16.28	11.76	1864.33	40.47
T2	17.33	19.87	27.67	16.59	8.33	928.67	30.11
T3	18.60	19.33	28.87	16.40	9.26	1132.33	32.09
T4	18.93	24.47	26.93	15.56	9.37	2204.67	34.80
T5	**18.67**	**22.40**	**29.67**	**15.80**	**11.55**	**1841.67**	**38.93**
T6	**20.80**	**23.47**	**32.40**	**15.85**	**13.40**	**2005.33**	**41.36**
T7	18.87	23.73	67.27	15.81	12.91	1774.33	19.19
T8	16.47	22.60	27.33	16.02	9.18	1553.67	33.57

T9	16.20	22.93	29.27	16.59	11.12	1473.33	38.00
T10	16.20	23.20	31.13	16.53	10.83	1459.00	34.79
SEm ±	**1.74**	**1.48**	**7.25**	**0.55**	**1.61**	**289.12**	**8.45**
CD at 5%	**3.45**	**2.19**	**8.14**	**0.68**	**2.24**	**344.16**	**9.28**

Results: The present investigation revealed that among all the treatment combinations, seed treated with T_7 (sodium molybdate + *Trichoderma harzianum*) followed byT_6 (Sodium Molybdate @ 500ppm) found superior for seed quality parameters and major seed yield attributing traits. Seed treatment with sodium molybdate + *Trichoderma harzianum* (T_7) exhibited highest seed yield per plot (2005.33 g) which is 37.40 % higher compared to control exhibiting superiority over other treatments.

General view of experimental plot of field pea cv. Prakash at ICAR-IISS, Mau

Effect of Seed priming on yield & yield attributes of field pea variety Prakash

Lentil (*Lens culinaris*)

Unified observations

- In Lentil, the experiment was conducted at three centres namely JNKVV, Jabalpur; NDUAT, Faizabad and CSAUAT, Kanpur. Among all the seed priming treatment combinations, seed priming with Sodium Molybdate @ 500 ppm + Seed coating with T. harzianum @ 15 g/kg seed found statistically superior and uniformly better in one location but in other two locations treatment T6 found to be second most superior in terms of seed yield/ha. Pooled analysis of the data over locations revealed that treatment T6 leads to 41.66% increase in seed yield/ha, 11.13% increase in germination percentage & 28.41% increase in vigour index, respectively over control.

Individual Centre wise observations

JNKVV, Jabalpur

Results: For assured field emergence of lentil under *utera* system of cultivation, the seed of variety JL 3 was sown on 11.11.2016 @ 35 kg/ha after application of 10 proposed seed priming treatments as per recommended plot size, replication and design at JNKVV, Jabalpur. The proposed priming treatments were performed as per technical programme.

Among all the treatment combinations, seed priming with T_6 (Sodium Molybdate + *T. harzianum*) found superior for germination and major yield attributing traits viz., biomass, no. of pods/plant, 100 seed weight, seeds per pod and seed yield/ plant.

Conclusion

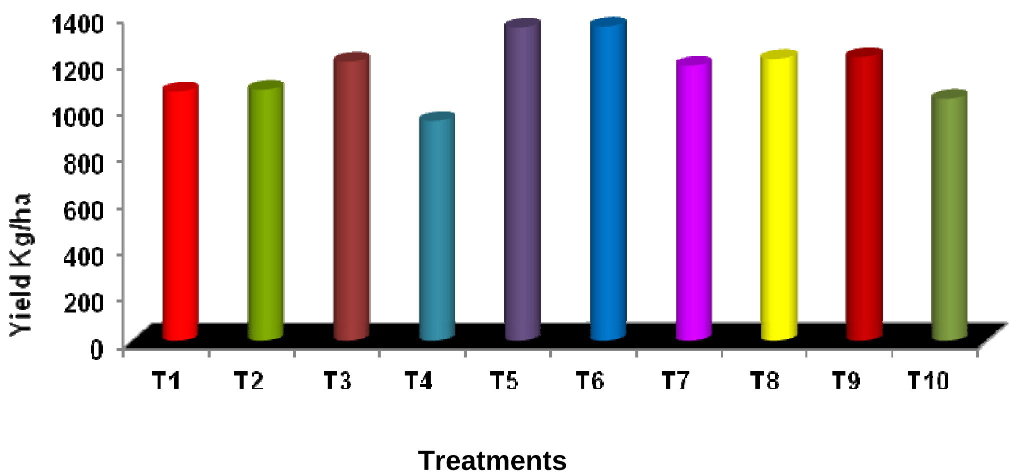
Among all the treatment combinations, seed priming with T_6 (Sodium Molybdate + *T. harzianum*) found superior for germination percentage and major yield attributing traits viz., no. of pods/plant, seeds and seed yield/ plant.

Table 2.20: Effect of pre sowing seed priming treatments on seed quality and health of lentil at JNKVV, Jabalpur during *Rabi* 2016-17

Treatment after priming of 8hrs	Germination (%)	Root length (cm)	Shoot length (cm)	Vigour index (length)	Plant population/ plot	Nodules/ plant	Incidence of root rot
T_1 *(Tricoderma hargianum@ 1.5%)*	85.00	7.67	17.82	2165	260.55	23.67	-
T_2 (Vitavax Power @0.25%)	80.00	6.93	17.61	1961	278.11	13.56	-
T_3 (GA_3 50 ppm)	78.00	8.37	16.78	1966	268.49	16.56	-
T_4 *(*GA_3 + *Trichoderma harzianum* @ 1.5%)	80.33	7.43	17.59	2010	259.85	14.00	-
T_5 *(*Sodium Molybdate @ 500 ppm)	83.00	7.22	18.37	2124	283.09	18.89	-
T_6 *(*Sodium Molybdate + *T. harzianum)*	93.00	7.67	18.78	1995	331.34	26.11	-
T_7 (Leaf Extract of *lantana camera* @ 10%)	90.00	6.97	18.17	2259	269.98	14.00	-
T_8 *(*Seed hydration for 8 hours)	92.00	7.98	17.71	2362	278.93	14.67	-
T_9 *(*Bavistin @ 3 g/kg seed)	85.00	9.26	18.28	2559	259.30	14.22	-
T_{10} *(*Control)	76.00	6.63	16.33	1744	255.32	12.56	-
SEm ±	**2..21**	**1.07**	**0.91**	**134.11**	**12.01**	**12.01**	-
CD at 5%	**4.68**	**2.26**	**1.90**	**281.74**	**25.24**	**25.24**	-

Table 2.21: Effect of pre sowing seed priming treatments on seed quality and health of lentil at JNKVV, Jabalpur during *Rabi* 2016-17

Treatments	Biomass/ plant (g)	Pods/ plant	100 seed weight (g)	Seeds /pod	Seed yield /plant (g)	Seed yield kg/ha	Harvest index
T_1 *(Trichoderma harzianum* @ 1.5%)	5.67	53.73	3.34	1.28	5.19	1074	38.14
T_2 (Vitavax Power @ 0.25%)	4.00	37.20	3.34	1.25	5.48	1081	44.45
T_3 (GA_3 50 ppm)	4.33	53.20	2.87	1.25	5.95	1203	44.33
T_4 *(*GA_3 + *Trichoderma harzianum* @ 1.5%)	3.67	37.47	3.14	1.27	4.62	946	43.82
T_5 *(*Sodium Molybdate @ 500ppm)	5.00	40.20	2.94	1.30	5.82	1351	44.20
T_6 *(*Sodium Molybdate + *T. harzianum)*	5.67	56.47	3.44	1.33	6.25	1355	45.44
T_7 (Leaf Extract of *Lantana camera* @ 10%)	5.67	54.00	3.19	1.32	6.23	1185	39.81
T_8 *(*Seed hydration for 8 hours)	5.00	45.73	3.36	1.24	5.98	1215	41.19
T_9 *(*Bavistin @ 3 g/kg seed)	5.67	52.33	3.36	1.23	6.09	1223	35.53
T_{10} *(*Control)	3.33	49.80	2.98	1.03	1.20	1042	31.88
SEm ±	**0.55**	**7.01**	**0.23**	**0.04**	**0.24**	**0.24**	**3.47**
CD at 5%	**1.64**	**20.84**	**0.69**	**0.09**	**0.72**	**205.4**	**10.32**



Effect of Seed priming treatments on yield of Lentil variety JL 3 (2016-17)

Untreated Control (no priming)

Leaf Extract of *Lantana camera* @10%

Seed hydration for 8 hours

Effect of pre-sowing seed priming treatments on lentil at JNKVV, Jabalpur

2017-18

For assured field emergence of lentil under *utera* system of cultivation, the seed of variety JL 3 was sown on 10.11.2017 @ 35 kg/ha after application of 10 proposed seed priming treatments as per recommended plot size, replication and design at JNKVV, Jabalpur. The experiment is in field.

NDUAT, Faizabad

Results: The experiment was conducted on lentil cv. NDL 1 as per technical programme during *Rabi* 2016-17. The relevant data are presented in table 2.25. There were significant differences among the treatments for most of the attributes under study. The highest seedling length and vigour index were recorded at seed primed with GA_3 @ 50ppm + seed coated with *Trichoderma harzianum* @ 15 g/kg seed whereas the maximum root nodulation was observed at seed primed with Sodium molybdate @ 500ppm + seed coated with *Trichoderma harzianum* @ 15 g/kg seed. Similarly, the highest and almost at par seed yield (15.88 q/ha & 15.72 q/ha) was observed at above both treatments, respectively. These seed priming treatments could therefore be exploited commercially leading to yield improvement in lentil even under *Utera* condition.

Table 2.22: Effect of pre sowing seed priming treatments in lentil cultivar NDL 1 under *Utera* condition at NDUAT, Faizabad during *Rabi* 2016-17

Treatment	Germination (%)	Seedling length (cm)	Vigour index	Seed yield (q/ha)	Nodules/ plant	Incidence of Root rot
Trichoderma harzianum @1.5 g/kg seed	84.10	18.64	1568	13.86	6.92	-
Vitavax Power @ 50.2%	84.86	19.23	1632	14.67	5.54	-
GA_3 @ 50 ppm	83.48	21.51	1796	14.21	7.12	-
GA_3 + *T. harzianum*	84.40	25.34	2139	15.88	7.87	-
Sodium molybdate @ 500 ppm	85.27	19.27	1643	14.46	9.43	-
Sodium molybdate +*Trichoderma harzianum*	85.50	19.48	1667	15.72	9.80	-
leaf extract of *Lantana camara* @ 10%	83.44	18.17	1516	13.95	5.22	-
Hydration (8 hrs)	84.60	20.12	1702	13.98	6.14	-
Bavistin @ 3 g/kg seed	83.75	19.89	1666	14.25	6.36	-
Control (without seed priming)	83.25	17.52	1459	11.08	5.51	Trace
CD (5%)	**1.51**	**6.89**	**262.27**	**1.66**	**2.57**	**-**

CSAUAT, Kanpur

Year of start: 2016-17

Results: The experiment was conducted for one year (Rabi 2016-17) at New Dairy Farm (NDF), Kalyanpur, Kanpur. The Breeder seeds of Lentil variety KLS-218 were obtained from the processing plant of the University. Seed priming treatment of sodium molybdate @ 500 ppm + coating with *T. harzianum* (T_7) exhibited significantly highest seed quality in terms of Field emergence (84.66%), No. of root nodules/plant (12.21), No. of plants/sq.m. (219.33), Number of pods/plant (120), Number of seed/pod (1.81), Seed yield (kg/plot) (2.18), Seed yield (q/ha) (21.6), Harvest index (34.76), 1000 Seed weight (g) (18.88). Next T_1 is priming with *Trichoderma harzianum* as it showed at par performance in No. of root nodules/plant (11.10), No. of plants/sq.m. (218.66), Number of pods/plant (108.66), Number of seed/pod (1.79), Seed yield (kg/plot) (1.96), Seed yield (q/ha) (19.63), 1000 Seed weight(g) (18.79), germination (93.33%), seedling length (26cm), seed dry weight (0.118g), seed vigour index-I (2426.66), seed vigour-II (11.04) and electrical conductivity (0.48dS^{-1}) (Table: 2.23).

Table 2.23: Effect of seed priming on growth, yield and seed quality of lentil (*Lens culinaris* Medic) at CSAUAT, Kanpur during *Rabi* 2016-17

Treatments	Field Emergence (%)	No of plant /sq. m.	No of root nodule /plant	No of pods /plant	No of seed/ pods	seed yield (kg/ plot)	seed yield (q/ ha)	Harvest index (%)	1000 seed wt (g)	Germination %	seedling length (cm)	Seedling dry weight (g)	Seed vigour index –I	Seed vigour index –II	EC dS/m^{-1}
T_0	79.00	203.33	6.10	58.66	1.52	1.58	15.8	26.18	17.20	85.33	18.01	0.09	1537.43	8.02	0.99
T_1	83.33	218.66	11.10	108.66	1.79	1.96	19.63	33.04	18.79	92.33	25.88	0.11	2389.91	10.15	0.51
T_2	80.00	205.33	6.44	66.00	1.69	1.41	14.13	28.20	18.43	86.33	20.86	0.10	1801.46	8.89	0.82
T_3	81.66	215.33	6.77	78.33	1.70	1.67	16.73	28.90	18.12	87.33	22.53	0.10	1967.90	9.00	0.75
T_4	81.00	210.00	6.66	73.33	1.72	1.22	12.23	29.00	18.47	87.00	25.03	0.10	2177.96	8.70	0.70
T_5	80.66	215.00	10.21	79.33	1.77	1.83	18.30	32.86	18.11	88.33	24.46	0.09	2161.20	8.95	0.61
T_6	82.66	212.33	7.22	93.33	1.74	1.78	17.86	30.38	18.36	90.00	23.88	0.10	2149.48	9.68	0.69
T_7	84.66	219.33	12.21	120.00	1.81	2.18	21.80	34.76	18.88	93.33	26.00	0.11	2426.66	11.04	0.48
T_8	81.33	213.33	7.21	112.00	1.78	1.61	16.10	31.51	18.26	89.00	25.63	0.10	2381.40	9.41	0.56
T_9	80.33	208.00	6.88	96.33	1.68	1.51	15.13	29.98	18.15	87.33	22.70	0.09	1982.49	8.38	0.72
C.D	**1.29**	**3.06**	**1.38**	**17.59**	**0.02**	**0.11**	**1.03**	**1.03**	**0.22**	**1.39**	**0.12**	**0.008**	**89.25**	**1.25**	**0.04**
SE (d)	**0.61**	**1.46**	**0.65**	**8.37**	**0.01**	**0.05**	**0.49**	**0.49**	**0.10**	**0.67**	**0.57**	**0.005**	**42.77**	**0.59**	**0.01**

2017-18

Following observation has been taken during the year. Experiment has been sown on 29-11-2017 with the variety Lentil KLS-218 and following observation has been recorded till now.

Table 2.24: Field Emergence (%) at CSAUAT, Kanpur during *Rabi* 2017-18

Treatments	Field emergence (%)
T_0 (Control)	78.00
T_1 (Seed priming with *Trichoderma harzianum* @ 1.5%)	82.66
T_2 (Seed priming with GA_3 @ 50 ppm.)	79.33
T_3 (Seed priming with Vitavax @ 0.25%)	81.33
T_4 (Seed priming with GA_3 50 ppm + seed coating with *T. harzianum* @ 15 g/kg)	81.00
T_5 (Chemical check: Seed treatment with Bavistin @ 3 g/kg.)	81.66
T_6 (Seed priming with Sodium molybdate @ 500 ppm)	80.33
T_7 (Seed priming with Sodium molybdate @ 500 ppm + Seed Coating with *T. harzianum* @ 15 g/kg)	83.33
T_8 (Seed hydration for 8 hrs.)	81.33
T_9 (Seed priming with leaf extract of *Lantana camara* @ 10%.)	80.33

Experiment 3: Standardization of seed production technology in green manure crops

Year of Start: 2015-16

Crops	Centers
Dhaincha (*Sesbania aculeata*)	TNAU, Coimbatore; AAU, Jorhat; MPKV, Rahuri; UAS, Dharwad; PJTSAU, Hyderabad; RPCAU, Pusa; BCKV, Nadia; PAJANCOA&RI, Karaikal; JAU, Junagadh; OUAT, Bhubaneswar; HPKV, Palampur and CCSHAU, Hisar
Sunhemp (*Crotolaria juncea*)	TNAU, Coimbatore; AAU, Jorhat; MPKV, Rahuri; UAS, Dharwad; ANGRAU, Guntur; BCKV, Nadia; JAU, Junagadh (Jamnagar).
Pillipesara (*Vigna trilobata)*	TNAU, Coimbatore; MPKV, Rahuri; UAS, Dharwad; ANGRAU, Guntur; JAU, Junagadh (Jamnagar).

Objectives:

1. To study the influence of nipping or pinching of terminal buds on the number and intervals of pod pickings, seed shattering loss, seed yield and quality.
2. To study the influence of phosphorous application on seed yield and quality.
3. To study the effect of DAP 2% as foliar spray to enhance seed yield and quality.

Methodology

1. Nitrogen application: 30kg/ha
2. Phosphorous application: 50 kg/ha as basal
3. Foliar spray: Two sprayings of the following nutrients as detailed below.
4. Effect of nipping or pinching of tendrils

- Being an indeterminate crop, pinching or nipping of terminal buds may have influence on seed yield and quality. Nipping should be done on *Sesbania aculeata* at 60 DAS, *Vigna trilobata* between 20 and 40 DAS. In sunhemp, the main stem of sunhemp when attains a height of 90 cm to break apical dominance and more branching.
- However, a control may be maintained without nipping and cutting in all crops.

Treatments

- **Main plot: Pinching**
  - M1: With pinching
  - M2: Without pinching
- **Sub plot: Foliar application**
  - T1-Foliar spray with DAP @ 2%
  - T2-Foliar spray with MN Mixture (ZnSO4@ 0.5% + Boric acid @ 0.3%)
  - T3-Foliar spray with NAA @ 40 ppm
  - T4-Foliar spray with DAP 2%+MN Mixture (Zn+B)+ NAA @ 40ppm
  - T5-Control

- The total fertilizer application is split into two, one as basal and other as top dressing.
- Foliar spray should be done at flowering. In addition, the recommended agronomic packages and plant protection practices should be followed.

Design : Split plot
Replications : 4
Spacing : Dhaincha -60 x 20 cm
Sunhemp -30 x 30 cm
Pillipesara -60 x 30 cm
Plot size : 20 m^2 (5 m x 4 m)

Observations to be made

1. No. of pods / plant
2. No. of seeds / pod (excluding shriveled and under developed seeds)
3. Pod yield / plant & plot
4. Seed yield / plant, plot and ha.
5. Seed recovery (%)
6. No. of pods shattered / plant before each pickings (Shattering loss)
7. No. of pickings made
8. 100 seed weight (g)
9. Seed germination (%)
10. Seedling vigour (length, dry weight and vigour index)
11. Cost Benefit ratio
12. Weather data should be recorded

Experiment allotted, conducted and number of centers having Uniform better results

Name of crop	Experiment allotted	Experiment conducted	Number of centers having uniform better results
Dhaincha	12	11	8
Sunhemp	7	6	4
Pillipesara	5	5	3

Observations of PI:

Uniformly better treatment details: T4 (Foliar spray with DAP 2%+MN Mixture (Zn+B)+ NAA @ 40ppm) is uniformly better treatment over the locations in all the three crops followed by T4 (Seed Priming with Gibberellic Acid @ 50 ppm + Seed coating with *T. harzianum* @ 15 g/kg seed).

Dhaincha (*Sesbania aculeata*)

Unified observations

- In Dhaincha, all the centres were submitted the report except AAU, Jorhat. Among all the treatment combinations P_1T_4 (Foliar spray with DAP 2%+MN Mixture (Zn+B)+ NAA @ 40ppm with pinching) was found superior and uniformly better in eight locations. Pooled analysis of the data over locations reveals that treatment P_1T_4 leads to 10% increase of seed yield/ha, 3.6% increase in germination percentage, 13.45% increase in number of pods/plant & 15.73% increase in seeds/pod, respectively over control.

Individual centre wise observations

Hisar

Results: Pinching in dhaincha crop recorded significantly higher seed yield as compared to without pinching. Seed quality parameters viz., germination (%), 1000 seed weight, seedling length and vigour index were observed significantly higher in without pinching. Among the treatments, foliar spray with DAP @ 2% + MN Mixture ($ZnSO_4$ @ 0.5% + Boric acid @ 0.3%)+ NAA @ 40 ppm followed by foliar spray with MN Mixture ($ZnSO_4$ @ 0.5% + Boric acid @ 0.3%) recorded higher seed yield per plot.

Table 3.1: Effect of pinching and foliar sprays on seed yield and quality in dhaincha at Hissar during *kharif* 2017

Treatments	No. of pods/ plants		No. of seeds/pod		Seed yield/plot		1000 seed weight (g)		Seed germination (%)		Seedling length (cm)		Vigour Index	
	P_1	P_2	P_1	P_2	P_1	P_2	P_1	P_2	P_1	P_2	P_1	P_2	P_1	P_2
T_1	56.33	100.67	26.67	31.00	0.994	0.833	15.97	18.20	75.33	82.00	14.67	16.67	1105	1366
T_2	55.00	94.33	25.33	24.00	1.090	0.852	16.77	17.53	76.00	76.67	11.67	15.00	887	1150
T_3	84.00	80.00	26.00	26.33	0.806	0.798	17.20	17.50	76.00	76.67	12.00	14.00	911	1072
T_4	85.67	95.33	27.00	27.67	1.138	0.884	17.23	17.67	76.33	81.00	14.00	16.00	1069	1297
T_5	83.00	74.33	23.33	28.33	0.767	0.760	17.37	16.80	75.00	76.33	13.33	13.00	999	991
CD at 5% T=														
P=	**8.058**		**1.65**		**0.104**		**0.248**		**1.242**		**0.843**		**71.76**	
PxT=	**NS**		**2.61**		**0.164**		**NS**		**1.964**		**1.333**		**113**	
	18.02		**NS**		**NS**		**0.555**		**2.78**		**NS**		**NS**	

T_1=Foliar spray with DAP @ 2%, T_2 = Foliar spray with MN Mixture ($ZnSO_4$ @ 0.5% + Boric acid @ 0.3%), T_3 = Foliar spray with NAA @ 40 ppm, T_4= Foliar spray with DAP @ 2% + MN Mixture ($ZnSO_4$ @ 0.5% + Boric acid @ 0.3%) + NAA @ 40 ppm, T_5= Control (Foliar spray with water only), P_1= Pinching, P_2= without pinching

JAU, Jamnagar (Gujarat)

Results: An experiment on “Standardization of seed production technology in Dhaincha” was conducted at Pearl Millet Research Station, JAU, Jamnagar (Gujarat) during *kharif*-2017. The experiment was laid down in split plot design in four replications with pinching as a main plot treatment (With pinching & without pinching) and in sub plot five different treatments *i.e.* foliar sprays with (T_1) DAP 2%, (T_2) MN mixture ($ZnSo_4$ 0.5% + Boric acid 0.3%), (T_3) NAA 40 ppm, (T_4) DAP 2% + MN mixture ($ZnSo_4$ 0.5% + Boric acid 0.3%) + NAA 40 ppm, and (T_5) Control. Pinching/nipping was done at 60 DAS to break apical dominance and more branching. Foliar spray was done two times *i.e.* first at initiation of flowering and second at end of flowering period. The soil of the experiment is medium black. The fertilizer was applied @ 30 kg/ha N and 50 kg/ha P. In addition, the recommended agronomic packages and plant protection practices were followed. To standardize the seed production technology and enhancement of productivity of quality seed, observations were recorded on number of pods per plant, number of seeds per pod, number of plants per plot, dry pod yield per plant (g), dry pod yield per plot (kg), seed yield per plant (g), seed yield per plot (kg), seed yield (q/ha), number of pods shattered per plant before picking, seed recovery (%), 100-seed weight (g), seed germination (%), seedling length (cm), seedling dry weight (g) and seedling vigour index-I & II.

(A) Pinching/nipping (M): Effect of pinching on all the characters except number of pods per plant was manifested non-significant. The number of pods per plant (137.20) was significantly higher with pinching than without pinching (133.43). However, the higher production of seed yield (16.42 q/ha) was obtained with pinching of terminal buds at 60 DAS.

(B) Foliar application (T): Effect of foliar application of different nutrients was found significant for seed yield per plant (g), seed yield per plot (kg), seed yield (q/ha), number of pods per plant, dry pod yield per plant (g) and dry pod yield per plot (kg). The remaining traits under study were reflected non-significant results in relation to foliar application of different nutrients. The foliar spray of treatment T_4*i.e.* DAP 2% + MN mixture ($ZnSo_4$ 0.5% + Boric acid 0.3%) + NAA 40 ppm at initiation of flowering and at end of flowering period was produced significantly higher seed yield (18.28 q/ha) over control (14.64 q/ha). The same treatment T_4 was also significantly superior over control (T_5) for seed yield per plant, number of pods per plant, dry pod yield per plant and dry pods yield per plot.

(C) Interaction: Interaction effect M x T was found non-significant for all the traits under study. It is thus concluded that the foliar application of DAP 2% + MN mixture ($ZnSo_4$ 0.5% + Boric acid 0.3%) + NAA 40 ppm at initiation of flowering and at end of flowering period with pinching was produced the highest seed yield (18.63q/ha), number of pods per plant (153.80), number of seeds per pod (31.90), dry pods yield per plant (47.67g) and per plot (7.61kg), 100-seed weight (1.55g), seedling dry weight (1.07g) and higher seed vigour index-I (899%) & II (92.56%) and less number of pods shattered per plant before picking (0.137).

Table 3.2: Replicated data for seed yield in Dhaincha at Pearl Millet Research Station, JAU, Jamnagar during *Kharif*-2017

Pinching	Foliar spray	Seed Yield (kg/plot)				Total	Mean	Seed yield (q/ha)
		I	II	III	IV			
M_1	T_1	3.235	2.340	3.340	2.850	11.765	2.941	16.34
	T_2	2.790	2.970	3.035	3.255	12.050	3.013	16.74
	T_3	2.920	3.495	2.540	2.255	11.210	2.803	15.57

	T_4	2.945	3.155	3.880	3.430	13.410	3.353	18.63
	T_5	3.000	2.550	2.140	2.995	10.685	2.671	14.84
M_2	T_1	3.490	2.990	2.180	2.690	11.350	2.838	15.76
	T_2	2.840	2.960	3.260	2.770	11.830	2.958	16.43
	T_3	2.980	2.255	2.675	2.110	10.020	2.505	13.92
	T_4	3.330	2.940	3.045	3.600	12.915	3.229	17.94
	T_5	2.160	2.380	2.620	3.230	10.390	2.598	14.43
Total		**29.690**	**28.035**	**28.715**	**29.185**	**115.625**	--	--

M_1=with pinching, M_2= Without pinching, T_1= Foliar spray with DAP 2%, T_2= Foliar spray with MN mixture ($ZnSo_4$ 0.5% + Boric acid 0.3%), T_3= Foliar spray with NAA 40 ppm, T_4= Foliar spray with DAP 2% + MN mixture ($ZnSo_4$ 0.5% + Boric acid 0.3%) + NAA 40 ppm, T_5=Control.

Table 3.3: Ancillary, physiological observations and seed yield in Dhaincha at Pearl Millet Research Station, JAU, Jamnagar during *Kharif*-2017

Treat.		Seed yield			No. of plants /plot	No. of pods/ plant	No. of seeds/ pod	Dry pods yield		Pods shattered /Plant before picking	Seed recovery (%)	100 seeds weight (g)	Seed germin-ation (%)	Seedling length (cm)	Seedling dry weight (g)	Seed vigour Index (%)	
		Per plant (g)	Per Plot (kg)	(q/ha)				Per Plant (g)	Per Plot (kg)							I	II
(A) Pinching /nipping (M)																	
M_1		22.41	2.96	16.42	188.75	137.20	30.70	41.44	5.94	0.150	54.78	1.53	86.10	10.11	0.98	871	84.46
M_2		21.38	2.83	15.70	185.79	133.43	30.13	39.30	5.62	0.154	55.48	1.52	84.85	9.90	1.01	841	85.43
SEm$\underline{+}$		0.30	0.04	0.20	0.78	0.79	0.35	1.09	0.13	0.01	1.60	0.01	1.31	0.18	0.03	16.53	2.63
CD 5%		NS	NS	NS	NS	3.54	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
C.V. %		6.19	5.47	5.47	1.87	2.60	5.15	12.05	9.71	19.39	13.02	1.03	6.85	7.98	13.33	8.64	13.84
(B) Foliar application (T)																	
T_1		21.07	2.89	16.05	188.48	133.33	30.90	41.18	5.65	0.145	51.35	1.52	83.38	10.18	0.98	850	81.57
T_2		22.22	2.99	16.58	191.37	137.15	30.83	43.52	6.26	0.150	51.30	1.53	85.75	9.69	1.02	833	86.83
T_3		20.04	2.65	14.74	182.63	127.93	29.63	36.61	4.96	0.149	56.46	1.52	84.75	9.84	0.97	834	82.15
T_4		25.16	3.29	18.28	194.13	151.43	30.93	45.97	7.40	0.144	55.14	1.54	88.00	10.17	1.03	893	90.09
T_5		20.98	2.63	14.64	179.75	126.75	29.80	34.57	4.62	0.172	61.41	1.52	85.50	10.15	0.98	867	84.09
SEm$\underline{+}$		1.13	0.16	0.88	5.38	4.63	0.62	2.30	0.35	0.01	3.35	0.02	2.00	0.31	0.03	35.52	2.53
CD 5%		**3.29**	**0.46**	**2.56**	**NS**	**13.53**	**NS**	**6.71**	**1.02**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
C.V. %		**14.55**	**15.45**	**15.45**	**8.12**	**9.69**	**5.72**	**16.11**	**17.11**	**19.77**	**17.20**	**3.04**	**6.63**	**8.80**	**7.47**	**11.74**	**8.42**
(C) Interaction effects (M x T):																	
M_1	T_1	21.42	2.94	16.34	189.00	135.70	30.05	42.66	5.94	0.152	50.20	1.52	83.50	10.34	0.96	864	80.26
	T_2	23.03	3.01	16.74	192.00	138.65	31.30	44.50	6.45	0.153	51.75	1.54	88.00	10.07	0.99	888	86.78
	T_3	20.42	2.80	15.57	186.75	129.65	30.10	38.13	5.08	0.150	54.16	1.53	86.50	9.87	0.96	855	82.45
	T_4	26.19	3.35	18.63	195.75	153.80	31.90	47.67	7.61	0.137	55.96	1.55	87.00	10.36	1.07	899	92.56
	T_5	20.97	2.67	14.84	180.25	128.20	30.15	34.23	4.63	0.158	61.84	1.52	85.50	9.92	0.94	846	80.26
M_2	T_1	20.73	2.84	15.76	187.97	130.95	31.75	39.71	5.36	0.138	52.51	1.53	83.25	10.01	1.00	837	82.88
	T_2	21.42	2.96	16.43	190.75	135.65	30.35	42.54	6.08	0.147	50.85	1.52	83.50	9.31	1.05	777	86.89
	T_3	19.66	2.51	13.92	178.50	126.20	29.15	35.09	4.84	0.149	58.77	1.50	83.00	9.82	0.99	813	81.85
	T_4	24.13	3.23	17.94	192.50	149.05	29.95	44.26	7.20	0.152	54.32	1.54	89.00	9.98	0.99	887	87.62
	T_5	20.99	2.60	14.43	179.25	125.30	29.45	34.91	4.62	0.186	60.97	1.52	85.50	10.39	1.03	888	87.92
SEm$\underline{+}$		**1.59**	**0.22**	**1.24**	**7.60**	**6.55**	**0.87**	**3.25**	**0.49**	**0.02**	**4.74**	**0.02**	**2.84**	**0.44**	**0.04**	**50.23**	**3.58**
CD 5%		**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

Dhaincha experiment *Kharif*-2017 photos

Dhaincha with Pinching (M_1T_5) ***Dhaincha without Pinching (M_2T_4)***

Field view of the experimental plot of Dhaincha at JAU, Jamnagar (Gujarat)

Palampur

Results: The results (Table 3.5 & 3.6) revealed significant differences among pinching and non-pinching treatments. The pinching of terminal buds at 60 DAS produced significantly higher number of pods per plant, pod yield per plant and plot, thereby exhibiting significant increase in seed yield per plant, plot as per hectare over no pinching treatment. However, no significant differences were observed with respect to number of seeds per pod and other seed quality parameter like 100 seed weight, germination percentage, seedling length and vigour index among pinching and non-pinching treatments.

Among foliar spray treatments, treatment T_4 (foliar spray with DAP @ 2% + MN mixture + NAA @ 40 ppm) produced significantly higher number of pods per plant, pod yield and seed yield, germination percentage, seedling weight and vigour index over control (T_5). The same treatment (T_4) did not exhibit any significant differences as compared to treatments T_1, T_2 and T_3. No significant effect on 100 seed weight was observed due to application of different foliar spray of nutrients.

Table 3.4: Effect of pinching and foliar application of nutrients on pods, yield attributes and seed yield of Dhaincha at Palampur during *kharif* 2017

Treatment	Pods per plant	Seeds per pod	Pod yield per plant(g)	Pod yield per plot (g)	Seed yield per plant (g)	Seed yield per plot (g)	Seed yield (q/ha)
Pinching							
M_1	51.09	16.80	21.37	2563.98	16.82	2018.88	14.02
M_2	46.57	17.10	19.72	2366.47	15.53	1863.36	12.94
SE (m) ±	**1.43**	**0.42**	**0.57**	**12.11**	**0.1**	**39.5**	**0.12**
CD (5%)	**4.02**	**NS**	**1.60**	**34.03**	**0.28**	**111.1**	**0.38**
Nutrient spray							
T_1	48.62	17.20	20.71	2485.34	16.31	1956.96	13.59
T_2	47.03	17.60	20.50	2459.74	16.14	1936.80	13.45
T_3	50.52	16.70	21.00	2520.09	16.54	1984.32	13.78
T_4	52.53	17.60	21.56	2587.75	16.98	2037.60	14.15
T_5	48.73	14.60	18.90	2267.71	14.88	1785.60	12.40
SE (m) ±	**1.12**	**0.98**	**1.12**	**144.56**	**0.94**	**45.7**	**0.86**
CD (5%)	**2.31**	**2.01**	**2.32**	**198.42**	**1.93**	**94.34**	**1.56**

Table 3.5: Effect of pinching and foliar application of nutrients on seed quality of Dhaincha at Palampur during *kharif* 2017

Treatment	Pod shattering per plant (%)	No. of pickings	100-seed weight	Germination (%)	Vigour Index-I	Seedling length (cm)
Pinching						
M_1	1.81	1.00	1.96	95.60	1739.92	18.20
M_2	1.78	1.00	1.95	95.30	1763.05	18.50
SE (m) ±	**0.06**	**0**	**0.04**	**0.08**	**2.49**	**0.05**
CD (5%)	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Nutrient spray						
T_1	1.80	1.00	1.95	95.80	1733.98	18.10
T_2	1.79	1.00	1.95	95.60	1740.33	18.30
T_3	1.81	1.00	1.96	95.70	1741.74	18.20

T_4	1.75	1.00	1.98	98.30	2015.15	20.50
T_5	1.86	1.00	1.94	92.70	1566.63	16.90
SE (m) ±	**0.06**	**0**	**0.09**	**1.31**	**85.23**	**1.18**
CD (5%)	**NS**	**NS**	**NS**	**2.70**	**175.96**	**2.43**

Main plots : M_1 – Pinching M_2 - Non pinching

Sub plots : T_1 - Foliar spray with DAP @ 2% T_2 - Foliar spray with MN mixture (Zn SO4 @ 0.5% + Boric acid @ .3%)

T_3 - Foliar spray with NAA @ 40 ppm T_4 - Foliar spray with DAP @ 2% + MN mixture + NAA @ 40 ppm

T_5 - Control

PJTSAU, Hyderabad

Results: Pinching had significant influence in improving plant height, branches/plant, pods/plant, pod length, seeds/pod, seed yield/plant and seed yield/ha. However, pinching was found ineffective in improving 100 seed weight and without pinching treatment has recorded bold seed as compared to pinching (2.87% increase). Pinching recorded 13.10% improvement in seed yield/ha over unpinched plots of dhaincha.

Significant differences were noticed among the different foliar sprays. Among the sub treatments, foliar application with DAP 2% + MN Mixture (Zn + B) + NAA resulted in higher seed yield (12.10 q/ha) and is significantly different from foliar spray with MN Mixture ($ZnSO_4$ 0.5% + Boric acid 0.3%) (11.76 q/ha) and foliar spray with DAP 2% (10.43 q/ha).

Non-significant differences were noticed for some of the seed quality traits like germination percentage and shoot length. However significant differences between pinching and without pinching treatments was noticed with respect to root length, seedling length and seedling vigour index I.

Table 3.6: Influence of pinching on flowering and growth characters of Dhaincha at PJTSAU, Hyderabad during *kharif*, 2017

Treatments	Days to 50% flowering				Plant height (cm)				Branches/plant (no.)			
	Pinching		Without pinching	Mean	Without pinching		Pinching	Mean	Without pinching		Pinching	Mean
Foliar spray with DAP 2%	31.7		31.7	31.7	256.8		67.2	162.0	11.4		16.9	14.2
Foliar spray with MN Mixture ($ZnSO_4$ 0.5% + Boric acid 0.3%)	32.7		31.3	32.0	255.9		70.4	163.2	11.4		18.0	14.7
Foliar spray with NAA 40 ppm	32.3		31.7	32.0	248.5		63.4	156.0	10.9		16.3	13.6
Foliar spray with DAP 2%+ MN Mixture (Zn +B) + NAA	33.0		32.3	32.7	255.2		75.9	165.6	13.0		18.7	15.9
Control	31.3		31.3	31.3	247.6		62.8	155.2	10.2		15.1	12.7
Mean	32.2		31.7	32.0	252.8		67.9	160.4	11.4		17.0	14.2
	S.E.	**S.Ed**	**C.D.**	**C.V. (%)**	**S.E.**	**S.Ed**	**C.D.**	**C.V. (%)**	**S.E.**	**S.Ed**	**C.D.**	**C.V. (%)**
Ai.-Aj.	**0.19**	**0.27**	**1.15**	**3.76**	**3.42**	**4.84**	**20.82**	**4.00**	**0.16**	**0.23**	**0.98**	**6.58**
Bi.-Bj.	**0.49**	**0.69**	**1.47**		**2.62**	**3.70**	**7.85**		**0.38**	**0.54**	**1.14**	
AiBi-AiBj	**0.69**	**0.98**	**2.08**		**3.70**	**5.24**	**11.10**		**0.54**	**0.76**	**1.61**	
AiBi-AjBi	**0.65**	**0.92**	**2.11**		**4.76**	**6.73**	**21.87**		**0.51**	**0.72**	**1.68**	

Table 3.7: Influence of pinching on pod characters of Dhaincha at PJTSAU, Hyderabad during *kharif*, 2017

Treatments	Pods/plant (no.)				Pod length (cm)				Seeds/pod (no.)			
	Without pinching		Pinching	Mean	Without pinching		Pinching	Mean	Without pinching		Pinching	Mean
Foliar spray with DAP 2%	99.20		123.30	111.3	22.1		23.6	22.9	33.5		35.7	34.6
oliar spray with MN Mixture ZnSO$_4$ 0.5% + Boric acid 0.3%)	132.27		134.40	133.3	22.0		24.3	23.2	33.7		35.5	34.6
Foliar spray with NAA 40 ppm	89.83		92.70	91.3	21.9		22.6	22.3	32.7		34.2	33.5
Foliar spray with DAP 2%+ MN Mixture (Zn +B) + NAA	92.93		120.60	106.8	21.8		23.9	22.9	33.0		35.4	34.2
Control	82.40		77.30	79.9	21.6		22.0	21.8	32.3		32.7	32.5
Mean	99.3		109.70	104.5	21.9		23.3	22.6	33.0		34.7	33.9
	S.E.	S.Ed	C.D.	CV(%)	S.E.	S.Ed	C.D.	CV (%)	S.E.	S.Ed	C.D.	CV (%)
Ai.-Aj.	**1.58**	**2.23**	**9.61**	**9.36**	**0.06**	**0.09**	**0.38**	**4.06**	**0.17**	**0.24**	**1.02**	**3.90**
Bi.-Bj.	**3.99**	**5.65**	**11.97**		**0.37**	**0.53**	**1.12**		**0.54**	**0.76**	**1.62**	
AiBi-AiBj	**5.65**	**7.98**	**16.93**		**0.53**	**0.75**	**1.59**		**0.76**	**1.08**	**2.29**	
AiBi-AjBi	**5.29**	**7.48**	**17.32**		**0.48**	**0.68**	**1.46**		**0.70**	**0.99**	**2.23**	

Table 3.8: Influence of pinching on yield attributing characters of Dhaincha at PJTSAU, Hyderabad during *kharif*, 2017

Treatments	Test weight (g)			Seed yield/plant (g)			Seed yield/plot (kg)			Seed yield/ha (q)		
	Without pinching	Pinching	Mean	Without pinching	Pinching	Mean	Without pinching	Pinching	Mean	Without pinching	Pinching	Mean
Foliar spray with DAP 2%	1.407	1.360	1.384	28.56	29.93	29.25	2.01	2.19	2.10	9.57	10.43	10.00
Foliar spray with MN Mixture (ZnSO$_4$ 0.5% + Boric acid 0.3%)	1.447	1.403	1.425	28.32	32.12	30.22	2.06	2.47	2.27	9.81	11.76	10.79
Foliar spray with NAA 40 ppm	1.420	1.357	1.389	25.66	28.95	27.31	1.87	2.11	1.99	8.90	10.05	9.48
Foliar spray with DAP 2%+ MN Mixture (Zn +B) + NAA	1.500	1.457	1.479	31.51	38.23	34.87	2.17	2.54	2.36	10.33	12.10	11.22
Control	1.407	1.403	1.405	21.44	27.78	24.61	1.78	2.07	1.93	8.48	9.86	9.17
Mean	1.436	1.396	1.416	27.10	31.40	29.25	1.98	2.28	2.13	9.42	10.84	10.13

	S.E.	S.Ed	C.D.	C.V. (%)	S.E.	S.Ed	C.D.	C.V. (%)	S.E.	S.Ed	C.D.	C.V. (%)	S.E.	S.Ed	C.D.	C.V. (%)
Ai.-Aj.	**0.004**	**0.006**	**0.027**	**2.21**	**0.15**	**0.21**	**0.91**	**5.91**	**0.04**	**0.05**	**0.22**	**5.02**	**0.19**	**0.23**	**1.05**	**5.02**
Bi.-Bj.	**0.013**	**0.018**	**0.038**		**0.71**	**1.00**	**2.12**		**0.04**	**0.06**	**0.13**		**0.19**	**0.29**	**0.62**	
AiBi-AiBj	**0.018**	**0.026**	**0.054**		**1.00**	**1.41**	**2.99**		**0.06**	**0.09**	**0.18**		**0.29**	**0.43**	**0.86**	
AiBi-AjBi	**0.017**	**0.024**	**0.054**		**0.91**	**1.28**	**2.79**		**0.07**	**0.09**	**0.26**		**0.33**	**0.43**	**1.24**	

Table 3.9: Influence of pinching on seed quality characters of Dhaincha at PJTSAU, Hyderabad

Treatments	Seedling length (cm)				SVI I			
	Pinching		Without pinching	Mean	Pinching		Without pinching	Mean
Foliar spray with DAP 2%	**17.5**		**17.6**	**17.6**	**1393**		**1413**	**1403**
Foliar spray with MN Mixture ($ZnSO_4$ 0.5% + Boric acid 0.3%)	**17.4**		**18.0**	**17.7**	**1340**		**1380**	**1360**
Foliar spray with NAA 40 ppm	18.0		19.5	18.8	1395		1493	1444
Foliar spray with DAP 2%+ MN Mixture (Zn +B) + NAA	17.9		18.7	18.3	1339		1446	1393
Control	17.4		18.8	18.1	1381		1431	1406
Mean	17.6		18.5	18.1	1369.8		1432.7	1401
	S.E.	S.Ed	C.D.	C.V. (%)	S.E.	S.Ed	C.D.	C.V. (%)
Ai.-Aj.	**0.04**	**0.05**	**0.22**	**1.16**	**6.99**	**9.89**	**42.54**	**2.04**
Bi.-Bj.	**00.09**	**0.12**	**0.26**		**11.65**	**16.47**	**34.91**	
AiBi-AiBj	**0.12**	**0.17**	**0.36**		**16.47**	**23.29**	**49.38**	
AiBi-AjBi	**0.11**	**0.16**	**0.38**		**16.30**	**23.06**	**58.14**	

Field view of dhaincha during *kharif*, 2017

MPKV, Rahuri

Results: The data on effect of pinching and foliar application on seed yield and quality parameters of Dhaincha are presented in Table 3.11 and 3.12. The data revealed that the seed yield and quality parameters are significantly influenced due to pinching and foliar application of fertilizers/micronutrients.

A) Effect of pinching:

Pinching had significant effect on seed yield and quality of Dhaincha irrespective of foliar application of fertilizer/micronutrients. Number of pods/plant (69.25), number of seeds/pod (30.69), 100 seed weight (1.95 g), seed yield (1.401 kg/plot), seed yield (700.27 kg/ha), germination (86.80%), root shoot length (30.71 cm), dry matter content (0.135 g), vigour index I (2671.07) and vigour index II (11.75) were significantly higher in the pinching treatment and pod shattering per cent (6.33) was also lower in this treatment.

Pooled data:

Pooled data revealed that pinching had significant effect on seed yield and quality of Dhaincha irrespective of foliar application of fertilizer/micronutrients. Number of pods/plant (77.53), number of seeds/pod (23.73), seed yield (1.318 kg/plot), seed yield (651.48 kg/ha), germination (87.35%), dry matter content (0.126 g) and vigour index II (10.99) were significantly higher with the pinching treatment.

B) Effect of foliar application of fertilizers/micronutrients:

Foliar application of fertilizers/micronutrients had significant effect on seed yield and quality of Dhaincha irrespective of pinching. Number of pods/plant (68.20), number of seeds/pod (32.30), 100 seed weight (2.01g), seed yield (1.479 kg/plot), seed yield (739.58 kg/ha), germination (87.67%), root shoot length (31.87 cm) dry matter content (0.143g), vigour index I (2797.16) and vigour index II (12.52) were significantly higher with the foliar application of DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid (0.3%)] + NAA (40 ppm) (T_4) treatment. The pod shattering per cent (4.67) was also lower in this treatment.

Pooled Data

Pooled data revealed that foliar application of fertilizers/micronutrients had significant effect on seed yield and quality of Dhaincha irrespective of pinching. Number of pods/plant (75.90), number of seeds/pod (25.55), seed yield (1.363 kg/plot), seed yield (674.45 kg/ha), germination (88.28%), root shoot length (29.21 cm) dry matter content (0.131g), vigour index I (2571.12) and vigour index II (11.62) were significantly higher in the foliar application of DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid (0.3%)] + NAA (40 ppm) (T_4) treatment. The pod shattering per cent (8.20) was also lower in this treatment.

C) Interaction effect:

The interaction effect of pinching and foliar application of fertilizers/micronutrients showed significant effect on seed yield. Seed yield (1.739 kg/plot) and seed yield (869.67 kg/ha) was significantly higher in the pinching and foliar application of DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid (0.3%)] + NAA (40 ppm) (P_1T_4).

Pooled Data

Pooled data revealed that seed yield (1.634 kg/plot) and seed yield (817.06 kg/ha) were significantly higher in the pinching and foliar application of DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid (0.3%)] + NAA (40 ppm).

Recommendation: The pinching practice after 60 days of sowing and foliar application of DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid (0.3%)] + NAA (40 ppm) at the time of flowering is recommended for better seed yield and seed quality in green manure Dhaincha crop.

Table 3.10: Effect of pinching and foliar application on seed yield and quality parameters of Dhaincha at MPKV, Rahuri during *Kharif 2017*

Treatments	No. of pods / plant				No. of seeds / pod				No. of pods shattered / plant			
Pinching	2015	2016	2017	Pooled	2015	2016	2017	Pooled	2015	2016	2017	Pooled
With pinching (P_1)	95.0	68.32	69.25	77.53	9.7	30.76	30.69	23.73	15.6	3.53	6.33	8.47
Without pinching (P_2)	83.3	42.24	48.02	57.87	7.0	25.28	25.89	19.50	18.6	9.66	8.67	12.30
SE ±	1.09	1.47	1.07	2.74	0.05	0.37	0.14	0.103	0.30	0.61	0.37	1.00
CD at 5%	7.14	9.66	7.02	9.49	0.31	2.41	0.93	0.467	1.97	4.02	2.41	3.47
Foliar application												
Spray with DAP 2% (F_1)	91.4	55.81	62.05	69.74	8.5	26.56	28.60	21.22	17.6	5.83	6.00	9.82
Spray with MN mixture (F_2)	91.7	53.61	55.77	67.03	8.8	27.30	27.83	21.32	17.0	5.83	8.50	10.42
Spray with NAA (40 ppm) (F_3)	87.0	51.40	57.45	65.28	9.0	25.73	28.10	20.95	16.0	7.33	8.17	10.49
Spay with DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid (0.3%)] + NAA (40 ppm)(F_4)	93.1	66.43	68.20	75.90	9.0	35.33	32.30	25.55	16.0	4.00	4.67	8.20
Control (F_5)	82.8	49.13	49.72	60.55	6.5	25.16	24.63	19.04	18.8	10.00	10.17	12.99
SE ±	**1.48**	**2.27**	**2.09**	**1.39**	**2.79**	**1.27**	**1.23**	**0.42**	**0.63**	**0.67**	**0.55**	**0.87**
CD at 5%	**4.47**	**6.86**	**6.32**	**4.21**	**8.15**	**3.83**	**3.71**	**1.30**	**1.92**	**2.16**	**1.67**	**2.55**

Treatments	100 seed weight (g)				Seed yield/ plot(kg)				Seed yield / ha (kg)			
Pinching	2015	2016	2017	Pooled	2015	2016	2017	Pooled	2015	2016	2017	Pooled
With pinching (P_1)	1.82	1.86	1.95	1.88	1.192	1.317	1.401	1.318	595.87	658.30	700.27	651.48
Without pinching (P_2)	1.78	1.74	1.82	1.78	0.863	0.945	1.065	0.973	431.33	472.47	532.60	478.80
SE ±	0.01	0.02	0.07	0.02	0.02	0.016	0.014	0.037	8.84	8.04	6.95	14.40
CD at 5%	NS	0.12	0.046	NS	0.12	0.105	0.091	0.126	97.92	22.67	45.51	49.83
Foliar application												
Spray with DAP (2%)(F_1)	1.85	1.84	1.95	1.88	1.013	1.286	1.431	1.222	506.50	643.17	715.25	621.64
Spray with MN mixture (F_2)	1.83	1.80	1.87	1.83	1.068	1.106	1.249	1.138	534.17	553.17	624.25	570.53
Spray with NAA (40 ppm) (F_3)	1.83	1.79	1.90	1.84	0.973	1.043	1.076	1.079	486.42	521.50	537.92	515.28
Spay with DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid (0.3%)]+ NAA (40 ppm) (F_4)	1.88	1.91	2.01	1.93	1.108	1.460	1.479	1.363	553.75	730.00	739.58	674.45
Control (F_5)	1.62	1.68	1.71	1.67	0.974	0.758	0.930	0.928	487.17	379.08	465.17	443.81
SE ±	**0.04**	**0.04**	**0.06**	**0.06**	**0.03**	**0.047**	**0.050**	**0.06**	**15.95**	**23.40**	**25.17**	**26.93**
CD at 5%	**0.11**	**0.11**	**0.18**	**NS**	**0.09**	**0.142**	**0.152**	**0.18**	**48.21**	**70.77**	**76.13**	**81.45**

Table 3.10contd….

Treatments	Germination (%)				Root shoot length (cm)				Dry matter content (g)			
Pinching	2015	2016	2017	Pooled	2015	2016	2017	Pooled	2015	2016	2017	Pooled
With pinching (P_1)	89.40 (71.49)	85.86 (68.20)	86.80 (68.88)	87.35 (69.52)	23.75	32.17	30.71	28.88	0.131	0.110	0.135	0.126
Without pinching (P_2)	80.33 (64.41)	78.20 (62.25)	81.40 (64.58)	79.99 (63.75)	21.81	30.33	28.43	26.86	0.126	0.104	0.126	0.119
SE ±	0.62	0.603	0.748	1.48	0.22	0.896	0.365	1.28	0.001	0.02	0.001	0.001
CD at 5%	4.05	3.948	4.902	5.10	1.46	NS	2.392	NS	NS	NS	0.004	0.005
Foliar application												
Spray with DAP (2%)(F_1)	86.00 (68.44)	84.00 (66.89)	87.17 (69.16)	85.72 (68.04)	23.85	31.80	29.97	28.54	0.128	0.110	0.140	0.126
Spray with MN mixture (F_2)	89.33 (71.76)	82.33 (65.33)	84.17 (66.68)	85.30 (67.62)	22.97	32.02	30.37	28.45	0.133	0.107	0.132	0.124
Spray with NAA (40 ppm) (F_3)	78.33 (62.57)	80.00 (63.52)	83.00 (65.73)	80.45 (63.86)	22.08	30.96	29.41	28.49	0.123	0.106	0.130	0.120
Spay with DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid (0.3%)] + NAA (40 ppm)(F_4)	91.00 (73.19)	86.16 (68.49)	87.67 (69.63)	88.28 (70.16)	23.37	32.37	31.87	29.21	0.138	0.114	0.143	0.131
Control (F_5)	79.67 (63.79)	77.66 (61.90)	78.50 (62.45)	78.60 (62.61)	21.63	29.10	26.23	25.65	0.121	0.100	0.110	0.110
SE ±	**1.71**	**1.366**	**1.339**	**1.05**	**0.51**	**0.61**	**0.687**	**0.36**	**0.002**	**0.002**	**0.003**	**0.002**
CD at 5%	**5.18**	**4.130**	**4.047**	**3.16**	**1.55**	**1.86**	**2.076**	**1.09**	**0.005**	**0.007**	**0.009**	**0.007**

(Figures in parenthesis are arc sin transformed values)

Table 3.10contd….

Treatments	Vigour index I				Vigour index II			
Pinching	2015	2016	2017	Pooled	2015	2016	2017	Pooled
With pinching (P_1)	2123.74	2766.90	2671.07	2520.74	11.70	9.48	11.75	10.99
Without pinching (P_2)	1758.10	2375.77	2320.53	2151.49	10.16	8.17	10.33	9.56
SE ±	37.10	88.90	43.91	136.67	0.03	0.067	0.143	0.209
CD at 5%	243.04	NS	287.65	NS	0.22	0.436	0.940	0.723
Foliar application								
Spray with DAP (2%)(F_1)	2056.53	2682.56	2614.33	2451.58	10.98	9.23	12.18	10.80
Spray with MN mixture (F_2)	2054.71	2640.50	2560.50	2418.61	11.89	8.78	11.12	10.60
Spray with NAA (40 ppm)(F_3)	1738.37	2478.55	2443.50	2220.15	9.64	8.50	10.75	9.64
pay with DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid 0.3%)]+ NAA (40 ppm)(F_4)	2123.13	2793.06	2797.16	2571.12	12.52	9.83	12.52	11.62
Control (F_5)	1731.89	2262.00	2063.50	2019.10	9.64	7.80	8.65	8.70
SE ±	**48.99**	**78.09**	**74.96**	**39.47**	**0.25**	**0.270**	**0.329**	**0.28**
CD at 5%	**148.14**	**236.15**	**226.65**	**119.35**	**0.75**	**0.816**	**0.996**	**0.85**

Table 3.11: Interaction effects of pinching and foliar applications on seed yield and quality parameters of Dhaincha at MPKV, Rahuri during *Kharif 2017*

Treatments	No. of pods / plant				No. of seeds / pod				No. of pods shattered / plant			
	2015	2016	2017	Pooled	2015	2016	2017	Pooled	2015	2016	2017	Pooled
P_1F_1	97.0	72.33	76.63	81.99	8.7	29.40	30.63	22.90	17.1	3.00	5.33	8.47
P_1F_2	96.5	65.26	66.23	75.99	10.0	28.40	29.43	22.61	16.2	3.33	6.67	8.72
P_1F_3	95.1	63.93	68.90	75.99	10.0	28.26	30.50	22.92	14.7	4.33	6.67	8.56
P_1F_4	99.7	76.80	78.33	84.96	11.3	39.60	33.57	28.17	12.4	1.00	3.67	5.69
P_1F_5	86.8	63.26	56.17	68.74	8.6	28.13	29.33	22.04	17.5	6.00	9.33	10.93
P_2F_1	85.7	39.30	47.47	57.49	8.3	23.73	26.57	19.54	18.2	8.66	6.67	11.18
P_2F_2	86.9	41.96	45.30	58.07	7.7	26.20	26.23	20.03	17.7	8.33	10.33	12.13
P_2F_3	78.9	38.86	46.00	54.58	8.0	23.20	25.70	18.97	17.3	10.33	9.67	12.42
P_2F_4	86.4	56.06	58.07	66.84	6.7	31.06	31.03	22.92	19.5	7.00	5.67	10.71
P_2F_5	78.8	38.00	43.27	52.36	4.3	22.20	19.93	16.04	20.1	14.00	11.00	15.04
Factor B at same level of A												
SE ±	**2.44**	**3.296**	**2.397**	**6.68**	**0.11**	**0.824**	**0.317**	**1.48**	**0.67**	**1.370**	**0.823**	**1.85**
CD at 5%	**NS**	**NS**	**NS**	**NS**	**1.38**	**NS**	**NS**	**NS**	**3.10**	**NS**	**NS**	**NS**
Factor A at same level of B												
SE ±	**2.16**	**3.225**	**2.853**	**3.47**	**0.41**	**1.642**	**1.559**	**1.36**	**0.86**	**1.042**	**0.790**	**1.08**
CD at 5%	**NS**	**NS**	**NS**	**NS**	**1.25**	**NS**	**NS**	**NS**	**2.96**	**NS**	**NS**	**NS**

Table 3.11contd…

Treatments	100 seed weight (g)				Seed yield per plot (kg)				Seed yield per ha (kg)			
	2015	2016	2017	Pooled	2015	2016	2017	Pooled	2015	2016	2017	Pooled
P_1F_1	1.85	1.91	2.02	1.93	1.168	1.551	1.682	1.467	583.83	775.33	841.17	733.44
P_1F_2	1.81	1.88	1.97	1.89	1.198	1.218	1.362	1.259	599.17	609.00	680.83	629.67
P_1F_3	1.85	1.85	1.96	1.89	1.098	1.211	1.234	1.181	548.83	605.33	617.00	590.39
P_1F_4	1.93	1.96	2.04	1.98	1.367	1.796	1.739	1.634	683.50	898.00	869.67	817.06
P_1F_5	1.66	1.71	1.77	1.72	1.128	0.808	0.985	0.974	564.00	403.83	492.67	486.83
P_2F_1	1.85	1.80	1.87	1.83	0.858	1.286	1.179	1.020	429.17	511.00	589.33	509.83
P_2F_2	1.84	1.71	1.78	1.78	0.938	1.106	1.135	1.023	469.17	497.33	567.67	511.39
P_2F_3	1.82	1.73	1.83	1.79	0.848	1.043	0.918	0.880	424.00	134.67	458.83	440.17
P_2F_4	1.82	1.86	1.97	1.88	0.848	1.460	1.219	1.064	410.33	565.00	609.50	531.83
P_2F_5	1.59	1.65	1.65	1.63	0.821	0.758	0.875	0.802	431.33	354.33	437.67	400.78
Factor B at same level of A												
SE ±	0.02	0.040	0.016	0.04	0.04	0.036	0.021	0.022	19.77	17.98	15.536	10.50
CD at 5%	NS	NS	NS	NS	NS	0.216	0.227	0.218	NS	51.10	113.366	104.60
Factor A at same level of B												
SE ±	**0.05**	**0.049**	**0.077**	**0.03**	**0.04**	**0.061**	**0.065**	**0.06**	**22.02**	**30.68**	**32.594**	**30.93**
CD at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**0.200**	**0.208**	**0.19**	**NS**	**100.19**	**103.783**	**87.71**

Table 3.11contd…

Treatments	Germination (%)				Root shoot length (cm)				Dry matter content (g)			
	2015	2016	2017	Pooled	2015	2016	2017	Pooled	2015	2016	2017	Pooled
P_1F_1	91.33 (72.95)	89.00 (71.05)	90.33 (71.89)	90.20 (71.75)	25.03	33.54	30.45	29.67	0.126	0.111	0.146	0.127
P_1F_2	92.00 (74.35)	84.66 (67.04)	86.67 (68.70)	87.80 (69.69)	23.23	32.53	31.02	28.93	0.138	0.110	0.137	0.128
P_1F_3	84.00 (66.64)	83.00 (65.67)	85.00 (67.24)	84.00 (66.40)	23.53	32.20	31.15	28.97	0.123	0.111	0.134	0.122
P_1F_4	92.33 (73.94)	90.66 (72.34)	90.33 (71.91)	91.10 (72.63)	53.87	32.83	33.19	29.97	0.142	0.117	0.148	0.136
P_1F_5	87.33 (69.55)	82.00 (64.89)	81.67 (64.64)	83.67 (66.20)	53.07	29.76	27.73	26.84	0.126	0.103	0.111	0.113
P_2F_1	80.67 (63.94)	79.00 (62.73)	84.00 (66.42)	81.23 (64.34)	22.67	30.06	29.49	27.41	0.130	0.109	0.134	0.124
P_2F_2	86.67 (69.16)	80.00 (63.63)	81.67 (64.65)	82.80 (65.55)	22.70	31.51	29.71	27.97	0.128	0.103	0.127	0.119
P_2F_3	72.67 (58.49)	77.00 (61.38)	81.00 (64.23)	76.90 (61.31)	20.63	29.72	27.67	26.01	0.124	0.102	0.125	0.117
P_2F_4	89.67 (72.43)	81.66 (64.65)	85.00 (67.34)	85.47 (67.70)	22.87	31.92	30.55	28.45	0.133	0.111	0.137	0.127
P_2F_5	72.00 (58.03)	73.33 (58.91)	75.33 (60.24)	73.53 (59.02)	20.20	28.43	24.72	24.56	0.115	0.097	0.109	0.107
Factor B at same level of A												
SE ±	1.38	1.348	1.673	1.67	0.50	2.004	0.816	0.21	0.002	0.003	0.001	0.002
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS	0.009	NS	NS	NS
Factor A at same level of B												
SE ±	**2.25**	**1.830**	**1.851**	**1.52**	**0.69**	**1.186**	**0.942**	**0.47**	**0.002**	**0.003**	**0.004**	**0.003**
CD at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**0.008**	**NS**	**NS**	**NS**

(Figures in parenthesis are arc sin transformed values)

Table 3.11contd…

Treatments	Vigour index I				Vigour index II			
	2015	2016	2017	Pooled	2015	2016	2017	Pooled
P_1F_1	2286	2987	2752	2675	11.48	9.84	13.16	11.50
P_1F_2	2141	2760	2694	2532	12.71	9.33	11.85	11.30
P_1F_3	1981	2671	2650	2434	10.28	9.18	11.38	10.28
P_1F_4	2205	2977	2995	2726	13.08	10.61	13.37	12.35
P_1F_5	2008	2439	2264	2237	10.98	8.45	9.07	9.50
P_2F_1	1830	2378	2477	2228	10.47	8.63	11.23	10.11
P_2F_2	1968	2521	2427	2306	11.07	8.23	10.38	9.90
P_2F_3	1495	2286	2237	2006	9.00	7.83	10.16	8.99
P_2F_4	2041	2609	2599	2416	11.96	9.05	11.65	10.89
P_2F_5	1456	2085	1863	1801	8.30	7.15	8.24	7.90
Factor B at same level of A								
SE ±	82.95	198.79	98.18	18.42	0.08	0.149	0.321	0.11
CD at 5%	273.99	NS	NS	NS	NS	NS	NS	NS
Factor A at same level of B								
SE ±	72.23	132.90	104.48	50.60	0.31	0.348	0.441	0.36
CD at 5%	285.62	NS	NS	NS	NS	NS	NS	NS

TNAU, Coimbatore

Results: Pinching of the dhaincha crop recorded significantly increased seed yield compared to non pinching. Pinching recorded the highest Number of pods per plant (63.37), seeds per pod (24.6), single plant yield (18.1 gm) and seed yield per plot (2.95 kg) whereas the plants without pinching recorded 48.8 number of pods per plant , 23.9 seeds per pod, 17.4 g of single plant yield and 2.7 kg of seed yield per plot.

Among the foliar sprays, foliar spray with DAP 2%+ MN Mixture (Zn+B) + NAA 40 ppm, recorded the highest single plant seed yield (19.6 gm). The same treatment recorded the highest seed yield per plot (3.23 kg).

Vigour index of the resultant seed from the seeds of foliar spray with DAP 2%+ MN Mixture (Zn+B) + NAA 40 ppm (2280) and the 100 seed weight 1.77 g which is highest from all the treatments and significantly higher than control.

Pinching combined with Foliar spray with DAP 2%+ MN Mixture (Zn+B) + NAA 40 ppm recorded the maximum number of pods per plant (67) compared to the control (60.3). Without pinching recorded the lowest number of pods per plant (48). Pinching combined with Foliar spray with DAP 2%+ MN Mixture (Zn+B) + NAA 40 ppm recorded the maximum number of seeds per pod (28.3) compared to the control (18.7).

Pinching the dhaincha crop with foliar spray of DAP 2%+ MN Mixture (Zn+B) + NAA 40 ppm is superior in all the parameters with highest single plant seed yield and seed yield per plot.

Table 3.12: Effect of pinching and different foliar spray during flower initiation on seed yield attributing characters, seed yield and resultant seed quality at TNAU, Coimbatore during *Kharif 2017*.

Treatment		Plant height	Number of pods / plant	Number of seeds /pod	Seed yield per plant (gm)	Seed yield per plot (kg)	100 seed weight (gm)	Germination (%)	Root length (cm)	Shoot length (cm)	Vigour index
With pinching	Foliar spray with DAP 2%	198.17	61.73	26.7	18.3	3.09	1.66	89.7	13.45	9.91	2095
	Foliar spray with MN Mixture (ZnSo4 0.5% + Boric acid 0.3%)	194.37	61.73	24.3	18.3	2.93	1.71	89.7	13.25	9.41	2033
	Foliar spray with NAA 40 ppm	201.77	65.53	24.7	17.5	2.81	1.62	90.7	12.75	9.21	1992
	Foliar spray with DAP 2%+ MN Mixture (Zn+B) + NAA 40 ppm	203.97	67.53	28.3	19.6	3.23	1.77	91.7	14.55	10.31	2280
	Control	193.97	60.33	18.9	16.8	2.69	1.61	87.7	12.25	9.41	1900
	Mean	198.45	63.37	24.6	18.1	2.95	1.674	89.9	13.25	9.65	2060
Without pinching	Foliar spray with DAP 2%	230.17	46.33	26.5	18.2	2.92	1.64	90.7	13.25	10.01	2110
	Foliar spray with MN Mixture (ZnSo4 0.5% + Boric acid 0.3%)	261.37	47.73	21.7	17	2.73	1.69	89.7	12.35	9.61	1970
	Foliar spray with NAA 40 ppm	246.57	50.13	23.7	16.4	2.63	1.61	91.7	12.25	9.61	2005
	Foliar spray with DAP 2%+ MN Mixture (Zn+B) + NAA 40 ppm	258.97	52.33	29.1	18.6	2.99	1.71	90.7	14.25	10.51	2246
	Control	213.77	47.53	18.7	14.9	2.39	1.58	89.7	12.75	9.51	1997
	Mean	242.17	48.81	23.94	17.42	2.732	1.646	90.5	12.97	9.85	2065
	SEd N	**3.31**	**1.92**	**0.85**	**3.26**	**4.64**	**1.42**	**1.01**	**0.65**	**0.9**	**53**
	F	**4.2**	**2.34**	**0.43**	**3.46**	**5.42**	**1.84**	**1.04**	**0.43**	**0.73**	**64**
	NXF	**5.12**	**2.62**	**0.06**	**5.27**	**4.88**	**2.12**	**1.33**	**-0.12**	**0.14**	**58**
	CD(P=0.05) N	**5.57**	**3.09**	**0.12**	**4.27**	**7.54**	**2.59**	**1.27**	**-0.44**	**-0.04**	**104**
	F	**7.33**	**3.54**	**-0.34**	**5.75**	**9.62**	**3.04**	**1.75**	**-0.36**	**0.25**	**131**
	NXF	**12.4**	**7.12**	**1.67**	**11.72**	**11.1**	**0.6**	**3.96**	**1.12**	**1.55**	**123**

OUAT, Bhubaneswar

Results: The results of the experiment are presented in Table 3.14. The yield attributing parameters, as well as pod and seed yield were improved due to pinching (nipping of terminal buds) at 60 DAS, as compared to the crop without pinching. Significantly higher number of pods per plant was recorded in case of pinching (60.17) as compared to non-pinching (56.55). The pod yield per plant as significantly high due to pinching (41.24 g) as compared to non-pinching (39.55 g). Similarly, seed yield per plant, seed yield per plot and seed yield per hectare were significantly higher in case of pinching (17.65 g, 2.89 kg and 14.45 q, respectively) in comparison to non-pinching (16.49 g, 2.70 kg and 13.49 q, respectively). Pinching of terminal buds increased the number of pickings (3.09) in contrast to non-pinching (2.83). The number of pods shattered per plant was also higher in case of pinching. The 1000-seed weight was slightly lower when pinching of terminal buds was done as compared to non-pinching, though the difference was found to be statistically non-significant. Pinching of terminal buds did not produce any significant effect in respect of seed quality parameters, viz. seed germination, seedling length, seedling dry weight, SVI-I and SVI-II.

Among various foliar sprays, T_4 (i.e. foliar spray with DAP, MN mixture and NAA) recorded highest number of pods per plant, pod yield per plant, seed yield per plant, seed yield per plot and seed yield per hectare. Highest seed yield per hectare was recorded in T_4 (15.84 q) while the lowest was in case of T_5 (Control) (13.20 q). The seed recovery (%) was highest in T_1 (43.44%). Significantly lower shattering of pods was observed in case of T_3 (4.25 per plant). The differences among treatments with regards to the number of pickings were found to be statistically non-significant. Foliar sprays with various nutrients / growth regulators in *Dhaincha* had no significant effect on the seed quality parameters, viz. seed germination, seedling length, seedling dry weight, SVI-I and SVI-II.

Among the treatment combinations, M_1T_4 (Pinching + foliar spray with DAP, MN mixture and NAA) produced significantly higher seed yield (16.82 q/ha).

Hence from the experiment, it can be concluded that *Dhaincha* seed production can be taken up with the recommended package of practices, along with pinching (nipping of terminal buds) at 60 DAS and foliar spray with 2% DAP, micronutrient mixture (0.5% $ZnSO_4$ + 0.3% Boric acid) and 40 ppm NAA at flowering stage, to improve the seed yield.

Table 3.13: Effect of pinching and foliar application of nutrients on pod, seed yield and its components, as well as seed quality parameters in *Dhaincha* at OUAT, Bhubaneswar during *Kharif* 2017

Treatments	No. of pods / plant	No. of seeds / pod	Pod yield / plant (g)	Seed yield / plant (g)	Seed yield / plot (kg)	Seed yield / ha (q)	Seed recovery (%)	No. of pods shattered / plant	No. of pickings	100-seed weight (g)	Seed germination (%)	Seedling length (cm)	Dry weight of 10 seedlings (g)	SVI-I	SVI-II
Main plot															
M_1	60.17	22.73	41.24	17.65	2.89	14.45	40.19	5.10	3.09	1.77	81.6 (9.03)	23.27	0.093	1912.93	0.763
M_2	56.55	23.59	39.55	16.49	2.70	13.49	41.33	4.71	2.83	1.82	82.8 (9.10)	23.08	0.092	1902.67	0.754
S.E.m(±)	**0.397**	**0.387**	**0.274**	**0.109**	**0.020**	**0.098**	**0.390**	**0.085**	**0.042**	**0.028**	**0.035**	**0.738**	**0.0009**	**60.029**	**0.0101**
CD(0.05)	**1.787**	**NS**	**1.233**	**0.491**	**0.088**	**0.442**	**NS**	**0.380**	**0.188**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Sub-plot															
T_1	54.02	20.46	37.01	17.20	2.81	14.07	43.44	5.44	3.03	1.78	80.4 (8.96)	23.51	0.091	1916.23	0.745
T_2	57.00	25.07	38.79	16.41	2.70	13.50	41.73	4.72	2.88	1.83	83.1 (9.12)	22.50	0.089	1872.09	0.741
T_3	60.67	23.56	42.78	16.14	2.65	13.26	40.69	4.25	3.05	1.72	81.1 (9.01)	23.17	0.097	1893.15	0.792
T_4	65.11	23.26	47.46	19.37	3.17	15.84	40.63	4.98	2.89	1.84	82.3 (9.07)	23.00	0.094	1895.61	0.777
T_5	55.00	23.45	35.94	16.22	2.64	13.20	37.29	5.16	2.94	1.82	84.0 (9.16)	23.70	0.089	1961.93	0.737
S.E.m(±)	**0.550**	**0.830**	**0.380**	**0.279**	**0.046**	**0.231**	**0.944**	**0.080**	**0.101**	**0.039**	**0.066**	**0.446**	**0.0040**	**44.704**	**0.0337**
CD(0.05)	**1.606**	**2.423**	**1.108**	**0.813**	**0.135**	**0.674**	**2.755**	**0.235**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
M x T interaction															
M_1T_1	55.91	21.08	37.33	17.36	2.83	14.13	42.38	5.67	3.02	1.68	77.8 (8.82)	24.02	0.097	1921.05	0.772
M_1T_2	59.54	24.74	39.90	16.57	2.73	13.63	41.16	4.91	3.25	1.84	83.5 (9.14)	22.72	0.090	1900.74	0.754
M_1T_3	62.56	23.14	43.37	16.63	2.74	13.68	40.06	4.46	3.08	1.68	81.0 (9.00)	22.31	0.095	1834.01	0.782
M_1T_4	66.27	22.50	49.43	20.48	3.36	16.82	40.12	5.26	2.98	1.83	81.0 (9.00)	22.83	0.092	1877.52	0.760
M_1T_5	56.55	22.19	36.17	17.20	2.80	14.00	37.21	5.21	3.11	1.82	84.5 (9.19)	24.48	0.090	2031.34	0.748
M_2T_1	52.13	19.84	36.70	17.03	2.80	14.01	44.51	5.21	3.04	1.87	83.0 (9.11)	23.00	0.086	1911.41	0.717
M_2T_2	54.46	25.40	37.68	16.25	2.67	13.37	42.30	4.52	2.50	1.81	82.8 (9.10)	22.28	0.088	1843.45	0.728
M_2T_3	58.77	23.98	42.19	15.65	2.57	12.84	41.31	4.04	3.02	1.77	81.3 (9.01)	24.02	0.099	1952.29	0.802
M_2T_4	63.96	24.03	45.48	18.25	2.97	14.85	41.14	4.69	2.81	1.85	83.5 (9.14)	23.18	0.096	1913.70	0.795
M_2T_5	53.44	24.71	35.71	15.24	2.48	12.40	37.37	5.10	2.78	1.81	83.5 (9.14)	22.92	0.088	1892.53	0.726
S.E.m(±)	**0.778**	**1.174**	**0.537**	**0.394**	**0.065**	**0.327**	**1.335**	**0.114**	**0.143**	**0.055**	**0.094**	**0.631**	**0.0057**	**63.221**	**0.0477**
CD(0.05)	**NS**	**NS**	**1.567**	**NS**	**0.191**	**0.954**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

* Figures in the parenthesis are square root transformed values

Field view of Dhaincha crop at OUAT, Bhubaneswar during *Kharif* 2017

UAS, Dharwad

Results:

Table 3.14: Effect of pinching and foliar spray on plant growth and yield characters of Dhaincha (*Sesbania aculeata*) at UAS, Dharwad during *Kharif 2017*

Treatments	No. of pods/plant	No. of seeds/pod	Pod yield per plant (g)	No. of Pickings	Seed yield per plant(g)	Seed yield per plot(kg)	Seed yield per ha (q)
M_1	201.88	27.83	201.88	3.13	96.11	7.21	31.36
M_2	114.70	25.34	114.70	3.13	54.61	5.73	24.94
SEm±	**3.96**	**0.99**	**3.96**	**0.07**	**1.89**	**0.15**	**0.67**
CD at 5%	**11.78**	**NS**	**11.78**	**NS**	**5.61**	**0.46**	**2.00**
P_1	163.59	25.67	163.59	3.00	77.89	6.74	29.32
P_2	169.72	26.53	169.72	3.00	80.80	6.87	29.86
P_3	152.92	25.88	152.92	3.00	72.80	6.20	26.96
P_4	151.48	31.26	151.48	3.87	72.12	6.23	27.10
P_5	153.74	23.58	153.74	3.00	73.19	6.32	27.51
SEm±	**6.27**	**1.56**	**6.27**	**0.11**	**2.98**	**0.24**	**1.07**
CD at 5%	**NS**	**NS**	**NS**	**0.32**	**NS**	**NS**	**NS**
M_1P_1	201.45	25.36	201.45	3.00	95.91	7.19	31.29
M_1P_2	226.73	26.95	226.73	3.00	107.95	8.10	35.22
M_1P_3	202.52	25.60	202.52	3.00	96.42	7.23	31.46
M_1P_4	188.15	38.16	188.15	3.67	89.58	6.72	29.22
M_1P_5	190.54	23.10	190.54	3.00	90.72	6.80	29.60
M_2P_1	125.73	25.98	125.73	3.00	59.86	6.29	27.34
M_2P_2	112.71	26.11	112.71	3.00	53.66	5.63	24.51
M_2P_3	103.32	26.15	103.32	3.00	49.19	5.16	22.47
M_2P_4	114.82	24.37	114.82	3.67	54.67	5.74	24.97
M_2P_5	116.94	24.07	116.94	3.00	55.67	5.85	25.43
SEm±	**8.86**	**2.21**	**8.86**	**0.15**	**4.22**	**0.35**	**1.51**
CD at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

Table 3.15: Effect of pinching and foliar spray on seed quality characters of Dhaincha (*Sesbania aculeata*) at UAS, Dharwad during *Kharif 2017*

Treatments	100 seed weight (g)	Seed germination (%)	Seedling length (cm)	Seedling dry weight (mg)	Seedling vigour index	No. of pods shattered	Seed recovery (%)
M_1	3.29	84.49	28.26	72.94	2389	16.23	87.23
M_2	2.82	77.71	27.25	72.72	2118	9.22	80.24
SEm±	**0.01**	**0.63**	**0.26**	**0.44**	**31**	**0.32**	**0.65**
CD at 5%	**0.03**	**1.88**	**NS**	**NS**	**92**	**0.95**	**1.94**
P_1	2.85	80.45	27.88	71.79	2243	13.15	83.06
P_2	3.51	81.86	27.10	72.98	2217	13.64	84.52
P_3	2.84	81.13	27.57	72.32	2240	12.29	83.77
P_4	3.29	81.98	28.28	73.68	2352	12.18	85.68
P_5	2.78	79.08	27.93	73.39	2214	12.36	81.65
SEm±	**0.01**	**1.00**	**0.41**	**0.69**	**49**	**0.50**	**1.03**
CD at 5%	**0.03**	**NS**	**NS**	**NS**	**NS**	**1.50**	**3.06**
M_1P_1	3.56	82.33	28.37	71.47	2336	16.19	85.01
M_1P_2	3.54	84.55	26.38	73.04	2231	18.22	87.30
M_1P_3	2.55	85.82	27.84	72.49	2393	16.28	88.61
M_1P_4	4.45	87.40	29.24	74.06	2557	15.12	90.24
M_1P_5	2.33	82.33	29.47	73.63	2427	15.32	85.01
M_2P_1	2.13	78.56	27.40	72.10	2150	10.11	81.12
M_2P_2	3.47	79.17	27.82	72.91	2203	9.06	81.74
M_2P_3	3.13	76.44	27.30	72.16	2087	8.30	78.92
M_2P_4	2.13	78.56	27.33	73.30	2147	9.23	81.12
M_2P_5	3.24	75.83	26.40	73.14	2002	9.40	78.30
SEm±	**0.02**	**1.41**	**0.58**	**0.97**	**69**	**0.71**	**1.46**
CD at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**2.12**	**4.33**

Field view of experiment plot with ongoing Pinching operation at UAS, Dharwad during *Kharif 2017*

BCKV, Mohanpur, Nadia

Results:

Table 3.16: Effect of pinching and foliar spray on seed quality characters of Dhaincha (*Sesbania aculeata*) at BCKV, Mohanpur, Nadia during *Kharif* 2017

Treatments	Days to 50% flowering	Plant height (cm)	No. of Pods /Plant	No. of Seeds /Pod	Pod Yield/ Plant (gm)	Seed yield/ Plant (gm)	Seed yield/ Plot ($20m^2$) (gm)	Seed yield/ Ha (kg/ha)	100 seed weight (gm)
T1	57.50	237.55	27.55	21.80	16.89	12.31	2351.08	1175.54	1.10
T2	57.75	249.25	26.25	23.05	18.11	13.07	2572.53	1286.27	1.08
T3	57.75	246.23	31.75	22.55	21.09	14.79	2642.08	1321.04	1.04
T4	59.00	249.75	36.60	25.33	21.60	15.11	3108.02	1554.01	1.09
T5	56.75	238.90	28.45	20.15	14.87	10.89	2183.38	1091.69	1.01
GM	**57.750**	**244.335**	**30.120**	**22.575**	**18.512**	**13.233**	**2571.420**	**1285.710**	**1.064**
S.Em	**0.60**	**5.54**	**2.43**	**1.89**	**0.91**	**0.98**	**126.24**	**63.12**	**0.06**
C.D. (5%)	**1.71**	**15.83**	**6.94**	**5.39**	**2.60**	**2.81**	**360.81**	**180.41**	**0.16**
C. V.	**2.1**	**4.5**	**16.1**	**16.7**	**9.8**	**14.8**	**9.8**	**9.8**	**10.7**

Table 3.17: Effect of without pinching and foliar spray on seed quality characters of Dhaincha (*Sesbania aculeata*) at BCKV, Mohanpur, Nadia during *Kharif* 2017

Treatment	Days to 50% flowering	Plant height (cm)	No. of Pods /Plant	No. of Seeds /Pod	Pod Yield/ Plant (gm)	Seed yield/ Plant (gm)	Seed yield/ Plot ($20m^2$) (gm)	Seed yield/ Ha (kg/ha)	100 seed wt. (gm)
T1	57.00	270.10	22.10	21.05	12.32	8.94	1741.92	870.96	1.02
T2	58.25	262.80	20.15	25.35	13.77	9.29	2135.55	1067.77	1.05
T3	58.00	271.25	26.05	24.55	17.35	12.84	2281.48	1140.74	1.04
T4	59.00	267.15	24.05	26.40	18.57	14.07	2605.97	1302.98	1.19
T5	58.50	261.80	19.78	23.35	13.69	9.46	1708.44	854.22	1.01
GM	**58.150**	**266.620**	**22.425**	**24.140**	**15.140**	**10.919**	**2094.671**	**1047.335**	**1.062**
S.Em	**0.87**	**6.20**	**2.13**	**1.46**	**0.99**	**0.86**	**131.39**	**65.70**	**0.07**
C.D. (5%)	**2.48**	**17.71**	**6.08**	**4.18**	**2.84**	**2.44**	**375.54**	**187.77**	**0.18**
C. V.	**3.0**	**4.6**	**19.0**	**12.1**	**13.1**	**15.7**	**12.5**	**12.5**	**9.95**

DRPCAU, Dholi

Results:

Analysis revealed that the effect of Pinching on all the characters under study was found non-significant except no. of Pods/Plant where highest value 83.90 was recorded with Pinching of terminal Bud. However, highest Seed Yield (q/ha) (7.150) was obtained with Pinching of terminal Bud.

Results also indicated that the effect of foliar application of different nutrients were found significant for Seed yield / Plant (g), Seed yield / Plot (g), Seed Yield (q/ha),seed recovery % and 100-seed weight. The remaining traits under study were found non-significant in relation to foliar application of different nutrients. Treatments F_1 was significantly superior over control (F_5) for seed recovery % &100-seed weight, for F_2 Seed Yield / Plant (g) , Seed Yield / ha (q) & seed recovery % , for F_3 Seed yield / Plant (g) & seed recovery % and for F_4 Seed Yield / ha (q) & seed recovery %. Analysis of data also showed that the interaction effect (M+F) was found non-significant for most of the traits studied except no. of Pods/Plant (0.346), for P_1F_2&Seed yield / Plant (g.) (0.429) for P_1F_3. Thus, it is concluded that Foliar application of F_2&F_4 with Pinching produced highest Seed Yield / ha (q).

Table 3.18: Effect of Pinching and Foliar application on Seed Yield and Quality Parameters in Dhaincha, at DRPCAU, Dholi during *Kharif, 2017.*

Treatment	No. of Pods/Plant	No. of Seeds/Pod	Pod yield/Plant (g)	Pod yield/Plot (Kg)	Seed yield/Plant (g)	Seed yield/Plot (g)	Seed yield/ha (q)	Seed Recovery %	100 seed wt(g)	Germination %
Pinching										
With Pinching(P1)	83.90	27.97	0.285	3.774	0.338	1.424	7.150	77.40	0.155	63.25
Without Pinching(P2)	75.90	26.49	0.270	3.777	0.302	1.424	7.120	77.30	0.140	66.50
SE±	**1.498**	**1.272**	**0.004**	**0.108**	**0.012**	**0.046**	**0.046**	**0.471**	**0.011**	**2.157**
CD at5%	**6.982**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Foliar Application										
F1	82.00	26.803	0.300	3.845	0.332	1.313	6.565	79.875	0.200	68.00
F2	91.00	26.565	0.304	4.270	0.321	1.676	8.380	81.750	0.138	66.25
F3	77.75	26.678	0.280	3.385	0.429	1.257	6.285	80.75	0.125	66.50
F4	75.50	29.563	0.222	3.873	0.224	1.532	7.660	77.625	0.150	66.12
F5(Control)	73.25	26583	0.281	3.505	0.297	1.343	6.715	66.750	0.125	57.50
SE±	**6.081**	**1.122**	**0.026**	**0.305**	**0.037**	**0.094**	**0.084**	**1.668**	**0.013**	**3.344**
CD at5%	**NS**	**NS**	**NS**	**NS**	**0.107**	**0.275**	**0.290**	**4.899**	**0.039**	**NS**

NS: Non Significant

Table 3.19: Interaction Effects influenced seed yield and quality parameters of Dhaincha at DRPCAU, Dholi during *Kharif, 2017.*

Treatments	No. of Pods/ Plant	No. of Seeds/Pod	Pod yield/Plant	Pod yield/Plot	Seed yield/Plant(g)	Seed yield/Plot (g)	Seed yield/ha (q)	Seed Recovery %	100 seed wt (g)	Germination %
P1F1	100.00	27.830	0.312	3.655	0.387	1.235	6.175	81.00	0.200	69.50
P1F2	111.00	26.750	0.346	4.180	0.293	1.573	7.865	77.75	0.125	65.00
P1F3	72.500	26.670	0.233	2.915	0.429	1.269	6.345	81.50	0.150	63.50
P1F4	68.500	32.610	0.192	4.060	0.310	1.483	7.415	78.00	0.150	67.75
P1F5	67.500	25.990	0.342	4.060	0.207	1.561	7.805	68.75	0.150	50.50

P2F1	64.00	25.775	0.287	4.035	0.276	1.390	6.950	78.75	0.200	66.50
P2F2	71.00	26.380	0.263	4.360	0.348	1.779	8.895	85.75	0.150	67.50
P2F3	83.00	26.605	0.326	3.855	0.365	1.245	6.225	80.00	0.100	69.50
P2F4	82.50	26.515	0.252	3.685	0.137	1.582	7.910	77.25	0.150	64.50
P2F5	79.00	27.175	0.220	2.950	0.386	1.125	5.625	64.75	0.100	64.50
SE±	**2.349**	**2.845**	**0.009**	**0.242**	**0.028**	**1.103**	**5.515**	**1.053**	**0.025**	**3.344**
CD at5%	**25.791**	**NS**	**0.107**	**NS**	**0.158**	**NS**	**NS**	**NS**	**NS**	**NS**

NS: Non Significant

PAJANCOA & RI, Karaikal

Results:

The results of effect of pinching and foliar treatments with nutrients on seed yield, yield components and resultant seed quality in dhaincha revealed that the method of pinching had significant influence on number of pods and sound seeds per plant, seed recovery (%), 100 seed weight and seed quality in terms of shoot length, root length, dry weight of seedlings and vigour indices. The foliar treatments had significant influence on all the traits except pod yield per plant, seed yield per plant and vigour index II. However, the number of pickings had significant effect on all the traits studied.

In the present investigation, the pinching methods didn't differ in pod and seed yield per plant as well as per plot and indicated that single pinching couldn't contribute more on productivity in dhaincha.

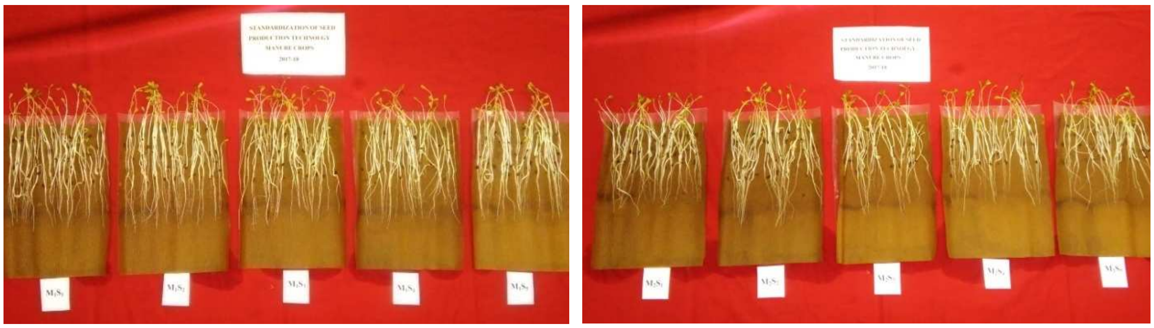
Irrespective of pinching methods and number of pickings, foliar spray with DAP 2% + MN mixture ($ZnSO_4$ 0.5 % + Boric acid 0.3 %) + NAA @ 40ppm (T4) out yielded other treatments in five traits out of seven traits studied *viz*., number of pods per plant (49.05), number of sound seeds per pod (14.04), pod yield per plant (27.41g) and seed yield per plant (14.01g) and seed recovery (48.72%), followed by NAA @ 40ppm (T3) in three traits *viz.,* number of sound seeds per plant (14.72), seed yield per plot (0.96 kg) and seed yield per ha (481 kg).

Between pickings, the first picking resulted in significantly more pods per plant (37.10), higher pod yield per plant (19.51g), maximum number of sound seeds per pod (18.74), higher pod yield per plot (1.90kg), seed yield per plant (9.85g) as well as seed yield per plot (0.69 kg) than second picking (8.62, 6.29, 9.35, 0.46, 2.41, 0.15, respectively).

Resultant seed quality

The results on resultant seed quality of seeds collected from different pickings revealed that the pinching method had influence on all the traits except 100 seed weight and seed germination. The foliar treatments also had significant effect on all the traits except vigour indices. However, significant differences were noticed in all the parameters due to number of pickings.

1st Picking



2nd Picking

Standardization of seed production technology in Dhainchaat PAJANCOA& RI, Karaikal during 2017-18

Table 3.20: Effect of pinching of terminal buds and foliar application on seed yield components in Dhaincha (*Sesbania aculeata*)at PAJANCOA & RI, Karaikal during 2017-18

Treatments		No. of pods/plant			No. of sound seeds/pod		
		1st Picking	2nd Picking	Total	1st Picking	2nd Picking	Mean
M1	T1	31.30	9.45	40.75	18.75	10.19	14.47
	T2	34.80	6.00	40.80	19.10	9.02	14.06
	T3	41.55	7.80	49.35	21.43	12.96	17.20
	T4	35.75	9.90	45.65	19.55	7.98	13.77
	T5	40.40	7.35	47.75	18.77	8.25	13.51
	Mean	**36.76**	**8.10**	**44.86**	**19.52**	**9.68**	**14.60**
M2	T1	34.80	9.70	44.50	17.33	8.85	13.09
	T2	37.25	7.60	44.85	17.85	8.49	13.17
	T3	36.35	10.10	46.45	16.13	8.33	12.23
	T4	40.85	11.60	52.45	20.00	10.08	15.04
	T5	37.90	6.65	44.40	18.43	9.26	13.85
	Mean	**37.43**	**9.13**	**46.53**	**17.95**	**9.002**	**13.48**
	Mean (P)	**37.10**	**8.62**		**18.74**	**9.35**	

	No. of pods/plant								No. of sound seeds/pod							
	M	**T**	**P**	**M x T**	**T x P**	**M x P**	**T x M**	**P x M**	**M**	**T**	**P**	**M x T**	**M x P**	**T x P**	**T X M**	**P x M**
SEd	0.135	0.473	0.299	0.614	0.669	NS	0.669	NS	0.062	0.183	0.116	0.239	0.131	0.258	0.258	0.163
CD (p=0.05)	0.429	0.949	0.600	1.265	1.342		1.342		0.196	0.366	0.232	0.498	0.297	0.518	0.518	0.328

Table 3.21: Effect of pinching of terminal buds and foliar application on seed yield components in Dhaincha (*Sesbania aculeata*) at PAJANCOA & RI, Karaikal during 2017-18

Treatments		Pod yield /plant (g)			Pod yield/plot (kg)		
		1st Picking	**2nd Picking**	**Total**	**1st Picking**	**2nd Picking**	**Total**
M1	T1	18.420	5.210	23.630	1.404	0.449	1.853
	T2	19.930	2.720	22.650	2.313	0.311	2.624
	T3	22.810	5.210	28.020	2.261	0.433	2.694
	T4	17.620	6.230	23.850	1.673	0.368	2.041
	T5	21.010	4.850	25.860	2.171	0.399	2.570
	Mean	**19.958**	**4.844**	**24.802**	**1.964**	**0.392**	**2.356**
M2	T1	18.550	7.640	26.190	1.840	0.623	2.463
	T2	18.380	5.920	24.300	2.260	0.603	2.863
	T3	17.120	6.100	24.020	1.690	0.484	2.174
	T4	21.920	9.040	30.960	1.635	0.594	2.229
	T5	19.320	3.150	22.470	1.744	0.348	2.092

		M	T	P	M x T	T x P	M x P	T x M	P x M	M	T	P	M x T	M x P	T x P	T X M	P x M
	Mean	**19.058**			**7.730**		**25.588**			**1.834**			**0.530**			**2.364**	
	Mean (P)	**19.510**			**6.290**					**1.900**			**0.460**				
	SEd	NS	0.184	0.116	0.246	0.260	0.142	0.260	0.164	NS	NS	0.080	NS	NS	0.180	NS	NS
	CD (p=0.05)		0.369	0.233	0.525	0.521	0.338	0.521	0.330			0.161			0.360		

Table 3.22: Effect of pinching of terminal buds and foliar application on seed yield components in Dhaincha (*Sesbaniaaculeata*) at PAJANCOA & RI, Karaikal during 2017-18

Treatments		Seed yield /plant (g)			Seed yield/plot (kg)		
		1st Picking	2nd Picking	Total	1st Picking	2nd Picking	Total
M1	T1	8.65	2.32	10.97	0.473	0.125	0.598
	T2	9.91	1.17	11.08	0.643	0.110	0.753
	T3	11.65	2.07	13.72	1.028	0.154	1.182
	T4	8.51	2.59	11.10	0.585	0.120	0.705
	T5	11.53	1.89	13.42	0.680	0.122	0.802
	Mean	**10.05**	**2.01**	12.06	**0.682**	**0.126**	**0.808**
M2	T1	8.24	3.60	11.84	0.653	0.207	0.860
	T2	9.06	2.50	11.56	0.950	0.198	1.148
	T3	9.04	2.16	11.20	0.600	0.142	0.742
	T4	12.79	4.26	17.05	0.718	0.194	0.912
	T5	9.10	1.46	10.56	0.555	0.109	0.664
	Mean	**9.65**	**2.80**	**12.44**	**0.695**	**0.170**	**0.865**
	Mean (P)	**9.85**	**2.41**		**0.689**	**0.148**	**0.837**

		M	T	P	M x T	T x P	M x P	T x M	P x M	M	T	P	M x T	M x P	T x P	T X M	P x M
	SEd.	NS	0.186	0.117	0.253	0.263	NS	0.581	NS	NS	0.042	0.027	0.058	NS	0.060	0.060	NS
	CD (p=0.05)		0.372	0.236	0.551	0.527		1.165			0.085	0.054	0.126		0.120	0.120	

Table 3.23: Effect of pinching of terminal buds and foliar application on seed yield components in Dhaincha (*Sesbania aculeata*) at PAJANCOA & RI, Karaikal during 2017-18

Treatments		Seed yield /ha (kg)		
		1st Picking	2nd Picking	Total
M_1	T_1	236.5	62.5	299.0
	T_2	321.5	55.0	376.5
	T_3	514.0	77.0	591.0
	T_4	292.5	60.0	352.5
	T_5	340.0	61.0	401.0
	Mean	**341.0**	**63.0**	**404.0**
M_2	T_1	326.5	103.5	430.0
	T_2	475.0	99.0	574.0
	T_3	300.0	71.0	371.0
	T_4	359.0	97.0	456.0
	T_5	277.5	54.5	332.0
	Mean	**347.5**	**85.0**	**432.5**
	Mean (P)	**344.3**	**74.0**	**418.3**

		M	**T**	**P**	**M x T**	**T x P**	**M x P**	**T x M**	**P x M**
	SEd	NS	3.802	2.404	5.915	NS	5.376	5.376	NS
	CD (p=0.05)		7.622	4.821	14.219		10.779	10.779	

Table 3.24: Effect of pinching of terminal buds and foliar application on seed recovery (%)/ plant and 100 seed weight (g) in Dhaincha (*Sesbania aculeata*) at PAJANCOA & RI, Karaikal during 2017-18

Treatments		Seed recovery (%) /plant			100 seed weight (g)		
		1st Picking	2nd Picking	Mean	1st Picking	2nd Picking	Mean
M1	T1	45.90	35.91	40.91	1.70	1.90	1.800
	T2	49.54	41.22	45.38	1.63	1.70	1.665
	T3	51.04	40.06	45.55	1.60	1.80	1.700
	T4	48.50	41.12	44.81	1.62	1.82	1.720
	T5	57.11	40.78	48.95	1.50	1.92	1.710
	Mean	**50.42**	**39.82**	**45.12**	**1.61**	**1.83**	**1.719**
M2	T1	42.94	47.71	45.33	1.68	2.03	1.855
	T2	49.57	40.81	45.19	1.63	1.99	1.810
	T3	52.76	37.24	45.00	1.59	1.61	1.615
	T4	57.43	47.80	52.62	1.64	1.92	1.780
	T5	48.17	51.04	49.61	1.69	1.89	1.790
	Mean	**50.17**	**44.92**	**47.55**	**1.65**	**1.859**	**1.770**
	Mean (P)	**50.30**	**42.37**		**1.630**	**1.845**	

		M	**T**	**P**	**M x T**	**T x P**	**M x P**	**T x M**	**P x M**	**M**	**T**	**P**	**M x T**	**M x P**	**T x P**	**T X M**	**P x M**
	SEd	0.174	0.629	0.398	0.814	0.889	0.434	0.889	0.562	NS	0.055	0.035	NS	NS	NS	NS	NS
	CD (p=0.05)	0.555	1.261	0.797	1.677	1.783	0.953	1.783	1.128		0.110	0.070					

Table 3.25: Effect of pinching of terminal buds and foliar application on seed germination (%) and root length (cm) of seedling in Dhaincha (*Sesbania aculeata*) at PAJANCOA & RI, Karaikal during 2017-18

Treatments		Seed germination (%)			Shoot length (cm)		
		1st Picking	2nd Picking	Mean	1st Picking	2nd Picking	Mean
M1	T1	94.0	96.0	95.0	8.96	11.48	10.22
	T2	93.0	93.0	93.0	8.56	10.92	9.74
	T3	96.0	92.0	94.0	8.92	11.42	10.17
	T4	97.0	95.0	96.0	8.62	10.35	9.49
	T5	93.0	99.0	96.0	8.95	11.05	10.00

	Mean	**94.6**	**95.0**	**94.8**	**8.80**	**11.04**	**9.92**
M2	T1	90.0	97.0	93.5	8.93	10.48	9.71
	T2	93.0	96.0	94.5	8.61	11.09	9.85
	T3	88.0	95.0	91.5	8.87	10.35	9.61
	T4	93.0	93.0	93.0	8.11	11.02	9.57
	T5	94.0	98.0	96.0	8.24	10.52	9.38
	Mean	**91.6**	**95.8**	**93.7**	**8.55**	**10.69**	**9.62**
	Mean (P)	**93.1**	**95.4**		**8.68**	**10.87**	

		M	T	P	M x T	T x P	M x P	T x M	P x M	M	T	P	M x T	M x P	T x P	T X M	P x M
	SEd	NS	0.764	0.483	1.185	1.080	0.839	1.080	0.683	0.117	0.137	0.087	0.209	NS	NS	0.194	NS
	CD (p=0.05)		1.531	0.968	2.842	2.166	2.341	2.166	1.370	0.372	0.275	0.174	0.496			0.388	

Table 3.26: Effect of pinching of terminal buds and foliar application on Root length (cm) and Dry weight of seedling (g/10 seedling) in Dhaincha (*Sesbania aculeata*) at PAJANCOA & RI, Karaikal during 2017-18

Treatments		Root length (cm)			Dry weight of seedling (g/10 seedling)		
		1st Picking	2nd Picking	Mean	1st Picking	2nd Picking	Mean
M1	T1	8.32	9.38	8.85	0.059	0.089	0.074
	T2	7.39	10.46	8.93	0.058	0.096	0.077
	T3	8.55	10.79	9.67	0.055	0.095	0.075
	T4	8.12	10.42	9.27	0.067	0.084	0.076
	T5	8.34	9.80	9.07	0.061	0.086	0.074
	Mean	**8.14**	**10.17**	**9.16**	**0.060**	**0.090**	**0.075**
M2	T1	7.89	9.50	8.70	0.058	0.098	0.078
	T2	7.30	9.53	8.42	0.077	0.099	0.088
	T3	7.52	9.59	8.56	0.059	0.087	0.073
	T4	8.04	9.94	8.99	0.073	0.087	0.080
	T5	8.13	9.71	8.92	0.056	0.095	0.076
	Mean	**7.78**	**9.65**	**8.72**	**0.065**	**0.093**	**0.079**
	Mean (P)	**7.96**	**9.91**		**0.063**	**0.092**	

		M	T	P	M x T	T x P	M x P	T x M	P x M	M	T	P	M x T	M x P	T x P	T X M	P x M

	SEd	0.124	0.176	0.111	0.255	0.249	NS	0.249	NS	0.002	0.003	0.001	NS	0.003	NS	NS	NS
	CD (p=0.05)	0.394	0.352	0.223	0.581	0.498		0.498		0.003	0.005	0.003		0.007			

Table 3.27: Effect of pinching of terminal buds and foliar application on Vigour indices in Dhaincha (*Sesbania aculeata*) at PAJANCOA & RI, Karaikal during 2017-18

Treatments		Vigour index I								Vigour index II							
		1st Picking			2nd Picking		Mean			1st Picking			2nd Picking			Mean	
M1	T1	1622			1993		1807.5			5.572			8.547			7.060	
	T2	1485			1987		1736.0			5.456			8.925			7.191	
	T3	1708			2045		1876.5			5.560			8.755			7.158	
	T4	1623			1973		1798.0			6.524			8.041			7.283	
	T5	1600			2054		1827.0			5.662			8.433			7.048	
	Mean	**1607.6**			**2010.4**		**1809.0**			**5.755**			**8.540**			**7.148**	
M2	T1	1514			1937		1725.5			5.222			9.548			7.385	
	T2	1471			1971		1721.0			7.140			9.397			8.269	
	T3	1434			1894		1664.0			6.086			8.307			7.197	
	T4	1495			1938		1716.5			6.751			8.044			7.398	
	T5	1541			1973		1757.0			5.306			9.284			7.295	
	Mean	**1491**			**1942.6**		**1716.8**			**6.101**			**8.916**			**7.509**	
	Mean (P)	**1549.3**			**1976.5**					**5.928**			**8.728**				
		M	**T**	**P**	**M x T**	**T x P**	**M x P**	**T x M**	**P x M**	**M**	**T**	**P**	**M x T**	**M x P**	**T x P**	**T X M**	**P x M**
	SEd	6.839	14.954	9.458	20.114	21.149	NS	21.149	NS	0.143	NS	0.126	0.291	NS	0.283	0.294	NS
	CD (p=0.05)	21.764	29.982	18.962	43.065	42.400		42.401		0.456		0.253	0.666		0.567	0.604	

Sunhemp (*Crotolaria juncea*)

Observations of PI

Unified Observation

In Sunhemp, the experiment was proposed at seven centers namely TNAU, Coimbatore; UAS, Dharwad; MPKV, Rahuri; JAU, Junagadh (Jamnagar); BCKV, Nadia; ANGRAU, Guntur and AAU, Jorhat. Data were received from only six centers (TNAU Coimbatore; JAU Jamnagar; BCKV Nadia, UAS Dharwad and MPKV Rahuri, ANGRAU, Guntur). Among all the treatment combinations, P_1T_4 (Foliar spray with DAP 2%+MN Mixture (Zn+B) + NAA @ 40ppm with pinching) was found superior and uniformly better in four locations. Pooled analysis of the data over locations revealed that treatment P_1T_4 contributed for 42.75% increase in seed yield/ha, 8.69% increase in germination percentage, 34.33% increase in number of pods/plant & 12.71% increase in seeds/pod over control.

Individual Centre wise Observations

ANGRAU, Guntur

Results: experiment is laid in early *rabi* season 2017-18 and results would be communicated after harvest of crop.

JAU, Jamnagar

Results: An experiment on "Standardization of seed production technology in Sun hemp" was conducted at Pearl Millet Research Station, JAU, Jamnagar (Gujarat) during *kharif*-2017. The experiment was laid down in split plot design in four replications as a main plot treatments pinching (With pinching & without pinching) and sub plot as five different treatments *i.e.* foliar sprays with (T_1) DAP 2%, (T_2) MN mixture ($ZnSO_4$ 0.5% + Boric acid 0.3%), (T_3) NAA 40 ppm, (T_4) DAP 2% + MN mixture ($ZnSo_4$ 0.5% + Boric acid 0.3%) + NAA 40 ppm, and (T_5) Control. Pinching/nipping was done in sun hemp when main stem attains a height of 90 cm (60 DAS) to break apical dominance and more branching. Foliar spray was done two times *i.e.* first at initiation of flowering and second at end of flowering period. The soil of the experiment is medium black. The fertilizer was applied @ 30 kg/ha N and 50 kg/ha P in the trial. In addition, the recommended agronomic packages and plant protection practices were followed. To standardize the seed production technology and enhancement of productivity of quality seed, observations were recorded on number of pods per plant, number of seeds per pod, number of plants per plot, dry pods yield per plant (g), dry pods yield per plot (kg), seed yield per plant (g), seed yield per plot (kg), seed yield (q/ha), number of pods shattered per plant before picking, seed recovery (%), 100 seed weight (g), seed germination (%), seedling length (cm), seedling dry weight (g) and seedling vigour index-I & II.

(A) Pinching/nipping (M): Effect of pinching was found non-significant for all the characters under studied. However, the higher production of seed yield (9.62 q/ha) was obtained with pinching of terminal buds at 60 DAS.

(B) Foliar application (T): Different nutrients spraying exert their significant effect on seed yield per plant (g), seed yield per plot (kg), seed yield (q/ha), number of pods per plant, dry pods yield per plant (g) and dry pods yield per plot (kg). The remaining traits under studied were reflected non-significant results in relation to foliar application of different nutrients. The maximum seed yield (10.70 q/ha) was produced when foliar sprayings of DAP 2% + MN mixture ($ZnSo_4$ 0.5% + Boric acid 0.3%) + NAA 40 ppm at initiation of flowering and at end of flowering period. The foliar sprayings of DAP 2% + MN mixture ($ZnSo_4$ 0.5% + Boric acid 0.3%) + NAA 40 ppm was significantly superior over control for seed yield per plant (g), seed yield (q/ha), number of pods per plant, dry pods yield per plant (g) and per plot (kg).

(C) Interaction: Interaction M x T was found non-significant for all the traits under studied. The overall results showed that the foliar application of DAP 2% + MN mixture ($ZnSo_4$ 0.5% + Boric acid 0.3%) + NAA 40 ppm at initiation of flowering and at end of flowering period with pinching was produced the highest seed yield (10.82 q/ha), number of pods per plant (129.75), seeds per pod (10.35), dry pods yield per plant (26.58g) & per plot (9.26 kg), seed vigour index-II (93.36%) and less number of pods shattered per plant before picking (0.20) in sun hemp.

Table 3.28: Replicated data for seed yield in sun hemp at Pearl Millet Research Station, JAU, Jamnagar during *Kharif*-2017

Pinching	Foliar spray	Seed Yield (kg/plot)				Total	Mean	Seed Yield (q/ha)
		I	II	III	IV			
M_1	T_1	1.460	1.831	1.760	1.743	6.794	1.699	9.44
	T_2	1.577	1.990	1.856	1.762	7.185	1.796	9.98
	T_3	1.204	1.630	1.812	1.859	6.505	1.626	9.03
	T_4	2.000	1.707	1.955	2.130	7.792	1.948	10.82
	T_5	1.605	1.384	1.851	1.513	6.353	1.588	8.82
M_2	T_1	2.082	1.585	1.367	1.462	6.496	1.624	9.02
	T_2	1.547	1.847	1.707	1.796	6.897	1.724	9.58
	T_3	1.385	1.628	1.864	1.465	6.342	1.586	8.81
	T_4	2.045	1.812	1.922	1.842	7.621	1.905	10.58
	T_5	1.250	1.575	1.637	1.800	6.262	1.566	8.70
Total		**16.155**	**16.989**	**17.731**	**17.372**	**68.247**	--	---

M_1=With pinching, M_2= Without pinching, T_1= Foliar spray with DAP 2%, T_2= Foliar spray with MN mixture ($ZnSo_4$ 0.5% + Boric acid 0.3%), T_3= Foliar spray with NAA 40 ppm, T_4= Foliar spray with DAP 2% + MN mixture ($ZnSo_4$ 0.5% + Boric acid 0.3%) + NAA 40 ppm, T_5=Control.

Table 3.29: Ancillary, physiological observations and seed yield in Sun hemp at Pearl Millet Research Station, JAU, Jamnagar during *Kharif*-2017

Treat.	Seed yield			No. of plants /plot	No. of pods/ plant	No. of seeds/ pod	Dry pods yield		Pods shattered /Plant before picking	Seed recovery (%)	100 seeds weight (g)	Seed germin ation (%)	Seedling length (cm),	Seedling dry weight (g)	Seed vigour Index (%)	
	Per plant (g)	Per Plot (kg)	(q/ha)				Per Plant (g)	Per Plot (kg)							I	II
(A) Pinching /nipping (M)																
M_1	6.04	1.73	9.62	266.8	117.99	10.10	23.12	8.22	0.22	26.35	1.41	87.05	11.46	1.01	998	87.99
M_2	5.92	1.68	9.34	266.0	112.89	10.03	21.64	7.79	0.23	27.55	1.41	87.30	11.51	0.97	1005	84.82
SEm$\pm$	0.17	0.04	0.22	2.17	3.10	0.23	1.11	0.30	0.01	0.71	0.03	1.22	0.40	0.03	38.81	3.34
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
C.V. %	12.42	10.28	10.28	3.64	12.01	10.21	20.21	16.63	18.18	11.83	10.44	6.28	15.68	12.75	17.33	17.30
(B) Foliar application (T)																
T_1	5.82	1.66	9.23	264.5	114.35	9.83	22.12	7.89	0.23	26.55	1.42	86.25	11.52	0.99	993	85.42
T_2	6.09	1.76	9.78	270.4	118.03	9.95	23.15	8.23	0.22	26.70	1.40	86.88	11.51	1.00	1000	86.77
T_3	5.68	1.61	8.92	262.3	110.18	10.05	20.88	7.43	0.24	27.29	1.39	87.88	11.43	0.98	1007	85.91
T_4	6.60	1.93	10.70	273.0	125.20	10.28	25.11	8.91	0.20	26.46	1.44	87.88	11.50	1.02	1012	89.56
T_5	5.71	1.58	8.76	261.8	109.45	10.23	20.65	7.55	0.24	27.74	1.40	87.00	11.48	0.97	996	84.35
SEm$\pm$	0.18	0.08	0.42	6.15	3.49	0.35	0.99	0.34	0.01	0.67	0.05	2.10	0.28	0.03	34.70	3.18
CD at 5%	0.54	0.22	1.23	NS	10.20	NS	2.89	0.99	NS	NS	NS	NS	NS	NS	NS	NS
C.V. %	8.71	12.55	12.55	6.53	8.56	9.72	12.52	11.96	13.71	7.08	10.10	6.80	6.94	8.11	9.80	10.42
(C) Interaction effects (M x T):																
M_1 T_1	5.90	1.70	9.44	266.3	116.00	10.00	22.55	8.09	0.24	26.59	1.42	85.75	11.00	0.97	941	83.16
T_2	6.13	1.80	9.98	274.0	121.05	9.80	24.15	8.58	0.21	25.60	1.37	87.00	11.61	1.00	1009	86.59
T_3	5.09	1.63	9.03	260.8	113.20	10.05	21.53	7.61	0.23	26.94	1.42	88.75	11.51	1.04	1026	92.26
T_4	6.74	1.95	10.82	271.5	129.75	10.35	26.58	9.26	0.20	25.48	1.43	87.75	11.69	1.06	1024	93.36
T_5	5.64	1.59	8.82	261.3	109.95	10.30	20.80	7.56	0.22	27.13	1.40	86.00	11.51	0.99	990	84.58
M_2 T_1	5.75	1.62	9.02	262.8	112.70	9.65	21.69	7.70	0.22	26.52	1.43	86.75	12.03	1.01	1044	87.69
T_2	6.05	1.72	9.58	266.8	115.00	10.10	22.15	7.88	0.23	27.80	1.43	86.75	11.42	1.00	992	86.96
T_3	5.58	1.59	8.81	263.8	107.15	10.05	20.23	7.26	0.25	27.64	1.36	87.00	11.36	0.92	989	79.55
T_4	6.46	1.91	10.58	274.5	120.65	10.20	23.65	8.57	0.21	27.45	1.44	88.00	11.31	0.97	999	85.77
T_5	5.78	1.57	8.70	262.3	108.95	10.15	20.50	7.55	0.25	28.36	1.41	88.00	11.45	0.96	1002	84.12
SEm$\pm$	0.26	0.11	0.59	8.70	4.94	0.49	1.40	0.48	0.02	0.95	0.07	2.96	0.40	0.04	49.07	4.50
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Sun hemp experiment *Kharif*-2017 photos

Sun hemp with pinching (M_1T_4) ***Sun hemp comparison between with(M_1T_5) and without(M_2T_2) pinching***

Field view of the experimental plot of Sun hemp at JAU, Jamnagar (Gujarat)

MPKV, Rahuri

Results: The data on effect of pinching and foliar application on seed yield and quality parameters of Sunhemp are presented in Table 3.30 and 3.31. The data revealed that the seed yield and quality parameters are significantly influenced by pinching and foliar application of fertilizers/micronutrients.

A) Effect of pinching:

Pinching had significant effect on seed yield and quality of Sunhemp irrespective of foliar application of fertilizer/micronutrients. Number of pods/plant (104.19), number of seeds/pod (11.49), 100 seed weight (2.55 g), seed yield (1.85 kg/plot), seed yield (924.53 kg/ha), germination (89.60%), root shoot length (27.64 cm), dry matter content (0.19 g), vigour index I (2484.27) and vigour index II (17.30) were significantly higher in the pinching treatment and pod shattering per cent (4.53) was also lower in this treatment.

Pooled data:

Pooled data revealed that pinching had significant effect on seed yield and quality of Sunhemp irrespective of foliar application of fertilizer/micronutrients. Number of pods/plant (93.80), seed yield (1.55 kg/plot), seed yield (772.97 kg/ha), root shoot length (23.02 cm), dry matter content (0.16 g), vigour index I (2027.27) and vigour Index II (14.10) were significantly higher in the pinching treatment.

B) Effect of foliar application of fertilizers/micronutrients:

Foliar application of fertilizers/micronutrients had significant effect on seed yield and quality of

Sunhemp irrespective of pinching. Number of pods/plant (104.10), number of seeds/pod (11.75), 100 seed weight (2.68g), seed yield (1.97 kg/plot), seed yield (984.00 kg/ha), germination (90.83%), root shoot length (28.65 cm) dry matter content (0.20 g), vigour index I (2600.16) and vigour index II (17.84) were significantly higher in the foliar application of DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid (0.3%)] + NAA (40 ppm) (T_4) treatment. The pod shattering per cent (2.83) was also lower in this treatment.

Pooled Data

Pooled data revealed that foliar application of fertilizers/micronutrients had significant effect on seed yield and quality of Sunhemp irrespective of pinching. Number of pods/plant (97.75), number of seeds/pod (10.60), 100 seed weight (2.16 g), seed yield (1.68 kg/plot), seed yield (843.87 kg/ha), germination (86.00%), root shoot length (22.82 cm) dry matter content (0.15g), vigour index I (2004.33) and vigour index II (13.61) were significantly higher in the foliar application of DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid (0.3%)] + NAA (40 ppm) (T_4) treatment. The pod shattering per cent (3.16) was also lower in this treatment.

C). Interaction effect:

The interaction effect of pinching and foliar application of fertilizers/micronutrients showed significant effect on seed yield. Seed yield (2.25 kg/plot) and seed yield (1126.83 kg/ha) were significantly higher in the pinching and foliar application of DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid (0.3%)] + NAA (40 ppm) (P_1T_4).

Pooled Data

Pooled data revealed that seed yield (1.98 kg/plot) and seed yield (991.00 kg/ha) were significantly higher in the pinching and foliar application of DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid (0.3%)] + NAA (40 ppm).

Recommendation:

The pinching practice after 50-60 days of sowing (plant height 90 cm) and foliar application of DAP (2%) + MN mixture [ZnSO4 (0.5%) + Boric acid (0.3%)] + NAA (40 ppm) at the time of flowering is recommended for better seed yield and seed quality in Sunhemp.

Undertaking pinching operation in sunhemp at MPKV, Rahuri

Table 3.30: Effect of pinching and foliar application on seed yield and quality parameters of Sunhemp at MPKV, Rahuri during *Kharif* 2017

Treatments	No. of pods / plant				No. of seeds / pod				No. of pods shattered / plant			
Pinching	2015	2016	2017	Pooled	2015	2016	2017	Pooled	2015	2016	2017	Pooled
With pinching (P_1)	80.69	96.54	104.19	93.80	7.86	11.30	11.49	10.22	5.00	4.80	4.53	4.78
Without pinching (P_2)	56.33	73.13	82.24	70.56	7.50	10.88	10.58	9.65	7.40	3.26	5.80	5.49
SE ±	0.93	3.76	1.52	5.37	0.07	0.38	0.147	0.537	0.75	0.78	0.20	1.42
CD at 5%	6.07	24.66	9.98	18.61	NS	NS	0.962	NS	NS	NS	1.34	NS
Foliar application												
Spray with DAP (2%) (F_1)	68.87	82.63	99.60	83.70	7.80	10.93	11.65	10.13	6.67	4.66	3.83	5.05
Spray with MN mixture (F_2)	70.87	88.70	97.25	85.60	7.80	10.93	11.56	10.10	5.83	3.83	4.17	4.61
Spray with NAA (40 ppm) (F_3)	66.20	81.13	90.98	79.43	7.45	11.53	11.23	10.07	6.67	4.50	6.00	5.72
Spay with DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid (0.3%)]+ NAA (40 ppm) (F_4)	87.62	101.53	104.10	97.75	7.98	12.06	11.75	10.60	5.33	1.33	2.83	3.16
Control (F_5)	48.98	70.18	74.11	64.42	7.37	10.00	9.00	8.78	6.50	5.83	9.00	7.11
SE ±	**1.16**	**3.02**	**1.35**	**1.19**	**0.11**	**0.32**	**0.24**	**0.32**	**0.38**	**0.79**	**0.40**	**0.79**
CD at 5%	**3.50**	**9.14**	**4.10**	**3.68**	**0.33**	**0.96**	**0.74**	**1.05**	**NS**	**2.40**	**1.20**	**2.30**

Treatments	**100 seed weight (g)**				**Seed yield/ plot (kg)**				**Seed yield/ha (kg)**			
Pinching	**2015**	**2016**	**2017**	**Pooled**	**2015**	**2016**	**2017**	**Pooled**	**2015**	**2016**	**2017**	**Pooled**
With pinching (P_1)	1.23	2.49	2.55	2.09	1.247	1.54	1.85	1.55	623.44	770.93	924.53	772.97
Without pinching (P_2)	1.086	2.23	2.28	1.87	0.831	1.06	1.35	1.08	415.38	530.26	673.90	539.86
SE ±	0.02	0.10	0.04	0.144	0.01	0.04	0.03	0.064	7.56	20.58	12.75	32.75
CD at 5%	NS	NS	0.26	NS	0.09	0.27	0.16	0.221	49.55	134.84	83.57	113.34
Foliar application												
Spray with DAP (2%) (F_1)	1.165	2.42	2.57	2.05	1.075	1.45	1.76	1.43	537.42	729.33	879.08	715.30
Spray with MN mixture (F_2)	1.210	2.31	2.41	1.98	1.041	1.30	1.45	1.26	520.41	655.83	727.58	632.97
Spray with NAA (40 ppm) (F_3)	1.107	2.39	2.58	2.03	0.974	1.10	1.57	1.22	486.91	550.66	786.75	608.10
Spay with DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid (0.3%)]+ NAA (40 ppm)(F_4)	1.253	2.54	2.68	2.16	1.348	1.74	1.97	1.68	673.85	873.75	984.00	843.87
Control (F_5)	1.040	2.13	1.86	1.68	0.757	0.89	1.23	0.96	378.47	448.41	618.67	481.87
SE ±	**0.03**	**0.10**	**0.05**	**0.812**	**0.04**	**0.10**	**0.02**	**0.031**	**23.03**	**52.90**	**12.86**	**15.53**
CD at 5%	**0.10**	**NS**	**0.16**	**0.264**	**0.14**	**0.32**	**0.08**	**0.096**	**69.64**	**159.97**	**38.88**	**47.86**

Table 3.30 contd….

Treatments	Germination (%)				Root shoot length (cm)				Dry matter content (g)			
Pinching	2015	2016	2017	Pooled	2015	2016	2017	Pooled	2015	2016	2017	Pooled
With pinching (P_1)	82.07 (65.00)	88.66 (70.58)	89.60 (71.53)	86.78 (69.04)	13.63	27.86	27.64	23.02	0.108	0.18	0.19	0.16
Without pinching (P_2)	70.73 (57.25)	82.40 (65.23)	86.53 (68.55)	79.89 (63.68)	10.02	24.14	24.44	19.52	0.069	0.16	0.18	0.14
SE ±	0.12	0.76	0.29	1.28	0.32	0.18	0.14	0.512	0.003	0.001	0.001	0.006
CD at 5%	0.82	4.98	1.88	4.43	2.11	1.20	0.93	1.772	0.019	0.005	0.007	NS
Foliar application												
Spray with DAP (2%)(F_1)	77.50 (61.78)	86.33 (68.67)	89.83 (71.55)	84.56 (67.33)	12.07	25.75	27.71	21.83	0.099	0.18	0.19	0.16
Spray with MN mixture (F_2)	76.83 (61.52)	87.16 (69.26)	89.67 (71.54)	84.56 (67.44)	12.15	26.96	25.80	21.62	0.091	0.17	0.18	0.15
Spray with NAA (40 ppm) (F_3)	76.17 (60.89)	85.00 (67.27)	87.50 (69.33)	82.89 (65.83)	11.28	27.78	26.53	21.85	0.083	0.18	0.19	0.15
Spay with DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid (0.3%)]+ NAA (40 ppm) (F_4)	79.00 (62.94)	88.16 (70.20)	90.83 (72.49)	86.00 (68.55)	13.10	26.76	28.65	22.82	0.094	0.17	0.20	0.15
Control (F_5)	72.50 (58.49)	81.00 (64.15)	82.50 (62.28)	78.67 (62.64)	10.517	22.73	21.50	18.23	0.075	0.16	0.17	0.13
SE ±	**1.00**	**0.722**	**0.995**	**1.36**	**0.32**	**0.78**	**0.83**	**0.390**	**0.002**	**0.005**	**0.005**	**0.002**
CD at 5%	**3.05**	**2.183**	**3.009**	**3.97**	**0.95**	**2.38**	**2.51**	**1.20**	**0.006**	**NS**	**0.14**	**0.06**

(Figures in parenthesis are arc sin transformed values)

Table 3.30 contd….

Treatments	Vigour index I				Vigour index II			
Pinching	2015	2016	2017	Pooled	2015	2016	2017	Pooled
With pinching (P_1)	1119.63	2477.51	2484.27	2027.27	8.89	16.13	17.30	14.10
Without pinching (P_2)	710.83	1991.35	2119.20	1606.73	4.89	11.83	15.81	11.51
SE ±	24.03	40.50	11.45	62.57	0.22	0.22	0.14	0.44
CD at 5%	157.43	265.33	75.03	216.53	1.46	1.49	0.91	1.53
Foliar application								
Spray with DAP (2%)(F_1)	947.73	2238.36	2491.50	1892.00	7.76	15.60	17.37	13.57
Spray with MN mixture (F_2)	944.07	2355.76	2322.00	1873.16	7.07	15.53	16.57	13.06
Spray with NAA (40 ppm) (F_3)	871.34	2366.11	2324.00	1853.53	6.43	15.29	16.53	12.75
Spay with DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid (0.3%)]+ NAA (40 ppm) (F_4)	1039.57	2369.70	2600.16	2004.33	7.58	15.41	17.84	13.61
Control (F_5)	773.43	1842.21	1771.00	1462.50	5.60	15.07	14.45	11.04
SE ±	**29.49**	**71.13**	**81.45**	**36.53**	**0.21**	**0.47**	**0.48**	**0.57**
CD at 5%	**89.18**	**215.08**	**246.30**	**112.59**	**0.64**	**1.42**	**1.46**	**1.68**

Table 3.31: Interaction effects of pinching and foliar application on seed yield and quality parameters of Sunhemp at MPKV, Rahuri during *Kharif* 2017

Treatments	No. of pods/ plant				No. of seeds/ pod				No. of pods shattered / plant			
	2015	2016	2017	Pooled	2015	2016	2017	Pooled	2015	2016	2017	Pooled
P_1F_1	85.90	96.80	108.50	97.07	8.20	11.20	12.70	10.70	5.67	5.00	3.33	4.67
P_1F_2	90.73	99.26	106.57	98.86	7.87	11.40	12.16	10.48	4.67	5.33	3.67	4.56
P_1F_3	84.10	93.33	103.17	93.53	7.50	12.13	11.50	10.38	4.67	6.00	5.00	5.22
P_1F_4	91.57	115.60	116.57	107.91	8.27	11.40	12.00	10.56	4.33	1.66	2.33	2.78
P_1F_5	51.13	77.70	86.10	71.64	7.47	10.40	9.13	9.00	5.67	6.00	8.33	6.67
P_2F_1	51.83	68.46	90.70	70.33	7.40	10.66	10.60	9.56	7.67	4.33	4.33	5.44
P_2F_2	51.00	78.13	87.93	72.36	7.73	10.46	10.97	9.72	7.00	2.33	4.67	4.67
P_2F_3	48.30	68.93	78.80	65.34	7.40	10.93	10.97	9.77	8.67	3.00	7.00	6.22
P_2F_4	83.67	87.46	91.63	87.59	7.70	12.73	11.50	10.64	6.33	1.00	3.33	3.56
P_2F_5	46.83	62.66	62.13	57.21	7.27	9.60	8.87	8.57	7.33	5.66	9.67	7.56
Factor B at same level of A												
SE ±	2.07	8.41	3.40	1.11	0.16	0.85	0.33	0.27	1.67	1.75	0.50	1.85
CD at 5%	6.60	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Factor A at same level of B												
SE ±	**1.73**	**5.36**	**2.29**	**3.29**	**0.16**	**0.55**	**0.34**	**0.36**	**0.89**	**1.27**	**0.54**	**1.06**
CD at 5%	**6.98**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

Table 3.31 contd…

Treatments	100 seed weight (g)				Seed yield per plot (kg)				Seed yield per ha (kg)			
	2015	2016	2017	Pooled	2015	2016	2017	Pooled	2015	2016	2017	Pooled
P_1F_1	1.190	2.51	2.72	2.14	1.376	1.82	2.06	1.76	687.97	913.16	1031.67	877.60
P_1F_2	1.309	2.42	2.57	2.10	1.290	1.65	1.64	1.53	645.36	826.16	819.00	763.51
P_1F_3	1.163	2.57	2.74	2.16	1.201	1.13	1.94	1.42	600.48	567.63	968.83	712.38
P_1F_4	1.353	2.77	2.82	2.32	1.541	2.15	2.25	1.98	770.50	1075.66	1126.83	991.00
P_1F_5	1.100	2.17	1.93	1.73	0.826	0.94	1.35	1.04	412.88	471.83	676.33	520.35
P_2F_1	1.140	2.33	2.42	1.97	0.774	1.09	1.45	1.11	386.87	545.50	726.50	552.95
P_2F_2	1.112	2.20	2.25	1.86	0.791	0.95	1.27	1.00	395.46	475.50	636.17	502.37
P_2F_3	1.050	2.22	2.43	1.90	0.747	1.06	1.21	1.01	373.33	533.50	604.67	503.83
P_2F_4	1.152	2.31	2.54	2.00	1.155	1.34	1.68	1.39	577.20	671.83	841.17	696.73
P_2F_5	0.979	2.10	1.80	1.63	0.688	0.85	1.12	0.89	344.06	425.00	561.00	443.36
Factor B at same level of A												
SE ±	0.05	0.22	0.09	0.07	0.03	0.09	0.06	0.04	16.91	46.02	28.52	20.31
CD at 5%	NS	NS	NS	NS	0.21	0.49	0.16	0.25	105.74	249.05	79.42	128.05
Factor A at same level of B												
SE ±	**0.05**	**0.17**	**0.08**	**0.08**	**0.06**	**0.14**	**0.04**	**0.07**	**30.10**	**70.01**	**20.67**	**37.83**
CD at 5%	**NS**	**NS**	**NS**	**NS**	**0.19**	**0.46**	**0.18**	**0.23**	**97.71**	**233.06**	**90.27**	**112.43**

Table 3.31 contd…

Treatments	Germination (%)				Root shoot length (cm)				Dry matter content (g)			
	2015	2016	2017	Pooled	2015	2016	2017	Pooled	2015	2016	2017	Pooled
P_1F_1	82.00 (64.89)	91.66 (73.20)	91.67 (73.38)	88.44 (70.42)	14.67	28.56	29.05	24.09	0.121	0.187	0.201	0.169
P_1F_2	84.00 (66.48)	90.66 (72.28)	92.67 (74.50)	89.11 (70.95)	13.60	28.80	28.54	23.65	0.104	0.182	0.186	0.157
P_1F_3	81.33 (64.39)	87.00 (68.88)	89.00 (70.65)	85.78 (67.94)	13.53	29.30	28.74	23.86	0.101	0.188	0.196	0.162
P_1F_4	84.67 (66.99)	92.33 (73.90)	92.00 (73.73)	89.67 (71.45)	14.13	29.33	29.70	24.39	0.115	0.183	0.204	0.167
P_1F_5	78.33 (62.23)	81.66 (64.65)	82.67 (65.40)	80.89 (64.08)	12.20	23.30	22.04	19.18	0.101	0.169	0.178	0.149
P_2F_1	73.00 (58.67)	81.00 (64.14)	88.00 (69.72)	80.67 (64.17)	9.47	22.93	26.34	19.58	0.077	0.174	0.186	0.145
P_2F_2	69.67 (56.56)	83.66 (66.24)	86.67 (68.60)	80.00 (63.76)	10.70	25.13	23.00	19.61	0.078	0.74	0.183	0.145
P_2F_3	71.00 (57.40)	83.00 (65.67)	86.00 (68.01)	80.00 (63.67)	9.03	26.26	24.29	19.86	0.065	0.171	0.182	0.140
P_2F_4	73.33 (58.89)	84.00 (66.50)	89.67 (71.25)	82.33 (65.50)	12.06	24.20	27.55	21.27	0.074	0.166	0.189	0.143
P_2F_5	66.67 (54.74)	80.33 (63.65)	82.33 (65.16)	76.44 (61.16)	8.83	22.16	20.93	17.31	0.050	0.154	0.173	0.125
Factor B at same level of A												
SE ±	0.28	1.701	0.64	3.80	0.72	0.41	0.32	0.26	0.006	0.002	0.002	0.015
CD at 5%	NS	4.563	NS	NS	1.97	NS	NS	NS	0.014	NS	NS	NS
Factor A at same level of B												
SE ±	1.28	1.189	1.29	1.84	0.51	1.01	1.06	0.77	0.004	0.007	0.006	0.007
CD at 5%	NS	5.311	NS	NS	2.26	NS	NS	NS	0.019	NS	NS	NS

(Figures in parenthesis are arc sin transformed values)

Table 3.31 contd...

Treatments	Vigour index I				Vigour index II			
	2015	2016	2017	Pooled	2015	2016	2017	Pooled
P_1F_1	1204.00	2618.20	2663	2161	9.90	17.14	18.41	15.14
P_1F_2	1142.40	2606.26	2644	2133	8.71	16.50	17.26	14.15
P_1F_3	1101.23	2550.63	2558	2069	8.21	16.38	17.41	14.00
P_1F_4	1194.80	2708.46	2733	2213	9.72	16.87	18.73	15.10
P_1F_5	955.73	1904.00	1822	1560	7.89	13.77	14.68	12.12
P_2F_1	691.47	1858.53	2318	1622	5.62	14.07	16.33	12.01
P_2F_2	745.73	2105.26	1994	1614	5.43	14.56	15.89	11.97
P_2F_3	641.50	2181.60	2089	1637	4.64	14.20	15.65	11.50
P_2F_4	884.33	2030.93	2470	1796	5.43	13.96	16.95	12.12
P_2F_5	591.13	1780.43	1724	1364	3.61	12.37	14.22	9.97
Factor B at same level of A								
SE ±	53.73	90.56	25.61	56.35	0.50	0.51	0.31	1.17
CD at 5%	NS	363.96	NS	NS	NS	NS	NS	NS
Factor A at same level of B								
SE ±	44.38	98.67	103.66	84.67	0.35	0.63	0.62	0.58
CD at 5%	NS	357.00	NS	NS	NS	NS	NS	NS

TNAU, Coimbatore

Results: Pinching of the sunhemp crop recorded significantly lesser seed yield compared to control. The sunhemp crop without pinching recorded significantly increased number of seeds per pod (7.16), seed yield per plant (10.1 g) and seed yield per plot (2.15 kg) compared to pinching treatment (6.92, 8.24 g and 1.51 kg respectively).

Among the foliar sprays, foliar spray with DAP 2%+ MN Mixture (Zn+B) + NAA 40 ppm, recorded the highest single plant seed yield (11.9 g) compared to control (9.2 gm). The same treatment has given the higher Vigour index of 2293when compare to 1970 of the control.

Non-pinching combined with Foliar spray with DAP 2%+ MN Mixture (Zn+B) + NAA 40 ppm found superior for all the traits studied such as plant height (113.01), pods per plant (25.59), number of seeds per pod (8), seed yield per plant (11.9 g), seed yield per plot(2.57 kg), 100 seed weight(1.44 g), germination % (90), root length (15.92) and shoot length (9.53) compared to the control.

Table 3.32: Effect of pinching and different foliar spray during flower initiation on seed yield attributing characters, seed yield and resultant seed quality in Sunnhemp (*Crotolaria juncea*) at TNAU, Coimbatore during *Kharif 2017*

Treatment		Plant height (cm)	Number of pods / plant	Number of seeds / pod	Seed yield per plant (gm)	Seed yield per plot(kg)	100 seed weight (gm)	Germinatioı (%)	Root length (cm)	Shoot length (cm)	Vigour index
With pinching	Foliar spray with DAP 2%	94.61	19.99	7	8.3	1.57	1.31	85	17.56	11.9	2504
	Foliar spray with MN Mixture (ZnSo4 0.5% + Boric acid 0.3%)	94.11	18.99	7.2	8.2	1.45	1.36	84	17.34	10.5	2339
	Foliar spray with NAA 40 ppm	95.01	22.29	7	8.3	1.41	1.28	82	17.3	9.8	2222
	Foliar spray with DAP 2%+ MN Mixture (Zn+B) + NAA 40 ppm	92.01	23.09	7.4	8.5	1.71	1.38	92	17.88	12.9	2832
	Control	94.61	14.99	6	7.9	1.41	1.25	82	16.88	8.8	2106
	Mean	**94.07**	**19.87**	**6.92**	**8.24**	**1.51**	**1.32**	**85**	**17.39**	**10.8**	**2400**
Without pinching	Foliar spray with DAP 2%	109.01	19.29	7.4	10.2	2.32	1.33	82	16.1	8.82	2043
	Foliar spray with MN Mixture (ZnSo4 0.5% + Boric acid 0.3%)	112.81	23.39	7.2	9.5	2.24	1.38	86	16.45	9.17	2203
	Foliar spray with NAA 40 ppm	107.41	22.09	7	9.7	1.91	1.29	88	16.4	8.95	2231
	Foliar spray with DAP 2%+ MN Mixture (Zn+B) + NAA 40 ppm	113.01	25.59	8	11.9	2.57	1.44	90	15.95	9.53	2293
	Control	110.51	15.99	6.2	9.2	1.71	1.28	82	15.62	8.4	1970
	Mean	**110.55**	**21.27**	**7.16**	**10.1**	**2.15**	**1.34**	**85.6**	**16.10**	**8.974**	**2148**
	SEd N	4.51	2.77	1.81	3.82	2.81	1.46	1.21	1.7	0.83	34
	F	7.15	3.35	2.35	4.34	5.45	2	0.43	0.35	0.34	49
	NXF	9.09	3.47	2.48	6.49	7.39	2.13	0.91	0.49	0.49	71
	CD(P=0.05) N	9.13	5.49	3.43	7.48	5.43	3.08	2.43	2.48	1.69	75
	F	12.48	6.66	4.61	8.6	10.78	4.26	0.88	0.6	0.59	99
	NXF	19.09	7.29	5.21	13.63	15.52	4.47	1.91	1.03	1.03	149

UAS, Dharwad

Results:

Table 3.33: Effect of pinching and foliar spray on plant growth and seed yield characters of Sunhemp (*Crotolaria juncea*) at UAS, Dharwad during *Kharif* 2017

Treatment	No. of pods/plant	No. of seeds/pod	Pod yield per plant (g)	No. of Pickings	Seed yield per plant g)	Seed yield per plot (kg)	Seed yield per ha (q)
M_1	279.45	17.66	177.72	2.15	39.95	4.00	19.98
M_2	169.61	15.36	107.87	2.10	29.64	2.78	13.89
SEm±	10.04	0.44	6.39	0.09	1.50	0.14	0.68
CD at 5%	29.84	NS	18.98	NS	4.45	0.40	2.02
P_1	225.96	16.94	143.70	2.19	36.87	3.69	18.44
P_2	232.72	15.74	148.00	2.10	34.81	3.48	17.41
P_3	219.22	16.99	139.42	2.26	35.72	3.29	16.44
P_4	261.52	16.99	166.32	2.00	39.35	3.89	19.45
P_5	183.24	15.89	116.54	2.08	27.21	2.59	12.93
SEm±	15.88	0.69	10.10	0.14	2.37	0.21	1.07
CD at 5%	NS	NS	NS	NS	NS	0.64	3.19
M_1P_1	281.38	18.12	178.95	2.38	42.45	4.25	21.23
M_1P_2	302.54	16.84	192.41	2.00	42.38	4.24	21.19
M_1P_3	259.23	18.18	164.86	2.36	37.28	3.73	18.64
M_1P_4	325.60	18.18	207.08	2.00	45.75	4.58	22.88
M_1P_5	228.49	17.00	145.31	2.00	31.88	3.19	15.94
M_2P_1	170.53	15.76	108.46	2.00	31.30	3.13	15.65
M_2P_2	162.90	14.65	103.60	2.20	27.24	2.72	13.62
M_2P_3	179.21	15.81	113.98	2.15	34.15	2.85	14.24
M_2P_4	197.43	15.81	125.56	2.00	32.95	3.21	16.03
M_2P_5	138.00	14.79	87.77	2.17	22.54	1.98	9.92
SEm±	22.46	0.98	14.28	0.19	3.35	0.30	1.52
CD at 5%	NS	NS	NS	NS	NS	NS	NS

Table 3.34: Effect of pinching and foliar spray on plant growth and seed yield characters of Sunhemp (*Crotolaria juncea*) at UAS, Dharwad during *Kharif* 2017

Treatment	100 seed weight (g)	Seed germination (%)	Seedling length (cm)	Seedling dry weight (mg)	Seedling vigour index	No. of pods shattered	Seed recovery (%)
M_1	2.46	80.97	38.31	75.60	3111	17.02	68.00
M_2	2.39	78.77	37.28	73.54	2948	12.63	60.35
SEm±	**0.03**	**0.95**	**0.45**	**0.88**	**69**	**0.64**	**2.67**
CD at 5%	**0.09**	**2.81**	**1.33**	**2.62**	**206**	**1.90**	**7.93**
P_1	2.37	78.11	36.96	72.93	2896	15.71	70.04
P_2	2.38	77.82	36.83	72.66	2875	14.83	67.91
P_3	2.37	78.22	37.02	73.03	2911	15.22	60.54
P_4	2.56	84.50	39.99	78.89	3381	16.76	76.29
P_5	2.45	80.69	38.18	75.34	3083	11.59	46.09
SEm±	**0.05**	**1.50**	**0.71**	**1.40**	**110**	**1.01**	**4.22**

CD at 5%	NS	NS	NS	NS	NS	NS	12.54
M_1P_1	2.40	79.09	37.43	73.85	2970	18.08	71.60
M1P2	2.40	77.69	36.76	72.53	2869	18.05	71.48
M1P3	2.51	82.68	39.13	77.20	3238	15.88	62.89
M1P4	2.58	85.01	40.23	79.37	3420	19.49	80.25
M1P5	2.44	80.36	38.03	75.03	3057	13.58	53.77
M2P1	2.34	77.13	36.50	72.02	2823	13.34	68.49
M2P2	2.36	77.95	36.89	72.78	2882	11.61	64.33
M2P3	2.24	73.76	34.90	68.86	2585	14.55	58.19
M2P4	2.55	83.99	39.74	78.42	3341	14.04	72.33
M2P5	2.46	81.02	38.34	75.65	3108	9.60	38.40
SEm±	**0.07**	**2.12**	**1.00**	**1.98**	**155**	**1.43**	**5.97**
CD at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

Pinching was found significant over control (without pinching) since the pinched plants produced significantly more number of branches, pods and seed yield per plant, per hectare. Foliar application of DAP @ 2% + Mixture (ZnSO4 +Boric Acid @ 0.3 %) + NAA @ 40 ppm significantly affected seed quality parameters like seed germination percentage, dry weight and seedling vigour index.

BCKV, Mohanpur, Nadia

Results:

Table 3.35: Effect of pinching and foliar spray on plant growth and yield characters of Sunhemp (*Crotolaria juncea*) at BCKV, Mohanpur, Nadia during *Kharif* 2017

Treatment	Days to 50% flowering	Plant height (cm)	No. of Pods /Plant	No. of Seeds /Pod	Pod Yield/ Plant (gm)	Seed yield/ Plant (gm)	Seed yield/ Plot ($20m^2$) (gm)	Seed yield/ Ha (kg/ha)	100 seed wt. (gm)
T1	79.25	193.80	87.70	7.10	13.75	7.95	961.93	480.97	2.39
T2	80.50	207.55	107.35	7.55	16.73	11.97	1024.18	512.09	2.42
T3	78.00	221.95	114.90	7.65	20.38	12.68	1092.85	546.42	2.46
T4	76.75	237.20	118.40	7.95	20.93	13.87	1341.15	670.58	2.44
T5	79.00	217.60	89.55	6.95	14.03	7.50	854.42	427.21	2.43
GM	**78.700**	**215.620**	**103.580**	**7.440**	**17.160**	**10.793**	**1054.907**	**527.454**	**2.428**
S.Em	**1.22**	**7.01**	**5.76**	**0.38**	**1.39**	**0.99**	**80.28**	**40.14**	**0.16**
C.D.(5%)	**3.50**	**20.04**	**16.45**	**1.10**	**3.96**	**2.83**	**229.45**	**114.73**	**0.42**
C. V.	**3.1**	**6.5**	**11.1**	**10.3**	**16.1**	**18.4**	**15.2**	**15.2**	**13.7**

Table 3.36: Effect of without pinching and foliar spray on plant growth and yield characters of Sunhemp (*Crotolaria juncea*) at BCKV, Mohanpur, Nadia during *Kharif* 2017

Treatment	Days to 50% flowering	Plant height (cm)	No. of Pods /Plant	No. of Seeds Pod	Pod Yield/ Plant (gm)	Seed yield/ Plant (gm)	Seed yield/ Plot($20m^2$) (gm)	Seed yield/ ha (kg/ha)	100 seed wt. (gm)
T1	78.75	217.55	60.80	6.93	13.50	6.77	999.38	499.69	2.46

T2	80.75	223.35	74.00	7.30	13.10	6.93	991.98	495.99	2.36
T3	80.75	222.95	78.40	6.48	14.72	7.73	1116.67	558.33	2.41
T4	82.25	226.80	81.45	7.70	16.32	8.24	1234.36	617.18	2.48
T5	80.50	209.08	61.65	7.33	13.47	7.11	890.23	445.11	2.46
GM	80.600	219.94	71.260	7.145	14.21	7.355	1046.52	523.26	2.410
S.Em	**1.13**	**13.20**	**3.02**	**0.45**	**0.96**	**0.49**	**34.75**	**17.38**	**0.16**
C.D. (5%)	**3.24**	**37.74**	**8.63**	**1.29**	**2.74**	**1.39**	**99.32**	**49.66**	**0.42**
C. V.	**2.8**	**12.0**	**8.5**	**12.6**	**13.5**	**13.2**	**6.6**	**6.6**	**12.5**

Pillipesara (*Vigna trilobata*)

Observations of PI

Unified Observations

- In Pillipesara, the experiment was proposed at five centers namely TNAU, Coimbatore; JAU, Jamnagar (Junagarh); MPKV, Rahuri; UAS, Dharwad and ANGRAU, Guntur. All the five centers were submitted the results. Among all the treatment combinations, P_1T_4 (Foliar spray with DAP 2%+MN Mixture (Zn+B) + NAA @ 40ppm with pinching) was found superior and uniformly better in three locations. Pooled analysis of the data over locations revealed that treatment P_1T_4 leads to 24.9% increase in seed yield/ha, 8.98% increase in germination percentage, 12.07% increase in number of pods/plant & 31.02% increase in number of seeds/pod over control.

Individual Centre wise Observations

ANGRAU, Guntur

Results: Experiment is laid in early rabi season 2017-18 and results would be communicated after harvest of crop.

JAU, Jamnagar

Results: An experiment on "Standardization of seed production technology in Pillipesara" was conducted at Pearl Millet Research Station, JAU, Jamnagar (Gujarat) during *kharif*-2017. The experiment was laid down in split plot design n four replications with pinching as a main plot treatment (With pinching & without pinching) and in sub plot five different treatments *i.e.* foliar sprays with (T_1) DAP 2%, (T_2) MN mixture ($ZnSo_4$ 0.5% + Boric acid 0.3%), (T_3) NAA 40 ppm, (T_4) DAP 2% + MN mixture ($ZnSo_4$ 0.5% + Boric acid 0.3%) + NAA 40 ppm, and (T_5) Control. Pinching/nipping was done at 40 DAS to break apical dominance and promote branching. Foliar spray was done two times *i.e*. first at initiation of flowering and second at end of flowering period. The soil of the experimental plot is medium black. The fertilizer was applied @ 30 kg/ha N and 50 kg/ha P. In addition, the recommended agronomic packages and plant protection practices were followed. To standardize seed production technology and enhancement of productivity of quality seed, observations were recorded on number of pods per plant, number of seeds per pod, number of plants per plot, dry pods yield per plant (g), dry pods yield per plot (kg), seed yield per plant (g), seed yield per plot (kg), seed yield (q/ha), number of pods shattered per plant before picking, seed recovery (%), 100 seed weight (g), seed germination (%), seedling length (cm), seedling dry weight (g) and seedling vigour index-I & II.

(A) Pinching/nipping (M): Effect of pinching on all the characters under study was reflected non-significant. However, the higher production of seed yield (1.17 q/ha) was obtained with pinching of terminal buds at 40 DAS.

(B) Foliar application (T): Effect of foliar application of different nutrients was found significant for seed yield per plot (kg), seed yield (q/ha), number of pods per plant, dry pod yield per plant (g) & per plot (kg) and 100-seeds weight (g). The remaining traits showed non-significant results in relation to foliar application of different nutrients. The foliar spray of DAP 2% + MN mixture ($ZnSo_4$ 0.5% + Boric acid 0.3%) + NAA 40 ppm at initiation of flowering and at end of flowering period was significantly superior over control for seed yield (q/ha), number of pods per plant, dry pod yield per plant (g), dry pod yield per plot (kg) and 100-seed weight (g).

(C) Interaction: Interaction M x T was found non-significant for all the traits studied. It is thus concluded that the foliar application of DAP 2% + MN mixture ($ZnSo_4$ 0.5% + Boric acid 0.3%) + NAA 40 ppm at initiation of flowering and at end of flowering period with pinching was produced the highest seed yield (1.39q/ha), number of pods per plant (52.90), number of seeds per pod (8.70), dry pods yield per plant (6.98g) & per plot (0.59 kg), seed recovery (43.07%), 100-seed weight (0.90g), seedling length (10.76cm) and less number of pods shattered per plant before picking (0.68).

Table 3.37: Replicated data for seed yield in Pillipesara at Pearl Millet Research Station, JAU, Jamnagar during *Kharif*-2017

Pinching	Foliar spray	Seed Yield (kg/plot)				Total	Mean	Seed Yield (q/ha)
		I	II	III	IV			
M_1	T_1	0.193	0.190	0.222	0.212	0.817	0.204	1.135
	T_2	0.238	0.181	0.208	0.215	0.842	0.211	1.169
	T_3	0.146	0.212	0.217	0.220	0.795	0.199	1.104
	T_4	0.258	0.205	0.285	0.255	1.003	0.251	1.393
	T_5	0.178	0.247	0.181	0.139	0.745	0.186	1.035
M_2	T_1	0.167	0.236	0.167	0.214	0.784	0.196	1.089
	T_2	0.189	0.201	0.180	0.235	0.805	0.201	1.118
	T_3	0.195	0.169	0.162	0.192	0.718	0.179	0.997
	T_4	0.235	0.260	0.280	0.148	0.923	0.231	1.282
	T_5	0.237	0.163	0.140	0.169	0.709	0.177	0.985
Total		**2.036**	**2.064**	**2.042**	**1.999**	**8.141**	**--**	**--**

M_1=With pinching, M_2= Without pinching, T_1= Foliar spray with DAP 2%, T_2= Foliar spray with MN mixture ($ZnSo_4$ 0.5% + Boric acid 0.3%), T_3= Foliar spray with NAA 40 ppm, T_4= Foliar spray with DAP 2% + MN mixture ($ZnSo_4$ 0.5% + Boric acid 0.3%) + NAA 40 ppm, T_5=Control.

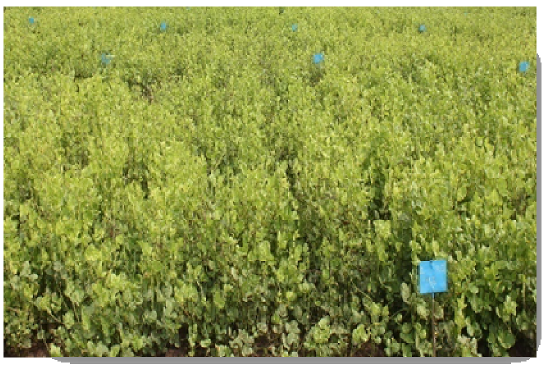
Table 3.38: Ancillary, physiological observations and seed yield in Pillipesara at Pearl Millet Research Station, JAU, Jamnagar during *Kharif*-2017

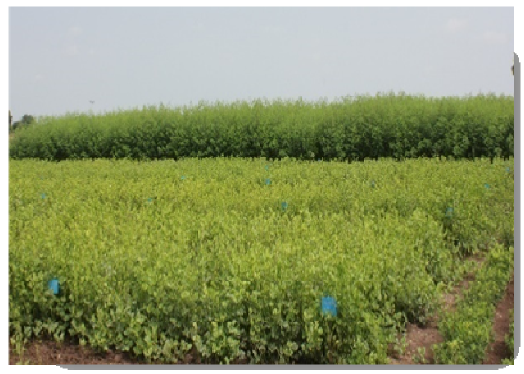
Treatment	Seed yield			No. of plants /plot	No. of pods/ plant	No. of seeds/ pod	Dry pods yield		Pods shattered /plant before picking	Seed recovery (%)	100 seeds weight (g)	Seed germination (%)	seedling length (cm)	seedling dry weight (g)	Seed vigour Index (%)	
	Per plant (g)	Per Plot (kg)	(q/ha)				Per Plant (g)	Per Plot (kg)							I	II
(A) Pinching /nipping (M)																
M_1	2.57	0.21	1.17	82.05	46.01	8.44	6.02	0.49	0.74	42.63	0.87	82.25	10.36	0.59	857	49.09
M_2	2.45	0.20	1.09	81.50	43.62	8.31	5.77	0.47	0.77	42.38	0.86	81.75	9.64	0.59	796	49.13
SEm±	0.05	0.01	0.03	1.78	0.66	0.25	0.11	0.01	0.03	0.09	0.01	0.79	0.19	0.01	26.74	1.25
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
C.V. %	8.47	13.78	13.78	9.71	6.57	13.58	8.09	13.21	18.20	0.93	3.30	4.33	8.69	10.57	14.47	11.40
(B) Foliar application (T)																
T_1	2.43	0.20	1.11	84.50	43.86	8.45	5.68	0.47	0.79	42.66	0.88	80.75	9.92	0.58	801	47.34
T_2	2.49	0.21	1.14	84.63	45.12	8.50	5.89	0.49	0.74	42.28	0.84	80.87	9.86	0.58	794	46.61
T_3	2.36	0.19	1.05	77.00	41.73	8.27	5.52	0.42	0.74	42.65	0.85	79.37	9.46	0.59	781	48.77
T_4	2.86	0.24	1.34	85.00	50.65	8.60	6.77	0.57	0.68	42.05	0.90	84.25	10.59	0.60	888	50.51
T_5	2.41	0.18	1.01	77.75	42.70	8.05	5.62	0.44	0.84	42.87	0.86	84.75	10.18	0.62	868	52.32
SEm±	**0.14**	**0.01**	**0.07**	**5.30**	**2.07**	**0.29**	**0.29**	**0.03**	**0.05**	**0.53**	**0.01**	**2.25**	**0.41**	**0.02**	**48.41**	**2.99**
CD at 5%	**NS**	**0.04**	**0.22**	**NS**	**6.05**	**NS**	**0.84**	**0.09**	**NS**	**NS**	**0.03**	**NS**	**NS**	**NS**	**NS**	**NS**
C.V. %	**15.62**	**18.61**	**18.61**	**18.33**	**13.08**	**9.70**	**13.87**	**17.21**	**19.81**	**3.50**	**3.45**	**8.79**	**11.56**	**9.21**	**16.57**	**17.23**
(C) Interaction effects (M x T):																
M_1 T_1	2.55	0.20	1.14	82.75	45.45	8.65	5.96	0.48	0.78	42.76	0.87	80.00	10.35	0.58	827	46.17
T_2	2.53	0.21	1.17	86.75	47.00	8.60	6.03	0.52	0.70	41.83	0.86	83.00	10.22	0.59	843	48.58
T_3	2.38	0.20	1.10	78.25	42.24	8.40	5.57	0.43	0.73	42.72	0.86	79.50	9.81	0.59	807	48.25
T_4	3.01	0.25	1.39	85.25	52.90	8.70	6.98	0.59	0.68	43.07	0.90	84.50	10.76	0.60	900	50.23
T_5	2.38	0.19	1.04	77.25	42.46	7.85	5.58	0.43	0.83	42.74	0.85	84.25	10.65	0.62	907	52.21
M_2 T_1	2.30	0.20	1.09	86.25	42.26	8.25	5.40	0.46	0.80	42.55	0.89	81.50	9.49	0.59	775	48.50
T_2	2.46	0.20	1.12	82.50	43.25	8.40	5.75	0.47	0.77	42.72	0.83	78.75	9.50	0.56	745	44.64
T_3	2.33	0.18	1.00	75.75	41.22	8.15	5.48	0.41	0.75	42.58	0.85	79.25	9.11	0.59	754	49.29
T_4	2.70	0.23	1.28	84.75	48.40	8.50	6.55	0.56	0.69	41.03	0.89	84.00	10.41	0.60	875	50.79
T_5	2.43	0.18	0.99	78.25	42.95	8.25	5.66	0.47	0.85	42.99	0.87	85.25	9.71	0.61	829	52.42
SEm±	**0.20**	**0.02**	**0.11**	**7.50**	**2.93**	**0.29**	**0.41**	**0.04**	**0.07**	**0.74**	**0.01**	**3.60**	**0.58**	**0.03**	**68.46**	**4.23**
CD at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

Pillipesara experiment *Kharif*-2017 photos

Pillipesara with pinching (M_1T_4)

Pillipesara without pinching (M_2T_5)





Field view of the experimental plot of Pillipesara at JAU, Jamnagar (Gujarat)

MPKV, Rahuri

Results: The data on effect of pinching and foliar application on seed yield and quality parameters of Pillipesara are presented in Table 3.39 and 3.40. The data revealed that the seed yield and quality parameters are significantly influenced due to pinching and foliar application of fertilizers/micronutrients.

A) Effect of pinching:

Pinching had significant effect on seed yield and quality of Pillipesara irrespective of foliar application of fertilizer/micronutrients. Number of pods/plant (143.89), number of seeds/pod (15.70), 100 seed weight (1.24 g), seed yield (0.85 kg/plot), seed yield (423.13 kg/ha), germination (90.0%), root shoot length (20.40 cm), dry matter content (0.06 g), vigour index I (1836.13) and vigour index II (5.75) were significantly higher in the pinching treatment and pod shattering per cent (7.80) was also less.

Pooled data: Pooled data revealed that pinching had significant effect on seed yield and quality of Pillipesara irrespective of foliar application of fertilizer/micronutrients. Seed yield/plot (0.80 kg), seed yield/ha (400.37 kg), number of seeds /pod (12.13), germination (87.49%) vigour index I (1842.50) and vigour index II (5.54) were significantly higher in the pinching treatment and pod shattering per cent (4.06) was also less.

B) Effect of foliar application of fertilizers/micronutrients:

Foliar application of fertilizers/micronutrients had significant effect on seed yield and quality of Pillipesara irrespective of pinching. Number of pods/plant (145.13), number of seeds/pod (16.40), 100 seed weight (1.25g), seed yield (0.88 kg/plot), seed yield (438.58 kg/ha), germination (88.83%), root shoot length (20.57 cm) dry matter content (0.067 g), vigour index I (1830.33) and vigour index II (5.99) were significantly higher in the foliar application of DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid (0.3%)] + NAA (40 ppm) (T_4) treatment. The pod shattering per cent (7.33) was also lower in this treatment.

Pooled Data

Pooled data revealed that foliar application of fertilizers/micronutrients had significant effect on seed yield and quality of Pillipesara irrespective of pinching. Number of pods/plant (130.39), number of seeds/pod (12.22), 100 seed weight (1.15 g), seed yield (0.82 kg/plot), seed yield (398.61 kg/ha), germination (87.11%), dry matter content (0.065 g) and vigour index II (5.68) were significantly higher in the foliar application of DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid (0.3%)] + NAA (40 ppm) (T_4) treatment.

C) Interaction effect:

The interaction effect of pinching and foliar application of fertilizers/micronutrients showed significant effect on seed yield. Seed yield (1.027 kg/plot) and seed yield (0.970 kg/ha) were significantly higher in the treatment pinching followed by foliar application of DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid (0.3%)] + NAA (40 ppm) (P_1T_4).

Pooled Data

Pooled data revealed that seed yield (0.970 kg/plot) and seed yield (479.61 kg/ha) were significantly higher in the pinching followed by foliar application of DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid (0.3%)] + NAA (40 ppm).

Recommendation:

The pinching practice after 20-40 days of sowing and foliar application of DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid (0.3%)] + NAA (40 ppm) at the time of flowering is recommended for better seed yield and seed quality in green manure Pillipesara.

Table 3.39: Effect of pinching and foliar application on seed yield and quality parameters of Pillipesara at MPKV, Rahuri from 2015 to 2017.

Treatments	No. of pods / plant				No. of seeds / pod				No. of pods shattered / plant			
Pinching	2015	2016	2017	Pooled	2015	2016	2017	Pooled	2015	2016	2017	Pooled
With pinching(P_1)	105.48	141.94	143.89	130.44	6.60	14.10	15.70	12.13	1.08	3.33	7.80	4.06
Without pinching (P_2)	91.02	106.42	113.41	103.62	5.90	10.67	12.59	9.71	1.75	9.06	9.60	6.79
SE ±	**1.50**	**3.94**	**4.76**	**7.96**	**0.04**	**0.381**	**0.37**	**0.69**	**0.05**	**0.57**	**0.21**	**0.11**
CD at 5%	**9.83**	**12.80**	**31.16**	**NS**	**0.27**	**2.497**	**2.45**	**2.39**	**0.35**	**3.76**	**1.41**	**0.51**
Foliar application												
Spray with DAP (2%) (F_1)	101.13	129.03	138.73	122.96	6.50	12.48	14.80	11.25	1.23	4.83	7.83	4.62
Spray with MN mixture (F_2)	101.33	132.06	117.63	117.01	6.47	12.33	13.57	10.78	1.13	6.33	8.67	5.38
Spray with NAA (40 ppm)(F_3)	91.33	112.53	129.70	111.18	5.90	11.77	14.30	10.67	1.83	7.50	8.50	5.93
Spay with DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid (0.3%)]+ NAA (40 ppm) (F_4)	104.30	141.83	145.13	130.39	6.57	13.70	16.40	12.22	1.67	4.16	7.33	4.37
Control (F_5)	**93.27**	**105.46**	**112.06**	**103.60**	**5.82**	**11.67**	**11.65**	**9.70**	**1.20**	**8.16**	**11.16**	**6.85**
SE ±	**1.57**	**4.49**	**3.69**	**3.72**	**1.96**	**0.31**	**0.60**	**0.11**	**0.07**	**0.48**	**0.84**	**0.60**
CD at 5%	**4.79**	**13.58**	**11.16**	**11.24**	**6.03**	**0.93**	**1.80**	**0.35**	**0.210**	**1.45**	**2.54**	**NS**

Treatments	**100 seed weight (g)**				**Seed yield / plot (kg)**				**Seed yield / ha (kg)**			
Pinching	**2015**	**2016**	**2017**	**Pooled**	**2015**	**2016**	**2017**	**Pooled**	**2015**	**2016**	**2017**	**Pooled**
With pinching (P_1)	1.04	1.12	1.24	1.13	0.70	0.86	0.85	0.80	349.23	432.07	423.13	400.37
Without pinching (P_2)	0.97	0.97	1.04	0.99	0.51	0.60	0.61	0.58	256.30	299.53	307.40	281.99
SE ±	0.01	0.03	0.017	0.04	0.01	0.03	0.006	0.04	5.65	15.74	3.11	21.96
CD at 5%	NS	NS	0.11	NS	0.07	0.20	0.041	0.15	37.00	41.14	20.38	76.00
Foliar application												
Spray with DAP (2%)(F_1)	1.00	1.02	1.23	1.09	0.62	0.83	0.79	0.75	311.92	414.75	397.67	375.05
Spray with MN mixture (F_2)	1.00	1.04	1.04	1.02	0.64	0.72	0.71	0.69	319.50	361.42	355.00	343.11
Spray with NAA (40 ppm) (F_3)	0.98	1.02	1.12	1.04	0.58	0.67	0.70	0.65	291.00	338.25	350.67	326.22
Spay with DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid (0.3%)]+ NAA (40 ppm)	1.04	1.13	1.25	1.15	0.67	0.90	0.88	0.82	335.75	454.67	438.58	398.61

(F_4)												
Control (F_5)	**0.94**	**1.004**	**1.04**	**1.01**	**0.51**	**0.52**	**0.57**	**0.53**	**255.67**	**259.92**	**284.42**	**362.88**
SE ±	**0.01**	**0.028**	**0.04**	**0.02**	**0.02**	**0.02**	**0.025**	**0.03**	**10.92**	**10.32**	**12.58**	**16.00**
CD at 5%	**0.04**	**0.084**	**0.14**	**0.05**	**0.06**	**0.06**	**0.076**	**0.09**	**33.01**	**31.22**	**38.03**	**46.70**

Table 3.39 contd...

Treatments	Germination (%)				Root shoot length (cm)				Dry matter content (g)			
Pinching	2015	2016	2017	Pooled	2015	2016	2017	Pooled	2015	2016	2017	Pooled
With pinching (P_1)	82.46 (65.38)	90.00 (72.10)	90.00 (71.80)	87.49 (69.76)	22.93	19.98	20.40	21.10	0.072	0.055	0.06	0.06
Without pinching (P_2)	76.73 (61.17)	82.40 (65.35)	82.47 (65.36)	80.53 (63.96)	21.77	19.85	18.90	20.17	0.063	0.053	0.05	0.06
SE ±	**1.06**	**0.18**	**0.86**	**1.82**	**0.18**	**0.26**	**0.09**	**0.42**	**0.001**	**0.001**	**0.001**	**0.001**
CD at 5%	**NS**	**1.18**	**5.62**	**6.30**	**1.21**	**NS**	**0.61**	**NS**	**0.003**	**NS**	**0.007**	**NS**
Foliar application												
Spray with DAP (2%)(F_1)	80.00 (63.47)	87.16 (69.47)	88.33 (70.39)	85.18 (67.78)	22.57	19.43	20.39	20.79	0.072	0.055	0.063	0.063
Spray with MN mixture (F_2)	81.00 (64.30)	86.50 (68.67)	86.50 (68.80)	84.67 (67.26)	23.10	20.70	19.95	21.25	0.068	0.056	0.060	0.062
Spray with NAA (40 ppm) (F_3)	76.67 (61.12)	88.50 (70.76)	86.17 (68.39)	83.77 (66.76)	22.00	19.60	19.01	20.21	0.066	0.052	0.060	0.059
Spay with DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid (0.3%)]+ NAA (40 ppm(F_4)	83.00 (65.88)	89.50 (71.75)	88.83 (70.72)	87.11 (69.45)	22.70	20.91	20.57	21.39	0.070	0.058	0.067	0.065
Control (F_5)	**73.33 (61.61)**	**79.33 (62.98)**	**81.33 (64.59)**	**79.30 (63.06)**	**21.38**	**18.93**	**18.32**	**19.54**	**0.063**	**0.049**	**0.052**	**0.55**
SE ±	**1.04**	**1.10**	**1.21**	**1.64**	**0.71**	**0.48**	**0.55**	**0.83**	**0.001**	**0.002**	**0.002**	**0.001**
CD at 5%	**3.14**	**3.34**	**3.67**	**4.81**	**NS**	**NS**	**1.66**	**NS**	**0.003**	**NS**	**0.007**	**0.003**

(Figures in parenthesis are arc sin transformed values)

Table 3.39 contd...

Treatments	Vigour index I				Vigour index II			
Pinching	2015	2016	2017	Pooled	2015	2016	2017	Pooled
With pinching (P_1)	1892.07	1799.36	1836.13	1842.50	5.95	4.91	5.75	5.54
Without pinching (P_2)	1671.66	1638.15	1561.46	1623.77	4.87	4.35	4.70	4.64
SE ±	**37.62**	**24.75**	**13.47**	**60.68**	**0.06**	**0.11**	**0.11**	**0.21**
CD at 5%	**NS**	**162.15**	**88.26**	**210.00**	**0.39**	**NS**	**0.72**	**0.75**
Foliar application								
Spray with DAP (2%) (F_1)	1804.43	1692.08	1803.50	1766.67	5.72	4.73	5.53	5.33
Spray with MN mixture (F_2)	1873.30	1790.75	1723.00	1795.71	5.54	4.81	5.18	5.18
Spray with NAA (40 ppm) (F_3)	1691.54	1737.08	1641.33	1690.03	5.02	4.87	5.16	4.92
Spay with DAP (2%) + MN mixture [$ZnSO_4$ (0.5%) + Boric acid (0.3%)]+ NAA (40 ppm) (F_4)	1884.52	1872.23	1830.33	1862.33	5.85	5.16	5.99	5.68
Control (F_5)	**1655.57**	**1501.63**	**1495.84**	**1550.93**	**4.92**	**3.85**	**4.26**	**4.35**
SE ±	**58.80**	**50.85**	**52.65**	**76.66**	**0.10**	**0.187**	**0.22**	**0.25**
CD at 5%	**177.80**	**153.78**	**159.20**	**NS**	**0.32**	**1.564**	**0.68**	**0.73**

Table 3.40: Interaction effects of pinching and foliar application on seed yield and quality parameters of Pillipesara at MPKV, Rahuri from 2015 to 2017.

Treatments	No. of pods / plant				No. of seeds/ pod				No. of pods shattered / plant			
	2015	2016	2017	Pooled	2015	2016	2017	Pooled	2015	2016	2017	Pooled
P_1F_1	106.80	148.40	161.13	138.78	6.60	14.53	16.53	12.53	1.13	2.33	7.67	3.71
P_1F_2	107.67	152.80	126.60	129.02	6.60	13.67	15.33	11.87	1.07	3.67	7.33	4.02
P_1F_3	97.87	124.73	144.73	122.44	6.47	13.27	15.60	11.80	1.13	4.33	8.00	4.49
P_1F_4	110.80	165.53	163.87	146.73	6.73	15.93	18.27	13.63	1.00	1.00	6.33	2.78
P_1F_5	104.27	118.27	123.13	115.22	6.60	13.13	12.77	10.83	1.07	5.33	9.67	5.36
P_2F_1	95.47	109.67	116.33	107.16	6.40	10.43	13.07	9.97	1.33	7.33	8.00	5.56
P_2F_2	95.00	111.33	108.67	105.00	6.33	11.00	11.80	9.70	1.20	9.00	10.00	6.73
P_2F_3	84.80	100.33	114.67	99.93	5.33	10.27	13.00	9.53	2.53	10.67	9.00	7.40
P_2F_4	97.60	118.13	126.40	114.04	6.40	11.47	14.53	10.80	2.33	7.33	8.33	6.00
P_2F_5	82.27	92.67	101.00	91.98	5.03	10.20	10.53	8.57	1.33	11.00	12.67	8.33
Factor B at same level of A												

SE ±	**3.35**	**8.13**	**10.64**	**10.04**	**0.09**	**0.852**	**0.84**	**1.35**	**0.12**	**1.28**	**0.48**	**2.44**
CD at 5%	**NS**	**NS**	**NS**	**NS**	**0.41**	**NS**	**NS**	**NS**	**0.39**	**NS**	**NS**	**NS**
Factor A at same level of B												
SE ±	**2.5**	**6.75**	**6.66**	**6.50**	**0.11**	**0.547**	**0.84**	**0.76**	**0.10**	**0.83**	**1.48**	**1.24**
CD at 5%	**NS**	**NS**	**NS**	**NS**	**0.40**	**NS**	**NS**	**NS**	**0.41**	**NS**	**NS**	**NS**

Table 3.40 contd...

Treatments	100 seed weight (g)				Seed yield per plot (kg)				Seed yield per ha (kg)			
	2015	2016	2017	Pooled	2015	2016	2017	Pooled	2015	2016	2017	Pooled
P_1F_1	1.03	1.08	1.34	1.15	0.753	1.019	0.972	0.915	376.33	509.67	486.00	457.33
P_1F_2	1.03	1.13	1.15	1.10	0.688	0.820	0.816	0.775	344.00	410.17	408.00	387.39
P_1F_3	1.01	1.09	1.25	1.12	0.662	0.784	0.787	0.744	331.00	392.17	393.33	372.17
P_1F_4	1.09	1.23	1.37	1.23	0.773	1.111	1.027	0.970	386.67	555.33	496.83	479.61
P_1F_5	1.04	1.08	1.10	1.07	0.616	0.586	0.630	0.611	308.17	293.00	314.83	305.33
P_2F_1	0.98	0.97	1.13	1.03	0.495	0.640	0.619	0.584	247.50	319.83	311.00	292.78
P_2F_2	0.96	0.95	0.94	0.95	0.590	0.625	0.604	0.606	295.00	312.67	288.83	298.83
P_2F_3	0.96	0.95	1.00	0.97	0.502	0.569	0.616	0.562	251.00	284.33	305.50	280.28
P_2F_4	1.00	1.04	1.14	1.06	0.570	0.708	0.727	0.668	284.83	354.00	314.00	317.61
P_2F_5	0.95	0.93	0.99	0.96	0.406	0.454	0.508	0.456	203.17	226.83	231.33	220.44
Factor B at same level of A												
SE ±	**0.03**	**0.068**	**0.04**	**0.06**	**0.02**	**0.070**	**0.01**	**0.04**	**12.63**	**35.20**	**6.96**	**20.16**
CD at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**0.149**	**0.11**	**0.13**	**NS**	**74.66**	**56.10**	**65.69**
Factor A at same level of B												
SE ±	**0.02**	**0.046**	**0.06**	**0.04**	**0.03**	**0.041**	**0.03**	**0.03**	**14.92**	**20.45**	**16.21**	**16.49**
CD at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**0.209**	**0.10**	**0.09**	**NS**	**57.58**	**51.13**	**47.87**

Table 3.40 contd...

Treatments	Germination (%)				Root shoot length (cm)				Dry matter content (g)			
	2015	2016	2017	Pooled	2015	2016	2017	Pooled	2015	2016	2017	Pooled
P_1F_1	82.00 (64.91)	91.67 (73.51)	91.67 (73.43)	88.44 (70.42)	22.93	18.78	21.05	20.92	0.075	0.050	0.064	0.063
P_1F_2	84.67 (67.04)	89.67 (71.36)	90.67 (72.38)	88.33 (70.11)	23.30	21.03	20.31	21.55	0.070	0.057	0.061	0.063
P_1F_3	77.33 (61.55)	93.00 (74.73)	90.33 (71.89)	86.89 (69.34)	22.91	19.67	19.89	20.82	0.072	0.053	0.066	0.064
P_1F_4	88.00 (69.75)	94.33 (76.52)	92.00 (73.70)	91.44 (73.14)	23.07	21.09	21.39	21.85	0.076	0.059	0.071	0.068
P_1F_5	80.33 (63.66)	81.33 (64.41)	85.33 (67.62)	82.33 (65.15)	22.47	19.33	19.35	20.38	0.069	0.054	0.056	0.060
P_2F_1	78.00 (62.02)	82.67 (65.43)	85.00 (67.36)	81.89 (64.85)	22.20	20.08	19.73	20.67	0.068	0.059	0.061	0.063
P_2F_2	77.33 (61.55)	83.33 (65.99)	82.33 (65.22)	81.00 (64.18)	22.91	20.37	19.59	20.96	0.067	0.055	0.059	0.060
P_2F_3	76.00 (60.69)	84.00 (66.80)	82.00 (64.89)	80.67 (63.97)	21.12	19.54	18.13	19.60	0.059	0.050	0.053	0.054
P_2F_4	78.00 (62.03)	84.67 (66.99)	85.67 (67.74)	82.78 (65.55)	22.32	20.73	19.74	20.93	0.065	0.057	0.064	0.062
P_2F_5	74.33 (59.56)	77.33 (61.55)	77.33 (61.57)	76.33 (60.87)	20.30	18.54	17.28	18.71	0.058	0.043	0.048	0.050
Factor B at same level of A												
SE ±	**2.38**	**0.402**	**1.92**	**0.97**	**0.41**	**0.577**	**0.21**	**0.65**	**0.001**	**0.003**	**0.002**	**0.003**
CD at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**0.004**	**NS**	**NS**	**0.008**
Factor A at same level of B												
SE ±	**1.69**	**1.408**	**1.76**	**1.25**	**0.92**	**0.665**	**0.70**	**0.39**	**0.001**	**0.003**	**0.003**	**0.002**
CD at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**0.004**	**NS**	**NS**	**0.010**

(Figures in parenthesis are arc sin transformed values)

Table 3.40 contd.

Treatments	Vigour index I				Vigour index II			
	2015	2016	2017	Pooled	2015	2016	2017	Pooled
P_1F_1	1878	1722	1929	1843	6.12	4.62	5.87	5.54
P_1F_2	1976	1886	1836	1899	5.90	5.07	5.55	5.51
P_1F_3	1774	1830	1796	1800	5.57	4.97	5.96	5.50
P_1F_4	2028	1988	1967	1994	6.66	5.54	6.53	6.24
P_1F_5	1805	1570	1653	1676	5.52	4.39	4.82	4.91
P_2F_1	1731	1663	1678	1691	5.33	4.84	5.19	5.12
P_2F_2	1771	1695	1610	1692	5.18	4.56	4.81	4.85
P_2F_3	1609	1644	1487	1580	4.49	4.17	4.36	4.34
P_2F_4	1741	1757	1693	1730	5.05	4.86	5.46	5.12
P_2F_5	1506	1433	1338	1426	4.33	3.33	3.69	3.78
Factor B at same level of A								
SE ±	**84.13**	**55.34**	**30.12**	**51.75**	**0.13**	**0.251**	**0.25**	**0.26**
CD at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**0.64**
Factor A at same level of B								
SE ±	**85.35**	**68.93**	**67.95**	**38.49**	**0.14**	**0.261**	**0.30**	**0.17**
CD at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**0.80**

TNAU, Coimbatore

Results: Pinching of the Pillipesara crop recorded significantly increased seed yield compared to non-pinching. Number of pods per plant (65.9), Number of seeds per pod (7.81), Seed yield per plant (20.91 gm), Seed yield per plot (2.85kg), 100 seed weight (1.40 gm), germination percentage (96) and vigour index (1732) were recorded in pinching treatment. Whereas the non-pinching treatment recorded less Number of pods per plant (61.7), Number of seeds per pod (6.6), Seed yield per plant (18.7 gm), Seed yield per plot (2.29 kg) but the qualities of the resultant seeds were on a par.

Among the foliar sprays, foliar spray with DAP 2%+ MN Mixture (Zn+B) + NAA 40 ppm, recorded the highest single plant seed yield (23.4 gm). The same treatment recorded the highest seed yield per plot (3.19 kg). Vigour index of the resultant seed is higher from the seeds of foliar spray with DAP 2%+ MN Mixture (Zn+B) + NAA 40 ppm (1884).

Pinching the pillipesara crop with foliar spray of DAP 2% + MN Mixture (Zn+B) + NAA 40 ppm is superior in all the treatments with highest Number of seeds per pod (8.6) single plant seed yield (20.9 gm) and seed yield per plot (2.85 kg).

Table 3.41: Effect of pinching and different foliar spray during flower initiation on seed yield attributing characters, seed yield and resultant seed quality in Pillipesara (*Vigna trilobata)* at TNAU, Coimbatore during *Kharif* 2017.

Treatment			Plant height	Number of pods / plant	Number of seeds / pod	Seed yield per plant (gm)	Seed yield per plot (kg)	100 seed weight (gm)	Germination (%)	Root length (cm)	Shoot length (cm)	Vigour index
With pinching	Foliar spray with DAP 2%		164.0	61.1	8.77	22.45	3.03	1.39	96	9.3	8.9	1741
	Foliar spray with MN Mixture (ZnSo4 0.5% + Boric acid 0.3%)		172.0	61.1	6.37	20.75	2.87	1.44	96	9.1	8.5	1683
	Foliar spray with NAA 40 ppm		173.6	68.1	6.77	19.35	2.85	1.35	95	9.1	8.8	1694
	Foliar spray with DAP 2%+ MN Mixture (Zn+B) + NAA 40 ppm		178.6	65.1	11.17	23.40	3.19	1.50	99	9.8	9.3	1884
	Control		170.6	74.1	5.97	18.61	2.33	1.34	94	9.1	8.6	1657
	Mean		171.8	65.9	7.81	20.91	2.85	1.40	96	9.3	8.8	1732
Without pinching	Foliar spray with DAP 2%		195.4	58.1	8.57	20.35	2.33	1.37	95	9.0	8.9	1694
	Foliar spray with MN Mixture (ZnSo4 0.5% + Boric acid 0.3%)		196.4	60.1	3.77	18.48	2.27	1.42	96	8.9	8.8	1693
	Foliar spray with NAA 40 ppm		201.2	62.1	5.77	17.56	2.16	1.34	95	9.0	8.7	1675
	Foliar spray with DAP 2%+ MN Mixture (Zn+B) + NAA 40 ppm		204.8	63.1	9.97	21.65	2.75	1.44	99	9.6	9.3	1864
	Control		194.6	65.1	4.87	15.58	1.93	1.31	95	9.2	8.7	1694
	Mean		198.5	61.7	6.59	18.72	2.29	1.38	96	9.1	8.9	1724
	SEd	**N**	**1.41**	**0.81**	**0.88**	**2.9**	**3.73**	**0.7**	**0.43**	**0.32**	**0.09**	**30.79**
		F	**3.54**	**2.72**	**3.02**	**4.95**	**6.95**	**2.84**	**1.75**	**0.92**	**0.91**	**42.21**
		NXF	**3.86**	**2.88**	**3.19**	**4.97**	**7.39**	**3.01**	**1.62**	**0.36**	**0.34**	**53.71**
	CD(P=0.05)	**N**	**3.72**	**3.58**	**2.95**	**7.05**	**8.58**	**2.77**	**1.67**	**1.64**	**0.58**	**62.77**
		F	**5.16**	**3.49**	**4.34**	**8.05**	**11.91**	**4.16**	**1.78**	**-0.18**	**-0.21**	**84.09**
		NXF	**8.91**	**6.98**	**7.84**	**11.06**	**15.57**	**7.66**	**3.52**	**1.53**	**1.47**	**109.7**

UAS, Dharwad

Results:

Table 3.42: Effect of pinching and foliar spray on plant growth and yield characters of Pillipesara (*Vigna trilobata)* at UAS, Dharwad during *Kharif* 2017

Treatments	No. of pods/pl	Pod yield per plant (g)	No. of Pickings	No. of seeds/pod	Seed yield per plant (g)	Seed yield per plot (kg)	Seed yield per ha (q)
M_1	132.74	66.37	3.70	10.73	6.11	0.68	25.10
M_2	80.45	40.23	2.24	9.49	4.21	0.36	13.21
SEm±	**4.50**	**2.25**	**0.13**	**0.41**	**0.39**	**0.04**	**1.61**
CD at 5%	**13.37**	**6.69**	**0.37**	**NS**	**1.16**	**0.13**	**4.79**
P_1	86.04	43.02	2.40	8.16	3.13	0.35	12.87
P_2	113.93	56.96	3.18	10.81	5.08	0.56	20.90
P_3	115.52	57.76	3.22	10.96	5.25	0.58	21.56
P_4	111.54	55.77	3.11	10.58	5.19	0.58	21.35
P_5	105.96	52.98	2.95	10.05	4.64	0.52	19.08
SEm±	**7.12**	**3.56**	**0.20**	**0.65**	**0.62**	**0.07**	**2.55**
CD at 5%	**21.14**	**10.57**	**0.59**	**1.92**	**1.84**	**0.20**	**7.57**
M_1P_1	107.15	53.57	2.99	8.66	4.14	0.46	17.03
M_1P_2	141.87	70.94	3.96	11.47	6.64	0.74	27.29
M_1P_3	143.86	71.93	4.01	11.63	6.66	0.74	27.38
M_1P_4	138.90	69.45	3.87	11.23	6.90	0.77	28.37
M_1P_5	131.95	65.98	3.68	10.67	6.19	0.69	25.45
M_2P_1	64.94	32.47	1.81	7.66	2.12	0.24	8.71
M_2P_2	85.98	42.99	2.40	10.14	3.53	0.39	14.52
M_2P_3	87.19	43.59	2.43	10.28	3.83	0.43	15.75
M_2P_4	84.18	42.09	2.35	9.93	3.49	0.39	14.33
M_2P_5	79.97	39.99	2.23	9.43	3.09	0.34	12.72
SEm±	**10.06**	**5.03**	**0.28**	**0.91**	**0.88**	**0.10**	**3.60**
CD at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

Table 3.43: Effect of pinching and foliar spray on seed quality characters of Pillipesara (*Vigna trilobata)* at UAS, Dharwad during *Kharif* 2017

Treatments	100 seed weight (g)	Seed germination (%)	Seedling length (cm)	Seedling dry weight (mg)	Seedling vigour index	No. of pods shattered/plant	Seed recovery (%)
M1	0.83	82.69	20.80	1.92	1752	21.84	71.94
M2	0.81	75.48	18.99	1.89	1442	11.49	69.66
SEm±	**0.01**	**0.79**	**0.20**	**0.02**	**32.60**	**1.40**	**0.69**
CD at 5%	**NS**	**2.34**	**0.59**	**NS**	**96.86**	**4.16**	**2.04**
P1	0.85	75.37	18.96	1.98	1433	11.20	65.57
P2	0.80	73.79	18.56	1.86	1372	18.19	64.20
P3	0.82	87.81	22.09	1.90	1969	18.76	76.39
P4	0.81	88.33	22.22	1.87	1971	18.58	76.84
P5	0.81	70.12	17.64	1.89	1240	16.60	61.00
SEm±	**0.01**	**1.25**	**0.31**	**0.03**	**51.54**	**2.22**	**1.08**

CD at 5%	**NS**	**3.70**	**0.93**	**NS**	**153.15**	**NS**	**3.22**
M1P1	0.87	76.41	19.22	2.01	1470	14.82	66.48
M1P2	0.81	73.92	18.59	1.87	1375	23.74	64.31
M1P3	0.79	98.28	24.72	1.83	2431	23.82	85.50
M1P4	0.83	93.00	23.39	1.92	2180	24.68	80.91
M1P5	0.84	71.84	18.07	1.95	1302	22.14	62.50
M2P1	0.84	74.33	18.70	1.94	1396	7.58	64.67
M2P2	0.80	73.67	18.53	1.86	1369	12.63	64.09
M2P3	0.85	77.33	19.45	1.97	1506	13.70	67.28
M2P4	0.79	83.65	21.04	1.83	1761	12.47	72.78
M2P5	0.79	68.40	17.21	1.83	1177	11.07	59.51
SEm±	**0.02**	**1.76**	**0.44**	**0.04**	**72.90**	**3.13**	**1.53**
CD at 5%	**NS**	**5.23**	**1.32**	**NS**	**216.58**	**NS**	**4.55**

Nipping of terminal bud at 60 DAS increased number of primary branches per plant, number of pods and seed yield over without nipping. Foliar sprays of 2 per cent DAP + MN mixture + NAA @ 40 ppm (T_4) significantly improved seed quality parameters. Treatment combination of M_2T_4 significantly increased number of branches, pods per plant, seed yield and quality as compare to rest of treatment combinations.

Field view of experimental plot of Pillipesara (*Vigna trilobata*)

Experiment 4: Integrated approach for enhancing seed yield and quality in millets

Year of start: 2015-16

Crop	Center
Finger millet	UAS, Bangalore; ANGRAU, Guntur; UAS, Dharwad; KKV, Dapoli; HPKV, Palampur and IGKV, Raipur
Foxtail millet	ANGRAU, Guntur; TNAU, Coimbatore and UAS Dharwad.
Kodo millet	JNKVV, Jabalpur; TNAU, Coimbatore and ANGRAU, Guntur
Proso millet	ANGRAU, Guntur and UAS, Bangalore.
Little millet	JNKVV, Jabalpur and TNAU, Coimbatore

Objective: To standardize suitable seed quality enhancement techniques to enhance the production potential of millets

<table>
<tr><th colspan="2">SMALL MILLETS TREATMENT DETAILS</th></tr>
<tr><td>No of treatments</td><td>Main plots (Nutrient management): 04
Sub-plots (Seed Priming): 04</td></tr>
<tr><td colspan="2">Sowing method</td></tr>
<tr><td colspan="2">Finger millet: Transplanting with spacing of 30 × 10 cm (raising a nursery and transplanting at 21 days in wet field capacity of soil)
Other four millets: Direct sowing – 30 × 10 cm – sown at 3-4 cm depth</td></tr>
<tr><td colspan="2">Note
1. Only one method of planting should be followed for each crop as mentioned above.
2. Nursery management and Transplanting (Finger millet) for one hectareof main field:
• Select 12.5 cents (500 m²) of nursery area near a water source, where water does not stagnate. Mix 37.5 kg of super phosphate with 500 kg of FYM or compost and spread the mixture evenly on the nursery area.
• Plough two or three times with a mould board plough or five times with a country plough form raised beds by marking units of 6 plots each of size 3m × 1.5 m.
• Provide 30 cm space between plots for irrigation.
• Excavate the soil from the interspace and all around to a depth of 15 cm to form channels and spread the soil removed from the channels on the bed and level it. 4-5 days before removing plants, spray the nursery with the fungicide Mancozeb 75% W.P @ 2 gm /liter
• Transplant the seedling from the nursery into the main field when they are only 15-25 days old.
• Before transplanting, irrigate the nursery for approximately 2 hours in advance, to moisten and loosen the soil for removing the plants easily if the soil is dry in that time.</td></tr>
<tr><td colspan="2">• Carefully uproot the seedlings, keeping the soil intact around the roots; if possible lift them out with a trowel or spade as this gives support to the soil and helps to keep it intact withthe roots.
• Transfer the uprooted seedlings to the main plot within next 30 minutes, before theroots and soil can dry out. The spacing will be 10 x 10 inches by using a rope or a marker.
• Transplant the seedlings at shallow depth in the pits; do not press or injure the roots whileplacing the seedlings at the intersection of planting lines.
3.Micronutrients: magnesium (20 kg per acre) and calcium (6 kg per acre) or dolomite / limestone (40 kg per acre). Apply these micronutrients, 20-25 days before transplantation in the field.</td></tr>
<tr><td colspan="2">Treatment details</td></tr>
<tr><td colspan="2">I. Main-Plot treatments (Nutrient management)</td></tr>
<tr><td colspan="2">N1 – No fertilizer</td></tr>
<tr><td colspan="2">N2 – 125 kg Neem + 1250 kg Vermi compost per ha or 12.5 tons FYM/ha</td></tr>
<tr><td colspan="2">N3 – 50 kg Urea + 50 kg Super phosphate and 50 kg Muriate of potash per ha + Top dressing urea at 3-4 weeks after transplanting + 2% Borax spay at flowering</td></tr>
<tr><td colspan="2">N4 - 125 kg Neem + 1250 kg Vermicompost (or) 12.5 tons FYM/ha + 50 kg Urea + 50 kg super phosphate and 50 kg Muriate of potash per ha + Top dressing urea at 3-4 weeks after transplanting + 2% Borax spay</td></tr>
<tr><td colspan="2">II. Sub-plot treatments (Priming)</td></tr>
<tr><td colspan="2">P1 – Control - No priming</td></tr>
<tr><td colspan="2">P2 - Hydropriming for 6 hours (Finger millet, Kodo millet), 8 hours (Foxtail millet, Proso millet, and Little millet) by adopting seed to solution ratio of 1:1 and then mixing in 2.5-3 gm /kg of Carbendazim (Bavistin) with the seeds and leaving the mixture for 24 hours before sowing</td></tr>
<tr><td colspan="2">P3 – Seed priming with 2 % KH_2PO_4 for 6 hours (Finger millet and Kodo millet), 8 hours (Foxtail millet, Proso millet and Little millet) by adopting seed to solution ratio of 1:1 and then mixing in 2.5-3 gm /kg of Carbendazim (Bavistin) with the seeds, and leaving the mixture for 24 hours before sowing</td></tr>
<tr><td colspan="2">P4 – Seed priming with 20 % liquid Pseudomonas fluoresces</td></tr>
<tr><td>Design</td><td>Split Plot Design</td></tr>
</table>

No. of replications		3
Plot size	**Gross plot size**	2 m × 5.0 m (10.0 m^2)
Space between plots		60 cm
Recommended dose of fertilizer (NPK)		75 kg P_2O_5 and 25 kg K_2O per ha or best recommended fertilizer dosage for your state, region or zone
Cultivar		Any recommended (bunch or spreading type) cultivar appropriate for seed production season
Source fertilizers		
1. Nitrogen		Urea (46 % N)
2. Phosphorus		Single super phosphate (SSP) (16 % P_2O_5)
3. Potassium		Muriate of potash (MOP) (60 % K_2O)
		OR
1. Nitrogen and Phosphorus		Diammonium Phosphate (DAP) (18 % N and 46 % P_2O_5)
2. Potassium		Muriate of potash (MOP) (60 % K_2O)

Pest / disease control

- **Blast:** Seed treatment, mixing 2.5 gm/kg of Carbendazim (Bavistin) for at least 30 minutes.
- **Seedling blight:** Spray Mancozeb 75 % WP @ 2 gm per liter in the nursery 15 days before sowing or 15 days after transplantation.
- **Downy mildew:** Spray the crop with Mancozeb 75 % W.P. @ 2 gm per liter of water at the onset of the disease, or when symptoms are seen in 5-10% of the plants.
- **Stem borer:** Use regent granules or its liquid form in the amount of 7 kgs / acre. 1 ml of the chemical should be mixed with 2 liters of water.

Observation

- Field emergence
- Plant height at 30 days and at harvest
- Chlorophyll content
- Days to first flowering
- Days to 50% flowering
- No. of tillers plant^{-1}
- Seed yield plant^{-1}
- Seed yield ha^{-1}
- 100 seed weight
- Seed recovery percent
- Resultant seed quality - seed germination and vigour index

Finger millet (*Eleusine coracana*)

Observations of PI

Unified Observations

Effect of nutrient management and seed priming on yield and seed quality attributing traits in Finger Millet (Mean over four locations)

The experiment was proposed for six centers namely UAS,Dharwad; ANGRAU, Guntur; UAS, Bangalore; KVK,Dapoli; HPKV,Palampur and IGKV Raipur. Results were received only from four centers.

Among all the treatment combinations seed priming with 20 % liquid *Pseudomonas fluoresces* and application of 125 kg Neem + 1250 kg Vermicompost (or) 12.5 tons FYM/ha + 50 kg urea + 50 kg super phosphate and 50 kg muriate of potash per ha + top dressing urea at 3-4 weeks after transplanting + 2% Borax spray was found superior and uniformly better in three locations out of four locations conducted. Pooled analysis of data over the locations revealed that there was 57.5, 6.6 and 34% increase in seed yield/ha, seed germination percentage and vigour index, respectively due to the treatment over control. The range of increase in seed yield/ha due to better treatment was 73.7% in UAS, Bengaluru and 209% in KKV, Dapoli over control.

Individual Centre wise observations

Palampur

Results: The nutrient management treatments had significant effect on growth, seed yield and quality of finger millet. Treatment N_4 (organic and inorganic fertilizers) produced significantly higher seed yield, 100 seed weight, seed germination and vigour index followed by N_3 (pure chemical fertilizers). The lowest of all parameters were recorded under control N_1 (No fertilizer). Significant differences in number of days to flowering and seed recovery were not observed among different nutrient treatments and all treatments were at par with each other.

No significant differences in growth, yield and quality parameters were observed due to different priming treatments

Table 4.1. Effect of planting methods, nutrient management and priming on growth, yield parameter and seed yield of finger millet at Palampur during *Kharif* 2017

Treatments	Plant height at harvest (cm)	Days to flowering	Branches/ plant	Seed yield/plant (g)	Seed yield (q/ha)	100-seed weight (g)	Seed recovery (%)	Seed germination (%)	Vigour Index
Nutrient Management									
N_1	95.3	73.4	4.9	2.214	7.38	0.281	88.46	83.45	1003.7
N_2	102.4	73.2	5.7	3.096	10.32	0.283	88.43	84.81	1081.4
N_3	101.8	72.9	6.4	3.885	12.95	0.285	88.56	85.64	1191.8
N_4	102.9	73.3	7.7	4.335	14.45	0.285	88.51	85.71	1226.0
SE (m) ±	0.86	0.38	0.32	0.10	0.34	0.003	0.35	0.35	20.9
CD (5%)	3.01	NS	0.85	0.36	1.2	0.011	NS	1.24	39.1
Priming									
P_1	100.9	73.4	6.1	3.384	11.28	0.287	88.44	84.35	1122.6
P_2	99.8	72.9	6.3	3.402	11.34	0.284	88.51	85.37	1121.7
P_3	101.3	73.8	6.2	3.363	11.21	0.283	88.46	84.95	1124.3
P_4	100.5	73.1	6.2	3.378	11.26	0.285	88.56	85.01	1125.1
SE (m) ±	1.82	0.38	0.19	0.135	0.45	0.062	0.6	1.43	3.3
CD (5%)	NS	NS	NS	NS	NS	NS	NS	NS	NS

UAS, Bangalore

Results:

Effect of nutrient management on plant growth, seed yield and quality attributes of ragi cultivar ML-365

Among the four nutrient management treatments, N_4 (125 kg Neem + 1250 kg vermicompost per ha + 50 kg Urea + 50 kg SSP and 50 kg MOP per ha + Top dressing with urea at 3 to 4 weeks after transplanting + 2% Borax at flowering stage) showed superiority with respect to growth and yield parameters *viz.,*field emergence (92.92%), minimum number of days to 50% flowering (65.92), chlorophyll content (39.17SPAD 502 *plus* values), plant height (130.5cm), no. of tillers (3.47), panicle weight (7.440 kg per plot), seed yield (26.10 g/plant; 4.097 kg/ plot & 40.97 q/ha) and seed recovery (98.13%). This was closely followed by N_3 (50 kg Urea + 50 kg SSP and 50 kg MOP per ha + Top dressing urea at 3 to 4 weeks after transplanting+2% Borax) with recorded seed yield of 25.067 g/plant; 3.528 kg/plot & 35.28 q/ha and seed recovery of 97.82%. They were lowest in control N_1 (21.4 5g/plant; 2.537 kg/plot; 25.37 q/ha and 96.44%, respectively) (Table 4.2).

The seed germination and test weight were found non-significant differences with respect to nutrient management. While, seed vigour differed significantly among the nutrient management treatments (Table4.4). It was recorded highest among N_4 (1027) which was on par with N_3 (1012.7) and was lowest in control N_1 (963.6).

Effect of priming on plant growth, seed yield and quality attributes of ragi cultivar ML-365

The priming treatment had significant effect on plant growth**,** seed yield and quality attributes of ragi*cv.* ML-365 (Table4.3&4.4). The field emergence (92.33%), chlorophyll content (37.332 SPAD 502 *plus* values), plant height (123.87cm), no. of tillers (3.07), panicle weight (6.810 kg/plot) & seed yield (26.27 g/plant: 3.619 kg/plot; 36.19 q/ha) were significantly higher in P_3 *(*priming of seeds with 2% KH_2PO_4 for 6h).This was on par with P_4 (priming of seeds with 20 % liquid *Pseudomonas florescence)* with seed yield (24.83 g/plant; 3.207 kg/plot and 32.07 q/ha), While, the non-primed seeds performed poor both in terms of growth and yield.The same priming treatment *viz.,* P_4 showed better performance in terms of 100 seed weight (1.442g) and vigour Index-I (1023.7).

Interaction effect on the plant growth, seed yield and quality attributes on ragi cultivar ML-365

The interaction of priming (P) with nutrient management (N) showed significant effect on plant growth, seed yield and quality attributes of ragi *cv.* ML-365 (Table4.3&4.4).The field emergence (96.66%), plant height (132.2cm), tillers/plant (4.07), panicle weight per plot (7.948 kg), seed yield (28.067g/plant; 4.325kg/plot; 43.25q/ha) and seed recovery (98.66%) was reported highest among the interaction N_4P_3 *viz.,* priming of seeds with 2% KH_2PO_4 followed by supply of inorganic and organic fertilizers along with borax spray at flowering. While lowest of all was recorded among the interaction $N_1P_1$with field emergence (74.33%), plant height (103.6cm), tillers (2.07) and seed yield (15.533g/plant; 2.493 kg/plot & 24.93 q/ha).

Conclusion*:*

Application of N_4 (125 kg Neem + 1250 kg vermicompost per ha + 50 kg Urea + 50 kg SSP and 50 kg MOP per ha + Top dressing urea at 3-4 weeks after transplanting + 2 % Borax) followed by N_3 (50 Kg Urea + 50 Kg SSP and 50 Kg MOP per ha + Top dressing urea at 3-4 weeks after transplanting + 2 % Borax) showed superiority with respect to all the recorded growth, yield and contributing characters over the rest of the nutrient management treatments Among different priming treatments, P_3 (seed priming with 2% KH_2PO_4 for 6h) alone or in combination with N_4 showed superiority in growth and seed yield followed by seed priming with 20% liquid *Pseudomonas fluorescence*. Hence, these treatments could be advocated and practically used to enhance the seed yield and quality in finger millet (ragi).

	
Seed priming	**Finger millet crop at vegetative stage**

Table 4.2: Effect of seed priming, nutrient management on plant growth and seed yield of ragi cultivar ML-365

Treatment	Field emergence (%)	Days to 1st flowering	Chlorophyll content (SPAD -502)	Plant height (cm)	No. of tillers	Panicle weight (kg/plot)	Seed yield (g/plant)	Seed yield (kg/plot)	Seed yield (q/ha)	Seed Recovery(%)
Nutrient Management										
N_1	82.75	68.67	35.13	111.60	2.38	5.473	21.450	2.537	25.37	96.44
N_2	85.08	67.08	30.29	109.95	2.17	5.431	23.317	2.755	27.55	97.53
N_3	89.67	66.92	37.56	125.95	3.13	7.078	25.067	3.528	35.28	97.82
N_4	92.92	65.92	39.17	130.50	3.47	7.440	26.100	4.097	40.97	98.13
Mean	**87.60**	**67.14**	**35.53**	**119.50**	**2.79**	**6.355**	**23.983**	**3.229**	**32.29**	**97.48**
SE m±	**1.770**	**0.315**	**1.212**	**1.968**	**0.157**	**0.3150**	**0.842**	**0.354**	**3.540**	**0.321**
CD (P 0.05)	**5.26**	**0.93**	**3.60**	**5.84**	**0.47**	**0.93**	**2.500**	**1.051**	**10.51**	**0.95**
Priming treatments										
P_1	79.92	67.25	34.215	116.28	2.42	6.010	20.817	2.985	29.85	97.14
P_2	87.33	67.33	35.543	119.07	2.68	6.189	24.017	3.105	31.05	97.20
P_3	92.33	67.00	37.332	123.87	3.07	6.810	26.267	3.619	36.19	97.93
P_4	90.83	67.00	35.063	118.77	2.98	6.412	24.833	3.207	32.07	97.65
Mean	**87.60**	**67.14**	**35.54**	**119.49**	**2.78**	**6.355**	**23.983**	**3.229**	**32.29**	**97.48**
SE m±	**0.881**	**0.393**	**0.857**	**1.532**	**0.071**	**0.164**	**0.681**	**0.124**	**1.241**	**0.281**
CD (P=0.05)	**2.617**	**NS**	**2.540**	**4.550**	**0.210**	**0.480**	**2.020**	**0.368**	**3.687**	**NS**
N x P (Nutrient management x Seed priming)										
N_1P_1	74.33	69.33	37.86	103.6	2.07	5.095	15.533	2.493	24.93	96.24
N_1P_2	83.33	68.33	32.43	110.2	2.53	5.236	22.533	2.163	21.63	95.61
N_1P_3	89.67	68.33	33.67	121.1	2.40	5.883	25.533	3.237	32.37	97.17
N_1P_4	83.67	68.66	36.57	111.5	2.53	5.676	22.200	2.255	22.55	96.74
N_2P_1	78.00	67.33	27.46	108.7	2.00	5.284	22.400	2.203	22.03	97.40
N_2P_2	82.33	67.66	32.62	114.3	2.07	5.038	22.000	2.334	23.34	97.02
N_2P_3	88.33	66.33	32.80	112.5	2.20	6.235	27.067	3.596	35.96	97.96
N_2P_4	91.66	67.00	28.26	104.3	2.40	5.167	21.800	2.885	28.85	97.77
N_3P_1	81.66	67.00	36.42	124.7	2.80	6.837	23.600	3.533	35.33	97.32
N_3P_2	88.66	67.33	41.10	121.5	2.87	6.957	24.800	3.597	35.97	97.93
N_3P_3	94.66	66.66	38.69	129.7	3.60	7.175	24.400	3.623	36.23	97.93
N_3P_4	93.66	66.66	34.04	127.9	3.27	7.342	27.467	3.358	33.58	98.09
N_4P_1	85.66	65.33	35.12	128.1	2.80	6.826	21.733	3.711	37.11	97.61
N_4P_2	95.00	66.00	36.02	130.3	3.27	7.524	26.733	4.019	40.19	98.28
N_4P_3	96.66	66.66	44.16	132.2	4.07	7.948	28.067	4.325	43.25	98.66
N_4P_4	94.33	65.66	41.38	131.4	3.73	7.464	27.867	4.331	43.31	97.99
Mean	**87.60**	**67.14**	**35.53**	**119.5**	**2.78**	**6.350**	**23.983**	**3.229**	**32.29**	**97.48**
SE m±	**1.587**	**0.607**	**3.268**	**2.117**	**0.182**	**0.462**	**1.585**	**0.279**	**2.791**	**0.403**
CD (0.05P)	**4.71**	**1.80**	**9.71**	**6.28**	**0.54**	**1.37**	**4.70**	**0.829**	**8.291**	**1.19**
CV (%)	**3.14**	**2.56**	**15.93**	**3.07**	**11.35**	**12.59**	**11.45**	**14.97**	**14.97**	**2.0**

Table 4.3: Effect of seed priming & nutrient management on seed quality of ragi cultivar ML-365 at UAS, Bangalore during *Kharif* 2017

Treatment	Germination (%)	Test weight (g)	SVI-I
N_1	76.08	1.315	963.6
N_2	76.91	1.332	944.1
N_3	78.08	1.408	1012.7
N_4	78.50	1.416	1027.0
Mean	**77.39**	**1.367**	**986.8**
SEm ±	**1.101**	**0.046**	**18.27**
CD (0.05P)	**NS**	**NS**	**54.27**
P_1	76.25	1.341	973.1
P_2	76.50	1.330	942.7
P_3	78.42	1.359	1007.7
P_4	78.42	1.442	1023.7
Mean	**77.39**	**1.368**	**986.8**
SEm ±	**1.205**	**0.036**	**22.12**
CD (0.05P)	**NS**	**0.107**	**65.71**
N x P (Nutrient management x seed priming)			
N_1P_1	74.66	1.368	942.4
N_1P_2	76.00	1.377	882.7
N_1P_3	75.66	1.378	1000.4
N_1P_4	78.00	1.389	1028.8
N_2P_1	76.33	1.385	985.1
N_2P_2	76.00	1.390	906.2
N_2P_3	77.33	1.395	945.8
N_2P_4	78.00	1.414	939.5
N_3P_1	78.00	1.412	1048.1
N_3P_2	78.00	1.407	962.0
N_3P_3	77.00	1.412	1010.1
N_3P_4	79.33	1.409	1030.6
N_4P_1	76.00	1.416	917.1
N_4P_2	76.00	1.433	1020.3
N_4P_3	83.66	1.534	1074.5
N_4P_4	78.33	1.522	1096.2
Mean	**77.39**	**1.415**	**986.8**
SEm ±	**1.960**	**0.089**	**41.12**
CD (0.05P)	**NS**	**NS**	**122.1**
CV (%)	**4.39**	**11.33**	**7.22**

Nutrient management: N_1-No fertilizer; **N_2-** 125 kg Neem + 1250 kg Vermicompost per ha; **N_3-** 50 kg Urea + 50 kg SSP and 50 kg MOP per ha + Top dressing urea at 3-4 weeks after transplanting + 2 % Borax; **N_4-** 125 kg Neem + 1250 kg Vermicompost per ha + 50 kg Urea + 50 kg SSP and 50kg MOP per ha + Top dressing urea at 3-4 weeks after transplanting + 2 % Borax

Priming treatments: P_1-Control; **P_2:** Hydro-priming for 6 hrs;**P_3-** Seed priming with 2% KH_2PO_4 for 6 hr; **P_4-** Seed priming with 20 % liquid *Pseudomonas fluoresces*

UAS, Dharwad

Results:

Table 4.4: Effect of seed priming and nutrient management on growth and yield characters of finger millet at UAS, Dharwad during *Kharif* 2017

Treatment	Field Emergence (%)	Plant ht at 30 DAS (cm)	Plant height at harvest (cm)	Days to flowering	Days to 50% flowering	No. of Tillers/plant
N1	80	20.07	104.96	48	65	4.48
N2	83	19.57	102.37	46	63	4.55
N3	84	21.57	112.80	47	64	4.66
N4	87	20.83	108.92	48	65	4.76
SEm ±	**3.31**	**0.48**	**2.50**	**0.54**	**0.74**	**0.11**
CD at 5%	**NS**	**1.38**	**7.22**	**NS**	**2.12**	**NS**
P1	93	19.46	101.78	48	61	4.49
P2	88	20.80	108.77	47	64	4.44
P3	82	21.35	111.67	46	63	4.74
P4	71	20.43	106.83	48	64	4.78
SEm ±	**3.31**	**0.48**	**2.50**	**0.54**	**0.74**	**0.11**
CD at 5%	**9.54**	**NS**	**NS**	**NS**	**NS**	**NS**
N1P1	98	19.50	101.97	47	**64**	**3.81**
N1P2	88	21.41	112.00	47	**63**	4.63
N1P3	78	22.05	115.34	45	**61**	4.24
N1P4	58	18.22	95.28	51	**69**	4.24
N2P1	99	19.50	101.97	47	**63**	4.35
N2P2	88	19.82	103.64	46	**62**	4.09
N2P3	83	21.86	114.34	45	**61**	4.47
N2P4	69	21.38	111.83	48	**64**	4.40
N3P1	97	20.14	105.31	52	**70**	5.18
N3P2	94	20.26	105.98	49	**66**	4.40
N3P3	83	22.50	117.68	43	**59**	4.57
N3P4	72	24.61	128.71	42	**57**	4.12
N4P1	94	19.50	101.97	48	**64**	4.73
N4P2	94	24.26	126.88	47	**64**	4.63
N4P3	88	20.46	106.98	51	**69**	4.02
N4P4	90	19.50	101.97	47	**64**	4.68
SEm ±	**9.35**	**1.35**	**7.08**	**1.54**	**2.08**	**0.32**
CD at 5%	**NS**	**3.90**	**20.41**	**4.44**	**6.00**	**0.92**

Table 4.5: Effect of seed priming and nutrient management on seed quality characters of finger millet at UAS, Dharwad during *Kharif* 2017

Treatment	Seed yield per plant (g)	Seed yield (q/ha)	Test weight (g)	Seed recovery (%)	Seed germination (%)	Vigour index
N1	114.31	41.24	2.18	83	72.66	2268
N2	110.10	39.05	2.22	82	71.77	2482
N3	111.59	39.41	2.08	81	71.56	1920
N4	114.36	42.49	2.11	82	72.32	1903
SEm±	1.29	0.63	0.10	0.45	0.40	124
CD at 5%	NS	SIG	NS	NS	NS	356
P1	114.62	41.72	2.10	82.04	72.13	1868
P2	112.51	40.76	2.18	81.18	71.38	2268
P3	110.21	39.79	2.13	82.20	72.27	2336
P4	113.01	39.92	2.18	82.49	72.53	2101
SEm±	1.29	0.63	0.10	0.45	0.40	124

CD at 5%	NS	NS	NS	NS	NS	NS
S1N1P1	111.66	40.15	1.98	82.00	72.10	2640
S1N1P2	111.05	39.07	1.79	81.17	71.37	3144
S1N1P3	107.40	41.79	2.55	80.26	70.57	2942
S1N1P4	120.78	42.74	1.53	83.87	73.74	1722
S1N2P1	110.74	40.58	1.53	84.52	74.31	2182
S1N2P2	108.37	38.25	1.79	81.30	71.48	3130
S1N2P3	107.34	34.71	2.42	79.69	70.07	3715
S1N2P4	112.81	39.02	2.68	81.26	71.45	2075
S1N3P1	123.52	43.34	1.72	81.17	71.37	1776
S1N3P2	115.86	39.89	2.23	79.56	69.95	2208
S1N3P3	102.83	34.54	1.91	78.78	69.27	2297
S1N3P4	100.89	36.52	2.17	77.21	67.89	1800
S1N4P1	112.87	40.02	3.25	81.78	71.91	1906
S1N4P2	112.27	45.00	1.85	82.26	72.33	2014
S1N4P3	122.06	44.32	1.85	81.74	71.87	2441
S1N4P4	112.57	39.35	1.98	81.69	71.83	2339
SEm±	3.66	1.78	0.28	1.27	1.12	349
CD at 5%	10.55	5.14	0.82	3.67	3.22	1008

Field view of finger millet experiment plot

Among the fertilizer combinations, N_4:125 kg Neem + 1250 kg Vermicompost (or) 12.5 tons FYM/ha + 50 kg Urea + 50 kg super phosphate and 50 kg Muriate of potash per ha + Top dressing urea at 3-4 weeks after transplanting + 2% Borax spay was significant over rest of combinations. Seed priming with (P_4) *Pseudomonas fluoresces @ 20 %* liquid was superior over other seed priming chemicals. Treatment combination of $S_1N_4P_3$ was significant over rest of combinations.

IGKVV, Raipur

Results:

Table 4.6: Effect of nutrient management and seed priming on seed yield and quality attributing characters of finger millets at IGKVV, Raipur during *Kharif* 2017

Treatment	Germination %	Seedling length (cm)	Seedling vigor	eed Index %	Days to flowering	Days to 50 % flowering	Plant height (cm) at 30DAS	No. of Tillers/ plant	PH at (cm) Harvest	1000 Seed wt (g)	Seed Yield/ Plant	Seed Recovery %	Seed Yield/Plot (Kg)	Seed Yield/ha (Kg)	Biological Yield/Plot (Kg)
NI	73	5.638	304.77	4.132	80.042	83.500	56.433	3.750	116.125	2.700	14.000	91.535	1.631	1,630.83	2.063
N2	80	6.8	441.05	5.473	81.000	84.667	60.492	4.000	125.433	2.918	18.667	94.575	2.128	2,128.25	2.963
N3	82.25	7.475	508.93	6.165	81.833	85.333	61.033	4.833	137.600	2.746	20.250	94.495	2.431	2,430.50	3.274
N4	84.25	8.95	638.16	7.553	81.958	86.750	60.417	5.167	143.200	2.947	21.500	95.185	2.606	2,606.42	3.604
CD	**1.708**	**1.208**	**89.087**	**1.02**	**0.719**	**1.344**	**1.888**	**0.457**	**10.933**	**0.051**	**2.481**	**2.538**	**0.288**	**295.918**	**0.331**
SEm±	**0.484**	**0.342**	**25.253**	**0.289**	**0.204**	**0.381**	**0.535**	**0.130**	**3.099**	**0.122**	**0.703**	**0.719**	**0.082**	**101.964**	**0.094**
P1	76.5	6.05	440.96	4.661	80.333	82.333	58.567	4.083	123.958	2.494	16.750	92.607	1.741	1,740.92	2.517
P2	78.25	6.938	550.86	5.512	81.042	84.417	59.033	4.167	129.933	2.780	18.417	93.826	2.270	2,270.08	2.950
P3	83	7.85	539.93	6.57	81.375	86.417	59.808	4.500	132.667	2.938	19.167	93.990	2.354	2,353.75	3.044
P4	81.75	8.025	**687.48**	6.58	82.083	87.083	60.967	5.000	135.800	3.099	20.083	95.365	2.431	2,431.25	3.394
CD	**2.229**	**0.865**	**23.414**	**0.748**	**0.521**	**0.748**	**1.378**	**0.565**	**5.354**	**0.353**	**1.749**	**1.456**	**0.312**	**295.918**	**0.289**
SEm±	**0.759**	**0.295**	**304.77**	**0.289**	**0.178**	**0.255**	**0.469**	**0.192**	**1.824**	**0.120**	**0.596**	**0.496**	**0.106**	**101.964**	**0.098**

Table 4.7: Interaction effect of Nutrient management and Priming on Seed Yield and Yield attributing characters in Finger millets at IGKVV, Raipur during *Kharif* 2017

Treatment	Germination %	Seedling length (cm)	Seedling vigor	Seed Index %	Days to flowering	50 % flowering	Plant height (cm) at 30DAS	No. of Tillers/ plant	PH at (cm) Harvest	1000 Seed wt (g)	Seed Yield/Plant	Seed Recovery %	Seed Yield/Plot (Kg)	Seed Yield/ha (Kg)
N_1P_1	89.26	5.10	224.53	3.38	78.83	80.67	52.80	3.00	103.97	2.26	11.67	89.26	1.16	1158
N_1P_2	92.29	5.85	276.58	4.02	79.83	83.00	55.20	3.67	116.87	2.65	14.33	91.47	1.58	1578
N_1P_3	93.12	5.55	337.66	4.33	80.67	84.67	57.87	4.00	118.27	2.87	14.67	92.29	1.85	1847
N_1P_4	93.98	6.05	380.32	4.79	80.83	85.67	59.87	4.33	125.40	3.02	15.33	93.12	1.94	1940
N_2P_1	94.00	5.85	360.28	4.59	80.67	82.33	59.60	4.33	120.93	2.31	17.67	93.98	1.70	1703
N_2P_2	94.18	5.45	324.37	4.21	80.83	85.00	61.87	3.33	124.73	2.88	18.00	94.18	2.22	2224
N_2P_3	94.22	8.50	567.55	6.94	81.00	85.33	58.83	3.67	126.60	3.21	19.00	94.22	2.30	2298
N_2P_4	95.92	7.40	511.99	6.15	81.50	86.00	61.67	4.67	129.47	3.27	20.00	95.92	2.29	2288
N_3P_1	93.58	6.45	403.50	5.10	80.50	83.00	62.20	4.33	131.60	2.83	18.00	93.58	1.72	1717
N_3P_2	94.73	7.85	516.81	6.37	82.00	84.67	60.60	4.67	134.93	2.89	20.00	94.73	2.55	2548
N_3P_3	93.86	8.00	591.45	6.88	82.17	86.67	61.53	5.00	141.87	2.56	21.33	93.86	2.73	2727
N_3P_4	95.81	7.60	523.94	6.31	82.67	87.00	59.80	5.33	142.00	2.70	21.67	95.81	2.73	2730
N_4P_1	93.60	6.80	456.33	5.57	81.33	83.33	59.67	4.67	139.33	2.57	19.67	93.60	2.39	2385
N_4P_2	94.94	8.60	646.09	7.45	81.50	85.00	58.47	5.00	143.20	2.70	21.33	94.94	2.73	2730
N_4P_3	95.58	9.35	706.78	8.13	81.67	89.00	61.00	5.33	143.93	3.11	21.67	95.58	2.54	2544
N_4P_4	96.62	11.05	743.47	9.06	83.33	89.67	62.53	5.67	146.33	3.41	23.33	96.62	2.77	2767

*CD is found Not Significant in between interactions

Where, N_1= No fertilizer; N_2=12.50 tons FYM/ha; N_3= 50 kg Urea + 50kg Super phosphate and 50kg Muriate of potash per ha + Top dressing urea at 3-4 weeks after transplanting +2 % Borax spray at flowering stage; N_4=N_2 + N_3; P_1= Control-No priming; P_2= Hydro-Priming for 6 h (Finger Millet) by adopting seed to solution ratio of 1:1 (and then mixing in 2.5-3 gm/kg of Carbendazim (Bavistin) with the seeds, and leaving the mixture for 24 hours before sowing); P_3= Seed Priming with 2% KH_2PO_4 for 6 h (Finger Millet) by adopting seed to solution ratio of 1:1, (and then mixing in 2.5-3 gm/kg of Carbendazim (Bavistin) with the seeds, and leaving the mixture for 24 hours before sowing); P_4= Seed priming with 20% liquid *Pseudomonas fluorescens*.

The experiment entitled "Integrated approach for enhancing seed yield and quality in Millets" was conducted with finger millet cultivar Chhattisgarh Ragi 2 at NSP, IGKV Raipur during Kharif 2017. Table 4.7 reveals that in Nutrient management germination %, seedling length, seedling vigour, seed Index %, No. of tillers per plant, 1000 seed wt, seed yield per plant, seed yield kg per ha, seed recovery % and biological yield per plant were recorded significantly highest in treatment N_4 (125 Kg Neem + 12.50 tons FYM/ha + 50 kg Urea + 50kg Super phosphate and 50kg Muriate of Potash per ha + Top dressing urea at 3-4 weeks after transplanting + 2 % Borax spray at flowering stage) followed by treatment N3 (50 kg Urea + 50kg Super phosphate and 50kg Muriate of Potash per ha + Top dressing urea at 3-4 weeks after transplanting + 2 % Borax spray at flowering stage) and lowest value was recorded in control plot i.e. N1. Treatments N3 (50 kg Urea + 50kg Super phosphate and 50kg Muriate of Potash per ha + Top dressing urea at 3-4 weeks after transplanting +2 % Borax spray at flowering stage) and N4 (125 Kg Neem + 12.50 tons FYM/ha + 50 kg Urea + 50kg Super phosphate and 50kg Muriate of Potash per ha + Top dressing urea at 3-4 weeks after transplanting + 2 % Borax spray at flowering stage) found at par for almost all the characters except 1000 seed wt. Significantly early flowering in treatment N1 may be due to less availability of nutrient composition which enhances the early flowering.

In case of seed priming, Seedling length, Seedling Vigour, Seed Index %, No. of tillers per plant, 1000 seed weight, Seed yield per plant, Seed yield kg per ha, Seed recovery % and Biological Yield per plant were found significantly higher in treatment P4 (Seed priming with 20% liquid *Pseudomonas fluorescens*) and lowest was recorded in treatment P1. Treatments P3 [Seed Priming with 2% KH_2PO_4 for 6 h (Finger Millet) by adopting seed to solution ratio of 1:1, (and then mixing in 2.5 - 3gm/kg of Carbendazim (Bavistin) with the seeds, and leaving the mixture for 24 hours before sowing) and P4 (Seed priming with 20% liquid *Pseudomonas fluorescens*] found at par for almost all the characters except Biological Yield per Plot.

In case of germination %, significantly highest value was recorded in P3 [Seed Priming with 2% KH_2PO_4 for 6 h (Finger Millet) by adopting seed to solution ratio of 1:1, (and then mixing in 2.5 - 3 gm/kg of Carbendazim (Bavistin) with the seeds, and leaving the mixture for 24 hours before sowing]. This result reveals that seed priming enhance the seed vigour and their stimulatory effects.

In case of interaction effects, some of the interactions between the different treatment combinations were found significant and among them interaction combination of P_3 N_4 and P_4N_4 were found advantageous for enhancement of seed yield and quality in Millets (Table 4.7).

KKV, Dapoli

Results: The results are presented in Table 4.9. Main plots i.e. nutrient management treatments (N) as well as subplots i.e. different priming methods (P) were found to reveal significant variation for all the characters except seed recovery percentage. However, nutrient management (N) × priming (P) interaction was found to be significant for all the characters under study.

In case of main plots, N4 was significantly superior for all the characters except seed recovery percentage viz., plant height at 30 DAS (34.38 cm), plant height at harvest (107.28 cm), total chlorophyll content (10.49 mg/g), days to first flowering (82.00), days to 50% flowering (90.83), tillers/plant (3.88), seed yield/plant (12.14 g), seed yield/plot (1.48 kg), seed yield/ha (2461.11 kg), 100 seed weight (0.242 g), germination (82.25 %) vigour index (1038.58). In sub-plots, P4 was significantly superior for days to first flowering (83.08), days to 50% flowering (90.83), tillers/plant (4.00), seed yield/plot (1.11 kg), seed yield/ha (1850.93 kg), 100 seed weight (0.228 g), germination (82.25 %) and vigour index (1044.97). However, P3 recorded significantly highest plant height at 30

DAS (30.92 cm), plant height at harvest (99.83 cm), total chlorophyll content (9.66 mg/g) and 100 seed weight (0.228 g).

In nutrient management (N) × Priming (P) interaction, N4P4 was significantly superior for days to first flowering (79.00), days to 50% flowering (89.33), tillers/ plant (4.40), seed yield/plant (13.54 g), seed yield/plot (1.93 kg), seed yield/ha (3211.11 kg), 100 seed weight (0.26 g), seed recovery (61.95 %), germination (86.33 %), vigour index (1163.80). It may be due to healthy and vigorous seedlings transplanted at 21 days and nutrient dose of 125 kg Neem + 1250 kg vermicompost/ha and 50 kg/ha each of Urea, SSP, MoP along with top dressing of urea at 3-4 weeks after transplanting and 2 % Borax spray at flowering.

Conclusion: For enhancing seed yield and resultant post-harvest seed quality in transplanted finger millet treatment combination N4P4 i.e. pre-sowing seed priming with 20% liquid *Pseudomonas fluorescens* along with per hectare fertilizer dose of 125 kg Neem + 1250 kg Vermicompost/ha + 50 kg Urea + 50 kg SSP and 50 kg MOP followed by Top dressing Urea at 3-4 weeks after transplanting and application of 2 % Borax spray at flowering was found to be most effective among all the treatment combination studied.

Table 4.8: Effect of Nutrient Management, Priming and their Interactions in Finger Millet Variety Dapoli Nagli-1 (Kharif-2017)

Treatment	Plant Height at 30 DAS (cm)	Plant Height at Harvest (cm)	Total Chlorophyll Content (mg/g)	Days to First Flowering (Days)	Days to 50% flowering (Days)	No. of Tillers/ Plant	Seed Yield/Plant (g)	Seed Yield/Plot (kg)	Seed Yield/ha (kg)	100 Seed Weight (g)	Seed Recovery (%)	Germination (%)	Vigour Index
Main Plot													
Fertilizer (N)													
N_1	24.72	87.95	8.18	87.08	93.07	2.88	8.42	0.69	1143.06	0.203	55.56 (7.52)	77.83 (61.90)	915.37
N_2	28.78	92.25	8.94	85.75	92.75	3.65	8.58	0.68	1129.63	0.220	56.21 (7.56)	79.50 (63.10)	916.23
N_3	29.23	103.58	8.91	84.67	92.00	3.61	10.84	1.02	1706.48	0.223	56.80 (7.60)	80.08 (63.58)	950.77
N_4	34.38	107.28	10.49	82.00	90.83	3.88	12.14	1.48	2461.11	0.242	59.62 (7.78)	82.25 (65.20)	1038.58
SE (m) ±	0.34	0.60	0.17	0.28	0.48	0.08	0.15	0.02	35.83	0.003	0.067	0.42	25.19
CD (0.05)	1.18	2.12	0.59	0.97	1.70	0.29	0.51	0.08	126.39	0.011	NS	1.49	88.86
Sub Plot													
Priming (P)													
P_1	26.80	94.67	8.37	86.92	93.75	2.95	8.44	0.77	1285.65	0.212	54.70 (7.46)	78.50 (62.44)	929.09
P_2	29.52	97.52	9.16	85.42	93.08	3.46	9.79	0.92	1529.63	0.218	57.64 (7.66)	79.17 (62.85)	911.47
P_3	30.92	99.83	9.66	84.08	91.58	3.65	10.92	1.07	1774.07	0.228	58.98 (7.74)	79.75 (63.33)	935.41
P_4	29.88	99.05	9.34	83.08	90.83	4.00	10.83	1.11	1850.93	0.228	56.86 (7.60)	82.25 (65.17)	1044.97
SE (m) ±	0.40	0.73	0.11	0.33	0.43	0.08	0.23	0.02	38.99	0.004	0.074	0.42	29.02
CD (0.05)	1.16	2.13	0.31	0.96	1.25	0.25	0.67	0.07	114.49	0.012	NS	1.24	85.20

(Figures in parenthesis are square root and arc sine values for seed recovery and germination percentage, respectively)

INTERACTION Nutrient x Priming :

Treatment	Plant height at 30 DAS (cm)	Plant height at harvest (cm)	Total Chlorophyll Content (mg/g)	Days to First Flowering (Days)	Days to 50% flowering (Days)	No. of Tillers/ Plant	Seed Yield/ Plant (g)	Seed Yield/ Plot (kg)	Seed Yield/ha (kg)	100 Seed Weight (g)	Seed Recovery (%)	Germination (%)	Vigour Index
N1P1	21.27	86.20	8.23	88.33	96.33	2.20	6.69	0.62	1038.89	0.19	53.46 (7.31)	76.33 (60.90)	883.47
N1P2	25.53	87.00	8.51	88.00	94.00	3.07	8.83	0.77	1288.89	0.21	55.51 (7.45)	79.00 (62.74)	894.40
N1P3	24.93	89.93	7.87	86.33	92.00	2.60	9.55	0.68	1133.33	0.21	58.91 (7.67)	78.67 (62.50)	928.47
N1P4	27.13	88.67	8.12	85.67	92.33	3.67	8.60	0.67	1111.11	0.20	54.37 (7.37)	77.33 (61.58)	955.13
N2P1	25.73	91.20	8.70	87.00	94.00	3.20	7.43	0.67	1122.22	0.21	54.50 (7.37)	77.33 (61.60)	973.77
N2P2	29.53	92.53	8.27	86.00	94.67	3.67	8.19	0.64	1062.96	0.22	58.30 (7.64)	78.33 (62.27)	843.37
N2P3	31.40	94.67	9.32	84.67	91.00	3.93	9.46	0.73	1222.22	0.23	58.82 (7.66)	80.00 (63.47)	857.77
N2P4	28.47	90.60	9.48	85.33	91.33	3.80	9.25	0.67	1111.11	0.22	53.21 (7.29)	82.33 (65.17)	990.00
N3P1	28.93	100.40	8.08	86.33	93.33	3.20	9.64	0.80	1333.33	0.23	54.45 (7.38)	84.00 (66.44)	947.33
N3P2	30.00	103.13	9.49	85.00	91.67	3.43	10.41	0.98	1640.74	0.21	57.42 (7.58)	77.67 (61.83)	930.80
N3P3	28.60	102.80	9.64	85.00	92.67	3.80	11.37	1.13	1881.48	0.22	57.39 (7.58)	75.67 (60.46)	882.00
N3P4	29.40	108.00	8.46	82.33	90.33	4.00	11.92	1.18	1970.37	0.23	57.92 (7.61)	83.00 (65.69)	1042.93
N4P1	31.27	100.87	8.49	86.00	91.33	3.20	9.98	0.99	1648.15	0.22	56.39 (7.51)	76.33 (60.91)	911.80
N4P2	33.00	107.40	10.37	82.67	92.00	3.67	11.74	1.28	2125.93	0.23	59.33 (7.70)	81.67 (64.66)	977.30
N4P3	38.73	111.93	11.82	80.33	90.67	4.27	13.28	1.72	2859.26	0.25	60.81 (7.80)	84.67 (66.98)	1073.40
N4P4	34.53	108.93	11.30	79.00	89.33	4.40	13.54	1.93	3211.11	0.26	61.95 (7.87)	86.33 (68.36)	1163.80
SE ± (m)	**0.76**	**1.39**	**0.25**	**0.63**	**0.88**	**0.16**	**0.42**	**0.05**	**76.45**	**0.01**	**0.14**	**0.85**	**56.22**
CD (0.05)	**2.22**	**4.06**	**0.72**	**1.84**	**2.58**	**0.48**	**1.22**	**0.14**	**223.16**	**0.025**	**0.41**	**2.47**	**164.09**

(Figures in parenthesis are square root and arc sine values for seed recovery and germination percentage, respectively)

ANGRAU, Guntur

Results:

Table 4.9: Plant height (cm), productive tillers/plant of Finger millet as influenced by sowing method and spacing, nutrient management and seed priming under irrigated conditions during *rabi -2016* at ANGRAU, Guntur

Treatment	Plant height (cm)	Number of productive tillers/plant	Seed yield (q/ha)
Main			
S1 : Direct sowing 30x10 cm sown at 3-4 cm depth	85.2	1.75	19.0
S2: Transplanting 30x10 cm (raising a nursery and transplanting at 21 days in wet field capacity of soil)	100.2	2.84	23.4
CD @ 5 %	1.07	0.39	0.59
Sub			
N1 No fertilizer	82.3	1.56	15.04
N2125 kg Neem cake + 12.5 tonnes of FYM /ha	85.6	1.93	18.48
N350:50:50 kg Urea : SSP : MOP /ha + top dressing of urea at 3-4 weeks after transplanting + 2% borax spray	98.7	2.87	22.87
N4125 kg Neem Cake + 1250 kg FYM /ha +50:50:50 kg Urea : SSP : MOP /ha + dressing of urea at 3-4 weeks after transplanting + 2% borax spray	104.3	2.82	28.67
CD @ 5%	1.38	0.587	0.50
Sub sub			
P1 : Control (No priming)	89.5	1.82	18.75
P2 : Hydro priming Primping -6 hours by adopting seed to solution ratio 1:1 (and the mixing in 2.5-3 gm of carbendazim with seeds and leaving the mixture for 24 hours before sowing)	91.9	2.37	21.22
P3 : Priming with 2% K2HPO4 for 6 hours by adopting seed to solution ratio 1:1(and the mixing in 2.5-3 gm of carbendiazam with seeds and leaving the mixture for 24 hours before sowing)	94.2	2.25	22.09
P4 : Priming with 20% liquid *Pseudomonas fluorescence*	95.3	2.75	22.98
CD @ 5%	1.01	NS	0.84
Interaction			
Main x sub	1.95	0.952	0.842
Main x sub sub	1.43	0.84	1.01
Sub x sub sub	2.03	NS	0.95

Results:

- Under rain fed with lifesaving irrigations during kharif season finger millet crop growth and seed yield are significantly influenced by the method of sowing and spacing, nutrient management and seed priming with significant interaction effects.
- Among two methods of sowings, raising a nursery and transplanting at 21 days in wet field capacity of soil with a spacing of 30 cm x 10 cm recorded significantly higher plant height and more number of productive tillers/plant compared to direct sowing with a spacing of 30 cm x 10 cm.
- Among four nitrogen management practices 125 kg neem cake + 1250 kg FYM /ha +50:50:50 kg Urea : SSP : MOP /ha + top dressing of urea at 3-4 weeks after transplanting + 2% borax spray recorded significant increase in plant height with more number of productive tillers/plant.
- Seed priming with 20% liquid *Pseudomonas fluorescence* recorded significantly higher plant height compared to seed priming with 2% K_2HPO_4 and water. But there was no significant difference observed in number of productive tillers due to seed priming.
- Significantly higher seed yield was recorded in seed Priming with 20% liquid *Pseudomonas fluorescence* and transplanting with a spacing of 30 cm x 10 cm with application of 125 kg neem cake + 1250 kg FYM /ha +50:50:50 kg Urea : SSP : MOP /ha + dressing of urea at 3-4 weeks after transplanting + 2% borax spray

Foxtail millet (*Sataria italica*)

Observations of PI

Unified Observations

Effect of nutrient management and seed priming on yield and seed quality attributing traits in Foxtail Millet (Mean over three locations)

During kharif 2017, this experiment was conducted at three locations namely UAS, Dharwad; TNAU, Coimbatore and ANGRAU, Guntur. Among all the treatment combinations, seed priming with 20 % liquid *Pseudomonas fluoresces* and application of 125 kg Neem + 1250 kg Vermicompost (or) 12.5 tons FYM/ha + 50 kg urea + 50 kg super phosphate and 50 kg muriate of potash per ha + top dressing urea at 3-4 weeks after transplanting + 2% Borax spray was found superior and uniformly better in all the three locations. Pooled analysis of data over the locations revealed that the applying the treatment resulted in increase of 13.7% increase in seed yield/ha, 3% increase in seed germination & 20.2% increase in vigour index over control. The range of increase in seed yield/ha due to better treatment was 12% in ANGRAU, Guntur and 43.2% in TNAU, Coimbatore over control.

Individual Centre wise observations

TNAU, Coimbatore

Results: The nutrient dosage of 125 kg neem + 1250 kg vermicompost per ha + 50 kg urea +50 kg Super phosphate + 50 kg Muriate of potash + Top dressing urea + 2 % Borax spray recorded the maximum number of tillers (9.0), Number of panicle per plant (10.5), single plant seed yield (16.3 gm), seed yield per plot (3.84 kg) compare to 6.9, 7.9, 13.6 gm and 2.69 kg, respectively in the direct sowing.

Priming with 20 % liquid *Pseudomonas fluorescens* recorded the maximum number of tillers 8.9, Number of panicle per plant (10.1), single plant seed yield (16.0 gm), seed yield per plot (3.35kg) compare to 7.2, 9.0, 14.2 gm and 2.96 kg respectively

Fertilizer application of 125 kg neem + 1250 kg vermicompost per ha + 50 kg urea + 50 kg Super phosphate + 50 kg Muriate of potash + Top dressing urea + 2 % Borax spray in combination of priming with 20 % liquid *Pseudomonas fluorescens* recorded highest plant height (85.6 cm), Number of tillers (9.3), single plant seed yield (17.9gm), seed yield per plot (4.01kg) compare to 73.8 cm, 5.6, 7.5, 12.5 gm and 2.47 kg, respectively in control.

Salient finding:

Priming with 20 % liquid *Pseudomonas fluorescens* combined with the treatment of 125 kg neem + 1250 kg vermicompost per ha + 50 kg urea + 50 kg Super phosphate + 50 kg Muriate of potash + Top dressing urea + 2 % Borax spray under direct sowing recorded the highest single plant seed yield and seed yield per plot.

Table 4.10: Effect of sowing method, nutrient application and seed priming on number of tillers and plant height (cm) in foxtail millet at TNAU, Coimbatore during *Kharif* 2017

	Number of tillers per plant					Plant height (cm)				
	N_1	N_2	N_3	N_4	Mean	N_1	N_2	N_3	N_4	Mean
P_1	5.6	7.3	7.4	8.3	7.2	73.8	78.0	80.7	77.2	77.4
P_2	6.9	7.4	8.5	8.7	7.9	75.7	81.3	84.7	84.4	81.5
P_3	7.1	7.1	8.8	9.6	8.2	76.2	87.1	84.5	83.9	82.9
P_4	7.9	8.6	9.9	9.3	8.9	75.3	84.2	82.8	85.6	82.0
Mean	6.9	7.6	8.7	9.0	8.0	75.3	82.7	83.2	82.8	81.0
	P	N	PXN			P	N	PXN		
SEd	0.178	0.179	0.357			0.69	0.97	1.36		
CD (P = 0.05)	0.357	0.357	0.714			1.47	2.09	2.95		

Table 4.11: Effect of sowing method, nutrient application and seed priming on Chlorophyll content and number of panicle per plant in foxtail millet at TNAU, Coimbatore during *Kharif* 2017

	Chlorophyll content					Number of panicle per plant				
	N_1	N_2	N_3	N_4	Mean	N_1	N_2	N_3	N_4	Mean
P_1	21.0	24.6	28.0	23.9	24.4	7.5	9.2	9.2	9.9	9.0
P_2	22.9	27.9	32.0	31.1	28.5	8.4	9.3	10.7	10.5	9.7
P_3	23.4	33.7	31.8	30.6	29.9	6.9	9.1	10.4	10.5	9.2
P_4	22.5	30.8	30.1	32.3	28.9	8.9	10.1	10.4	10.9	10.1
Mean	22.5	29.3	30.5	29.5	27.9	7.9	9.4	10.2	10.5	9.5
	P	N	PXN			P	N	PXN		
SEd	0.70	0.86	1.17			1.39	0.88	1.06		
CD (P = 0.05)	1.48	1.82	2.48			3.20	2.02	2.44		

Table 4.12: Effect of sowing method, nutrient application and seed priming on days to first flowering and 100 seed weight (gm) in foxtail millet at TNAU, Coimbatore during *Kharif* 2017

Treatment	Days to first flowering					100 seed weight (gm)				
	N_1	N_2	N_3	N_4	Mean	N_1	N_2	N_3	N_4	Mean
P_1	52.7	52.8	52.7	55.1	53.3	0.274	0.275	0.270	0.272	0.273
P_2	52.9	52.4	52.5	54.8	53.1	0.274	0.270	0.285	0.282	0.278
P_3	51.9	51.8	51.8	54.1	52.4	0.274	0.275	0.282	0.282	0.278
P_4	51.7	51.6	52.0	54.1	52.3	0.271	0.277	0.287	0.277	0.278
Mean	52.3	52.1	52.3	54.5	52.8	0.273	0.274	0.281	0.279	0.277
	P	N	PXN			P	N	PXN		
SEd	1.24	1.28	0.85			0.71	0.34	NS		

CD (P = 0.05)	2.46	2.60	1.74		1.43	0.67		

Table 4.13: Effect of sowing method, nutrient application and seed priming on single plant yield (gm) and seed yield per plot (kg) in foxtail millet at TNAU, Coimbatore during *Kharif* 2017

Treatment	Single plant yield (gm)					Seed yield per plot (kg)				
	N_1	N_2	N_3	N_4	Mean	N_1	N_2	N_3	N_4	Mean
P_1	12.5	14.6	14.8	15.1	14.2	2.47	2.91	2.93	3.53	2.96
P_2	13.8	14.3	16.9	17.2	15.5	2.73	2.85	3.35	3.95	3.22
P_3	13.9	14.8	15.9	17.5	15.5	2.75	2.95	3.15	3.87	3.18
P_4	14.1	15.7	16.8	17.9	16.0	2.79	3.13	3.45	4.01	3.35
Mean	13.6	14.8	16.1	16.3	15.3	2.69	2.96	3.22	3.84	3.18
	P	N	PXN			P	N	PXN		
SEd	1.35	1.35	1.34			3.55	3.42	3.64		
CD (P = 0.05)	3.11	3.11	3.08			7.21	6.94	7.39		

Table 4.14: Effect of sowing method, nutrient application and seed priming on resultant seed germination and shoot length (cm) in foxtail millet at TNAU, Coimbatore during *Kharif* 2017

Treatment	Germination %					Shoot length (cm)				
	N_1	N_2	N_3	N_4	Mean	N_1	N_2	N_3	N_4	Mean
P_1	97	97	98	98	97	4.81	5.06	5.01	4.99	4.97
P_2	96	98	97	96	98	4.88	4.81	5.62	5.31	5.16
P_3	97	97	97	97	97	4.81	5.08	5.51	5.38	5.20
P_4	97	97	98	97	97	4.72	5.10	5.71	5.17	5.18
Mean	96	97	97	97	97	4.81	5.01	5.46	5.21	5.12
	P	N	PXN			P	N	PXN		
SEd	NS	NS	NS			0.54	0.67	0.85		
CD (P = 0.05)						1.12	1.39	1.77		

Table 4.15 Effect of sowing method, nutrient application and seed priming on resultant seed root length and vigour index in foxtail millet at TNAU, Coimbatore during *Kharif* 2017

Treatment	Root length (cm)					Vigour index				
	N_1	N_2	N_3	N_4	Mean	N_1	N_2	N_3	N_4	Mean
P_1	9.79	9.74	9.79	9.87	9.80	1410	1431	1447	1452	1435
P_2	9.86	9.49	10.40	10.19	9.99	1409	1397	1551	1483	1460
P_3	9.79	9.76	10.29	10.26	10.03	1410	1435	1529	1512	1472
P_4	9.70	9.78	10.49	10.05	10.01	1393	1439	1584	1472	1472
Mean	9.79	9.69	10.24	10.09	9.95	1406	1426	1528	1480	1460
	P	N	PXN			P	N	PXN		
SEd	0.73	0.80	0.71			0.70	0.75	0.68		
CD (P = 0.05)	1.47	1.54	1.44			1.42	1.52	1.38		

UAS, Dharwad

Results:

Table 4.16: Effect of seed priming and nutrient management on growth and yield characters of foxtail millet at UAS, Dharwad during *Kharif* 2017

Treatment	Field Emergence (%)	Plant ht at 30 DAS (cm)	Plant height at harvest (cm)	Days to flowering	Days to 50% flowering	No. of Tillers/plant
N1	81.47	19.27	83.77	42.28	57.50	4.94
N2	82.15	19.76	90.93	41.78	60.29	5.36
N3	82.01	20.25	96.93	41.27	54.57	5.72
N4	81.07	19.64	100.08	42.93	56.57	5.90
SEm ±	**1.04**	**0.49**	**0.57**	**0.67**	**1.28**	**0.03**
CD at 5%	NS	NS	**1.64**	NS	**3.68**	**0.10**
P1	78.37	18.90	91.52	42.61	56.83	5.40
P2	79.72	19.58	91.34	40.99	57.66	5.39
P3	83.23	20.58	93.73	42.44	54.36	5.53
P4	85.39	19.86	95.12	42.22	60.09	5.61
SEm ±	**1.04**	**0.49**	**0.57**	**0.67**	**1.28**	**0.03**
CD at 5%	**2.99**	NS	**1.64**	NS	**3.68**	**0.10**
N1P1	79.57	19.29	90.84	43.37	55.60	5.36
N1P2	80.12	18.27	90.66	44.40	53.95	5.35
N1P3	82.84	21.52	93.03	42.83	48.60	5.49
N1P4	86.66	17.89	94.41	39.29	66.30	5.57
N2P1	80.12	19.12	93.02	43.41	61.36	5.49
N2P2	81.21	19.88	92.84	36.96	60.95	5.48
N2P3	83.93	21.69	95.27	41.17	54.77	5.62
N2P4	86.66	20.76	96.68	43.59	64.25	5.70
N3P1	79.03	19.94	98.80	40.10	56.83	5.83
N3P2	81.75	17.89	98.60	38.44	56.83	5.82
N3P3	83.93	21.93	101.18	41.93	55.60	5.97
N3P4	86.66	25.49	102.68	45.30	66.72	6.06
N4P1	77.94	19.12	102.01	42.97	51.48	6.02
N4P2	79.03	20.87	101.81	43.24	61.77	6.01
N4P3	85.57	19.85	104.47	44.63	50.65	6.16
N4P4	85.02	20.46	106.02	43.75	55.18	6.26
SEm ±	**2.93**	**1.39**	**1.61**	**1.90**	**3.61**	**0.09**
CD at 5%	NS	**4.01**	**4.64**	**5.49**	**10.42**	NS

Table 4.17: Effect of seed priming and nutrient management on seed quality characters of foxtail millet at UAS, Dharwad during *Kharif* 2017

Treatment	Seed yield per plant (g)	Seed yield (q/ha)	Test weight (g)	Seed recovery (%)	Seed germination (%)	Vigour index
N1	8.78	14.75	3.11	70.59	66.25	1255
N2	9.53	16.01	3.10	74.44	71.91	1474
N3	10.16	17.07	3.04	79.36	76.66	1675
N4	10.49	17.62	3.10	81.94	79.15	1786
SEm ±	**0.06**	**0.10**	**0.06**	**0.47**	**0.45**	**19**
CD at 5%	**0.17**	**0.29**	**NS**	**1.34**	**1.30**	**55**
P1	9.59	16.11	3.08	74.93	72.38	1500
P2	9.57	16.08	3.22	74.78	72.24	1494
P3	9.82	16.50	3.07	76.74	74.13	1574
P4	9.97	16.75	2.99	77.87	75.23	1621
SEm ±	**0.06**	**0.10**	**0.06**	**0.47**	**0.45**	**19**
CD at 5%	**0.17**	**0.29**	**NS**	**1.34**	**1.30**	**55**
N1P1	9.52	15.99	3.30	74.37	71.84	1404
N1P2	9.50	15.96	3.20	74.22	71.70	1398
N1P3	9.75	16.38	3.05	76.17	73.58	1473
N1P4	9.90	16.62	2.75	77.29	74.67	1517
N2P1	9.75	16.38	3.15	76.16	73.57	1472
N2P2	9.73	16.35	3.20	76.01	73.42	1466
N2P3	9.99	16.77	2.90	77.99	75.34	1544
N2P4	10.13	17.02	2.95	79.15	76.46	1590
N3P1	10.36	17.39	2.95	80.88	78.13	1661
N3P2	10.33	17.36	2.80	80.73	77.98	1654
N3P3	10.61	17.81	2.95	82.84	80.02	1742
N3P4	10.76	18.08	3.15	84.06	81.21	1794
N4P1	10.69	17.96	3.00	83.51	80.67	1770
N4P2	10.67	17.92	3.10	83.35	80.52	1763
N4P3	10.95	18.39	3.30	85.53	82.62	1857
N4P4	11.11	18.67	2.85	86.80	83.84	1912
SEm ±	0.17	0.28	0.16	1.32	1.27	54
CD at 5%	**NS**	**NS**	**0.46**	**NS**	**NS**	**NS**

Field view of foxtail millet experimental plot

Among the fertilizer combinations, N_4 :125 kg Neem + 1250 kg Vermicompost (or) 12.5 tons FYM/ha + 50 kg Urea + 50 kg super phosphate and 50 kg Muriate of potash per ha + Top dressing urea at 3-4 weeks after transplanting + 2% Borax spay was significant over rest of combinations. Seed priming with (P_4) *Pseudomonas fluoresces @ 20 %* liquid was superior over other seed priming chemicals. Treatment combination of N_4P_3 was significant over rest of combinations.

ANGRAU, Guntur

Results:

Table 4.18: Effect of nutrient management and seed priming treatments and their interactions on yield and yield attributing Characters in foxtail millet at ANGRAU, Guntur, Nandyal during *Kharif* 2017

Treatments	Field Emergence (%)	Plant height at 30 days(cm)	Plant height at harvest (cm)	SCMR	Days to first flowering	Days to 50% flowering	Number of tillers / plant	Seed yield /plant (kg)	Seed yield /ha (kg)	1000 seed weight (g)	Seed recovery (%)
N1: Control	99	42.20	116.05	40.19	40	48	4	9.79	2942	2.03	96.0
N2:125kg Neem + 1250 kg Vermicompost or 1.25 t FYM/ha	99	47.11	119.28	37.15	40	45	4	8.48	2533	2.12	96.3
N3: 50kg Urea + 50 kg SSP + 50 kg MOP/ha + T.D urea at 3-4 WAT+ 2% Borax spray	98	50.70	123.03	46.19	40	45	4	12.08	3608	2.50	98.3
N4: N2 + N3	99	46.66	118.85	44.68	40	46	4	11.34	3402	2.29	97.5
SEm ±	0.40	0.45	1.45	1.37	0.25	0.52	0.26	0.16	48.89	0.04	0.28
CD (0.05)	**NS**	1.29	4.19	3.95	**NS**	**NS**	**NS**	0.46	141.25	0.11	0.79
Priming treatments (P)											
P1: Control	98	44.87	119.65	41.22	40	45	4	10.55	3148	2.23	97.5
P2: H/D for 8 hrs	99	44.05	118.77	42.61	40	46	4	10278	3071	2.28	96.8
P3: 2% KH_2PO_4 for 8 hrs	99	48.96	118.40	43.01	40	45	4	10.18	3058	2.20	96.9
P4: 20% liquid *P. fluoresces*	99	48.76	120.40	42.38	40	45	4	10.67	3209	2.23	96.8
SEm ±	0.40	0.45	1.45	1.37	0.25	0.51	0.26	0.16	48.89	0.04	0.27
CD (0.05)	**NS**	1.29	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
N X P											
SEm ±	0.80	0.89	2.91	2.73	0.51	1.03	0.51	0.32	97.78	0.08	0.55
CD (0.05)	**NS**	2.58	**NS**	**NS**	**NS**	**NS**	**NS**	0.91	282.50	0.23	1.59

N1- Control , **N2**- 125 kg neem+ 1250 kg Vermicompost /ha or 12.5 tons FYM/ha , **N3**: 50 kg Urea+ 50 kg Super phosphate and 50 kg Muriate of potash per ha + Top dressing urea at 3-4 weeks after transplanting + 2% Borax spray. **N4** : N2 + N3

P1- Control ,**P2**- Hydro priming for 8 hrs by adopting seed to solution of 1:1 ratio (and then mixing in 2.5-3 gm/kg of Carbendazim (Bavistin) with the seeds, and leaving the mixture for 24 hrs before sowing.**P3-** Seed priming with 2% KH_2PO_4 for 8 hr by adopting seed to solution of 1:1 ratio(and then mixing in 2.5-3 gm/kg of Carbendazim (Bavistin) with the seeds, and leaving the mixture for 24 hrs before sowing. **P4**- Seed priming with 20% liquid *Pseudomonas fluoresces*

With respect to plant height at 30 days (50.7 cm), plant height at harvest (123.03 cm), SPAD reading (46.19) N3 treatment recorded significantly higher values compared to other nutrient levels. Same trend observed with respect to seed yield /plant (12.08 kg), seed yield /ha (3608 kg), 1000 seed weight (2.5g) and seed recovery percentage (98.3) in which N3 treatment recorded significantly higher values compared to other nutrient levels.
However, significant effects of priming treatments were recorded only with respect to plant height at harvest (48.96 cm & 48.76 cm) by P3 & P4 respectively.

Table 4.19: Effect of nutrient management and seed priming treatments interaction on seed yield (kg/ha) in foxtail millet at ANGRAU, Guntur, Nandyal during *Kharif* 2017

Nutrient treatments	Seed yield (kg/ha)			
	Priming treatments (P)			
	P1: Control	P2: H/D for 8 hrs	P3: 2% KH_2PO_4 for 8 hrs	P4: 20% liquid *P. fluoresces*
N1: Control	2934	2726	2754	3354
N2:125kg Neem + 1250 kg Vermicompost or 1.25 t FYM/ha	2516	2632	2507	2479
N3: 50kg Urea + 50 kg SSP + 50 kg MOP/ha + T.D urea at 3-4 WAT+ 2% Borax spray	3460	**3781**	3476	**3715**
N4: N2+ N3	3363	3463	3495	3287
SEm ±	97.78			
CD (0.05)	**282.50**			

Significant differences with respect to nutrient levels and priming treatments were observed for seed yield /hectare. Significantly higher seed yield was obtained with N3P2 (3781 kg/ha) followed by N3P4 (3715 kg/ha). Significantly lower seed yield was recorded with N2P4 (2479 kg/ha).

Table 4.20: Effect of nutrient management and seed priming treatments and their interactions on seed quality parameters of foxtail millet at ANGRAU, Guntur, during *Kharif* 2017

Treatments	Germination (%)	Seedling length SL (cm)	Seedling Vigour Index I(G% X SL)	Seedling Dry Weight (g)	Seedling Vigour Index II(G% X SDW)
N1: Control	94	11.59	1093	0.18	16.53
N2:125kg Neem + 1250 kg Vermicompost or 1.25 t FYM/ha	94	11.53	1084	0.18	16.46
N3: 50kg Urea + 50 kg SSP + 50 kg MOP/ha + T.D urea at 3-4 WAT+ 2% Borax spray	93	12.83	1193	0.16	14.73
N4: N2+ N3	93	11.61	1077	0.17	15.42
SEm ±	0.59	0.20	19.35	0.20	1.87
CD (0.05)	**NS**	0.57	55.91	**NS**	**NS**
Priming treatments (P)					
P1: Control	94	11.69	1094	0.16	14.78
P2: H/D for 8 hrs	94	12.09	1138	0.16	14.98
P3: 2% KH2PO4 for 8 hrs	94	11.88	1110	0.18	16.38
P4: 20% liquid *P. fluoresces*	93	11.89	1106	0.18	17.01
SEm ±	0.58	0.19	19.35	0.21	1.82
CD (0.05)	**NS**	**NS**	**NS**	**NS**	**NS**

N X P					
SEm ±	1.17	0.39	38.70	0.04	3.75
CD (0.05)	NS	NS	NS	NS	NS

Significant differences were recorded with respect to nutrient levels for seedling length in which N3 recorded higher value (12.83 cm) followed by N4 (11.61 cm).

Kodomillet (*Paspalum scrobiculatum*)

Observations of PI

Unified Observations

Effect of nutrient management and seed priming on yield and seed quality attributing traits in Kodo Millet

The experiment was conducted at three centers TNAU Coimbatore; JNKVV Jabalpur and ANGRAU, Guntur. Seed priming with 20 % liquid *Pseudomonas fluoresces* and application of 125 kg Neem + 1250 kg Vermicompost (or) 12.5 tons FYM/ha + 50 kg urea + 50 kg super phosphate and 50 kg muriate of potash per ha + top dressing urea at 3-4 weeks after transplanting + 2% Borax spray was found superior and uniformly better, among all the treatment combinations, in all the three locations. Pooled analysis of data over the locations revealed that the treatment has produced 28.6% increase in seed yield/ha, 7.2% increase in germination percentage and 12.4% increase in vigour index over control. The range of increase in seed yield/ha due to better treatment was 32% in TNAU, Coimbatore and 68.4% in JNKVV, Jabalpur over control.

Individual Centre wise observations

JNKVV, Jabalpur

Results: The experiment was conducted with Kodo millet variety JK 439 as per technical programme during *Kharif* 2017. Sowing was done on 10.07.2017 in a spacing 30 × 10 cm. The seeds were treated with carbandazim @ 2.5 gkg^{-1} seeds before sowing. All the four proposed priming treatments were given on 06.07.2017. Recommended dose of fertilizers were applied as per technical programme.

Effect of nutrient management on plant growth, seed yield and quality attributes

The nutrient management treatments had significant effect on plant growth, seed yield and quality of kodo millet. Highest seed yield (q/ha) and other yield attributing traits were recorded by N_4 (125 kg Neem + 1250 kg Vermicompost/ ha + 50 kg Urea + 50 kg Super phosphate and 50 kg Muriate of potash per ha). This was closely followed by N_3 (50 kg Urea + 50 kg Super phosphate and 50 kg Muriate of potash per ha).

Effect of priming on plant growth, seed yield and quality attributes

The priming treatment had significant effect on plant growth, seed yield and quality attributes. Highest seed yield per plant and seed yield (q/ha) was noticed in P_3 (Seed priming with 2% KH_2PO_4 for 6 hour) followed by P_4 (Seed Priming with 20% liquid *Pseudomonas fluorescens*).

Interaction effect of nutrient management and priming on plant growth, seed yield and quality attributes

Considering different treatments, seed priming with P_4 (20% liquid *Pseudomonas fluorescens*) with N_4 (125 kg Neem + 1250 kg Vermicompost/ ha + 50 kg Urea + 50 kg Super phosphate and 50 kg Muriate of potash per ha) recorded higher seed yield. It was closely followed by seed priming with P_3 (2% KH_2PO_4 for 6 hour) in combination with N_4 (125 kg Neem + 1250 kg Vermicompost/ ha + 50 kg Urea + 50 kg Super phosphate and 50 kg Muriate of potash per ha) under direct sown condition.

Conclusion

Therefore, it is concluded that direct sowing with fertilizer dose125 kg Neem + 1250 kg Vermicompost/ ha + 50 kg Urea + 50 kg Super phosphate and 50 kg Muriate of potash per ha and seed Priming with 20% liquid *Pseudomonas fluorescens* were found better for seed yield and its attributing traits.

Table 4.21: Seed yield and yield attributing characters of Kodo millet as influenced by nutrient management and priming at JNKVV, Jabalpur

Main plot (Nutrient Management)	Sub Plot (Priming)	Field Emergence %	Plant Height at 30 days	Plant Height at harvest	Chlorophyll content	Days to first flowering	Days to 50% flowering	No. of tillers/ plant	Seed yield/ plant (g)	100 seed weight (g)	Seed Yield q/ha	Germination %	Vigour Index I
N1	P1	65.67	29.83	86.93	25.43	65.20	72.00	3.20	4.28	4.51	8.75	66.00	1024.67
	P2	70.00	35.05	94.20	25.71	60.70	68.00	3.47	4.47	4.64	8.88	70.67	1174.33
	P3	72.00	35.49	95.60	29.74	57.60	65.00	3.67	4.28	4.72	13.70	88.00	1264.67
	P4	70.00	35.20	95.80	29.70	57.90	68.00	3.47	4.47	4.64	8.73	77.33	1175.33
N2	P1	73.33	32.36	95.53	28.02	63.10	70.00	3.73	4.43	4.46	9.38	75.00	941.67
	P2	75.33	34.04	96.87	28.02	60.50	69.00	3.80	4.94	4.59	13.50	75.33	1121.67
	P3	79.67	35.10	98.40	30.84	61.30	66.00	3.93	4.88	4.72	14.60	85.67	1221.00
	P4	77.33	33.48	98.07	30.20	61.60	67.00	3.87	4.59	4.55	13.67	82.00	1199.33
N3	P1	76.00	36.03	96.00	28.04	67.80	70.00	4.00	4.73	4.13	12.68	71.67	997.67
	P2	78.00	38.03	96.60	29.79	64.00	68.00	4.07	4.59	4.58	13.60	76.67	1075.67
	P3	79.33	39.44	99.00	32.40	60.20	65.00	4.13	5.05	4.65	14.72	84.00	1246.67
	P4	76.00	38.11	98.13	28.52	63.60	65.20	4.13	4.75	4.37	13.72	83.33	1178.33
N4	P1	78.00	34.49	93.73	24.99	71.40	79.67	4.00	5.71	4.61	12.45	84.00	1160.00
	P2	83.33	36.05	99.87	30.65	67.30	76.00	4.07	5.84	4.70	13.56	86.33	1160.00
	P3	84.00	36.52	100.60	31.16	65.00	72.00	4.13	5.89	4.72	14.66	90.00	1166.67
	P4	86.00	38.09	96.87	34.26	63.50	69.00	4.27	5.91	4.81	14.74	92.00	1300.00
Nutrient Management (Main plot)	No fertilizer	69.42	33.89	93.13	27.64	60.35	68.25	3.45	4.38	4.63	10.02	75.50	1159.75
	12.5 tons FYM/ha	76.42	33.74	97.22	29.27	61.63	68.00	3.83	4.71	4.58	12.79	79.50	1120.92
	50 kg Urea +50 kg Super phosphate and 50 kg MOP	77.33	37.90	97.43	29.69	63.90	67.05	4.08	4.78	4.43	13.68	78.92	1124.58
	12.5 tons FYM/ha+ 50 kg Urea +50 kg Super phosphate and 50 kg MOP	82.83	36.29	97.77	30.27	66.80	74.17	4.12	5.84	4.71	13.85	88.08	1196.67
Priming (Sub plot)	No priming	73.25	33.18	93.05	26.62	66.88	72.92	3.73	4.79	4.43	10.82	74.17	1031.00
	Hydro priming for 6 hours	76.67	35.79	96.89	28.54	63.13	70.25	3.85	4.86	4.63	12.39	77.25	1132.92
	Seed priming with 2% KH_2PO_4 for 6 hours	78.75	36.64	98.40	31.03	61.03	67.00	3.97	5.03	4.70	14.42	86.92	1224.75
	Seed priming with 20% liquid *P. fluorescens*	77.33	36.22	97.22	30.67	61.65	67.30	3.94	4.93	4.59	12.71	83.67	1213.25
Nutrient Management	CD at 5%	1.71	3.15	46.11	1.30	26.47	31.40	5.65	5.79	1.96	5.29	34.19	487.04
Priming	CD at 5%	19.98	19..98	46.11	1.30	26.47	31.40	5.65	5.79	1.96	5.29	34.19	487.04
Interactions	CD at 5%	3.43	6.30	92.22	2.61	50.94	62.81	11.30	11.58	3.93	10.58	68.39	974.09

TNAU, Coimbatore

Results: The treatments have significant result in seed yield and resultant seed quality in kodo millet. The fertilizer treatment of 125 kg neem + 1250 kg vermicompost per ha + 50 kg urea +50 kg Super phosphate + 50 kg Muriate of potash + Top dressing urea + 2 % Borax spray in direct sowing recorded the maximum number of tillers (9.8), Number of panicle per plant (10.68), single plant seed yield (8.3 gm), seed yield per plot (1.71 kg) compare to 7.7, 9.05, 7.5 gm and 1.35 kg respectively in the direct sowing .

Priming with 20 % liquid *Pseudomonas fluorescens* recorded the maximum number of tillers 9.6, Number of panicle per plant (10.91), seed yield per plot (1.57kg) compare to 7.9, 9.86 and 1.42 kg respectively.

Fertilizer application of 125 kg neem + 1250 kg vermicompost per ha + 50 kg urea + 50 kg Super phosphate + 50 kg Muriate of potash + Top dressing urea + 2 % Borax spray in combination of priming with 20 % liquid *Pseudomonas fluorescens* recorded highest plant height (70.5 cm), single plant seed yield (9.9gm), seed yield per plot (1.79kg) compare to 62.1 cm, 8.3 gm and 1.55 kg respectively in control.

- Direct sowing recorded higher single plant seed yield and seed yield per plot.
- Priming with 20 % liquid *Pseudomonas fluorescens* combined with the treatment of 125 kg neem + 1250 kg vermicompost per ha + 50 kg urea + 50 kg Super phosphate + 50 kg Muriate of potash + Top dressing urea + 2 % Borax spray under direct sowing recorded the highest single plant seed yield and seed yield per plot.

Table 4.22: Effect of sowing method, nutrient application and seed priming on number of tillers and plant height (cm) in Kodo Millet at TNAU, Coimbatore during *Kharif* 2017

Treatment	Number of tillers per plant					Plant height (cm)				
	N_1	N_2	N_3	N_4	Mean	N_1	N_2	N_3	N_4	Mean
P_1	6.4	8.1	8.2	8.7	7.9	55.4	59.1	61.3	62.1	59.5
P_2	7.7	8.2	10.1	10.8	9.2	57.3	62.4	67.3	69.3	64.1
P_3	7.9	7.9	9.6	10.0	8.9	57.8	68.2	67.1	67.8	65.2
P_4	8.7	9.4	10.7	9.7	9.6	56.9	65.3	65.4	70.5	64.5
Mean	7.7	8.4	9.7	9.8	8.9	56.9	63.8	65.3	67.4	63.3
	P	N	PXN			P	N	PXN		
SEd	1.82	2.63	3.04			6.2	5.22	3.11		
CD (P = 0.05)	3.66	5.32	6.14			12.86	10.64	6.24		

Table 4.23: Effect of sowing method, nutrient application and seed priming on Chlorophyll content and number of panicle per plant in Kodo Millet at TNAU, Coimbatore during *Kharif* 2017

Treatment	Chlorophyll content					Number of panicle per plant				
	N_1	N_2	N_3	N_4	Mean	N_1	N_2	N_3	N_4	Mean
P_1	40.4	44.4	48.2	49.6	45.6	8.62	10.22	10.48	10.13	9.86
P_2	42.3	47.7	52.2	54.8	49.2	9.52	10.32	11.68	10.73	10.56
P_3	42.8	53.5	52.0	51.3	49.9	8.02	10.12	11.38	10.73	10.06
P_4	41.9	50.6	50.3	56.0	49.7	10.02	11.12	11.38	11.13	10.91
Mean	41.9	49.0	50.7	52.9	48.6	9.05	10.45	11.23	10.68	10.35
	P	N	PXN			P	N	PXN		
SEd	0.66	1.24	1.22			2.64	2.58	2.68		
CD (P =0.05)	1.32	2.56	2.38			5.22	5.82	5.44		

Table 4.24 : Effect of sowing method, nutrient application and seed priming on days to first flowering and 100 seed weight (gm) in Kodo Millet at TNAU, Coimbatore during *Kharif* 2017

Treatment	Days to first flowering					100 seed weight (gm)				
	N_1	N_2	N_3	N_4	Mean	N_1	N_2	N_3	N_4	Mean
P_1	72.6	72.2	71.7	72.7	72.3	0.52	0.51	0.62	0.67	0.58
P_2	72.8	71.8	71.5	72.4	72.1	0.45	0.59	0.49	0.47	0.50
P_3	71.8	71.2	70.8	71.7	71.4	0.53	0.50	0.52	0.51	0.52
P_4	71.6	71.0	71.0	71.7	71.3	0.50	0.61	0.59	0.57	0.57
Mean	72.2	71.6	71.3	72.1	71.8	0.50	0.56	0.56	0.56	0.54
	P	N	PXN			P	N	PXN		
SEd	NS	NS	NS			0.81	0.98	0.63		
CD (P =.05)						1.62	1.95	1.13		

Table 4.25: Effect of sowing method, nutrient application and seed priming on single plant yield (gm) and seed yield per plot (kg) in Kodo Millet at TNAU, Coimbatore during *Kharif* 2017

Treatment	Single plant yield (gm)					Seed yield per plot (kg)				
	N_1	N_2	N_3	N_4	Mean	N_1	N_2	N_3	N_4	Mean
P_1	7.5	8.1	7.9	8.3	7.5	1.30	1.40	1.43	1.55	1.42
P_2	7.8	8.0	9.2	9.6	7.8	1.35	1.39	1.62	1.74	1.53
P_3	8.0	8.2	8.5	9.6	8.0	1.38	1.42	1.52	1.74	1.52
P_4	7.8	8.6	9.4	9.9	7.8	1.35	1.48	1.65	1.79	1.57
Mean	7.5	8.1	7.9	8.3	7.5	1.35	1.42	1.56	1.71	1.51
	P	N	PXN			P	N	PXN		
SEd	0.95	1.6	0.81			1.31	1.57	0.88		
CD(P= 0.05)	1.92	2.32	1.64			2.72	3.16	182		

Table 4.26: Effect of sowing method, nutrient application and seed priming on resultant seed germination and shoot length (cm) in Kodo Millet at TNAU, Coimbatore during *Kharif* 2017

Treatment	Germination %					Shoot length (cm)				
	N_1	N_2	N_3	N_4	Mean	N_1	N_2	N_3	N_4	Mean
P_1	97	97	99	98	98	6.51	6.29	7.48	7.84	7.03
P_2	96	98	97	96	97	5.73	7.13	6.15	5.84	6.21
P_3	97	97	98	96	97	6.60	6.23	6.48	6.32	6.41
P_4	97	99	98	97	98	6.27	7.36	7.15	6.84	6.91
Mean	97	97	98	97	97	6.28	6.75	6.82	6.71	6.64
	P	N	PXN			P	N	PXN		
SEd	0.58	0.4	0.42			0.33	0.57	0.76		
CD (P = 0.05)	1.21	0.84	0.88			0.66	1.18	1.56		

Table 4.27: Effect of sowing method, nutrient application and seed priming on resultant seed root length and vigour index in Kodo Millet at TNAU, Coimbatore during *Kharif* 2017

Treatment	Root length (cm)					Vigour index				
	N_1	N_2	N_3	N_4	Mean	N_1	N_2	N_3	N_4	Mean
P_1	11.04	10.87	12.16	12.57	11.66	1706	1659	1937	2004	1826
P_2	10.26	11.71	10.83	10.57	10.84	1538	1841	1640	1579	1649
P_3	11.13	10.81	11.16	11.05	11.04	1723	1648	1722	1671	1691
P_4	10.80	11.94	11.83	11.57	11.54	1659	1905	1852	1789	1801
Mean	10.81	11.33	11.50	11.44	11.27	1657	1763	1788	1761	1742
	P	N	PXN			P	N	PXN		
SEd	0.48	0.53	0.46			41	33	43		
CD (P = 0.05)	1.01	1.11	0.97			86	69	90		

ANGRAU, Guntur

Results: Results of the study indicated that grain yield obtained in organic and inorganic fertilizers in combination treatment N4 (3789kg/ha) was significantly high as compared to no fertilizer application (1838 kg/ha) and either organic (3109kg/ha) or inorganic (3451kg/ha) nutrient management practices. Among different priming methods, seed priming with 20% liquid *Pseudomonas fluorescence* was recorded highest grain yield (3538 kg/ha) and it was on par with Seed priming with 2% KH_2PO_4 (3240 kg/ha). Treatment N4 has recorded highest germination percent (82.58) and vigour index (777.20), whereas, lowest were recorded in the treatment N1 (55.83 and 523.58 respectively). Among the priming methods, germination percent in priming with 20% liquid *Pseudomonas fluorescence* (73.67) was on par with seed priming with 2% KH_2PO_4 (75.92). Vigour index was significantly high in seed priming with 20% Liquid *Pseudomonas fluorescence* (733.39).

Table 4.28: Effect of nutrient management and seed priming on growth and yield attributes of Kodo millet at ANGRAU, Guntur during *Kharif* 2017

Treatments	Field emergence (%)	Plant height (cm)	Chlorophyll content (SPAD readings)	Days to 1st flowering	Productive branches/ plant	Panicle weight/ plot (kg)
Nutrient management(N)						
N1: No fertilizer	75.8	70.80	23.40	69.42	6.73	1.73
N2:125 kg Neem+1250kg Vermicompost per ha or 12.5 tons FYM per ha.	79.1	82.36	29.32	77.75	8.87	2.31
N3: 50kg Urea+ 50 kg SSP and 50kg MOP per ha + Top dressing urea at 3-4 weeks after transplanting + 2% Borax spray	81.0	95.58	38.11	78.42	10.15	3.36
N4: 125 kg Neem+1250kg Vermicompost per ha or 12.5 tons FYM per ha + 50kg Urea + 50 kg SSP and 50kg MOP per ha + Top dressing urea at 3-4 weeks after transplanting + 2% Borax spray	87.1	106.73	47.74	82.17	11.85	4.5
S.Em ±	1.55	2.18	1.09	1.40	0.41	0.11
C.D	5.37	7.55	3.77	4.83	1.40	0.38
Seed priming (P)						
P1:Control (No priming)	72.3	84.92	31.18	79.17	8.00	2.49
P2 :Hydro priming	81.4	87.36	34.01	77.67	9.05	2.81
P3:Seed priming with 2% KH_2PO_4	83.6	90.69	36.04	76.50	10.02	3.13
P4: Seed priming with 20% Liquid *Pseudomonas fluorescence*	85.5	92.50	37.34	74.42	10.53	3.45
S.Em ±	1.67	1.93	1.47	1.13	0.50	0.14
C.D	4.88	5.62	4.29	5.07	1.47	0.42
Interaction	NS	NS	NS	NS	NS	NS

Table 4.29: Effect of nutrient management and seed priming on yield and seed quality indices of Kodo millet at ANGRAU, Guntur during *Kharif* 2017

Treatments	Seed yield (kg/ha)	100 seed weight (g)	Seed recovery %	Germination %	Vigour index on length basis
Nutrient management(N)					
N1: No fertilizer	1837.50	0.49	47.81	55.83	523.58
N2:125 kg Neem+1250kg Vermicompost per ha or 12.5 tons FYM per ha.	3109.44	0.65	61.25	68.00	584.58

N3: 50kg Urea+ 50 kg SSP and 50kg MOP per ha+ Top dressing urea at 3-4 weeks after transplanting+ 2% Borax spray	3451.39	0.77	68.49	77.33	711.42
N4: 125 kg Neem+1250kg Vermicompost per ha or 12.5 tons FYM per ha+50kg Urea+ 50 kg SSP and 50kg MOP per ha+ Top dressing urea at 3-4 weeks after transplanting+ 2% Borax spray	3788.89	0.90	74.48	82.58	777.20
S.Em ±	63.54	0.01	1.56	1.53	13.36
C.D	219.87	0.05	8.55	5.31	46.25
Seed priming(P)					
P1: Control (No priming)	2447.22	0.65	59.10	65.08	570.30
P2 : Hydro priming	2961.67	0.69	61.25	69.08	616.63
P3: Seed priming with 2% KH2PO4	3240.28	0.72	64.31	73.67	676.47
P4: Seed priming with 20% Liquid *Pseudomonas fluorescence*	3538.06	0.76	67.36	75.92	733.39
S.Em ±	104.01	0.02	1.32	1.10	12.76
C.D	303.58	0.06	3.86	3.20	6.81
Interaction	NS	NS	NS	NS	NS

Prosomillet *(Panicum miliaceum)*

Observations of PI

Unified observations

Effect of nutrient management and seed priming on yield and seed quality attributing traits in Proso Millet.

The experiment was conducted at two centres namely ANGRAU, Guntur and UAS, Bangalore. Among all the treatment combinations, seed priming with 20 % liquid *Pseudomonas fluoresces* and application of 125 kg Neem + 1250 kg Vermicompost (or) 12.5 tons FYM/ha + 50 kg urea + 50 kg super phosphate and 50 kg muriate of potash per ha + Top dressing urea at 3-4 weeks after transplanting + 2% Borax spray was found better as compared to other treatments. The increase in seed yield/ha, germination and vigour index was 133.5, 14.6 and 64.2%, respectively over control.

Individual Centre wise Observations

UAS, Bangalore

Results:

Effect of Nutrient Management on plant growth, seed yield and quality attributes of proso millet cultivar *TNAU-145*

The nutrient management treatments had significant effect on growth, seed yield and quality parameters of proso-millet. The nutrient dosage of 125 kg Neem + 1250 kg vermicompost per ha + 50 kg Urea + 50 kg SSP and 50 kg MOP per ha + Top dressing urea at 3-4 weeks after transplanting + 2 % Borax recorded highest field emergence (83.17%), plant height (140.38cm), tillers (7.93), panicle weight (2.262kg/plot), seed yield (19.58g/plant; 1.572kg/plot & 15.72q/ha), seed recovery (98.71%) and resultant seed quality. This was followed by N_3 (pure chemical fertilizers) with recorded seed yield (16.70g/plant; 1.261kg/plot & 12.61q/ha) and seed recovery (99.02%). The lowest of all parameters were recorded under control N_1 (no fertilizer).

Effect of Priming on plant growth, seed yield and quality attributes of proso milletcultivar *TNAU-145*

Priming treatments improved the seed yield & attributing characters compared to control. The priming treatment P_4 **(**Seed priming with 20 % liquid *Pseudomonas fluoresces* by adopting seed to solution ratio of 1:1 and then mixing in 2.5-3 g/kg carbendazim) was found to enhance the seed yield (19.40 g/plant; 1.526 kg/plot & 15.26 q/ha), field emergence (82.83%) and quality *viz.,* seed germination (78.75%) and vigour index (1583) significantly over control P_1 (field emergence-74.25% and seed yield 9.55q/ha). This was closely followed by P_3 (seed priming with 2% KH_2PO_4 for 6h) with field emergence (79.42%) and seed yield (12.89q/ha) (Table 4.30 & 4.31).

Interaction effect on the plant growth, seed yield and quality attributes of proso millet cultivar *TNAU-145*

Among the interactions, seed priming P_4 (20 % liquid *Pseudomonas fluoresces* for 6h) with N_4 ***(***125 kg Neem + 1250 kg vermicompost per ha + 50 kg Urea + 50 kg SSP and 50 kg MOP per ha + Top dressing urea at 3-4 weeks after transplanting + 2 % Borax) recorded higher seed yield (20.58q/ha) and resultant quality. It was closely followed by N_4 (125 kg Neem + 1250 kg vermicompost per ha + 50 kg Urea + 50 kg SSP and 50 kg MOP per ha + Top dressing urea at 3-4 weeks after transplanting + 2 % Borax) P_3 (seed priming with 2% KH_2PO_4 for 6h) with seed yield (16.71q/ha) and lowest seed yield (9.12q/ha) was recorded among the interaction $N_1 \times P_1$ (No priming and no fertilizer application).

Conclusion: The direct sowing of proso millet with fertilizer dose 125 kg Neem + 1250 kg vermicompost per ha + 50 kg Urea + 50 kg SSP and 50 kg MOP per ha + Top dressing urea at 3-4 weeks after transplanting + 2 % Borax spray at flowering stage and seed priming with 20 % liquid *Pseudomonas fluoresces* by adopting seed to solution ratio of 1:1 and then mixing in 2.5-3 g/kg carbendazim and their combinations were found better to enhance the growth, seed yield, its contributing characters and quality.

Field view of experimental plot of proso millet at UAS, Bangalore during *Kharif* 2017

Table 4.30: Effect of seed priming, nutrient management on plant growth and seed yield of proso millet *cv.* TNAU-145 at UAS, Bangalore during *Kharif* 2017

Treatment	Field emergence (%)	Days to 1st flowering	Chlorophyll content (SPAD -502)	Plant height (cm)	No. of tillers	Panicle weight (kg/plot)	Seed yield (g/ plant)	Seed yield (kg /plot)	Seed yield (q/ha)	Seed recovery (%)
Nutrient Management										
N_1	74.33	47.75	30.50	130.05	7.30	1.797	16.53	1.118	11.18	98.80
N_2	76.67	47.08	32.04	125.43	6.85	1.610	15.07	0.959	9.59	98.88
N_3	78.92	45.83	33.33	132.68	6.88	2.104	16.70	1.261	12.61	99.02
N_4	83.17	45.58	34.25	140.38	7.93	2.262	19.58	1.572	15.72	98.71
Mean	**78.27**	**46.56**	**32.53**	**132.13**	**7.24**	**1.943**	**16.97**	**1.227**	**12.27**	**98.85**
SEm ±	**1.275**	**0.716**	**0.743**	**1.485**	**0.385**	**0.069**	**0.461**	**0.088**	**0.883**	**0.310**
CD (0.05P)	**3.787**	**2.127**	**2.207**	**4.411**	**1.143**	**0.205**	**1.369**	**0.261**	**2.623**	**0.920**
Priming treatments										
P_1	74.25	47.08	33.42	125.61	6.85	1.606	14.38	0.955	9.55	97.98
P_2	76.58	46.83	30.93	131.35	7.07	1.909	16.38	1.140	11.40	99.13
P_3	79.42	46.17	32.47	133.10	7.37	1.932	17.72	1.290	12.89	99.14
P_4	82.83	46.17	33.31	138.48	7.68	2.327	19.40	1.526	15.26	99.16
Mean	**78.27**	**46.56**	**32.53**	**132.12**	**7.24**	**1.943**	**16.97**	**1.227**	**12.27**	**98.85**
SEm ±	**0.499**	**0.346**	**0.689**	**2.082**	**0.1914**	**0.097**	**0.6688**	**0.0625**	**0.6246**	**0.1923**
CD (0.05P)	**1.482**	**1.028**	**2.047**	**6.185**	**0.568**	**0.288**	**1.986**	**0.186**	**1.855**	**0.571**
N x P (Nutrient management × seed priming)										
N_1P_1	71.33	48.67	31.76	124.27	6.93	1.481	11.47	0.912	9.12	98.08
N_1P_2	72.67	48.33	30.36	128.00	7.27	1.790	17.80	1.107	11.07	98.92
N_1P_3	75.00	46.33	29.80	131.20	7.67	1.813	18.20	1.149	11.49	99.15
N_1P_4	78.33	47.67	30.09	136.73	7.33	2.105	18.67	1.304	13.04	99.05
N_2P_1	72.00	47.67	33.35	119.67	6.73	1.437	12.27	0.765	7.64	98.45
N_2P_2	76.00	47.00	29.61	124.33	6.80	1.491	13.20	0.861	8.60	99.19
N_2P_3	78.33	47.00	32.20	122.53	6.67	1.428	16.07	0.945	9.44	99.15
N_2P_4	80.33	46.67	33.01	135.20	7.20	2.084	18.73	1.268	12.67	98.72
N_3P_1	74.33	46.33	35.59	127.07	7.00	1.861	17.60	1.068	10.68	98.53
N_3P_2	77.33	46.00	32.33	134.33	6.73	2.079	15.20	1.108	11.08	99.06
N_3P_3	80.00	46.00	32.85	136.27	6.87	2.035	15.87	1.393	13.93	99.23
N_3P_4	84.00	45.00	32.53	133.07	6.93	2.441	18.13	1.476	14.75	99.25
N_4P_1	79.33	45.67	32.97	131.47	6.73	1.645	16.20	1.075	10.74	96.87
N_4P_2	80.33	46.00	31.43	138.73	7.47	2.277	19.33	1.485	14.84	99.36
N_4P_3	84.33	45.33	35.01	142.40	8.27	2.450	20.73	1.672	16.71	99.02
N_4P_4	88.67	45.33	37.60	148.93	9.27	2.676	22.07	2.058	20.58	99.60
Mean	**78.27**	**46.56**	**32.53**	**132.13**	**7.241**	**1.943**	**16.97**	**1.227**	**12.273**	**98.85**
SEm ±	**0.655**	**0.674**	**1.065**	**2.773**	**0.496**	**0.119**	**1.815**	**0.154**	**1.540**	**0.620**
CD (0.05P)	**1.946**	**2.002**	**3.164**	**8.238**	**1.473**	**0.353**	**5.392**	**0.457**	**4.575**	**1.841**
CV (%)	**1.45**	**2.51**	**5.67**	**3.64**	**11.88**	**10.64**	**18.53**	**21.73**	**21.73**	**1.09**

Table 4.31: Effect of seed priming and nutrient management on seed quality of proso millet cultivar TNAU-145 at UAS, Bangalore during *Kharif* 2017

Treatment	Germination (%)	Test weight (g)	SVI-I
N_1	74.33	1.795	1482
N_2	75.42	1.791	1496
N_3	75.92	1.802	1442
N_4	78.42	1.872	1577
Mean	**76.02**	**1.815**	**1499**
SEm ±	**0.943**	**0.109**	**25.29**
CD (0.05P)	**2.801**	**0.323**	**75.1**
P_1	73.50	1.651	1386

P_2	75.33	1.665	1439
P_3	76.50	1.947	1589
P_4	78.75	1.996	1583
Mean	**76.02**	**1.814**	**1499**
SEm ±	**1.557**	**0.087**	**37.79**
CD (0.05P)	**4.625**	**0.258**	**112.3**
N x P (Nutrient management × seed priming)			
N_1P_1	69.333	1.468	1269
N_1P_2	74.667	1.430	1486
N_1P_3	75.667	2.223	1623
N_1P_4	77.667	2.059	1550
N_2P_1	76.000	1.705	1501
N_2P_2	72.333	1.771	1396
N_2P_3	74.333	1.778	1528
N_2P_4	79.000	1.910	1558
N_3P_1	72.000	1.717	1299
N_3P_2	75.333	1.653	1364
N_3P_3	78.000	1.866	1532
N_3P_4	78.333	1.967	1571
N_4P_1	76.667	1.714	1475
N_4P_2	79.000	1.805	1508
N_4P_3	78.000	1.922	1672
N_4P_4	80.000	2.046	1652
Mean	**76.02**	**1.815**	**1499**
SEm ±	**2.290**	**0.217**	**101.4**
CD (0.05P)	**6.803**	**0.645**	**301.2**
CV (%)	**5.22**	**10.76**	**11.72**

Nutrient management

N_1: No fertilizer; **N_2:** 125 kg Neem + 1250 kg Vermicompost per ha; **N_3:** 40 kg Urea + 20 kg SSP and 10 kg MOP per ha + Top dressing urea at 3-4 weeks after transplanting + 2 % Borax; **N_4:** 125 kg Neem + 1250 kg Vermicompost per ha + 40 kg Urea + 20 kg SSP and 10 kg MOP per ha + Top dressing urea at 3-4 weeks after transplanting + 2 % Borax

Priming treatments

P_1: Control ;**P_2:** Hydro-priming for 6h ; **P_3:** Seed priming with 2% KH_2PO_4 for 6h
P_4: Seed priming with 20 % liquid *Pseudomonas fluorescens*.

ANGRAU, Guntur

Results: Results of the study indicated that grain yield obtained in organic and inorganic fertilizers in combination treatment N4 (1070kg/ha) was significantly high as compared to no fertilizer application (663 kg/ha) and either organic (819kg/ha) or inorganic (907kg/ha) nutrient management practices. Among the seed priming methods, on par grain yield was attained in the treatments P4 and P3 (913 kg/ha and 872 kg/ha respectively). Seed qualitative parameters *viz*., germination percent and vigour index were significantly affected by application of organic and inorganic fertilizers in combination (N4) and seed priming with 20% Liquid *Pseudomonas fluorescence* and 2% KH_2PO_4.

Table 4.32: Effect of nutrient management and seed priming on growth and yield attributes of Proso millet at ANGRAU, Guntur during *Kharif* 2017

Treatments	Field emergence (%)	Plant height (cm)	Chlorophyll content (SPAD reading)	Days to 1^{st} flowering	Productive branches/ plant	Panicle weight/ plot (kg)

Nutrient management(N)						
N1: No fertilizer	80.3	80.2	21.1	23.1	2.4	0.99
N2: 125 kg Neem + 1250kg Vermicompost per ha or 12.5 tons FYM per ha.	81.7	91.8	24.4	26.8	3.5	1.58
N3: 50kg Urea+ 50 kg SSP and 50kg MOP per ha+ Top dressing urea at 3-4 weeks after transplanting+ 2% Borax spray	82.2	104.4	27.4	27.2	4.6	2.0
N4: 125 kg Neem +1250kg Vermicompost per ha or 12.5 tons FYM per ha+50kg Urea+ 50 kg SSP and 50kg MOP per ha+ Top dressing urea at 3-4 weeks after transplanting + 2% Borax spray	84.2	113.2	31.5	29.2	5.5	2.5
S.Em ±	1.22	2.31	1.06	0.33	0.09	0.04
C.D	NS	7.98	3.66	1.13	0.31	0.13
Seed priming (P)						
P1: Control (No priming)	72.7	94.6	24.4	27.9	3.6	1.5
P2 : Hydro priming	81.3	96.4	25.8	26.6	3.8	1.6
P3: Seed priming with 2% KH_2PO_4	85.6	98.3	26.6	26.1	4.2	1.9
P4: Seed priming with 20% Liquid *Pseudomonas fluorescence*	88.8	100.4	27.7	25.6	4.4	2.0
S.Em ±	1.04	1.36	0.63	0.48	0.06	0.05
C.D	3.05	3.97	8.34	1.40	0.18	0.14
Interaction	NS	NS	NS	NS	NS	NS

Table 4.33: Effect of nutrient management and seed priming on yield and seed quality indices of Proso millet at ANGRAU, Guntur during *Kharif* 2017

Treatments	Seed yield (kg/ha)	100 seed weight (g)	Seed recovery %	Germination %	Vigour index on length basis
Nutrient management(N)					
N1: No fertilizer	663.0	0.44	46.0	52.6	557.5
N2: 125 kg Neem +1250kg Vermicompost per ha or 12.5 tons FYM per ha.	818.6	0.51	54.4	68.1	684.9
N3: 50kg Urea + 50 kg SSP and 50kg MOP per ha + Top dressing urea at 3-4 weeks after transplanting + 2% Borax spray	906.8	0.55	62.2	75.6	737.0
N4: 125 kg Neem+1250kg Vermicompost per ha or 12.5 tons FYM per ha + 50kg Urea + 50 kg SSP and 50kg MOP per ha + Top dressing urea at 3-4 weeks after transplanting + 2% Borax spray	1069.7	0.60	74.7	82.4	773.8
S.Em ±	20.56	0.02	1.10	1.74	29.5
C.D	71.16	0.08	3.80	6.03	102.2
Seed priming (P)					
P1: Control (No priming)	807.5	0.50	55.9	66.1	627.9
P2: Hydro priming	835.2	0.53	58.0	68.9	662.0
P3: Seed priming with 2% KH2PO4	872.4	0.53	60.9	70.0	715.8
P4: Seed priming with 20% liquid *Pseudomonas fluorescence*	913.0	0.55	62.5	73.7	747.5
S.Em ±	18.02	0.01	1.24	1.74	19.4
C.D	52.59	0.03	3.62	5.07	56.7
Interaction	NS	NS	NS	NS	

Little millet *(Panicum sumatrense)*

Observations of PI

Unified Observations

Effect of nutrient management and seed priming on yield and seed quality attributing traits in Little Millet

During kharif 2017, this experiment was conducted at two locations namely TNAU Coimbatore and JNKVV Jabalpur. Among all the treatment combinations, seed priming with 20 % liquid *Pseudomonas fluoresces* and application of 125 kg Neem + 1250 kg Vermicompost (or) 12.5 tons FYM/ha + 50 kg urea + 50 kg super phosphate and 50 kg muriate of potash per ha + top dressing urea at 3-4 weeks after transplanting + 2% Borax spray was found superior and uniformly better in both the locations. Pooled analysis of data of two locations revealed that there was 32.5, 7.7 and 11.3% increase due to the treatment in seed yield/ha, germination percentage and vigour index, respectively over the control.

Individual Centre wise Observations

JNKVV, Jabalpur

Results: The experiment was conducted with little millet variety JK 8 as per technical programme during *Kharif* 2017. Sowing was done on 08.07.2017 in a spacing 30 × 10 cm. The seeds were treated with carbandazim @ 2.5 gkg^{-1} seeds before sowing. All the four proposed priming treatments were given on 04.07.2017. Recommended dose of fertilizers were applied as per technical programme.

Effect of nutrient management on plant growth, seed yield and quality attributes

The nutrient management treatments had significant effect on seed yield and attributing traits of little millet. Highest field emergence %, plant height, chlorophyll content, number of tillers/ plant, panicle per plot, seed yield per plant and seed yield (q/ha) were recorded in N_4 (125 kg Neem + 1250 kg Vermicompost/ ha + 50 kg Urea + 50 kg Super phosphate and 50 kg Muriate of potash per ha followed by N_3 (50 kg Urea + 50 kg Super phosphate and 50 kg Muriate of potash per ha).

Effect of priming on plant growth, seed yield and quality attributes

The priming treatment had significant effect on plant growth, seed yield and quality attributes. Highest field emergence %, chlorophyll content, no. of tillers/ plant, seed yield per plant and seed yield (q/ha) were noticed in P_3 (Seed priming with 2% KH_2PO_4 for 6 hour) followed by P_4 (Seed Priming with 20% liquid *Pseudomonas fluorescens)*.

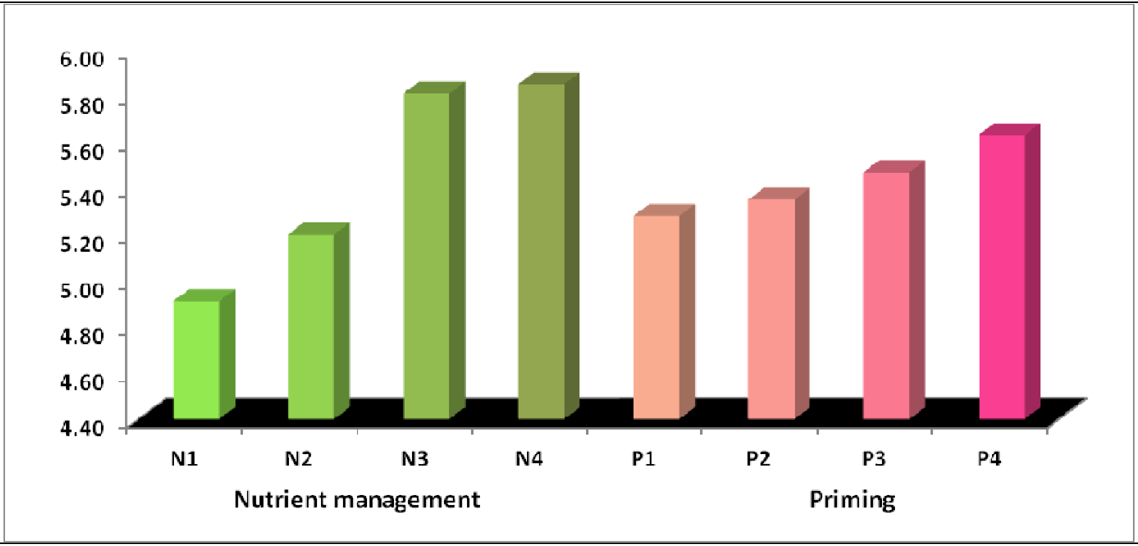
Interaction effect of sowing method, nutrient management and priming on plant growth, seed yield and quality attributes

Considering different treatments, seed priming with P_4 (Seed Priming with 20% liquid *Pseudomonas fluorescens*) with N_4 (125 kg Neem + 1250 kg Vermicompost/ ha + 50 kg Urea + 50 kg Super phosphate and 50 kg Muriate of potash per ha) recorded higher seed yield under direct sown condition. It was closely followed by seed priming with P_3 (Seed priming with 2% KH_2PO_4 for 6 hour) in combination with N_4 (125 kg Neem + 1250 kg Vermicompost/ ha + 50 kg Urea + 50 kg Super phosphate and 50 kg Muriate of potash per ha) under direct sown condition.

Conclusion: Therefore, it is concluded that direct sowing with fertilizer dose 125 kg Neem + 1250 kg Vermicompost/ ha + 50 kg Urea + 50 kg Super phosphate and 50 kg Muriate of potash per ha and seed priming with 20% liquid *Pseudomonas fluorescens* were found better for yield and its attributing traits.

Table 4.34: Seed yield and yield attributing characters of little millet as influenced by nutrient management and priming at JNKVV, Jabalpur during *Kharif* 2017

Main plot (Nutrient Management)	Sub Plot (Priming)	Field Emergence %	Plant Height at 30 days	Plant Height at harvest	Chlorophyll content	Days to first flowering	Days to 50% flowering	No. of tillers/ plant	Seed yield/ plant (g)	100 seed weight (g)	Seed Yield q/ha	Germination %	Vigour Index I
N1	P1	64.33	33.00	55.18	25.33	35.00	41.50	2.67	2.05	0.15	4.72	80.00	872.00
	P2	66.67	33.31	57.07	25.75	35.00	41.20	3.33	2.16	0.15	4.84	81.20	891.33
	P3	68.67	35.33	58.08	27.93	33.00	29.92	3.33	2.19	0.19	5.16	84.67	967.67
	P4	66.33	34.33	57.92	21.39	34.00	40.50	2.67	2.07	0.17	4.91	81.67	910.67
N2	P1	70.00	38.67	58.59	25.75	39.00	45.34	3.33	2.20	0.15	5.15	73.33	950.00
	P2	71.33	39.00	59.05	26.57	38.00	45.00	3.67	2.20	0.15	5.18	78.00	956.00
	P3	75.33	40.00	59.39	32.94	37.00	43.70	3.67	2.40	0.20	5.26	82.50	975.67
	P4	74.33	36.00	59.80	29.71	38.00	44.73	3.33	2.30	0.15	5.22	81.67	974.67
N3	P1	75.00	39.00	55.23	31.77	40.00	46.50	3.33	2.43	0.15	5.63	76.00	920.33
	P2	73.33	43.67	60.22	32.33	38.00	44.70	4.00	2.46	0.21	5.73	83.00	935.33
	P3	76.00	43.67	61.87	33.67	35.00	42.60	4.00	2.51	0.22	6.03	85.33	956.33
	P4	74.33	41.67	60.34	32.67	35.31	44.70	4.00	2.39	0.17	5.72	83.00	938.67
N4	P1	76.00	41.67	60.75	31.58	40.00	44.32	3.33	2.58	0.16	5.61	84.00	946.33
	P2	76.67	44.33	60.85	33.42	37.00	44.00	4.00	2.58	0.18	5.65	85.00	961.00
	P3	77.33	45.33	61.34	31.84	36.00	43.30	4.00	2.65	0.17	5.91	87.67	1069.33
	P4	77.03	45.67	64.38	34.17	35.00	40.26	4.33	2.83	0.19	6.17	91.33	1099.67
Nutrient Management (Main plot)	No fertilizer	66.50	33.99	57.06	25.10	34.25	38.28	3.00	2.12	0.16	4.91	81.89	910.42
	12.5 tons FYM/ha	72.75	38.42	59.21	28.74	38.00	44.69	3.50	2.27	0.16	5.20	78.88	964.09
	50 kg Urea +50 kg Super phosphate and 50 kg MOP +	74.67	42.00	59.41	32.61	37.08	44.63	3.83	2.45	0.19	5.81	81.83	937.67
	12.5 tons FYM/ha+ 50 kg Urea +50 kg Super phosphate and 50 kg MOP	76.76	44.25	61.83	32.75	37.00	42.97	3.92	2.66	0.18	5.85	87.00	1019.08
Priming (Sub plot)	No priming	71.33	38.09	57.44	28.61	38.50	44.42	3.17	2.32	0.15	5.28	78.33	922.17
	Hydro priming for 6 hours	72.00	40.08	59.30	29.52	37.00	43.73	3.75	2.35	0.17	5.35	81.80	935.92
	Seed priming with 2% KH_2PO_4 for 6 hours	74.33	41.08	60.17	31.60	35.25	39.88	3.75	2.44	0.20	5.47	85.04	992.25
	Seed priming with 20% liquid *P. fluorescens*	73.01	39.42	60.61	29.49	35.58	42.55	3.58	2.40	0.17	5.63	84.42	980.92
Nutrient Management	CD at 5%	1.7174	3.1536	46.1115	1.306	26.4728	31.405	5.653	5.794	1.966	5.291	34.195	487.047
Priming	CD at 5%	19.9893	19.9893	46.1115	1.306	26.4728	31.405	5.653	5.794	1.966	5.291	34.195	487.047
Interactions	CD at 5%	3.4348	6.3073	92.225	2.613	50.9457	62.811	11.307	11.589	3.932	10.583	68.391	974.095



Effect of nutrient management and priming on seed yield of little millet

TNAU, Coimbatore

Result: The treatments have significant effect on seed yield and resultant seed quality in little millet. The fertilizer treatment of 125 kg neem + 1250 kg vermicompost per ha + 50 kg urea + 50 kg Super phosphate + 50 kg Muriate of potash + Top dressing urea + 2 % Borax spray in direct sowing recorded the maximum number of tillers (9.8), Number of panicle per plant (9.8), single plant seed yield (7.6 gm), seed yield per plot (1.59 kg) compare to 7.6, 9.05, 6.2 gm and 1.26 kg respectively in the direct sowing.

Priming with 20 % liquid *Pseudomonas fluorescens* recorded the maximum number of tillers 9.6, Number of panicle per plant (9.6), single plant seed yield (7.1 gm),seed yield per plot (1.74 kg) compare to 7.8, 9.86, 6.0 gm and 1.20 kg respectively.

Fertilizer application of 125 kg neem + 1250 kg vermicompost per ha + 50 kg urea + 50 kg Super phosphate + 50 kg Muriate of potash + Top dressing urea + 2 % Borax spray in combination of priming with 20 % liquid *Pseudomonas fluorescens* recorded highest plant height (94.1 cm), Number of panicle per plant (9.7), single plant seed yield (8.2 gm), seed yield per plot (1.96 kg) compare to 79.6 cm, 6.3, 6.1gm and 1.16 kg respectively in control.

- Direct sowing recorded higher single plant seed yield and seed yield per plot.
- Priming with 20 % liquid *Pseudomonas fluorescens* combined with the treatment of 125 kg neem + 1250 kg vermicompost per ha + 50 kg urea + 50 kg Super phosphate + 50 kg Muriate of potash + Top dressing urea + 2 % Borax spray under direct sowing recorded the highest single plant seed yield and seed yield per plot.

Table 4.35: Effect of sowing method, nutrient application and seed priming on number of tillers and plant height (cm) in little Millet at TNAU, Coimbatore during *Kharif* 2017

	Number of tillers per plant					Plant height (cm)				
	N_1	N_2	N_3	N_4	Mean	N_1	N_2	N_3	N_4	Mean
P_1	8.3	9.6	9.7	10.0	9.4	79.6	83.4	87.0	82.7	83.2
P_2	9.6	10.1	11.6	12.1	10.9	81.5	86.7	91.0	92.9	88.0
P_3	9.8	9.8	11.1	11.3	10.5	82.0	92.5	90.8	89.4	88.7
P_4	10.6	11.3	12.2	11.0	11.3	81.1	89.6	89.1	94.1	88.5
Mean	9.6	10.2	11.2	11.1	10.5	81.1	88.1	89.5	89.8	87.1

	P	N	PXN		P	N	PXN	
SEd	2.98	3.86	4.26		2.76	4.95	6.63	
CD (P = 0.05)	6.12	7.94	8.64		5.38	9.66	13.34	

Table 4.36: Effect of sowing method, nutrient application and seed priming on Chlorophyll content and number of panicle per plant in little millet at TNAU, Coimbatore during *Kharif* 2017

	Chlorophyll content					Number of panicle per plant				
	N_1	N_2	N_3	N_4	Mean	N_1	N_2	N_3	N_4	Mean
P_1	61.6	66.6	70.6	66.9	66.4	6.3	8.0	8.3	8.7	7.8
P_2	63.5	69.9	74.6	77.1	71.3	7.6	8.1	10.2	10.8	9.2
P_3	64.0	75.7	74.4	73.6	71.9	7.8	7.8	9.7	10.0	8.8
P_4	63.1	72.8	72.7	78.3	71.7	8.6	9.3	10.8	9.7	9.6
Mean	63.1	71.3	73.1	74.0	70.3	7.6	8.3	9.8	9.8	8.9
	P	N	PXN			P	N	PXN		
SEd	0.73	0.37	1.19			1.64	2.12	2.08		
CD (P=0.05)	1.46	0.74	2.38			3.52	4.32	4.16		

Table 4.37: Effect of sowing method, nutrient application and seed priming on days to first flowering and 100 seed weight (gm) in little Millet at TNAU, Coimbatore during Kharif 2017

	Days to first flowering					100 seed weight (gm)				
	N_1	N_2	N_3	N_4	Mean	N_1	N_2	N_3	N_4	Mean
P_1	55.6	55.0	55.7	54.8	55.3	0.29	0.26	0.24	0.25	0.26
P_2	55.8	54.6	55.5	54.5	55.1	0.26	0.24	0.28	0.31	0.27
P_3	54.8	54.0	54.8	53.8	54.4	0.29	0.25	0.27	0.25	0.27
P_4	54.6	53.8	55.0	53.8	54.3	0.26	0.36	0.34	0.31	0.32
Mean	55.2	54.4	55.3	54.2	54.8	0.28	0.28	0.28	0.28	0.28
	P	N	PXN			P	N	PXN		
SEd	1.45	2.24	1.64			0.72	NS	NS		
CD (P = 0.05)	2.92	4.46	3.28			1.56				

Table 4.38: Effect of sowing method, nutrient application and seed priming on single plant yield (gm) and seed yield per plot (kg) in Little Milletat TNAU, Coimbatore during Kharif 2017

	Single plant yield (gm)					Seed yield per plot (kg)				
	N_1	N_2	N_3	N_4	Mean	N_1	N_2	N_3	N_4	Mean
P_1	6.1	4.6	6.3	6.8	6.0	1.16	1.00	1.26	1.37	1.20
P_2	6.2	6.0	7.4	7.6	6.8	1.18	1.24	1.45	1.51	1.35
P_3	6.5	5.3	6.9	7.7	6.6	1.23	1.12	1.36	1.53	1.31
P_4	5.8	6.3	7.9	8.2	7.1	1.46	1.64	1.88	1.96	1.74
Mean	6.2	5.6	7.1	7.6	6.6	1.26	1.25	1.49	1.59	1.40
	P	N	PXN			P	N	PXN		
SEd	1.86	1.92	1.36			1.24	1.12	1.45		
CD (P = 0.05)	3.74	3.86	2.76			2.35	2.26	2.92		

Table 4.39: Effect of sowing method, nutrient application and seed priming on resultant seed germination and shoot length (cm) in Little Millet at TNAU, Coimbatore during Kharif 2017

	Germination %	Shoot length (cm)

	N_1	N_2	N_3	N_4	Mean	N_1	N_2	N_3	N_4	Mean
P_1	91	93	90	90	91	4.6	6.1	3.7	3.6	4.5
P_2	92	91	91	91	91	4.2	4.1	5.0	4.4	4.4
P_3	91	91	90	92	91	4.8	4.7	3.5	4.1	4.3
P_4	91	92	91	91	91	4.7	5.1	4.4	4.9	4.8
Mean	91	92	91	91	91	4.6	5.0	4.1	4.2	4.5
	P	N	PXN			P	N	PXN		
SEd	NS	0.23	0.24			NS	0.26	0.28		
CD (P=0.05)		0.48	0.46				0.52	0.56		

Table 4.40: Effect of sowing method, nutrient application and seed priming on resultant seed root length and vigour index in Little Millet at TNAU, Coimbatore during Kharif 2017

	Root length (cm)					Vigour index				
	N_1	N_2	N_3	N_4	Mean	N_1	N_2	N_3	N_4	Mean
P_1	10.14	9.66	9.29	11.16	10.06	1337	1463	1169	1326	1324
P_2	11.77	9.70	10.55	10.00	10.51	1467	1257	1411	1311	1362
P_3	10.41	10.33	11.05	10.66	10.61	1386	1371	1306	1355	1355
P_4	10.33	10.66	10.02	10.49	10.38	1371	1447	1315	1400	1383
Mean	10.66	10.09	10.23	10.58	10.39	1390	1385	1300	1348	1356
	P	N	PXN			P	N	PXN		
SEd	0.17	0.21	0.19			34	36	27		
CD (P = 0.05)	0.36	0.44	0.42			70	72	56		

Experiment 5: Planting windows for quality seed production of soybean in offseason

Centers	**Varieties**
UAS- Dharwad (Dharwad and Haveri)	DB 21 (October to January end)
UAS, Bangalore	JS 335 (Mandya) (in paddy fallows November to Jan.)
MAU, Parbhani	MAUS 162 (October to January end)
PJTSAU, Hyderabad	JS 335 (Andhra and Telangana) (October to January end)
JNKVV, Jabalpur	JS 20-34 and JS 20-29 (November to January End)
MPKV, Rahuri	JS 335 and MAUS 162 (September to January)

Objective:

To standardize best planting date off season soybean seed production and to assess seed quality.

Experimental details

Design : FRBD **Replication : Three**
Plot size : 3.6 m × 5.0 m **Sowing : Ridges and furrow**
Spacing : 45 cm × 5 cm

Fertilizer & Micro nutrients

50% higher dose than RDF 20:80:40 kg/ha (415kg DAP /ha), Ridge sowing + soil application of $ZnSO_4$ @ 30 kg/ha along with foliar spray @ 0.5% at 48 and 56 days after sowing

Season: Best date of sowing for off season crop- centers will decide based on their data

Observations to be recorded

A. Growth and yield parameters

1. Field emergence (%)

2. Plant height (cm)
3. Number of primary branches per plant
4. Days to 50% flowering
5. Days to maturity
6. Number of pods per plant
7. Number of seeds per pod
8. Seed yield per ha.
9. Harvest index (%)

B. Flowering and Pod characteristics

1. Days to flower initiation
2. Days to 50% flowering
3. Days to pod maturity
4. Length of pod (cm)
5. Diameter of pod (cm)
6. Shattering (%)

C. Seed Morphometry (Image Analysis)

1. Length of seed (mm)
2. Width of seed (mm)
3. Area of seed (mm^2)
4. Seed Diameter (mm)
5. Seed perimeter (mm)
6. Seed roundness

D. Biochemical parameters

1. Protein content (%)
2. Oil content (%)

Storage study

The seeds from offseason production will be evaluated for seed quality parameters at monthly interval.

1. Germination (%)
2. Moisture content
3. Seed vigour
4. Dry matter production
5. Seed mycoflora
6. Electrical conductivity

Observations of PI

Unified Observations

Effect of planting window on yield and seed quality attributing traits for quality seed production of soybean in off season

The experiment was laid out during off season at six centres namely UAS, Dharwad; UAS, Bangalore; MAU, Parbhani; PJTSAU, Hyderabad; JNKVV, Jabalpur and MPKV, Rahuri with the aim to standardize best planting date for off season soybean seed production and also to assess seed quality. The observations on yield and seed quality attributing traits were recorded as per technical programme. The centre wise best planting period recorded for off season soybean seed production are presented in table 5.1.

Table 5.1: Centre wise best planting window for soybean seed production during off season

Centre	Variety used	Window period	Best window period	Remark/Parameters					
				Normal			Best Window Period		
				Seed Yield q/ha	GP	SV I	Seed Yield q/ha	GP	SV I
UAS, Dharwad	DB 21	Oct. to Jan.	November 1-4	24.45	86.24	2154	18.66	83.69	1893
UAS, Bangalore	JS 335	Nov. to Jan.	December I[st]	19.52	88.33	3150	17.81	95.33	3680
MAU, Parbani	MAUS 162	Oct. to Jan.	November 1 -4	22.05	85.70	2450	18.87	86.00	2485
PJTSAU, Hyderabad	JS 335	Oct. to Jan.	September 3 -4	-	-	-	6.32	99.00	1790
JNKVV, Jabalpur	JS 20-34 JS 95-60 JS 20-29	Nov. to Jan.	December 3-4	11.29 11.00 10.74	94.42 91.00 90.36	3395.34 2874.69 2729.78	8.22 10.37 6.90	92.50 90.47 88.25	3052.50 2700.00 2605.14
MPKV, Rahuri	JS 335	Sept. to Jan.	January 3[rd]	19.71	91.67	3197.53	11.58	87.33	2756.93

zSignificant Observations: Best planting window during off season soybean seed production

Centre	**Best Planting Window**	
	Week	**Date**
UAS, Dharwad	November 1-4	November 1-30
UAS, Bangalore	December I[st]	December 1-7
MAU, Parbani	November 1 -4	November 1 - 30
PJTSAU, Hyderabad (Warangal)	September 3 -4	September 15-30
JNKVV, Jabalpur	December 3-4	December 15-30
MPKV, Rahuri	January 3[rd]	January 15-21

Individual Center wise Observations

JNKVV, Jabalpur

Results: The experiment was laid out using three soybean varieties viz., JS 20-34, JS 95-60 and JS 20-29 in FRBD with five sowing dates. The first date of sowing was 15.12.2016 and subsequently five sowing were done in 10 days interval. Different growth and yield parameters, pod characteristics and seed morpho-metry recorded at different stages.

JS 20-34 and JS 95-60 is early maturing variety compared to JS 20-29 which is a late maturing variety. From the observed data, it was concluded that early sowing dates yielded higher than the late sowing dates. JS 95-60 yielded better than JS 20-34 and JS 20-29 in all the dates of sowing. All three varieties almost recorded low yield in the late sowing dates due to its late maturity characteristic and environmental factors. The size of seeds also declined significantly with late sowing dates. Protein and oil quality also deteriorated with late sowing dates due to various environmental factors. **Conclusion:** Therefore, it is concluded that the variety JS 95-60, JS 20-29 and JS 20-34 could be recommended for sowing up to December 25, as these dates found at par for yield and other parameters.

Table 5.2: Effect of planting windows on yield and attributing traits for quality seed production of soybean in off-season at JNKVV, Jabalpur during *Rabi* 2016-17

Main treatment	Sub treatment	Field Emergence %	Days to 50% flowering	Plant height cm	No. of branches/plant	No. of pods/ plant	Length of pods cm	Width of pods cm	No. of seeds /pod	100 seed weight	Days to flowering	Days to maturity	Seed yield q/ha	HI %	Days to 1st flower bud initiation	Days to first flower	Days to pod maturity
JS 20-34	**10.07.2017**	**85.64**	**48.25**	**37.09**	**8.36**	**35.64**	**4.66**	**0.96**	**2.42**	**11.83**	**67.33**	**95.33**	**11.29**	**37.79**	**34.08**	**62.67**	**90.33**
	15.12.2016	80.00	54.00	34.77	7.33	32.67	4.60	0.93	3.33	10.79	65.00	83.67	8.22	35.36	55.00	57.67	86.33
	25.12.2016	81.67	52.67	35.37	6.77	29.27	4.37	0.89	3.07	9.29	62.00	87.33	7.67	31.63	46.33	52.33	88.00
	05.01.2017	65.00	49.00	31.67	6.57	23.67	4.10	0.91	3.03	8.77	61.00	90.67	6.42	30.48	45.00	49.00	92.67
	15.01.2017	56.67	45.33	24.67	6.03	22.33	3.60	0.88	2.90	8.17	63.33	87.00	5.74	29.43	46.67	52.00	94.67
	25.01.2017	63.33	43.33	24.67	5.47	18.33	3.47	0.90	2.80	8.17	56.33	86.33	4.42	29.43	43.00	52.33	84.67
JS 95-60	**10.07.207**	**82.15**	**48.93**	**75.39**	**7.01**	**65.00**	**4.42**	**0.92**	**2.39**	**11.30**	**30.33**	**102.66**	**11.00**	**32.47**	**34.24**	**25.67**	**91.66**
	15.12.2016	80.33	61.33	36.40	9.63	73.67	5.02	0.94	3.73	11.50	28.33	90.00	10.37	31.27	32.67	41.00	95.00
	25.12.2016	84.00	56.67	34.60	8.27	55.67	4.73	0.94	3.43	10.05	37.00	83.67	9.48	30.97	31.67	35.67	93.00
	05.01.2017	72.67	53.00	25.57	7.27	35.13	4.33	0.96	3.07	10.02	32.00	80.00	8.68	28.45	28.67	35.33	90.00
	15.01.2017	65.00	48.00	24.00	6.07	26.67	4.43	0.97	3.07	9.85	30.00	75.00	8.19	28.58	26.00	32.67	88.00
	25.01.2017	55.00	45.33	21.67	6.00	20.00	4.13	0.97	3.00	8.68	36.33	70.00	7.44	27.58	24.33	35.00	82.00
JS 20-29	**10.07.2017**	**84.11**	**63.15**	**80.58**	**6.32**	**66.36**	**4.37**	**0.94**	**2.59**	**10.77**	**89.67**	**106.00**	**10.74**	**30.76**	**54.34**	**83.33**	**95.33**
	15.12.2016	91.00	78.33	67.67	5.93	54.00	3.93	0.93	5.57	9.73	87.33	137.33	6.90	29.43	37.67	41.67	103.00
	25.12.2016	86.67	75.67	62.33	6.20	49.00	3.77	0.87	5.33	9.27	84.67	135.33	5.52	28.33	34.67	40.67	94.33
	05.01.2017	71.67	74.67	60.67	5.90	43.00	3.60	0.93	5.17	8.50	85.00	128.33	4.86	28.10	33.67	40.67	88.00
	15.01.2017	46.67	71.33	58.67	5.40	40.00	3.30	0.93	4.93	8.07	77.00	124.00	4.58	26.32	31.33	36.67	82.00
	25.01.2017	60.00	69.67	56.00	5.20	36.67	3.30	1.02	4.73	7.27	71.00	119.67	4.28	25.23	29.67	36.00	80.00
Varieties	JS 20-34	69.33	48.87	30.23	6.43	25.25	4.03	0.90	3.03	9.04	61.53	87.00	6.49	31.27	47.20	52.67	89.27
	JS 95-60	71.40	52.87	28.45	7.45	42.23	4.53	0.96	3.26	10.02	32.73	79.73	8.83	29.37	28.67	35.93	89.60
	JS 20-29	74.00	75.00	62.33	5.86	46.50	3.65	0.92	5.25	8.89	83.50	131.25	5.47	28.04	34.33	39.92	91.83
	SEd	1.73	0.34	0.68	0.54	0.68	0.05	0.01	0.03	0.03	0.32	0.49	0.02	0.27	0.04	0.54	0.57
	CD	5.01	1.00	1.97	1.58	1.97	0.14	0.04	0.09	0.11	0.95	1.42	0.07	0.79	1.19	1.56	1.65
Sowing Dates	10.07.2017	83.97	53.44	64.35	7.23	55.67	4.48	0.94	2.47	11.30	62.44	101.33	11.01	33.67	40.89	57.22	92.44
	15.12.2016	83.78	64.56	46.28	7.63	53.44	4.52	0.93	4.21	10.68	62.89	103.67	8.50	32.02	41.78	46.78	94.78
	25.12.2016	84.11	61.67	44.10	7.08	44.64	4.29	0.90	3.94	9.53	61.22	102.11	7.56	30.31	37.56	42.89	91.78
	05.01.2017	69.78	58.89	39.30	6.58	33.93	4.01	0.94	3.76	9.10	59.33	99.67	6.65	29.01	35.78	41.67	90.22
	15.01.2017	64.44	56.00	36.44	6.00	30.67	3.88	0.93	3.71	8.84	59.44	96.78	6.26	28.70	35.44	41.78	90.22
	25.01.2017	55.00	53.33	35.00	5.62	26.11	3.63	0.93	3.58	8.31	53.89	93.44	5.48	27.78	32.89	41.33	82.89
	SEd	2.23	0.44	0.88	0.70	0.88	0.06	0.01	0.40	0.04	0.42	0.63	0.03	0.35	0.53	0.69	0.73
	CD	6.57	1.29	2.54	2.04	2.55	0.19	0.05	0.11	0.14	1.23	1.83	0.10	1.02	1.53	2.01	2.13
Varieties x	**SEd**	3.87	0.77	1.52	1.22	1.52	0.11	0.03	0.07	0.08	0.73	1.09	0.06	0.61	0.91	1.20	1.27

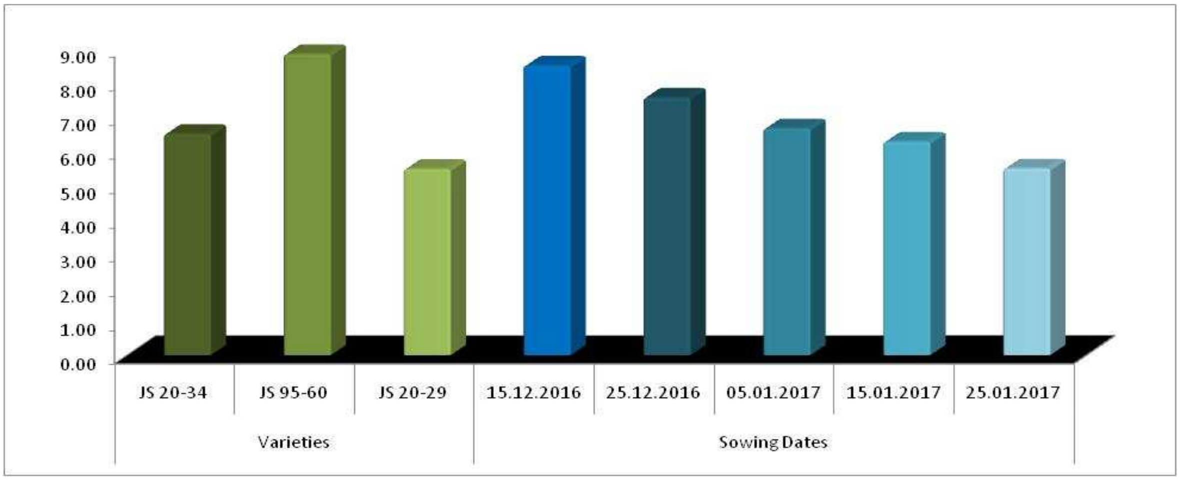
Sowing Dates	**CD**	11.21	2.24	4.41	3.53	4.42	0.32	0.09	0.20	0.24	2.13	3.18	0.17	1.77	2.66	3.48	3.69

Table 5.3: Effect of planting windows on seed quality parameters for quality seed production of soybean in off-season at JNKVV, Jabalpur during *Rabi* 2016-17

Treatments	Germination (%)					Seedling Length (cm)				
	Initial	60 DAS	120 DAS	180 DAS	240 DAS	Initial	60 DAS	120 DAS	180 DAS	240 DAS
JS 20-34										
Normal	94.42	93.03	90.53	87.50	81.90	35.96	34.40	32.85	31.88	27.38
15.12.2016	92.50	91.25	90.00	85.20	84.30	33.64	32.16	31.22	30.89	26.15
25.12.2006	90.60	88.10	86.20	84.00	80.70	31.55	31.18	30.26	29.35	25.55
05.01.2017	88.20	86.50	84.20	82.10	78.50	30.66	29.25	28.12	27.56	25.15
15.01.2017	80.00	78.30	76.55	75.20	73.83	28.22	27.24	26.32	26.13	24.44
25.01.2017	79.10	78.00	74.10	73.00	70.00	26.15	25.82	25.22	24.71	25.05
JS 95-60										
Normal	91.00	89.98	88.66	83.62	77.95	31.59	30.08	29.43	29.52	26.82
15.12.2016	90.47	86.16	86.34	80.54	76.14	30.68	28.12	28.38	28.35	27.23
25.12.2006	88.17	84	82.55	78.15	75.46	28.16	27.47	26.33	25.08	24.03
05.01.2017	86.24	82.18	80.37	76.25	74.16	26.82	26.74	26.87	24.22	23.54
15.01.2017	84.25	80	78.62	74.82	70.82	26.34	25.15	25.24	25.74	24.12
25.01.2017	82.48	78.4	75.46	72.24	70.51	24.54	23.31	22.24	21.21	20.21
JS 20-29										
Normal	90.36	88.34	85.16	81.99	78.16	30.21	28.56	27.36	27.34	25.18
15.12.2016	88.25	86.25	85.24	83.12	81.56	29.52	29.44	28.12	26.55	24.24
25.12.2006	87.16	85.17	84.28	81.54	80.27	28.11	28.54	27.18	25.52	24.69
05.01.2017	85.32	84.64	82.18	80.21	78.21	26.56	25.19	25.68	24.25	23.54
15.01.2017	83.17	81.05	79.53	78.25	76.55	24.33	24.87	23.72	23.25	22.08
25.01.2017	80.78	78.34	73.25	71.47	68.21	23.21	22.15	22.45	21.64	20.53
SEd	**0.882**	**0.442**	**0.403**	**0.644**	**0.792**	**0.707**	**0.038**	**0.030**	**0.122**	**1.091**
CD	**2.552**	**1.270**	**1.159**	**1.852**	**2.276**	**2.033**	**0.109**	**0.088**	**0.249**	**2.218**

Table 5.4: Effect of planting windows on seed quality parameters for quality seed production of soybean in off-season at JNKVV, Jabalpur during *Rabi* 2016-17

Treatments	Seedling dry weight					SVI					SVII				
	Initial	60 DAS	120 DAS	180 DAS	240 DAS	Initial	60 DAS	120 DAS	180 DAS	240 DAS	Initial	60 DAS	120 DAS	180 DAS	240 DAS
JS 20-34															
Normal	1.40	1.26	1.15	1.11	1.10	3395.34	3200.23	2974.02	2789.50	2242.42	131.81	117.50	103.75	96.78	90.17
15.12.2016	1.28	1.25	1.14	1.10	1.69	3052.50	2934.60	2809.80	2556.00	2200.23	118.49	114.52	102.60	94.06	142.47
25.12.2006	1.27	1.25	1.13	1.11	1.07	2853.90	2739.91	2608.41	2465.40	2061.89	115.06	110.13	98.01	92.40	86.51
05.01.2017	1.26	1.24	1.13	1.09	1.06	2646.00	2530.13	2367.70	2257.75	1974.28	111.31	107.43	95.23	89.82	83.29
15.01.2017	1.24	1.23	1.22	1.07	1.04	2257.60	2114.10	2014.80	1964.98	1772.00	99.76	96.70	94.00	81.07	76.79
25.01.2017	1.23	1.22	1.21	1.07	1.02	2064.51	2013.96	1852.50	1803.83	1753.73	97.53	95.00	89.96	78.26	71.26
JS 95-60															
Normal	1.21	1.18	1.08	0.96	0.95	2874.69	2706.60	2609.26	2468.46	2090.62	110.38	106.18	95.40	80.28	73.74
15.12.2016	1.2	1.17	1.07	0.94	0.93	2700.00	2422.82	2416.40	2254.00	2054.70	108.00	100.89	92.43	75.67	70.93
25.12.2006	1.17	1.16	1.04	0.93	0.91	2482.87	2268.00	2172.23	1958.75	1813.46	103.16	97.69	85.97	72.63	69.20
05.01.2017	1.14	1.14	1.02	0.86	0.78	2306.52	2194.21	2087.80	1845.56	1702.00	98.73	93.77	81.99	65.76	57.72
15.01.2017	1.14	1.13	1.56	0.84	0.72	2190.50	2008.00	1965.00	1850.00	1708.18	96.05	90.48	78.60	62.16	51.13
25.01.2017	1.13	1.11	0.94	0.81	0.70	2009.00	1826.72	1675.36	1512.00	1424.81	92.09	87.49	71.39	58.90	49.49
JS 20-29															
Normal	1.14	1.06	1.04	0.90	0.80	2729.78	2522.99	2329.98	2241.61	1968.07	103.28	93.91	88.82	73.79	62.61
15.12.2016	1.19	1.06	1.03	0.86	0.76	2605.14	2534.28	2388.50	2206.31	1975.56	99.63	91.37	87.98	71.47	62.59
25.12.2006	1.12	1.04	1.03	0.84	0.74	2445.57	2382.80	2290.73	2078.25	1920.00	97.44	88.67	86.81	68.54	59.92
05.01.2017	1.11	1.03	1.02	0.82	0.73	2217.80	2115.96	2054.50	1940.00	1798.60	94.85	87.11	83.99	65.76	57.16
15.01.2017	1.07	1.02	1.01	0.8	0.70	2021.82	1945.20	1886.53	1819.31	1689.12	89.42	82.75	80.41	62.60	53.70
25.01.2017	1.09	1.08	1.00	0.94	0.66	1840.00	1734.35	1610.40	1533.60	1400.37	87.28	84.41	73.25	66.88	45.15
SEd	**0.268**	**2.317**	**2.305**	**2.279**	**2.256**	**23.038**	**12.793**	**13.969**	**12.130**	**42.305**	**2.533**	**3.219**	**1.322**	**0.781**	**1.540**
CD	**0.546**	**4.710**	**4.686**	**4.632**	**4.585**	**46.819**	**25.999**	**28.389**	**24.652**	**85.974**	**5.147**	**6.542**	**2.687**	**1.588**	**3.131**



Effect of planting windows on seed yield for quality seed production of soybean in off-season (2016-17)

2017-18

The different dates of sowing experiment during *Rabi* have been initiated. The observations as per technical programme are in progress.

PJTSAU, Hyderabad

Results:

SRTC, Hyderabad: Seed production of soybean in offseason is not economical as the seed yield ranged from 0.76 to 2.17 q/ha.

RARS, Palem: Seed production of soybean in offseason is not economical as the seed yield ranged from 0.77 to 2.84 q/ha.

RARS, Warangal: Seed yield ranged from 0.98 q/ha to 6.32 q/ha. Crop sown on 29.09.2016 recorded maximum yield of 6.32 q/ha followed by crop sown on 15.09.2016 (5.68 q/ha). Harvested produce from crop sown on 30.12.2016 exhibited superiority for seedling characters like seedling length and SVI and are significantly different from other treatments.

Table 5.5: Influence of sowing dates on seed yield and yield attributing characters of soybean during *Rabi*, 2016-17 SRTC, Rajendranagar

Dates of sowing	Varieties	Plant height (cm)	Branches/ plant (no.)	Pods/ plant (no.)	Pod length (cm)	Seeds/ pod (no.)	Seed yield/ plant (g)	Seed yield/ha (q)	100 seed weight (g)	Germination (%)	Root length (cm)	Shoot length (cm)	Seedling length (cm)	SVI I
5.10.2016	JS 335	19.8	2.0	13.4	3.3	2.5	10.47	1.93	7.73	100	15.1	16.0	31.1	3115
	DSb 21	17.7	1.9	5.0	3.3	2.4	3.53	0.83	6.96	100	12.9	15.8	28.7	2869
	Basar	18.2	1.8	7.8	3.3	2.4	8.35	2.17	8.66	100	16.0	20.1	36.1	3608
9.11.2016	JS 335	24.6	1.6	12.2	3.6	2.8	4.56	1.52	6.08	100	13.6	16.3	29.9	2986
	JS 97-52	29.3	3.2	24.2	3.4	2.4	0.53	0.76	3.05	100	15.9	15.6	31.5	3146
	Basar	22.2	3.0	15.0	3.6	2.6	7.11	1.68	6.72	100	15.5	18.2	33.7	3375
23.11.2016	JS 335	25.9	1.2	22.2	4	3.0	11.92	2.11	8.42	100	15.4	17.9	33.3	3327
	JS 97-52	22.3	1.2	14.8	3.3	2.8	2.20	1.53	6.11	100	12.6	14.3	26.9	2692
	Basar	18.8	0.8	6.6	3.3	2.4	3.03	1.51	6.04	100	12.2	16.2	28.4	2836
09.12.2016	JS 335	16.66	2.3	6.4	3.2	2.6	0.72	0.90	4.49	96.0	4.0	8.1	12.1	1158
	JS 97-52	22.51	2.6	15.5	3.6	2.3	4.23	1.85	3.92	88.0	5.1	10.5	15.6	1367
	Basar	16.08	1.4	8.4	3.1	2.2	1.04	1.31	5.39	90.7	4.3	8.6	12.8	1171

Table 5.6: Influence of sowing dates on yield and yield attributing characters of soybean during *Rabi*, 2016-17 (RARS, Palem)

Dates of sowing	Varieties	Seed yield/ plot (g)	Seed yield/ha (q)	100 seed weight (g	Germination (%)	Root length (cm)	Shoot length (cm)	Seedling length (cm)	SVI I
08.09.16	JS 335	276	0.77	9.26	88	14.7	18.9	33.6	2958
	Basar	318	0.88	9.66	96	16.0	22.4	38.4	3690
	DSb 21	332	0.92	9.00	92	13.7	20.1	33.7	3101
	Mean	309	0.86	9.31	92	14.8	20.4	35.3	3250
21.9.16	JS 335	-	-	-					
	Basar	334	0.93	9.60	100	14.8	20.0	34.8	3478
	DSb 21	-	-	-					
	Mean	334	0.93	9.60	100	14.8	20.0	34.8	3478
8.10.16	JS 335	1022	2.84	10.80	96	15.5	20.6	36.1	3468
	Basar	-	-	-					
	DSb 21	684	1.90	9.37	92	14.6	22.9	37.5	3450
	Mean	853	2.37	10.09	94	15.0	21.8	36.8	3459
11.11.16	JS 335	732	2.03	10.26	88	15.1	16.7	31.8	2799
	Basar	738	2.05	11.83	100	15.7	19.5	35.2	3515
	DSb 21	426	1.18	10.20	94	13.6	19.4	33.0	3098
	Mean	632	1.75	10.76	94	14.8	18.5	33.3	3137
26.11.16	JS 335	388	1.08	11.83	96	17.3	20.0	37.3	3579
	Basar	936	2.60	8.86	88	14.1	17.9	31.9	2811
	DSb 21	810	2.25	7.56	86	12.6	19.7	32.3	2779
	Mean	711	1.98	9.42	90	14.7	19.2	33.8	3056

Table 5.7: Influence of sowing dates on yield and yield attributing characters of soybean during *Rabi*, 2016-17 (RARS, Warangal)

Dates of sowing	Field emergence (%)	Days to field emergence	Days to flower initiation	Days to flower initiation to 50% flowering	Days to 50% flowering	Days to 50% flowering to pod initiation	Days to pod initiation	Days to pod initiation to 50% pod maturity	Days to 50% pod maturity	Days to crop maturity
15.9.16	84	5	31	4	34	4	38	30	66	73
29.9.16	85	5	30	4	35	4	39	31	70	76
14.10.16	80	4	35	4	39	5	44	29	73	80
29.10.16	80	5	31	4	34	5	39	29	68	76
15.11.16	78	6	35	8	44	6	50	33	83	89
30.11.16	83	5	31	9	40	4	44	34	78	86
14.12.16	85	5	29	12	41	7	49	31	80	87
30.12.16	80	5	31	10	41	7	48	35	83	89
18.1.17	72	7	33	9	40	8	48	36	84	91

Table 5.8: Influence of sowing dates on yield and yield attributing characters of soybean during *Rabi*, 2016-17 (RARS, Warangal)

Dates of sowing	Plant height (cm)	No. of fruiting branches/plant	No. of pods/plant	No. of seeds/ pod	Pod length (cm)	Pod diameter (cm)	Shattering (%)	Test weight (g)	Grain yield (kg/ha)
15.9.16	22.9	8.97	53.7	2.60	4.43	2.44	0.13	11.3	558
29.9.16	22.2	8.37	44.2	2.47	4.41	2.40	1.06	10.3	632
14.10.16	26.1	6.27	34.9	2.27	4.08	2.64	1.15	12.2	427
29.10.16	30.7	6.34	29.6	2.34	3.40	2.48	0.26	11.6	462
15.11.16	21.4	6.20	20.0	2.40	3.54	2.37	0.17	9.4	243
30.11.16	25.8	5.47	16.0	2.70	3.34	2.07	Nil	8.4	110
14.12.16	26.6	5.14	13.5	2.40	2.34	2.19	Nil	8.0	107
30.12.16	24.3	4.74	13.9	2.70	2.40	2.07	Nil	7.9	113
18.1.17	20.2	3.62	10.4	2.40	2.21	1.92	Nil	7.6	98

Table 5.9: Influence of dates of sowing on seed quality parameters of Soybean variety Basar during *Rabi*, 2016-17 (RARS, Warangal)

Dates of sowing	Germination (%)	Root length (cm)	Shoot length (cm)	Seedling length (cm)	SVI I
15.09.2016	99	10.8	9.7	20.5	2023
29.09.2016	100	8.7	9.2	17.9	1790
14.10.2016	100	8.9	8.1	17	1699
29.10.2016	100	9.4	9	18.4	1840
15.11.2016	99	8.7	9.9	18.6	1835
30.11.2016	100	10.1	9.4	19.5	1952
15.12.2016	100	9.8	10.5	20.3	2034
30.12.2016	100	13.1	11.6	24.7	2465
Mean	**99.7**	**9.9**	**9.7**	**19.6**	**1955**
SEM	**0.69**	**0.46**	**0.2**	**0.48**	**48.7**
SED	**0.98**	**0.65**	**0.28**	**0.68**	**68.9**

Field view of offseason soybean (Basar) at RARS, Warangal during 2016-17

MPKV, Rahuri

Results: The data on effect of different sowing dates on phenology, morphometry, seed yield and quality of soybean, storage study are presented in Table 5.10 to 5.11.

From the data it was observed that the soybean at different sowing dates had significant effect on phenology, morphometry, seed yield and quality of soybean. Seed sown at 15th June (S_1) recorded the highest field emergence (88.12%), days to 1st flower bud (36. 33), days to 1st flower open (40.33), days to 50% flowering (46.00), plant height (84.97 cm), number of primary branches (7.63/plant), number of pods (103.33/plant), pod length (4.20 cm), 100 seed weight (13.75 g), seed yield (3.55 kg/plot), seed yield (1971.09 kg/ha). seed length (6.75 mm), seed width (4.74 mm), surface area (76.87 mm) roundness (86.82 mm). The protein content (37.69 %) and oil content (20.27 %) was also the highest at 15th June sowing date.

The best alternative window for soybean seed production is 15th January during summer season. Seed sown at 15th January (S_8) recorded the field emergence (77.20%), plant height (60.53 cm), number of primary branches (6.60/plant), number of pods (79.67/plant), pod length (4.00 cm), 100 seed weight (12.54 g), seed yield (2.09 kg/plot), seed yield (1158. 32 kg/ha).

The data presented in Table 5.10 revealed that the seed harvested from 15th June to 15th January sowing maintained their seed quality as per IMSCS up to 8 month.

Table 5.10: Effect of sowing dates on phenology, yield and seed quality of soybean at MPKV, Rahuri during *Rabi* 2016-17

Treatments Sowing at	Field Emergence (%)	Days to 1st flower bud	Days to 1st flower open	Days to 50% flowering	Plant height (cm)	No. of primary branches Plant^{-1}	No. of pods Plant^{-1}	No. of seeds pod^{-1}	Length of pod (cm)	Days to maturity
15th June (S_1)	88.12 (69.94)	36.33	40.33	46.00	84.97	7.63	103.33	2.73	4.20	104.67
30th June (S_2)	86.37 (68.48)	36.33	39.67	45.33	82.17	7.03	96.67	2.60	4.13	106.33
15th July (S_3)	82.90 (65.71)	37.00	40.00	44.33	80.20	6.97	92.63	2.50	4.07	103.67
30th July (S_4)	82.06 (64.98)	37.00	40.33	45.67	75.07	6.73	80.50	2.50	3.95	102.33
1st October (S_5)	66.39 (54.55)	37.33	42.33	47.00	72.63	5.50	51.10	2.40	3.67	107.00
15th October (S_6)	65.22 (53.85)	37.00	42.00	46.33	64.33	5.67	62.00	2.53	3.87	106.33
30th October (S_7)	66.72 (54.79)	38.33	42.00	47.67	61.07	5.03	53.87	2.50	3.67	108.67
15th January (S_8)	77.20 (61.51)	34.00	37.33	41.67	60.53	6.60	79.67	2.50	4.00	99.67
30th January (S_9)	76.19 (60.81)	33.67	37.00	41.67	59.20	6.10	72.63	2.50	3.93	99.00
5th February(S_{10})	75.31 (60.34)	33.33	36.33	40.67	58.60	5.73	65.67	2.30	3.37	98.67
SE ±	2.679	0.776	0.767	0.724	1.905	0.365	4.164	0.132	0.113	0.872
CD at 5%	7.961	2.306	2.278	2.150	5.661	1.084	12.373	NS	0.337	2.591

Treatments Sowing at	100 seed weight (g)	Seed yield plot^{-1} (kg)	Seed yield ha^{-1} (kg)	Seed length (mm)	Seed width (mm)	Surface area (mm)	Roundness (mm)	Protein content (%)	Oil content (%)
15th June (S_1)	13.75	3.55	1971.09	6.75	4.74	76.87	86.82	37.69	20.27
30th June (S_2)	13.46	3.14	1741.65	6.75	4.55	74.74	86.30	36.36	18.23
15th July (S_3)	13.45	3.01	1673.32	6.46	4.39	70.15	82.76	35.52	17.50
30th July (S_4)	12.60	2.46	1364.43	6.29	3.78	68.17	78.81	34.79	16.40
1st October (S_5)	10.71	1.02	564.99	5.13	3.57	54.30	70.60	36.67	18.26
15th October (S_6)	11.82	1.87	1041.10	5.75	3.90	61.32	71.49	35.86	17.45
30st October (S_7)	10.00	1.36	753.14	5.26	3.86	62.41	70.73	36.29	17.18
15th January (S_8)	12.54	2.09	1158.32	5.67	4.17	64.90	73.77	37.34	18.54
30th January (S_9)	11.93	0.96	532.22	5.27	3.70	56.24	71.18	36.50	17.83
15th February (S_{10})	9.67	0.65	363.51	3.93	3.40	49.97	70.20	36.38	15.70
SE ±	0.467	0.157	87.319	0.160	0.084	1.633	1.173	0.532	0.500
CD at 5%	1.387	0.467	259.447	0.476	0.249	4.852	3.485	1.580	1.486

(Figures in parenthesis are arc sin transformed values)

Table 5.11: Effect of sowing dates on seed quality of soybean during storage at MPKV, Rahuri during *Rabi* 2016-17

Treatments	Germination (%)					Root shoot length (cm)				
	Initial	60 DAS	120 DAS	180 DAS	240 DAS	Initial	60 DAS	120 DAS	180 DAS	240 DAS
15th June (S_1)	91.67 (73.52)	90.33 (71.94)	88.00 (69.80)	85.67 (67.78)	81.67 (64.66)	34.90	31.93	30.10	29.20	26.77
30th June (S_2)	90.67 (72.26)	89.33 (70.94)	86.67 (68.58)	84.67 (66.94)	79.67 (63.18)	32.60	31.49	30.43	28.53	25.43
15th July (S_3)	88.67 (70.35)	87.67 (69.46)	86.33 (68.30)	84.00 (66.40)	79.00 (62.72)	32.60	31.38	30.00	28.63	26.40
30th July (S_4)	87.33 (69.13)	85.33 (67.47)	82.33 (65.14)	81.00 (64.15)	75.67 (60.42)	30.40	28.83	27.93	26.60	24.10
1st October (S_5)	85.00 (67.25)	84.00 (66.44)	82.33 (65.14)	80.67 (63.91)	73.00 (58.69)	29.58	28.33	26.63	24.60	22.67
15th October (S_6)	87.33 (69.33)	85.00 (67.32)	82.33 (65.16)	77.33 (61.55)	72.67 (58.47)	24.45	24.00	23.70	22.00	19.90
30st October (S_7)	88.00 (69.72)	83.67 (66.15)	82.00 (64.91)	78.67 (62.49)	70.33 (56.98)	30.55	30.03	29.63	27.50	23.43
15th January (S_8)	87.33 (69.14)	83.67 (66.16)	80.67 (63.90)	79.33 (62.95)	76.00 (60.70)	31.57	31.20	30.87	27.81	25.10
30th January (S_9)	84.33 (66.69)	82.33 (65.16)	78.33 (62.24)	73.33 (58.89)	67.67 (55.34)	28.53	24.77	23.20	22.20	20.53
15th February (S_{10})	79.67 (63.18)	78.00 (62.01)	75.67 (60.42)	71.00 (57.40)	67.00 (54.92)	24.93	23.07	21.87	20.87	19.80
SE ±	1.334	1. 101	0.910	0.770	0.913	0.508	0.642	0.528	0.673	0.777
CD at 5%	3.964	3.272	2.703	2.288	2.712	1.508	1.906	1.570	2.000	2.308

Figures in parenthesis are Arc sin transformed values

Table 5.11: Contd…

Treatments	Dry matter content (g)					Vigour Index I					Vigour Index II				
	Initial	60 DAS	120 DAS	180 DAS	240 DAS	Initial	60 DAS	120 DAS	180 DAS	240 DAS	Initial	60 DAS	120 DAS	180 DAS	240 DAS
15th June (S_1)	1.33	1.22	1.15	1.13	1.03	3197.53	2883.53	2649.00	2501.47	2183.17	122.26	110.06	101.13	96.41	84.13
30th June (S_2)	1.24	1.13	1.08	1.03	0.97	2955.03	2812.56	2636.50	2414.93	2025.53	112.10	101.29	93.90	87.24	77.26
15th July (S_3)	1.29	1.05	1.03	0.98	0.96	2889.53	2750.60	2590.33	2405.77	2086.40	114.69	92.33	88.64	82.03	75.83
30th July (S_4)	1.07	1.02	0.94	0.90	0.87	2654.77	2461.50	2301.63	2156.60	1823.97	93.16	86.72	77.64	73.15	66.08
1st October (S_5)	1.07	1.06	1.02	0.98	0.95	2515.39	2381.37	2193.77	1985.33	1656.47	91.34	88.75	84.21	78.75	69.11
15th October (S_6)	1.08	1.00	0.95	0.92	0.90	2132.93	2042.03	1952.23	1701.53	1445.23	94.02	85.02	78.32	71.38	65.72
30st October (S_7)	1.17	1.07	1.05	0.94	0.84	2688.93	2513.47	2431.27	2164.23	1648.83	102.93	89.19	86.37	73.59	58.80
15th January (S_8)	1.19	1.04	1.02	0.96	0.91	2756.93	2610.67	2489.57	2204.00	1907.07	103.66	87.34	82.50	76.34	69.19
30th January (S_9)	1.10	1.04	0.90	0.89	0.83	2405.17	2041.80	1816.47	1628.27	1390.87	92.77	85.41	70.45	65.06	55.88
15th February (S_{10})	0.98	0.93	0.89	0.86	0.80	1986.00	1799.40	1654.37	1481.77	1327.00	78.09	72.27	67.34	60.83	53.60
SE ±	**0.029**	**0.040**	**0.036**	**0.032**	**0.030**	**43.751**	**74.728**	**58.928**	**63.460**	**66.203**	**2.713**	**3.226**	**2.642**	**2.355**	**2.430**
CD at 5%	**0.085**	**0.119**	**0.107**	**0.095**	**0.090**	**129.995**	**222.035**	**175.089**	**188.556**	**196.705**	**8.062**	**9.585**	**7.850**	**6.997**	**7.221**

UAS, Bangalore

Results: Sowing time and date had significant effect on phenology, morphometry, seed yield and quality of soybean cultivar JS-335. Seed sown in the normal season *viz.,* during *kharif* (25-07-2016) recorded the highest field emergence (75%), pods/plant (49.47), seed yield (3.417 kg/plot & 19.52 q/ha), pod maturity (83 days), seed length (0.666 cm), seed width (0.555 cm) and seed diameter (0.587) with less days to 1st flowering (34 days), 50% flowering (42 days) (Table 5.12, 5.13 and 5.14). However, for the alternate window for soybean seed production, the sowing at December 1st week (2-07-2016) was best suited for off-season sowing. Most of the plant growth, seed morphometry and quality parameter *viz*., plant height (40.07 cm), branches/plant (7.00), pods/plant (54.80), seeds/pod (2.66), pod length (4.05 cm), pod diameter (0.690 cm), seed length (0.588 cm), seed width (0.421 cm), seed area (0.576 cm^2), seed diameter (0.469 cm), seed perimeter (2.771 cm) and seed vigour (3680) were found significantly highest with less days to 1st flowering (33.67), days to 50% flowering (42.33) days to pod maturity (84.00) among the 2st December sowing. The seed yield (17.81 q/ha) was on par with the *kharif* sowing (19.52 q/ha) (Table Table 5.12, 5.13 and 5.14). The lowest seed yield was recorded in November 2nd (7.68 q/ha) and November 16th (8.47 q/ha) sowing. Hence December 1st week sowing could be a best alternative planting window for soybean seed production during off-season.

Table 5.12: Influence of sowing dates on growth and yield parameters of soybean cultivar JS-335 at UAS, Bangalore during 2016-17

Treatments	Field Emergence (%)	Plant height (cm)	No. of branches/ plant	No. of pods/ plant	No. of seeds/pod	Seed yield/ plot (kg)	Seed yield/ha (q)
T_0 (Normal season sowing)	75.00	35.40	3.60	49.47	2.37	3.417	19.52
T_1 (November 1st week)	59.65	29.15	3.50	24.10	2.30	1.345	7.68
T_2 (November 3rd week)	57.49	23.34	6.10	27.20	2.41	1.484	8.47
T_3 (December 1st week)	73.33	40.07	7.00	54.80	2.66	3.117	17.81
T_4 (December 3rd week)	59.67	35.95	5.70	30.20	2.15	2.297	13.12
T_5 (January 1st week)	73.00	37.73	7.40	47.30	2.81	2.780	15.88
T_6 (January 3rd week)	52.33	31.15	6.20	38.80	2.50	2.655	15.17
Mean	**64.35**	**33.25**	**5.64**	**38.83**	**2.45**	**2.44**	**13.95**
SEm ±	**2.179**	**0.879**	**0.178**	**1.296**	**0.099**	**0.088**	**0.502**
CD (P=0.05)	**6.713**	**2.708**	**0.548**	**3.993**	**0.305**	**0.271**	**1.546**
CV (%)	**8.96**	**6.99**	**8.34**	**8.83**	**10.73**	**9.51**	**9.51**

Table 5.13: Influence of sowing dates on flowering and pod characteristics of soybean cultivar JS-335 at UAS, Bangalore during 2016-17

Treatments	Days to Ist flowering	Days to 50% flowering	Days to pod maturity	Length of pods (cm)	Diameter of pods (cm)
T_0 (Normal season sowing)	34.00	42.00	83.00	3.82	0.293
T_1 (November 1st week)	38.33	42.33	86.00	2.33	0.250
T_2 (November 3rd week)	36.33	46.00	85.00	3.10	0.430
T_3 (December 1st week)	33.67	42.33	84.00	4.05	0.690

T_4 (December 3rd week)	36.33	46.33	87.00	3.05	0.330
T_5 (January 1st week)	35.33	42.67	85.00	3.57	0.480
T_6 (January 3rd week)	36.33	45.00	87.00	3.52	0.450
Mean	**35.76**	**43.80**	**85.28**	**3.34**	**0.41**
SEm ±	**0.661**	**0.898**	**0.594**	**0.158**	**0.022**
CD (P=0.05)	**2.036**	**2.766**	**1.830**	**0.486**	**0.067**
CV (%)	**4.89**	**5.42**	**2.85**	**12.49**	**14.09**

Table 5.14: Influence of sowing dates on seed morphometry (Image Analysis) and seed quality of soybean cultivar JS-335 at UAS, Bangalore during 2016-17

Treatments	Length of seeds (cm)	Width of seed (cm)	Area of seed (sq.cm)	Diameter of seed (cm)	Seed perimeter (cm)	Germination (%)	Seedling length (cm)	SVI-I
T_0 (Normal season)	0.666	0.555	0.293	0.587	1.997	88.33	35.71	3150
T_1 (November 1st week)	0.408	0.177	0.147	0.292	1.274	92.00	30.31	2793
T_2 (November 3rd week)	0.400	0.240	0.200	0.250	1.200	91.67	32.03	2935
T_3 (December 1st week)	0.588	0.421	0.576	0.469	2.771	95.33	38.60	3680
T_4 (December 3rd week)	0.410	0.241	0.214	0.326	0.766	94.00	36.10	3395
T_5 (January 1st week)	0.516	0.367	0.428	0.416	2.375	94.67	28.66	2715
T_6 (January 3rd week)	0.498	0.334	0.278	0.399	2.085	96.00	36.63	3519
Mean	**0.498**	**0.333**	**0.305**	**0.391**	**1.781**	**93.14**	**34.00**	**3169**
SEm ±	**0.016**	**0.016**	**0.019**	**0.011**	**0.077**	**0.936**	**0.943**	**102**
CD (P=0.05)	**0.049**	**0.049**	**0.058**	**0.033**	**0.237**	**2.883**	**2.905**	**314**
CV (%)	**8.92**	**13.15**	**17.27**	**7.6**	**11.41**	**2.66**	**7.34**	**8.5**

UAS, Dharwad

Results:

Table 5.15: Effect of sowing dates on seed quality of soybean during storage at UAS, Dharwad during *Rabi* 2016-17

Treatment combination	Field Emergence (%)	Plant height (cm)	No. of Primary branches	Days to 50 % flowering	Days to maturity
L_1	77.74	50.53	5.16	49.32	89.72
L_2	73.41	48.28	4.93	46.91	86.11
SEm ±	**0.19**	**1.00**	**0.10**	**0.05**	**1.76**
CD at 5%	**0.57**	**2.94**	**NS**	**0.17**	**NS**
S_1	77.55	55.70	5.69	54.82	98.18
S_2	76.61	52.00	5.31	50.52	92.73
S_3	72.31	51.03	5.21	49.57	90.99
S_4	77.55	49.46	5.05	48.05	88.20
S_5	75.66	46.24	4.72	44.93	82.47
S_6	73.77	42.01	4.29	40.82	74.92
S_7	88.12	64.12	6.51	53.14	98.01
SEm ±	**5.55**	**1.74**	**0.18**	**1.69**	**3.04**
CD at 5%	**NS**	**5.10**	**0.52**	**4.95**	**8.92**
$L_1 S_1$	79.54	57.13	5.84	56.90	99.57
$L_1 S_2$	78.57	53.33	5.45	51.82	95.11
$L_1 S_3$	75.50	52.33	5.35	50.84	93.33
$L_1 S_4$	79.54	50.73	5.18	49.29	90.46
$L_1 S_5$	77.60	47.43	4.84	46.08	84.58
$L_1 S_6$	75.66	42.22	4.31	41.02	75.29
$L_1 S_7$	83.17	64.50	5.95	55.50	96.10
$L_2 S_1$	75.56	54.27	5.54	52.73	96.79
$L_2 S_2$	74.64	50.67	5.18	49.23	90.35
$L_2 S_3$	69.11	49.72	5.08	48.30	88.66
$L_2 S_4$	75.56	48.19	4.92	46.82	85.94
$L_2 S_5$	73.72	45.06	4.60	43.78	80.35
$L_2 S_6$	71.88	41.80	4.27	40.61	74.54
$L_2 S_7$	84.21	59.95	5.50	53.45	96.50
SEm ±	**0.48**	**2.46**	**0.25**	**2.39**	**4.30**
CD at 5%	**NS**	**NS**	**NS**	**7.00**	**NS**

Table 5.16: Effect of sowing dates on seed quality of soybean during storage at UAS, Dharwad during *Rabi* 2016-17

Treatment combination	No. of pods/plant	No. of seeds/pod	Seed yield q/ha	Pod length (cm)	Pod Diameter (cm)
L_1	27.81	2.8	16.67	3.74	1.72
L_2	26.41	3.0	15.84	3.62	1.67
SEm ±	**0.55**	**0.07**	**0.33**	**0.07**	**0.30**
CD at 5%	**NS**	**NS**	**NS**	**NS**	**NS**
S_1	30.44	3.0	18.66	4.17	1.92
S_2	28.75	3.0	17.63	3.94	1.81
S_3	28.21	3.0	17.30	3.86	1.78
S_4	27.34	2.8	16.77	3.75	1.72
S_5	25.56	2.8	15.68	3.64	1.67
S_6	22.37	2.7	11.48	2.73	1.25
S_7	45.25	3.1	24.45	4.50	1.95
SEm ±	**0.96**	**0.12**	**0.57**	**0.13**	**0.60**
CD at 5%	**2.82**	**NS**	**1.68**	**0.38**	**NS**
$L_1 S_1$	30.87	3.00	18.93	4.23	1.94
$L_1 S_2$	29.48	3.00	18.08	4.04	1.86
$L_1 S_3$	28.93	3.00	17.74	3.96	1.82
$L_1 S_4$	28.04	2.67	17.20	3.84	1.77
$L_1 S_5$	26.22	2.67	16.08	3.59	1.65
$L_1 S_6$	23.34	2.33	11.98	3.77	1.27
$L_1 S_7$	48.12	3.20	25.24	4.52	1.89
$L_2 S_1$	30.00	3.00	18.40	4.11	1.89
$L_2 S_2$	28.01	3.00	17.18	3.84	1.76
$L_2 S_3$	27.48	3.00	16.85	3.76	1.73
$L_2 S_4$	26.64	3.00	16.34	3.65	1.68
$L_2 S_5$	24.91	3.00	15.28	3.68	1.69
$L_2 S_6$	21.39	3.00	10.98	3.08	1.23
$L_2 S_7$	43.27	3.15	23.15	4.25	1.88
SEm ±	1.36	0.16	0.81	0.18	0.90
CD at 5%	3.99	NS	2.38	NS	NS

Table 5.17: Effect of sowing dates on seed quality of soybean during storage at UAS, Dharwad during *Rabi* 2016-17

Treatment combination	Seed moisture (%)	Seed germination (%)	Seedling length (cm)	Seedling vigour index	Seedling dry weight (mg)
L_1	11.09	80.14	21.64	1760	1.76
L_2	11.12	78.40	21.17	1691	1.69
SEm ±	**0.25**	**1.77**	**0.48**	**107**	**0.07**
CD at 5%	**NS**	**NS**	**NS**	**NS**	**NS**
S_1	11.98	83.69	22.60	1893	1.89
S_2	11.31	84.59	22.84	1934	1.93
S_3	11.10	84.62	22.85	1939	1.94
S_4	10.76	79.59	21.49	1748	1.75
S_5	10.45	75.49	20.38	1576	1.58
S_6	11.01	67.63	18.26	1264	1.26
S_7	10.50	86.24	27.25	2154	1.95
SEm ±	**0.95**	**3.07**	**0.83**	**123**	**0.12**
CD at 5%	**NS**	**8.99**	**2.43**	**362**	**0.36**
$L_1 S_1$	12.15	83.33	22.50	1876	1.88
$L_1 S_2$	11.60	85.16	22.99	1959	1.96
$L_1 S_3$	11.39	86.79	23.43	2039	2.04
$L_1 S_4$	11.04	79.26	21.40	1724	1.72
$L_1 S_5$	10.32	76.26	20.59	1602	1.60
$L_1 S_6$	10.03	70.02	18.91	1360	1.36
$L_1 S_7$	10.25	88.25	26.50	2560	1.96
$L_2 S_1$	11.81	84.04	22.69	1909	1.91
$L_2 S_2$	11.02	84.03	22.69	1909	1.91
$L_2 S_3$	10.82	82.45	22.26	1840	1.84
$L_2 S_4$	10.48	79.92	21.58	1772	1.77
$L_2 S_5$	10.59	74.73	20.18	1549	1.55
$L_2 S_6$	12.00	65.24	17.62	1168	1.17
$L_2 S_7$	10.25	85.25	25.51	2450	1.98
SEm ±	**0.87**	**4.33**	**1.17**	**174**	**0.17**
CD at 5%	**NS**	**NS**	**3.43**	**511**	**0.51**

Experimental locations (Dharwad and Haveri) has no significant effect on plant growth and yield parameters. Among the different dates of sowing evaluated early sowing was found significant, with delayed sowing the field emergence, plant stand, seed yield and quality parameters were affected negatively.

VNMKV, Parbhani

Results: The experiment was conducted with two soybean varieties *viz.,* MAUS-162 and MAUS-158 and six dates of sowing in FRBD during 2016-17.

The first date of sowing was 01-07-2016 as normal sowing. The off season date of sowing was 07-11-2016 and subsequently four sowings was done in 15 days interval.

The variety MAUS-158 was found early maturing as compared to MAUS-162 in all date of sowing. Normal sowing date recorded highest yield and yield contributing parameters. Early sowing dates yielded highest than late sowing dates in offseason soybean seed production

The MAUS-158 yielded better than MAUS-162 in all dates of sowing and both varieties yielded almost negligible in off season sowing dates due to its late maturity and environmental factors. Seed morphometry character also declined significantly with late sowing dates due to various environmental factors. The MAUS-162 was recorded significantly higher germination percentage, root shoot length and seed vigour index than MAUS-158 in all date of sowing seed quality parameters declined with advancement of date of sowing.

Conclusion: The variety MAUS-158 recorded better yield and yield components in all sowing dates than variety MAUS-162 and both varieties could be recommended for sowing up to November 30 as these dates found at par for yield and other parameters. All yield and yield components, morphometry and seed Quality parameter decline with advancement of sowing dates.

Results 2017-18: Experiment on planting windows for quality seed production of soybean in offseason is in progress with two varieties viz., MAUS-162 & MAUS-158 and one date of sowing as normal and Six offseason during 2017-18.

On the basis of preliminary data, variety MAUS-158 recorded highest yield and yield components and other parameters than MAUS-162 in normal as well as offseason (Oct 1st 2017) date of sowing.

Table 5.18: Effect of planting windows on yield and yield parameters for quality seed production of soybean in offseason at VNMKV, Parbhani during *Rabi* 2016-17

Sr. No.	Treatments	Field emergence %	Plant height (cm)	No. branches	Days to flowering	Days to 50 % flowering	Days to maturity	Pods/ Plant	Seeds/Pod	Seed yield (kg/ha)	HI (%)
1	Variety										
	V1 -MAUS- 162	81.6	59.16	1.78	48.5	53.3	99.5	29.48	2.64	948.2	44.6
	V2-MAUS-158	67.3	54.53	2.80	50.3	54.8	96.3	32.73	2.80	1146	49.6
2	Date of sowing										
	D0-01-07-2016	90.5	67.25	2.30	33.5	40.5	102.5	37.55	3.0	2205	52.4
	D1 - 07-11-2016	79.5	60.60	2.25	51.0	56.0	100.5	31.78	2.77	1887	50.3
	D2- 21-11-2016	71.5	54.81	2.10	53.5	56.5	102.0	33.16	2.70	1287	48.2
	D3-30-11-2016	72.0	48.92	2.3	53.0	56.5	99.0	29.65	2.50	1177	46.9
	D4-15-12-2016	69.0	42.10	2.4	55.5	60.00	94.0	31.55	2.60	1024	43.2
	D5-30-12-2016	65.0	37.38	2.4	50.0	55.00	91.0	23.2	2.55	541	41.5
	SE±	0.37	1.75	0.15	0.30	0.20	0.40	0.06	0.012	81.11	0.30
	CD	1.04	02.99	0.42	0.85	0.57	1.10	0.17	0.037	220.5	0.75
3	Interaction										
	D0V1	96	88.07	1.6	33	40	105	27.77	3.00	1767	50.1
	D1V1	95	59.47	1.8	50	56	102	30.53	2.75	1105	48.2
	D2V1	81	61.33	1.4	52	55	105	32.83	2.50	1072	46.4
	D3V1	75	56.27	1.5	49	53	102	28.17	2.40	833	44.1
	D4V1	73	45.20	2.1	57	61	94	33.17	2.70	0478	40.2
	D5V1	70	41.60	2.3	50	55	90	24.40	2.50	0333	38.7
	D0V2	85	46.43	3.0	34	41	100	47.33	3.00	2006	54.7
	D1V2	64	61.73	2.7	52	56	99	33.03	2.80	1467	52.4
	D2V2	62	48.30	2.8	55	58	100	33.50	2.90	1283	50.1
	D3V2	68	41.57	3.1	57	60	95	31.13	2.60	1016	49.7
	D4V2	65	39.00	1.7	54	59	94	29.40	2.90	0605	46.3
	D5V2	60	33.17	2.5	50	55	92	22.00	2.60	0499	44.4
	SE ±	1.2	3.8	0.85	0.98	0.70	0.40	2.85	0.031	100	0.75
	CD	3.4	11.1	2.4	2.70	2.07	1.10	8.36	0.092	295	2.10
	CV %	12.9	12.62	16.9	14.2	12.4	3.5	15.9	4.5	17.81	14.6

Table 5.19: Effect of planting windows on pod and morphometry character for quality seed production of soybean in offseason at VNMKV, Parbhani during *Rabi* 2016-17

Sr. No.	Treatments	Length of Pod (cm)	Diameter of Pods (cm)	Length of seed (mm)	Width of Seed (mm)	Area of Seed (mm)	Seed roundness
1	Variety						
	V1 - MAUS- 162	3.801	0.769	6.25	4.08	71.19	81.26
	V2 - MAUS- 152	3.553	0.814	6.42	4.15	72.73	83.62
2	Date of sowing						
	D0-01-07-2016	4.443	0.933	7.25	4.70	78.31	91.08
	D1 - 07-11-2016	4.114	0.877	6.89	4.41	76.81	88.83
	D2- 21-11-2016	3.888	0.826	6.48	4.15	76.05	84.62
	D3-30-11-2016	3.521	0.759	6.19	4.01	72.03	79.75
	D4-15-12-2016	3.159	0.695	5.86	3.77	67.02	76.48
	D5-30-12-2016	2.938	0.661	5.32	3.72	61.51	73.89
	SE±	0.152	0.048	0.098	0.078	0.567	0.689
	CD	0.447	0.142	0.290	0.200	1.58	1.96
3	Interaction						
	D0V1	4.561	0.897	7.12	4.66	78.12	90.77
	D1V1	4.178	0.842	6.80	4.35	76.30	88.32
	D2V1	3.905	0.812	6.42	4.11	75.70	83.55
	D3V1	3.755	0.730	6.05	3.98	70.81	78.10
	D4V1	3.401	0.680	5.80	3.75	65.73	74.44
	D5V1	3.006	0.655	5.30	3.61	60.48	72.40
	D0V2	4.326	0.970	7.38	4.75	78.50	91.40
	D1V2	4.050	0.912	6.98	4.48	77.33	89.35
	D2V2	3.871	0.840	6.55	4.19	76.40	85.70
	D3V2	3.287	0.789	6.33	4.05	73.25	81.40
	D4V2	2.917	0.710	5.92	3.80	68.32	78.52
	D5V2	2.871	0.668	5.35	3.68	62.55	75.38
	SE ±	0.374	0.119	0.280	0.214	1.61	1.92
	CD	1.095	0.348	0.805	0.690	4.10	5.75
	CV %	10.5	8.3	4.2	5.3	8.9	7.4

Table 5.20: Effect of sowing dates on seed germination, root shoot length and vigour index for quality seed production in soybean at VNMKV, Parbhani during *Rabi* 2016-17

Sr. No.	Treatments	Germination					Root Shoot length					Vigour Index				
		Initial	60 DAS	120 DAS	180 DAS	240 DAS	Initial	60 DAS	120 DAS	180 DAS	240 DAS	Initial	60 DAS	120 DAS	180 DAS	240 DAS
1	Variety															
	V1 - MAUS- 162	86.7	86.5	85.8	82.8	76.5	29.8	26.4	25.6	22.6	20.9	2583	2283	2196	1871	1598
	V2 - MAUS- 152	85.5	85.4	84.9	81.7	71.5	27.8	25.4	22.4	19.5	18.7	2376	2169	1901	1593	1337
2	Date of sowing															
	D0-01-07-2016	85.7	85.5	84.7	87.6	75.7	28.6	25.9	25.9	23.1	21.9	2450	2218	2089	1865	1665
	D1 - 07-11-2016	86.0	85.8	85.2	82.2	73.8	28.9	26.1	25.4	21.8	20.3	2485	2244	2162	1797	1505
	D2- 21-11-2016	86.5	86.2	85.6	82.4	73.3	29.1	26.7	24.4	21.6	20.4	2520	2305	2087	1781	1503
	D3-30-11-2016	85.7	85.6	85.0	80.6	73.0	29.9	25.9	23.6	21.3	19.7	2560	2266	2012	1772	1440
	D4-15-12-2016	86.3	86.2	85.8	81.5	73.5	28.2	24.8	22.2	19.7	18.3	2510	2175	1948	1709	1350
	D5-30-12-2016	86.5	86.3	86.1	82.1	74.3	28.0	25.8	22.3	19.0	18.1	2422	2236	1924	1535	1347
	SE±	0.20	0.33	0.20	0.25	0.30	0.16	0.11	0.13	0.20	0.12	40.5	35.0	27.8	20.3	14.9
	CD	10.58	0.98	0.57	0.71	0.85	0.47	0.35	0.40	0.58	0.34	118.2	103.2	84.1	62.1	43.5
3	Interaction:															
	D0V1	86.1	85.9	85.0	82.1	78.3	28.9	25.3	24.8	24.3	22.9	2488	2173	2108	1995	1793
	D1V1	86.4	86.3	85.4	82.2	77.4	29.3	26.1	26.0	23.7	21.2	2531	2252	2260	1948	1641
	D2V1	86.8	86.5	86.0	82.7	75.3	31.1	27.5	25.4	23.4	22.7	2699	2378	2184	1935	1709
	D3V1	86.2	86.0	85.2	81.2	75.7	31.4	26.6	25.5	22.6	20.4	2706	2287	2172	1835	1544
	D4V1	87.3	87.1	86.6	82.7	75.8	29.3	25.4	24.1	21.1	19.2	2557	2212	2087	1744	1455
	D5V1	87.4	87.2	86.8	82.9	76.3.	28.7	27.5	24.7	20.3	19.0	2508	2398	2143	1682	1449
	D0V2	85.3	85.1	84.5	81.1	73.2	28.3	26.6	24.5	21.4	21.0	2413	2263	2070	1735	1537
	D1V2	85.6	85.4	85.0	82.3	70.3	28.5	26.2	24.4	20.0	19.5	2439	2237	2065	1646	1370
	D2V2	86.1	85.9	85.1	82.2	71.3	27.2	26.0	23.4	19.8	18.2.	2341	2233	1991	1627	1297
	D3V2	85.3	85.2	84.8	80.1	70.4	28.4	25.3	21.7	20.1	19.0	2422	2155	1840	1610	1337
	D4V2	85.4	85.3	85.0	80.4	71.2	27.1	24.2	20.3	18.3	17.5	2314	2064	1725	1471	1246
	D5V2	85.6	85.5	85.3	1.3	72.4	27.3	24.1	20.0	17.7	17.2	2336	2060	1706	1439	1245
	SE ±	0.45	0.62	0.42	0.35	1.10	0.32	0.35	0.42	0.36	0.27	93.2	69.2	55.3	41.5	32.4
	CD	1.30	1.80	1.23	1.10	3.30	0.92	1.07	1.24	1.06	0.80	270.4	201.4	165.2	125.2	94.8

Conclusion: The variety MAUS-158 recorded better yield and yield components in all sowing dates than variety MAUS-162 and both varieties could be recommended for sowing up to November 30 as these dates found at par for yield and other parameters. All yield and yield components, morphometry and seed Quality parameter decline with advancement of sowing dates.

Experiment 6: Efficacy of hydrogels (Pusa hydrogel and herbal hydrogel) on seed yield, quality and water use efficiency on wheat

Year of start- 2016-17

Centers: ICAR-IARI, New Delhi and ICAR-IISS, Mau

Objective:

To evaluate the efficacy of hydrogels in improving seed yield and quality under limited irrigation condition in wheat.

Treatment Details:

Main Plot: Irrigation (Treatments-4)

S_1 - Sowing under normal moisture + Skip irrigation (3 irrigations)

S_2 - Sowing under normal moisture + Normal irrigation (6 irrigations)

S_3 - Sowing under restricted moisture + Skip irrigation (3 irrigations)

S_4 - Sowing under restricted moisture + Normal irrigation (6 irrigations)

Sub Plots: Hydrogels (Treatments-3)

T_0 - Control

T_1 - Soil application of Pusa hydrogel developed by Dr. Anupama, Division of Agricultural Chemicals, IARI, New Delhi

T_2 - Seed coated with Herbal hydrogel developed by Dr. V.S. Lather, IARI, RS, Karnal

Sub-sub Plot: Varieties (Treatments-2)

V_1 - HD2967 (Suitable for normal irrigation)

V_2- HD 3043 (Suitable for limited irrigation)

Total Plots: 72

Spacing: 20 X 10 cm

Design: Split Plot

Observations to be recorded:

Seed quality of treated seed

- Germination (%)
- Seedling length
- Seedling dry weight
- Vigour index
- Speed of germination

Soil Parameters

- Soil Moisture at 15 days interval
- Soil structure and texture analysis

Yield Parameters

- Field emergence
- Seedling fresh and dry weight
- Plant height
- Days to 50% flowering

- No. of tillers and effective tillers per unit area
- No. of filled seeds per panicle
- 1000 seed weight
- Seed yield / ha

Observations of PI

Unified Observations

Effect of seed coating and soil application with hydrogel on yield and seed quality traits of wheat

The experiment was proposed for two centers, IARI New Delhi; ICAR-IISS Mau. Results from both the centers received in time. The detailed mean data over locations are presented in table 6.1.

The average over locations revealed that seed germination studies showed, no effect of seed coating with herbal hydrogel on seed germination and vigour for both the wheat varieties under lab condition.

Results indicated no significant effect with soil application of Pusa hydrogel and herbal hydrogel on field emergence and seedling growth.

Both the hydrogel failed to show effect on plant growth (height), flowering induction (days to 50% flowering), no. of tillers/unit area and seed yield in both the varieties.

Irrigation scheduling and moisture level had shown the difference on seedling emergence, early plant growth, days to flowering, no. of effective tillers and seed yield wherein plant showed early emergence , growth, better plant height and yield under normal moisture and irrigation levels then under restricted moisture and skip irrigation condition.

Seed quality of harvested seed from treated plots had no significant effect of hydrogel treatments.

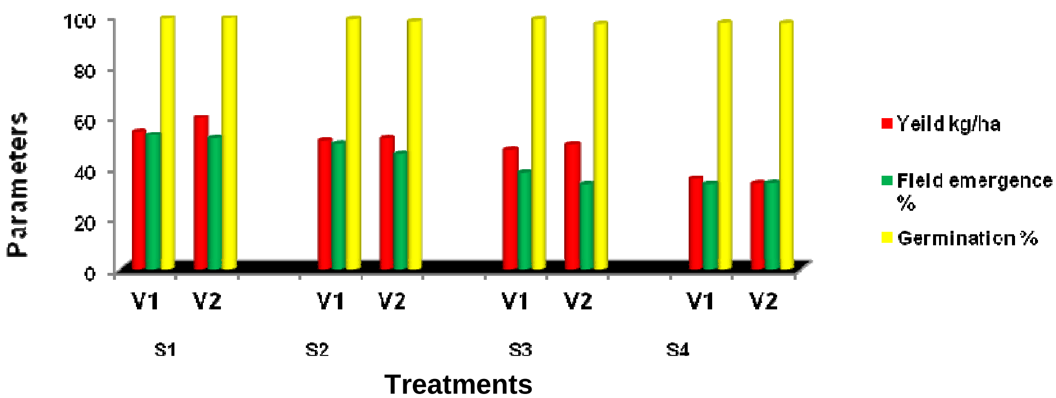
Significant Observations:

Based on average over locations it is observed that hydrogel (Herbal and Pusa hydrogel) were not effective for enhancing plant establishment, plant growth and yield under restricted moisture and skip irrigation conditions.

Table 6.1: Effect of seed coating and soil application of hydrogels on seedling and yield attributing traits of Wheat (Mean over two locations).

Sowing Conditions (Main Plot)	Treatment (Sub-plots)	Field Emergence (%)	Germination (%)	VI-I	Seed yield (q/ha)	Plant height (cm)	No. of tiller per m2
Sowing under normal moisture + normal irrigation (S1)	V1T0	49.53	98.66	3545.30	52.64	91.85	210.03
	V1T1	53.32	98.16	3564.07	53.44	91.85	209.33
	V1T2	55.36	98.33	3311.91	56.22	91.76	201.9
	Mean V1	**52.73**	**98.38**	**3473.55**	**54.04**	**91.82**	**207.09**
	V2T0	48.82	97.75	3335.77	58.60	105.87	209.16
	V2T1	50.90	98.50	3327.90	58.54	104.08	213.3
	V2T3	53.95	99.50	3554.59	61.17	106.03	213.66
	Mean V2	**51.22**	**98.52**	**3403.03**	**59.42**	**105.31**	**190.86**
Sowing under + normal moisture + skip irrigation (S2)	V1T0	50.14	97.91	3338.29	53.06	89.16	182.36
	V1T1	49.69	98.25	3286.29	48.24	88.64	182.70
	V1T2	47.74	97.83	3433.07	50.47	90.32	177.40
	Mean V1	**49.18**	**98.00**	**3352.37**	**50.32**	**89.37**	**180.80**
	V2T0	45.82	96.00	3273.02	53.75	104.46	195.73
	V2T1	45.51	98.00	3271.8	48.69	99.89	187.50
	V2T3	44.88	97.75	3318.21	51.17	102.03	186.90
	Mean V2	**45.40**	**97.25**	**3287.55**	**51.17**	**102.11**	**190.03**

Sowing under restricted moisture + normal irrigation (S3)	V1T0	41.11	98.83	3011.62	47.82	91.43	179.96
	V1T1	37.39	96.66	2953.44	44.84	90.23	175.10
	V1T2	35.625	98.58	2988.89	48.42	90.41	185.50
	Mean V1	**38.04**	**98.02**	**2985.05**	**46.94**	**90.65**	**180.15**
	V2T0	34.74	96.66	3341.66	53.57	98.31	184.46
	V2T1	34.66	94.50	3181.4	44.32	101.17	187.26
	V2T3	30.32	97.66	3327.29	48.77	100.54	187.26
	Mean V2	**33.24**	**96.27**	**3283.14**	**48.89**	**100.01**	**186.31**
Sowing under restricted moisture + skip irrigation (S4)	V1T0	34.90	95.91	2903.755	34.68	81.815	181.2
	V1T1	33.61	97.83	3030.42	34.21	81.71	179.40
	V1T2	31.59	96.25	2994.08	37.24	82.44	197.00
	Mean V1	**33.36**	**96.66**	**2976.31**	**35.37**	**81.98**	**185.85**
	V2T0	32.68	96.75	3200.87	34.41	90.09	198.40
	V2T1	36.40	95.96	3119.54	32.51	91.13	184.10
	V2T3	32.47	97.00	3117.06	33.97	93.83	206.33
	Mean V2	**33.68**	**96.53**	**3099.55**	**33.61**	**91.67**	**196.28**



Effect of seed coating and soil application of hydrogels on yield

ICAR-IISS, Mau

Results: The efficacy of hydrogels (Pusa hydrogel and Herbal hydrogel) was studied on wheat varieties; HD 2967 and HD 3043 under restricted and normal irrigation condition. The results showed non- significant effect of soil application of Pusa hydrogel and Herbal hydrogel on field emergence, speed of emergence and early seedling growth (seedling fresh and dry weight) in wheat (Table 6.2). Both the hydrogels failed to show any significant effect on plant vegetative growth (plant height), No. of tiller per m^2, seed yield per plot (kg) and total seed yield (t/ha) in both the varieties (Table 6.2). The irrigation scheduling and moisture levels had evident effect on seedling emergence, early plant growth and yield attributing traits, wherein plants showed early emergence, better seedling growth, seed yield under normal moisture and irrigation levels than under restricted moisture and skip irrigation conditions. Seed germination studies showed no effect of seed coating with Herbal hydrogel on seed germination and vigour of both the wheat varieties under lab condition and seed quality attributes of seed obtained from normal moisture and normal irrigation regimes performed better than that of restricted moisture regimes (Table 6.3).

Field view of experiment on hydrogel to enhance seed yield under moisture stress condition

Plants under restricted moisture at sowing with limited irrigation

Wheat Plants under Restricted Moisture at Sowing with Normal Irrigation

Wheat Plants under Normal Moisture at Sowing with Normal Irrigation

Table 6.2: Effect of seed coating and soil application of hydrogels on seedling and yield attributing traits in two varieties of wheat at ICAR-IISS, Mau during *Rabi* 2016-17

Sowing Conditions (Main Plot)	Treatment (Sub-plots)	Field Emergence (%)	Seedling fresh wt (g)	Seedling dry wt (g)	Plant height (cm)	No. of tiller per m2	No. of filled seed per panicle	No. of filled seed per plant	1000 seed weight (g)	seed yield per plot (kg)	Seed yield (t/ha)
Sowing under normal moisture + normal irrigation (S1)	V1T0	42.95	14.87	2.59	89.11	90.07	53.93	182.67	33.58	3.01	5.01
	V1T1	51.14	13.30	2.36	89.51	83.67	58.33	216.80	34.67	3.05	5.09
	V1T2	53.81	12.95	2.25	92.23	78.80	55.53	250.07	32.27	3.47	5.78
	Mean V1	**49.30**	**13.71**	**2.40**	**90.29**	**84.18**	**55.93**	**216.51**	**33.50**	**3.17**	**5.29**
	V2T0	48.95	10.97	2.05	97.75	93.33	48.20	172.60	39.29	3.55	5.91
	V2T1	53.52	11.25	1.69	96.67	86.60	51.20	206.33	35.08	3.64	6.07
	V2T3	58.67	11.00	2.05	99.07	82.33	47.93	134.07	34.26	3.80	6.33
	Mean V2	**53.71**	**11.07**	**1.93**	**97.83**	**87.42**	**49.11**	**171.00**	**36.21**	**3.66**	**6.10**
Sowing under + normal moisture + skip irrigation (S2)	V1T0	46.10	11.93	2.39	86.53	64.73	54.13	147.53	35.29	3.17	5.28
	V1T1	44.29	10.71	2.06	85.38	67.40	61.93	176.73	31.05	2.62	4.37
	V1T2	40.67	11.19	2.62	87.34	69.80	52.67	148.27	31.53	2.78	4.63
	Mean V1	**43.68**	**11.28**	**2.36**	**86.42**	**67.31**	**56.24**	**157.51**	**32.62**	**2.86**	**4.76**
	V2T0	42.57	11.24	2.46	97.13	71.47	54.00	192.27	35.16	3.20	5.34
	V2T1	42.95	10.38	2.03	87.88	68.00	47.60	153.20	37.93	2.67	4.46
	V2T3	41.52	9.37	2.07	92.56	60.80	48.07	182.33	35.67	2.86	4.77
	Mean V2	**42.35**	**10.33**	**2.19**	**92.52**	**66.76**	**49.89**	**175.93**	**36.26**	**2.91**	**4.85**
Sowing under restricted moisture + normal irrigation (S3)	V1T0	29.52	9.19	1.79	91.26	55.93	57.27	229.60	36.16	2.92	4.86
	V1T1	24.38	11.54	2.95	86.66	55.20	52.87	201.67	36.06	2.48	4.13
	V1T2	20.00	9.63	2.03	90.53	56.00	61.60	212.47	35.11	2.96	4.94
	Mean V1	**24.63**	**10.12**	**2.26**	**89.48**	**55.71**	**57.24**	**214.58**	**35.77**	**2.79**	**4.64**
	V2T0	24.86	9.20	1.58	90.53	67.93	61.27	257.60	37.80	3.34	5.57
	V2T1	23.71	8.68	1.99	94.95	59.53	59.67	247.47	36.31	2.28	3.80
	V2T3	14.10	6.60	1.70	93.58	62.53	55.47	217.87	29.15	2.76	4.61

	Mean V2	**20.89**	**8.16**	**1.76**	**93.02**	**63.33**	**58.80**	**240.98**	**34.42**	**2.80**	**4.66**
Sowing under restricted moisture + skip irrigation (S4)	V1T0	19.62	9.78	3.33	76.73	52.40	53.13	238.60	34.19	1.55	2.59
	V1T1	15.81	9.73	2.77	76.72	46.80	51.07	256.20	36.02	1.36	2.27
	V1T2	12.10	9.65	2.28	76.39	46.00	59.40	271.27	35.76	1.78	2.97
	Mean V1	**15.84**	**9.72**	**2.79**	**76.61**	**48.40**	**54.53**	**255.36**	**35.32**	**1.57**	**2.61**
	V2T0	20.29	10.13	2.64	77.09	44.80	62.87	271.47	32.22	1.36	2.27
	V2T1	26.76	7.90	2.55	81.16	41.20	60.20	266.80	34.86	1.18	1.97
	V2T3	19.90	8.24	2.10	85.47	44.67	51.20	259.00	30.98	1.76	2.93
	Mean V2	**22.32**	**8.76**	**2.43**	**81.24**	**43.56**	**58.09**	**265.76**	**32.69**	**1.43**	**2.39**
CD (P=0.05)	V	NA	NA	0.36	2.49	NA	NA	NA	NA	NA	NA
	T	NA	0.64	NA	NA	NA	NA	NA	NA	0.16	NA
	S	3.76	1.58	NA	3.50	6.90	NA	33.24	NA	0.36	0.92
	V×T	NA	NA	NA	NA	NA	4.02	NA	NA	NA	NA
	V×S	5.32	NA	NA	NA	NA	NA	NA	NA	NA	NA
	T×S	6.52	NA	NA	NA	NA	NA	NA	NA	NA	NA
	V×T×S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 6.3: Effect of seed coating and soil application of hydrogels on seed quality attributes in two varieties of wheat at ICAR-IISS, Mau during *Rabi* 2016-17

Sowing Conditions (Main Plot)	Treatment (Sub-plots)	Germination (%)	Seedling length (cm)	Seedling dry weight (g)	VI-I	VI-II
Sowing under normal moisture + normal irrigation (S1)	V1T0	98.33	40.23	0.13	3956.11	12.40
	V1T1	96.33	40.78	0.12	3928.15	11.44
	V1T2	96.67	36.45	0.23	3523.82	22.50
	Mean V1	**97.11**	**39.15**	**0.16**	**3802.28**	**15.46**
	V2T0	96.00	37.88	0.09	3636.80	8.35
	V2T1	97.00	37.17	0.12	3605.81	11.37
	V2T3	99.00	39.99	0.11	3959.18	11.17
	Mean V2	**97.21**	**38.35**	**0.11**	**3727.81**	**10.27**
Sowing under + normal moisture + skip irrigation (S2)	V1T0	96.33	36.77	0.15	3542.34	14.32
	V1T1	97.00	35.45	0.13	3438.33	12.67
	V1T2	96.67	38.26	0.10	3698.14	9.23
	Mean V1	**96.67**	**36.83**	**0.12**	**3559.75**	**12.08**
	V2T0	94.00	36.80	0.11	3459.04	9.90
	V2T1	96.00	36.39	0.12	3493.60	11.70
	V2T3	97.00	37.45	0.13	3632.17	12.20
	Mean V2	**95.67**	**36.88**	**0.12**	**3528.03**	**11.26**
Sowing under restricted moisture + normal irrigation (S3)	V1T0	97.67	34.54	0.13	3373.24	12.93
	V1T1	93.33	35.97	0.19	3356.89	17.65
	V1T2	97.67	35.74	0.13	3490.28	13.10
	Mean V1	**96.22**	**35.41**	**0.15**	**3407.60**	**14.62**
	V2T0	93.33	40.00	0.11	3733.33	10.56
	V2T1	90.00	39.35	0.11	3541.80	9.73
	V2T3	95.33	39.91	0.22	3804.59	20.56
	Mean V2	**92.89**	**39.75**	**0.15**	**3692.69**	**13.53**
Sowing under restricted	V1T0	93.33	35.31	0.10	3295.76	9.50

moisture + skip irrigation (S4)	V1T1	96.67	35.05	0.08	3387.84	7.76
	V1T2	93.00	36.04	0.10	3351.41	9.19
	Mean V1	**94.33**	**35.47**	**0.09**	**3345.53**	**8.83**
	V2T0	95.00	36.80	0.07	3496.00	6.34
	V2T1	93.67	36.72	0.11	3438.97	9.92
	V2T3	95.00	38.01	0.09	3610.63	8.88
	Mean V2	**94.56**	**36.20**	**0.09**	**3422.66**	**8.65**
CD(P=0.05)	V	NA	NA	NA	NA	NA
	T	NA	NA	NA	NA	NA
	S	NA	1.97	NA	NA	NA
	V×T	NA	NA	NA	NA	NA
	V×S	NA	NA	NA	NA	NA
	T×S	NA	NA	NA	NA	NA
	V×T×S	NA	NA	NA	NA	NA

ICAR-IARI, New Delhi

Results:

Seed germination studies showed no effect of seed coating with herbal hydrogel on seed germination and vigour of both the wheat varieties under lab conditions (Table 6.4).

Evaluation of efficacy of hydrogels (pusa hydrogel and herbal hydrogel) was studied on wheat varieties; HD 2967 and HD 3043 under restricted and normal irrigation conditions (Fig 1). The results showed no significant effect of soil application of pusa hydrogel and herbal hydrogel on field emergence (Fig 2), speed of emergence and early seedling growth (seedling fresh and dry weight) of wheat. Both the hydrogels failed to show effect on plant vegetative growth (plant height) and flowering induction (days to 50% flowering), number of tillers/unit area, seeds/panicle and seed yield in both the varieties (Table 6.5). The genotypic differences were expressed for all the traits under study. The irrigation scheduling and moisture levels had evident effect on seedling emergence, early plant growth, days to flowering, number of effective tillers and seed yield wherein plants showed early emergence, better seedling growth, better plant height and yield under normal moisture and irrigation levels than under restricted moisture and skip irrigation conditions. Seed quality of harvested seed from treated plots i.e. seed germination and vigour had no evident effect of hydrogel treatments (Table 6.4).

Results

Table 6.4: Effect of seed coating with herbal hydrogel on lab germination and vigour of wheat

Variety	Treatment*	Seed germination (%)	Seedling length(cm)	Seedling dry weight(g)	Vigour Index 1	Vigour Index 2
HD2967	**T0**	100	37.92	0.463	3792.00	46.36
	T2	99.5	38.56	0.488	3836.72	48.55
HD3043	**T0**	99.5	34.51	0.424	3433.74	42.18
	T2	99.5	34.23	0.430	3405.88	42.78

*T_0: Untreated control; T_2: Herbal hydrogel coated wheat seed

Table 6.5: Effect of seed coating with hydrogels on field emergence, seedling growth, plant height and yield contributing traits of wheat at ICAR-IARI, New Delhi

Sowing Conditions (Main Plot)	Treatment (Sub-plots)	Field Emergence (%)	Seedling fresh wt (g)	Seedling dry wt (g)	Plant height (cm)	Days to 50% flowering	No. of tiller per m^2	No. of effective tiller per m2	Plant biomass(kg)	No. of filled seed per panicle	seed yield per plot (kg)
Sowing under restricted moisture + skip irrigation (S1)	V1T0	50.18	22.23	3.44	86.9	92.5	310	290	9.13	62.8	3.26
	V1T1	51.42	23.95	3.43	86.7	92.5	312	302	9.80	57.8	3.43
	V1T2	51.09	20.84	3.38	88.5	92.3	348	338	9.70	59.1	3.36
	Mean V1	**50.89**	**22.34**	**3.41**	**87.36**	**92.4**	**323.3**	**310.0**	**9.54**	**59.9**	**3.35**
	V2T0	45.08	16.90	3.31	103.1	91.5	352	322	10.06	62.0	3.46
	V2T1	46.04	16.67	3.38	101.1	92.3	327	312	10.30	62.0	3.40
	V2T3	45.05	15.52	3.32	102.2	91.5	368	325	9.36	66.8	2.90
	Mean V2	**45.05**	**16.36**	**3.33**	**102.1**	**91.7**	**349.0**	**319.6**	**9.90**	**63.6**	**3.25**
Sowing under restricted moisture + normal irrigation (S2)	V1T0	52.7	23.41	4.64	91.6	94.0	304	291	11.20	60.0	3.53
	V1T1	50.41	24.05	3.43	93.8	94.5	295	283	11.33	55.8	3.63
	V1T2	51.25	23.67	3.08	90.3	94.2	315	300	11.10	55.8	3.56
	Mean V1	**51.45**	**23.71**	**3.71**	**91.83**	**94.2**	**304.6**	**202.3**	**11.21**	**57.2**	**3.57**
	V2T0	44.62	16.91	3.31	106.1	93.5	301	292	11.76	59.5	3.86
	V2T1	45.62	17.41	3.68	107.4	93.5	315	305	11.43	57.6	3.80
	V2T3	46.54	17.08	3.42	107.5	93.5	312	300	11.56	56.2	3.86
	Mean V2	**45.59**	**17.13**	**3.47**	**107.0**	**93.5**	**309.3**	**299.0**	**11.58**	**57.7**	**3.84**
Sowing under normal moisture + normal irrigation (S3)	V1T0	56.12	32.23	4.64	94.6	93.5	330	300	11.03	62.6	4.14
	V1T1	55.50	30.54	4.59	94.2	93.5	335	325	10.70	62.5	4.20
	V1T2	56.91	31.03	4.66	91.3	93.5	325	320	10.8	58.6	4.10
	Mean V1	**56.17**	**31.26**	**4.63**	**93.36**	**93.5**	**330.0**	**315.1**	**10.84**	**61.2**	**4.14**
	V2T0	48.7	26.85	3.77	114.0	92.5	325	300	11.86	60.1	4.36
	V2T1	48.29	25.68	3.77	111.5	92.2	340	329	11.93	68.1	4.23
	V2T3	49.24	26.76	3.88	113.0	92.5	345	336	11.96	63.5	4.43
	Mean V2	**48.74**	**26.43**	**3.80**	**112.8**	**92.4**	**294.3**	**321.6**	**11.91**	**63.9**	**4.34**
Sowing under + normal moisture + skip irrigation (S4)	V1T0	54.19	32.41	4.74	91.8	93.2	300	284	10.40	56.0	4.00
	V1T1	55.09	32.06	4.59	91.9	93.3	298	285	9.76	61.3	3.96
	V1T2	54.81	32.04	4.66	93.3	93.5	285	276	10.8	62.2	4.10
	Mean V1	**54.69**	**32.83**	**4.33**	**92.33**	**93.3**	**294.3**	**304.6**	**10.32**	**59.83**	**3.98**
	V2T0	49.08	28.01	3.27	111.8	91.5	320	310	11.3	62.0	4.06
	V2T1	48.07	26.11	3.87	111.9	92.5	307	301	11.2	61.5	3.96
	V2T3	48.24	26.81	3.38	111.5	91.5	313	303	11.2	64.6	4.10
	Mean V2	**48.46**	**26.97**	**3.50**	**111.7**	**91.8**	**313.3**	**304.6**	**11.25**	**62.7**	**4.04**
CD(P=0.05)	V	1.07	1.64	0.27	1.21	NS	2.01	3.21	NS	NS	NS
	T	NS	0.88	0.21	NS	NS	1.01	NS	NS	0.16	NS
	S	1.08	1.58	0.21	4.50	NS	1.01	10.21	1.21	0.246	.73
	V×T	4.21	NS	NS	NS	NS	4.02	NS	NS	NS	NS
	V×S	3.24	NS	NS	NS	NS	NS	NS	NS	NS	NS
	T×S	2.21	NS	NS	NS	NS	NS	NS	NS	NS	NS
	V×T×S	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

*T_0: Untreated control;T_1: Pusa hydrogel applied in root zone; T_2: Herbal hydrogel coated wheat seed

Table 6.6: Effect of seed coating and soil application of hydrogels on seed quality attributes at ICAR-IARI, New Delhi

Sowing Conditions (Main Plot)	Treatment (Sub-plots)	Germination (%)	Seedling length (cm)	Seedling dry weight (g)	VI-I	VI-II
Sowing under restricted moisture + skip irrigation (S1)	V1T0	98.5	25.5	0.085	2511.75	8.43
	V1T1	99.0	27.0	0.083	2673.00	8.26
	V1T2	99.5	26.5	0.085	2636.75	8.45
	Mean V1	**99.0**	**26.3**	**0.084**	**2607.1**	**8.38**
	V2T0	98.5	29.5	0.079	2905.75	7.78
	V2T1	98.25	28.5	0.082	2800.12	8.05
	V2T3	99.0	26.5	0.081	2623.50	8.01
	Mean V2	**98.5**	**28.1**	**0.800**	**2776.45**	**7.98**
Sowing under restricted moisture + normal irrigation (S2)	V1T0	100.0	26.5	0.080	2650.00	8.00
	V1T1	100.0	25.5	0.085	2550.00	8.50
	V1T2	99.5	25.0	0.085	2487.50	8.45
	Mean V1	**99.83**	**25.8**	**0.083**	**2562.5**	**8.31**
	V2T0	100.0	29.5	0.081	2950.00	8.10
	V2T1	99.0	28.5	0.081	2821.00	8.02
	V2T3	100.0	28.5	0.080	2850.00	8.00
	Mean V2	**99.66**	**28.1**	**0.080**	**2873.6**	**8.04**
Sowing under normal moisture + normal irrigation (S3)	V1T0	99.0	31.5	0.086	3134.50	8.51
	V1T1	100.0	32.0	0.089	3200.00	8.90
	V1T2	100.0	31.0	0.088	3100.00	8.80
	Mean V1	**99.66**	**31.5**	**0.087**	**3144.83**	**8.73**
	V2T0	99.5	30.5	0.080	3034.75	7.92
	V2T1	100.0	30.5	0.082	3050.00	8.20
	V2T3	100.0	31.5	0.081	3150.00	8.18
	Mean V2	**99.83**	**30.83**	**0.081**	**3078.25**	**8.178**
Sowing under + normal moisture + skip irrigation (S4)	V1T0	99.5	31.5	0.081	3134.25	8.02
	V1T1	99.5	31.5	0.082	3134.25	8.12
	V1T2	99.0	32.0	0.084	3168.00	8.31
	Mean V1	**99.33**	**31.6**	**0.082**	**3145.00**	**8.16**
	V2T0	98.0	31.5	0.079	3087.00	7.74
	V2T1	100.0	30.5	0.080	3050.00	8.01
	V2T3	98.5	30.5	0.080	3004.25	7.88
	Mean V2	**98.83**	**30.83**	**0.079**	**3047.08**	**7.87**
CD (P=0.05)	Variety	NS	NS	NS	NS	NS
	Treatment	NS	NS	NS	NS	NS
	Sowing cond	NS	1.07	NS	100.1	0.91
	V×T	NS	NS	NS	NS	NS
	V×S	NS	NS	NS	NS	NS
	T×S	NS	NS	NS	NS	NS
	V×T×S	NS	NS	NS	NS	NS

Experimental layout of wheat crop at IARI, New Delhi

Experiment 7: Optimization of seed rate in Soybean (*Glycine max* L.)

Year of start: 2017-18
Centers:

Centers	Variety	
	Medium maturity	**Early Maturity**
JNKVV, Jabalpur	JS 20-29	JS 20-34
RVSKVV, Gwalior	JS 20-29	JS 20-34
VNMKV, Parbhani	MAUS 162	JS 20-34
UAS, Dharwad	DSB 21	JS 93-05
MPKV, Rahuri	KDS 344	JS 93-05
AU, Kota	RKS 45	JS 20-34
IISR, Indore	NRC 86	JS 20-34
PDKV, Akola	NRC 86	JS 20-34
PJTSAU, Hyderabad	Any suitable variety	-do-
UAS, Bengaluru	Any suitable variety	-do-

Objectives: Soybean crop is highly sensitive to climatic factors and supply of quality seeds is becoming a critical problem due to climatic uncertainties. Study need to be conducted on reduction of seed requirement with following objectives

- To increase the productivity with reduced seed rate
- To study the effect of less plant population on control of insect and disease infestation
- To enhance the Interaction of early and medium maturing varieties to reduced seed rate
- To find out economic viability of low seed rate and production

Treatment Details

T_0 - Recommended seed rate @ 70 kg/ha
T_1 - Reduced seed rate @ 60kg/ha
T_2 - Reduced seed rate @ 50kg/ha
T_3 - Reduced seed rate @ 40kg/ha

T4 - Reduced seed rate @ 30kg/ha

Technical Details

- Plot size: 6 rows of 6m for each treatment
- Uniform seed treatment: 2g Xelora + 1.5 g Vitavax power + 2 g Thiomethoxam + 5 ml water per kg seed.
- Weed management: Due to less plant population weed may be more. Pre (Diclosulam @ 26g/ha) and post emergence (Imazythopyr @ 1 l/ha) herbicides may be followed.
- Sowing by dibbling of single seed per spot as per spacing at uniform depth of 3-5 cm.
- No. of replications: 4
- Experimental design: RBD

Observations to be recorded

1. Plant population per sq. meter
2. Plant height at maturity
3. Plant canopy diameter
4. Number of branches per plant
5. Number of pods per plant
6. Yield per plant
7. Yield per ha.
8. 100 seed weight
9. Seed quality parameters (Germination % and SVI-I & II)
10. Storability of seeds at monthly interval (Germination %; seedling length; Seed Vigor; Dry matter production; Seed health)
11. Information on pests & diseases during crop growth.

Observations of PI

Unified Observations

Effect of seed rate on plant growth, yield and seed quality parameters of soybean

Soybean crop is highly sensitive to climatic factors. Adequate, timely supply of quality seeds is becoming a critical problem due to variable production in climatic uncertainty. Studies have been initiated on reduction of seed requirement (70, 60, 50, 40 and 30 kg) with the aim to increase the productivity with reduced seed rate and also to study the effect of less plant population on control of insect and diseases.

The experiment was proposed at ten centers; however, only eight centers reported the results. The study includes characterization of yield and yield related traits by reducing the seed rate in early and medium maturing soybean varieties. The study conducted reveals that with the reduced seed rate of 50-60kg/ha, there is a reduction in seed yield. In medium maturing varieties, number of pods/plant increased by 7.2% by the application of seed rate at 50 kg/ha as compared to recommended seed rate (70 kg/ha) but there is decrease in yield up to 13.7%. Even though there is decrease in plant population, it is compensated by the increase in number of pods/plant. In case of early maturing varieties, the number of pods per plant increased by 17.9% and there was a decrease in yield up to 13.8% as compared to recommended seed rate (70 kg/ha).

Parameters	Early maturity varieties	Medium maturity varieties
Seed yield/ ha	13.83% decrease	13.74% decrease
100 seed weight	0.3% increase	1.9% decrease
No. of pods/plant	17.92% increase	7.23% increase

Individual Center wise Observations

JNKVV, Jabalpur

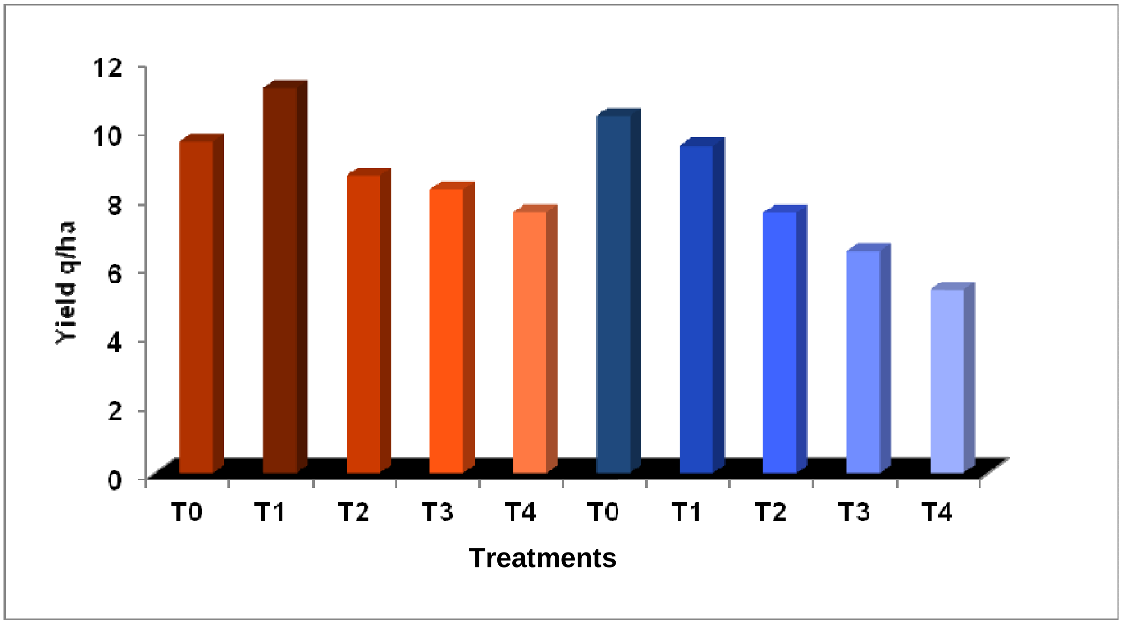
Results: The experiment was laid out using two soybean varieties viz., JS 20-29 and JS 20-34 in FRBD with different seed rate. Different growth and yield parameters recorded at different stages as per technical programme.

From the observed data under variable seed rate observation, the 60 kg seed /ha has shown promising results over recommended seed rate in variety JS 20-29. While in case of bold seeded variety JS 20-34, recommended seed rate has shown promising results as compared to treatments with low seed rate.

It was observed that infection due to aerial blight (*Rhizoctonia solani*) decreased in relation to plant population i.e. in higher population and dense canopy, the infection was greater (12%) in treatment (T_o) that decreased up to 4.0% in T_4 (where plant population was least). Similar trends were noticed for other diseases in both the varieties. In JS 20-29, disease incidence was lower in T_1 and yield is at par with T_o, hence it can be recommended to use seed rate 60 kg/ha., but this cannot be applied for JS 20-34 because the yield of T_0 is highest and getting reduced in subsequent treatments (lower seed rate). The canopy of JS 20-29 is spreading type, provides congenial atmosphere to development of disease as compared to JS 20-34 having erect plant type.

Table 7.1: Disease incidence in optimization of seed rate in Soybean

Main treatment	Sub treatment	(%) infected plants			
		Green mosaic (%)	Aerial blight	Cercospora leaf spot	Anthracnose
JS 20-29	T_0	12.0	23.0	22.0	7.0
	T_1	6.0	13.2	15.0	6.0
	T_2	3.0	9.0	12.0	3.0
	T_3	4.0	2.33	3.0	3.0
	T_4	4.0	1.67	5.0	3.0
JS 20-34	T_0	9.0	27.0	19.0	11.0
	T_1	3.0	18.0	17.0	7.0
	T_2	2.0	9.0	15.0	7.0
	T_3	2.0	4.0	14.0	3.0
	T_4	1.0	0.0	9.0	3.0



Effect of optimization of seed rate in soybean yield (q/ha)

T_0: Recommended seed rate @ 70 kg/ha

T_1: Reduced seed rate @ 60kg/ha

T_2: Reduced seed rate @ 50kg/ha

JS 20-29

T_0: Recommended seed rate @ 70 kg/ha

T_1: Reduced seed rate @ 60kg/ha

T_2: Reduced seed rate @ 50kg/ha

JS 20-34

Table 7.2: Effect of different seed rate on yield attributing traits and seed quality of soybean

Main treatment	Sub treatment	Plant population/ m^2	Plant height (cm)	Plant canopy diameter (m)	No. of branches / plant	No. of pods/ plant	Seed yield/ plant (g)	Seed yield (q/ha)	100 seed weight	Seed quality parameters					Storability of seed at monthly interval				
										Germination %	Seedling length (cm)	Seedling dry weight (g)	SVI-I	SVI-II	Germination %	Seedling length (cm)	Seedling dry weight (g)	SVI-I	SVI-II
JS 20-29	T_0	35.75	62.88	4.25	4.20	75.95	13.50	9.65	10.96	81.65	31.48	0.18	2713.22	15.21	83.80	28.98	0.17	2430.66	29.33
	T_1	23.35	57.57	4.19	4.85	77.75	14.45	11.2	10.69	86.15	29.26	0.15	2562.83	13.28	83.63	27.23	0.17	2382.38	13.06
	T_2	19.20	56.95	4.18	4.30	77.25	13.05	8.65	11.07	83.49	28.47	0.15	2507.24	13.16	82.34	28.12	0.16	2455.08	13.67
	T_3	15.20	53.60	4.18	4.05	69.60	9.50	8.25	10.89	81.04	27.86	0.15	2421.61	13.01	82.81	28.17	0.15	2070.90	12.69
	T_4	12.08	52.95	4.08	3.95	58.80	8.64	7.59	10.57	82.56	27.50	0.14	2490.35	13.55	80.97	26.09	0.14	2071.51	13.03
JS 20-34	T_0	32.55	30.85	4.10	2.70	68.65	12.55	10.39	12.06	89.28	34.00	0.19	3036.34	16.75	87.50	32.65	0.19	2856.53	16.28
	T_1	22.65	29.55	4.02	2.65	66.45	12.14	9.53	11.86	85.96	26.45	0.18	2848.99	16.10	88.32	30.29	0.18	2766.67	16.04
	T_2	17.65	27.50	4.04	2.65	63.70	12.03	7.58	11.94	87.78	26.90	0.17	2806.61	15.44	85.34	29.75	0.18	2620.73	14.17
	T_3	14.20	27.40	4.01	2.55	61.20	11.05	6.46	11.59	86.56	27.53	0.17	2835.73	15.70	84.25	29.25	0.17	2578.70	13.51
	T_4	11.28	27.55	3.94	2.45	60.10	11.55	5.33	11.69	83.96	25.85	0.16	2832.20	15.01	77.58	28.94	0.17	2346.95	13.57
Varieties	JS 20-29	21.12	56.79	4.18	4.27	71.87	9.52	5.28	10.84	82.98	28.91	0.15	2539.05	13.64	82.71	27.71	0.16	2282.11	16.36
	JS 20-34	19.67	28.57	4.02	2.60	64.02	12.05	11.27	11.83	86.71	28.14	0.17	2871.97	15.80	84.60	30.17	0.18	2633.91	14.71
	SEd	**8.55**	**1.31**	**0.02**	**0.17**	**5.47**	**1.67**	**0.08**	**0.11**	**0.77**	**0.56**	**0.00**	**33.02**	**0.23**	**1.40**	**0.44**	**0.00**	**44.03**	**0.21**
	CD	**17.56**	**2.69**	**0.05**	**0.36**	**11.23**	**3.44**	**0.18**	**0.23**	**1.58**	**1.14**	**0.00**	**67.76**	**0.47**	**2.88**	**0.91**	**0.00**	**90.35**	**0.43**
Seed rate	T_0	34.15	46.87	4.17	3.78	73.20	10.86	8.76	11.51	87.71	32.74	0.18	2874.78	15.98	85.65	30.81	0.18	2643.60	22.81
	T_1	23.00	43.56	4.11	3.48	71.85	11.48	9.70	11.27	83.80	27.85	0.16	2705.91	14.69	85.97	28.76	0.18	2574.53	14.55
	T_2	18.43	42.23	4.11	3.43	69.83	11.14	8.91	11.51	85.63	27.68	0.16	2656.93	14.30	83.84	28.94	0.17	2537.91	13.92
	T_3	14.70	40.50	4.09	3.30	65.40	10.42	7.49	11.24	83.80	27.69	0.16	2628.67	14.35	83.53	28.71	0.16	2324.80	13.10
	T_4	11.68	40.25	4.01	3.20	59.45	10.07	6.74	11.13	83.26	26.67	0.15	2661.28	14.28	79.27	27.51	0.16	2209.23	13.30
	SEd	**13.53**	**2.08**	**0.04**	**0.28**	**8.66**	**1.67**	**0.14**	**0.17**	**1.22**	**0.88**	**0.00**	**52.22**	**0.36**	**2.22**	**0.70**	**0.00**	**69.62**	**0.33**
	CD	**27.76**	**4.26**	**0.09**	**0.58**	**17.77**	**3.44**	**0.28**	**0.36**	**2.49**	**1.81**	**0.00**	**107.14**	**0.74**	**4.55**	**1.44**	**0.00**	**69.62**	**0.33**
Varieties x Seed rate	**SEd**	**19.73**	**2.94**	**0.06**	**0.40**	**12.24**	**3.75**	**0.19**	**0.25**	**1.72**	**1.24**	**0.00**	**73.85**	**0.51**	**3.14**	**0.99**	**0.00**	**98.46**	**0.47**
	CD	**40.48**	**6.03**	**0.12**	**0.82**	**25.13**	**7.70**	**0.40**	**0.51**	**3.53**	**2.55**	**0.01**	**151.52**	**1.05**	**6.44**	**2.04**	**0.01**	**202.04**	**0.97**

PJTSAU, Hyderabad

Results: Data on seed quality parameters revealed non-significant differences among two varieties of soybean (JS 335 and Basar) for germination percentage, root length, shoot length, seedling length and seedling vigour index I. Soybean planted at a spacing of 45 x 12.5 cm was found superior for majority of the seed quality characters

Field view of the experimental plot of soybean at ARS, Adilabad

Table 7.3: Influence of seed rate/spacing on seed quality parameters of soybean during *Kharif,* 2017 at ARS, Adilabad

Seed rate (kg/ha)	Spacing (cm)	Germination (%)				Root length (cm)				Shoot length (cm)			
		JS 335		Basar	Mean	JS 335		Basar	Mean	JS 335		Basar	Mean
70	45 x 5.0	93.3		91.7	92.5	11.6		11.9	11.7	13.6		14.7	14.2
60	45 x 7.5	90.3		91.0	90.7	12.7		12.7	12.7	15.2		16.3	15.7
50	45 x 12.5	90.3		93.7	92.0	12.6		14.1	13.4	15.2		15.4	15.3
40	45 x 15.0	95.3		90.3	92.8	13.1		12.3	12.7	15.4		15.0	15.2
30	45 x 20.0	91.0		91.3	91.2	12.4		12.8	12.6	15.8		14.8	15.3
	Mean	**92.1**		**91.6**	**91.8**	**12.5**		**12.8**	**12.6**	**15.0**		**15.3**	**15.1**
		S.Em	**S.Ed**	**C.D.**	**C.V. (%)**	**S.Em.**	**S.Ed**	**C.D.**	**C.V. (%)**	**S.Em.**	**S.Ed**	**C.D.**	**C.V. (%)**
	Ai.-Aj.	0.21	0.29	0.62	0.88	0.23	0.33	0.69	7.09	0.25	0.36	0.75	6.44
	Bi.-Bj.	0.33	0.46	0.98		0.37	0.52	1.09		0.40	0.56	1.18	
	AiBi-AiBj	0.46	0.66	1.38		0.52	0.73	1.53		0.56	0.80	1.67	
	AiBi-AjBi	0.46	0.66	1.38		0.52	0.73	1.53		0.56	0.80	1.67	

Seed rate (kg/ha)	Spacing (cm)	Seedling length (cm)				SVI I			
		JS 335		Basar	Mean	JS 335		Basar	Mean
70	45 x 5.0	25.2		26.6	25.9	2349		2440	2395
60	45 x 7.5	27.9		28.9	28.4	2520		2633	2577
50	45 x 12.5	27.8		29.5	28.7	2515		2767	2641
40	45 x 15.0	28.5		27.3	27.9	2715		2466	2590
30	45 x 20.0	28.2		27.6	27.9	2565		2521	2543
	Mean	**27.5**		**28.0**	**27.8**	**2532.8**		**2565.3**	**2549**
		S.Em.	**S.Ed**	**C.D.**	**C.V. (%)**	**S.Em.**	**S.Ed**	**C.D.**	**C.V. (%)**
	Ai.-Aj.	0.39	0.55	1.16	5.43	36.83	52.09	109.43	5.60
	Bi.-Bj.	0.62	0.87	1.83		58.23	82.36	173.02	
	AiBi-AiBj	0.87	1.23	2.59		82.36	116.47	244.69	
	AiBi-AjBi	0.87	1.23	2.59		82.36	116.47	244.69	

MPKV, Rahuri

Results: The data on influence of varieties and sowing dates on seed yield, yield contributing traits and quality are presented in Table 7.6 to 7.7. From the data it is revealed that the seed yield and seed quality of soybean influenced significantly due to varieties and seed rates.

A. Effect of varieties :

From the data it was observed that plant height (69.42 cm), leaf width (7.77cm), leaf length (11.83cm), leaf area (92.10 dm^2 $plant^{-1}$), number of pods (36.26 $plant^{-1}$), seed yield (28.48 g $plant^{-1}$), seed yield (4.46 kg $plot^{-1}$), seed yield (2302.88 kg ha^{-1}), germination (87.20 %), root shoot length (31.35 cm), dry matter content (1.179 g), vigour index I (2736.90) and vigour index II (102.86) were significantly higher in soybean variety KDS 344. However, 100 seed weight was higher in JS 9305 (14.14 g).

B. Effect of seed rates:

It was observed that leaf width (7.34 cm), leaf length (12.14 cm), leaf area (89.37 dm^2 $plant^{-1}$), number of branches (7.73 $plant^{-1}$), number of pods (67.14 $plant^{1}$), pod weight (36.83 g $plant^{-1}$) and seed yield (29.33 g $plant^{-1}$) were significantly higher at seed rate 30 kg ha^{-1}. However seed yield (4.84 kg $plot^{-1}$), seed yield (2497.49 kg ha^{-1}), 100 seed weight (14.16 g), germination (88.88 %), root shoot length (33.75 cm), dry matter content (1.193 g), seed vigour index I (3000.25) and vigour index II (105.99) were significantly higher at seed rate 70 kg ha^{-1} followed by the seed rate 60 kg ha^{-1}.

C. Interaction effect:

The interaction effect of varieties and seed rates showed significant effect on growth parameters. Leaf width (8.85 cm), leaf length (12.38 cm), leaf area (106.13 dm^2 $plant^{-1}$), pod weight (37.88 g $plant^{-1}$) and seed yield (32.80 g $plant^{-1}$) were highest in KDS 344 at seed rate 30 kg ha^{-1} seed yield. However, seed yield (4.64 kg $plot^{-1}$) seed yield (2391.09 kg ha^{-1}), 100 seed weight (14.72 g), germination (88.25 %), root shoot length (32.50 cm), dry matter content (1.175 g), seed vigour index I (2868.25) and vigour index II (103.69) were significantly higher at seed rate 70 kg ha^{-1} followed by the seed rate 60 kg ha^{-1}.

Table 7.4: Influence of varieties and seed rates on seed yield and quality parameters of soybean at MPKV, Rahuri during *Kharif* 2017-18

Treatments	Plant population/ m^2	Plant height (cm)	Leaf width (cm)	Leaf length (cm)	Leaf area (cm^2)	No. of branches $Plant^{-1}$	No. of pods $plant^{-1}$	Pod weight $Plant^{-1}$ (g)	Seed yield $Plant^{-1}$ (g)
Sowing dates									
JS 9305 V_1	33.56	58.22	5.88	11.44	67.26	6.43	61.48	32.86	22.10
KDS 344 V_2	32.45	69.42	7.77	11.83	92.10	6.89	67.56	36.26	28.48
SE ±	0.213	0.536	0.092	0.038	1.154	0.131	0.958	0.401	0.202
CD at 5%	0.959	2.412	0.416	0.169	5.191	NS	4.312	1.806	0.910
Seed rates									
70 kg ha^{-1} S_1	42.61	76.94	6.24	10.91	68.16	5.43	57.13	29.39	19.36
60 kg ha^{-1} S_2	36.73	71.60	6.70	11.48	77.07	6.18	64.89	35.65	22.76
50 kg ha^{-1} S_3	33.80	62.25	6.88	11.64	80.16	6.86	66.50	35.15	26.18
40 kg ha^{-1} S_4	30.54	58.63	6.95	12.00	83.64	7.10	66.94	35.78	28.81
30 kg ha^{-1} S_5	21.35	49.68	7.34	12.14	89.37	7.73	67.14	36.83	29.33
SE ±	0.742	1.427	0.142	0.156	1.935	0.222	2.007	0.648	0.552
CD at 5%	2.164	4.167	0.414	0.455	5.649	0.647	5.858	1.892	1.610

Treatments	Seed yield $plot^{-1}$ (kg)	Seed yield ha^{-1} (kg)	100 seed weight (g)	Germination (%)	Root shoot length (cm)	Dry matter content (g)	Vigour index I	Vigour index II
Sowing dates								
JS 9305 V_1	4.08	2104.78	14.14	85.40 (67.61)	29.75	1.159	2546.25	98.99
KDS 344 V_2	4.46	2302.88	12.64	87.20 (69.08)	31.35	1.179	2736.90	102.86
SE ±	0.032	16.468	0.116	0.169	0.351	0.001	30.110	0.143
CD at 5%	0.144	74.105	0.524	0.492	1.580	0.005	135.497	0.642
Seed rates								
70 kg ha^{-1} S_1	4.84	2497.49	14.16	88.88 (70.50)	33.75	1.193	3000.25	105.99
60 kg ha^{-1} S_2	4.79	2469.76	13.90	88.13 (69.84)	31.38	1.180	2764.88	104.00
50 kg ha^{-1} S_3	4.14	2135.09	13.20	87.38 (69.18)	30.13	1.179	2632.50	103.00
40 kg ha^{-1} S_4	3.90	2009.34	13.00	85.25 (67.40)	29.38	1.163	2504.50	99.10
30 kg ha^{-1} S_5	3.70	1907.46	12.68	81.88 (64.81)	28.13	1.130	2305.75	92.53
SE ±	0.033	17.007	0.131	0.268	0.332	0.003	28.176	0.493

CD at 5%	0.096	49.642	0.383	0.777	0.968	0.009	82.243	1.438

(Figures in parenthesis are arc sin transformed values)

Table 7.5: Interaction effects of variety and seed rate on seed yield and quality parameters of soybean at MPKV, Rahuri during *Kharif* 2017-18

Treatments	Plant population/m^2	Plant height (cm)	Leaf width (cm)	Leaf length (cm)	Leaf area (cm^2)	No. of branches/plant	No. of pods/plant	Pod weight plant^{-1} (g)	Seed yield/ Plant(g)
V_1S_1	41.25	69.90	5.73	10.73	61.40	5.15	51.13	25.65	18.00
V_1S_2	36.73	62.15	5.78	11.33	65.50	5.90	62.23	34.50	19.60
V_1S_3	35.63	58.95	5.88	11.45	67.19	6.75	64.13	33.58	21.63
V_1S_4	31.55	53.63	5.90	11.80	69.59	6.98	64.90	34.80	25.40
V_1S_5	22.65	46.45	6.10	11.90	72.62	7.38	65.03	35.78	25.85
V_2S_1	43.98	83.98	6.75	11.10	74.92	5.70	63.13	33.13	20.73
V_2S_2	36.73	81.05	7.63	11.63	88.64	6.45	67.55	36.80	25.93
V_2S_3	31.98	65.55	7.88	11.83	93.13	6.98	68.88	36.73	30.73
V_2S_4	29.53	63.63	8.00	12.20	97.70	7.23	68.98	36.75	32.23
V_2S_5	20.05	52.90	8.58	12.38	106.13	8.08	69.25	37.88	32.80
SE ±	1.049	2.019	0.201	0.221	2.737	0.314	2.838	0.917	0.780
CD at 5%	3.061	5.892	0.586	NS	7.989	NS	NS	2.676	2.277

Treatments	Seed yield Plot^{-1} (kg)	Seed yield ha^{-1} (kg)	100 seed weight(g)	Germination (%)	Root shoot length (cm)	Dry matter content (g)	Vigour index I	Vigour index II
V_1S_1	4.64	2391.09	14.72	88.25 (69.93)	32.50	1.175	2868.25	103.69
V_1S_2	4.59	2367.88	14.31	87.50 (69.29)	31.00	1.165	2712.25	101.94
V_1S_3	3.85	1983.55	14.23	86.50 (68.42)	29.50	1.173	2551.75	101.42
V_1S_4	3.78	1948.73	13.91	84.75 (66.99)	29.25	1.155	2479.00	97.88
V_1S_5	3.55	1832.65	13.52	80.00 (63.41)	26.50	1.125	2120.00	90.00
V_2S_1	5.05	2603.89	13.61	89.50 (71.07)	35.00	1.210	3132.25	108.30
V_2S_2	4.99	2571.65	13.49	88.75 (70.39)	31.75	1.195	2817.50	106.06
V_2S_3	4.43	2286.63	12.16	88.25 (69.95)	30.75	1.185	2713.25	104.58
V_2S_4	4.01	2069.96	12.09	85.75 (67.80)	29.50	1.170	2530.00	100.33
V_2S_5	3.84	1982.26	11.85	83.75 (66.20)	29.75	1.135	2491.50	95.06

SE ±	0.047	24.051	0.186	0.379	0.469	0.005	39.847	0.697
CD at 5%	0.136	70.205	0.542	1.137	1.368	0.013	116.310	2.089

UAS, Bengaluru

Results: Seed rate had significant effect on the yield and yield attributing characters of soybean cultivar JS-335. Significant highest plant height (71.42 cm), plant canopy diameter (15.04 cm), branches/plant (3.55), pods/plant (33.60) seed yield (18.65 g/plant; 6.834 kg/plot & 18.98 q/ha), harvest index (58.04%), germination (97.75%) and vigour index (3475) was recorded at the seed rate of 40 kg/ha (table 7.8 & 7.9). This was closely followed by seed rate @ 30 kg with seed yield (17.50q/ha). The lowest seed yield (15.88 q/ha) was recorded with seed rate @ 60 kg/ha. Hence, there is a possibility of optimizing the seed rate of soybean from existing seed rate of 70 kg/ha to 40 kg/ha.

Table 7.6: Effect of seed rate on plant growth, seed yield and quality parameters of soybean cultivar JS-335 at UAS, Bengaluru during *Kharif* 2017-18

Treatments	Plant population /m^2	Plant height (cm)	Plant canopy diameter (cm)	No. of branches/ plant	No. of pods/ plant	Seed yield/ Plant (g)
T_1 (seed rate @ 70 kg/ha)	24.96	70.01	12.37	2.90	29.65	13.00
T_2 (seed rate @ 60 kg/ha)	22.61	66.18	13.23	2.20	30.95	15.00
T_3 (seed rate @ 50 kg/ha)	21.13	64.82	14.25	2.10	32.10	15.35
T_4 (seed rate @ 40 kg/ha)	19.17	71.42	15.04	3.55	33.60	18.65
T_5 (seed rate @ 30 kg/ha)	15.47	62.66	14.43	2.25	30.85	13.80
Mean	**20.67**	**67.02**	**13.86**	**2.6**	**31.43**	**15.16**
SEm ±	**1.201**	**1.827**	**0.697**	**0.454**	**0.946**	**0.732**
CD(P=0.05)	**3.700**	**5.629**	**2.147**	**1.398**	**2.914**	**2.255**
CV(%)	**11.63**	**5.45**	**11.25**	**14.96**	**6.73**	**10.81**

Table 7.7: Effect of seed rate on plant growth, seed yield and quality parameters of soybean cultivar JS-335 at UAS, Bengaluru during *Kharif* 2017-18

Treatments	Seed yield/ plot (kg)	Seed yield per ha (q)	Harvest Index (%)	Test weight (g)	Germination (%)	SVI-I
T_1 (seed rate @ 70 kg/ha)	5.920	16.44	55.09	15.89	92.25	3066
T_2 (seed rate @ 60 kg/ha)	5.721	15.88	54.94	15.59	96.75	3262
T_3 (seed rate @ 50 kg/ha)	6.185	17.17	58.31	15.07	93.50	2947
T_4 (seed rate @ 40 kg/ha)	6.834	18.98	58.04	15.24	97.75	3475
T_5 (seed rate @ 30 kg/ha)	6.301	17.50	57.81	16.21	94.00	3382
Mean	**6.19**	**17.19**	**56.84**	**15.60**	**94.85**	**3226**
SEm ±	**0.338**	**0.941**	**1.985**	**0.489**	**2.661**	**133**
CD(P=0.05)	**1.041**	**2.899**	**6.115**	**1.506**	**8.198**	**409.7**
CV (%)	**12.22**	**12.23**	**7.81**	**6.27**	**5.61**	**8.27**

UAS, Dharwad

Results: Among the different seed rate of soybean evaluated, significantly increased plant height was recorded with 70 kg per ha, whereas the higher number of branches, number of pods, yield per plant and seed quality parameters were significant with reduced seed rate of 30 kg per ha. Whereas, the total yield per ha was significantly higher in case of recommended seed rate (70 kg/ha) and on par with 60 kg per ha irrespective of varieties.

Table 7.8: Effect of seed rate on plant growth, seed yield and quality parameters of soybean *cv.* JS-335 at UAS, Dharwad during *Kharif* 2017-18

Treatment details	Final plant stand at maturity		Plant height at maturity (cm)		Number of branches per plant	
	DSb-21	JS-93-05	DSb-21	JS-93-05	DSb-21	JS-93-05
T_1: Recommended seed tare of 70 kg/ha	553	515	61.53	57.22	2.83	2.72
T_2: Reduced seed tare of 60 kg/ha	428	413	54.33	45.97	4.89	4.69
T_3: Reduced seed tare of 50 kg/ha	428	402	51.33	68.77	4.82	4.63
T_4: Reduced seed tare of 40 kg/ha	253	236	42.06	26.20	6.23	5.98
T_5: Reduced seed tare of 30 kg/ha	143	145	42.08	37.34	7.17	6.88
SEm ±	**12.20**	**13.16**	**2.72**	**1.55**	**0.25**	**0.24**
CD at 5%	**39.79**	**42.92**	**8.86**	**5.06**	**0.83**	**0.79**

Treatment details	Number of pods per plant		Seed yield per plant (g)		Seed yield per ha (q)	
	DSb-21	JS-93-05	DSb-21	JS-93-05	DSb-21	JS-93-05
T_1: Recommended seed tare of 70 kg/ha	21.74	17.02	19.57	15.32	22.51	20.93
T_2: Reduced seed tare of 60 kg/ha	34.03	29.38	30.63	26.44	19.87	19.37
T_3: Reduced seed tare of 50 kg/ha	33.57	28.98	30.21	26.08	18.78	16.33
T_4: Reduced seed tare of 40 kg/ha	43.38	37.45	35.53	29.11	16.62	12.19
T_5: Reduced seed tare of 30 kg/ha	49.87	43.06	35.57	30.71	15.39	11.02
SEm ±	**1.48**	**1.52**	**1.22**	**0.93**	**0.57**	**1.48**
CD at 5%	**4.84**	**4.97**	**3.97**	**3.05**	**1.85**	**4.82**

Treatment details	100 seed weight (g)		Seed germination (%)		Seedling length (cm)		Seedling vigour index	
	DSb-21	JS-93-05	DSb-21	JS-93-05	DSb-21	JS-93-05	DSb-21	JS-93-05
T_1: Recommended seed tare of 70 kg/ha	12.79	11.97	81.29	82.91	25.20	25.70	2050	2133
T_2: Reduced seed tare of 60 kg/ha	12.92	12.09	82.09	83.74	25.45	25.96	2090	2174
T_3: Reduced seed tare of 50 kg/ha	13.22	12.37	83.98	85.66	26.03	26.55	2187	2276
T_4: Reduced seed tare of 40 kg/ha	14.06	13.15	89.32	87.73	27.69	27.20	2488	2388
T_5: Reduced seed tare of 30 kg/ha	15.06	14.09	88.86	90.63	27.55	28.10	2450	2549

SEm ±	**0.34**	**0.31**	**2.13**	**1.24**	**0.06**	**0.39**	**120**	**67**
CD at 5%	**1.10**	**1.03**	**NS**	**4.06**	**0.17**	**1.26**	**360**	**219**

Table 7.9: Seed germination percentage during storage at UAS, Dharwad during *Kharif* 2017-18

Varity	Seed rate	First month	Second month	Third month	Fourth month	Fifth month	Sixth month	Seventh month	Eighth month	Ninth month
DSb-21	**T_1:** 70 kg/ha	81.29	78.85	77.22	73.36	65.03	59.83	52.65	44.75	36.70
	T_2: 60 kg/ha	82.09	79.63	77.99	74.09	65.67	60.42	53.17	45.19	37.06
	T_3: 50 kg/ha	83.98	81.46	79.78	75.79	67.18	61.81	54.39	46.23	37.91
	T_4: 40 kg/ha	89.32	86.64	84.85	80.61	71.45	65.74	57.85	49.17	40.32
	T_5: 30 kg/ha	88.86	86.19	84.41	80.19	71.08	65.40	57.55	48.92	40.11
JS-93-05	**T_1:** 70 kg/ha	82.91	80.43	78.77	74.83	66.33	61.03	53.70	45.65	37.43
	T_2: 60 kg/ha	83.74	81.22	79.55	75.57	66.99	61.63	54.23	46.10	37.80
	T_3: 50 kg/ha	85.66	83.09	81.38	77.31	68.53	63.04	55.48	47.16	38.67
	T_4: 40 kg/ha	87.73	85.10	83.35	79.18	70.19	64.57	56.82	48.30	39.61
	T_5: 30 kg/ha	90.63	87.91	86.10	81.80	72.51	66.71	58.70	49.90	40.91

Table 7.10: Seedling length (cm) during storage at UAS, Dharwad during *Kharif* 2017-18

Varity	Seed rate	First month	Second month	Third month	Fourth month	Fifth month	Sixth month	Seventh month	Eighth month	Ninth month
DSb-21	**T_1:** 70 kg/ha	25.20	24.44	23.94	22.74	20.16	18.55	16.32	13.87	11.38
	T_2: 60 kg/ha	25.45	24.69	24.18	22.97	20.36	18.73	16.48	14.01	11.49
	T_3: 50 kg/ha	26.03	25.25	24.73	23.50	20.83	19.16	16.86	14.33	11.75
	T_4: 40 kg/ha	27.69	26.86	26.30	24.99	22.15	20.38	17.93	15.24	12.50
	T_5: 30 kg/ha	27.55	26.72	26.17	24.86	22.04	20.27	17.84	15.16	12.43
JS-93-05	**T_1:** 70 kg/ha	25.70	24.93	24.42	23.20	20.56	18.92	16.65	14.15	11.60
	T_2: 60 kg/ha	25.96	25.18	24.66	23.43	20.77	19.11	16.81	14.29	11.72
	T_3: 50 kg/ha	26.55	25.76	25.23	23.97	21.24	19.54	17.20	14.62	11.99
	T_4: 40 kg/ha	27.20	26.38	25.84	24.55	21.76	20.02	17.62	14.97	12.28
	T_5: 30 kg/ha	28.10	27.25	26.69	25.36	22.48	20.68	18.20	15.47	12.68

Table 7.11: Seedling vigour index during storage at UAS, Dharwad during *Kharif* 2017-18

Varity	Seed rate	First month	Second month	Third month	Fourth month	Fifth month	Sixth month	Seventh month	Eighth month	Ninth month
DSb-21	**T_1:** 70 kg/ha	2048	1927	1849	1668	1311	1110	859	621	417
	T_2: 60 kg/ha	2089	1966	1886	1702	1337	1132	876	633	426
	T_3: 50 kg/ha	2186	2057	1973	1781	1399	1184	917	663	446
	T_4: 40 kg/ha	2473	2327	2232	2014	1583	1340	1037	750	504
	T_5: 30 kg/ha	2448	2303	2209	1994	1566	1326	1027	742	499
JS-93-05	**T_1:** 70 kg/ha	2131	2005	1923	1736	1364	1154	894	646	434
	T_2: 60 kg/ha	2174	2045	1962	1770	1391	1177	912	659	443
	T_3: 50 kg/ha	2275	2140	2053	1853	1456	1232	954	689	464
	T_4: 40 kg/ha	2386	2245	2154	1944	1527	1293	1001	723	486
	T_5: 30 kg/ha	2546	2396	2298	2074	1630	1379	1068	772	519

VNMKV, Parbhani

Results:

Seed yield and yield components :

Soybean crop is highly sensitive to climatic factors and supply of seeds is becoming a critical problem due to climatic uncertainties. Study need to be conducted on reduction of seed requirement. Plant population/m^2 is found significant irrespective to reduced seed rate, which ranges from 48.2 to 32.0 m^2, whereas both varieties are found at par with each other's in respective to plant population. Plant canopy diameter (cm) increased with reduction in seed rate from 70 kg/ha to 30 kg/ha whereas variety JS-93-05 recorded higher plant canopy diameter (cm) as compared to variety MAUS-162.

The variety MAUS-162 recorded higher plant height (cm) as compared to JS-93-05 whereas plant height (cm) reduced irrespective to reduction in seed rate. Number of branches per plant increased with reduction in seed rate, whereas MAUS-162 recorded lowest branches per plant as compared to JS-93-05. Pods per plant increased with reduction in seed rate in variety JS-93-05, whereas the variety MAUS-162 recorded highest pods per plant at 70 and 60 kg/ha seed rate thereafter it is decline. The variety JS-93-05 recorded highest 100 seed weight (cm) irrespective to reduction in seed rate as compared to variety MAUS-162. Yield per plant recorded maximum irrespective to reduction in seed rate in both varieties.

The variety JS-93-05 recorded highest seed yield (2016 kg/ha) with 30 kg/ha seed rate followed by 40 kg/ha (2073 ha), 50 kg/ha (1985/ha) & 60 kg/ha (1973 kg/ha) as compared to 70 kg/ha seed rate (1837 kg/ha) and variety MAUS-162. Reduction in seed rate were found superior for higher productivity as compared to recommended seed rate (70 kg/ha), whereas the early maturing varieties found suitable for reduced seed rate as compared to late or medium maturity varieties like MAUS-162.

Seed Quality Parameters:

At initial stage, germination percent was found lower in both the varieties because of hard seed, but after that germination percentage was increased. The variety JS-93-05 recorded numerically highest germination percentage as compared to MAUS-162. Germination percentage was increased irrespective to seed rate.

At initial stage, Root-Shoot length was found higher in both varieties there after decline. At 60 DAS, the variety JS-93-05 recorded highest root shoot length as compared to variety MAUS-162.

At initial stage, seed vigour index was found higher in both varieties and there after decline. The variety JS-93-05 was recorded highest seed vigour index as compared to MAUS-162.

Seed Health:

Soybean seed was found to be infested with the major pathogens like soybean mosaic virus (SMV), purple stain (PS), anthracnose (AN) and charcoal rot (CR).

Conclusion:

The experiment was laid out with two varieties MAUS-162 & JS-93-05 with Five Seed rate (kg/ha) treatment. Reduction in seed rate was found superior for productivity in early maturing varieties as compared to mid late maturity group. The variety JS-93-05 was found superior to reduced seed rate with respect to yield components. Seed quality parameter was also found superior in respect to reduction in seed rate. The variety JS-93-05 recorded numerically higher germination %, root shoot length (cm) and seed vigour index as compared to MAUS-162.

Table 7.12: Influence of seed rate/ha on yield and yield components for quality seed production in soybean at VNMKV, Parbhani during *Kharif* – 2017.

Sr. No.	Treatments	Plant Population (m^2)	Plant canopy Diameter (cm)	Plant Height (cm)	No. of branches	No. of Pods/plant	100 seed weight (g)	Yield/ Plant (g)	Seed Yield Kg/ha
1	Seed rate @ 70 kg/ha V1 - MAUS- 162 V2 - JS- 93-05	48.2 46.0	39.3 40.5	106.1 49.8	1.82 2.4	45.9 35.7	10.78 12.31	9.6 10.88	1582 1837
2	Seed rate @ 60 kg/ha V1 - MAUS- 162 V2 - JS- 93-05	46.7 44	41.3 41.8	109.8 51.55	1.85 2.85	42.6 39.1	10.49 13.62	9.82 12.61	1608 1973
3	Seed rate @ 50 kg/ha V1 - MAUS- 162 V2 - JS- 93-05	39 35	40 42.5	106.3 42.35	1.8 3.5	42.2 49.1	10.98 13.12	9.35 14.53	1578 1985
4	Seed rate @ 40 kg/ha V1 - MAUS- 162 V2 - JS- 93-05	37.5 35.0	40.1 42.7	101.8 40.8	2.45 3.65	41.1 55.4	10.94 13.85	10.75 14.68	1660 2073
5	Seed rate @ 30 kg/ha V1 - MAUS- 162 V2 - JS- 93-05	32 32.2	40.1 43.0	98.0 40.5	3.4 4.75	43.1 67.6	10.75 13.96	10.78 19.49	1693 2106
	Mean	39.6	41.13	74.7	2.8	46.18	12.08	12.29	1839.5
	SE± CD CV%	1.22 3.76 12.4	1.11 3.42 11.7	2.7 7.88 16.4	0.18 0.601 8.7	1.29 3.99 12.1	0.42 1.12 10.3	13 3.27 18.9	61.25 64.38 11.35

Table 7.13: Influence of seed rate/ha on seed yield and seed quality parameters for quality seed production in soybean at VNMKV, Parbhani during *Kharif* – 2017

Sr. No.	Treatments	Germination %		Root Shoot length		Seed vigour index	
		Initial	60 DAS	Initial	60 DAS	Initial	60 DAS
1	Seed rate @ 70 kg/ha V1 - MAUS- 162 V2 - JS- 93-05	75 (46.8) 79 (50.2)	80 (62.9) 85 (63.4)	23.9 23.56	21.3 20.8	1793 1861	1704 1468
2	Seed rate @ 60 kg/ha V1 - MAUS- 162 V2 - JS- 93-05	78 (55.6) 83 (63.6)	89 (64.4) 91 (65.1)	26.29 25.64	22.9 23.7	2051 2128	2038 2107
3	Seed rate @ 50 kg/ha V1 - MAUS- 162 V2 - JS- 93-05	74 (51.8) 80 (62.9)	82 (59.4) 88 (64.2)	24.9 26.54	21.4 22.3	1843 2123	1754 1962
4	Seed rate @ 40 kg/ha V1 - MAUS- 162 V2 - JS- 93-05	72 (58.2) 83(62.4)	79 (50.2) 92 (65.9)	25.47 25.6	21.8 22.4	1834 2125	1722 2061
5	Seed rate @ 30 kg/ha V1 - MAUS- 162 V2 - JS- 93-05	81(58.6) 90 (64.8)	85 (63.4) 94 (66.8)	24.6 25.77	21.9 23.3	1993 2319	1862 2190
	Mean	79.5 (57.5)	86.5 (62.6)	25.23	22.18	2007.0	1917
	SE± CD CV%	3.33 9.67 11.6	2.90 8.58 14.6	0.127 0.345 8.4	0.132 0.364 7.4	20.42 56.51 12.8	22.07 61.10 13.7

PDKV, Akola

Results: The two genotypes of soybean were sown with reduced seed rate to study the optimization of seed rate in soybean. Reduced seed rate @ 60 Kg/ha was found effective with higher seed yield and other seed quality parameters than the recommended seed rate in both the varieties.

Table 7.14: Seed quality parameters before sowing at PDKV, Akola during *Kharif* 2017

Varieties	Seed Germination (%)	Seedling length (cm)	Seeding dry wt. (g)	VI-I	VI-II
NRC 86	73.25	29.42	0.36	2153.60	26.72
JS 20-34	76.75	27.75	0.34	2125.38	25.23

Table 7.15: Effect of different seed rate on yield and yield attributing traits at PDKV, Akola during *Kharif* 2017

Treatments	Plant population per sq. meter	Plant height at maturity (cm)	Plant canopy diameter (cm)	Number of branches per plant	Number of pods per plant	Yield per plant (g)	Yield per ha (q/ha)	100 seed weight (g)
V_1T_0	49.83	31.92	31.15	6.10	25.40	7.70	17.06	10.33
V_1T_1	36.94	35.80	31.85	6.30	28.95	8.10	19.86	10.40
V_1T_2	30.08	34.30	31.60	6.15	27.20	8.10	18.58	10.43
V_1T_3	24.39	34.10	34.25	6.85	25.40	8.24	17.71	10.21
V_1T_4	18.87	33.42	33.40	6.75	31.95	8.21	14.90	10.17
V_2T_0	50.33	29.70	28.25	4.95	17.70	7.60	17.32	11.08
V_2T_1	36.41	34.12	25.20	5.35	16.95	7.94	18.97	11.25
V_2T_2	30.02	34.30	27.10	5.70	18.40	7.81	17.88	11.09
V_2T_3	24.00	33.50	26.70	6.15	16.45	7.80	16.84	11.22
V_2T_4	19.08	33.42	27.45	5.60	20.70	7.74	14.23	11.20
S.E(m±)	**0.11**	**0.26**	**1.61**	**0.31**	**2.26**	**0.02**	**0.05**	**0.15**
CD at 5%	**0.33**	**0.77**	**4.66**	**0.89**	**6.57**	**0.07**	**0.15**	**0.45**

Table 7.16: Observations of post-harvest seed quality parameters at PDKV, Akola during *Kharif* 2017

Treatments	Seed Germination (%)	Vigour Index-I	Vigour Index-II
V_1T_0	90.00 (71.60)	1947.10	31.49
V_1T_1	94.00 (75.91)	2391.20	33.83
V_1T_2	92.00 (73.63)	2211.75	31.50
V_1T_3	89.60 (71.20)	2111.93	30.69
V_1T_4	89.25 (70.87)	2044.55	32.34
V_2T_0	90.00 (71.60)	1815.45	31.49
V_2T_1	93.00 (74.67)	2166.65	31.15
V_2T_2	91.75 (73.32)	2080.87	30.73
V_2T_3	91.00 (72.59)	1926.12	31.40
V_2T_4	90.00 (71.57)	1844.75	31.94
S.E(m±)	**0.60**	**88.51**	**0.61**
CD at 5%	**1.74**	**256.85**	**1.76**

*Figures in parenthesis are arc sin values.

Table 7.17: Seed quality parameters after two months during storage at PDKV, Akola during *Kharif* 2017

Treatments	Seed Germination (%)	Seedling length (cm)	Seedling dry weight (g)	Vigour Index-I	Vigour Index-II
V_1T_0	89.75 (71.34)	21.12	0.34	1895.125	30.518
V_1T_1	93.25 (74.94)	25.05	0.35	2335.900	33.105
V_1T_2	91.00 (72.55)	23.17	0.33	2108.775	30.710
V_1T_3	88.55 (70.22)	23.12	0.32	2047.650	28.996
V_1T_4	88.75 (70.41)	22.57	0.34	2002.950	30.175
V_2T_0	88.75 (70.40)	19.95	0.33	1771.100	29.955
V_2T_1	92.25 (73.85)	22.50	0.32	2075.125	29.985
V_2T_2	91.00 (72.55)	22.67	0.33	2063.100	30.020
V_2T_3	90.25 (71.83)	20.82	0.32	1879.875	29.330
V_2T_4	89.75 (71.34)	20.12	0.34	1806.875	30.960
S.E(m±)	**0.42**	**0.74**	**0.01**	**67.73**	**0.48**
CD at 5%	**1.23**	**2.15**	**0.02**	**196.53**	**1.39**

*Figures in parenthesis are arc sine transformed values.

IISR, Indore

Results:

The experiment was undertaken at the institute farm during *Kharif* 2017 under rainfed condition. The crop was grown following the standard package of practices and plant protection measures. Two varieties were selected on the basis of maturity group - JS 20-34 early maturing (<90 days) and NRC 86 medium maturity group (95-105 days). The seed rate for 13.5 m^2 experimental plot (6 rows of 5 m length with 45 cm row spacing) was calculated as 40, 54, 68, 82 and 95 g for respective seed rate of 30, 40, 50, 60 and 70 kg/ha. The initial shock to seedlings was due to lack of initial rainless days at early vegetative stage which caused reduction in plant height from optimum in all the treatment plots. The crop duration i.e. flowering and maturity period were not varied among the treatments in both the varieties. The days to 50% flowering in case of early maturing JS 20-34 was 32 days and in NRC 86 it was 44 days. The maturity period was 90 and 105 days in JS 20-34 and NRC 86 respectively. The plant population was significantly high with higher seed rate and yield was also significantly increased with increasing seed rate in both the varieties. The seed crop was affected due to unfavorable climate and incidence of diseases namely *Rhizoctonia* aerial blight, charcoal rot and Anthracnose. The crop growth was affected and the yield was compensated due to increase in plant population. The germination of seeds was also highly affected and remained below 70%. The incidence of high rate of abnormality in seedlings indicates that either the seed were failed to develop fully or incidence of diseases caused seed death. All the diseases appeared during this season are seed borne. The rainless days during 1st and 2nd week of Aug followed by heavy rain and succeeding dry spell caused incidence of diseases which damaged the seed crop. The air temperature during pod filling stage during 2nd week of September had negative impact on seed development thus caused reduced seed size.

Table 7.18: The yield and yield attributing characters in JS 20-34 and NRC 86 as influenced by reduced seed rate at IISR, Indore during *Kharif* 2017

Variety	Treatment	50% Flowering (Days)	Plant height (cm)	Plant population	Days to maturity	Yield (q/ha)	100 seed weight (g)	Normal seedling (%)	Abnormal seedling (%)	Dead seedling (%)
JS 20-34	T1 (30kg/ha)	32	41.01	230	88	4.09	9.212	68.0	17.7	14.0
	T2 (40kg/ha)	32	42.54	303	90	4.91	9.263	68.0	17.3	14.3
	T3 (50kg/ha)	32	43.22	361	90	5.64	9.453	70.0	15.0	15.3
	T4 (60kg/ha)	33	44.21	438	92	7.78	9.519	66.0	18.3	15.7
	T5 (70kg/ha)	33	48.25	497	92	8.15	9.810	66.0	19.3	14.7
	Average	**32.40**	**43.84**	**365.93**	**90.40**	**6.11**	**9.45**	**67.60**	**17.53**	**14.80**
	CD at 5%	**-**	**1.659**	**56.16**	**-**	**0.806**	**0.857**	**3.61**	**4.99**	**2.73**
NRC 86	T1 (30kg/ha)	43	52.89	238.7	104	3.323	7.830	63.0	20.0	17.0
	T2 (40kg/ha)	43	54.88	280.0	105	3.783	7.781	64.0	22.0	14.0
	T3 (50kg/ha)	44	55.75	345.3	104	3.802	7.752	67.0	21.0	12.0
	T4 (60kg/ha)	44	57.03	451.3	106	4.677	8.281	66.0	18.0	16.0
	T5 (70kg/ha)	45	63.24	529.7	107	5.630	8.436	65.0	20.0	15.0
	Average	**43.80**	**56.76**	**369.00**	**105.20**	**4.24**	**8.02**	**65.00**	**20.20**	**14.80**
	CD at 5%	**-**	**1.177**	**51.51**	**-**	**0.549**	**0.707**	**3.22**	**5.01**	**2.83**

Table 7.19: Correlation between seed rate and other characters in JS 20-34 and NRC 86 at IISR, Indore during *Kharif* 2017

Varieties	Treatments	Seed rate	50% Flowering	Plant height	Plant population	Days to maturity	Yield
JS 20-34	**Seed rate**	1.000	0.866	0.938	0.999	0.945	0.976
	50% Flowering		1.000	0.799	0.878	0.873	0.948
	Plant height			1.000	0.932	0.835	0.886
	Plant population				1.000	0.957	0.982
	Days to maturity					1.000	0.961
	Yield						1.000
NRC 86	**Seed rate**	1.000	0.945	0.921	0.989	0.849	0.950
	50% Flowering		1.000	0.931	0.942	0.733	0.902
	Plant height			1.000	0.930	0.885	0.971
	Plant population				1.000	0.888	0.973
	Days to maturity					1.000	0.955
	Yield						1.000

Seed Processing

Experiment 8: Optimum sieve size and type of screen for grading seeds of different crop varieties and hybrids including their parents.

Year of start: 2009-10

Crop	Centers
Chickpea	CSAUAT, Kanpur; MPKV, Rahuri; UAS Dharwad and UAS, Raichur
Pigeon pea	UAS, Bangaluru and UAS, Raichur
Soybean	UAS, Dharwad; UAS, Raichur and MPKV, Rahuri
Paddy	ICAR-IARI, RS, Karnal; UAS, Raichur; NDUAT, Faizabad and TNAU, Coimbatore
Maize	TNAU, Coimbatore; UAS, Bengaluru
Mustard	CSAUA&T, Kanpur
Field bean	UAS, Bengaluru
Finger millet	UAS, Bengaluru

Objectives:

1. Crop-wise classification of varieties in seed chain with respect to their seed size (small, medium and bold)
2. To standardize the size and type of grading sieve.

Treatments

1. Crop : As above
2. Machine : Standard sieve shaker (specifications as per ISTA)
3. Sieve sizes : Grading sieve:
   a. Recommended sieve (as per IMSCS)
   b. Two sieves above the recommended sieve
   c. Two sieves below the recommended sieve

Procedure

Unprocessed seed of the each crop variety will be procured from reliable source. Specified quantity of unprocessed seed material will be sieved using sieve shaker for 10 minutes at the rate of 25 strokes per minutes. Seed material retained over each grading sieve will be tested for observation on seed quality. The screen that retains maximum seeds with superior seed quality will be considered as optimum.

Observations

1. Recovery (%) and rejection (%)	2. Seed size: Length, breadth and thickness (mm)
3. Germination (%)	4. Vigour index
5. Physical purity (%)	6. 1000 seed weight (g)
7. Moisture content (%)	8. Processing efficiency (%)

Mustard

CSAUAT, Kanpur

Year of Start: 2017-18

Results: Unprocessed seed of four varieties of mustard viz: Varuna, Maya, Rohini and Kanti were graded by using sieve sizes of 1.2 and 1.7 mm (round). The seed retained on each sieve was collected for assessment of seed recovery and seed quality parameters. Interactions of variety with sieve size had shown significant effect for all quality parameters except seed diameter which was non-significant. Seed recovery showed significant reduction with the increased sieve size and range was 86-98% among all three varieties.

The interaction of verities with various sieve sizes reveals that highest 1000 seed wt, germination %, seedling length, seedling dry wt; seed vigour Index-I & seed vigour index-II were found when the seeds were graded with 1.7 mm sieve size in all four varieties. The seed recovery was more (93.75 to 97.13%) in 1.2 mm sieve size processed seed than the 1.7 mm sieve size processed seed (88 to 90%) showing an average difference of 5.75 to 7.13%. Though, superior results have been reported for most of quality parameters by 1.7 mm sieve graded seed but most of these are non significant.

Thus it is concluded from this investigation that 1.2 mm sieve size is appropriate for seed processing of Varuna, Maya, Rohini and Kanti varieties of mustard.

Table 8.1: Grading screen size and quality parameters of Mustard at CSAUAT, Kanpur (2017-18)

Variety	Perforation size (mm)	Seed-Recovery (%)	Seed-Rejection (%)	Pure seed (%)	1000-Seed wt. (g.)	Seed-Germination (%)	Mean of Seedling length (cm)	Mean of 10-seedling Dry wt. (g.)	Seed vigour-Index (I)	Seed Vigour Index (II)	Seed moisture (%)
Varuna	unprocessed	-	-	98.0	4.38	91	10.83	0.02	985.53	1.82	11.9
	1.20	95.25	4.75	99.7	4.48	87	12.03	0.02	1046.61	1.74	
	1.70	90.00	0.00	98.6	4.85	92	12.1	0.03	1061.97	2.76	
Maya	unprocessed	-	-	98.4	4.35	91	11.67	0.02	1061.97	1.82	12.1
	1.20	93.75	6.25	98.4	4.23	96	11.73	0.04	1126.08	3.84	
	1.70	89.00	11.00	99.0	3.61	90	10.83	0.02	974.7	1.8	
Rohini	unprocessed	-	-	98.6	4.13	90	10.97	0.03	987.3	2.7	12.0
	1.20	97.13	2.87	99.1	3.88	91	11.33	0.03	1031.03	2.73	
	1.70	89.88	10.12	97.8	4.09	90	10.97	0.01	987.3	0.9	
Kanti	unprocessed	-	-	97.3	3.58	89	11.73	0.01	1043.97	0.89	11.8
	1.20	95.56	4.44	98.2	3.60	90	11.13	0.02	1001.7	1.8	
	1.70	88.00	12.00	98.0	3.97	90	11.6	0.02	1044.0	1.8	
CD A		1.411	0.562	0.279	0.084	0.842	0.323	0.006	20.793	0.225	0.094
B		1.222	0.487	0.241	NS	0.730	NS	0.005	18.007	0.195	
AXB		2.444	0.973	0.483	0.146	1.459	0.559	0.010	36.015	0.389	
CV(%)		2.87	5.52	0.35	2.18	1.20	2.92	28.17	2.08	11.23	0.46

Gram

CSAUAT, Kanpur

Result: Unprocessed seeds of four varieties of gram viz. KWR-108, Awarodhi, KGD-1168 and Udai were graded by using 5.0, 5.5, 6.00 mm sieve sizes.

The seeds retained on each sieve were collected for assessment of seed recovery and seed quality parameters. Seed recovery (%) showed significant reduction as the size of sieves increased and range was 35.97 to 96.4 for all varieties.

It was revealed from the interaction of varieties to various sizes of sieves that 5.0 mm sieve size is an appropriate for grading all four varieties with respect to seed recovery and all quality parameters. Highest performance with regard to quality parameters have been shown by 5.0 mm sieve size with high seed recovery. Sieve size 5.0 mm is at par with 5.5mm for various quality parameters like 1000 wt., seed germination %, seedling length, Seed Vigour Index-I & SVI-II with higher seed recovery.

It is concluded from this investigation that all four varieties should be processed by 5.0 mm sieve size from commercial point of view and from quality point view as the average seed recovery is higher (94.69%) of the seed processed by 5.0 mm sieve than the 5.5 mm sieve size (86.38%)

Table 8.2: Grading screen size and quality parameters of Gram at CSAUAT, Kanpur (2017-18)

Variety	Perforation size (mm)	Seed-Recovery (%)	Seed-Rejection (%)	Pure seed (%)	1000-Seed wt. (g.)	Seed-Germin (%)	Mean of Seedling length (cm)	Mean of 10-seedling Dry wt. (g.)	Seed vigour-Index (I)	Seed Vigour Index (II)	Seed moisture (%)
KWR-108	unprocessed	-	-	99.72	206.11	95	13.5	0.49	1282.5	46.55	12.0
	5.0	96.2	3.80	99.63	207.67	93	17.1	0.43	1590.3	39.99	
	5.5	91.7	8.30	99.51	196.38	93	14.5	0.44	1348.5	40.92	
	6.00	79.4	20.60	99.60	185.60	93	16.37	0.43	1522.41	39.99	
Avrodhi	unprocessed	-	-	99.60	180.94	94	15.43	0.45	1450.42	42.3	12.03
	5.0	96.4	3.6	99.64	187.88	98	18.7	0.47	1832.6	46.06	
	5.5	89.62	10.38	99.52	188.40	98	1817	0.47	1780.66	46.06	
	6.0	53.18	46.82	99.51	196.44	99	18.83	0.50	1864.17	49.5	
KGD-1168	unprocessed	-	-	99.71	188.72	93	14.4	0.44	1339.2	40.92	12.6
	5.0	94.07	5.93	99.69	195.42	95	16.6	0.47	1577.0	44.65	
	5.5	87.36	12.64	99.72	199.05	97	17.47	0.49	1694.59	47.53	
	6.0	53.65	46.35	99.74	186.72	98	17.2	0.51	1685.6	49.98	
UDA I	unprocessed	-	-	99.34	180.01	94	15.13	0.44	1422.22	41.36	12.5
	5.0	92.09	7.91	99.65	179.81	96	17.33	0.47	1663.68	45.12	
	5.5	76.85	23.15	99.48	192.88	96	17.8	0.50	1708.8	43.2	
	6.0	35.97	64.03	99.56	176.09	95	16.83	0.50	1598.85	47.5	
CD A		5.704	1.252	0.242	1.248	0.416	0.416	0.021	37.849	0.832	0.194
B		5.704	1.252	NS	1.248	0.416	0.416	0.021	37.849	0.832	
AXB		11.408	2.504	NS	2.495	0.832	0.832	0.042	75.666	1.664	
CV(%)		14.42	9.50	0.34	0.83	0.64	3.02	5.38	2.87	2.26	0.85

UAS, Dharwad

Results:

Table 8.3: Effect of different screen size on seed quality characters of soybean (cv: JS-9305)

Screen size and type	Seed recovery (%)	Seed germination (%)	Root length (cm)	Shoot length (cm)	Seedling vigour index	Physical purity (%)	Test weight (g)	Seed Moisture (%)
S_1:4.40 (s)	79.17	85.25	13.52	12.10	2184	98.90	153.14	10.26
S_2:4.30(s)	79.75	84.75	13.02	11.10	2044	98.50	152.95	11.15
S_3:4.00(s) Recommend by IMSCS	84.35	86.50	12.50	11.30	2059	98.12	151.17	10.95
S_4:3.50 (s)	92.31	85.60	11.75	10.29	1887	97.25	149.23	11.45
S_5:3.20 (s)	94.57	86.25	11.10	10.10	1829	96.13	149.02	10.75
SEm±	**0.07**	**5.69**	**0.92**	**0.04**	**147**	**0.41**	**0.32**	**3.57**
CD at 5%	**0.21**	**NS**	**NS**	**0.12**	**443**	**1.29**	**0.98**	**NS**

Sieve size of 3.2 (s) mm was effective for grading of soybean (variety JS-93-05) since it recorded highest seed recovery with seedling vigour index of 2059, whereas the physical purity and 1000 seed weight was significant with 4.40 (s) mm sieve size more than recommendation (4.00 mm) (s).

Table 8.4: Effect of different screen size on seed quality characters of Bengal gram (cv: Jaki-9218)

Screen size and type	Seed recovery (%)	Seed germination (%)	Root length (cm)	Shoot length (cm)	Seedling vigour index	Physical purity (%)	Test weight (g)	Seed moisture (%)
S_1: 8.0 (r)	73.12	93.25	16.39	14.82	2910	98.90	306.28	13.63
S_2: 7.0 (r)	75.17	94.55	15.78	14.27	2842	98.40	305.90	13.13
S_3:6.0 (r) Recommend by IMSCS	82.35	92.15	15.15	13.70	2184	98.11	302.34	12.60
S_4: 5.5 (r)	83.01	93.25	14.24	12.88	2529	96.28	298.46	11.85
S_5: 5.0 (r)	88.57	89.75	13.46	12.17	2300	87.48	298.04	11.19
SEm±	**0.9**	**5.69**	**1.13**	**1.05**	**217**	**0.12**	**0.32**	**1.21**
CD at 5%	**2.88**	**NS**	**3.62**	**3.36**	**694**	**0.38**	**1.02**	**NS**

A sieve size of 5.00 (r) mm was effective for grading of Bengal gram (variety Jaki-9218) since it recorded highest seed recovery (88.57) with seedling vigour index of 2300, whereas the physical purity and 1000 seed weight was significant with 8.0 (r) mm sieve size more than recommendation (6.00 m).

Maize

UAS, Bangalore

Results:

Table 8.5: Effect of sieve size on seed recovery and seed quality parameters in maize hybrid MAH 14-5 parental lines

Female	Seed recovery (%)	Test weight (gm)	Germination (%)	Seedling length (cm)	Seedling vigour index-I	Seedling dry weight (mg)	Seedling vigour index
Parents							
G_1: Female	97.11	28.0	90.20	33.89	3061	194	17532
G_2: Male	93.82	27.0	91.80	30.56	2806	192	17613
S.Em±	0.016	0.11	0.680	0.049	23.551	1.62	176.59
CD (P= 0.05)	0.05	0.32	2.01	0.15	69.48	NS	520.95
Screens (R)							
S_1: 6.00	98.00	25.70	88.17	30.47	2687	181	15959
S_2:6.25	97.59	26.68	90.33	31.36	2832	186	16763
S_3:6.40	96.47	27.66	92.33	34.29	3163	199	18360
S_4:6.75	94.13	27.51	91.83	31.88	2922	200	18356
S_5:7.00	91.14	28.33	92.33	33.14	3063	200	18426
S.Em±	0.032	0.22	1.360	0.099	69.48	3.24	353.19
CD (P= 0.05)	0.09	0.65	4.01	0.29	138.95	9.56	1041.90
Interaction							
G_1T_1	98.75	26.40	87.33	30.18	2636	181	15811
G_1T_2	98.21	26.48	89.00	32.18	2864	180	16022
G_1T_3	97.74	28.07	91.00	36.06	3281	205	18647
G_1T_4	96.23	28.00	90.00	35.16	3164	204	18357
G_1T_5	94.60	28.80	93.67	35.86	3359	201	18822
G_1T_1	97.26	25.00	89.00	30.76	2738	181	16106
G_1T_2	96.97	26.88	91.67	30.54	2799	191	17504
G_1T_3	95.19	27.25	93.67	32.51	3045	193	18073
G_1T_4	92.02	27.02	93.67	28.60	2679	196	18354
G_1T_5	87.68	27.85	91.00	30.41	2768	198	18030
S.Em±	0.026	0.18	1.110	0.081	38.46	2.65	288.37
CD (P= 0.05)	0.08	0.53	3.27	0.24	113.44	7.80	850.58

Among the sieve sizes seeds retained on 6.40 mm (R) showed germination (91.00 % in female and 93.67 % in male) above the minimum seed certification standard with better recovery (97.74 % in female and 95.19 % in male) and with good seed quality parameters such as 100 seed weight (28.07 g in female and 27.25 g in male), seedling length (36.06 cm in female and 32.51 cm in male), seedling dry weight (205 mg in female and 193 mg in male) vigour index-I (3281 in female and 3045 in male) and seedling vigour index-II (18647 in female and 18073 in male) (Table 8.5).

Conclusion:

Presently recommended screen for grading of maize parental lines is 6.40 mm (R) and same screen can be employed to obtain better seed quality parameters in female and male parents of hybrid maize MAH 14-5 with better seed recovery.

TNAU, Coimbatore

Materials

1. Crop : Maize
2. Machine : Standard sieve shaker
3. Sieve sizes : Grading sieve: 6.3 mm, 8.0 mm and 10 mm

Var : COMH 6 and its parental lines UMI 1200 and UMI 1230

Variety	Sieve size	Recovery (%)	Germi nation (%)	Root length (cm)	Shoot length (cm)	Seedling length (cm)	Vigour index	100 seed weight	Physical purity (1%)
UMI 1200	6.3 mm	6.9	84	21.4	17.3	39.7	3335	19.35	63.28
	8.0 mm	88.8	95	24.3	22.0	49.3	4684	30.89	99.15
	10.0 mm	4.2	94	30.1	21.0	53.1	4991	35.01	99.85
UMI 1230	6.3 mm	5.0	91	13.6	16.0	29.6	2694	19.43	56.21
	8.0 mm	89.0	93	15.0	16.3	31.3	2911	32.59	99.52
	10.0 mm	5.9	91	16.6	18.0	34.6	3149	35.31	99.79
COMH 6	6.3 mm	5.7	88	18.7	15.6	34.3	3018	19.4	67.86
	8.0 mm	87.3	97	18.0	20.4	38.4	3725	30.35	99.31
	10.0 mm	6.8	98	21.4	20.0	41.4	4057	35.3	99.63
	Mean	33.3	92	19.9	18.5	39.1	3618	28.63	87.18
	SEd		**1.21**	**0.32**	**0.21**	**0.27**	**3.45**	**0.23**	**0.11**
	CD (P=0.05)		**2.28**	**0.65**	**0.44**	**0.58**	**6.94**	**0.47**	**0.24**

Result

The seeds of maize hybrid COMH 6 and its parental lines (UMI 1200 and UMI 1230) were subjected to the sieve sizes of 6.3 mm, 8.0 mm and 10 mm. The sieve size 8.0 mm, retained larger quantity of seeds (88.8, 89.0 and 87.3 % in UMI 1200, UMI 1230 and COMH 6 respectively). The seeds retained in 10.0 mm sieves were bold in size which reflected in the 100 seed weight (35.01, 35.31 and 35.3 gm in UMI 1200, UMI 1230 and COMH 6 respectively compare to 19.35, 19.43 and 19.4 gm in 6.3 mm retained seeds). The same trend expressed in seed physiological quality also. The germination percentage was high in 8.0 mm retained sieves followed by 10.0 mm retained seeds. The vigour index was high in 10.0 mm retained seeds followed by 8.3 mm retained seeds. The seeds retained both in 8.0 and 10.0 mm were recorded the good seed qualities and so all the seeds retained in 8.0 mm and above sieve sizes can be used for sowing. Hence for seed processing of COMH 6 and its parental lines with two screens, 10.0 mm sieve can be used as top sieve and 8.0 mm sieve can be used as bottom screen. For manual sieving with single screen 8 mm sieve can be used.

Pigeon pea cv. BRG-5

UAS, Bengaluru

The bulk seeds of pigeon pea variety BRG-5 procured from farmers field was processed with air screen cleaner using five different round sieves *viz.,* 4.50 mm, 4.75 mm, 5.00 mm, 5.50 mm,6.00 mm and bulk (unprocessed). The air screen cleaner cum grader was adjusted to normal running condition. The seed samples were collected and the observations were recorded on seed recovery (%), physical purity (%), 100 seed weight (g), germination (%), seedling vigour index and seed moisture content (%).

The data revealed that the optimum sieve size for grading of pigeon pea variety BRG-5 was 5.0 mm (S_3) which recorded significantly higher seed germination (93.5%), pure seed (99.74%), 100 seed weight highest (14.16g), mean seedling dry weight (40.20 mg/seedling) and seedling vigour index-I (3762) with seed recovery of 90.31 percent. Although S_1 registered significantly higher seed recovery (95.13%); other seed quality parameters were significantly lower. However, seed recovery in screen size S_3 (90.31 %) was on par with S_2 (94.37%). Seedling dry weight and seed moisture content were found non-significant. Hence, the pigeon pea variety BRG-5 could be processed by using 5.0 mm (R) grading sieve for better seed recovery and quality parameters (Tables 8.6, 8.7 and to 8.8).

Inference: Pigeon pea variety BRG-1 could be processed satisfactorily by using grading sieve size of 5.00mm (Round) in order to get satisfactory seed recovery and quality parameters.

Table 8.6: Effect of sieve size on seed recovery and pure seeds in pigeon pea cv. BRG-5

Treatments (Screen size)	Seed Recovery (%)					Pure Seeds (%)				
	R-I	R-II	R-III	R-IV	Mean	R-I	R-II	R-III	R-IV	Mean
S_1: 4.50 mm	95.66	94.54	95.20	95.13	**95.13**	98.90	98.76	98.70	98.81	**98.77**
S_2: 4.75 mm	93.90	94.70	94.45	94.44	**94.37**	99.44	99.28	99.50	99.50	**99.43**
S_3: 5.00 mm	89.17	89.97	91.40	90.70	**90.31**	99.70	99.80	99.91	99.56	**99.74**
S_4: 5.50 mm	89.98	90.23	89.21	90.40	**89.96**	99.40	99.30	99.70	99.46	**99.47**
S_5:6.00 mm	54.20	52.40	51.50	52.90	**52.75**	99.90	99.71	99.85	99.82	**99.82**
S_6: Unprocessed	--	--	--	--	--	97.75	96.13	95.82	95.90	**96.40**
Mean	**84.58**	**84.37**	**84.35**	**84.71**		**99.18**	**98.83**	**98.91**	**98.84**	
S.Em±	**0.373**					**0.193**				
CD (0.05P)	**1.126**					**0.575**				
CV (%)	**0.884**					**0.391**				

Table 8.7: Effect of sieve size on 100 seed weight and germination in pigeon pea cv. BRG-5

Treatments (Screen size)	100 Seed Weight (g)					Germination (%)				
	R-I	R-II	R-III	R-IV	Mean	R-I	R-II	R-III	R-IV	Mean
S_1: 4.50 mm	13.57	14.03	14.28	13.96	**13.96**	92.00	96.00	90.00	90.00	**92.00**
S_2: 4.75 mm	14.21	14.15	13.91	14.09	**14.09**	94.00	90.00	99.00	90.00	**93.25**
S_3: 5.00 mm	14.09	14.24	14.15	14.16	**14.16**	94.00	93.00	97.00	90.00	**93.50**
S_4: 5.50 mm	14.04	15.85	15.26	15.05	**15.05**	92.00	97.00	97.00	94.00	**95.00**
S_5:6.00 mm	15.89	15.21	15.37	15.49	**15.49**	96.00	97.00	93.00	99.00	**96.25**
S_6: Unprocessed	13.22	13.69	13.76	13.55	**13.55**	96.00	92.00	90.00	94.00	**93.00**
Mean	**14.17**	**14.53**	**14.45**	**14.38**		**94.0**	**94.16**	**94.33**	**92.83**	
S.Em±	**0.184**					**1.493**				
CD (0.05P)	**0.548**					**4.44(NS)**				
CV (%)	**2.56**					**3.18**				

Table 8.8: Effect of sieve size on moisture content seedling dry weight and seedling vigour index in pigeon pea cv. BRG-5

Treatments (Screen size)	Moisture content (%)					Seedling dry weight (mg/seedling)					Seedling vigour Index				
	R-I	R-II	R-III	R-IV	Mean	R-I	R-II	R-III	R-IV	Mean	R-I	R-II	R-III	R-IV	Mean
S_1: 4.50 mm	9.0	8.7	8.9	8.7	**8.83**	36.30	37.60	39.60	38.40	**37.98**	3340	3610	3474	3456	**3470**
S_2: 4.75 mm	9.3	9.1	9.2	9.9	**9.38**	36.70	39.20	39.80	40.20	**38.98**	3450	3528	3940	3618	**3634**
S_3: 5.00 mm	9.9	10.4	10.3	10.2	**10.20**	39.60	40.30	42.60	38.30	**40.20**	3722	3748	4132	3447	**3762**
S_4: 5.50 mm	10.2	10.4	10.4	10.2	**10.30**	40.80	41.30	40.30	42.00	**41.10**	3754	4006	3909	3948	**3904**
S_5:6.00 mm	9.2	9.0	9.1	9.2	**9.13**	41.50	42.60	43.10	41.10	**42.08**	3984	4132	4008	4069	**4048**
S_6: Unprocessed	10.0	9.7	9.9	10.1	**9.93**	39.20	41.80	39.40	38.30	**39.68**	3763	3846	3546	3600	**3688**
Mean	**9.6**	**9.5**	**9.6**	**9.71**		**39.02**	**40.46**	**40.80**	**39.71**		**3669**	**3812**	**3835**	**3690**	
S.Em±	**0.102**					**0.685**					**84.99**				
CD (0.05P)	**0.303**					**2.036**					**252**				
CV (%)	**2.12**					**3.43**					**4.53**				

Field bean cv.HA-4

UAS, Bengaluru

The bulk seeds of field bean cv.HA-4 procured from the farmers field is processed with air screen cleaner using five different round sieves *viz.,*5.0 mm, 5.5 mm, 6.0 mm, 6.5 mm, 7.0 mm and bulk (unprocessed). The air screen cleaner cum grader was adjusted to normal running condition. The seed samples were collected and the observations were recorded on seed recovery (%), physical purity (%), 100 seed weight (g), germination (%), seedling dry weight (mg/seedling), seedling vigour index and seed moisture content (%).

The results revealed that the optimum sieve size for grading of field bean cv.HA-4 was 6.5 mm (S_4) which recorded significantly highest seed germination (95.33%),pure seed (98.47%), 100 seed weight (16.93 g), seedling dry weight (41.97 mg / seedling)and seedling vigour index-I (4001) with seed recovery(90.87 %). Although, the screen size S_1 registered significantly higher seed recovery (97.77%), the other seed quality parameters were significantly lower. Further, seed moisture content did not differ significantly with screen sizes. Hence, the Field bean cv.HA-4 could be processed by using 6.5mm(R) grading sieve for better seed recovery and seed quality parameters (Tables 8.9, 8.10 and 8.11).

Inference: Field bean cv.HA-4 could be processed satisfactorily by using grading sieve size 6.5 mm (Round) in order to get satisfactory seed recovery and quality parameters.

Table 8.9: Effect of sieve size on seed moisture content, physical purity and test weight in Field bean cv. HA-4

Treatments (Screen size)	Seed recovery (%)				Pure seeds (%)				100 seed weight (g)			
	R-I	R-II	R-III	Mean	R-I	R-II	R-III	Mean	R-I	R-II	R-III	Mean
S_1 :5.0 mm (R)	98.0	97.8	97.5	**97.77**	97.10	97.90	98.00	**97.67**	15.70	15.80	15.50	**15.67**
S_2:5.5 mm (R)	97.0	96.9	95.6	**96.50**	98.10	98.20	97.50	**97.93**	16.20	16.00	16.10	**16.10**
S_3: 6.0 mm (R)	93.2	93.1	90.9	**92.40**	98.20	98.10	97.20	**97.83**	16.10	16.15	16.20	**16.15**
S_4: 6.5 mm (R)	91.0	91.6	90.0	**90.87**	98.30	98.50	98.60	**98.47**	16.40	17.10	17.30	**16.93**
S_5 :7.0 mm (R)	64.5	65.0	66.0	**65.17**	98.50	99.60	99.10	**99.07**	16.80	17.50	17.40	**17.23**
S_6: Unprocessed	-	-	-	--	95.90	95.90	96.30	**96.03**	15.50	16.40	16.10	**16.00**
Mean	**88.7**	**88.88**	**88.0**		**97.68**	**98.03**	**97.78**		**16.12**	**16.49**	**16.43**	
SEm±	**0.490**				**0.244**				**0.184**			
CD (0.05P)	**1.544**				**0.751**				**0.568**			
CV (%)	**0.958**				**0.432**				**1.954**			

Table 8.10: Effect of sieve size on seed germination, seedling length and seedling dry weight in Field bean cv. HA-4

Treatments (Screen size)	Seed germination (%)				Seedling dry weight (mg/seedling)			
	R-I	R-II	R-III	Mean	R-I	R-II	R-III	Mean
S_1 :5.0 mm (R)	91	87	89	**89.00**	33.8	37.1	36.1	**35.67**
S_2:5.5 mm (R)	92	89	91	**90.67**	36.9	38.8	37.5	**37.73**
S_3: 6.0 mm (R)	92	94	93	**93.00**	41.4	43.1	39.7	**41.40**
S_4: 6.5 mm (R)	96	94	96	**95.33**	42.0	40.9	43.0	**41.97**
S_5 :7.0 mm (R)	97	97	94	**96.00**	44.8	42.6	42.1	**43.17**
S_6: Unprocessed	86	87	90	**87.67**	38.9	39.2	40.9	**39.67**
Mean	**92.33**	**91.33**	**92.17**		**39.63**	**40.28**	**39.88**	
S.Em±	**0.943**				**0.783**			
CD (0.05P)	**2.905**				**2.412**			
CV (%)	**1.776**				**3.395**			

Table 8.11: Effect of sieve size on seedling vigour index and seed moisture content in field bean cv. HA-4

Treatments (Screen size)	Seedling vigour index				Seed moisture content (%)			
	R-I	R-II	R-III	Mean	R-I	R-II	R-III	Mean
S_1:5.0 mm (R)	3075	3227	3212	**3171**	9.42	9.49	9.89	**9.60**
S_2 :5.5 mm (R)	3395	3453	3412	**3420**	9.67	9.58	9.70	**9.65**
S_3:6.0 mm (R)	3809	4051	3692	**3851**	9.54	9.29	9.50	**9.44**
S_4: 6.5 mm (R)	4032	3844	4128	**4001**	9.38	9.25	9.49	**9.37**
S_5 :7.0 mm (R)	4346	4132	3957	**4145**	9.50	9.80	9.60	**9.63**
S_6: Unprocessed	3345	3410	3681	**3479**	9.50	9.70	9.80	**9.67**
Mean	**3667**	**3686**	**3680**		**9.50**	**9.52**	**9.66**	
S.Em±	**85.64**				**0.090**			
CD (0.05P)	**264.0**				**NS**			
CV (%)	**4.033**				**1.639**			

Note: Seedling vigour index-I is computed based on mean seedling dry weight (mg) & germination (%).

Rice

TNAU, Coimbatore

Var : CO 51

Treatments	Recovery (%)	Physical purity (%)	Germination (%)	Root length (cm)	Shoot length (cm)	Vigour index	1000 seed weight (gm)
Unprocessed	0	92.32	86	10.7	9.4	1729	16.02
BSS 8 retained	13.1	99.45	98	12.8	10.4	2274	16.91
BSS 9 retained	78.6	99.56	99	12.6	10.1	2247	16.83
BSS 10 retained	6.4	63.75	38	11.8	9.8	821	15.41
BSS 10 passed	1.9	39.31	27	10.6	10.1	559	11.73
Mean		78.88	70	11.7	10.0	1526	15.38
SEd	0.37	1.51	0.73	0.36	0.27	12.17	2.21
CD(P=0.05)	0.79	3.12	1.58	0.82	0.58	24.42	4.52

Result

The seeds retained with BSS 8 and BSS 9 sieves put together resulted in the seed recovery of 91.7 percent (BSS 8 – 13.1 percent and BSS 9 - 78.6 percent) processed seeds of the taken seed lot. The unprocessed seeds recorded physical purity of 92.32% and vigour index of 1729. The seeds retained in BSS 10 size sieves and the seeds passed through BSS 10 recorded the physical purity (63.75 and 39.31 %) and vigour index (821 and 559) respectively, which were significantly inferior than BSS 8 retained BSS 9 retained (2274 and 2247) and unprocessed seeds (1729). Hence the seeds retained in BSS 8 and BSS 9 are recommended for processing the seeds of rice variety of CO (R) 51. Hence for seed processing of rice var. CO 51 with two screen machine, BSS 8 sieve can be used as top sieve and BSS 9 sieve can be used as bottom screen. For manual sieving with single screen BSS 9 sieve can be used.

Soybean

UAS, Dharwad

Results:

Treatment details	:	**Sieve size (mm)**	Soybean (JS-9305)	Bengal gram (Jaki-9218)
		S_1:	S_1:4.40 (s)	S_1: 8.0 (r)
		S_2:	S_2:4.30(s)	S_2: 7.0 (r)
Recommended (IMSCS)		**S_3:**	**S_3:4.00**(s)	**S_3:6.0 (r)**
		S_4:	S_4:3.50 (s)	S_4: 5.5 (r)
		S_5:	S_5:3.20 (s)	S_5: 5.0 (r)

Effect of different screen size on seed quality characters of soybean (cv: JS-9305)

Screen size and type	Seed recovery (%)	Seed germination (%)	Root length (cm)	Shoot length (cm)	Seedling vigour index	Physical purity (%)	Test weight (g)	Seed moisture (%)
S_1:4.40 (s)	79.17	85.25	13.52	12.10	2184	98.90	153.14	10.26
S_2:4.30(s)	79.75	84.75	13.02	11.10	2044	98.50	152.95	11.15
S_3:4.00(s) Recommend by IMSCS	84.35	86.50	12.50	11.30	2059	98.12	151.17	10.95
S_4:3.50 (s)	92.31	85.60	11.75	10.29	1887	97.25	149.23	11.45
S_5:3.20 (s)	94.57	86.25	11.10	10.10	1829	96.13	149.02	10.75
SEm±	**0.07**	**5.69**	**0.92**	**0.04**	**147**	**0.41**	**0.32**	**3.57**
CD at 5%	**0.21**	**NS**	**NS**	**0.12**	**443**	**1.29**	**0.98**	**NS**

Sieve size of 3.2 (s) mm was effective for grading of soybean (variety JS-93-05) since it recorded highest seed recovery with seedling vigour index of 2059, whereas the physical purity and 1000 seed weight was significant with 4.40 (s) mm sieve size more than recommendation (4.00 mm) (s).

Effect of different screen size on seed quality characters of Bengal gram (cv: Jaki-9218)

Screen size and type	Seed recovery (%)	Seed germination (%)	Root length (cm)	Shoot length (cm)	Seedling vigour index	Physical purity (%)	Test weight (g)	Seed moisture (%)
S_1: 8.0 (r)	73.12	93.25	16.39	14.82	2910	98.90	306.28	13.63
S_2: 7.0 (r)	75.17	94.55	15.78	14.27	2842	98.40	305.90	13.13
S_3:6.0 (r) Recommend by IMSCS	82.35	92.15	15.15	13.70	2184	98.11	302.34	12.60
S_4: 5.5 (r)	83.01	93.25	14.24	12.88	2529	96.28	298.46	11.85
S_5: 5.0 (r)	88.57	89.75	13.46	12.17	2300	87.48	298.04	11.19
SEm±	**0.9**	**5.69**	**1.13**	**1.05**	**217**	**0.12**	**0.32**	**1.21**
CD at 5%	**2.88**	**NS**	**3.62**	**3.36**	**694**	**0.38**	**1.02**	**NS**

A sieve size of 5.00 (r) mm was effective for grading of Bengal gram (variety Jaki-9218) since it recorded highest seed recovery (88.57) with seedling vigour index of 2300, whereas the physical purity and 1000 seed weight was significant with 8.0 (r) mm sieve size, more than recommendation (6.00 mm).

B. Seed Physiology, Storage and Testing

Experiment 1: To revalidate the seeds of field crops including hybrids for use in seed system

Year of Start: 2017

Introduction:

Seed vigour is an important quality parameter which needs to be assessed to supplement germination and viability tests to know the performance of a seed lot in the field or in storage. As the germination test is conducted in an optimum condition specific to different species, it is not always possible to get an idea of the performance of a seed lot in the field on the basis of germination test in the laboratory. It is mainly because of the reason that field conditions are seldom optimum and the emerging seedling suffers from one or the other kind of stress. In many cases seed lots having similar laboratory germinations may give widely differing field emergence values. This indicate the incompleteness of germination test in assessing the performance of a seed lot in the field and offers scope and possibility to determine vigour of a seed lot so that its field performance can be assessed and leftover seed lots can be revalidated.

Objective: To study the vigour status of seeds for consideration to revalidate the leftover seed lots for sowing purpose.

Details of the crops taken up by different centres for experiments

Crops		Centres
Wheat	:	ICAR-IARI, New Delhi; GBPUAT, Pantnagar; VNMKV, Parbhani; SKNAU, Durgapura; MPKV, Rahuri; NDUAT, Faizabad; CSAUAT, Kanpur and CSKHPAU, Palampur
Rice	:	ICAR-IARI, New Delhi; PJTSAU, Hyderabad; TNAU, Coimbatore; PAJANCOA&RI, Karaikal; UAS, Bengaluru; KAU, Thrissur; AAU, Jorhat and OUAT, Bhubaneswar
Maize	:	ICAR-IARI, New Delhi; TNAU, Coimbatore and PAU, Ludhiana
Sorghum	:	ICAR-IARI, New Delhi; VNMKV, Parbhani; MPKV, Rahuri and UAS, Dharwad
Cotton	:	ICAR-CICR, Nagpur; PJTSAU, Hyderabad and UAS, Dharwad
Soybean	:	ICAR-IARI, New Delhi; JNKVV, Jabalpur; VNMKV, Parbhani; MPKV, Rahuri and UAS, Dharwad
Chickpea	:	ICAR-IARI, New Delhi; JNKVV, Jabalpur; VNMKV, Parbhani; SKNAU, Jobner and CSAUAT, Kanpur

Technical Programme:

Seed lots: Minimum of three seed lots of different storage period of two varieties in a crop may be directly procured from Seed Agencies preferably the Foundation or Certified class. Samples may be collected at three different time intervals to avoid the storage of seeds in the laboratory conditions.

Vigour tests to be employed: As per the ISTA guidelines including seed moisture content (%), radicle emergence, 1st count, final count and seedling dry mass.

Laboratory evaluation: Four replications with 100 seeds in each may be tested for germination.

Field performance:

- Field emergence in 5 rows 6 m length or in 3 x 2 m plots (expressed in per m^2).

- Days to 50% emergence i.e. 7, 8, 9, 10 days (as per crop requirement) after sowing up to five consecutive days.
- Days to flowering.
- Days to maturity.
- Number of productive tillers.
- Seed yield
- 1000 / 100 seed weight (Test weight)

Crop-wise and centre-wise research findings during 2017-18

Crop: Wheat

Centre: GBPUAT, Pantnagar

Experimental details: Two lots of foundation seed (S1= Revalidated and S2=Fresh) of each of the five varieties of wheat; V1= HD2967, V2= CBW 38, V3=PBW550, V4= DPW621-50 and V5=UP 2565 were included in study. The five revalidated seed lots of wheat was brought from UP Seed Certification Agency regional station, Bilaspur and fresh seed lots were brought from University Research Station.

Results: The seed moisture content of all the lots ranged from 11 to 13.5 %. Seed germination of revalidated seed lot was 87.8% which was significantly lower than fresh seed lot (98.3%). The same trend was observed with seedling length and seedling dry mass. Revalidated seed lot also took significantly more time for radicle emergence than fresh seed lot.

Among the varieties, the highest germination (%) was observed with HD 2967 and CBW 38 which were at par with DPW621-50 and UP 2565.The lowest germination was recorded with variety PBW 550 which was significantly lower than rest of the varieties. The maximum seedling length and seedling dry mass was recorded with variety UP 2565 which differ significantly than rest of the varieties (Table 1).

The crop was planted in the field (Plate 1) on November 25, 2017 in factorial RBD with three replications and the observations are being recorded as per technical programme.

Plate 1: Field view of crop grown with revalidated and fresh/new seed lot of four varieties of wheat

Table 1: Seed germination and seedling vigour of revalidated and fresh seed varieties of wheat

Varieties	Germination (%)			Seedling length (cm/seedling)			Seedling dry mass (mg/seedling)			Days to radicle emergence (days)		
	S1	S2	Mean	S1	S2	Mean	S1	S2	Mean	S1	S2	Mean
V1	89.0	98.7	93.8	18.7	22.6	20.7	17.7	19.3	18.5	4.3	2.3	3.3
V2	88.3	99.3	93.8	19.6	22.6	21.1	18.3	19.8	19.1	4.6	2.0	3.3
V3	87.0	97.3	92.2	20.5	23.4	22.0	19.1	21.5	20.3	4.3	2.6	3.5
V4	87.3	98.0	92.7	21.2	23.5	22.3	18.9	21.2	20.1	4.3	2.3	3.3
V5	87.6	98.3	92.9	21.2	27.0	24.1	19.4	21.6	20.5	4.3	2.3	3.3
Mean	87.8	98.3	93.1	20.2	23.8	22.0	18.7	20.7	19.7	4.4	2.3	3.3
	V	S	VxS	V	S	VxS	V	S	VxS	V	S	VxS
SEm (±)	0.55	0.35	0.77	0.20	0.13	0.28	0.30	0.19	0.43	0.22	0.14	0.31
CD(p=0.05)	1.6	1.0	NS	0.6	0.4	NS	0.9	0.6	NS	NS	0.4	NS

V1=HD2967; V2=CBW 38; V3=PBW 550; V4=DPW621-50 and V5=UP 2565
S1=Revalidated seed lot and S2= Fresh seed lot

Centre: VNMKV, Parbhani

Experimental details: Two lots; Fresh Seed (Lot No.1: April17-13-2205VNMKV794) of April 2017 harvest and Leftover Seed (Lot No.2: April16-13-2205VNMKV551) of April 2016 harvest of wheat variety; NIAW301 were taken for the study.

Results: Among all the laboratory parameters, the final count in both the lots was more than the IMSCS, however, the first count was found very much less (13) in left over seed lot than that of fresh seed lot (42), which is an indicator of low vigour. Though, there were no differences in days to 50% flowering and days to maturity, but the grain yields was much higher in fresh seed lot (Table 2) that could be attributed to higher test weight.

Table 2: Various laboratory and field parameters observed in fresh and left over seed lots of wheat

Laboratory Parameters/ Seed Lots	Seed Moisture Content %	Radical emergence	1st Count	Final Count	Seedling dry mass (gm)
Fresh	10.7	96	42	96	0.130
Left over	10.9	90	13	90	0.122
Field Parameters/ Seed Lots	**Field emergence (m^2)**	**Days to 50% Flowering**	**Days to Maturity**	**Grain Yield (gm per m^2)**	**1000 Seed Weight (gm)**
Fresh	35	60	103	393.42	40.06
Left over	34	60	103	312.14	37.04

Centre: SKNAU, Durgapura

Experimental details: Fresh and one year old seeds of two popular wheat varieties namely Raj-4238 and Raj-4079 were used for study.

Results: The data observed revealed that the moisture content was in general higher in fresh seeds of both the varieties. However, the statistical variations were found non-significant. Germination percentage and seedling dry weight were significantly higher in fresh seeds of both the varieties. It was observed that the variations in old and fresh seed lots of both wheat varieties were non-significant for most of the parameters. (Table 3, Plate 2).

Table 3: Variations in moisture content, germination percentage and seedling dry weight of old and new wheat seeds.

Variety	Seed lot	Germination percentage	Moisture content (%)	Radicle emergence		Seedling dry weight at 10 DAS (mg/10 seedlings)
				First count	Final count	
Raj-4238	New	96.78	8.70	85.60	96.68	270.56
Raj-4238	Old	94.56	7.78	82.70	91.45	254,87
Raj-4079	New	96.00	8.96	86.94	95.60	290.43
Raj-4079	Old	95.00	7.80	84.56	92.34	268.94
CD(p=0.05)		NS	NS	NS	NS	18.54

Plate 2: Germination in fresh and one year old wheat varieties

The same wheat varieties (Raj-4238 and Raj-4079) were grown in the field on November 15, 2017 under standard package of practices recommended for this area. The experiment was laid down in a randomized block design with five replications under irrigated conditions. It was noticed that the field emergence was higher in fresh seeds over one year old seeds; however, the variations were statistically non-significant. The seedling vigour indexes reduced significantly with higher magnitude in Raj-4328. Chlorophyll content at anthesis stage was comparatively better in fresh seeds over one year old seeds in both the varieties (Table 4).

Table 4: Variations in field emergence, seedling vigour index I, II and chlorophyll content in old and fresh seed lots

Variety	Seed lot	Field emergence per m^2	Seedling vigour index I	Seedling Vigour Index II	Days to flowering	Chl. content at anthesis stage (mg /g/f.w.)
RSG-963	New	71.23	3217	167	60	2.16
RSG-963	Old	67.75	3145	161	58	2.10
CAJD-884	New	73.82	3456	185	61	2.29
CAJD-884	Old	70.68	3317	178	60	2.17
CD(p=0.05)		NS	416	14.65	NS	0.29

Centre: MPKV, Rahuri

Experimental details: The material comprised of three lots; S1: Fresh, S2: RVD Istand S3: RVD IInd ofBreeder and Foundation seed of two wheat varieties; Trambak (V1) and Netravati (V2). The details have been mentioned in the table 5.

Table 5: Information of Seed lot, type, stage and germination of seed:

Variety	Seed lot	Type of seed	Stage of seed	Date of harvest	Date of test	Germination (%)
V1: Trambak	April 17-13-1601-1727	Fresh	Foundation	April. 2017	23.10.2017	96
	April 16-13-1601-45	RVD I	Foundation	April. 2016	31.08.2017	95
	April 15-13-1601-45	RVDII	Foundation	April. 2015	30.05.2017	86
	April 17-13-1601-1730	Fresh	Foundation	April. 2017	23.10.2017	96
	April 16-13-1601-47	RVD I	Foundation	April. 2016	31.08.2017	92
	April 15-13-1601-47	RVDII	Foundation	April. 2015	30.05.2017	85
V2: Netravati	April 17-13-MPKVR-49.	Fresh	Breeder	April. 2017	28.09.2017	97
	April 16-13-MPKVR-46	RVD I	Breeder	April. 2016	31.08.2017	88
	April 15-13-MPKVR-46	RVDII	Breeder	April. 2015	30.05.2017	80
	April 17-13-MPKVR-51.	Fresh	Breeder	April. 2017	28.09.2017	96
	April 16-13-MPKVR-54	RVD I	Breeder	April. 2016	31.08.2017	87
	April 15-13-MPKVR-54	RVDII	Breeder	April. 2015	30.05.2017	85

Results: The data on effect of variety, seed lot and seed type on seed quality of wheat are presented in table 6.

A) *Effect of variety*: The germination (89.6%), seedling length (30.22 cm) and vigour index I (2719) were significantly higher in Trimbak. However, moisture, dry matter content, vigour index II and field emergence found to be non significant.
B) *Effect of seed type*: Seed quality parameters due to seed lot were influenced non-significant except seedling dry weight.
C) *Effect of Seed lot*: The fresh seed lot recorded the highest germination (95 %), followed by 1st revalidated seed (88.5 %). However, revalidated II ndseed also recorded better germination (81.75 %) which was just below the minimum seed certification standard (85%).
D) *Interaction effect of variety, lot and seed type on seed quality parameters of wheat*: The interaction effect of variety, seed lot and seed type was non-significant (Table 6a).

Table 6: Effect of variety, lot and seed types on seed quality parameters in wheat

Treatments	Moisture content (%)	Germination (%)	Seedling length (cm)	Dry matter content (g)	Vigor index I	Vigor index II	Field emergence (%)
Variety							
V1: Trimbak	9.05 (17.49)*	89.67 (72.06)	30.22	0.255	2719	22.99	83.56 (66.49)
V2: Netravati	9.16 (17.60)	87.17 (69.56)	28.83	0.247	2536	21.67	81.33 (64.66)
SEm(±)	**0.14**	**0.57**	**0.19**	**0.005**	**23.05**	**0.51**	**0.61**
CD(p=0.05)	**NS**	**1.67**	**0.55**	**NS**	**67.31**	**NS**	**NS**
Seed type							
L1: Lot 1	9.09 (17.53)	88.33 (70.82)	29.67	0.243	2641	21.65	82.00 (65.21)
L2: Lot 2	9.12 (17.56)	88.50 (70.80)	29.39	0.258	2614	23.00	82.89 (65.93)
SEm(±)	0.14	**0.57**	**0.19**	**0.005**	**23.05**	0.51	**0.61**
CD(p=0.05)	**NS**	**NS**	**NS**	**0.013**	**NS**	**NS**	**NS**
Seed lot							
S1: Fresh	9.58 (18.01)	95.00 (77.25)	33.65	0.283	3195	26.84	88.83 (70.59)
S2: RVD Ist	8.92 (17.36)	88.50 (70.36)	28.61	0.255	2536	22.56	82.50 (65.40)
S3: RVD IInd	8.81 (17.26)	81.75 (64.81)	26.32	0.215	2152	17.59	76.00 (60.74)
SEm(±)	**0.17**	**0.70**	**0.23**	**0.006**	**28.24**	**0.62**	**0.75**
CD(p=0.05)	**0.49**	**2.04**	**0.68**	**0.017**	**82.44**	**1.82**	**2.19**

*Figures in parenthesis are arc sin transformed values

Table 6a: Interaction effect of variety, lot and seed types on seed quality parameters in wheat

Treatments	Moisture content (%)	Germination (%)	Seedling lenght (cm)	Dry matter content (g)	Vigor Index I	Vigor Index II	Field emergence (%)
V1L1S1	9.62 (18.05)*	96.00 (78.69)	32.90	0.28	3157.60	26.85	90.00 (71.55)
V1L1S2	8.56 (18.05)	92.00 (78.69)	31.35	0.21	2885.03	19.35	85.00 (72.89)
V1L1S3	8.91 (17.95)	85.00 (75.82)	27.94	0.21	2374.42	17.88	80.00 (67.25)
V1L2S1	9.62 (17.90)	96.00 (75.82)	31.80	0.30	3053.20	28.79	91.33 (70.65)
V1L2S2	8.59 (16.99)	88.00 (73.62)	29.60	0.29	2601.47	25.59	83.00 (67.37)
V1L2S3	8.97 (17.03)	81.00 (69.99)	27.72	0.24	2244.46	19.50	72.00 (65.64)
V2L1S1	9.52 (17.51)	94.00 (68.92)	34.80	0.28	3271.33	26.33	85.00 (63.64)
V2L1S2	9.06 (17.90)	87.00 (68.92)	25.70	0.27	2238.30	23.53	80.00 (64.92)
V2L1S3	8.84 (17.36)	76.00 (67.21)	25.30	0.21	1922.00	15.97	72.00 (63.43)
V2L2S1	9.56 (17.42)	94.00 (64.17)	35.10	0.27	3299.53	25.37	89.00 (58.05)
V2L2S2	9.47 (17.29)	87.00 (60.65)	27.80	0.25	2419.40	21.79	82.00 (58.04)
V2L2S3	8.52 (16.95)	85.00 (67.22)	24.30	0.20	2066.63	17.01	80.00 .(63.45)
SEm(±)	0.33	1.40	0.46	0.011	56.47	1.25	1.49
CD(p=0.05)	NS	NS	1.36	NS	NS	NS	NS

*Figures in parenthesis are arc sin transformed values

Centre: NDUAT, Faizabad

Experimental details: Three seed lots of two varieties namely; NW-1076 and PBW-373 were obtained from Seed Processing Plant at three different time intervals to study the vigour status of seeds for consideration to revalidate the leftover seed lots for sowing purpose.

Results: The experiment was conducted as per technical programme. The vigour performance revealed that the moisture content was at par but radical emergence, first count, final count, seedling length and seedling dry weight decreased significantly over the three different storage periods. The germination per cent was observed quite below as per Indian Minimum Seed Certification Standard that is 85% in wheat crop (Table 7, 8 & 9). Field emergence was 21% and it took 59 days to flowering in variety, NW-1076, while Field emergence was 18% and it took 63 days to flowering in variety, PBW-373.

Table 7: Vigour status of different seed lots of wheat variety NW-1076 Laboratory condition

Lot No./ 3 different periods (one month interval)		MC (%)	Radicle emergence (%)	First count (%)	Final count (%)	Seedling length (cm)	Seedling dry wt. (mg)
Lot No. A	Sample No. 1	12.15	70	52	62	15.45	212
	Sample No. 2	12.25	61	47	55	14.20	207
	Sample No. 3	12.30	53	40	47	12.75	195
Lot No. B	Sample No. 1	12.25	73	55	64	15.53	210
	Sample No. 2	12.50	65	50	59	14.89	204
	Sample No. 3	12.65	58	46	52	13.13	197
Lot No. C	Sample No. 1	12.10	75	58	66	14.82	203
	Sample No. 2	12.40	68	53	62	13.65	194
	Sample No. 3	12.75	61	49	55	12.50	190

Table 8: Vigour status of different seed lots of wheat variety PBW-373 Laboratory condition

Lot No./ 3 different periods (one month interval)		MC (%)	Radicle emergence (%)	First count (%)	Final count (%)	Seedling length (cm)	Seedling dry wt. (mg)
Lot No. A	Sample No. 1	12.45	64	50	58	14.70	207
	Sample No. 2	12.50	52	41	46	13.15	199
	Sample No. 3	12.55	43	39	42	12.27	192
Lot No. B	Sample No. 1	12.40	67	55	63	15.15	201
	Sample No. 2	12.55	61	43	57	14.54	196
	Sample No. 3	12.63	54	38	45	13.27	187
Lot No. C	Sample No. 1	12.40	63	52	60	15.15	200
	Sample No. 2	12.59	57	46	54	13.67	194
	Sample No. 3	12.67	46	40	42	12.80	185

Table 9: Days to emergence and days to 50 % flowering of wheat varieties

Variety	Days to emergence				Days to 50 % flowering
	7	8	9	10	
NW-1076	05(2%)	38(15%)	8(3%)	01(0.4%)	59
PBW-373	03(1%)	34(13%)	6(2%)	04(1.5%)	63

Centre: CSAUAT, Kanpur

Experimental details: Eight months old wheat seeds of five varieties i.e. K 307, K407, K 7903, K 1006 and K 607 were used in the study.

Results: The moisture was within maximum permissible limits in wheat variety; K–1006, while the variety; K-307 had the highest germination (91.6%), field emergence per 6m^{2}plot (277.3) but it took maximum days to 50% emergence (Table 10).Experiment is in progress.

Table 10: Seed quality parameters of aged seed lots (8 months) of wheat varieties

Crop varieties	Seed MC (%)	Radical emergence	1st count	Final count (%)	Seedling dry wt. (gm)	Field observations	
						Field (6m^2) emergence	Days to 50% emergence
K-307	12.80	18.03	87.00	91.66	0.16	277.33	139.33
K-407	13.00	16.16	74.00	89.00	0.15	258.33	129.66
K-903	12.40	15.12	78.66	86.00	0.16	245.00	122.66
K-1006	12.00	19.92	79.33	89.00	0.14	246.00	123.00
K-607	12.60	13.19	81.00	89.33	0.17	243.66	122.00

Centre: CSKHPAU, Palampur

Experimental details: Three seed lots of foundation seed (2014-15, 2015-16 and 2016-17) of two wheat varieties (HPW 249 and HPW 349) were used to conduct the experiment.

Results: The HPW 349 (2016-17) seed lot recorded highest germination percentage (95.67 %), seedling length (22.65 cm), vigourindex-I (2167.20), vigour index-II (16.65), speed of germination (76.50), field emergence (1005.7), while seed lot HPW 249 (2014-15) exhibited lowest germination percentage (73.33 %), seedling length (22.08 cm), vigourindex-I (1619.42), vigour index-II (11.66), speed of germination (60.17), field emergence (482.7). Further, HPW 349 (2016-17) seed lot also recorded lowest electrical conductivity (0.242 m mhos/cm/g), days to 50 % radical emergence (1.57) and days to 50 % emergence (8.33), while HPW 249 (2014-15) showed highest electrical conductivity (0.268 m mhos/cm/g) and days to 50 % emergence (12.67). Two seed lots, namely, HPW 249 (2015-16) and HPW 349 (2014-15) which showed marginal low germination i.e. 82.67 % and 81.33 %, respectively than IMSCS (85 %) did not show improvement for different vigour traits in comparison to the seed lots HPW 249 (2016-17), HPW 349 (2015-16) and HPW 349 (2016-17) having germination percentage above the IMSCS (85 %).Two seed lots, namely, HPW 249 (2015-16) and HPW 349 (2014-15) which showed marginal low germination i.e. 82.67 % and 81.33 %, respectively than the IMSCS (85 %) did not show improvement with respect to different vigour traits in comparison to the seed lots HPW 249 (2016-17), HPW 349 (2015-16) and HPW 349 (2016-17) having germination percentage above the IMSCS (85 %) (Table 11).

Table 11: Performance of different wheat seed lots at Palampur (2017-18)

Seed lot Nos.	Seed MC (%)	First count (%)	Final count (%)	Seedling length (cm)	Seedling dry wt. (g)	Vigour index I)	Vigour index II	Electrical conductivity(m mhos / cm/g)	Speed of germination	Field emergence (m^2)	Days to 50 % emergence
1	10.57	73.00	73.33	22.08	0.159	1619.42	11.66	0.268	60.17	482.7	12.67
2	10.57	82.33	82.67	22.40	0.171	1851.77	14.11	0.247	68.72	487.7	11.33
3	10.27	88.67	89.33	22.48	0.177	2008.52	15.84	0.226	70.26	784.7	10.33
4	10.67	81.00	81.33	21.52	0.156	1750.51	12.69	0.250	63.43	520.0	11.33
5	10.63	89.33	89.67	22.21	0.162	1992.09	14.55	0.246	70.63	790.0	10.67
6	10.53	95.33	95.67	22.65	0.174	2167.20	16.65	0.242	76.50	1005.7	8.33
SEm(±)	0.03	0.42	0.35	0.06	0.0008	9.44	0.07	0.0008	0.34	2.00	0.29
CD(p=0.05)	0.09	1.31	1.10	0.19	0.0025	29.74	0.23	0.0024	1.06	6.20	0.92

Seed lot No.: 1- HPW 249 (2014-15), 2- HPW 249 (2015-16), 3- HPW 249 (2016-17), 4- HPW 349 (2014-15), 5- HPW 349 (2015-16) and 6- HPW 349 (2016-17)

Crop: Rice

Centre: PJTSAU, Hyderabad

Experimental details: Seeds of 3 varieties viz.; BPT 5204, MTU 1010 and RNR 15048 were collected from the 12 months (Rabi-2015-16), 9 months (Kharif, 2017) and 3 months (Rabi-2016-17) old seed lots. All the 3 varieties were sown on 01.07.2017 and transplanted on 03.08.2017 in 3 three replications at spacing of 20 cm x 15 cm in 6 rows of 3.0 m length.

Results: There was not much significant difference noticed between the 9 months and 3 months aged seed lots (12, 13). However, both the seed lots differed significantly from the 12 months aged seeds for most of the seedling vigor traits. There were no significant differences recorded for the all yield and yield attributing traits among the 12 months, 9 months and 3 months aged seed in three varieties.

Table 12: Seedling vigour and yield contributing characters in different storage periods of rice varieties

Treatments	Moisture (%)	Initial count (%)	Final count (%)	Root length (cm)	Shoot length (cm)	Total length(cm)	Dry mass (10seedlings) (g)	SVI I	SVI II	4th Day (%)	5th Day (%)
BPT 5204	10.7	89.8	87.1	11.3	8.6	19.9	0.4	1740.8	33.9	44.7	66.0
RNR 15048	10.3	91.6	88.1	12.0	11.8	23.8	0.4	2098.9	34.0	63.6	72.2
MTU 1010	10.9	94.4	90.9	12.0	8.7	20.7	0.4	1878.2	33.0	71.6	78.0
Mean	**10.6**	91.9	88.7	11.8	9.7	21.5	0.4	1906.0	33.6	59.9	72.1
SEm (±)	**0.1**	0.6	1.5	0.3	0.2	0.2	**0.0**	38.0	0.6	5.4	2.6
CD (p=0.05)	**0.3**	**2.0**	**NS**	**NS**	**0.5**	**0.7**	**0.0**	**114.8**	**NS**	**16.4**	**7.8**
12 months	10.6	87.0	86.1	11.0	9.5	20.4	0.3	1762.0	27.3	60.4	74.4
6 Months	10.4	94.6	91.1	12.1	10.5	22.5	0.5	2047.8	49.1	40.9	59.6
3 months	10.9	94.2	88.9	12.3	9.2	21.5	0.3	1908.1	24.5	78.4	82.2
Mean	**10.6**	91.9	**88.7**	**11.8**	**9.7**	**21.5**	**0.4**	**1906.0**	**33.6**	**59.9**	**72.1**
SEm (±)	**0.1**	0.6	1.5	0.3	0.2	0.2	0.0	38.0	0.6	5.4	2.6
CD (p=0.05)	**0.3**	2.0	**NS**	0.8	0.5	0.7	0.0	114.8	1.8	16.4	7.8
BPT 5204 (12 months)	10.8	76.7	80.0	9.5	8.7	18.2	0.3	1456.4	24.8	42.0	60.7
BPT 5204 (6 months)	10.5	95.7	93.0	11.6	9.1	20.7	0.6	1921.8	52.4	6.0	49.3
BPT 5204 (3 months)	10.8	97.0	88.3	12.9	8.0	20.9	0.3	1844.1	24.4	86.0	88.0
MTU 1010(12 months)	10.1	92.3	85.7	12.2	11.0	23.2	0.3	1986.6	27.1	66.7	80.0
MTU 1010 (6 months)	10.2	92.7	88.7	12.6	13.3	25.9	0.6	2296.3	50.8	44.7	51.3
MTU 1010 (3 months)	10.5	89.7	90.0	11.2	11.2	22.4	0.3	2014.0	24.0	79.3	85.3
RNR 15048(12months)	10.8	92.0	92.7	11.2	8.7	19.9	0.3	1843.0	30.0	72.7	82.7
RNR 15048(6 months)	10.6	95.3	91.7	12.0	9.0	21.0	0.5	1925.4	44.0	72.0	78.0
RNR 15048(3 months)	11.4	96.0	88.3	12.8	8.4	21.1	0.3	1866.3	25.0	70.0	73.3
Mean	**10.6**	**91.9**	**88.7**	**11.8**	**9.7**	**21.5**	**0.4**	**1906.0**	**33.6**	**59.9**	**72.1**
SEm (±)	**0.2**	1.1	2.6	0.4	0.3	0.4	0.0	65.7	1.0	9.4	4.5
CD (p=0.05)	**NS**	3.4	**NS**	1.3	0.8	1.2	0.0	198.8	3.1	28.4	13.5

Table 13: Seedling vigour and yield contributing characters in different storage periods of rice varieties

Treatments	6th Day (%)	7th Day (%)	8th day (%)	days to 50% flowering	Plant height (cm)	Panicle length (cm)	Productive tillers	No.of grains/ panicle	Test weight (g)	Yield (kg/Plot)	Yield (kg/ha)
BPT 5204	77.3	84.4	87.1	110.2	103.3	20.8	17.4	896.4	12.7	2.5	5697.6
RNR 15048	80.7	90.7	91.8	95.8	96.2	20.4	15.0	620.6	14.9	2.8	6163.2
MTU 1010	89.6	89.6	90.7	100.7	105.6	21.4	16.0	1031.1	14.6	3.1	6719.0
Mean	82.5	88.2	89.9	102.2	101.7	20.9	16.1	849.4	14.1	2.8	6193.3
SEm (±)	2.0	1.6	1.3	0.7	1.6	1.0	1.0	63.7	0.9	0.1	115.5
CD (p=0.05)	**6.2**	**4.8**	**3.8**	**2.2**	**4.7**	**NS**	**NS**	**192.8**	**NS**	**0.2**	**349.3**
12 months	81.3	84.0	85.8	102.7	99.6	21.3	17.9	801.3	12.7	2.7	6115.9
6 Months	74.0	88.7	90.4	101.2	99.7	19.6	16.1	855.7	14.7	2.8	6173.6
3 months	92.2	92.0	93.3	102.8	105.9	21.7	14.4	891.1	14.9	2.9	6290.3
Mean	**82.5**	**88.2**	**89.9**	**102.2**	**101.7**	**101.7**	**101.7**	**101.7**	**101.7**	**101.7**	**101.7**
SEm (±)	2.0	1.6	1.3	0.7	1.6	1.0	1.0	63.7	0.9	0.1	115.5
CD (p=0.05)	6.2	4.8	3.8	NS	4.7	1.4	NS	NS	NS	NS	NS
BPT 5204 (12 months)	68.0	69.3	72.0	110.0	98.9	20.2	20.1	816.3	10.5	2.6	5918.2
BPT 5204 (6 months)	68.7	88.7	94.0	110.0	100.7	19.5	17.1	997.7	13.6	2.5	5552.2
BPT 5204 (3 months)	95.3	95.3	95.3	110.7	110.3	22.7	14.9	875.3	14.1	2.6	5621.7
MTU 1010(12 months)	86.0	92.7	94.7	97.0	92.9	20.7	16.7	530.0	13.2	2.8	6083.6
MTU 1010 (6 months)	61.3	86.0	86.0	96.0	97.7	20.6	14.8	631.0	15.2	2.8	6131.0
MTU 1010 (3 months)	94.7	93.3	94.7	94.3	98.0	19.8	13.5	700.7	16.3	2.9	6275.4
RNR 15048(12months)	90.0	90.0	90.7	101.0	106.9	23.1	16.9	1057.7	14.2	2.9	6345.9
RNR 15048(6 months)	92.0	91.3	91.3	97.7	100.6	18.5	16.4	938.3	15.3	3.1	6837.5
RNR 15048(3 months)	86.7	87.3	90.0	103.3	109.2	22.7	14.8	1097.3	14.4	3.2	6974.2
Mean	**82.5**	**88.2**	**89.9**	**102.2**	**101.7**	**20.9**	**16.1**	**849.4**	**14.1**	**2.8**	**6193.3**
SEm (±)	3.5	2.7	2.2	1.2	2.7	1.7	1.7	110.4	1.5	0.1	200.1
CD (p=0.05)	10.7	8.3	6.6	NS	NS	NS	NS	NS	NS	NS	NS

Centre: TNAU, Coimbatore

Experimental details: Three seed lots of different storage period (Fresh, 6 months old, 9 months old and 12 months old) of two varieties; CO 51 and ADT 43 were directly procured from a private seed company. Seed moisture content (%), radicle emergence, 1st count, final count (Plate 3, 4) and seedling dry mass were estimated as per the ISTA guidelines.

Plate 3: Germination test of stored paddy seeds

Plate 4: Inclined plate method in rice showing good seedling growth in all the aged seeds

Results: The results revealed that in both the varieties of CO 51 (Table 14) and ADT 43 (Table 15), seeds maintain the viability above 80 % after 12 months of storage. The variety CO 51 recorded 92.1 percentage of germination after nine months of storage. Whereas, ADT 43 recorded 88.4 percent of germination after nine months of storage. The radicle emergence was 86% for the varieties CO 51 and ADT 43 respectively after nine months of storage. But the radicle emergence after twelve months was recorded as 75 and 82.8 after twelve months of storage. It indicated that the deterioration pattern varies between varieties. The initial vigour index of the variety CO 51 recorded as 2758, and 2610 after six months of storage. There was considerable reduction after six months and it recorded 2207 during nine months and 2040 during twelve months. As the aging progresses, the vigour index deteriorates in faster rate. The same trend followed in the var. ADT 43, it recorded 2919, 2709, 2359 and 2143 respectively.

Table 14: Effect of different age of seeds on Seed Physiological parameters in Paddy Var.Co.51

Differently aged seeds lots	First count (%)	Final count (%)	Shoot length (cm)	Root length (cm)	Dry matter (mg)	Vigour index	Speed of Ger.	RE Test (%)at72 hrs	FE (%)
Lot 1	98	95	11.4	18.3	0.113	2803	44.61	96	
Lot 2	97	95	11.2	17.3	0.107	2707	44.12	93	86
Lot 3	97	96	11.2	17.6	0.111	2763	44.3	94	85
Mean	97	95	11.3	17.7	0.110	2758	44.34	94	87
Lot 4	97	94	11.1	18.2	0.109	2732	44.26	93	89
Lot5	94	91	10.8	17.3	0.103	2555	42.17	91	86
Lot6	97	94	10.6	17.3	0.095	2542	43.8	94	87
Mean	96	93	10.8	17.6	0.102	2610	43.41	93	88
Lot 7	94	92	10.3	16.6	0.101	2488	38.21	90	86
Lot 8	92	92	9.5	14.2	0.081	2057	32.31	84	81
Lot 9	89	92	9.8	13.7	0.085	2075	32.37	83	83
Mean	92	92	9.9	14.8	0.089	2207	34.30	86	84
Lot 10	91	87	9.6	15.3	0.096	2265	36.56	76	78
Lot 11	87	83	9	14.7	0.087	1879	34.33	71	71
Lot 12	85	83	9.1	15.1	0.094	1976	36.41	78	75
Mean	88	84	9.2	15.0	0.092	2040	35.77	75	75
SEd	0.98	0.56	0.71	0.87	0.23	4.8	1.13	0.31	3.2
CD (p=0.05)	2.12	1.12	1.45	1.84	0.48	9.8	2.22	0.64	6.6

Table 15: Effect of different age of seeds on Seed Physiological parameters in Paddy Var.ADT 43

Differently aged seeds lots	First count (%)	Final count (%)	Shoot length (cm)	Root length (cm)	Dry matter (mg)	Vigour index	Speed of Ger.	RE Test (%)at72 hrs	FE (%)
Lot 1	95	95	12.4	18.40	0.58	2926	45.80	92.5	88
Lot 2	96	94	12.3	18.10	0.58	2868	45.62	91.9	90
Lot 3	95	94	12.5	19.10	0.58	2963	46.11	93.1	92
Mean	95	94	12.4	18.53	0.58	2919	45.84	92.5	90
Lot 4	95	94	11.8	18.00	0.57	2792	45.30	92.3	91
Lot 5	94	93	12.2	19.00	0.58	2889	45.76	91.6	91
Lot 6	94	91	11.9	18.10	0.57	2709	43.67	89.4	89
Mean	94	92	12.0	18.37	0.57	2769	44.91	91.1	90
Lot 7	91	86	10.7	15.00	0.55	2206	33.81	86.7	83
Lot 8	93	92	11.5	17.40	0.57	2645	39.71	89.1	88
Lot 9	91	88	10.9	14.50	0.56	2226	33.87	82.3	82
Mean	91	88	11.0	15.63	0.56	2359	35.80	86.0	84
Lot 10	85	84	10.2	15.90	0.56	2114	37.91	80.3	71
Lot 11	89	86	10.8	16.10	0.57	2301	38.06	86.1	76
Lot 12	86	84	10.1	15.50	0.56	2014	35.83	82.1	74
Mean	87	85	10.4	15.83	0.56	2143	37.27	82.8	74
SEd	0.71	0.29	0.44	0.6	0.42	4.53	0.86	0.63	2.93
CD(p=0.05)	1.491	0.609	0.924	1.26	0.84	9.513	1.806	1.24	6.153

Lot Nos.: 1, 2 & 3 - Fresh seeds; 4, 5 & 6 - Six months old seeds;7, 8 & 9 - Nine months old seeds and 10, 11 & 12 - Twelve months old seeds

Centre: PAJANCOA&RI, Karaikal

Experimental details: Fresh,6 months stored, 9 months stored, and 12 months stored seed lots of Paddy cv. CO (R)51 were taken for the present study. Different seed quality parameters (Plate 5, 6) were assessed (ISTA) and field emergence (Plate 8) was observed. The observation on yield components under field condition is in progress.

Results: The results revealed that even after 12 months of storage (revalidated seed lot) the germination was maintained above IMSCS (83.5%). Further, only 11% reduction in vigour index was recorded in revalidated seed lot (Table 16). The seed vigour in terms of speed of germination and radicle emergence test of revalidated seed lot was also appreciable. Only 4.1% reduction in field emergence was observed in revalidated seed lot (12months stored seeds).

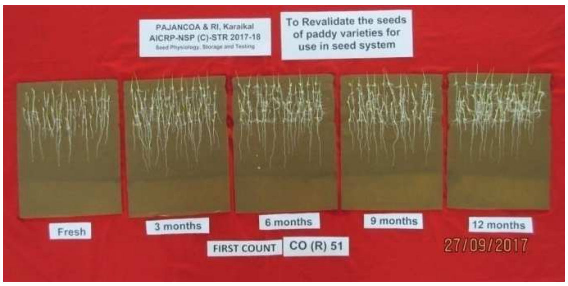


Plate 5: Observations on first count in aged seeds of CO (R) 51

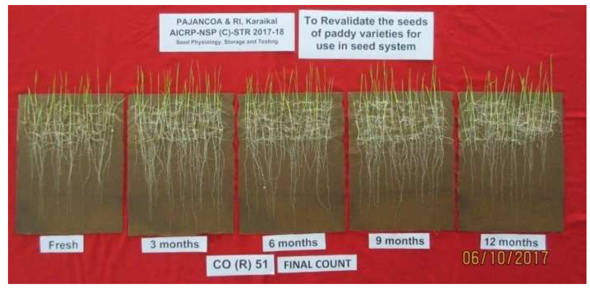


Plate 6: Observations on final count in aged seeds of CO (R) 51

Plate 7: Field view of paddy crop planted with aged seeds of CO (R) 51

Table 16: Effect of age of seeds on Seed quality parameters in Paddy cv. CO (R)51

Seed lots	Parameters									
	First count (%)	Final count (%)	Shoot length (cm)	Root length (cm)	Dry matter (g)	Vigour index - I	Vigour index - II	Radical emergence (%)	Speed of germination	Field emergence (%)
Fresh seed	96.5	90.0	10.05	19.17	0.109	2631	9.76	93	42.98	73.3
6 months stored	93.5	87.0	9.62	18.28	0.108	2427	9.36	93	42.82	65.8
9 months stored	93.0	80.5	10.37	17.77	0.108	2266	8.69	91	39.25	62.1
12 months stored	93.5	83.5	10.56	17.54	0.108	2345	9.03	93	39.75	70.4
Mean	**94.1**	**85.3**	**10.15**	**18.19**	**0.108**	**2417**	**9.21**	**92.5**	**41.2**	**67.9**
SEd	NS	2.53	0.20	0.45	NS	75	0.28	0.47	0.53	NS
CD (p=0.05)		5.52	0.43	0.99		164	0.60	1.02	1.15	

Centre: UAS, Bengaluru

Experimental details: Two seed lots (Fresh, I-Revalidated & II-Revalidated) three paddy varieties (IR-64, Jaya, MTU-1001) were procured. Initial seed quality parameters were recorded as per ISTA, 2017. Three replications of each variety were raised in experimental plot of 8m x 4m size (Plate 10) to study the vigour status of seeds for consideration to revalidate the leftover seed lots for sowing purpose.

Results: Among the varieties IR-64 recorded highest seed vigour parameters *viz*., root length (20.83 cm), shoot length (14.50 cm), root dry weight (3.18 mg/seedling), shoot dry wt. (3.78 mg / seedling), seedling vigour index-I (3048), seedling vigour index-II (600) with good germination (84%) and field emergence (86%) compared to other varieties (Table 17, 18). Among the seed lots, fresh lot recoded highest seed quality parameters in all the varieties compared to revalidated lots. Whereas, in interaction variety IR-64 with fresh lot recorded highest vigour parameters followed by revalidated lots of IR-64 and fresh and revalidated lots of other varieties. The growth and seed yield attributing characters in variety IR-64 with fresh lot were recorded highest values *viz.*, no. of tillers (13), plant height (76.16 cm), seed yield /plant (20.39 g), seed yield / plot (3.17 kg) and 100 seed weight (13.75 g) with less crop duration (140 days) when compared to other varieties with different lots (Table 19, 20). In variety IR-64 having variation in seed germination, but there was no difference in seedling vigour among the seed lots, hence there won't be much variation in yield and yield attributing parameters and all the seed quality is within the Minimum Seed Certification Standards hence, we can use revalidated lots for seed production purpose where lots are vigorous.

Table 17: Seed quality parameters of different lots of paddy varieties

Treatments	Seed moisture (%)	Germination (%)	Root length (cm)	Shoot length (cm)	Root dry wt. (mg/seedling)	Shoot dry wt. (mg/seedling)
Varieties						
IR-64	13.16	86	20.83	14.50	3.18	3.78
Jaya	13.41	94	17.83	12.00	2.81	3.46
MTU-1001	13.21	93	18.83	10.83	3.01	3.33
Lots						
Fresh	13.70	94	18.88	12.55	2.94	3.65
R-I	12.82	88	19.44	12.33	3.06	3.40
R-II	11.73	80	20.30	12.30	3.00	3.40
Varieties x Lots						
IR-64x fresh	13.77	93	21.00	15.66	3.23	4.00
IR-64x R-I	12.55	79	20.66	13.33	3.13	3.56
IR-64 x R-II	11.73	80	20.30	12.30	3.00	3.40
Jaya x Fresh	13.62	95	17.33	11.66	2.73	3.56
Jaya x R-I	13.20	92	18.33	12.33	2.90	3.36
MTU-1001x Fresh	13.71	93	18.33	10.33	2.86	3.40
MTU-1001x R-I	12.71	92	19.33	11.33	3.16	3.26
Mean	**13.04**	**90**	**19.32**	**12.42**	**3.00**	**3.50**
SEm(±)	**0.029**	**1.020**	**1.032**	**0.467**	**0.142**	**0.081**
CD (p=0.05)	**0.086**	**3.034**	**3.070**	**1.389**	**0.422**	**0.240**
CV (%)	**0.39**	**1.95**	**9.33**	**6.51**	**8.23**	**4.00**

Table 18: Seed quality and growth parameters of paddy varieties with different lots

Treatments	Seedling vigour index I	Seedling vigour index II	Root to shoot ratio	Field emergence (%)	Days to emergence	Days to flowering
Varieties						
IR-64	3048	600	1.41	86	8	84
Jaya	2792	588	1.43	93	7	107
MTU-1001	2743	587	1.71	90	7	107
Lots						
Fresh	2941	617	1.51	92	7	98
R-I	2781	566	1.53	87	8	100
R-II	2589	512	1.60	85	8	85
Varieties x Lots						
IR-64x fresh	3396	669	1.33	91	7	83
IR-64x R-I	2700	531	1.50	80	8	85
IR-64 x R-II	2589	512	1.60	85	8	85
Jaya x Fresh	2763	600	1.43	95	7	105
Jaya x R-I	2821	576	1.43	91	7	110
MTU-1001x Fresh	2665	582	1.76	90	7	106
MTU-1001x R-I	2822	592	1.66	91	8	106
Mean	**2822**	**580**	**1.53**	**89**	**7.42**	**97.14**
SEm(±)	**107.64**	**16.2**	**0.104**	**0.62**	**0.21**	**0.62**
CD (p=0.05)	**320.2**	**48.31**	**0.309**	**1.06**	**0.361**	**1.06**
CV (%)	**6.52**	**4.75**	**11.85**	**1.20**	**4.98**	**1.10**

R-I: First time revalidated, R-II: Second time revalidated

Table 19: Growth and yield parameters of paddy varieties with different lots

Treatments	Chlorophyll content	No. of tillers	No. of productive tillers	Days to maturity	Plant height (cm)	Seed yield /plant (g)
Varieties						
IR-64	23.16	13.00	11.00	140	76.16	20.39
Jaya	26.23	12.00	11.00	154	71.00	20.76
MTU-1001	23.03	12.00	12.00	148	69.50	20.81
Lots						
Fresh	24.47	14.00	12.00	147	73.55	23.64
R-I	23.81	11.00	10.00	147	70.88	17.66
R-II	23.10	13.00	11.00	140	75.00	19.57
Varieties x Lots						
IR-64x fresh	23.20	14.00	13.00	140	78.00	22.42
IR-64x R-I	23.13	12.00	11.00	140	74.33	18.36
IR-64 x R-II	23.10	13.00	11.00	140	75.00	19.57
Jaya x Fresh	26.36	13.00	12.00	154	70.66	23.62
Jaya x R-I	26.10	11.00	9.00	154	71.33	17.89
MTU-1001 x Fresh	23.86	13.00	12.00	148	72.00	24.89
MTU-1001x R-I	22.20	11.00	10.00	148	67.00	16.73
Mean	**23.99**	**12.42**	**11.14**	**146**	**72.61**	**20.49**
SEm(±)	**0.29**	**0.87**	**0.81**	**0.00**	**2.58**	**2.36**
CD (p=0.05)	**0.86**	**2.58**	**2.40**	**0.00**	**7.67**	**7.02**
CV (%)	**2.14**	**12.30**	**12.57**	**0.00**	**6.21**	**19.85**

Table 20: Yield parameters of paddy varieties with different lots

Treatments	Seed yield /plot (kg)	100 seed weight (g)
Varieties		
IR-64	3.17	13.75
Jaya	2.83	11.80
MTU-1001	2.94	11.95
Lots		
Fresh	3.19	12.63
R-I	2.78	12.37
R-II	3.11	12.28
Varieties X Lots		
IR-64x fresh	3.14	13.86
IR-64x R-I	3.19	13.64
IR-64 x R-II	3.11	12.28
Jaya x Fresh	3.18	11.42
Jaya x R-I	2.48	12.17
MTU-1001x Fresh	3.26	12.61
MTU-1001x R-I	3.66	11.29
Mean	**3.00**	**12.46**
SEm(±)	**0.188**	**0.757**
CD (p=0.05)	**0.558**	**2.252**
CV (%)	**10.91**	**10.49**

R-I: First time revalidated, R-II: Second time revalidated

Centre: AAU, Jorhat

Experimental details: Three seed lots (May, August and November) of two varieties; Ranjit and Kola joha thus making six lots were taken for study, while certified seed and revalidated seed lot of MTU -1001 were procured from Seed Agencies. Seeds were received very late, when the sowing season was over. The crop got infested with brown spot (Plate 8)**.**Initial seed quality parameters were recorded.


Plate 8: Field view of MTU-1001 variety infested with brown spot

Results: The results of seed quality parameters assessed for Ranjit and Kola joha (Table 21).Data on seed and field quality parameters on seeds of different storage duration of variety MTU-1001have been presented in the table 22. Since the observations preliminary were recorded and thus it was not possible to draw any significant conclusions.

Table 21: Seed quality parameters at different storage duration in Ranjit and Kola joha

Lots	Moisture Content (%)	First count (%)	Germination (%)	Seedlings dry mass (g)	Field emergence/m^2
Ranjit (May)	11.28	82.25	87.60	6.07	80.37
Ranjit (Aug.)	12.61	79.85	86.00	5.46	76.61
Ranjit (Nov.)	12.20	75.60	84.67	5.02	73.36
Kolajoha (May)	12.65	79.05	83.27	4.54	78.22
Kolajoha (Aug.)	12.26	75.82	82.07	3.73	74.19
Kolajoha (Nov.)	11.52	73.41	80.20	3.24	72.43
SEm(±)	0.26	0.89	1.70	0.33	1.08
CV (%)	4.82	2.55	4.55	15.78	3.18
CD(p=0.05)	0.78	2.61	5.01	0.97	3.19

Table 22: Seed quality parameters at different storage duration in variety MTU-1001

Lots	Moisture Content (%)	First count (%)	Ger. (%)	Seedlings dry mass (g)	Field Eme. /m^2	Days to flowering (days)	Numbers of productive tillers	Days to maturity (Days)
Fresh seed lot	10.25	76.25	85.00	4.12	68.29	120	10.0	165
Re- validated lot	10.03	72.85	82.25	4.06	52.60	130	3.25	175

*Statistical analysis was not done as error df is less than 10

Centre: OUAT, Bhubaneswar

Experiment details: The experiment was conducted during *Kharif* 2017 in the Central Farm of OUAT, Bhubaneswar. The vigour status and field performance of two seed lots (S_1 – *Kharif* 2016 (harvested in November 2016) and S_2 – *Rabi* 2016-17 (harvested in May 2017)) each of four rice varieties; V_1 – Lalat, V_2 – Swarna, V_3 – Hiranmayee and V_4 – Mahalaxmi were studied to consider for revalidation of leftover seed lots for sowing purposes (Plate 9).

Plate 9: View of the field experiment at OUAT, Bhubaneswar

Results: The results of the experiment have been presented in table 23. No significant difference was recorded for initial mean seed moisture content between the two seed lots. However, since the seed lots were collected from different sources, there was significant difference in the initial seed moisture contents among varieties. Varietal differences in seed germination and vigour parameters, viz. first count (%), radicle emergence (%), seedling dry mass (g), field emergence (%) and days to emergence were statistically non-significant. Significant differences, however, were recorded for these parameters between the two seed lots, with the *Rabi* 2016-17 seed lot proving to be superior to the *kharif* 2016 seed lot.

Varietal differences for days to 50% flowering, days to maturity, number of productive tillers, seed yield and 1000-seed yield were found to be statistically significant. Highest seed yield of 52.650 q/ha was recorded in variety Swarna, followed by Mahalaxmi (51.840 q/ha), Hiranmayee (47.270 q/ha) and Lalat (44.812 q/ha). The *Rabi* 2016-17 seed lot proved to be superior than *Kharif* 2016 seed lot with regards to field performance and seed yield. The *Rabi* 2016-17 took less number of days to reach 50% flowering and maturity in all the four varieties, compared to the *Kharif* 2016 seed lot. Number of productive tillers was significantly higher in the *Rabi* 2016-17 seed lot (7.68) as compared to the *kharif* 2016 seed lot (6.89). Mean seed yield in *Rabi* 2016-17 and *kharif* 2016 seed lots were 51.020 q/ha and 47.266 q/ha, respectively, and the difference was statistically significant. The mean 1000-seed weights of both the seed lots were found to be statistically at par.

From the experiment, it can be concluded that the freshly harvested seeds (*Rabi* 2016-17) of the four varieties recorded higher germination and vigour as compared to the 7-month old seeds (*Kharif* 2016). Though the germination percentage of *Kharif* 2016 seed lots was above IMSCS at the start of the experiment in all four varieties, the vigour status of the seeds was considerably lower, which was manifested in relatively reduced field performance leading to lower yields as compared to the *Rabi* 2016-17 seed lots. Therefore, in addition to germination percentage, seed vigour status of seed lots may be included as a criterion for revalidation of leftover seed lots.

Table 23: Differences in germination, vigour and field performance of rice seeds as influenced by variety and seed lot

Treatment	Initial seed moisture content (%)	First count (%)	Germi. (%)	Radicle emergence (%)	Seedling dry mass (g)	Field emergence (%)	Days to emergence	Days to 50% flowering	Days to maturity	No. of productive tillers	Seed yield (q/ha)	1000-seed weight (g)
Variety												
V_1–Lalat	11.0	35.83 (36.67)	84	79.5	0.241	75.7 (60.69)	5.0	96.3	125.8	7.40	44.812	22.11
V_2–Swarna	10.7	37.00 (37.37)	86	81.3	0.249	77.3 (61.86)	4.9	114.8	144.8	7.63	52.650	21.48
V_3–Hiranmayee	10.9	36.50 (37.12)	86	81.5	0.247	77.5 (62.18)	5.0	105.0	134.8	6.97	47.270	22.80
V_4–Mahalaxmi	10.4	36.33 (36.96)	86	81.0	0.245	77.0 (61.72)	5.0	124.5	154.2	7.13	51.840	22.91
SEm(±)	**0.03**	**0.200**	**0.2**	**0.22**	**0.0011**	**0.165**	**0.02**	**0.17**	**0.16**	**0.038**	**0.216**	**0.011**
CD(p=0.05)	**0.10**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**0.50**	**0.49**	**0.116**	**0.654**	**0.032**
Seed lot												
S_1–*Kharif* 2016	10.7	39.67 (32.99)	82	77.0	0.217	69.0 (56.17)	5.2	111.8	141.3	6.89	47.266	22.32
S_2–*Rabi* 2016-17	10.8	43.17 (41.07)	90	84.7	0.274	84.8 (67.05)	4.8	108.5	138.6	7.68	51.020	22.32
SEm(±)	**0.02**	**0.100**	**0.1**	**0.11**	**0.0005**	**0.082**	**0.01**	**0.08**	**0.08**	**0.019**	**0.108**	**0.005**
CD(p=0.05)	**NS**	**0.303**	**0.4**	**0.34**	**0.0017**	**0.250**	**0.02**	**0.25**	**0.25**	**0.058**	**0.327**	**NS**
V x S interaction												
V_1S_1	10.5	28.67 (32.37)	81	76.7	0.210	68.7 (55.96)	5.2	97.7	127.0	6.87	41.857	22.13
V_1S_2	11.5	43.00 (40.97)	87	82.3	0.272	82.7 (65.41)	4.9	95.0	124.7	7.93	47.767	22.08
V_2S_1	11.2	29.67 (32.99)	83	78.3	0.217	70.3 (57.00)	5.1	116.7	146.3	7.17	51.010	21.47
V_2S_2	10.1	44.33 (41.74)	89	84.3	0.281	84.3 (66.71)	4.7	113.0	143.3	8.10	54.290	21.49
V_3S_1	10.4	31.67 (34.24)	81	76.3	0.232	68.3 (55.76)	5.3	106.3	136.0	6.73	46.147	22.79
V_3S_2	11.4	41.33	92	86.7	0.262	86.7	4.7	103.7	133.7	7.20	48.393	22.80

		(40.01)				(68.60)						
V_4S_1	10.7	28.67 (32.36)	82	76.7	0.210	68.7 (55.96)	5.3	126.7	155.7	6.80	50.050	22.90
V_4S_2	10.1	44.00 (41.55)	90	85.3	0.279	85.3 (67.48)	4.8	122.3	152.7	7.47	53.630	22.91
SEm(±)	**0.06**	**0.400**	**0.5**	**0.44**	**0.0022**	**0.330**	**0.03**	**0.33**	**0.33**	**0.076**	**0.431**	**0.021**
CD(p=0.05)	**0.19**	**NS**	**1.5**	**1.34**	**0.0067**	**1.000**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

Figures in the parenthesis are arc sine transformed values

Centre: RARS, KAU, Patambi (STR Voluntary centre)

Experimental Details: Three seed lots of different storage period of paddy varieties Jyothi and Uma were procured from registered farmer's field. The storage period of seed lots varied from 5to 10 months. Laboratory assessment of initial vigour tests, including seed moisture content, germination, seedling dry mass and field emergence parameters revealed that seed lots with longer storage period exhibited low vigour index. Field emergence was higher in Uma variety compared with Jyothi of same storage period. The seeds were sown in nursery on 5/8/17 and transplanted to main field on 30/8/2017. Experiment was laid out in Randomized Block Design with four replications (Plate 10) and observations were noted on emergence, flowering, maturity, plant height, productive tillers and other yield parameters.

Plate 10: View of the field experiment at RARS, KAU, Patambi

Results: Seed lot with low vigour showed more days to emergence and 50% flowering in both varieties (Table 24). Seed lot with highest storage period of 10 months showed lowest grain yield (Table 25) in Jyothi and Uma (Lot 1 and Lot 3 respectively).

Table 24: Seed Quality Parameters conducted on seed lots with different storage period at RARS, KAU, Pattambi during 2017-18

Variety	Lot	Date of Harvest	Storage period of seed lot (month)	Initial			Vigour	Days to Emergence					Field Emergence (%)	Days to 50% Flowering
				Moisture (%)	Germi. (%)	Seedling dry wt. (g)		3 DAS	4 DAS	5 DAS	6 DAS	7 DAS		
Jyothi	**1**	4/10/2016	10	15.3	6	0.1	0.6	3	3	3	3	3	3	90.3
	2	10/3/2017	5	12.7	98.75	0.27	26.7	70	85	85	85	84	84	90.8
	3	1/2/2017	6	13.7	93.75	0.24	22.5	73	83	83	83	81	81	91.3
UMA	**1**	27/2/17	6	13.5	96.75	0.14	13.6	79	87	88	88	88	88	100.5
	2	15/1/17	7	14.3	96	0.22	21.1	95	94	94	95	95	95	104
	3	30/10/16	10	17.6	1.5	0.02	0.03	0	1	1	1	1	1	106.8

Table 25: Yield Parameters of seed lots with different storage period at RARS, KAU, Pattambi during 2017-18

Variety	Lot	Plant Height (cm)	Total tillers /plant	Productive tillers/ plant	Panicle length (cm)	Grains/ Panicle	100 grain wt. (g)	Field establishment %	Grain yield (kg/plot)	Straw yld. (kg/plot)	Grain yield (kg/ha)	Straw yld (kg/ha)	HI
Jyothi	**1**	86.2	11.8	11.5	22.5	98.1	2.9	70.0	4.4	6.3	3687.9	5282.9	0.4
	2	103.8	17.7	15.2	24.3	88.7	2.8	70.8	5.2	9.2	4366.3	7681.7	0.4
	3	96.3	17.0	16.8	23.3	97.3	2.7	63.8	4.8	7.5	4019.4	6229.8	0.4
UMA	**1**	102.6	13.5	8.4	22.1	104.1	2.6	68.8	8.3	18.4	6912.3	10714.1	0.4
	2	107.2	12.3	9.8	22.4	123.1	2.4	66.2	7.5	17.0	6238.8	9926.9	0.4
	3	101.4	12.2	9.8	22.1	128.1	2.4	48.0	5.3	12.6	4378.1	7322.7	0.4

Crop: Maize

Centre: TNAU, Coimbatore

Experimental details: Three seed lots each of different storage period (Fresh, 6 months, 9 months and 12 months old) of two hybrids; MH 500 and MH 501were procured from a private seed company and assessed for seed quality (Plate 11, 12). The vigour tests were employed as per the ISTA guidelines including seed moisture content (%), radicle emergence (72 hours), 1st count, final count and seedling dry mass.

Plate 11: Germination Test in Maize

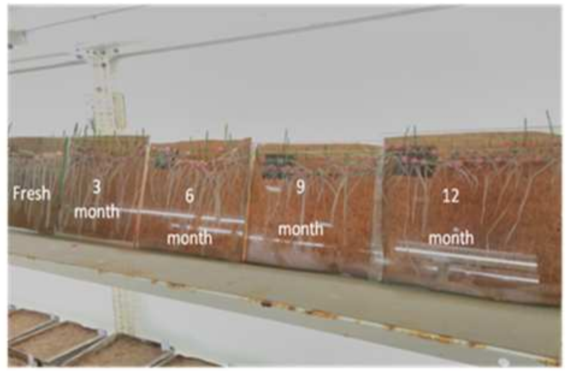


Plate 12: Inclined Plate method in maize showing the different seedling growth in differently aged seeds

Results: The results revealed that the seeds of both hybrids (MH 500 and MH 501), maintained the viability above 90 % up to 9 months (Table 26, 27). The seeds lose its viability below 90 % after 9 months of storage (91.9 and 90.3 percent respectively). It declined from the initial germination percentage of 98.9 and 97.3 respectively. The radicle emergence recorded as 98.2 and 95.6 in MH 500 and MH 501 respectively during the fresh seeds and declined into 90.1 and 87.5 respectively after 9 months of storage. It declined further to 84.5 and 81.9 percentages after twelve months of storage. It indicates the vigour status of the seed is getting deteriorated in faster rate as age progresses. The vigour index of MH 500 recorded as 3615 and speed of germination 57.3 at fresh seed lots and after nine months of storage 2684 and 47.3, respectively and 2023 and 38.5 after 12 months of storage. In MH 501, the vigour and speed of germination were 3417 and 56.1, 2507 and 46.1 and 1863 and 37.3 respectively during initial, nine months and twelve months after storage. The maize seeds deteriorates faster after six months of storage, which indicated by the vigour index and reaches very low during twelve months of storage.

Table 26: Effect of different age of seeds on Seed Physiological parameters in Maize Var.MH 500

Lots	First count (%)	Final count (%)	Shoot length (cm)	Root length (cm)	Dry matter prodn. (mg)	Vigour index	Speed of Germi.	RE Test (%)	Field Eme. (%)
Lot 1- Fresh	100	100	17.6	19.4	0.960	3682	55.3	99.5	99
Lot 2- Fresh	98	99	17.1	18.5	0.910	3507	57.3	97.2	95
Lot 3- Fresh	98	99	17.5	19.5	0.920	3656	59.2	97.9	96
Mean	99	99	17.4	19.1	0.930	3615	57.3	98.2	97
Lot 4–3m old	99	99	16.7	19.3	0.910	3546	54.9	99.0	99
Lot 5 - 3m old	99	99	17.3	19.4	0.920	3644	54.8	97.2	95

Lot 6 - 3m old	98	99	17.9	19.7	0.890	3704	56.2	96.7	94
Mean	98	99	17.3	19.5	0.907	3631	55.3	97.6	96
Lot 7- 6m old	96	94	14.2	18.6	0.850	3073	53.1	95.7	93
Lot 8 - 6m old	97	95	15.7	18.1	0.840	3225	51.5	94.3	92
Lot 9 - 6m old	96	95	15.8	19.1	0.810	3309	52.6	96.2	88
Mean	97	95	15.2	18.6	0.833	3202	52.4	95.4	91
Lot 10- 9m old	93	92	11.2	15.3	0.790	2425	46.2	90.5	85
Lot 11- 9m old	95	92	13.1	16.8	0.780	2742	47.6	90.1	81
Lot 12- 9m old	95	93	14.8	16.4	0.760	2886	48.2	89.7	80
Mean	94	92	13.0	16.2	0.777	2684	47.3	90.1	82
Lot 13 - 12m old	90	86	9.6	12.1	0.730	1858	39.2	86.3	81
Lot 14 - 12m old	89	86	12.1	13.4	0.710	2188	38.0	83.2	76
Lot 15 - 12m old	86	87	11.4	11.8	0.760	2023	38.2	84.1	79
Mean	88	86	11.0	12.4	0.733	2023	38.5	84.5	79
SEd	0.63	0.78	0.21	0.31	0.17	3.1	0.37	0.26	4.8
CD(p=0.05)	1.18	1.56	0.44	0.65	0.34	6.4	0.78	0.54	9.8

Table 27: Effect of different age of seeds on Seed Physiological parameters in Maize Var. MH 501

Lots	First count (%)	Final count (%)	Shoot length (cm)	Root length (cm)	Dry matter prodn. (mg)	Vigour index	Speed of Germi.	RE Test (%)	Field Eme. (%)
Lot 1- Fresh	97	97	16.8	17.8	0.790	3360	58.0	96.9	93
Lot 2- Fresh	96	97	16.4	18.7	0.780	3398	56.1	94.6	96
Lot 3- Fresh	96	98	16.9	18.8	0.830	3492	54.1	95.3	92
Mean	97	97	16.7	18.4	0.800	3417	56.1	95.6	93
Lot 4– 3m old	97	98	16.6	18.7	0.760	3446	53.7	96.4	95
Lot 5 - 3m old	96	97	16.0	18.6	0.790	3350	53.6	94.6	91
Lot 6 - 3m old	96	97	17.2	19.0	0.780	3505	50.3	94.1	91
Mean	96	97	16.6	18.7	0.777	3434	52.5	95.0	92
Lot 7- 6m old	95	93	15.1	17.4	0.720	3026	51.9	93.1	88
Lot 8 - 6m old	94	94	15.0	17.9	0.680	3083	55.0	91.7	90
Lot 9 - 6m old	93	92	13.5	18.4	0.710	2935	51.4	93.6	85
Mean	94	93	14.5	17.9	0.703	3015	52.8	92.8	88
Lot 10- 9m old	93	91	10.5	14.6	0.660	2279	46.4	87.9	76
Lot 11- 9m old	92	90	12.4	16.1	0.650	2565	45.0	87.5	78
Lot 12- 9m old	90	90	14.1	15.7	0.630	2676	47.0	87.1	82
Mean	92	90	12.3	15.4	0.647	2507	46.1	87.5	79
Lot 13 - 12m old	86	86	8.9	11.1	0.630	1709	36.8	83.7	73
Lot 14 - 12m old	84	84	10.7	12.7	0.580	1968	38.0	80.6	77
Lot 15 - 12m old	87	84	11.4	11.4	0.600	1913	37.0	81.5	76
Mean	86	85	10.3	11.7	0.603	1863	37.3	81.9	76
SEd	0.35	0.21	0.17	0.24	0.19	5.2	0.47	0.31	6.7
CD(p=0.05)	0.72	0.42	0.36	0.50	0.38	10.4	0.96	0.64	13.8

Centre: PAU, Ludhiana

Experimental details: To study the vigour status of seeds for consideration to revalidate the leftover seed lots for sowing purpose in hybrids and inbred crop plants a total of eight different maize seed lots;

Four lots of hybrid PMH1: Kharif 2016 –Three (L1, L2, L3), Kharif 2015- One (L4), Two lots of Parkash: Kharif 2016- One (L5) and Kharif 2015- One (L6), Two lots of LM 14: Kharif 2016 - One (L7) and Kharif 2015- One (L8)were procured. The seed quality was assessed and the crop from all the lots was sown on July 5, 2017 in plots of 3m x2m size at 60/20 cm row/plant distance for observing the field performance.

Results: The older seeds of hybrids PMH 1 and Parkash exhibited significant reduction in germination (%), speed of germination and seedling growth as compared to their fresh seeds. The older seeds of these hybrids also recorded significant reduction in field emergence. As compared to fresh seeds, seed yield of older PMH 1 seeds was significantly reduced; but seed yield of Parkash and male parent line LM14 of older seed lots was statistically at par with fresh seeds (Table 28, 29).

Table 28: Seed quality parameters in different lots of Maize hybrids PMH 1 and Parkash

Lot no	Germi. %	Seed moisture content %	Speed of Germi.	Radicle Emergence %	Seedling length (cm)	Seedling dry Weight (g)	Vigour Index I	Vigour Index II
L1	94.5	9.5	6.14	87	31.1	0.785	2938.95	74.1825
L2	92	10.5	6.08	85	32.8	0.731	3017.6	67.252
L3	90	9.5	6.11	82	32.4	0.698	2916	62.82
L4	71	9.5	5.5	60	28.5	0.528	2023.5	37.488
L5	93.5	9.8	6.23	83	31.7	0.534	2963.95	49.929
L6	87	9.4	5.17	71	28.6	0.488	2488.2	42.456
L7	87.5	9.5	6.9	75	29.4	0.566	2572.5	49.525
L8	85	9.7	5.8	70	28	0.488	2380	41.48
CD (p=0.05)	6.24	0.30	0.43	7.75	1.60	0.10	297.19	11.19

Table 29: Seed vigour observations in the field of Maize hybrids PMH 1 and Parkash

Lot no	Field emergence %	Days to 50% emergence	Days to maturity	Seed yield (kg/ha)	1000 Seed weight
L1	88	27	94	50	313.16
L2	85	26	95	48.8	307.38
L3	83	27	95	46.2	316.47
L4	60.5	30	95	30.4	300.17
L5	88	23	84	35.8	158.12
L6	76	28	84	31.4	150.88
L7	78	25	108	18.8	240.45
L8	70	29	108	16.5	238.04
CD (p=0.05)	8.03	1.87	7.61	10.86	57.10

L1, L2, L3:PMH1-Kharif 2016 lots, L4: PMH1- Kharif 2015 lot, L5: Parkash-Kharif 2016 lot, L6: Parkash-Kharif 2015 lot, L7: LM14- Kharif 2016 lot, L8 LM14 - Kharif 2015 lot

Crop: Sorghum

Centre: MPKV, Rahuri

Experimental details: The material comprised of three lots;S1: Fresh, S2: RVD Istand S3: RVD IInd ofBreeder and Truthful seed of two sorghum varieties;Phule Rohini (V1) andPhule Vasudha (V2) (Table 30).

Table 30: Information of Seed lot, type, stage and germination of seed

Variety	Seed lot	Type of seed	Stage of seed	Date of harvest	Date of test	Germi. (%)
V1: Phule Rohini	April 17-13- MPKVR-09	Fresh	Breeder	April 2017	08.08.2017	97
	Feb. 16-13- MPKVR-09	RVD I	Truthful	Feb. 2016	22.08.2017	86
	Feb. 15-13- MPKVR-09	RVDII	Truthful	Feb.2015	22.08.2017	76
	April 17-13- MPKVR-10	Fresh	Breeder	April 2017	08.08.2017	96
	Feb. 16-13- MPKVR-11	RVD I	Truthful	Feb. 2016	22.08.2017	88
	Feb. 15-13- MPKVR-11	RVDII	Truthful	Feb.2015	22.08.2017	72
V2: Phule Vasudha	March 17-13- MPKVR-12	Fresh	Breeder	Mar. 2017	08.08.2017	97
	Feb. 16-13- MPKVR-04	RVD I	Truthful	Feb. 2016	23.08.2017	88
	Feb. 15-13- MPKVR-05	RVDII	Truthful	Feb.2015	23.08.2017	70
	March 17-13- MPKVR-15	Fresh	Breeder	Mar. 2017	08.08.2017	95
	Feb. 16-13- MPKVR-08	RVD I	Truthful	Feb. 2016	23.08.2017	89
	Feb. 15-13- MPKVR-08	RVDII	Truthful	Feb.2015	23.08.2017	82

Results: The data on effect of variety, seed lot and seed type on seed quality of sorghum are presented in table 31.

Effect of variety: The seed quality parameters were influenced due to varieties irrespective of seed lot and seed type. The germination (80.44 %) of variety Phule Vasudha was the highest. The other quality parameters *viz.;* root shoot length (32.77 cm), dry matter content (0.273 g), vigour index I (2645) vigour index II (22.45) had significantly higher values over the variety Phule Rohini

Effect of seed lot: Effect of quality parameters due to seed lot were not influenced significantly except moisture content.

Effect of Seed type: The germination & other quality parameters were influenced significantly due to seed type i.e. fresh and revalidated seed irrespective of variety and lot. The fresh seed recorded the highest germination (91.25 %) followed by revalidated I seed (84.83). However revalidated II seed recorded the lowest germination (63.08). Similar trend was observed in other quality parameters of seed.

Interaction effect of variety, lot and seed type on seed quality parameters in sorghum: The data on interaction effect of variety, seed lot and seed type presented in table 32a. This was not influenced significantly.

Table 31: Effect of variety, lot and seed types on seed quality parameters in Sorghum

Treatments	Moisture content (%)	Germi. (%)	Seedling length (cm)	Dry matter content (g)	Vigor index I	Vigor index II	Field emergence (%)
Variety							
V1: P. Rohini	8.58 (17.02)	79.00 (63.67)	30.04	0.133	2425	10.80	76.17 (61.554)
V2: P. Vasudha	8.41 (16.84)	80.44 (64.67)	32.77	0.273	2645	22.45	77.17 (62.08)
SEm(±)	**0.05**	**0.35**	**0.40**	**0.004**	**36.59**	**0.39**	**0.70**

CD (p=0.05)	**0.14**	**NS**	**1.18**	**0.013**	**106.83**	**1.14**	**NS**
Seed lot							
L1: Lot 1	8.37 (16.81)	79.56 (63.88)	31.15	0.205	2505	16.62	77.50 (62.22)
L2: Lot 2	8.62 (17.06)	79.89 (64.46)	31.66	0.202	2566	22.84	75.83 (61.42)
SEm(±)	0.05	**0.35**	**0.40**	**0.004**	**36.59**	0.39	0.70
CD (p=0.05)	**0.14**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Seed type							
S1: Fresh	8.95 (17.40)	91.25 (72.86)	33.76	0.250	3082	16.35	88.50 (70.31)
S2: RVD Ist	8.60 (17.04)	84.83 (67.08)	32.45	0.193	2755	10.68	80.00 (63.45)
S3: RVD IInd	7.94 (16.36)	63.08 (52.58)	28.00	0.168	1770	13.82	61.50 (51.70)
SEm(±)	**0.06**	**0.43**	**0.49**	**0.005**	**44.81**	**0.48**	**0.86**
CD (p=0.05)	**0.17**	**1.26**	**2.04**	**0.022**	**130.84**	**1.39**	**2.51**

Figures in parenthesis are arc sin transformed values

Table 31a: Interaction effect of variety, lot and seed types on seed quality parameters in Sorghum

Treatments	Moisture content (%)	Germi. (%)	Seedling length (cm)	Dry matter content (g)	Vigor Index I	Vigor Index II	Field emergence (%)
V1L1S1	9.10 (17.55)	90.00 (71.55)	33.00	0.15	2971	13.51	87.00 (68.87)
V1L1S2	8.26 (17.37)	84.00 (73.56)	32.00	0.14	2690	11.71	82.00 (71.67)
V1L1S3	8.10 (17.08)	63.00 (71.59)	23.73	0.11	1493	6.93	63.00 (69.08)
V1L2S1	8.92 (17.60)	92.00 (74.73)	34.50	0.16	3175	14.71	90.00 (71.50)
V1L2S2	8.70 (16.70)	85.00 (66.42)	32.00	0.14	2723	11.91	80.00 (64.89)
V1L2S3	8.40 (17.15)	60.00 (67.22)	25.00	0.10	1501	6.03	55.00 (63.42)
V2L1S1	8.63 (16.94)	90.00 (67.47)	33.45	0.34	3012	30.61	87.00 (63.43)
V2L1S2	8.50 (17.36)	85.33 (67.22)	32.60	0.25	2782	21.35	80.00 (62.04)
V2L1S3	7.65 (16.53)	65.00 (52.52)	32.10	0.24	2083	15.61	66.00 (52.58)
V2L2S1	9.15 (16.84)	93.00 (50.75)	34.10	0.35	3169	32.54	90.00 (47.85)
V2L2S2	8.92 (16.05)	85.00 (53.72)	33.20	0.24	2825	20.43	77.00 (54.47)
V2L2S3	7.62 (16.02)	64.33 (53.31)	31.15	0.22	2003	14.16	62.00 (51.92)
SEm(±)	**0.11**	**0.86**	**0.99**	**0.011**	**89.63**	**0.954**	**1.71**
CD (p=0.05)	**0.33**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

Figures in parenthesis are arc sin transformed values

Centre: UAS, Dharwad

Experimental details: Revalidation of Sorghum seed lots were conducted using three aged seed lots (9-10 months old) of cultivar M-35-1 and SPV-2217 and three freshly harvested seed lots of similar cultivars M-35-1 and SPV-2217.

Results: Overall performance of fresh seed lots were significantly higher compare to the aged seeds lots. Fresh seed lots recorded significantly higher mean seed germination in first count test (45.65 %) and also in final germination count (90.86), less time period was required for radical emergence (3.47 days), increased seedling length (21.18 cm), seedling vigour index (1986), seedling dry weight (2.67 mg) and optimum seed moisture (12.86 %), average days to 50 per cent field emergence (8.0 days), seed yield per plot (3.16 kg per plot) and test weight (2.80 g) were significant in fresh seeds compare to old seed lots, on contrary aged seed lots recorded significantly less in yield and quality parameters (Table 32-35)

Table 32: Effect of type of seeds and seed lots on seed moisture (%), first count (%) and Final count (%) on fresh and aged seeds of sorghum cultivars

Variety, Seed lots	Seed moisture (%)			First count (%)			Germination (%)		
	Type of seeds		Mean	Type of seeds		Mean	Type of seeds		Mean
	Fresh seeds	Aged seeds		Fresh seeds	Aged seeds		Fresh seeds	Aged seeds	
M-35-1,Lot 1	13.38	13.85	**13.62**	43.76	30.20	**36.98**	87.12	60.11	**73.61**
M-35-1, Lot 2	13.15	15.65	**14.40**	47.14	27.06	**37.10**	93.84	53.86	**73.85**
M-35-1, Lot 3	12.98	14.95	**13.97**	46.55	29.89	**38.22**	92.67	59.49	**76.08**
SPV-2217,Lot 1	12.06	14.74	**13.40**	45.50	28.94	**37.22**	90.57	57.62	**74.09**
SPV-2217,Lot 2	12.89	13.81	**13.35**	45.38	28.00	**36.69**	90.33	55.73	**73.03**
SPV-2217,Lot 3	12.70	14.30	**13.50**	45.55	25.89	**35.72**	90.67	51.53	**71.10**
Mean	**12.86**	**14.55**		**45.65**	**28.33**		**90.86**	**56.39**	
	Type	Lots	Interaction	Type	Lots	Interaction	Type	Lots	Interaction
SEm(±)	0.30	0.52	0.74	0.83	1.43	2.02	1.64	2.84	4.02
CD (p=0.05)	0.89	1.54	NS	2.42	4.19	NS	4.82	NS	NS

NS: Nonsignificant

Table 33: Effect of type of seeds and seed lots on Days to radical emergence, Seedling length (cm)and Vigour Index-I on fresh and aged seeds of sorghum cultivars

Variety, Seed lots	Days to radical emergence			Seedling length (cm)			Vigour Index-I		
	Type of seeds		Mean	Type of seeds		Mean	Type of seeds		Mean
	Fresh seeds	Aged seeds		Fresh seeds	Aged seeds		Fresh seeds	Aged seeds	
M-35-1,Lot 1	3.86	3.42	**3.64**	20.91	19.24	**20.07**	1829	1161	**1495**
M-35-1, Lot 2	3.82	4.57	**4.20**	22.52	17.24	**19.88**	2116	956	**1536**
M-35-1, Lot 3	3.33	3.87	**3.60**	22.24	19.04	**20.64**	2061	1136	**1598**
SPV-2217,Lot 1	3.02	3.63	**3.32**	21.74	18.44	**20.09**	1972	1079	**1526**
SPV-2217,Lot 2	3.47	3.57	**3.52**	21.68	17.83	**19.76**	1963	1015	**1489**
SPV-2217,Lot 3	3.33	3.55	**3.44**	21.76	16.49	**19.13**	1974	869	**1421**
Mean	**3.47**	**3.77**		**21.81**	**18.05**		**1986**	**1036**	
	Type	Lots	Interaction	Type	Lots	Interaction	Type	Lots	Interaction
SEm(±)	0.07	0.13	0.18	0.50	0.87	1.22	62	107	152
CD (p=0.05)	0.22	0.37	NS	1.47	2.54	NS	182	314	NS

Table 34: Effect of type of seeds and seed lots on Seedling dry weight (mg), Field emergence (%) per m²and Days to 50 % field emergence on fresh and aged seeds of sorghum cultivars

Variety, Seed lots	Seedling dry weight (mg)			Field emergence (%) per m²			Days to 50 % field emergence		
	Type of seeds		Mean	Type of seeds		Mean	Type of seeds		Mean
	Fresh seeds	Aged seeds		Fresh seeds	Aged seeds		Fresh seeds	Aged seeds	
M-35-1,Lot 1	2.56	2.07	**2.31**	63.00	37.72	**50.36**	8	8	**8**
M-35-1, Lot 2	2.76	1.85	**2.31**	75.07	43.09	**59.08**	8	10	**9**
M-35-1, Lot 3	2.72	2.05	**2.39**	74.13	47.59	**60.86**	7	9	**8**
SPV-2217,Lot 1	2.66	2.20	**2.43**	72.45	46.09	**59.27**	7	10	**8**
SPV-2217,Lot 2	2.65	2.08	**2.37**	72.27	44.59	**58.43**	8	9	**8**
SPV-2217,Lot 3	2.66	2.24	**2.45**	72.53	41.23	**56.88**	7	10	**9**
Mean	**2.67**	**2.08**		**71.58**	**43.39**		**8**	**9**	
	Type	Lots	Interaction	Type	Lots	Interaction	Type	Lots	Interaction
SEm(±)	4.37	7.58	10.72	1.27	2.20	3.11	0.16	0.27	0.38
CD (p=0.05)	NS	NS	NS	3.72	6.44	NS	0.46	0.79	NS

NS: Nonsignificant

Table 35: Effect of type of seeds and seed lots on Days to flowering initiation, Days to maturity and Seed yield (Kg) per plot on fresh and aged seeds of sorghum cultivars

Variety, Seed lots	Days to flowering initiation			Days to maturity			Seed yield (Kg) per plot		
	Type of seeds		Mean	Type of seeds		Mean	Type of seeds		Mean
	Fresh seeds	Aged seeds		Fresh seeds	Aged seeds		Fresh seeds	Aged seeds	
M-35-1,Lot 1	49.3	42.7	**46.0**	118	120	**119**	3.33	2.59	**2.96**
M-35-1, Lot 2	46.3	53.0	**49.6**	124	120	**122**	3.15	2.81	**2.98**
M-35-1, Lot 3	49.6	49.2	**49.4**	125	118	**122**	3.11	2.68	**2.90**
SPV-2217,Lot 1	45.3	51.8	**48.6**	132	125	**128**	3.26	2.93	**3.10**
SPV-2217,Lot 2	46.5	45.9	**46.2**	121	119	**120**	3.15	2.96	**3.06**
SPV-2217,Lot 3	47.0	49.6	**48.3**	121	124	**123**	3.00	2.90	**2.95**
Mean	**47.3**	**48.7**		**124**	**121**		**3.16**	**2.81**	
	Type	Lots	Interaction	Type	Lots	Interaction	Type	Lots	Interaction
SEm(±)	1.43	2.48	3.51	1.56	2.70	3.82	0.04	0.06	0.09
CD (p=0.05)	NS	NS	NS	4.58	7.93	11.21	0.11	0.18	NS

Crop: Cotton

Centre: PJTSAU, Hyderabad

Experimental details: Seeds of one hybrid (V1- ACH-155-2 BG –II) and two varieties (V2- WGCV-45 and V3- ADB-39) were collected from the lots of 12 months (L1) and 3 months (L2) old seed. Thus it formed six treatments; V1L1-ACH-155-2 BG –II (12 months old seed) (10.03.2016), V1L2- ACH-155-2 BG -II (3 months old seed) (01.03.2017), V2L1-WGCV-45 (12 months old seed) (20.05.2016), V2L2- WGCV-45(3 months old seed) (08.06.2017), V3L1-ADB-39 (12 months old seed) (20.05.2016) and V2L2- ADB-39 (3 months old seed) (08.06.2016). Sowing of the experiment was done on 29.06.2017 in 7 rows of 4.2m long plots at spacing of 90 x 60cm.

Results: All the seedling vigour and yield attributing traits, except germination and SVI& II showed no significant differences among the 12 months and 3 months aged seeds in hybrids and varieties (36 & 36a).

Table 36: Seedling vigour and yield contributing characters in different storage periods of cotton varieties & Hybrids

Treatments	Moisture percentage (%)	Initial count (%)	Final count (%)	Root length (cm)	Shoot length (cm)	Total length (cm)	dry weight (g)	SVI I	SVI II	4th day (%)	5th day (%)
V1	7.5	87.3	82.5	5.6	10.9	16.5	1.6	1416.8	136.8	6.0	29.3
V2	7.7	78.0	81.5	5.1	10.0	15.1	1.7	1139.4	122.5	21.5	33.5
V3	7.5	85.3	85.5	3.8	9.9	13.8	1.5	1084.8	119.8	30.8	48.5
Mean	**7.6**	**83.6**	**83.2**	**4.8**	**10.3**	**15.1**	**1.6**	**1213.6**	**126.3**	**19.4**	**37.1**
SEm(±)	0.1	2.3	NS	0.4	0.6	0.9	0.1	94.4	8.0	2.8	4.6
CD (p=0.05)	NS	7.2	1.597	1.1	NS	NS	NS	NS	NS	9.0	14.8
L1	7.6	80.4	86.3	5.0	10.0	15.0	1.6	1069.1	108.3	19.7	45.3
L2	7.5	86.7	80.0	4.7	10.6	15.3	1.6	1358.2	144.4	19.2	28.8
Mean	**7.6**	**83.6**	**83.2**	**4.8**	**10.3**	**15.1**	**1.6**	**1213.6**	**126.3**	**19.4**	**37.1**
SEm(±)	0.1	1.8	4.846	0.3	0.5	0.7	0.1	77.1	6.5	2.3	3.8
CD (p=0.05)	NS	5.9	1.304	NS	NS	NS	NS	246.0	20.8	NS	12.1
V1L1	7.5	92.7	82.0	6.8	11.1	17.9	1.6	1468.5	127.1	7.3	38.0
V1L2	7.5	82.0	90.7	4.4	10.7	15.1	1.6	1365.0	146.4	4.7	20.5
V2L1	7.8	72.0	72.7	4.7	9.8	14.5	1.6	907.4	97.2	26.7	40.0
V2L2	7.5	84.0	87.3	5.6	10.2	15.7	1.7	1371.4	147.7	16.3	27.0
V3L1	7.5	76.7	66.7	3.5	9.0	12.6	1.5	831.4	100.6	25.0	58.0
V3L2	7.5	94.0	89.3	4.1	10.8	14.9	1.5	1338.2	139.0	36.7	39.0
Mean	**7.6**	**83.6**	**81.4**	**4.8**	**10.3**	**15.1**	**1.6**	**1213.6**	**126.3**	**19.4**	**37.1**
SEm(±)	0.1	3.2	2.258	0.5	0.9	1.2	0.1	133.5	11.3	4.0	6.6
CD (p=0.05)	NS	10.2	8.393	1.6	NS	NS	NS	NS	NS	NS	NS

Table 36a: Seedling vigour and yield contributing characters in different storage periods of cotton varieties & Hybrids

Treatments	6th day (%)	7th day (%)	8th day (%)	10thday (%)	Days 50% flowering	Plant height (cm)	No. of Monopodia	No. of Sympodia	No.of bolls /plant	Bolls weight (g)	Yield (kg/plot)	Yield (kg/ha)
V1	59.5	71.5	79.5	81.5	61.2	118.7	0.9	17.8	20.9	5.1	4.4	1,652.8
V2	34.5	55.5	65.8	73.3	62.0	98.3	1.1	20.9	21.6	5.7	4.7	1,763.6
V3	53.5	63.5	69.5	69.5	61.2	108.6	1.2	23.1	29.9	4.9	4.6	1,756.1
Mean	**49.2**	**63.5**	**71.6**	**74.8**	**61.4**	**108.5**	**1.0**	**20.6**	**24.2**	5.2	4.6	1724.2
SEm(±)	2.1	2.5	2.2	1.9	0.5	2.7	0.1	0.9	2.0	0.415	0.154	1,652.8
CD (p=0.05)	6.6	8.1	7.1	6.2	NS	8.5	NS	2.9	6.3	NS	NS	NS
L1	56.7	65.7	70.8	70.5	61.4	108.3	1.2	21.5	24.9	5.2	4.509	1,704.1
L2	41.7	61.3	72.3	79.0	61.4	108.8	0.9	19.7	23.4	5.2	4.616	1,744.3
Mean	**49.2**	**63.5**	**71.6**	**74.8**	**61.4**	**108.5**	**1.0**	**20.6**	**24.2**	5.2	4.6	1724.2
SEm(±)	1.7	2.1	1.8	1.6	0.4	2.2	0.1	0.7	1.6	0.339	0.126	47.507
CD (p=0.05)	5.4	NS	NS	5.1	NS	NS	NS	NS	NS	NS	NS	NS
V1L1	66.0	76.0	82.0	84.0	60.3	122.4	0.9	18.5	19.9	5.0	4.3	1612.5
V1L2	53.0	67.0	77.0	79.0	62.0	115.0	0.8	17.0	21.9	5.2	4.5	1693.1
V2L1	43.0	59.0	62.5	64.5	62.0	91.4	1.0	19.3	21.9	5.7	4.7	1785.1
V2L2	26.0	52.0	69.0	82.0	62.0	105.2	1.1	22.5	21.3	5.7	4.6	1742.3
V3L1	61.0	62.0	68.0	63.0	62.0	111.1	1.5	26.7	32.8	4.9	4.5	1714.5
V3L2	46.0	65.0	71.0	76.0	60.3	106.1	0.8	19.5	27.1	4.8	4.8	1797.7
Mean	**49.2**	**63.5**	**71.6**	**74.8**	**61.4**	**108.5**	**1.0**	**20.6**	**24.2**	**5.2**	**4.6**	**1724.2**
SEm(±)	2.9	3.6	3.1	2.7	0.8	3.8	0.2	1.3	2.8	0.587	0.218	82.285
CD (p=0.05)	NS	NS	NS	8.8	NS	12.1	NS	4.1	NS	NS	NS	NS

Centre: UAS, Dharwad

Experimental details:

Revalidation of cotton seed lots were conducted using three aged seed lots (10-11 months old) of two cultivars; DLSA-17-160 and RAHS-14-175against three freshly harvested seed lots of similar cultivars DLSA-17-160 and RAHS-14-175.

Results: Overall performance of fresh seed lots were significantly higher compare to the aged seeds lots. Fresh seed lots recorded significantly higher mean seed germination in first count test (54.06 %) and also in final germination count (80.04), less time period was required for radical emergence (4.99 days), increased seedling length (13.61 cm), seedling vigour index (1091), seedling dry weight (1.37 mg) and optimum seed moisture (8.41 %), average days to 50 per cent field emergence (8.0 days), seed yield per plot (0.97 kg per plot) and test weight (5.23 g) on contrary aged seed lots were recorded significantly less in yield and quality parameters (Table 37 to 40).

Table 37: Effect of type of seeds and seed lots on Seed germination (%), Seedling length (cm) and Vigour index I

Variety, Seed lots	Seed germination (%)			Seedling length (cm)			Vigour index I		
	Type of seeds		Mean	Type of seeds		Mean	Type of seeds		Mean
	Fresh seeds	Aged seeds		Fresh seeds	Aged seeds		Fresh seeds	Aged seeds	
DLSA-17-160, Lot L_1	76.74	33.42	**55.08**	13.05	10.53	**11.79**	1005	356	**680**
DLSA-17-160, Lot L_2	82.66	30.38	**56.52**	14.05	9.57	**11.81**	1163	293	**728**
DLSA-17-160, Lot L_3	81.63	31.28	**56.45**	13.88	9.85	**11.86**	1133	337	**735**
RAHS-14-175,Lot L_1	79.78	38.89	**59.33**	13.56	12.25	**12.91**	1084	484	**784**
RAHS-14-175,Lot L_2	79.57	37.62	**58.60**	13.53	11.85	**12.69**	1079	455	**767**
RAHS-14-175,Lot L_3	79.87	38.70	**59.28**	13.58	12.19	**12.88**	1085	480	**782**
Mean	**80.04**	**35.05**		**13.61**	**11.04**		**1091**	**401**	
	Type	Lots	Interaction	Type	Lots	Interaction	Type	Lots	Interaction
SEm(±)	1.38	2.40	3.39	0.40	0.69	0.97	31	54	76
CD (p=0.05)	4.06	NS	NS	1.16	2.01	NS	91	NS	NS

NS: Non significant

Table 38: Effect of type of seeds and seed lots on Seedling dry weight (mg), Seed moisture (%) and First count (%)

Variety, Seed lots	Seedling dry weight (mg)			Seed moisture (%)			First count (%)		
	Type of seeds		Mean	Type of seeds		Mean	Type of seeds		Mean
	Fresh seeds	Aged seeds		Fresh seeds	Aged seeds		Fresh seeds	Aged seeds	
DLSA-17-160, Lot L_1	1.43	1.11	**1.27**	8.74	9.05	**8.90**	51.83	35.76	**43.79**
DLSA-17-160, Lot L_2	1.40	1.26	**1.33**	8.59	10.23	**9.41**	55.82	32.04	**43.93**
DLSA-17-160, Lot L_3	1.38	1.20	**1.29**	8.49	9.77	**9.13**	55.13	35.39	**45.26**
RAHS-14-175,Lot L_1	1.29	1.18	**1.23**	7.88	9.63	**8.76**	53.88	34.28	**44.08**
RAHS-14-175,Lot L_2	1.37	1.11	**1.24**	8.43	9.02	**8.73**	53.74	33.16	**43.45**
RAHS-14-175,Lot L_3	1.35	1.15	**1.25**	8.30	9.35	**8.82**	53.94	30.66	**42.30**
Mean	**1.37**	**1.17**		**8.41**	**9.51**		**54.06**	**33.55**	
	Type	Lots	Interaction	Type	Lots	Interaction	Type	Lots	Interaction
SEm(±)	0.03	0.05	0.07	0.19	0.34	0.49	0.98	1.69	2.40
CD (p=0.05)	0.09	NS	NS	0.58	NS	NS	2.87	NS	NS

Table 39: Effect of type of seeds and seed lots on Field emergence (%), Days to flowering and Days to maturity

Variety, Seed lots	Field emergence (%)			Days to flowering			Days to maturity		
	Type of seeds		Mean	Type of seeds		Mean	Type of seeds		Mean
	Fresh seeds	Aged seeds		Fresh seeds	Aged seeds		Fresh seeds	Aged seeds	
DLSA-17-160, Lot L_1	61	28	**45**	50	51	**50**	168	171	**169**
DLSA-17-160, Lot L_2	66	26	**46**	50	51	**50**	169	171	**170**
DLSA-17-160, Lot L_3	65	27	**46**	51	50	**51**	171	170	**171**
RAHS-14-175,Lot L_1	64	33	**48**	50	51	**51**	170	171	**171**
RAHS-14-175,Lot L_2	64	32	**48**	50	50	**50**	169	170	**169**
RAHS-14-175,Lot L_3	64	33	**48**	50	51	**50**	168	171	**169**
Mean	**64**	**30**		**50**	**51**		**169**	**171**	
	Type	Lots	Interaction	Type	Lots	Interaction	Type	Lots	Interaction
SEm(±)	1.16	2.01	2.84	0.20	0.34	0.48	0.67	1.15	1.63
CD (p=0.05)	3.40	NS	NS	NS	NS	NS	NS	NS	NS

NS: Non significant

Table 40: Effect of type of seeds and seed lots on Seed yield/ plot (kg) and 100 Seed weight (g)

Variety, Seed lots	Seed yield per plot (kg)			100 Seed weight (g)		
	Type of seeds		Mean	Type of seeds		Mean
	Fresh seeds	Aged seeds		Fresh seeds	Aged seeds	
DLSA-17-160, Lot L_1	1.08	0.32	**0.70**	5.06	4.50	**4.78**
DLSA-17-160, Lot L_2	0.92	0.24	**0.58**	5.16	5.17	**5.16**
DLSA-17-160, Lot L_3	1.06	0.23	**0.64**	5.47	5.10	**5.28**
RAHS-14-175,Lot L_1	0.90	0.45	**0.68**	5.43	5.00	**5.22**
RAHS-14-175,Lot L_2	0.86	0.23	**0.55**	5.17	4.97	**5.07**
RAHS-14-175,Lot L_3	1.00	0.45	**0.72**	5.10	4.90	**5.00**
Mean	**0.97**	**0.32**		**5.23**	**4.94**	
	Type	Lots	Interaction	Type	Lots	Interaction
SEm(±)	0.05	0.08	0.12	0.06	0.10	0.14
CD (p=0.05)	0.14	0.24	NS	0.16	0.28	NS

Crop: Soybean

Centre: JNKVV, Jabalpur

Experimental details: Three varieties of soybean viz., JS 335, JS 95-60 and JS 93-05 certified seeds were collected from Govt. Seed Agency. Each variety has fresh seed lot and two of its revalidated seed lots. The crop was sown with three replications and observations were recorded as per the technical programme.

Results: The significant variations were observed for different seed quality, yield and yield attributing traits (Table 41). JS 335 fresh seed lot (A/1) recorded maximum seed yield (956 kg/ha) followed by revalidated seed lot A/2 (872.33 kg/ha) and A/3 (800.00 kg/ ha). Whereas in case of JS 95-60, fresh seed lot B/1 had registered maximum seed yield (810 kg/ha) followed by B/2 (720.00 kg/ha) and B/3 (678.33 kg/ha). JS 93-05 fresh seed lot C/1 had maximum seed yield (672.67 kg/ha) followed by revalidated seed lot C/2 (665.00 kg/ha) and C/3 (603.33 kg/ha) (Figure 1).

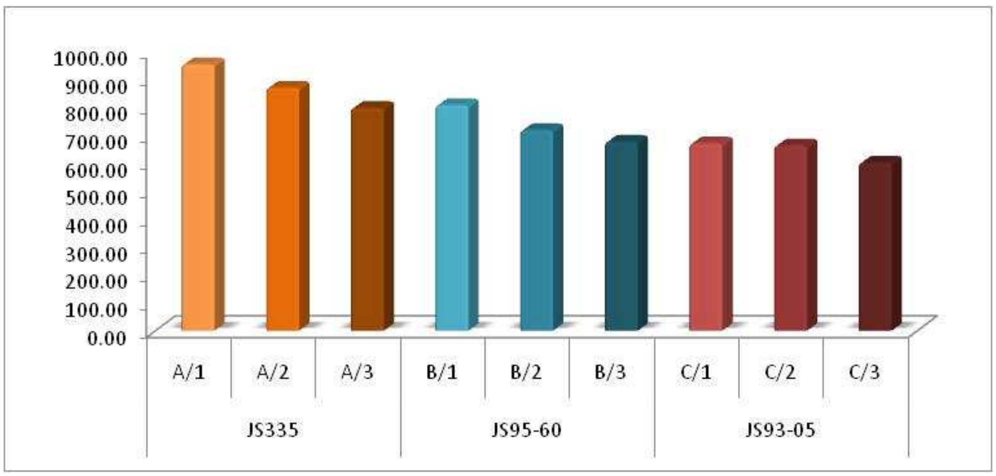


Figure 1:Grain yield (kg/ha) obtained from fresh and revalidated seeds lots of soybean

Table 41: Seed quality characters and field performance parameters of fresh and revalidated seeds lots of different soybean cultivars

Variety	Seed lot	Moisture content %	Radicle emergence	First count	Final count	Seedling dry weight (g)	Days to emergence				Days to flowering	Days to maturity	No. of branches per plant	Grain yield (kg/ha)	100 - seed wt. (g)
							7th	8th	9th	10th					
JS335	A/1	9.80	4.67	89.33	93.33	1.30	64.33	69.00	75.00	80.67	32.00	97.00	9.33	956.00	10.69
	A/2	10.37	6.00	82.00	88.67	1.25	57.33	64.67	69.00	75.00	32.00	97.00	9.33	872.33	10.06
	A/3	10.50	6.67	85.33	93.33	1.08	57.33	63.67	69.00	73.00	32.00	97.00	9.00	800.00	10.45
	SEd	**0.19**	**0.41**	**1.56**	**1.10**	**0.01**	**6.28**	**1.54**	**1.41**	**1.25**	**0.38**	**0.28**	**0.67**	**16.06**	**0.44**
	CD (p=0.05)	**0.40**	**0.87**	**3.31**	**2.33**	**0.04**	**13.30**	**3.27**	**2.99**	**2.66**	**0.81**	**0.58**	**1.42**	**34.05**	**0.92**
JS95-60	B/1	11.17	6.33	84.00	87.00	1.30	65.67	73.33	78.00	80.67	32.00	92.33	6.00	810.00	12.04
	B/2	10.70	7.33	80.00	84.00	1.25	60.00	65.67	71.00	79.00	32.33	92.67	5.00	720.00	11.79
	B/3	10.87	7.33	77.33	80.67	0.96	58.00	65.33	70.67	78.00	31.67	92.67	4.00	678.33	11.97
	SEd	**0.33**	**0.71**	**2.70**	**1.90**	**0.03**	**10.87**	**2.67**	**2.44**	**2.17**	**0.66**	**0.48**	**1.16**	**27.82**	**0.76**
	CD (p=0.05)	**0.70**	**1.51**	**5.73**	**4.03**	**0.06**	**23.04**	**5.66**	**5.18**	**4.60**	**1.41**	**1.01**	**2.45**	**58.98**	**1.60**
JS93-05	C/1	10.47	5.67	87.00	90.33	1.18	68.33	73.00	76.67	81.33	38.67	94.00	6.33	672.67	10.85
	C/2	10.60	6.00	70.33	73.33	1.26	61.33	66.00	71.00	76.00	37.67	94.67	5.67	665.00	10.59
	C/3	11.33	6.67	70.67	75.33	1.03	57.00	64.67	70.33	77.33	37.00	94.67	6.00	603.33	10.69
	SEd	**0.33**	**0.71**	**2.70**	**1.90**	**0.03**	**10.87**	**2.67**	**2.44**	**2.17**	**0.66**	**0.48**	**1.16**	**27.82**	**0.76**
	CD (p=0.05)	**0.70**	**1.51**	**5.73**	**4.03**	**0.06**	**23.04**	**5.66**	**5.18**	**4.60**	**1.41**	**1.01**	**2.45**	**58.98**	**1.60**

Centre: VNMKV, Parbhani

Experimental details:

Two lots: Lot No.1; MAUS162Oct15-13-2205VNMKV456 of October, 2015 harvest (Leftover Seed) and Lot No.2; MAUS162Oct16-13-2205VNMKV709of October, 2016 harvest (Fresh Seed) of soybean variety; MAUS-162 were taken for the study. The left over seed of MAUS-162 failed to germinate in field trail. Therefore, observations were recorded only from fresh seed of MAUS-162 for Lab and Field Condition.

Results: Data recorded on fresh seed of MAUS-162 for Lab and Field Condition were as; seed moisture content (Fresh -7.9& Left over-6.5%), radical emergence (93%), first count (81.66%), final count (93%), seedling dry mass (0.97g), field emergence per m^2(39),days to 50% flowering (41), days to maturity(101), grain yield (1.81kg/plot) and1000 seed weight (7.81g).

Centre: MPKV, Rahuri

Experimental details: The material comprised of three lots; S1: Fresh, S2: RVD Istand S3: RVD IInd of Breeder and Certified seed of two soybean varieties; Phule Agrani (V1) and DS 228 (V2) (Table 42).

Table 42: Information of Seed lot, type, stage and germination of seed

Variety	Seed lot	Type of seed	Stage of seed	Date of harvest	Date of test	Germi. (%)
V1: Phule Agrani	Oct-16-13MPKVK-45	Fresh	Breeder	Oct. 2016	05.05.2017	92
	Oct-15-13MPKVK-44	RVD I	Breeder	Oct. 2015	16.04.2017	67
	Oct-14-13MPKVK-44	RVDII	Breeder	Oct.2014	17.02.2017	36
	Oct-16-13MPKVK-08	Fresh	Breeder	Oct. 2016	05.05.2017	95
	Oct-15-13MPKVK-15	RVD I	Breeder	Oct. 2015	31.03.2017	62
	Oct-14-13MPKVK-15	RVDII	Breeder	Oct.2014	01.01.2017	35
V2: DS 228	Oct-16-13-1601-1620	Fresh	Certified	Oct. 2016	02.04.2017	96
	Nov-14-13-1601-1617	RVD I	Certified	Nov. 2014	02.04.2016	65
	Nov.-14-13- 1601-1617	RVDII	Certified	Nov.2014	10.02.2017	42
	Oct-16-13-1601-1615	Fresh	Certified	Oct. 2016	02.04.2017	95
	Nov-15-13-1601-1618	RVD I	Certified	Nov. 2015	02.04.2017	61
	Nov.-14-13- 1601-1618	RVDII	Certified	Nov.2014	10.02.2017	38

Results: The data on effect of variety, seed lot and seed type on seed quality of soybean are presented in table 43.

Effect of variety: The seed quality parameters were influenced due to varieties irrespective of seed lot and seed type. The moisture content of the seed of variety DS-228 was the lowest (8.85 %). The germination percentage of variety DS-228 was the highest (56.50 %) and seed quality parameters *viz.* vigour index I (1868), Vigour index II (28.83), field emergence (52.33 %) and 1000 seed weight (126.63 g) were significantly superior over the variety Phule Agrani. The root shoot length, dry matter content, days required for flowering and seed yield per ha were not influenced significantly.

Effect of seed lot: The seed quality parameters *viz.;* germination, root shoot length, dry matter content, vigour index, field emergence, days to flowering, days to maturity, seed yield per ha and 1000 seed weight were not influenced significantly irrespective of seed lot.

Effect of seed type: The quality parameters of the seed were significantly influenced due to seed type i.e. fresh and revalidated seed. The fresh seed lot recorded the highest values of germination (90.50 %), root shoot length (35.36 cm), dry matter (0.563 g), vigour index I (3203), vigour index II (50.93), field emergence (84.42) seed yield per ha (23.02 q/ha) and 1000 seed weight (119.70g). However, the germination and other seed quality parameters were not maintained in revalidated Ist and drastically reduced in revalidated IInd seed lot.

Interaction effect of variety, lot and seed type on seed quality parameters in soybean: The data on interaction effect of variety, lot and seed type presented in table 44 which are not influenced significantly.

Table 43: Effect of variety, lot and seed types on seed quality parameters in soybean

Treatments	Moisture content (%)	Germination (%)	Seedling length (cm)	Dry matter content (g)	Vigor index I	Vigor index II	Field emergence (%)	Days to 50% flowering	Days to maturity	Seed yield (qt/ha)	1000 seed weight (g)
Variety											
V1: P. Agrani	9.21 (17.64)	49.50 (45.43)	31.87	0.417	1667	23.87	45.00(42.07)	42.44	96.33	14.23	110.08
V2: DS 228	8.85 (17.29)	56.50 (49.98)	31.61	0.460	1868	28.83	52.33(46.81)	42.22	99.17	14.32	126.63
SEm(±)	**0.10**	**0.45**	**0.38**	**0.019**	**31.90**	**0.88**	**0.43**	**0.39**	**0.40**	**0.23**	**0.20**
CD (p=0.05)	**0.29**	**1.30**	**NS**	**NS**	**93.13**	**2.55**	**1.26**	**NS**	**1.18**	**NS**	**0.58**
Seed lot											
L1: Lot 1	8.94 (17.38)	52.67 (47.43)	31.28	0.425	1738	25.74	48.33(44.22)	42.39	98.00	14.13	118.15
L2: Lot 2	9.13 (17.55)	53.33 (47.98)	32.20	0.452	1798	26.96	49.00(44.66)	42.28	97.50	14.43	118.55
SEm(±)	0.10	**0.45**	**0.38**	**0.019**	**31.90**	**0.88**	**0.43**	**0.39**	**0.4**	**0.23**	**0.20**
CD (p=0.05)	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Seed type											
S1: Fresh	9.71 (18.14)	90.50 (72.21)	35.36	0.563	3203	50.93	84.42(66.83)	42.33	96.00	23.02	119.70
S2: RVD Ist	9.23 (17.67)	45.50 (42.37)	31.97	0.453	1460	21.22	41.75(40.18)	42.58	97.75	12.42	118.30
S3: RVD IInd	8.16 (16.58)	23.00 (28.53)	27.89	0.300	641	6.90	19.83(26.32)	42.08	99.50	7.39	117.06
SEm(±)	**0.12**	**0.55**	**0.46**	**0.024**	**39.07**	**1.07**	**0.53**	**0.48**	**0.49**	**0.32**	**0.24**
CD (p=0.05)	**0.35**	**1.59**	**1.35**	**0.069**	**114.06**	**3.13**	**1.55**	**NS**	**1.45**	**0.95**	**0.71**

Figures in parenthesis are arc sin transformed values

Table 44: Interaction effect of variety, lot and seed types on seed quality parameters in soybean

Treatments	Moisture content (%)	Germination (%)	Seedling length (cm)	Dry matter content (g)	Vigor Index I	Vigor Index II	Field emergence (%)	Days to 50% flowering	Days to maturity	Seed yield (qt/ha)	1000 seed weight (g)
V1L1S1	10.15(18.57)	87.00 (68.92)	34.50	0.540	3004	47.02	82.00(64.87)	41.67	94.00	23.50	110.80
V1L1S2	9.17(18.35)	38.00 (73.62)	31.60	0.300	1204	11.95	34.00(67.25)	43.33	96.00	11.50	109.50
V1L1S3	8.27(17.40)	17.00 (74.73)	28.10	0.300	482	5.14	15.00(69.75)	42.67	98.00	6.60	108.37
V1L2S1	9.92(18.24)	92.00 (71.59)	35.05	0.580	3219	53.37	85.00(65.43)	42.67	95.00	24.50	111.90
V1L2S2	9.88(17.62)	41.00 (38.02)	30.80	0.450	1261	18.44	36.00(35.64)	42.67	97.00	12.30	110.65
V1L2S3	7.89(18.31)	22.00 (39.80)	29.15	0.330	644	7.29	18.00(36.84)	41.67	98.00	7.50	109.26
V2L1S1	8.95(17.3.5)	93.00 (46.70)	35.20	0.570	3275	52.97	88.00(44.98)	42.00	98.00	22.50	128.50
V2L1S2	8.90(17.41)	53.00 (44.98)	33.18	0.560	1756	29.51	50.00(43.26)	42.33	100.00	14.25	126.65
V2L1S3	8.19(16.70)	28.00 (24.29)	25.10	0.280	706	7.87	25.00(22.75)	42.33	102.00	8.20	125.10
V2L2S1	9.80(16.28)	90.00 (27.95)	34.70	0.560	3124	50.37	82.67(25.07)	43.00	97.00	21.60	127.60
V2L2S2	8.96(16.61)	50.00 (31.93)	32.30	0.500	1617	24.98	47.00(29.97)	42.00	98.00	11.62	126.42
V2L2S3	8.30(16.72)	25.00 (29.96)	29.20	0.290	732	7.31	21.33(27.47)	41.67	100.00	7.25	125.50
SEm(±)	0.24	1.09	0.92	0.047	78.13	2.14	1.05	0.97	0.99	0.56	0.48
CD(p=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Figures in parenthesis are arc sin transformed values

Centre: UAS, Dharwad

Experimental details: Revalidation of soybean seed lots were conducted using three aged seed lots (9-10 months old) of two cultivars; Dsb-21 and JS-9305against three freshly harvested seed lots of similar cultivars Dsb-21 and JS-9305.

Results: Overall performance of fresh seed lots were significantly higher compare to the aged seeds lots (Table 45 – 48). Fresh seed lots recorded significantly higher mean seed germination in first count test (73.60 %) and also in final count (92.00), less time period was required for radical emergence (3.37 days), increased seedling length (18.40 cm), seedling vigour index (1697), seedling dry weight (1.02 mg) and optimum seed moisture (9.77 %), average days to 50 per cent field emergence (6 days), field emergence percentage (73.60), seed yield per plot (1.35 kg per plot) and test weight (13.69 g), on contrary aged seed lots were recorded significantly less in yield and quality parameters.

Table 45: Effect of type of seeds and seed lots on seed moisture (%), first count (%) and Final count (%)

Variety, Seed lots	Seed moisture (%)			First count (%)			Final count/Germination (%)		
	Type of seeds		Mean	Type of seeds		Mean	Type of seeds		Mean
	Fresh seeds	Aged seeds		Fresh seeds	Aged seeds		Fresh seeds	Aged seeds	
Dsb-21 , Lot L_1	10.17	10.53	**10.35**	70.56	29.71	**50.14**	88.21	37.13	**62.67**
Dsb-21, Lot L_2	9.99	11.89	**10.94**	76.01	27.00	**51.50**	95.01	33.75	**64.38**
Dsb-21, Lot L_3	9.87	11.36	**10.62**	75.06	27.80	**51.43**	93.83	34.75	**64.29**
JS-335, Lot L_1	9.17	11.20	**10.18**	73.36	34.57	**53.96**	91.70	43.21	**67.46**
JS-335, Lot L_2	9.80	10.49	**10.15**	73.17	33.44	**53.31**	91.46	41.80	**66.63**
JS-335, Lot L_3	9.65	10.87	**10.26**	73.44	34.40	**53.92**	91.80	43.00	**67.40**
Mean	**9.77**	**11.06**		**73.60**	**31.15**		**92.00**	**38.94**	
	Type	Lots	Interaction	Type	Lots	Interaction	Type	Lots	Interaction
SEm(±)	0.23	0.40	0.56	1.24	2.15	3.04	1.55	2.69	3.80
CD (p=0.05)	0.67	NS	NS	3.64	NS	NS	4.55	NS	NS

NS: Nonsignificant

Table 46: Effect of type of seeds and seed lots on Days to radical emergence, Seedling length (cm)and Vigour Index-I

Variety, Seed lots	Days to radical emergence			Seedling length (cm)			Vigour Index-I		
	Type of seeds		Mean	Type of seeds		Mean	Type of seeds		Mean
	Fresh seeds	Aged seeds		Fresh seeds	Aged seeds		Fresh seeds	Aged seeds	
Dsb-21 , Lot L_1	3.48	3.60	**3.54**	17.64	11.30	**14.47**	1562	425	**994**
Dsb-21, Lot L_2	3.59	4.59	**4.09**	19.00	10.26	**14.63**	1808	350	**1079**
Dsb-21, Lot L_3	3.38	3.89	**3.63**	18.77	13.48	**16.12**	1761	456	**1108**
JS-335, Lot L_1	3.14	3.83	**3.48**	18.34	13.16	**15.75**	1685	579	**1132**
JS-335, Lot L_2	3.35	3.59	**3.47**	18.29	12.71	**15.50**	1677	544	**1111**
JS-335, Lot L_3	3.30	3.72	**3.51**	18.36	13.01	**15.69**	1686	568	**1127**
Mean	**3.37**	**3.87**		**18.40**	**12.32**		**1697**	**487**	
	Type	Lots	Interaction	Type	Lots	Interaction	Type	Lots	Interaction
SEm(±)	0.09	0.15	0.22	0.36	0.63	0.89	40	69	97
CD (p=0.05)	0.26	0.45	NS	1.06	1.84	NS	116	NS	NS

Table 47: Effect of type of seeds and seed lots on Seedling dry weight (mg), Field emergence (%) per m^2 and Days to 50 % field emergence

Variety, Seed lots	Seedling dry weight (mg)			Field emergence (%) per m^2			Days to 50 % field emergence		
	Type of seeds		Mean	Type of seeds		Mean	Type of seeds		Mean
	Fresh seeds	Aged seeds		Fresh seeds	Aged seeds		Fresh seeds	Aged seeds	
Dsb-21 , Lot L_1	1.25	1.29	**1.27**	70.56	29.71	**50.14**	7	6	**6**
Dsb-21, Lot L_2	1.23	1.46	**1.35**	76.01	27.00	**51.50**	7	8	**7**
Dsb-21, Lot L_3	1.21	1.40	**1.31**	75.06	27.80	**51.43**	6	7	**6**
JS-335, Lot L_1	1.13	1.38	**1.25**	73.36	34.57	**53.96**	5	8	**7**
JS-335, Lot L_2	1.21	1.29	**1.25**	73.17	33.44	**53.31**	6	6	**6**
JS-335, Lot L_3	1.19	1.34	**1.26**	73.44	34.40	**53.92**	6	8	**7**
Mean	**1.20**	**1.36**		**73.60**	**31.15**		**6**	**7**	
	Type	Lots	Interaction	Type	Lots	Interaction	Type	Lots	Interaction
SEm(±)	0.03	0.05	0.07	1.24	2.15	3.04	0.19	0.33	0.47
CD (p=0.05)	0.08	NS	NS	3.64	NS	NS	0.56	0.98	NS

NS: Nonsignificant

Table 48: Effect of type of seeds and seed lots on Days to maturity, 100 seed weight (g) and Seed yield (Kg) per plot

Variety, Seed lots	Days to maturity			100 seed weight (g)			Seed yield (Kg) per plot		
	Type of seeds		Mean	Type of seeds		Mean	Type of seeds		Mean
	Fresh seeds	Aged seeds		Fresh seeds	Aged seeds		Fresh seeds	Aged seeds	
Dsb-21 , Lot L_1	100	99	**100**	15.44	13.13	**14.29**	1.51	0.44	**0.98**
Dsb-21, Lot L_2	100	101	**101**	13.12	11.15	**12.14**	1.28	0.34	**0.81**
Dsb-21, Lot L_3	102	101	**101**	14.61	12.42	**13.52**	1.47	0.32	**0.90**
JS-335, Lot L_1	112	116	**114**	14.26	12.12	**13.19**	1.25	0.63	**0.94**
JS-335, Lot L_2	117	113	**115**	12.30	11.56	**11.93**	1.20	0.32	**0.76**
JS-335, Lot L_3	117	115	**116**	12.38	12.43	**12.41**	1.38	0.62	**1.00**
Mean	**108**	**107**		**13.69**	**12.13**		**1.35**	**0.45**	
	Type	Lots	Interaction	Type	Lots	Interaction	Type	Lots	Interaction
SEm(±)	0.74	1.29	1.82	0.32	0.56	0.79	0.07	0.11	0.16
CD (p=0.05)	NS	3.77	NS	0.94	NS	NS	0.19	0.34	NS

Centre (Volunteer): PDKV, Akola

Remarks: Three seed lots (L1, L2, and L3) of two soybean varieties; V1- JS-335 and V2- JS 20-34 were collected for study. The seed quality traits were assessed and all the three lots of two varieties were sown in field for assessing the performance in field (Table 49, 50) post harvest seed quality parameters (Table 51). Lot 1 (Fresh) of both the varieties showed significantly superior in yield and seed quality parameters.

Table 49: Laboratory observations before sowing

Treatments	Seed Germination (%)	Moisture content (%)	Radicle emergence (Days)	First count (%)	Seedling dry weight (g)	VI-II
V_1L_1	76 (60.66)	8.9 (17.42)	2.0	74	0.44	33.69
V_1L_2	73 (58.69)	8.7 (17.15)	1.8	72	0.42	30.66
V_1L_3	72 (58.05)	8.5 (16.98)	1.8	69	0.40	28.80
V_2L_1	73 (58.69)	8.9 (17.35)	2.0	70	0.41	29.93
V_2L_2	71 (57.41)	8.8 (17.25)	1.8	68	0.39	27.69
V_2L_3	71 (57.41)	8.5 (16.95)	2.0	69	0.37	26.27
SEm(±)	**0.40**	**0.05**	**0.12**	**0.62**	**0.01**	**1.31**
CD (p=0.05)	**N/S**	**0.18**	**N/S**	**1.99**	**N/S**	**4.14**

Figures in parenthesis are arc sin values

Table 50: Effect of different seed lots on field performance

Treatments	Field emergence/m^2	Days to emergence	Days to flowering	Days to maturity	Number of pods/plant	Grain Yield (g/plant)	Grain yield (q/ha)	100 seed weight (g)
V1L1	20.83	7.3	40.00	98.00	24	9.46	18.09	10.62
V1L2	20.33	6.6	41.33	99.66	23	9.08	16.85	10.22
V1L3	20.00	7.6	42.66	100.00	22	8.8	14.70	10.08
V2L1	18.66	8.6	35.33	87.33	27	10.61	18.25	11.36
V2L2	18.33	8.3	36.33	88.33	25	10.14	17.61	11.12
V2L3	18.00	8.0	37.66	88.66	24	9.9	15.40	11.02
SEm(±)	0.19	0.32	0.41	0.52	0.51	0.03	0.01	0.31
CD (p=0.05)	0.62	1.03	1.31	1.66	1.62	0.11	0.04	N/S

Table 51: Observations on post harvest seed quality parameters.

Treatments	Germination Percentage (%)	Moisture content (%)	Seedling length (cm)	Seedling dry weight (g)	Vigour index-I	Vigour index-II
V_1L_1	92.66(74.34)	9.43(17.88)	26.30	0.45	2437.13	41.70
V_1L_2	90.00(71.69)	9.33(17.78)	24.60	0.42	2214.00	37.80
V_1L_3	91.33(72.92)	9.26(17.72)	23.70	0.41	2164.60	37.44
V_2L_1	90.33(71.92)	9.50(17.95)	27.03	0.51	2442.01	46.07
V_2L_2	89.67(71.28)	9.56(18.01)	26.83	0.46	2406.05	41.24
V_2L_3	88.33(70.03)	9.43(17.88)	25.06	0.43	2214.22	37.98
SEm(±)	1.04	0.09	1.14	0.03	108.49	3.31
CD (p=0.05)	N/S	N/S	N/S	N/S	N/S	N/S

Figures in parenthesis are arc sin values

Crop: Chickpea

Centre: JNKVV, Jabalpur

Experimental details: The experimental material of chickpea variety JG 16 certified seeds (Fresh seed lot), JG 16 revalidate seed lot-1 & JG 16 revalidated seed lot-2 and JG 63 (Fresh seed lot),JG 63 revalidated seed lot-1, JG 63 revalidated seed lot-2 were collected from the MP Seed corporation, Jabalpur. The experiment was laid out in three replications having plot size 5m x 2.10m and sowing was done on 29/11/2017. The soil testing report of experimental area (Table 52) at STR Centre, JNKV, Jabalpur have been given.

Table 52: Soil Testing Report of Experimental area STR Centre, JNKV, Jabalpur

Sample code	pH	EC (dSm^{-1})	OC %	Av. N	Av. P	Av. K	Av. S	Zn	Cu	Mn	Fe
				Kg ha^{-1}			Mg/kg				
Field A	7.57	0.17	0.55	208	22.27	295	14.12	0.67	1.21	2.34	9.92
Field B	7.61	0.19	0.57	214	25.67	304	15.01	0.61	1.40	2.51	10.87

Results: Significant variations was observed for the seed moisture content (%), radical emergence, first count, final count and seeding dry weight (Table 53) and field emergence (%).The maximum seed moisture content (10.57 %) was recorded in fresh seed lot of JG-63 followed by JG 16 fresh seed lot (10.24). The lowest days was recorded for radical emergence (7.0 days) for JG 16 Fresh seed lot followed by fresh seed lot of JG 63 (7.33 days). First count was recorded highest under JG 63 fresh seed lot (52.33) followed by JG 63 fresh seed lot (47.67) whereas final count was recorded maximum under JG 63 Fresh seed lot (93.67), closely followed by JG-16 fresh seed lot (92.00). Seedling dry weight (g)/10 seedling was noted highest under JG 63 Fresh seed lot (1.41 g) followed by JG-16 fresh seed lot (1.36 g). The highest field emergence (79.00%) was noted in JG-16 fresh seed lot closely followed by JG-63 Fresh seed lot (75.00%) whereas, revalidated seed lot of JG-16 & JG-63 had lower field emergence (Table 54). It is indicated that revalidated seed lots of JG 16 to JG 63 recorded lowest vigour parameters as compared to certified fresh seed lots of JG16 & JG 63 chickpea varieties. The remaining observations will be recorded at different stages of the experiment.

Table 53: Seed quality parameters of fresh & revalidated seed lots of different chickpea varieties

Seed Lots	Moisture Content %	Radical emergence	First Count	Final Count	Seedling dry weight (g)
JG-16 Fresh Seed Lot	10.24	7.00	47.67	92.00	1.36
JG-16 (Revalidated Seed Lot 1)	10.09	8.33	34.00	84.00	1.23
JG-16 (Revalidated Seed Lot 2)	10.12	9.33	34.67	86.67	1.24
JG-63 (Fresh Seed Lot)	10.57	7.33	52.33	93.67	1.41
JG-63 (Revalidated Seed Lot 1)	10.22	7.67	45.67	88.33	1.32
JG-63 (Revalidated Seed Lot2)	9.96	9.67	44.67	91.67	1.23
SEm(±)	**0.024**	**0.233**	**0.774**	**0.735**	**0.011**
CD (p=0.05)	**0.076**	**0.734**	**2.438**	**2.314**	**0.036**

Table 56: Field emergence (%) in Chickpea varieties for five consecutive days to emergence

Seed Lot	7 Day	8 Day	9 Day	10 Day	11 Day
JG-16 Fresh Seed Lot	40.00	48.00	66.00	75.00	79.00
JG-16 (Revalidated Seed Lot 1)	35.00	40.00	50.00	64.00	67.00
JG-16 (Revalidated Seed Lot 2)	30.00	42.00	55.00	68.00	70.00
JG-63 (Fresh Seed Lot)	48.00	58.00	68.00	72.00	75.00
JG-63 (Revalidated Seed Lot 1)	37.00	42.00	60.00	64.00	70.00
JG-63 (Revalidated Seed Lot2)	42.00	48.00	64.00	69.00	72.00
SEm(±)	0.024	0.233	0.774	0.735	0.011
CD (p=0.05)	0.076	0.734	2.438	2.314	0.036

Centre: CSAUAT, Kanpur

Experimental details: Five varieties of chickpea i.e. KPG-59, K 3256, KGD-1168 Awrodhi and KWR-108 were used in the study.

Results: Less than 10% of seed moisture was in chickpea varieties were recorded. The variety, KPG-59 recorded maximum field emergence followed by Awrodhi variety (Table 55).

Table 55: Seed quality characters and field emergence of chickpea seed lots

Crop varieties	Seed moisture (%)	Radical emergence	1st count test	Final count test (germination %)	Seedling dry weight (gm)	Field observation	
						Field emergence	Days to 50% emergence
KPG-59	9.30	11.26	64.33	83.66	0.27	84.33	42.33
K-3256	9.60	12.32	58.66	79.66	0.33	78.33	39.66
KGD-1168	9.80	14.30	70.66	78.00	0.28	74.66	37.66
Awrodhi	9.00	12.08	50.00	81.66	0.30	81.33	40.66
KWR-108	9.50	12.15	74.33	80.00	0.30	76.33	38.66

Centre: SKNAU, Durgapura

Experimental details: Fresh and one year old seeds of two popular chickpea varieties namely RSG-963 and CAJD-884 were collected and tested in laboratory as well as grown field conditions.

Results: Moisture content was found to be higher in fresh seeds as compared to one year old seeds. However, the variations were statistically non significant. The germination percentage and seedling dry weight were significantly higher in fresh seeds of both the varieties. Between varieties RSG-963 was found better over CAJD-884 (Table 56). Field emergence was higher in fresh seeds as compared to one year old seeds. The seedling vigour indexes and chlorophyll content were found to vary significantly among fresh and one year old seeds of both the varieties (Table 57).

Table 56: Variations in moisture content, germination percentage and seedling dry weight of old and new chickpea seeds.

Variety	Seed lot	Moisture content (%)	Germination percentage (%)	Radicle emergence		Seedling dry weight at 10 DAS (mg/10 seedlings)
				First count	Final count	
RSG-963	New	9.80	94.45	76.76	92.88	370.45
RSG-963	Old	8.56	83.54	75.45	78.75	320.90
CAJD-884	New	9.65	91.36	78.90	90.68	345.60
CAJD-884	Old	8.48	78.84	78.44	75.60	315.82
CD (p=0.05)		NS	5.67	NS	5.98	22.50

Table 57: Variations in field emergence, seedling vigour index I, II and chlorophyll content in old and new chickpea seeds.

Variety	Seed lot	Field emergence per m^2	Vigour index I	Vigour Index II	Days to flowering	Chl. content at flowering stage (mg/g/f.w.)
RSG-963	New	54.65	3940	191	65	1.89
RSG-963	Old	46.70	3665	179	64	1.84
CAJD-884	New	53.68	3281	165	69	1.79
CAJD-884	Old	40.76	3309	170	69	1.78
CD (p=0.05)		4.67	416	17.69	NS	0.24

Crops: Paddy, Chickpea, Soybean, Sorghum and Maize

Centre: ICAR-IARI, New Delhi

Experimental Details : One seed lot each of Foundation or certified class of two varieties in each crop (Paddy, Chickpea, Soybean, Sorghum), except Maize where only one hybrid was available, were procured from NSC H.O., New Delhi during May, 2017and stored under ambient conditions at DSST, ICAR-IARI, New Delhi. Details of the experimental material used are mentioned in table 58. The test report in respect of these samples was also obtained from the respective state seed certification agency to know the initial seed quality of the seed lots.

Table 60: Details of materials used in the experiment

S. No.	Crop	Variety	Class of Seed	Year of harvest	RO/Farm Units
1.	Paddy	MTU-1010	Certified Seed	*Kharif* 2016	CSF, Raichur
2.	Paddy	Cherang Sub-I	Certified Seed	*Kharif* 2016	CSF, Raichur
3.	Chickpea	JAKI-9218	Certified Seed	*Rabi* 2016-17	CSF, Raichur
4.	Chickpea	JG-11	Certified Seed	*Rabi* 2016-17	CSF, Raichur
5.	Soybean	JS-335	Certified Seed	*Kharif* 2016	NSC, Indore
6.	Soybean	JS-9560	Certified Seed	*Kharif* 2016	NSC, Indore
7.	Sorghum	CSV-23	Certified Seed	*Rabi* 2015-16	NSC, Secunderabad
8.	Sorghum	CSV-27	Foundation Seed	*Rabi* 2015-16	NSC, Secunderabad
9.	Maize	PEHM-5	Certified Seed	*Rabi* 2015-16	CSF, Raichur

The seed samples were analyzed for the seed quality parameters at quarterly intervals under laboratory conditions, including seed moisture content (%), radicle emergence, First count, final count and seedling dry mass. Four replications of 100 seeds each were used for the Standard germination test. The meteorological data for the monthly average temperature and relative humidity (RH) under Delhi conditions is depicted in figure 2.One hundred seeds each were taken for the pot culture studies and the seedling emergence was recorded after 15 days.

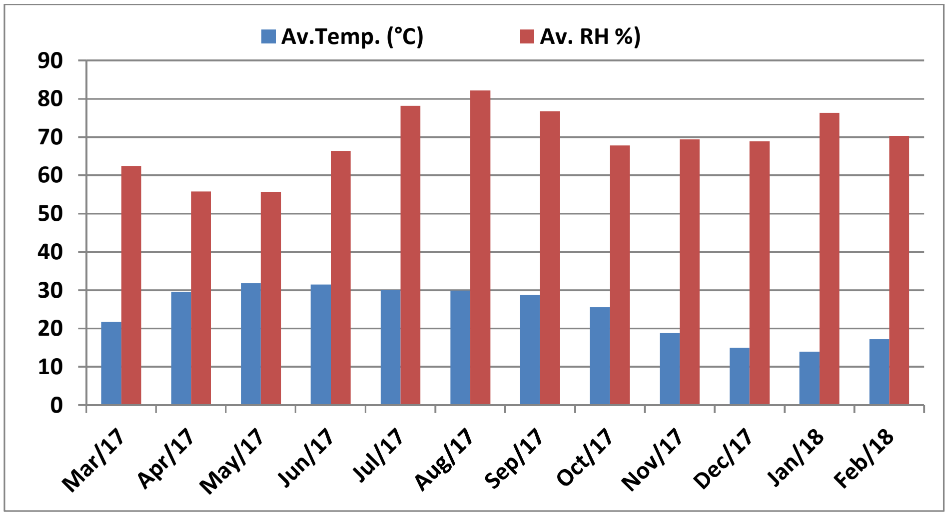


Figure 2: Monthly average temperature and relative humidity (RH) under Delhi conditions

Results: The germination percentage of different seed samples as recoded under the laboratory conditions is presented in the table 59. The seed deterioration and reduction in germination was gradual in all the seed crops, but it was more significant in case of soybean varieties. Seed moisture content was regulated by the climatic variables, temperature and relative humidity (RH), which ultimately influenced the pattern of seed deterioration during storage (Figure 2). The field emergence studies also indicated similar trends as in germination per cent and there was a progressive decline in the seedling emergence as the storage period increased (Figure 3, 4). The crop wise details are given as under:

Paddy: The initial germination of paddy varieties, MTU 1010 and Cherang Sub-1 was 82 and 87 per cent, respectively. The variety, Cherang Sub-1 could meet the IMSCS for a period of six months, whereas, variety MTU 1010 could meet for a period of three months only, as the initial seed quality was lower.

Chickpea: The initial germination of chickpea varieties, JAKI 9218 and JG-11 was 91 and 89 per cent, respectively. Both the varieties were able to meet the IMSCS for a period of nine months of storage.

Soybean: The initial germination of soybean varieties, JS-335 and JS-9560 was 91 and 89 per cent, respectively. The initial seed quality of both the varieties was quite low and gradual reduction in germinability and other seed quality parameters was observed with the progression of storage period. However, the storage potential of the variety, JS-335 was lower as compared to JS-7560.

Sorghum: The initial germination of paddy varieties, CSV-23 and CSV-27 was 77 and 78 per cent, respectively. The initial seed quality of both the varieties was quite low, as the validity period (nine months) of the seed lots had expired. Therefore, these seed lots were found not suitable for revalidation.

Maize: The initial germination of maize hybrid, PEHM-5 was 97 per cent and it maintained IMSCS for period of more than a year, but there was a subsequent decline in germinability afterwards.

Table 59: Effect of storage period on the germination per cent of different crops

S. No.	Crop	Variety	Storage period					C.D. (p=0.05)
			Initial germination (date of test by S.C.A.)	0 months	3 months	6 months	9 months	
1.	Paddy	MTU-1010	82* (20.04.2017)	81.00 (64.16)	80.00 (63.43)	76.75 (61.16)	75.00 (60.00)	2.63
2.	Paddy	Cherang Sub-I	87* (20.4.2017)	85.00 (67.24)	83.25 (65.85)	80.00 (63.43)	77.50 (61.68)	2.89
3.	Chickpea	JAKI-9218	91 (21.09.2017)	94.50 (76.64)	92.75 (74.47)	89.25 (70.86)	88.00 (69.80)	3.82
4.	Chickpea	JG-11	89** (06.09.2017)	91.25 (72.81)	89.50 (71.14)	86.50 (68.43)	85.25 (67.41)	2.51
5.	Soybean	JS-335	73.0** (28.02.2017)	70.25 (56.93)	65.50 (54.01)	59.00 (50.16)	57.50 (49.30)	2.44
6.	Soybean	JS-9560	70.0 (16.04.2017)	67.00 (54.93)	60.50 (51.04)	53.25 (46.85)	48.75 (44.27)	2.07
7.	Sorghum	CSV-23	77.0# (22.03.2016)	68.50 (55.83)	65.25 (53.86)	61.00 (51.34)	59.50 (50.45)	1.66
8.	Sorghum	CSV-27	78.0# (22.03.2016)	69.75 (56.62)	66.25 (54.48)	62.50 (52.22)	61.00 (51.33)	2.45
9.	Maize	PEHM-5	97.0## (09.05.2016)	90.00 (71.63)	86.75 (68.69)	82.50 (65.26)	81.00 (64.15)	2.94

*Seed lot was revalidated on 27.03.18 (MTU 1010) and 12.01.2018 (Cherang Sub 1) respectively

**Seeds were procured before the conduct of seed germination test

#Carry over seed (Not revalidated)

##Seed lot was revalidated during May 2017

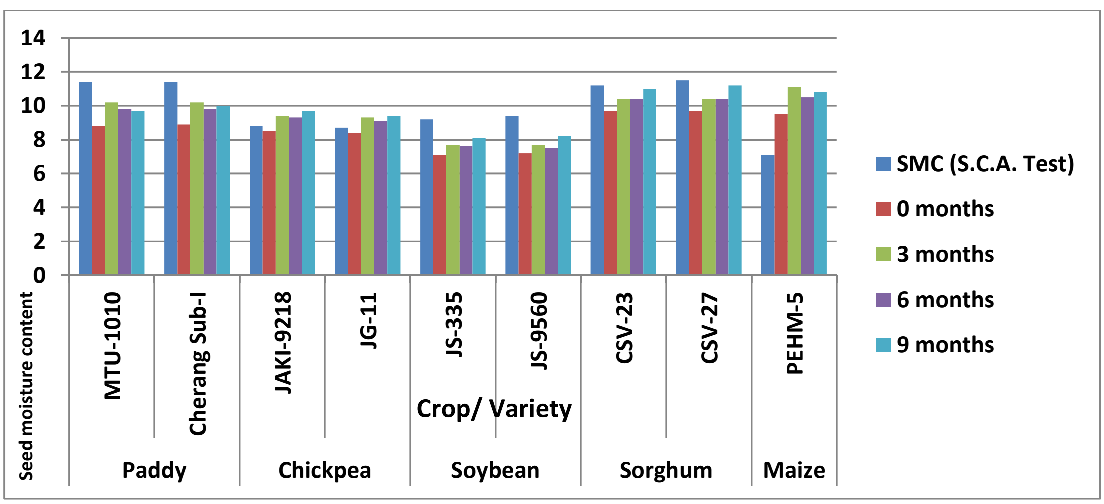


Figure 3: Effect of storage period on the seed moisture content of different crops

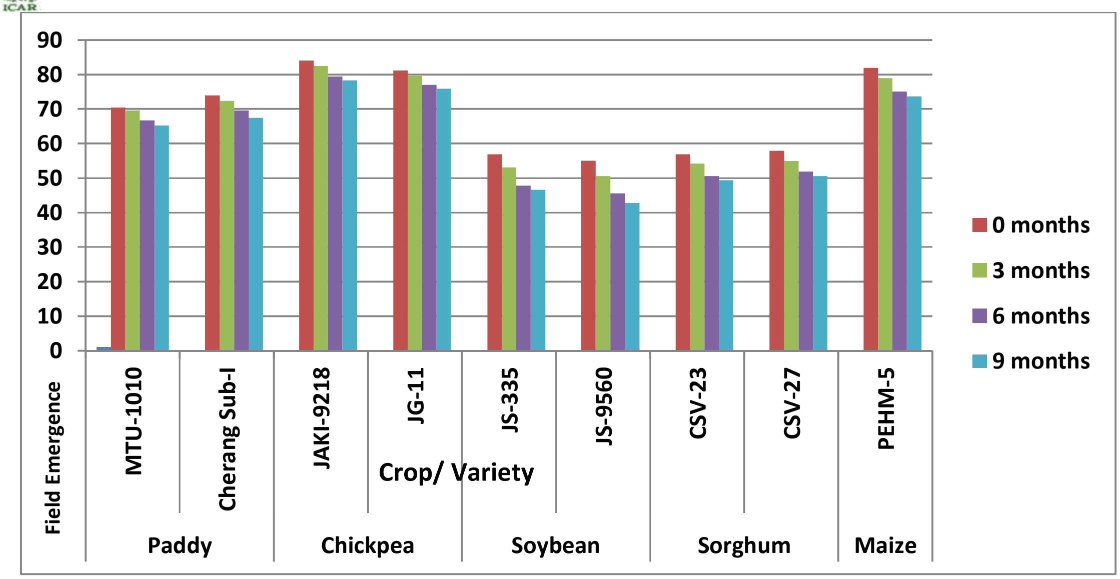


Figure 4: Effect of storage period on the field emergence of different crops

On the basis of above results, it can be concluded that the chickpea and maize varieties performed best, followed by paddy and sorghum. The sorghum seed could not qualify for revalidation, as the initial seed quality was quite low. The high quality seed lots of maize, paddy and chickpea seeds can be stored safely for a period of one year and qualify for revalidation (after nine months). The sorghum seed lots with high seed quality can also be revalidated, but with proper storage facilities. However, the soybean varieties were most vulnerable to seed deterioration due to low initial quality of seed lots and gradual reduction in seed quality, on account of high temperature and humidity conditions, especially during the monsoon period. Hence, soybean seed lots need to be handled with utmost care for minimizing the rate of seed deterioration during storage and obtaining revalidation, as they are poor storer species.

Experiment 2: Identification of variety and hybrid specific SSR makers in field crops

Year of Start: 2011- 2012

Objective: To identify unique markers for varietal identification and maintenance of genetic purity.

Details of the crops taken up by different centres for experiments

Crops		Centres
Rice	:	PJTSAU, Hyderabad; UAS, Bangalore; TNAU, Coimbatore; CSKHPAU, Palampur; ICAR-IISS, Mau; JNKVV, Jabalpur, AAU, Jorhat and KAU, Thrissur
Maize	:	UAS, Dharwad and PAU, Ludhiana
Pearl millet	:	SKNAU, Jobner
Soybean	:	VNMKV, Parbhani and JNKVV Jabalpur

Proposed Technical Programme: Crop varieties which are present in seed chain and available at the respective centres may be studied for DNA fingerprinting and electrophoresis/PCR analysis for identification of polymorphic markers unique for hybrid/ cultivar/ variety/ parental lines using SSR microsatellite marker.

Note:

i) Each centre will search for the literature on use of primers in each crop and will use the most important one.

ii) ii) The set of identified crop specific markers will be validated between the Centres and information will be shared among them, and with NBPGR, New Delhi.

Crop-wise and centre-wise research findings during 2017-18

Crop: Rice

Centre: PJTSAU, Hyderabad

Experimental details: Twenty rice varieties; MTU-7029,RNR-15048, BPT-5204, JGL-18047, MTU-1001,KNM-118, Tellahamsa, JGL-1470, Siddhi, KNM-1184, Somnath, WGL-283, Satya, Krishna, JGL-11118, MTU-1010, JGL-384, WGL-23985, JGL-3844 and JGL-17004 were taken for employing SSR markers; RM 44, RM 124, RM 431, RM 495, RM105, RM5, RM536, RM287, RM455, RM171, RM511, RM161, RM 312, RM452, RM277, RM484, RM259, RM286, RM333, RM592.

Results: During 2017-18 a total of 20 SSR markers were employed for fingerprinting of 20 rice varieties. All twenty rice cultivars were successfully amplified with the ten microsatellite primer pairs (RM 312, RM105, RM452, RM277, RM484, RM259, RM286, RM333, RM511and RM592). Out of them RM 105, RM 312 and RM 511were found to be polymorphic with MTU-7029, JGL-1470, Siddhi (Plate 1, 2 & 3). Further RM 592 showed less polymorphism with JGL-1470, KNM-118 and MTU-1001 (Plate 4). The single primer RM 105 (Plate 1) amplified two alleles of 500 and 600 base pairs with JGL-1470 and Siddhi.

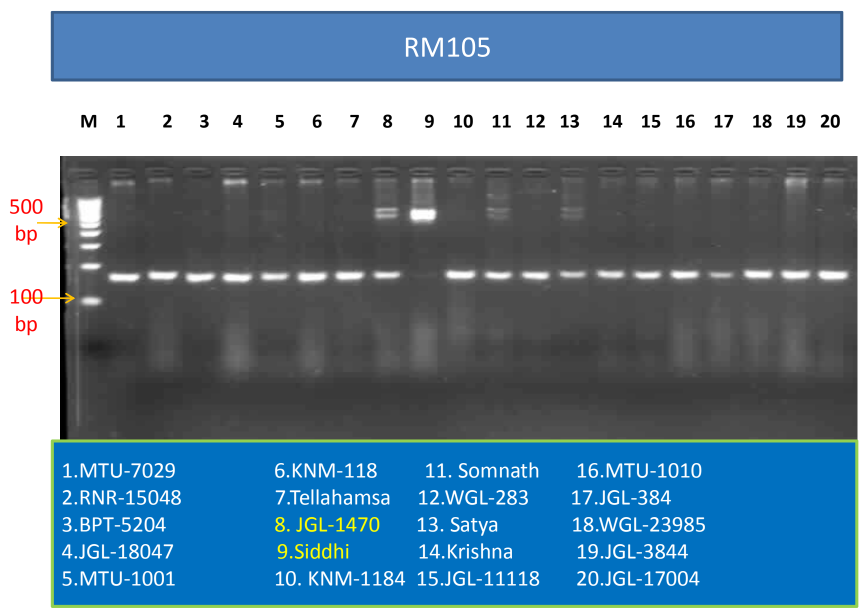
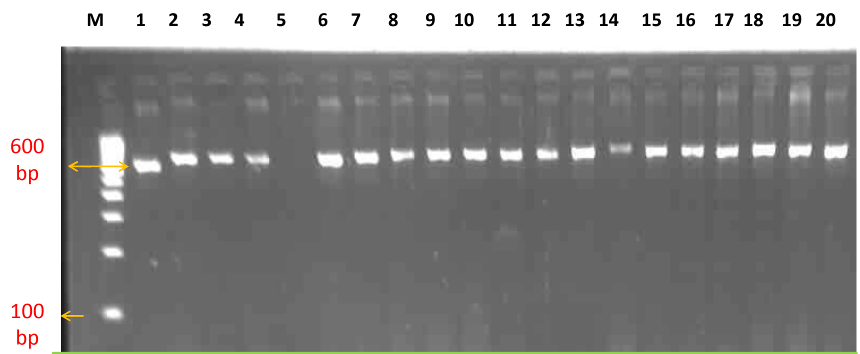


Plate: 1 Amplification pattern rice DNA with the marker RM 105
Lanes 1-20: Rice cultivars as given in Table below Lane M: 100bp DNA

RM 312



1.MTU-7029	6.KNM-118	11. Somnath	16.MTU-1010
2.RNR-15048	7.Tellahamsa	12.WGL-283	17.JGL-384
3.BPT-5204	8. JGL-1470	13. Satya	18.WGL-23985
4.JGL-18047	9.Siddhi	14.Krishna	19.JGL-3844
5.MTU-1001	10. KNM-1184	15.JGL-11118	20.JGL-17004

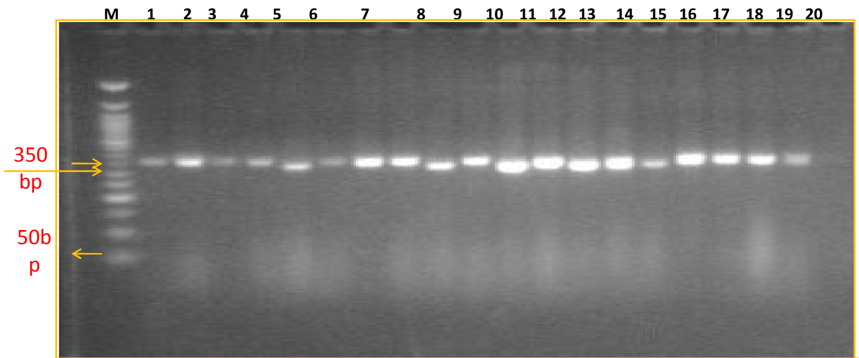
Plate: 2 Amplification pattern rice DNA with the marker RM 312
Lanes 1-20: Rice cultivars as given in Table below Lane M: 100bp DNA

RM511

1.MTU-7029	6.KNM-118	11. Somnath	16.MTU-1010
2.RNR-15048	7.Tellahamsa	12.WGL-283	17.JGL-384
3.BPT-5204	8. JGL-1470	13. Satya	18.WGL-23985
4.JGL-18047	9.Siddhi	14.Krishna	19.JGL-3844
5.MTU-1001	10. KNM-1184	15.JGL-11118	20.JGL-17004

Plate: 3 Amplification pattern rice DNA with the marker RM 511
Lanes 1-20: Rice cultivars as given in Table below Lane M: 100bp DNA

RM592



1.MTU-7029	6.KNM-118	11. Somnath	16.MTU-1010
2.RNR-15048	7.Tellahamsa	12.WGL-283	17.JGL-384
3.BPT-5204	8. JGL-1470	13. Satya	18.WGL-23985
4.JGL-18047	9.Siddhi	14.Krishna	19.JGL-3844
5.MTU-1001	10. KNM-1184	15.JGL-11118	20.JGL-17004

Plate: 4 Amplification pattern rice DNA with the marker RM 592
Lanes 1-20: Rice cultivars as given in Table below Lane M: 100bp DNA

Centre: UAS, Bangalore

Experimental details: Freshly harvested pure seeds of rice varieties, hybrids and parental lines were collected from Hybrid Rice Section, ZARS, VC Farm, Mandya. The details of paddy varieties and hybrids used for the study have been given in table 1.

Table 1: Details of paddy varieties and hybrids with parental lines

Varieties		
MTU-1010	BR- 2655	BPT- 5204
MTU-1001	Jyothi	MAS- 26
Rathna Choodi	Thanu	CTH- 1
Jaya	Thunga	Raksha
MAS 946-1	Gangavathi Sona	Mandya Sona-3
JGL-1798	Mandya Sona-1	Mandya Sona-2
ARB- 6	KMP-128	KMP-175
KMP-153	KMP-200	KMP-201
Thella hamsa	Rasi	CTH-3
Raja mudi	IR-64	IR-30864
Hybrids with parental lines		
Hybrid	A line	R line
KRH- 4	CRMS -32A	MSN- 36
KRH-2	IR- 58025	KMR-3

Screening of these lines with identified polymorphic markers was carried for validation of identified markers and also some new primers were studied along with previously identified primers. The hybrid KRH-2 and KRH-4 and its parental lines were characterized using 96 SSR primers distributed uniformly across the chromosome.

Results: Among the used SSR primers, 5 primers showed complementary banding pattern between hybrid KRH-2 and its parental lines with different amplicons. SSR markers RM 234, RM 276, RM 202, RM 206 were found to be polymorphic from earlier study is added to this one more primer identified for KRH-2 i.e., RM 164 (Plate 5). In KRH-4 paddy hybrid, SSR markers RM-206, RM-276, RM-202, RM-204, RM-263, RM-216, RM-219, RM-6844, RM-1385, RM-6696, RM-21 RM-209, RM-7279, RM-336 were found to be polymorphic primers from earlier study added to these, there are three primers were identified as polymorphic RM 444, RM 228 and RM 258. The SSR primer RM 204 was found polymorphic at 185bp and 145bp in MTU 1010 and IR-64 varieties, respectively. The SSR primer RM 6696 was found polymorphic at 130bp and 150bp in Rasi and CTH-1 varieties, respectively, however polymorphism with SSR primer RM 70 was observed in CTH-3 at 140bp and IR-58025A at 110bp (Plate 6-8). There were some variety/hybrid specific polymorphic SSR markers and SSR marker combinations suitable for multiplexing identified (Table 2).

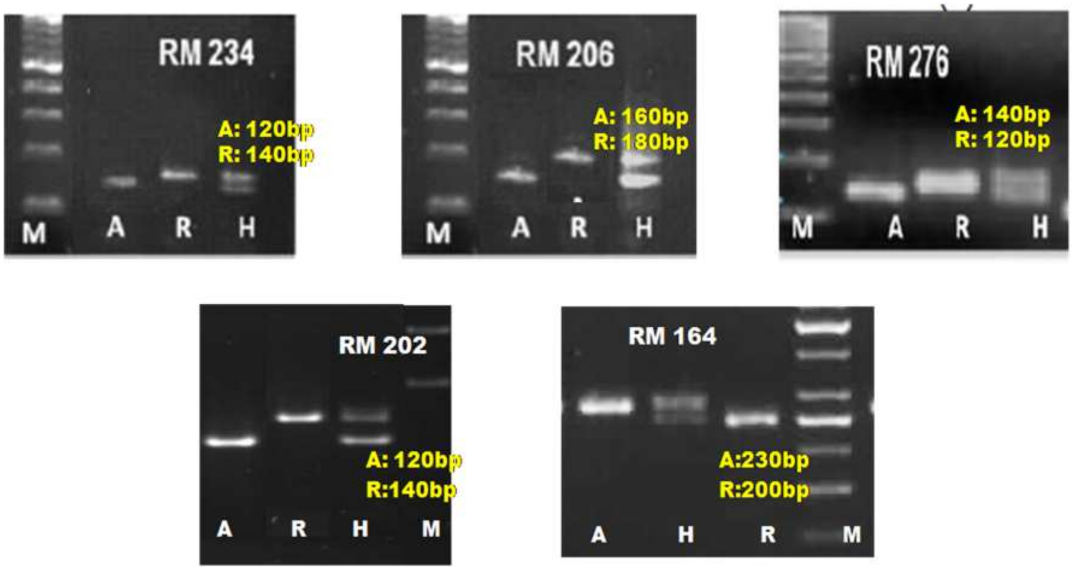


Plate 5: Polymorphic banding pattern of parental lines and rice hybrid (KRH-2) using SSR primers

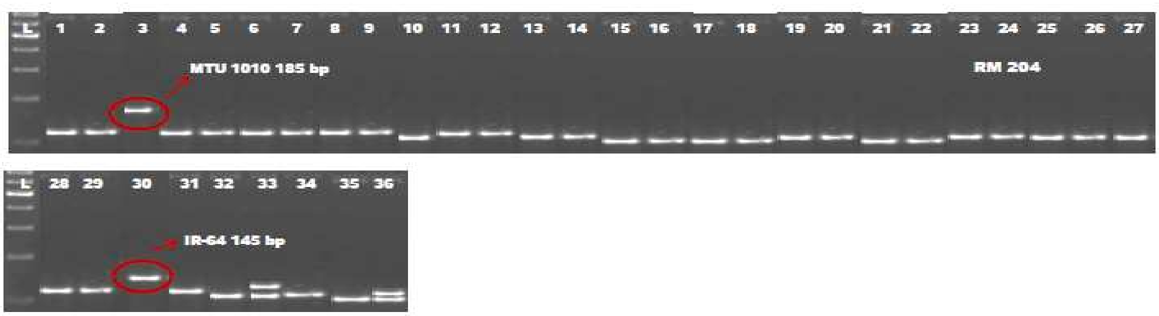


Plate 6: Polymorphic banding pattern of MTU 1010 verity at 185bp and IR-64 at 145bp with RM 204 SSR primer

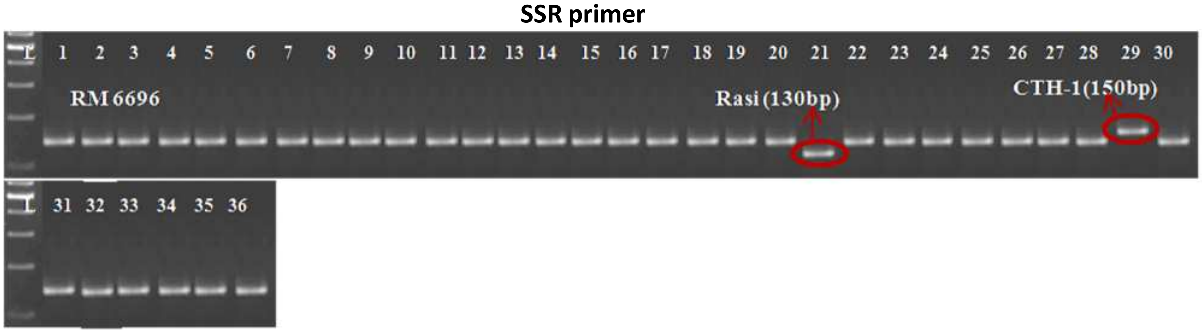


Plate 7: Polymorphic banding pattern of Rasi variety at 130bp and CTH-1 at 150bp with RM 6696 SSR primers

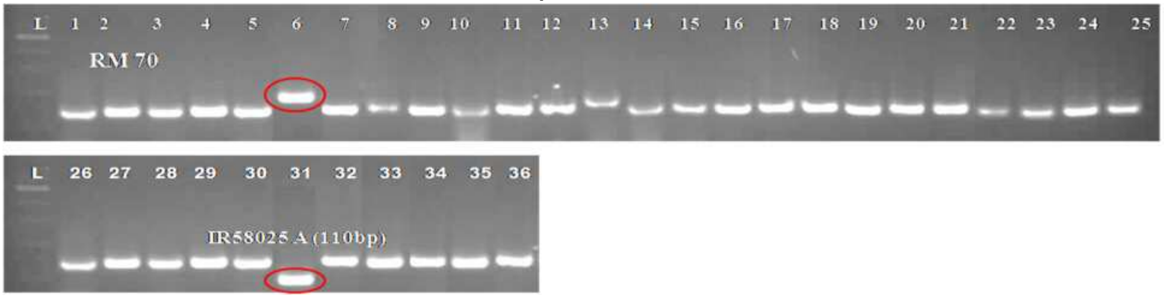


Plate 8: Polymorphic banding pattern of CTH-3 at 140bp and IR-58025A at 110bp with RM 70 SSR primer

Table 2: Identified unique SSR Markers for varieties

Varieties / Hybrids	Unique Polymorphic SSR Markers	SSR marker combinations suitable for multiplexing
BR-2655	RM10103	RM10103 + RM982
Jyothi	RM-961,RM-9 & RM-19	RM9106 + RM98
KCP-1	RM-551	RM 982 + RM 81057
Thanu	RM-19 & RM-3323	RM 982 + RM9310
Jaya	RM-10107 & RM-551	RM 9a9 + RM 913
MTU1010	RM9a2, RM-258, RM-836 & RM-231	RM 982 + RM9310
MTU1001	RM9a9	RM 982 + RM 81057
Thunga	RM-55	-
CTH-3	RM-70	-
IR-58025A	RM-70	-
IR-30864	RM-53	-
BPT-5204	RM-334	-
CTH-1(KH-14)	RM-1912, RM- 3323	-
MAS-26	RM9a3	-
Rasi	RM- 6696	-
KRH-2	RM-276, RM-202, RM-234, RM-206, RM- 164	RM-276 + RM-206
KRH-4	RM-21, RM-7279, RM-263, RM-216, RM- 444, RM-204	RM-263 + RM-216

Conclusion: Out of 96 microsatellite primers studied sixty five were found to be polymorphic markers among the thirty rice lines and two hybrids studied. Forty two markers amplified a specific allele among the thirty six rice lines studied. The experiment is in progress.

Centre: TNAU, Coimbatore

Experimental details: Four new varieties of rice viz.; CO (R) 51, ADT (R) 50, CR 1009 sub 1 and TKM 13 were taken for this study.

Results: Among the various SSR markers; RM 407 showed polymorphism for CR 1009 (Sub 1), RM 490 exhibited polymorphism for the variety ADT (R) 50 and RM 3769 showed polymorphism for the variety TKM 13 between four varieties tested (Table 3 & Plate 9,10).

Table 3: Specific SSR markers identified for ADT(R) 50, TKM 13 and CR 1009 (Sub) 1.

Marker	Annealing Temperature (^{0}C)	CO (R) 50	ADT (R) 50	TKM 13	CR 1009 (Sub 1)
RM 324	55^{0}C	156.60 bp	156.60 bp	178.79 bp	178.79 bp
RM 407	55^{0}C	182.62 bp	184.62 bp	186.23 bp	**175.18 bp**
RM 490	55^{0}C	116.52 bp	**110.73 bp**	116.52 bp	116.52 bp
RM 514	55^{0}C	292.62 bp	269.40 bp	292.64 bp	269.40 bp
RM 3769	50^{0}C	103.72 bp	97.30 bp	**116.77 bp**	100.92 bp
RM 5424	50^{0}C	216.22 bp	211.22 bp	212.87 bp	- - - -

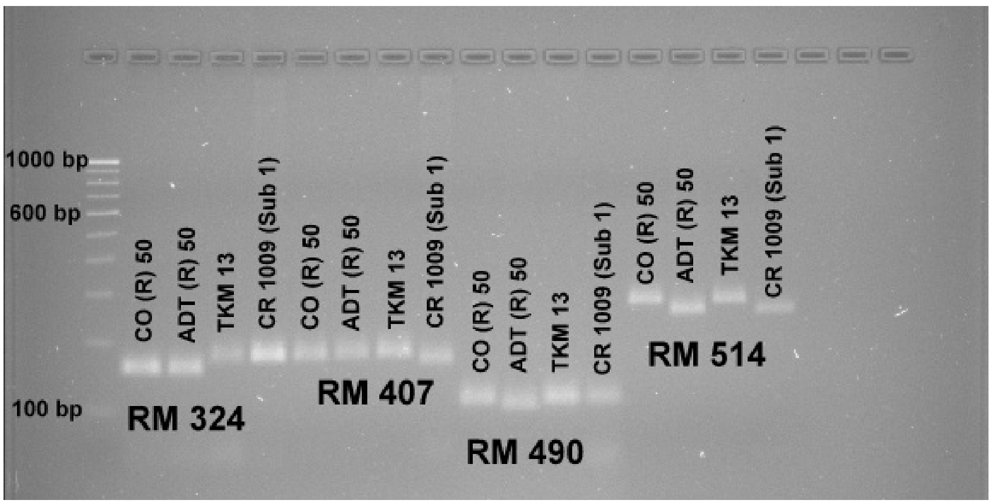


Plate 9: SSR markers RM 407 and RM 490 showing polymorphism for CR 1009 (Sub 1) and ADT (R) 50 varieties

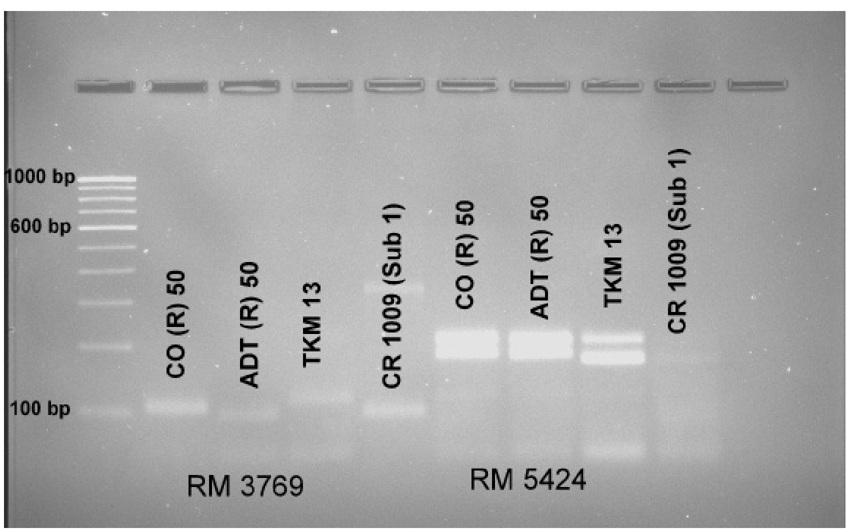


Plate 10: SSR marker RM 3769 exhibiting polymorphism for TKM 13 variety

Centre: CSKHPAU, Palampur

Experimental details: In the present study, a total of 48 SSR markers which were dispersed throughout the 12 chromosomes were used (Table 4) to assess the extent of genetic diversity across 12 rice genotypes (Table 5).

Table 4: Number of scorable and polymorphic SSR bands along with their fragment size generated by 20 primers.

Sl. No.	Marker	Number of fragments/alleles	% Polymorphism	PIC	Chromosome Number	Fragments Size (bp)
1	*RM5314*	3	67	0.50	6	300-360
2	*RM8267*	3	67	0.46	3	220-250
3	*RM21304*	3	67	0.37	7	210-260
4	*RM15326*	4	75	0.42	3	210-270
5	*RM16781*	3	67	0.59	4	180-240
6	*RM27328*	3	67	0.18	11	250-290
7	*RM23708*	3	67	0.08	9	200-210
8	*RM28697*	3	67	0.51	12	210-250
9	*RM8120*	2	50	0.50	6	280-300
10	*RM25137*	2	50	0.23	10	250-290
11	*RM10162*	2	50	0.46	1	220-270
12	*RM23201*	3	67	0.56	8	190-220
13	*RM26440*	4	75	0.46	11	160-200
14	*RM23998*	3	67	0.51	9	180-210
15	*RM14375*	2	50	0.42	3	2030-260
16	*RM14095*	2	50	0.58	2	190-200
17	*RM27328*	2	50	0.46	11	230-250
18	*RM23968*	2	50	0.31	9	230-280
19	*RM26440*	3	67	0.41	11	160-190
20	*RM21304*	3	67	0.28	7	210-270
21	*RM27558*	2	50	0.43	12	200-230
22	*RM10352*	2	50	0.54	1	260-280
23	*RM18874*	2	50	0.49	5	230-270
24	*RM22073*	3	67	0.54	7	200-240
25	*RM22863*	5	100	0.61	8	220-280
26	*RM22870*	3	67	0.39	8	180-200
27.	*RM28160*	2	50	0.47	12	210-240
	Total	**74**	**1671**	**12.67**		
	Mean	**2.74**	**61.88**	**0.422**		

Table 5: Rice cultivars/improved lines/landraces and their sources

Sr. No.	Varieties	Source	Year of release	Source/Pedigree
1.	HPR-2143	CSKHPKV, Palampur	2005	HPR 9020-22-2-1-1-1 PhulPatas × HUP 741
2.	HPR-2682	Do	Improved lines	Him dhan-1 × IR-53915
3.	HPR-2687	Do	do	VL Dhan-221 × RP2421 ×× IR53925
4.	HPR-2697	Do	do	957 × RP-2421
5.	HPR-2699	Do	do	RP-2421 × VL dhan-221
6.	HPR-2707	Do	do	VL dhan-221 × JD-3

Sr. No.	Varieties	Source	Year of release	Source/Pedigree
7.	HPR-2711	Do	do	TS-29 × HPV-2216
8.	HPR-2766	Do	do	HIM-1 × IR-53915
9.	HPR-2748	Do	do	HessanSerai × T23 ×IR66295
10.	HPR-2746	Do	do	HessanSerai ×T23 ××IR66295-36-2
11.	Chinudhan	Jandrangal	Landraces	Villege-Jandrangal
12.	Jhinidhan	Timber	do	Pritam Chand. Dadh-Timber

Results: Out of 48 SSR markers tested, 27 were found to be polymorphic, 3 monomorphic and 25 did not amplify. The details of primers used in the study and their PIC value and fragments size are given in table 4. Out of 27 polymorphic primers only few can be used as unique primers for the identification of the specific variety/line. Marker RM22863 present on chromosome 8 and amplified the fragment size of 220-280 can be used to characterize the varieties namely HPR2143, HPR2697 and HPR2711 (Plate 11). In these three varieties the amplified fragment was of 220bp whereas in other varieties and line the fragment size of 280 bp. To further differentiate these varieties from each other another primers namely RM15326 can be used, which differentiate HPR2143 from the rest of the two varieties viz HPR2697 and HPR2711.

1: HPR2143; 2: HPR2682;3:HPR2687; 4:HPR2697; 5:HPR2699;6:HPR2707
7:HPR2711; 8:HPR2766;9:HPR2748;10:HPR2746;11:CHINUDHAN;12:JHINIDHAN

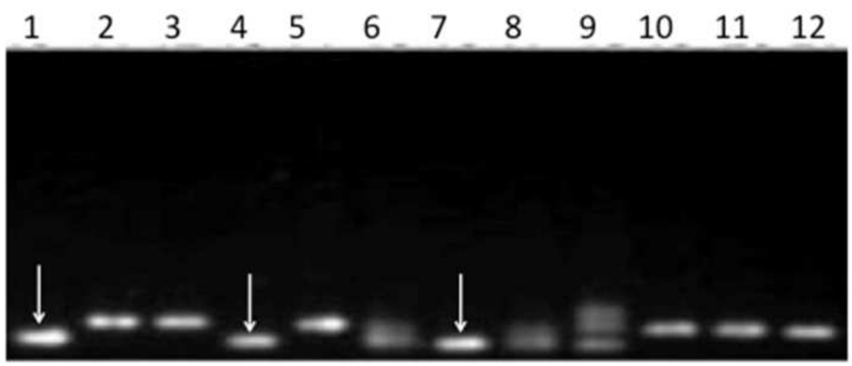


Plate 11: SSR Marker RM22863 showing amplification specific to HPR2143 (1), HPR2697 (4) and HPR2711 (7) varieties

Centre: ICAR-IISS, Mau

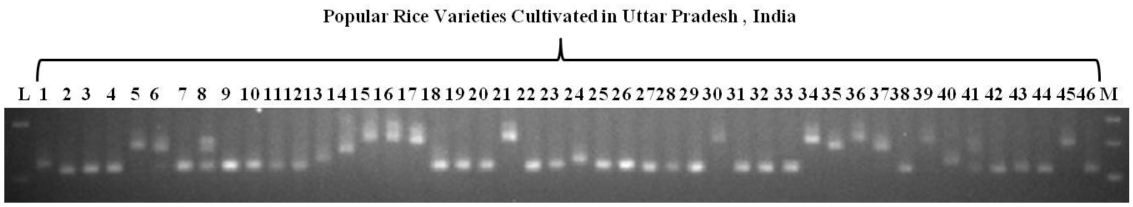
Experimental details: ICAR-Indian Institute of Seed Science (ICAR-IISS), Mau has been assigned to develop variety/parental lines/ hybrid specific markers in paddy. As of now, ICAR-IISS had released no rice hybrids for cultivation in India. However, major rice hybrids such as DRRH-3, PSD-1, PSD-3, PRH-10 and NDRH-2, which are released and recommended for cultivation in Uttar Pradesh were chosen for identification of hybrid specific SSR makers in Paddy. Moreover, molecular characterization of major cultivated varieties of paddy in the country and in Uttar Pradesh state were also selected for identification of variety specific SSR makers in Paddy. The PCR conditions performed in the study is given in Table-6.

Table 6: PCR reaction conditions for the experiments

Template	25 ng	PCR reaction
Buffer	1X	94^{o}C for 5 min
dNTP	200 µMole	94^{o}C for 1 min

Primer (F)	1 µMole	55°C for 1 min
Primer (R)	1 µMole	72°C for 2 min
***Taq* DNA polymerase**	1 Unit	72°C for 7 min
Water	Up to 25 1 µl	-

Results: The identification of RM228 molecular marker (Simple sequence repeat markers) for differentiating DRRH3 rice hybrid from 23 major paddy hybrids and its parental line cultivated in India and revalidated this informative marker in 46 major rice varieties cultivated in Uttar Pradesh (Plate 12 &



13).

Plate 12: Molecular characterisation of parental lines rice hybrids using SSR marker

Legends from left: L (100bp DNA ladder), 1. DR174-R, 2. IR68897-A, 3. RPHR-1005R, 4., 5. APMS-6A, 6. KMR-3R, 7. IR58025A, 8. MSN36R, 9. CRMS-32A, 10. CB87R, 11. TNAU-CMS2A, 12. CB174-R, 13. COMS32A, 14. UPARI93-133R, 15. UPARI95-17A, 16. UPARI93-287R, 17. UPARI95-17A, 18. sahyadri R, 19. sahyadri A, 20. sahyadri 2R, 21. sahyadri 2A, 22. sahyadri 3R, 23. sahyadri 3A, 24. sahyadri 4R, 25. sahyadri 4A, 26. sahyadri 5R, 27. sahyadri 5A, 28. R-710 Indirasona R, 29. 25A, 30. PR78 R, 31. PUSA 6A, 32. Rajalakshmi R, 33. Rajalakshmi A, 34. Ajay R, 35. Ajay A, 36. CR Dhan 701-R, 37. CR Dhan 701-A, 38. NDR3026-3-1-R, 39. IR 58025 A, 40. NDRK-5026-1R, 41. JRH 5R, 42. JRK 5A, 43. JRH 8R, 44. JRH8 A, and M (Low range DNA ladder plus).

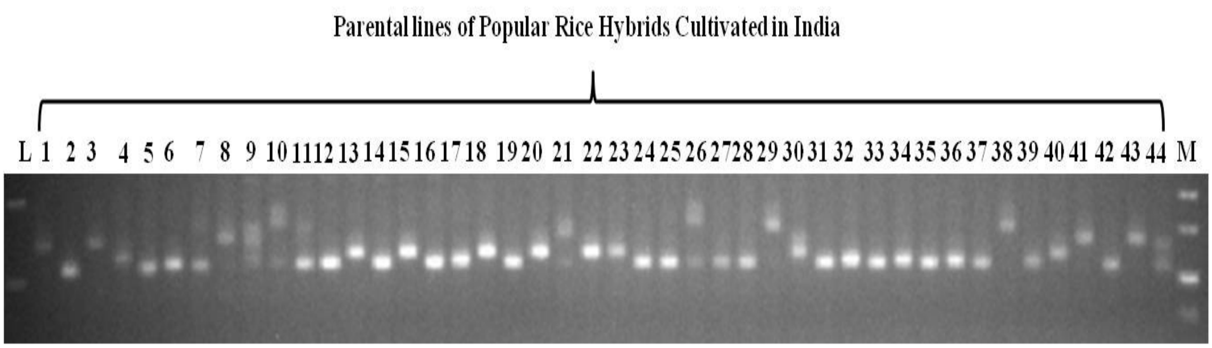
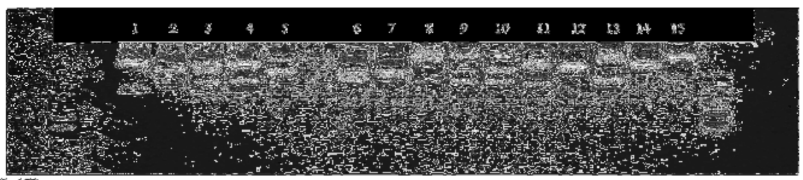


Plate 13: DNA fingerprinting of fourty six rice varieties cultivated in Uttar Pradesh using RM228 SSR marker.

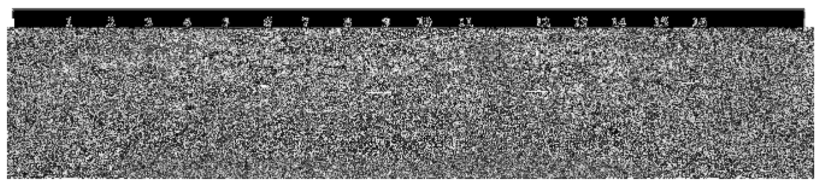
Legends from left: L (100bp DNA ladder), 1. Sahbhagi Dhan, 2. HUBR 2-1, 3. HUR-105, 4. MTU-7029, 5. BPT 5204, 6. HUR 36, 7. HUR4-3, 8. Pant Dhan-6, 9. Pant Dhan-11, 10. Govind, 11. Narendra 359, 12. Pant Sugandh Dhan-17, 13. Pant sugandh15, 14. IR64, 15. HUR 3022, 16. IDR 763, 17. Swarna sub1, 18. HKR-47, 19. Pant Dhan-4, 20. Kranti, 21. Pant Dhan-12, 22. Sarju 52, 23. PB 1, 24. Lalmati, 25. Usar3, 26. Shukhsamart, 27. NDR 2064, 28. Sugandha 5, 29. NDGR-201, 30. Pant Dhan 10, 31. Pant Dhan19, 32. Pant Dhan 18, 33. Naveen, 34. IR 36, 35. NDR 3112, 36. Godawari, 37. Pant Dhan 16, 38. MTU 1010, 39. Pusa sugandha 4, 40. Type-3, 41. Barnideep, 42. NDR-8002-1, 43. PB-6, 44. PR 118, 45. PB 1509, 46. Kalanamak and M (Low range DNA ladder plus).

For the study, 100 SSR markers were chosen to amplify the regions encompassing 12 chromosomes of rice genome. From the results, it was observed that 31 markers were able to amplify a total of 512 different alleles. In which, some of the bands are monomorphic in nature which substantiates the homogeneity in rice genome. However, a marker has showed polymorphism with an average of 1.66 allelic variants per SSR locus. Since this marker has showed a unique pattern of identification of variety it may be used for further validation. Hybrids recommended in the Uttar Pradesh region were indentified with RM228 and has showed its potential as unique marker. It could be included not only to identify the hybrids and but also to determine the seed lot purity.

In addition, RM-452 and RM-316 have showed polymorphism 15 paddy varieties cultivated at ICAR-IISS farm. These SSR markers are able to differentiate 15 notified paddy varieties with unique banding pattern (Plate 14).



RM-452
Ladder , 1- [illegible], 2- [illegible], 3- [illegible], 4- [illegible], 5- [illegible], 6- [illegible], 7- [illegible], 9- [illegible], 10- [illegible], 11- [illegible], 13- [illegible], 13- [illegible], 14- [illegible], 15- [illegible], 16- [illegible], Ladder



RM-316
Ladder , 1- [illegible], 2- [illegible], 3- [illegible], 4- [illegible], 5- [illegible], 6- [illegible], 7- [illegible], 8- [illegible], 9- [illegible], 10- [illegible], 11- [illegible], 12- Rajendra Bhagwati, 13- [illegible], 14- [illegible], 15- [illegible], 16- [illegible], Ladder

Plate 14: RM-452 and RM-316 SSR markers and their differentiating ability of 15 paddy varieties cultivated at ICAR-IISS, Mau.

Centre: AAU, Jorhat

Results: Rice varieties present in seed chain were utilized for DNA fingerprinting and PCR analysis for identification of polymorphic markers unique for variety/ using SSR microsatellite marker. The centre is using trait linked markers and phenotyping of the grains to identify unique diagnostic key markers for individual variety (Plate 15-17).

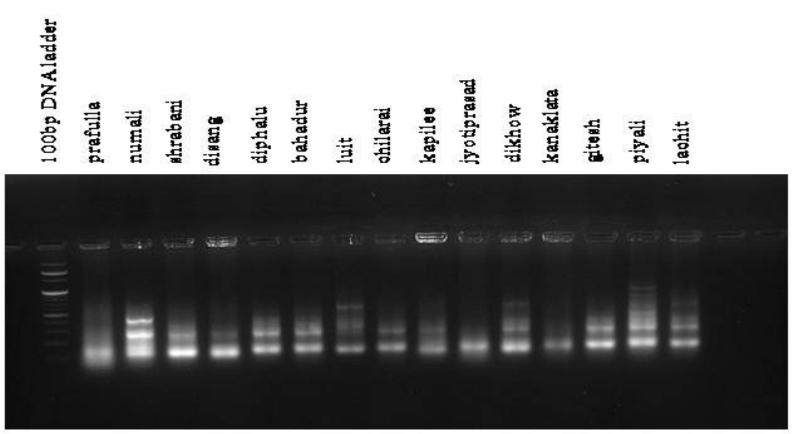


Plate 15: Primer RM-287 (Linked Trait: Protein content)

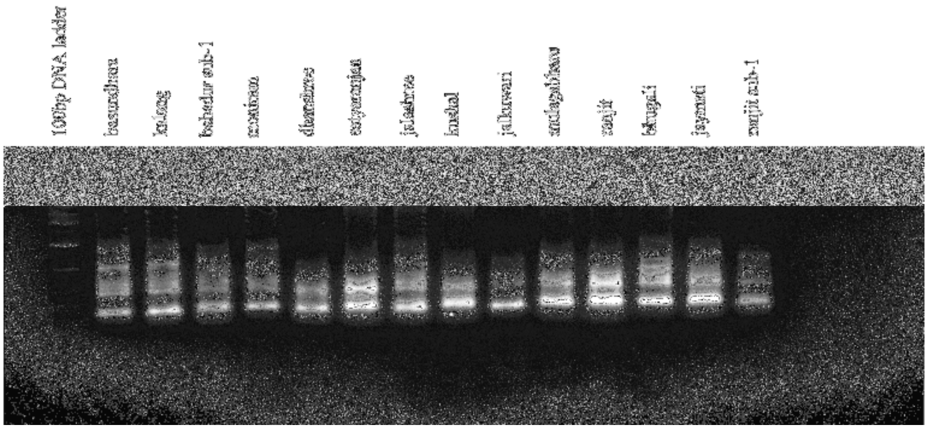


Plate 16: Primer RM-287 (Linked Trait: Protein content)

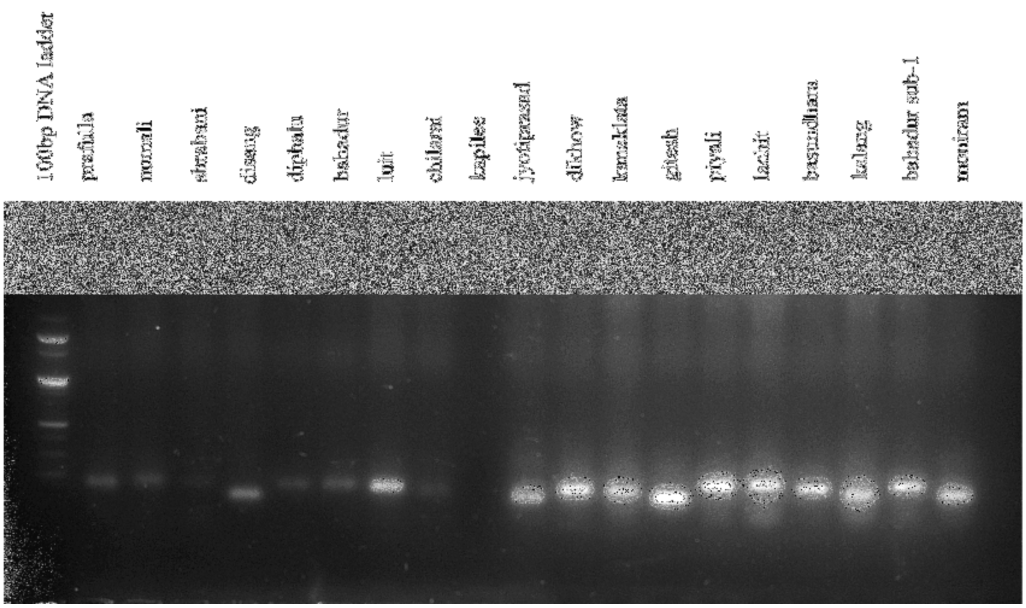


Plate 17: Primer RM-206 (Linked Trait: Grain size)

Centre: RARS, KAU, Patambi (STR Voluntary centre)

Experimental details: The study was conducted with 58 popular rice varieties released from Kerala including recent high yielding varieties; Annapoorna, Jyothi, Swarnaprabha, MattaTriveni, Neeraja, Kanchana, Aathira, Aiswarya, MangalaMahsuri, Karuna, Harsha, Varsha, Swetha, Anashwara, Samyuktha and Vaishak, present in the seed chain. The selected genotypes were raised and genomic DNA was isolated using standard protocol. PCR amplification was standardized and amplified fragments were run on 2% Agarose gel. Reproducible bands were scored and consistency of the scored bands was checked by repeating the reaction.

Results: 31 SSR markers were used in the study among which 23 SSR markers showed polymorphism among the varieties studied (Plate 18-21). Number of bands ranged from 1(RM 234, 315, 319) to 5 (RM 152). Band size ranged from 35 bp (RM 334) to 327bp (RM 228). Out of 23 polymorphic SSR markers tested, 6 markers showed unique bands specific to varieties; Primer RM 433 Band (241 bp) specific to

PTB 54 Karuna (Plate), RM 3805 Band (157 bp) specific to PTB 43 Swarnaprabha (Plate) and RM 472 Band (273 bp) specific to PTB 43 Swarnaprabha (Plate), RM 55 band (204 bp) specific to PTB 44 Resmi, RM 228 band (327 bp) specific to PTB 7 Parambuvattan, (Plate), RM 525 Band (129 bp) specific to PTB 30 Chuvannamodan. The details of markers and polymorphic bands identified are as in table 7.

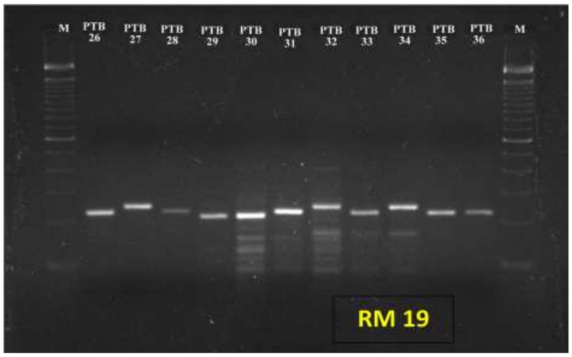


Plate 18: Polymorphism in rice varieties identified with SSR markers

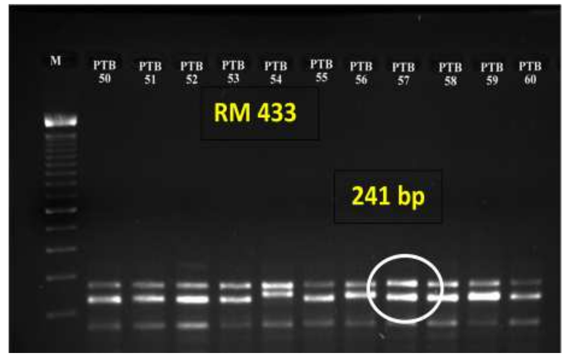


Plate 19: Unique SSR marker identified with RM 433

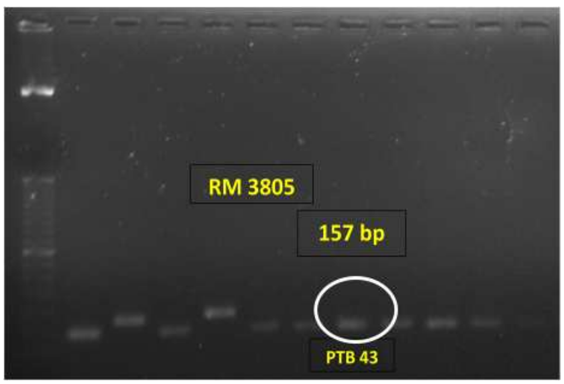


Plate 20: Unique SSR marker identified with RM 3805

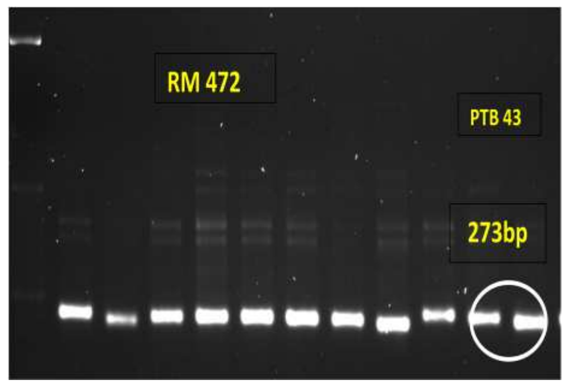


Plate 21: Unique SSR marker identified with RM 472

Table 7: Identification of variety specific SSR markers in rice at RARS, Pattambi

No.	Primer	No. of Bands	Range (bp)	Remark
1.	RM 19	3	200-230	
2.	RM 25	4	39-54	
3.	RM 44	3	70-129	
4.	RM 55	3	204-238	Band (204 bp) specific to PTB 44 Resmi
5.	RM 72	2	104-169	
6.	RM 152	5	54-133	
7.	RM 202	2	166-221	
8.	RM 212	3	78-140	
9.	RM 219	2	162-285	
10.	RM 225	2	204	
11.	RM 228	3	226-327	Band (327 bp) specific to PTB 7 Parambuvattan
12.	RM 234	1	175	
13.	RM 259	2	101-113	
14.	RM 263	2	119-159	
15.	RM 334	3	35-55	
16.	RM 336	2	183-221	

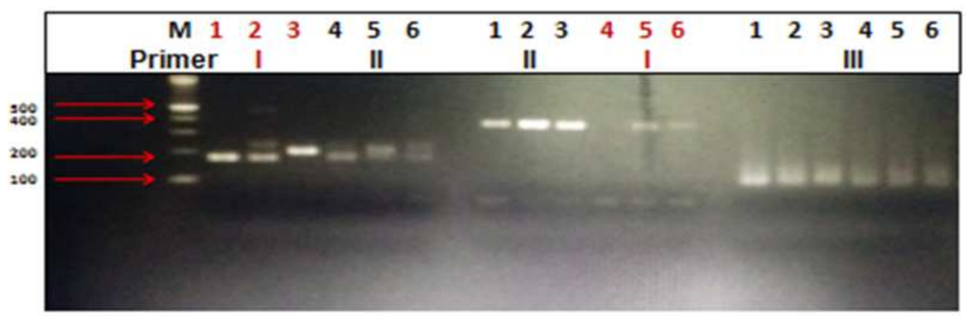
17.	RM 431	2	194-247	
18.	RM 433	3	228-267	Band (241 bp) specific to PTB 54 Karuna
19.	RM 518	2	124-230	
20.	RM 242	2	251-315	
21.	RM 302	2	114-169	
22.	RM 319	1	82	
23.	RM 315	1	88	
24.	RM 472	3	273-287	Band (273 bp) specific to PTB 43 Swarnaprabha
25.	RM 525	2	115-129	Band (129 bp) specific to PTB 30 Chuvannamodan
26.	RM 3805	3	89-157	Band (157 bp) specific toPTB 43Swarnaprabha

Crop: Maize

Centre: UAS, Dharwad

Experimental details: A total of 10 polymorphic SSR markers were employed for identifying hybrid specific markers.

Results: A primer named bnlg161k8 has confirmed Hybridity in CI 4 between maize parental lines P1 and P2 separating at around 170 and 210 bp respectively. And primer bnlg439w1 confirmed Hybridity in GPMH-1101 between parents KDMI (P1) and GH 0727 (P2) separating at 180 and 200 bp respectively (Plate 22).



M: Marker, 1: P1, 2: Hybrid CI4, 3: P2, 4: KDMI 15, 5: GH 0727, 6: Hybrid GPMH-1101

	Primer	Forward sequence	Reverse sequence
I	bnlgl61k8	TCTCAGCTCCTGCTTATTGCTTTCG	GATGGATGGAGCATGAGCTTGC
II	bnlg439w1	AGTTGACATCGCCATCTTGGTGAC	GAACAAGCCCTTAGCGGGTTGTC
III	UMC1394	CCCGAGTCAGAAAAACATTCACTT	CCTAACCTGAAGAAGGGAGGTCAT

Plate 22: Confirmation of Hybridity in GPMH-1101 using primer bnlg439w1

Centre: PAU, Ludhiana

Experimental details: Marker analysis using SSR for these 22 maize genotypes; PMH 1, PMH 3, PMH 5, PMH 6, PMH 9, LM-5, LM-12, LM-13, LM-14, LM-15, Buland, LM-16, LM-17, LM-18, LM-19, LM-19, LM-20, LM-23, LM-24, LM-139, LM-140 and Parkash was conducted.

Results: Total 42 markers were tested, only 20 markers showed amplification at 55/58^{0}C. All the 20 SSR markers revealed clear and consistent amplification profile (Table 8). Among these, two markers (bnlg1784 and bnlg149) showed monomorphic pattern. The remaining 18 SSR showed polymorphic pattern and amplified a total of 48 alleles (Plate 23). The number of alleles ranged from 2 to 5 (Table 9).

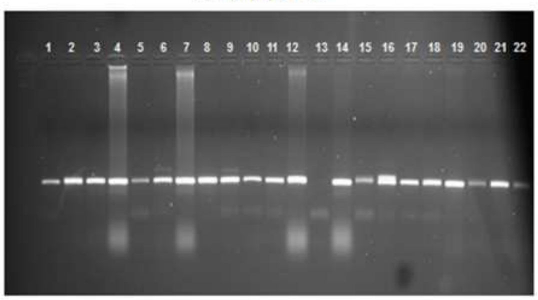
Table 8: Details of markers showing polymorphism in Maize (Total markers: 20)

Sl. no.	Type of markers	Number	Markers Name
1.	Polymorphic	18	Umc1420, Umc1185, Bnlg1265, Bnlg1638, Bnlg1178, Phi109642, Umc2206, Bnlg1124, Bnlg1331, Umc1662, Umc1534, Phi079, Umc1683, Phi076, Umc1082, Umc1833, Umc1099, Umc1552
2.	Monomorphic	2	Bnlg1784, Bnlg149

Table 9: Multiple Allelic expression of Maize using SSR markers

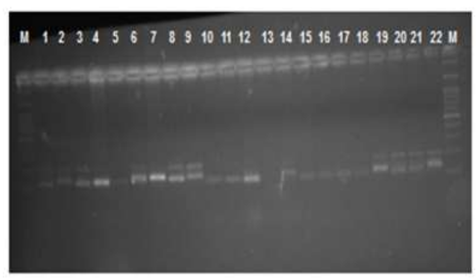
S. no.	Marker	Chr No	No. of Allele	Sr no.	Marker	Chr No	No. of Allele
1.	Umc1420	9	3	11.	Bnlg1331	1	2
2.	Umc1185	2	2	12.	Umc1662	4	3
3.	Bnlg1265	4	4	13.	Umc1534	1	2
4.	Bnlg1638	3	5	14.	Phi079	4	2
5.	Bnlg1784	4	1	15.	Umc1683	3	2
6.	Bnlg149	1	1	16.	Phi076	4	2
7.	Bnlg1178	1	3	17.	Umc1082	1	2
8.	Phi109642	2	2	18.	Umc1833	1	2
9.	Umc2206	4	2	19.	Umc1099	1	2
10.	Bnlg1124	1	2	20.	Umc1552	2	2

Primer UMC 1420



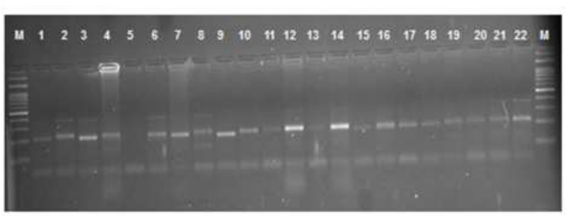
1.PMH-1 2.PMH-3 3.PMH-5 4.PMH-6 5.PMH-9 6.LM-5 7.LM-12 8.LM-13 9.LM-14 10.LM-15 11.LM-16 12.LM-17 13.LM-18 14.LM-19 15.LM-20 16.LM-22 17.LM-23 18.LM-24 19.CM-139 20.CM-140 21.BULAND 22.PRAKASH

Primer UMC 1185



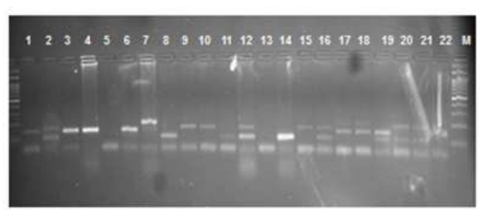
1.PMH-1 2.PMH-3 3.PMH-5 4.PMH-6 5.PMH-9 6.LM-5 7.LM-12 8.LM-13 9.LM-14 10.LM-15 11.LM-16 12.LM-17 13.LM-18 14.LM-19 15.LM-20 16.LM-22 17.LM-23 18.LM-24 19.CM-139 20.CM-140 21.BULAND 22.PRAKASH

Primer bnlg 1265



1.PMH-1 2.PMH-3 3.PMH-5 4.PMH-6 5.PMH-9 6.LM-5 7.LM-12 8.LM-13 9.LM-14 10.LM-15 11.LM-16 12.LM-17 13.LM-18 14.LM-19 15.LM-20 16.LM-22 17.LM-23 18.LM-24 19.CM-139 20.CM-140 21.BULAND 22.PRAKASH

Primer bnlg 1638



1.PMH-1 2.PMH-3 3.PMH-5 4.PMH-6 5.PMH-9 6.LM-5 7.LM-12 8.LM-13 9.LM-14 10.LM-15 11.LM-16 12.LM-17 13.LM-18 14.LM-19 15.LM-20 16.LM-22 17.LM-23 18.LM-24 19.CM-139 20.CM-140 21.BULAND 22.PRAKASH

Plate 23: Different markers showing polymorphism in Maize

Crop: Pearl millet

Centre: SKNAU, Durgapura

Experimental details: This experiment was conducted to identify unique marker for variety identification and maintenance of genetic purity in pearl millet. Five pearl millet hybrids along with their parents (Table 10) were sown in petri plates under control environment in the laboratory. In total, 15 SSR markers were used in this study to screen pearl millet hybrids (Table 11).

Table 10: Bajra hybrids and their parents taken for study of polymorphism at Durgapura, Jaipur

S. No.	Hybrid	Female Parent	Male Parent
1.	RMS6AX98-109	RMS6A	Inbred 98-109
2.	ICMA 843-22 X 58-64	ICMA 843-22	Inbred 58-64
3.	ICMA 843-22X 65-74	ICMA 843-22	Inbred 65-74
4.	ICMA 843-22 X 75-85	ICMA 843-22	Inbred 75/85
5.	ICMA 97111 A X 1-7	ICMA 977111	Inbred 1-7

Table 11: List of SSR markers along with their nucleotide sequences used to study the polymorphism in pearl millet at Durgapura, Jaipur.

Sr. No.	SSR marker	F/R	Primer sequence (5'-3')	T_m(^{0}C)
1	PSMP2069	F	CCCATCTGAAATCTGGCTGAGAA	60.6
		R	CCGTGTTCGTACAAGGTTTTGC	60.3
2	PSMP2090	F	AGCAGCCCAGTAATACCTCAGCTC	64.4
		R	AGCCCTAGCGCACAACACAAACTC	64.4
3	PSMP2246	F	CGGATGCTAAATTAACCGAAGC	58.4
		R	CCAGCTTGCTTCTGTTGCGTTC	62.1
4	PSMP2273	F	AACCCCACCAGTAAGTTGTGCTGC	64.4
		R	GATGACGACAAGACCTTCTCTCC	62.4
5	PSMP2088	F	AAGAAGCCACCAGCACAAAA	55.3
		R	TGCATGAAAGTAGAGGATGGTAAA	57.6
6	PSMP2089	F	TTCGCCGCTGCTACATACTT	57.3
		R	TGTGCATGTTGCTGGTCATT	55.3
7	PSMP2206	F	AGAAGAAGAGGGGGTAAGAAGGAG	62.7
		R	AGCAACATCCGTAGAGGTAGAAG	60.6
8	PSMP2237	F	TGGCCTTGGCCTTTCCACGCTT	64.0
		R	CAATCAGTCCGTAGTCCACACCCCA	66.3
9	PSMP2056	F	ACCTGTAGCTTCAAAATTCAAAAA	54.2
		R	AATTCAGTGTGATTTCGATGTTGC	57.6
10	PSMP2251	F	TCAAACATAGATATGCCGTGCCTCC	63.0
		R	CAGCAAGTCGTGAGGTTCGGATA	62.4
		R	GGTTAGTTTGTTTGAGGCAAATGC	53.9
11	PSMP2086	F	CGCTTGTTTTCCTTTCTTGCTGTT	59.3
		R	CCTTCTCAGATCCTGTGCTTTCTT	61.0
12	PSMP2001	F	CATGAAGCCAATTAGGTCTC	55.3
		R	ACCATCTGACTTGTTCTTATCC	56.5
13	PSMP2248	F	TCTGTTTIGTTTGGGTCAGGTCCTTC	63.2
		R	CGAATACGTATGGAGAACTGCGCATC	64.8
14	PSMP2224	F	GGCGAATTGGAATTCAGATTG	55.9
		R	CGTAATCGTAGCGTCTCGTCTAA	60.6
15	PSMP2263	F	AAAGTGAATACGATACAGGAGCTGAG	61.6

Sr. No.	SSR marker	F/R	Primer sequence (5'-3')	T_m(^{0}C)
		R	CATTTCAGCCGTTAAGTGAGACAA	59.3

Results: Among these, few SSR markers showed polymorphism between the varieties used in this study (Plate 24). Study with some more SSR markers is in progress.

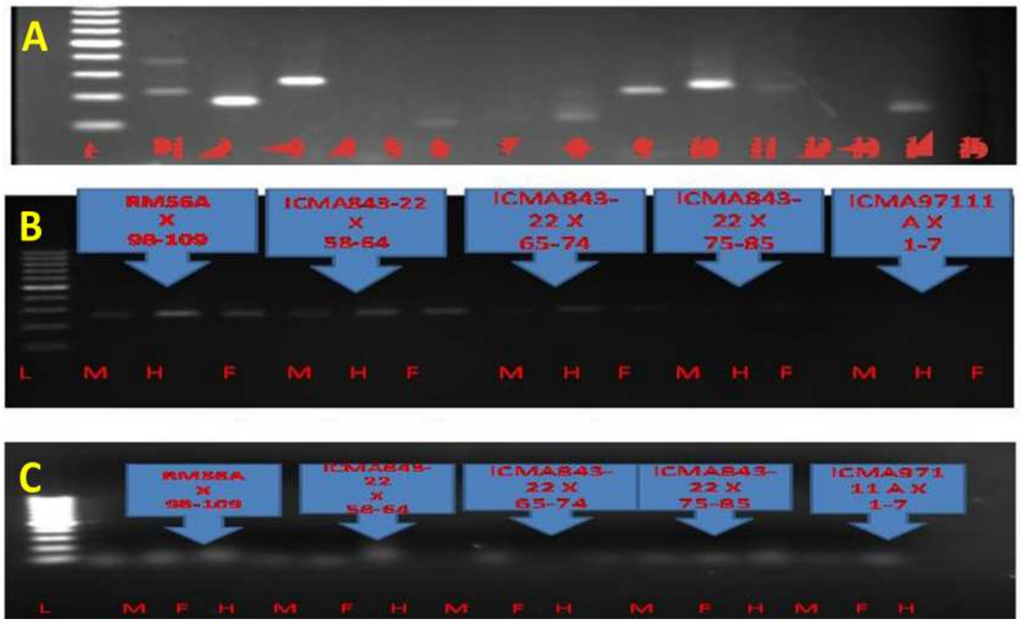


Plate 24: A. Screening of 15 SSR markers in pearl millet. B. Gel Analysis of PCR product using primer PSMP2246 and C. Gel Analysis of PCR product using primer PSMP2246

Crop: Soybean

Centre: JNKVV Jabalpur

Experimental details: The experiment was taken up to develop the hybrid specific markers that are capable of detecting contamination in the hybrid seed lot due to pollen shedders/ volunteer plants/ partials/ parental seeds and of types due to other varieties and hybrids seeds and to identify a unique SSR marker for varietal identification and maintenance of genetic purity. Details of primers used in varietal purity testing with their sequence have been given in table 12. To carry out the work genomic DNA from fresh leaves of eight different soybean varieties; JS 97-52, JS 20-29, JS 20-69, JS 20-34, JS 93-05, JS 95-60, JS 20-98 and JS 335 was isolated at seedling stage following the CTAB method with some modifications. Quantification of DNA was accomplished by analyzing the DNA on 0.8% agarose gel stained with ethidium bromide using diluted uncut lambda DNA as standard.

The reaction for PCR amplification was prepared as follows:
PCR reaction (12 µl)

Contains	**Volume for one spls. In µl**
Template DNA	1.0
Sterile water (MQ)	4.25
2x PCR master mix	6.25
Primer (F/R)	0.25 each
Grand total	12.0

The reaction mixture was given a momentary spin for through mixing of the reaction components. Then PCR tubes were loaded in a thermal cycler. The reaction in thermal cycler was programmed as follows:

Profile 1:	95^0 C for 5 minutes	Initial denaturation
Profile 2:	95^0 C for 30 seconds	Denaturation
Profile 3:	50-55^0 C for 30 seconds	Annealing
Profile 4:	72^0 C for 30 seconds	Extension
Profile 5:	72^0 C for 7 minutes	Final extension
Profile 6:	4^0 C	Hold the sample

Results: To verify the extent of contamination with other varieties grown nearby or threshed in the same threshing floor and processed in the same processing plant, the present experiment was undertaken with eight soybean varieties. A total of 56 markers showed polymorphism. Out of that, eighteen unique SSR markers were identified for eight varieties (Table 13).

Table 12: List of primers used in varietal purity testing with their information at JNKVV, Jabalpur 2016-17

Primers	Reverse sequence	Forward sequence	Amplification temperature (°C)
Satt 146	GTG GTGGTGGTG AAA ACT ATT AGA A	AAG GGA TCC CTC AAC TGA CTG	55
Sat_268	GCG TGA GGA GGT TCA AAA ATA ACA T	GCG TGC AAC ATA TGA CAC CAT AAA T	55
Satt 270	GCG CAG TGC ATG GTT TTC TCA	TGT GAT GCC CCT TTT CT	55
Satt 207	GCG ATT GTG ATT GTA GTC CCT AAA	GCG TTT TTC TCA TTT TGA TTC CTA AAC	55
Satt 369	GCG AGT TCG AAT TTC TTT TCA AGT	AAC ATC CAA AGA AAT GTG TTC ACA A	55
Satt 309	GCG CCT TAA ATA AAA CCC GAA ACT	GCG CCT TCA AAT TGG CGT CTT	55
Sat_243	GCG GCA ACC GCT TAA AAA TAA TTTAAG AT	GCG ATG TCG AAT GAT TAT TAA TCA AAA TC	55
Satt 152	TAG GGT TGT CAC TGT TTT GTT CTT A	GCG CTA TTC CTA TCA CAA CAC A	55
Sat_167	TTG AGC CGA AAG TTC AAT TCT A	AAG GCA CTC TTC CAT CAA TAC AA	52
Satt 529	GCA CAA TGA CAA TCA CAT ACA	GCG CAT TAA GGC ATA AAA AAG GAT A	52
Satt 441	AAA TGC ACC CAT CAA TCA CA	AAA CCC ACC CTC AAA AAT AAA AA	52
Satt 598	CAC AAT ACC TGT GGC TGT TAT ACT AT	CGA TTT GAA TAT ACT TAC CGT CTA TA	52
Satt 453	TAG TGG GGA AGG GAA GTT ACC	GCG GAA AAA AAA CAA TAA ACA ACA	52
Satt 318	GCG ATA TTT ATA TGG CCG CTA AG	GCG CAC GTT GAT TTT TTT ATA GTA A	52
Satt 671	GCG AGA AAT GAG ATA AGT GGT GAT A	GCG TAA ATC CAA AAG TAG AAT AAA ATA A	52
Satt 386	CTT CGT TGA TAC CTC AGT AGA GTA CAA A	GCG GAT GAT TTT TAT AGA ATA GAT AAT	52
Satt 281	TGC ATG GCA CGA GAA AGA AGT A	AAG CTC CAC ATG CAG TTC AAA AC	55
Satt 215	CCC ATT CAA TTG AGA TCC AAA ATT AC	GCG CCT TCT TCT GCT AAA TCA	55
Satt 244	GCG ATG GGG ATA TTT TCT TTA TTA TCA G	GCG CCC CAT ATG TTT AAA TTA TAT GGA G	55
Satt 431	GCG CAC GAA AGT TTT TCT GTA ACA	GCG TGG CAC CCT TGA TAA ATA A	55
Satt 519	CCG CAA GGT TAC GAA CTG CTC GAA	GGA TTT CAA AGA ATG AAC ACA GA	55
Satt 523	GCG CTT TTT CGG CTG TTA TTT TTA ACT	GCG ATT TCT TCC TTG AAG AAT TTT CTG	55
Satt 353	GCG AAT GGG AAT GCC TTC TTA TTC TA	CAT ACA CGC ATT GCC TTT CCT GAA	55
Satt 414	GCG TCA TAA TAA TGC CTA GAA CAT AAA	GCG TAT TCC TAG TCA CAT GCT ATT TCA	55
Sat_124	GGG AGT TCA AAC ATC CAT TAG TGG TAT A	GGG TCC ATT CCA CTT TTT GTA CAA TAT	55
Satt 552	GAT CCG CAT TGG TTT CTT ACT T	CGA ACC GGC AAA ACC AAG AT	55
Satt 294	GCG CTC AGT GTG AAA GTT GTT TCT AT	GCG GGT CAA ATG CAA ATT ATT TTT	55
Satt 285	GCG GAC TAA TTC TAT TTT ACA CCA ACA AC	GCG ACA TAT TGC ATT AAA AAC ATA CTT	55

Satt 538	GGG GCG ATA AAC TAG AAC AGG A	GCA GGC TTA TCT TAA GAC AAG T	55
Satt 156	CCA ACT AAT CCC AGG GAC TTA CTT	CGC ACC CCT CAT CCT ATG TA	55
Sat_107	GGA GGA ATT ATT TGG GTT GTA C	TTT GGA AGT ATA AAA TTA TGA ATG ACT	50
Satt 045	ATG CCT CTC CCT CCT	TGG TTT CTA CTT TCT ATA ATT ATT T	50
Satt 160	CAT CAA AAG TTT ATA ACG TGT AGA T	TCC CAC ACA GTT TTC ATA TAA TAT A	50
Satt 267	CAC GGC GTA TTT TTA TTT TG	CCG GTC TGA CCT ATT CTC AT	50
Satt 423	GTT GGG GAA TTA AAA AAA TG	TTC GCT TGG GTT CAG TTA CTT	50
Satt 154	AAA GAA ACG GAA CTA ATA CTA CAT T	AGA TAC TAA CAA GAG GCA TAA AAC T	50
Satt 371	GAG ATC CCG AAA TTT TAG TGT AAC A	TGC AAA CTA ACT GGA TTC ACT CA	50
Satt 002	TCA TTT TGA ATC GTT GAA	TGT GGG TAA AAT AGA TAA AAA T	50
Satt 229	GCG AGG TGG TCT AAA ATT ATT ACC TAT	TGG CAG CAC ACC TGC TAA GGG AAT AAA	58
Satt 557	GCG CAC TAA CCC TTT ATT GAA	GCG GGA TCC ACC ATG TAA TAT GTG	58
Satt 367	GCG GAA TAG TTG CCA AAC AAT AAT C	GCG GAT ATG CCA CTT CTC TCG TGA C	58
Satt 232	GCG GAC ATA AAT GCA ATC ACT TAA AAA G	GCG GCG TGA ATA GTA TAC GTT GAG A	58
Sat_366	GCG GAC ATG GTA CAT CTA TAT TAC GAG TAT T	GCG GCA CAA GAA CAG AGG AAA CTA TT	58
Satt 597	CGA GGC ACA ACC ATC ACC AC	GCT GCA GCG TGT CTG TAG TAT	58
Satt 549	GCG CGC AAC AAT CAC TAG TAC G	GCG GCA AAA CTT TGG AGT ATT GCA A	58
Satt 589	GCG AAA AAG TAA TAT AAG TAG AAA AAG G	GCG CAG ACA ATT TCA GTG GCA GAT AGA	58
Satt 323	TGT GCG TTT AAA TTG CAG CTA AAT	GCG GTC GTC CTA TCT AAT GAA GAG	55
Satt 333	GCG CAA CGA CAT TTT CAC GAA GTT	GCG AAT GGT TTT TGC TGG AAA GTA	55
Satt 327	GCG TCG TAG CAA TGT CAC CA	GCG CAC CCA AAA GAT AAC AAA	55
Satt 337	GCG TAA TAC GCA AAA CAT AAT TAG CCT A	GCG TAA ATC TGA TAT ATG TTA CCA CTG A	55
Satt 364	ATC GGG TCA TGA CTT TTG AAG A	GCG GCA TAA GTT TTC ATC CCA TC	55
Satt 380	GCG TGC CCT TAC TCT CAA AAA AAA A	GCG AGT AAC GGT CTT CTA ACA AGG AAA G	55
Satt 446	GCG GGC AAA TTT GAC CTA ACT CAC AAC	CCG CAT AAA AAA CAC AAC AAA TTA	55
Satt 313	GCG CGA GGT ATG GAA CCT AAC TCA CA	GCG GTA AGT CAT GGC TTT TTA ATC TT	55

Table 13: The summarized result of identifying the variety specific SSR markers

Variety	Unique marker	Size (bp)	Variety	Unique marker	Size (bp)
JS 97-52	Satt 215	133	JS 20-69	Satt 244	200
JS 20-29	Satt 519	217		Satt 364	225
JS 20-34	Satt 152	330	JS 95-60	Satt 523	167
	Sat_167	305	JS 20-98	Satt 369	338
	Satt 598	238		Satt 386	178
	Satt 154	326		Satt 267	318
JS 93-05	Satt 453	217		Satt 337	184
	Satt 294	269	JS 335	Satt 146	392
	Satt 446	300		Satt 552	180

Fingerprints of eight Soybean varieties with unique markers identified have been given below (Plate 25-28).

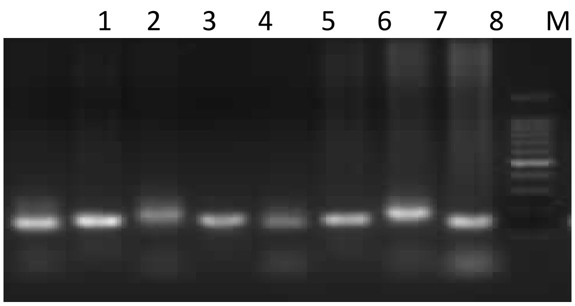


Plate 25: Fingerprints of Soybean Variety JS 20-69 using SSR marker Satt 244

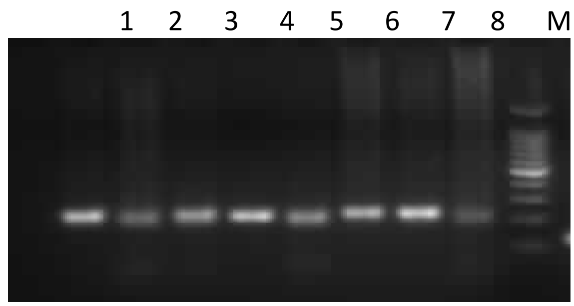
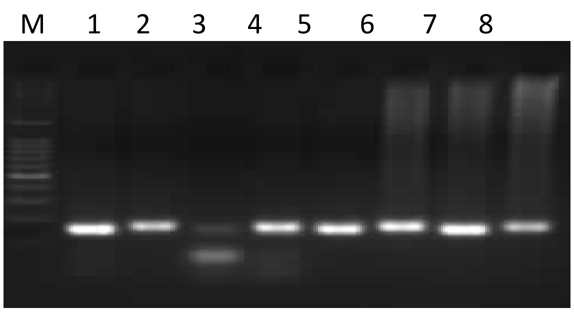
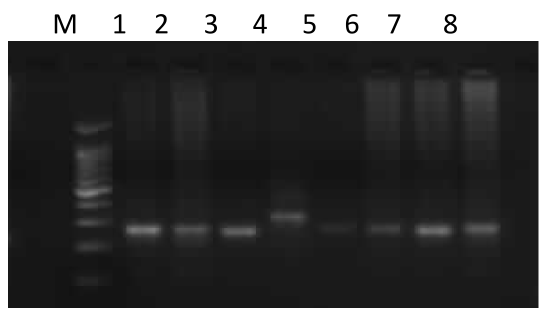


Plate 26: Fingerprints of Soybean Variety JS 20-69 using SSR marker Satt 364

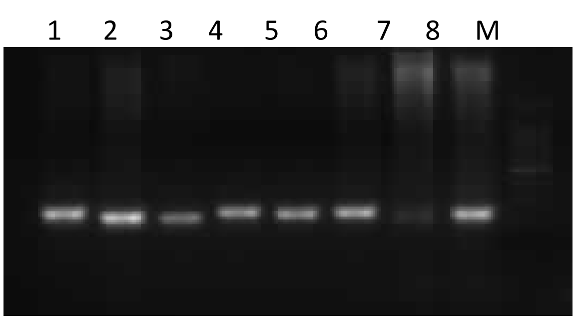


Satt 598

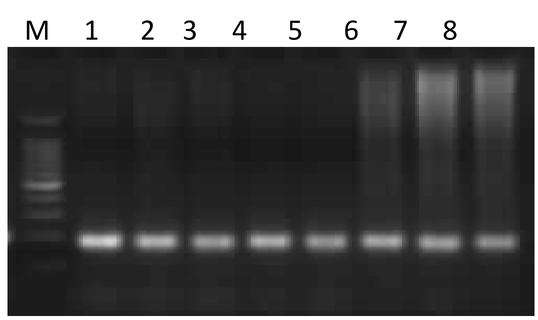


Satt 154

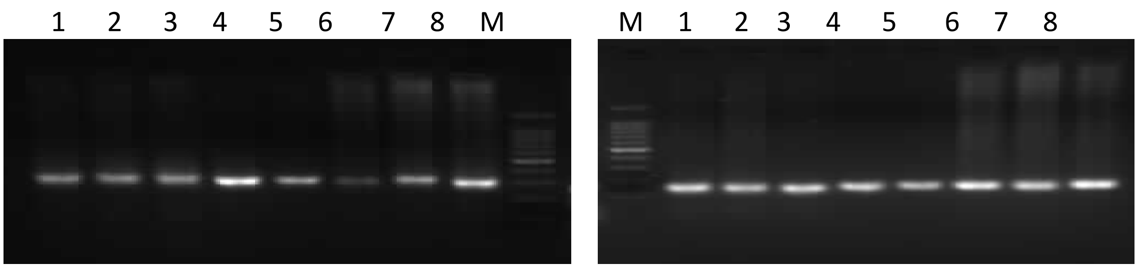
Plate 27: Fingerprints of Soybean Variety JS 20-34 using different SSR markers



Satt 369



Satt 386



Satt 146 Satt 552

Plate 28: Fingerprints of Soybean Variety JS 335using different SSR markers

Experiment 3: Basic studies for developing priming technology in crop plants

Year of start: 2016

Objective: To improve field emergence under sub-optimal conditions in different field crops.

Details of the crops taken up by different centres for experiments

Crops		Centres
Pigeonpea	:	IARI, New Delhi
Chickpea	:	ICAR-IISS, Mau
Rice	:	AAU, Jorhat

Proposed Technical programme:

Technical programme for each crop was developed by each Centre as mentioned below against each crop, and was submitted to the PI with a copy to the Director, ICAR-IISS, Mau.

Crop-wise and centre-wise research findings during 2017-18

Crop: Pigeonpea

Centre: IARI, New Delhi

Technical programme: Varieties preferably tolerant and susceptible to abiotic stresses to be taken, if available, to standardize seed priming technology under soil moisture-deficit and salinity stress conditions.

Treatments:

1. Control- Untreated seeds of all varieties.
2. Moisture Stress (Given by soaking in PEG 6000 solutions at $30^{0}C$);
    a. Soaking in water equivalent to FC (Free available water -0.03MPa)
    b. Soaking in available water equivalent to 80% of FC and drying.
    c. Soaking in available water equivalent to 60% of FC and drying.
    d. Soaking in available water equivalent to 40% of FC and drying.
    e. Soaking in available water equivalent to 20% of FC and drying.
    f. Soaking in water stress equivalent to PWP (-1.5MPa), and drying.

3. Salt Stress (Given with soaking in $NaCl+CaCl_2$ solution at $30^{0}C$);
    a. Soaking in $NaCl+CaCl_2$ solution having $2dsm^{-}1$ EC and drying.
    b. Soaking in $NaCl+CaCl_2$ solution having $4dsm^{-}1$ EC and drying.

c. Soaking in NaCl+$CaCl_2$ solution having 6dsm^{-}1 EC and drying.
d. Soaking in NaCl+$CaCl_2$ solution having 8dsm^{-}1 EC and drying.
e. Soaking in NaCl+$CaCl_2$ solution having 10dsm^{-}1 EC and drying.
f. Soaking in NaCl+$CaCl_2$ solution having 12dsm^{-}1 EC and drying.

Experimental details: The seeds osmoprimed for different hours were tested for Germination percentage (ISTA, 2017) and vigour parameters on filter paper soaked with PEG solutions prepared for water stress equivalent to the requirements was calculated using formula as suggested by Michel and Kaufmann (1973). Since, soaking in water stress equivalent to PWP (-1.5MPa), and drying was not possible so soaking in available water equivalent to 15% of FC was done and seeds were dried. For salt stress the seeds were soaked in 2, 4, 6, 8, 9, 10 and 12dsm^{-1} EC solutions for variable hours. Dried and put for germination on filter paper soaked with water and 2, 4, 6, 8, 9, 10 and 12 dsm^{-1} EC solutions. The EC solutions were prepared using Subbarao *et al.*, 1990 formula. While preparing salt solutions care has to be taken with regard to salt used is Dihydrated or Anhydrous, as the molar weights differ.

Results: The work of standardization of priming protocol/s for enhanced planting value and started during 2016 with 3 lots of 3 varieties of soybean and 6 lots of 4 varieties of pigeonpea for various abiotic stresses. Since no seedlings survived under salt stress of 12dsm^{-}1 EC, therefore this treatment was not included in the analysis. Water activity measurements in primed seeds of Soybean and Pigeonpea were also done during the year of report.

Standardization of halopriming treatments in Pigeonpea under salt stress conditions: Various seed quality parameters were observed in seeds primed in salt solution of 2, 4, 6, 8, 10 and 12 dsm^{-1} EC for ten hours on hourly basis. All the seed quality parameters were found better under 6dSm^{-1} of various salt stress conditions and over mean, however, none of the treatments gave better results than the untreated seeds tested under normal conditions (Table 1). Significantly higher VI –I & II were noticed after 8hrs of soaking whereas percentage Germination & first count were better after 5 hrs of soaking under various levels of salt stress (Table 2). Halopriming (NaCl+$CaCl_2$ @6dSm^{-1}) of pigeonpea seeds for 8 hrs displayed improved vigour under salt stress conditions.

Table 1: Seed quality parameters in pigeonpea var. Pusa 991 after priming under different levels of salt stress

Treatments	Seed Quality Parameters								
	FC%	Ger%	ABSL	HARD	RL	TSL	DW	VI-I	VI-II
2dSm^{-1}	54.5	62.0	7.5	30.0	12.26	22.79	0.0890	1413	5.52
4dSm^{-1}	55.0	62.5	6.5	30.5	12.05	23.61	0.0919	1476	5.75
6dSm^{-1}	61.5	66.0	4.5	26.5	12.87	25.05	0.1011	1654	6.67
8dSm^{-1}	49.5	58.5	7.0	33.5	12.47	25.03	0.0890	1464	5.21
9dSm^{-1}	51.5	57.5	6.0	35.5	11.80	22.79	0.0905	1311	5.20
10dSm^{-1}	52.5	61.0	7.5	31.0	12.46	23.02	0.0881	1404	5.38
Control	76.2	94.2	2.0	3.0	12.96	27.02	0.1826	2544	17.19
Mean	57.2	65.9	5.9	27.14	12.41	24.19	0.1046	1609	7.27
SEm(±)	2.95	3.11	1.74	2.84	0.584	0.965	0.0038	85.7	0.42

Table 2: Standardization of duration of priming in pigeonpea var. Pusa 991 under different levels of salt stress

Duration	Seed Quality Parameters								
	FC%	Ger%	ABSL	HARD	RL	TSL	DW	VI-I	VI-II
1hr	59.50	64.79	8.50	26.64	13.51	24.96	0.1040	1616.8	6.74
2hr	62.21	64.64	5.21	28.36	12.50	24.01	0.1097	1552.4	7.09
3hr	54.86	58.71	6.71	33.43	11.06	22.13	0.1053	1299.4	6.18
4hr	59.86	64.43	6.43	28.43	12.25	23.28	0.1056	1500.0	6.81
5hr	65.07	66.79	4.50	26.21	11.13	21.92	0.1048	1464.2	7.00
6hr	61.00	63.43	5.14	27.57	11.11	20.76	0.0976	1317.0	6.19
7hr	61.07	66.36	7.21	25.64	12.79	24.59	0.0990	1631.4	6.57
8hr	60.14	64.71	7.57	27.14	13.04	27.73	0.1079	1794.5	6.98
9hr	61.00	65.57	6.29	27.57	13.88	27.09	0.1058	1776.6	6.94
10hr	53.36	54.36	3.64	38.93	12.79	25.39	0.1063	1379.9	5.78
Mean	59.81	63.38	6.12	28.99	12.41	24.19	0.1046	1533.2	6.63
SEm(±)	3.53	2.51	2.07	3.40	0.698	1.15	0.0046	102.5	0.50

Standardization of halopriming treatments in Soybean under salt stress conditions: Soaking of soybean variety, JS 9752 seeds for 4 hrs in salt solution resulted in higher values than control for all the seed quality parameters. First count and Germination percent of soybean was significantly higher in haloprimed seeds with 2EC salt solution, however it was at par in haloprimed seeds with 4EC and 6 EC salt solutions. Vigour index II was significantly higher in seeds haloprimed with 4EC salt solution (Table 3), however, Vigour index I was at par among haloprimed seeds with 2EC, 4EC and 6 EC salt solutions. Therefore, It could be recommended that the soybean seeds could be haloprimed for 4 hrs in 4EC salt solution before sowing under salt stress conditions.

Table 3: Standardization of SQE treatment in soybean for salt stress condition

Soaking Period (SP)/ Treatments (T)	Mean values of vigour Index II (JS 9752)						Mean (SP)
	2EC	4EC	6EC	8EC	9EC	10EC	
1hr	283.1	309.9	174.4	226.9	221.6	300.9	252.8ab
2hr	239.3	223.0	261.8	152.1	214.4	254.5	224.2abc
3hr	249.4	173.4	201.4	127.6	131.6	146.4	171.6bc
4hr	310.4	322.2	311.6	237.0	208.0	267.7	276.2a
5hr	237.9	212.0	152.8	96.6	76.0	221.6	166.2c
6hr	237.6	288.7	215.6	182.9	196.3	184.0	217.5abc
7hr	239.9	278.6	298.9	182.1	152.5	209.1	226.9abc
8hr	285.0	317.3	188.9	200.3	179.5	200.6	228.6abc
Mean (Tr)	260.3a	265.6a	225.7ab	175.7bc	172.5bc	223.1ab	220.5
CD (p=0.05)	T=40.6		SP=46.9		TXSP= 114.9		

Standardization of osmopriming treatments in pigeonpea under water stress conditions: The primed seeds of Var. Pusa 991 exhibited better superior seed quality parameters under 60% available water (Table 4). The primed seeds of Var. Pusa 992 exhibited; better Germination percent and vigour index I under 60% available water (Table 5). Vigour index II was at par under all stress levels except, 80% AW. Eleven hrs soaking resulted in significantly improved germination%, VI-I and VI-II over mean (Table 6).

Table 4: Seed quality parameters in pigeonpea var. Pusa 991 after priming (PEG) under different levels of water stress

Treat. Parameters	Available water (AW)					
	15%	20%	40%	60%	80%	Mean
FC%	84.22	83.33	85.11	84.22	84.00	84.2
Ger%	85.33	84.00	85.33	85.66	84.22	84.9
ABNL%	1.55	1.77	2.44	3.22	2.22	2.24
HARD%	13.00	13.88	13.22	10.55	13.00	12.7
RL (cm)	15.42	15.40	15.69	17.57	17.15	16.2
TSLRL (cm)	30.24	30.14	32.70	35.86	35.40	32.9
Dry Wt. (g)	0.0185	0.0192	0.0209	0.0229	0.0218	0.0207
VI-I	2580.4	2531.8	2790.3	3071.8	2981.4	2791.1
VI-II	1.58	1.61	1.78	1.96	1.84	1.75

Table 5: Seed quality parameters in pigeonpea var. Pusa 992 after priming (PEG) under different levels of water stress

Treat. Parameters	Available water (AW)					
	15%	20%	40%	60%	80%	Mean
FC%	70.00	69.33	69.55	70.22	62.00	68.2
Ger%	71.11	71.33	70.66	72.88	66.66	70.5
ABNL%	5.11	5.22	7.44	6.66	8	6.49
HARD%	23.66	23.22	21	20.11	24.77	22.6
RL (cm)	14.73	14.39	12.93	12.97	13.90	13.8
TSLRL (cm)	27.36	27.00	31.74	32.84	28.82	29.6
Dry Wt. (g)	0.0194	0.0194	0.0195	0.0190	0.0196	0.0194
VI-I	1945.6	1925.9	2242.7	2393.4	1921.1	2085.7
VI-II	1.38	1.38	1.38	1.38	1.31	1.37

Table 6: Mean vigour index II of pigeonpea primed (PEG) seeds tested under different stress levels of water availability

Duration	Treatments						
	Ctrl -100%	15%	20%	40%	60%	80%	Mean
10hr	1.90	1.36	1.00	0.69	0.92	0.83	1.12
11hr	1.71	3.54	5.25	1.08	0.86	2.38	2.47
12hr	1.82	3.20	4.18	0.98	0.64	1.22	2.01
13hr	1.81	1.21	2.42	0.79	0.93	0.73	1.31
14hr	1.80	2.96	3.40	1.18	1.06	0.79	1.87
15hr	1.72	3.65	3.29	1.30	1.40	2.47	2.31
16hr	1.77	3.23	3.47	0.59	1.07	0.59	1.79
17hr	2.09	2.67	3.47	1.54	1.20	1.84	2.13
18hr	1.83	2.47	1.30	0.73	1.31	0.69	1.39
Mean	1.83	2.70	3.09	0.99	1.04	1.28	1.82
CD (p=0.05)	Treatment : 0.417		Duration : 0.510		Treat X Duration: 1.249		

Standardization of osmopriming treatments in soybean under water stress conditions: Soaking for 6 hrs at 25^{0}C under water was found optimum in Soybean Var. JS 9752 (Table 7). Both the vigour indices were found at par in all the treatments. However, germination percent significantly improved in priming under 60% of available water (Table 8).

Table 7: Standardization of duration of priming under water stress in soybean var. JS 9752

Soaking Duration	Ger% (Transformed)	VI-I	VI-II	HS% (Transformed)	RL (cm)	SL (cm)
4hr	40.83^{ab}	792.4^{bc}	2.74^{bc}	44.23^{a}	8.42^{abc}	10.40^{abc}
5hr	40.67^{ab}	810.4^{bc}	2.80^{bc}	44.20^{a}	8.97^{bc}	11.11^{bc}
6hr	46.67^{a}	995.8^{c}	3.49^{c}	39.53^{b}	9.36^{c}	11.47^{c}
7hr	48.17^{a}	958.4^{c}	3.23^{c}	39.66^{b}	8.44^{abc}	10.86^{abc}
8hr	33.58^{bc}	580.0^{a}	1.77^{a}	47.51^{ac}	7.66^{ab}	9.50^{a}
9hr	32.08^{c}	532.9^{a}	1.78^{a}	49.15^{c}	7.40^{a}	9.60^{a}
10hr	34.08^{bc}	643.1^{ab}	2.15^{ab}	48.77^{ac}	7.65^{ab}	9.93^{ab}
SE(m)	1.94	45.7	0.21	1.19	0.35	0.34

Table 8: Standardization of priming under different levels of water stress in soybean var. JS 9752

Stress Condition	Ger% (Transformed)	VI-I	VI-II	HS% (Transformed)	RL (cm)	SL (cm)
Control	35.36^{a}	737.7^{a}	2.39^{a}	49.24^{a}	8.01^{a}	11.45^{a}
15% AW	39.57^{ab}	795.8^{a}	2.58^{a}	44.71^{abc}	8.55^{a}	10.69^{ab}
20%AW	42.14^{ab}	810.5^{a}	2.64^{a}	42.44^{c}	8.84^{a}	10.57^{ab}
40%AW	39.57^{ab}	768.2^{a}	2.54^{a}	43.12^{abc}	8.93^{ab}	9.94^{b}
60%AW	42.71^{b}	784.1^{a}	3.01^{a}	41.96^{c}	7.74^{a}	10.10^{b}
80%AW	37.29^{ab}	657.8^{a}	2.23^{a}	46.86^{ab}	7.57^{ac}	9.72^{b}
SE(m)	1.80	42.3	0.20	1.11	0.322	0.315

Water activity measurements in primed seeds of Soybean and Pigeonpea: The water activity was measured in Soybean and Pigeonpea seeds primed with different standardized methods. In both the crops there were significant differences among the treatments, though the highest activity was observed in seeds primed in PEG 6000 (Fig. 1).

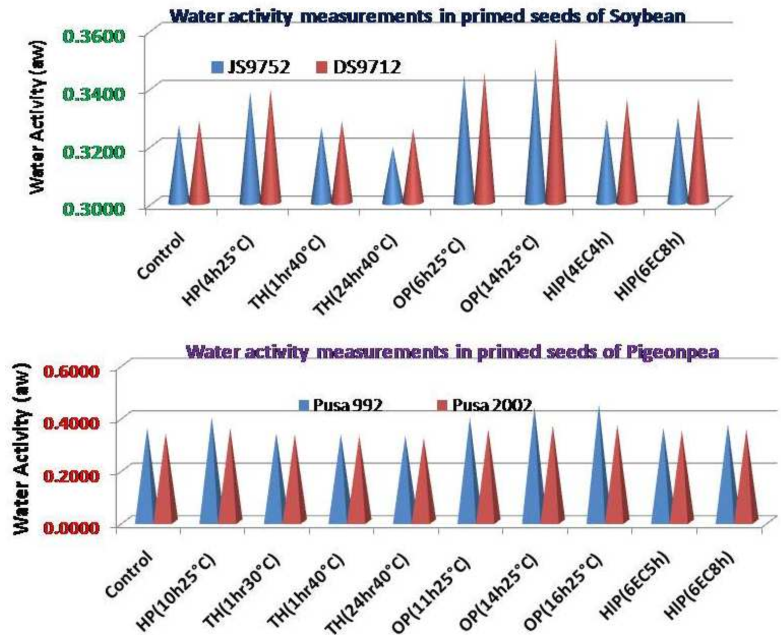


Figure 1: Water activity measurements in primed seeds of Soybean and Pigeonpea

Crop: Chickpea

Centre: ICAR-IISS, Mau

Technical programme:

Materials: Two varieties; BGD-72 and Kabuli Shubhra of chickpea were taken during the year 2017-18 to standardize seed priming technology for sodic soil conditions.

Treatments:

- Control-Unprimed
- Hydropriming for 6 h under sand.
- Priming with KNO_3 @ 0.2% for 6 h under sand.
- Priming with GA_3 @ 100ppm for 6 h under sand.

Methodology: The seeds of both the varieties of chickpea were primed with above set of treatments keeping one set as control. The sodicity level including ESP and pH of the field was measured before sowing and harvesting of crop. The experiment was conducted in field with recommended package of practices.

Results: Observations on seed quality parameters including germination percentage and vigour, growth, yield and its attributes will be recorded periodically. Storability of seeds will be also evaluated after harvesting of crop.

Crop: Rice (direct seeded)

Centre: AAU, Jorhat

Proposed Technical programme:

Materials:

Direct seeded paddy varieties were taken. Bio priming agents; Org-Trichojal and Org-Beauverijal were tried for upland direct seeded in organic condition.

Treatments:

1. Seed priming with Org-Trichojal @ 5ml/lit of water
2. Seed priming with Org-Trichojal @ 10ml/lit of water
3. Seed Priming with Org-Beauverijal @ 5ml/water
4. Seed Priming with Org-Beauverijal @ 10ml/water
5. Seed Hydration for 8 hrs (Control).
6. Absolute Control without hydration.

Methodology:

Replication: 4
Plot size: 3 X 2 m^2
Spacing: 20 x 15cm
Experimental Design: RBD
Sowing: recommended sowing time

Observations:

(A) Laboratory tests

i. Germination first and final count
ii. Seedling length
iii. Seedling dry weight

(B) Pre sowing field test

i. Soil microbial population before sowing and at harvest

(C) Field Observations (Recorded on 30 days old seedlings)

i. Field emergence
ii. Root and shoot length
iii. Seedling height
iv. Chlorophyll content

(D) Seed yield attributing traits

i. Number of effective tillers / plant
ii. No. of panicle / plant
iii. Seeds / panicle
iv. Seed yield / plant
v. Seed yield / plot
vi. 1000 seed weight

(E) Seed-borne pathogens

i. Incidence of diseases

(F) Bio-chemical parameters

i. Alpha amylase activity
ii. Peroxidase activity

Specific objectives with which the experiment was conducted:

1. Performance evaluation of different bio priming techniques for assured field emergence in organic condition.
2. To identify the benefits of seed priming methods for reduced seed rate in direct seeded upland rice.

Research findings during 2017-18

Experimental details: To improve field emergence under sub-optimal conditions in different field crops following treatments were given;

1. Seed priming with *Trichoderma harzianum*@ 1.5% following recommended seed rate
2. Seed Priming with *Trichoderma harzianum*@ 1.5% following 10% reduced seed rate
3. Seed Priming with bacterial strain (ABTJ11)@ 1.5% following recommended seed rate
4. Seed Priming with bacterial strain (ABTJ11)@ 1.5% following 10% reduced seed rate
5. Seed Priming with *Consortium* @1.5% following recommended seed rate
6. Seed Priming with *Consortium* @1.5% following 10% reduced seed rate
7. Seed Hydration for 8 hrs (Control)
8. Control without hydration.

Results: Field emergence percentage significantly varied in response to seed treatment with different bio agents and highest field emergence was observed in T_7 (Hydration) and least was observed in (T_8) control. Effect of seed treatment was non-significant for seedling/m^2, but it shows significant variation in growth parameters like seedling height and seedling biomass (Table 9). The vigour indicators root length and shoot length varied significantly in response to different treatments (Table 10). Plant growth response was found to be non-significant for different seed treatment except total biomass production which varied significantly among the treatments. The total biomass production was found to be higher in treatment with consortium (T_6) and *Bacillus cereus* (T_4). Total biomass production was found to be significantly higher in treatments with 10% reduced seed rate (Table 11). All the recorded yield and yield attributes were found to be non-responsive to seed priming with bio agents except harvest index. Highest harvest index was observed in T_2 (*T. harzianum*) followed by (T_8) control and (T_7) hydration. Comparatively lower harvest index in treatments with *Bacillus* species and consortium indicates higher vegetative growth of the plants (Table 12). Significant difference of weed density was observed at early stage of seedling development among the treatments. Treatment formulations had significant effect on physiological seed vigour; Vigour index I and II (Table 13). These formulations also had significant effect on amylase and peroxidase activity (Table 14). Seedling dry weight was found to be significantly correlated with Vigour index I and II (Table 15).

Table 9: Effects of Bio-priming treatments on seed rate in respect to early seedling growth

Treatment	Field emergence (%)	Seedling per sqm	Seedling height (cm)	Seedling Biomass (g)
T_1	81.67	119.17	44.0	0.33
T_2	80.92	122.33	44.1	0.25
T_3	85.08	126.17	42.4	0.34
T_4	83.92	124.17	45.0	0.22
T_5	80.87	136.00	45.9	0.34
T_6	81.17	134.00	45.8	0.28
T_7	86.25	135.00	45.1	0.29
T_8	80.54	134.17	35.17	0.21
SEm(±)	0.49	9.41	1.79	0.02
CD (p=0.05)	1.49	NS	5.44	0.07

CD (p=0.01)	2.07	NS	7.55	0.10

Table 10: Effect of seed treatment on seed rate in respect to seed vigour indicators

Treatments	Root length (cm)	Shoot length (cm)	Chlorophyll a	Chlorophyll b
T_1	6.07	40.15	12.47	3.08
T_2	6.57	37.51	13.41	2.80
T_3	6.07	36.36	13.05	3.13
T_4	6.62	38.39	12.73	2.00
T_5	6.70	39.15	10.79	2.57
T_6	7.14	38.63	12.33	3.11
T_7	6.56	38.59	11.05	2.56
T_8	5.08	29.75	10.77	2.65
SEm(±)	0.32	1.16	1.76	0.58
CD (p=0.05)	0.96	3.52	NS	NS
CD (p=0.01)	NS	4.88	NS	NS

Table 11: Effect of seed priming on vegetative growth of rice

Treatment	No of Tiller/plant (nos.)	Plant height (cm)	Total Bio-Mass (g)
T_1	6.22	122.30	42.16
T_2	6.22	121.62	45.13
T_3	6.67	121.05	42.27
T_4	6.11	120.66	51.04
T_5	6.22	119.82	45.11
T_6	5.55	120.05	53.11
T_7	6.00	122.20	45.44
T_8	5.89	119.70	42.22
SEm(±)	0.53	2.08	2.05
CD (p=0.05)	NS	NS	6.21
CD (p=0.01)	NS	NS	8.62

Table 12: Effect of seed priming on yield and yield attributes of rice

Treatments	No. of Panicle/ plant	Panicle length (cm)	Seeds / panicle (nos.)	Seed yield / plant (g)	Seed yield / plot (kg)	1000 seed wt. (g)	Harvest index
T_1	4.88	24.50	186.55	16.87	1.55	25.45	0.35
T_2	4.58	24.34	175.77	17.03	1.54	25.02	0.38
T_3	5.56	25.00	185.00	17.20	1.52	26.52	0.33
T_4	5.43	25.54	174.22	16.30	1.45	25.20	0.32
T_5	5.22	24.80	150.44	16.10	1.55	23.11	0.31
T_6	5.13	25.30	143.22	15.40	1.50	24.01	0.32
T_7	5.11	24.76	171.77	17.30	1.56	26.66	0.36
T_8	3.62	24.52	173.33	15.77	1.35	23.60	0.37
SEm(±)	0.41	0.66	10.29	0.58	0.08	1.06	0.01
CD (p=0.05)	NS	NS	NS	NS	NS	NS	0.04
CD (p=0.01)	NS	NS	NS	NS	NS	NS	0.06

Table 13: Effect of treatment formulations on physiological seed quality

Treatments	Germi. (%)	Field Emergence (%)	Root Length (cm)	Shoot length (cm)	Seedling dry weight (g)	SVI-I	SVI-II
T_1	87.20	84.87	9.51	6.21	0.15	1389.33	13.35
T_2	91.63	85.5	9.31	4.57	0.19	1270.24	17.38
T_3	92.10	87.33	9.44	5.89	0.19	1418.92	17.74
T_4	89.50	86.20	9.28	6.80	0.19	1426.58	16.99
T_5	88.50	85.57	8.61	7.02	0.19	1425.27	17.11
T_6	90.53	88.03	9.01	6.73	0.22	1415.56	20.29
T_7	90.73	88.00	8.56	6.41	0.19	1354.45	17.56
T_8	92.83	88.37	9.04	5.77	0.23	1412.12	21.39
T_9	86.08	84.15	8.26	5.55	0.19	1190.79	16.34
T_{10}	81.63	76.6	8.19	5.45	0.15	1113.69	12.54
SEm(±)	2.57	1.95	0.36	0.32	0.01	45.05	1.27
CD (p=0.05)	NS	5.85	NS	0.96	0.04	133.84	3.77
CD (p=0.01)	NS	NS	NS	1.32	0.05	183.38	5.16

Table 14: Effect of treatment formulations on enzymatic activity

Treatments	α - amylase (IU/ml)	Peroxidase (MDA) (nmol/mg)
T_1	0.37	0.83
T_2	0.41	0.30
T_3	0.43	0.50
T_4	0.72	0.46
T_5	0.55	0.45
T_6	0.42	0.37
T_7	0.72	0.46
T_8	0.92	0.45
SEm(±)	0.09	0.01
CD (p=0.05)	0.27	0.03
CD (p=0.01)	0.38	0.04

Table 15: Correlation studies of physiological seed quality characters.

Variables	FE	RL	SL	SDW	SVI-I	SVI-II
FE	**1**					
RL	0.610	**1**				
SL	0.354	-0.014	**1**			
SDW	**0.839**	0.464	0.241	**1**		
SVI-I	**0.838**	0.664	0.652	**0.681**	**1**	
SVI-II	**0.888**	0.550	0.240	**0.986**	**0.744**	**1**
Values in bold are different from 0 with a significance level alpha=0.05						

FE : Field emergence   RL : Root length   SL : Shoot length
SDW : Seedling dry weight   SVI-I : Seed vigour index-I
SVI-II : Seed vigour index-II

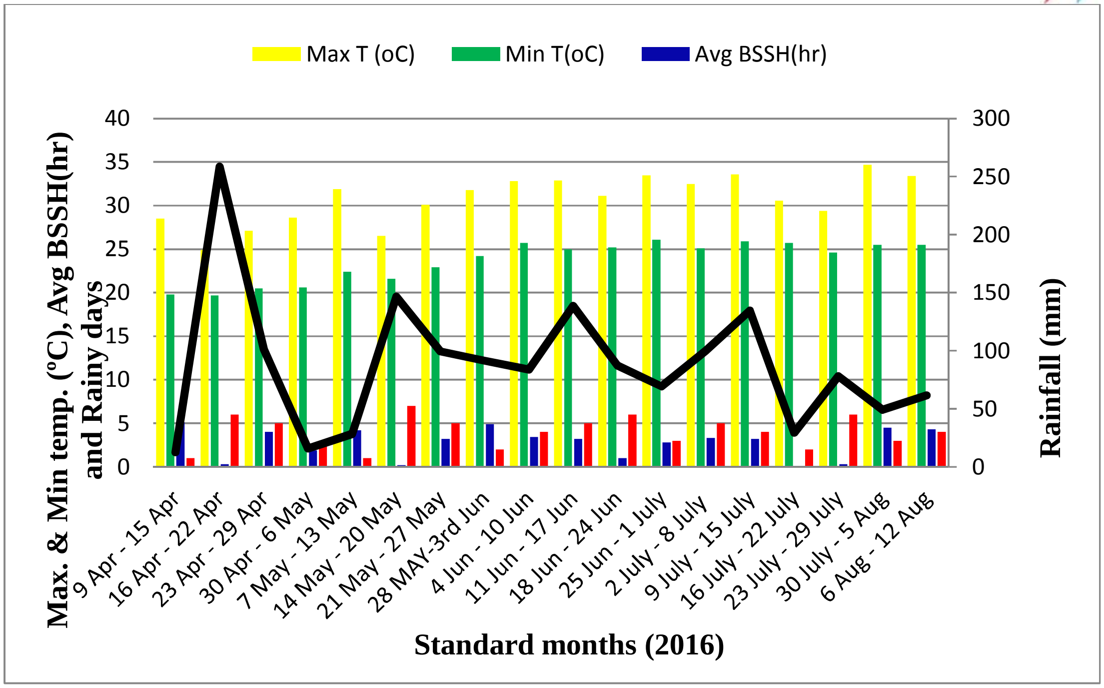


Figure 2:Weekly weather data during experimentation

Experiment 4: Use of nano-particles in enhancing seed quality and storability of Pigeonpea (*Cajanus cajan*)

Year of start: 2016

Objectives:

1. To standardize the optimum concentration of different nano-particles for seed treatment in pigeonpea
2. To know the effect of different nano-particles on seed quality and storability of pigeonpea.

Details of the crops taken up by different centres for experiments

Crops		**Centres**
Pigeonpea	:	TNAU, Coimbatore and UAS, Bengaluru

Proposed Technical programme

Crop: Pigeonpea cv. BRG 2 and BRG4

Treatments:

Nano-particles: Zinc oxide, Silver, Silicon dioxide (both bulk and nano form).

Dosage: Control (no treatment); 100 ppm, 250 ppm, 500 ppm, 750 ppm and 1000 ppm

Formulation: Dry form

Experiment Details:

Treatment combinations: Nano-particle x bulk x concentration (3 x 3 x 5) = 45

Replication: Three
Design: FCRD

Sub. Experiment I (As per Objective 1): Standardization of optimum concentration of different Nano-particle s for seed treatment in pigeonpea

Methodology:

- Freshly harvested seeds of pigeonpea are dried to safer and uniform moisture level (8 to 9%).
- The seeds are directly treated with the selected chemicals (bulk &nano form) in a plastic or glass jar by mixing thoroughly for even distribution.
- Thereafter, the treated seeds shall be evaluated for various seed quality attributes like moisture content (SMC), germination and vigour, electrical conductivity (EC) and total dehydrogenase activity (TDH) etc.

Observations:

1. Seed germination (%) (ISTA, 2014)- first count, final count and T_{50} value
2. Mean root and shoot length (cm)
3. Mean seedling length (cm)
4. Mean seedling dry weight (mg)
5. Seedling vigour index I and II (Abdul Baki and Anderson, 1973)
6. Electrical conductivity of seed leachate (µS/cm/g)
7. Total dehydrogenase activity (A_{480} nm).
8. Seed health (infection and infestation)

Centre-wise research findings during 2017-18

Crop: Pigeonpea

Centre: TNAU, Coimbatore

Experimental details: The experiment was undertaken as per the proposed technical programme. The pigeonpea seeds of var. BRG 1, BRG 2 and CO 7 were treated with Zinc oxide, Silver and silicon dioxide in nano as well as bulk form with 100 ppm, 250 ppm, 500 ppm, 750 ppm and 1000 ppm along with control. The treated seeds were subjected to seed quality analysis.

Results: Data on effect of seed treatment (bulk and nano particles) on pigeonpea seed germination (Table 1); seedling length (Table 2); seedling dry weight and vigour index (Table 3) was recorded. The results revealed that the seeds treated with Zinc oxide 500 ppm and 750 ppm and silver 1000 ppm recorded significantly improved germination percentage over the control. BRG 2 recorded 92, 91, and 89 percentage of germination with the treatments of Zinc oxide 500 ppm and 750 ppm and silver 1000 ppm, respectively, where as the control recorded 83%. Similar results obtained in BRG 4 and CO 7 varieties also. BRG4 recorded 91, 90 and 90 percentage of germination with the treatments of Zinc oxide 500 ppm and 750 ppm and silver 1000 ppm, respectively, where as the control recorded 83%. CO 7 recorded 92, 91, and 91 percentage of germination with the treatments of Zinc oxide 500 ppm and 750 ppm and silver 1000 ppm, respectively, where as the control recorded 86%. The zinc oxide, silicon dioxide and silver in bulk form are not having beneficial effect as seed treatment.

BRG 2 recorded the vigour index of 1958, 1883 and 1877 with the treatments of Zinc oxide 500 ppm and 750 ppm and silver 1000 ppm, respectively, where as the control recorded 1750 . BRG4 recorded the vigour index of 1871,1816 and 1808 with the treatments of Zinc oxide 500 ppm and 750 ppm and silver 1000 ppm, respectively, where as the control recorded 1620. CO 7 recorded the vigour index of 2001,1930 and 1961 with the treatments of Zinc oxide 500 ppm and 750 ppm and silver 1000 ppm, respectively, where as the control recorded 1804. Hence the treatments Zinc oxide 500 ppm and 750 ppm and silver 1000 ppm were taken for storage studies.

Table 1: Effect of seed treatment (Bulk and nano particles) on seed germination percentage in pigeonpea

Treatment	Seed Germination (%)					
	First count	Final count	First count	Final count	First count	Final count
	BRG 2	BRG 2	BRG 4	BRG 4	CO 7	CO7
Control	81	83	80	83	83	86
Zinc oxide 100 ppm (Nano)	83	86	82	85	84	89
Zinc oxide 250 ppm (Nano)	84	88	85	88	86	91
Zinc oxide 500 ppm (Nano)	84	92	85	91	87	92
Zinc oxide 750 ppm (Nano)	86	91	85	90	86	91
Zinc oxide 1000 ppm (Nano)	84	88	84	89	85	88
Silver 100 ppm (Nano)	83	85	83	83	83	87
Silver 250 ppm (Nano)	85	85	83	85	85	87
Silver 500 ppm (Nano)	85	86	85	88	85	87
Silver 750 ppm (Nano)	87	87	87	88	87	89
Silver 1000 ppm (Nano)	88	89	87	90	89	91
Silicon dioxide 100 ppm (Nano)	76	77	71	75	65	71
Silicon dioxide 250 ppm (Nano)	73	75	73	71	68	75
Silicon dioxide 500 ppm (Nano)	64	70	70	70	69	65
Silicon dioxide 750 ppm (ano)	60	67	68	65	68	65
Silicon dioxide 1000 ppm (Nano)	62	68	61	64	60	62
Zinc oxide 100 ppm (Bulk)	82	85	81	84	83	88
Zinc oxide 250 ppm (Bulk)	83	87	84	87	85	90
Zinc oxide 500 ppm (Bulk)	83	91	84	90	86	91
Zinc oxide 750 ppm (Bulk)	85	90	84	89	85	90
Zinc oxide 1000 ppm (Bulk)	83	87	83	88	84	87
Silver 100 ppm (Bulk)	82	84	82	82	82	86
Silver 250 ppm (Bulk)	84	84	82	84	84	86
Silver 500 ppm (Bulk)	84	85	84	87	84	86
Silver 750 ppm (Bulk)	86	86	86	87	86	88
Silver 1000 ppm (Bulk)	87	88	86	89	88	90
Silicon dioxide 100 ppm (Bulk)	75	76	70	74	64	70
Silicon dioxide 250 ppm (Bulk)	72	74	72	70	67	74
Silicon dioxide 500 ppm (Bulk)	63	69	69	69	68	64
Silicon dioxide 750 ppm (Bulk)	59	66	67	64	67	64
Silicon dioxide 1000 ppm (Bulk)	61	67	60	63	59	61
Mean	78	82	79	81	79	82
SEd	0.25	0.33	0.27	0.37	0.29	0.39
CD (p=0.05)	0.51	0.67	0.55	0.77	0.58	0.7.8

Table 2: Effect of seed treatment (Bulk and nano particles) on seedling length (cm) in pigeonpea

Treatment	Seedling length (cm)											
	Shoot length (cm)				Root length (cm)				Seedling length (cm)			
	BRG 2	BRG 4	CO7	Mean	BRG 2	BRG 4	CO7	Mean	BRG 2	BRG 4	CO7	Mean
Control	7.3	6.5	7.0	6.9	13.3	13.1	14.0	13.5	20.8	20.5	21.2	20.8
Zinc oxide 100 ppm (Nano)	7.4	6.6	7.1	7.0	13.5	13.4	14.2	13.7	21.1	21.1	21.5	21.2
Zinc oxide 250 ppm (Nano)	7.4	6.7	7.2	7.1	13.7	13.6	14.3	13.9	21.3	21.3	21.9	21.5
Zinc oxide 500 ppm (Nano)	7.5	6.8	7.3	7.2	13.8	13.8	14.4	14.0	21.5	21.6	22.1	21.7
Zinc oxide 750 ppm (Nano)	7.3	6.7	7.2	7.1	13.4	13.5	14.0	13.6	20.9	21.2	21.7	21.3
Zinc oxide 1000 ppm (Nano)	7.2	6.3	6.8	6.8	13.2	12.8	13.8	13.3	20.6	20.1	20.5	20.4
Silver 100 ppm (Nano)	7.3	6.6	7.1	7	13.4	13.2	14.0	13.5	20.9	20.8	21.3	21.0
Silver 250 ppm (Nano)	7.4	6.6	7.1	7.0	13.5	13.2	14.2	13.6	21.1	20.8	21.5	21.1
Silver 500 ppm (Nano)	7.4	6.6	7.1	7.0	13.6	13.3	14.2	13.7	21.2	20.9	21.5	21.2
Silver 750 ppm (Nano)	7.4	6.6	7.1	7.0	13.6	13.3	14.2	13.7	21.2	20.9	21.6	21.2
Silver 1000 ppm (Nano)	7.4	6.6	7.2	7.1	13.7	13.4	14.3	13.8	21.3	21.1	21.9	21.4
Silicon dioxide 100 ppm (Nano)	7.0	6.6	7.0	6.9	12.9	13.4	13.5	13.3	20.1	21.1	21	20.7
Silicon dioxide 250 ppm (Nano)	7.0	6.6	6.9	6.8	12.9	13.2	13.5	13.2	20.1	20.8	20.9	20.6
Silicon dioxide 500 ppm (Nano)	6.8	6.5	6.9	6.7	12.5	13.2	13.1	12.9	19.5	20.7	20.8	20.3
Silicon dioxide 750 ppm (Nano)	6.8	6.5	6.9	6.7	12.4	13.1	13.0	12.8	19.4	20.5	20.7	20.2
Silicon dioxide 1000ppm(Nano)	6.8	6.3	6.8	6.6	12.4	12.8	13.0	12.7	19.4	20.1	20.5	20.0
Zinc oxide 100 ppm (Bulk)	6.9	6.1	6.6	6.5	12.9	12.7	13.6	13.1	20.4	20.1	20.8	20.4
Zinc oxide 250 ppm (Bulk)	7.0	6.2	6.7	6.6	13.1	13.0	13.8	13.3	20.7	20.7	21.1	20.8
Zinc oxide 500 ppm (Bulk)	7.0	6.3	6.8	6.7	13.3	13.2	13.9	13.5	20.9	20.9	21.5	21.1
Zinc oxide 750 ppm (Bulk)	7.1	6.4	6.9	6.8	13.4	13.4	14.0	13.6	21.1	21.2	21.7	21.3
Zinc oxide 1000 ppm (Bulk)	6.9	6.3	6.8	6.7	13.0	13.1	13.6	13.2	20.5	20.8	21.3	20.9
Silver 100 ppm (Bulk)	6.8	5.9	6.4	6.4	12.8	12.4	13.4	12.9	20.2	19.7	20.1	20.0
Silver 250 ppm (Bulk)	6.9	6.2	6.7	6.6	13.0	12.8	13.6	13.1	20.5	20.4	20.9	20.6
Silver 500 ppm (Bulk)	7.0	6.2	6.7	6.6	13.1	12.8	13.8	13.2	20.7	20.4	21.1	20.7
Silver 750 ppm (Bulk)	7.0	6.2	6.7	6.6	13.2	12.9	13.8	13.3	20.8	20.5	21.1	20.8
Silver 1000 ppm Bulk)	7.0	6.2	6.7	6.6	13.2	12.9	13.8	13.3	20.8	20.5	21.2	20.8
Silicon dioxide 100 ppm (Bulk)	7.0	6.2	6.8	6.7	13.3	13.0	13.9	13.4	20.9	20.7	21.5	21.0
Silicon dioxide 250 ppm (Bulk)	6.6	6.2	6.6	6.5	12.5	13.0	13.1	12.9	19.7	20.7	20.6	20.3
Silicon dioxide 500 ppm (Bulk)	6.6	6.2	6.5	6.4	12.5	12.8	13.1	12.8	19.7	20.4	20.5	20.2
Silicon dioxide 750 ppm (Bulk)	6.4	6.1	6.5	6.3	12.1	12.8	12.7	12.5	19.1	20.3	20.4	19.9
Silicon dioxide 1000ppm (Bulk)	6.4	6.1	6.5	6.3	12.0	12.7	12.6	12.4	19.0	20.1	20.3	19.8
Mean	**6.8**	**6.2**	**6.7**		**12.9**	**12.9**	**13.5**	**13.1**	**19.0**	**19.7**	**20.1**	**19.6**
SEd	**0.38**	**0.43**	**0.31**		**0.36**	**0.47**	**0.45**		**0.51**	**0.61**	**9.8**	
CD (p=0.05)	**0.79**	**0.89**	**0.64**		**0.73**	**0.98**	**0.93**		**1.05**	**1.12**	**0.95**	

Table 3: Effect of seed treatment (Bulk and nano particles) on seedling dry weight and vigour index in pigeonpea

Treatments	Seedling dry weight (mg / seedling)				Vigour index			
	BRG 2	BRG 4	CO7	Mean	BRG 2	BRG 4	CO7	Mean
Control	21.6	22.3	22.8	22.2	1750	1620	1804	1725
Zinc oxide 100 ppm (Nano)	21.7	22.4	22.9	22.3	1796	1707	1894	1799
Zinc oxide 250 ppm (Nano)	21.7	22.6	23.1	22.5	1856	1784	1961	1867
Zinc oxide 500 ppm (Nano)	21.8	22.6	23.1	22.5	1958	1871	2001	1943
Zinc oxide 750 ppm (Nano)	21.6	22.5	23.0	22.4	1883	1816	1930	1876
Zinc oxide 1000 ppm (Nano)	21.5	22.1	22.6	22.1	1795	1703	1814	1771
Silver 100 ppm (Nano)	21.6	22.4	22.9	22.3	1759	1643	1834	1745
Silver 250 ppm (Nano)	21.7	22.4	22.9	22.3	1776	1683	1851	1770
Silver 500 ppm (Nano)	21.7	22.4	22.9	22.3	1805	1751	1857	1804
Silver 750 ppm (Nano)	21.7	22.5	23.0	22.4	1826	1751	1903	1827
Silver 1000 ppm (Nano)	21.7	22.6	23.1	22.5	1877	1808	1961	1882
Silicon dioxide 100ppm (Nano)	21.3	22.3	22.8	22.1	1532	1506	1451	1496
Silicon dioxide 250ppm (Nano)	21.3	22.2	22.7	22.1	1492	1406	1531	1476
Silicon dioxide 500ppm (Nano)	21.1	22.2	22.7	22.0	1351	1379	1298	1343
Silicon dioxide 750ppm (Nano)	21.1	22.2	22.7	22.0	1287	1268	1292	1282
Silicon dioxide 100 0ppm (Nano)	21.1	22.1	22.6	21.9	1306	1225	1228	1253
Zinc oxide 100 ppm (Bulk)	20.8	21.5	22.0	21.4	1667	1702	1679	1683
Zinc oxide 250 ppm (Bulk)	20.9	21.6	22.1	21.5	1712	1795	1766	1758
Zinc oxide 500 ppm (Bulk)	20.9	21.8	22.3	21.7	1728	1896	1800	1808
Zinc oxide 750 ppm (Bulk)	21.0	21.8	22.3	21.7	1787	1902	1816	1835
Zinc oxide 1000 ppm (Bulk)	20.8	21.7	22.2	21.6	1695	1803	1762	1753
Silver 100 ppm (Bulk)	20.7	21.3	21.8	21.3	1650	1649	1642	1647
Silver 250 ppm (Bulk)	20.8	21.6	22.1	21.5	1716	1707	1708	1710
Silver 500 ppm (Bulk)	20.9	21.6	22.1	21.5	1733	1728	1766	1742
Silver 750 ppm (Bulk)	20.9	21.6	22.1	21.5	1783	1757	1808	1783
Silver 1000 ppm (Bulk)	20.9	21.7	22.2	21.6	1803	1798	1817	1806
Silicon dioxide 100 ppm (Bulk)	20.9	21.8	22.3	21.7	1561	1567	1499	1542
Silicon dioxide 250 ppm (Bulk)	20.5	21.5	22.0	21.3	1412	1526	1477	1472
Silicon dioxide 500 ppm (Bulk)	20.5	21.4	21.9	21.3	1235	1401	1408	1348
Silicon dioxide 750 ppm (Bulk)	20.3	20.8	21.7	20.9	1121	1334	1361	1272
Silicon dioxide 1000 ppm (Bulk)	20.3	21.4	21.9	21.2	1153	1341	1212	1235
Mean	21.5	22.4	22.9	22.3	1489	1610	1581	1560
SEd	0.21	0.27	0.31		3.217	4.336	3.153	
CD(p=0.05)	0.48	0.45	0.64		6.585	8.952	6.422	

Centre: UAS, Bengaluru

Experimental details: Freshly harvested seeds of pigeonpea variety, BRG 2 was obtained from NSP, GKVK and dried to safer and uniform moisture level (8-9 %). Initial seed quality parameters were recorded (Table 4) and the red gram seeds were subjected for wet treatment with different Nano-particles (Zinc oxide, Silver, Silicon dioxide) with different concentrations (100 ppm, 250 ppm, 500 ppm, 750 ppm and 1000 ppm) both in nano and bulk form (Table 5). To standardize the optimum concentration and know the effect of different Nano-particle s on seed quality and storability, the treated seeds were tested in three replications for different seed quality and biochemical parameters. The data was analysed using CRD.

Table 4: Initial seed quality parameters of red gram

Parameters	Moisture content (%)	Germination (%)	Seedling length (cm)	Dry weight (mg/seedling)	Seedling vigour index-I	Seedling vigour index-II
R_1	11.26	99	32.50	41.59	3218	4117
R_2	11.18	98	31.62	40.89	3099	4007
R_3	11.28	99	32.86	41.64	3253	4122
R_4	11.23	99	32.54	41.70	3221	4128
Mean	**11.23**	**99**	**32.38**	**41.45**	**3197**	**4093**

Table 5: Details of Nano-particle s (both nano and bulk) treatments

T_1	Zinc oxide NP 100 ppm	T_5	Zinc oxide NP 1000 ppm	T_9	Silver NP 750 ppm	T_{13}	Silicon NP 500 ppm
T_2	Zinc oxide NP 250 ppm	T_6	Silver NP 100 ppm	T_{10}	Silver NP 1000 ppm	T_{14}	Silicon NP 750 ppm
T_3	Zinc oxide NP 500 ppm	T_7	Silver NP 250 ppm	T_{11}	Silicon NP 100 ppm	T_{15}	Silicon NP 1000 ppm
T_4	Zinc oxide NP 750 ppm	T_8	Silver NP 500 ppm	T_{12}	Silicon NP 250 ppm	T_{16}	Control

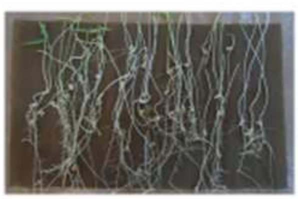
Results: In wet treatment all the treatment combinations showed reduced seed quality parameters compared to control. This may be due to the soaking injury to the seed coat. Further the seeds were subjected to dry treatment of zinc oxide, silver, silicon dioxide (both nano and bulk) with different concentrations (Plate 1). Dry treatment showed promising results (Table 6-8 & Plate 1, 3) with respect to seed quality parameters. Among the treatment combinations ZnO nano form at 500 ppm showed higher germination (97%) followed by silver Nano-particle at 250 ppm showing germination (97%) and silicon dioxide bulk form at 100 ppm with germination (95%).

The best treatment which responded positively to Nano-particle s in above experiment has been selected to study seed quality and storability. Freshly harvested seeds of pigeonpea was obtained from NSP, GKVK and dried to safer and uniform moisture level (8-9 %) is treated with Nano-particle s and is packed in cloth bag and stored under ambient conditions. All the seed quality and biochemical parameters were recorded on every month.

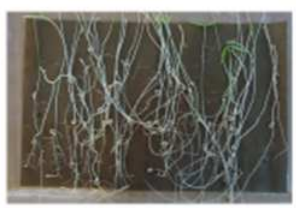
Table 6: Effect of Zinc oxide (both nano and bulk form) dry treatment on seed quality parameters of pigeonpea

Treatments	Germi.	Field emergence (%)	Shoot length (cm)	Root length (cm)	Mean seedling length (cm)	Dry weight (mg/seedling)	Seedling vigour Index-I	Seedling vigour Index-II
T_0	97	61	19.15	19.28	38.52	36.53	3748	3555
T_1	94	82	18.27	21.06	39.43	38.03	3708	3579
T_2	95	63	18.78	17.14	36.02	37.93	3412	3589
T_3	97	78	19.59	19.81	39.49	38.13	3814	3689
T_4	93	78	20.29	21.06	41.45	40.03	3842	3712
T_5	93	79	18.51	20.86	39.47	37.20	3660	3447
T_6	98	86	21.36	21.21	42.67	36.77	4182	3601
T_7	95	86	19.92	22.04	42.06	44.23	4007	4207
T_8	93	89	18.82	19.58	38.50	34.80	3574	3227
T_9	95	86	17.70	20.66	38.46	34.77	3640	3287
T_{10}	97	94	19.66	20.68	40.44	37.93	3937	3692
Mean	**95**	**80**	**19.28**	**20.31**	**39.68**	**37.85**	**3774**	**3598**
SEm(±)	**1.67**	**3.65**	**0.92**	**0.77**	**1.07**	**2.46**	**131.18**	**235.52**
CD (p=5%)	**4.89**	**10.70**	**2.71**	**2.26**	**3.14**	**7.42**	**384.74**	**690.77**
CV (%)	**3.04**	**7.88**	**8.30**	**6.59**	**4.67**	**11.29**	**6.01**	**11.33**

T_0 : Control	T_3 :Zinc oxide NP 500 ppm	T_6 :Zinc oxide bulk 100 ppm	T_9 : Zinc oxide bulk 750 ppm
T_1 : Zinc oxide NP 100 ppm	T_4 :Zinc oxide NP 750 ppm	T_7 :Zinc oxide bulk 250 ppm	T_{10} :Zinc oxide bulk 1000 ppm
T_2 : Zinc oxide NP 250 ppm	T_5 :Zinc oxide NP 1000 ppm	T_8 :Zinc oxide bulk 500 ppm	



ZnO NP 100 ppm



ZnO NP 250 ppm

ZnO NP 500 ppm

ZnO NP 750 ppm

ZnO NP 1000 ppm

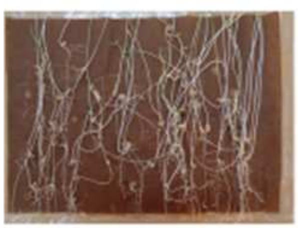
Control

Plate 1: Germination test of pigeonpea seeds with nano Zinc oxide dry treatment

Table 7: Effect of silver (both nano and bulk form) dry treatment on seed quality parameters of pigeonpea

Treatments	Germi. (%)	Field emergence (%)	Shoot length (cm)	Root length (cm)	Mean seedling length (cm)	Dry weight (mg/seedling)	Seedling vigour Index-I	Seedling vigour Index-II
T_0	97	61	19.15	19.28	38.52	36.53	3748	3555
T_1	93	95	18.20	22.29	40.59	39.10	3788	3642
T_2	97	93	18.72	24.95	43.78	40.77	4233	3939
T_3	91	74	18.32	22.80	41.22	41.60	3766	3786
T_4	93	93	17.53	23.44	41.08	38.70	3808	3579
T_5	93	86	18.18	24.03	42.31	37.97	3949	3544
T_6	93	81	19.31	23.06	42.47	39.77	3936	3686
T_7	91	76	18.61	21.96	40.67	36.23	3721	3307
T_8	91	84	18.76	22.98	41.84	38.73	3790	3511
T_9	90	92	19.68	21.70	41.48	39.97	3737	3602
T_{10}	90	91	18.27	21.42	39.79	37.00	3587	3334
Mean	**93**	**84**	**18.61**	**22.54**	**41.25**	**38.76**	**3823**	**3589**
SEm(±)	**1.70**	**4.20**	**0.99**	**1.03**	**1.05**	**1.97**	**136.6**	**171.6**
CD (p=5%)	**5.00**	**12.31**	**2.91**	**3.03**	**3.08**	**5.77**	**400.7**	**503.5**
CV (%)	**3.18**	**8.64**	**9.25**	**7.95**	**4.42**	**8.80**	**6.19**	**8.28**

T_0 : Control	**T_3 :** Silver NP 500 ppm	**T_6 :** Silver bulk 100 ppm	**T_9 :** Silver bulk 750 ppm
T_1 : Silver NP 100 ppm	**T_4 :** Silver NP 750 ppm	**T_7 :** Silver bulk 250 ppm	**T_{10} :** Silver bulk 1000 ppm
T_2 : Silver NP 250 ppm	**T_5 :** Silver NP 1000 ppm	**T_8 :** Silver bulk 500 ppm	


Ag NP 100 ppm


Ag NP 250 ppm


Ag NP 500 ppm


Ag NP 750 ppm


Ag NP 1000 ppm


Control

Plate 2: Germination test of pigeonpea seeds with nano silver dioxide dry treatment

Table 8: Effect of silicon dioxide (both nano and bulk form) dry treatment on seed quality parameters of pigeonpea.

Treatments	Germi. (%)	Field emergence (%)	Shoot length (cm)	Root length (cm)	Mean seedling length (cm)	Dry weight (mg/seedling)	Seedling vigour Index-I	Seedling vigour Index-II
T_0	97	61	19.15	19.28	38.52	36.53	3748	3555
T_1	95	87	20.63	18.45	39.18	47.27	3734	4499
T_2	94	85	17.68	23.54	41.32	47.33	3884	4446
T_3	93	80	20.90	18.97	39.97	44.33	3732	4140
T_4	91	89	19.00	21.76	40.85	46.33	3705	4204
T_5	93	82	19.65	19.64	39.39	43.73	3646	4045
T_6	**97**	**88**	**19.57**	**19.34**	**39.02**	**43.80**	**3797**	**4264**
T_7	93	87	18.88	19.56	38.54	44.63	3569	4136
T_8	95	71	19.23	22.69	42.02	47.80	3978	4526
T_9	92	46	18.11	22.42	40.63	45.33	3736	4169
T_{10}	95	71	18.66	20.29	39.06	44.30	3724	4222
Mean	**94**	**77**	**19.22**	**20.54**	**39.86**	**44.67**	**3750**	**4200**
S.Em±	**1.67**	**3.64**	**0.85**	**1.00**	**0.78**	**1.62**	**82.65**	**149.38**
CD (P=5%)	**4.89**	**10.69**	**2.52**	**2.95**	**2.31**	**4.75**	**242.42**	**438.12**
CV	**3.07**	**8.20**	**7.74**	**8.50**	**3.42**	**6.28**	**3.81**	**6.16**

T_0 : Control	T_3 : Silicon dioxide NP 500 ppm	T_6 : Silicon dioxide bulk 100 ppm	T_9 : Silicon dioxide bulk 750 ppm
T_1 : Silicon dioxide NP 100 ppm	T_4 : Silicon dioxide NP 750 ppm	T_7 : Silicon dioxide bulk 250 ppm	T_{10} : Silicon dioxide bulk 1000 ppm
T_2 : Silicon dioxide NP 250 ppm	T_5 : Silicon dioxide NP 1000 ppm	T_8 : Silicon dioxide bulk 500 ppm	

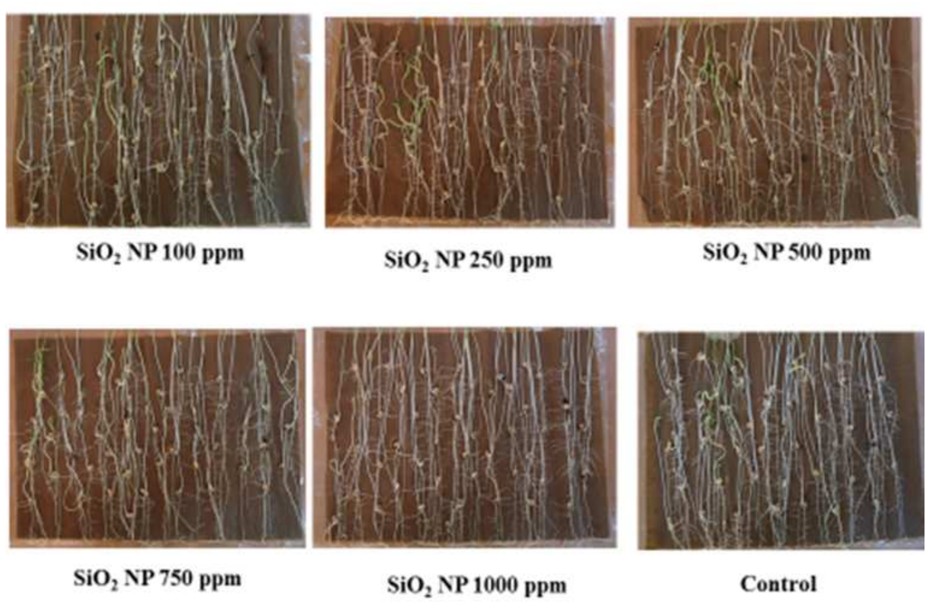


Plate 4: Germination test of pigeonpea seeds with nano Silicon dioxide dry treatment

Sub. Experiment-II (As per Objective 2): Studies on effect of selected nano-particles on seed quality and storability in pigeonpea

The best treatment (s), which responded positively to nano-particles in Experiment-I shall be selected to study their influence on seed quality and storability. The treated pigeonpea seeds are to be packed in cloth bag and stored under ambient conditions. Storage studies will be conducted up to 10 months and the following observations are to be recorded at monthly interval including weather data of storage conditions.

Observations:

1. Seed germination (%) (ISTA, 2014)
2. Mean root and shoot length (cm)
3. Mean seedling length (cm)
4. Mean seedling dry weight (mg)
5. Seedling vigour index I and II (Abdul Baki and Anderson, 1973)
6. T_{50} value
7. Seed health (infection and infestation)
8. Electrical conductivity of seed leachate (µS/cm/g)
9. Total dehydrogenase activity (A_{480} nm)

Centre-wise research findings during 2017-18

Crop: Pigeonpea

Centre: TNAU, Coimbatore

Experimental details: The experiment was undertaken as per the proposed technical programme. The treatments; Zinc oxide 500 ppm and 750 ppm and silver 1000 ppm which were found significantly better under sub-experiment I were taken for storage studies to know the effect of different Nano-particle s on seed quality during storage. The treated seeds with Zinc oxide 500 ppm and 750 ppm and silver 1000 ppm were packed in cloth bag and stored in ambient conditions. The treated seeds were subjected to seed quality analysis on monthly basis in three replications.

Results: The Pigeonpea seeds maintain the viability in good condition during these 4 months of storage study. The control seeds of BRG 2 recorded the initial germination of 85% during initial and recorded germination of 84 percent after 4 months of storage. The zinc oxide 500 ppm treated seeds recorded 91 percent germination even after the 4 months of storage. Zinc oxide 750 ppm treated seeds recorded 90 percent and silver 1000 ppm treated seeds recorded germination of 88 percent after 4 months of storage (Table 9). The similar effect was recorded in seedling length (Table 10) and vigor index also (Table 11). The storage study is in progress.

Table 9: Effect of nano particles on pigeonpea seed germination during storage

Period	Var. BRG 2				Var. BRG 4				Var. CO 7			
	Control	Zinc oxide 500 ppm	Zinc oxide 750 ppm	Silver 1000 ppm	Control	Zinc oxide 500 ppm	Zinc oxide 750 ppm	Silver 1000 ppm	Control	Zinc oxide 500 ppm	Zinc oxide 750 ppm	Silver 1000 ppm
Initial	85	92	91	89	83	91	90	90	86	92	91	91
1 month	85	92	91	89	83	91	90	90	86	92	90	90
2 month	85	92	91	88	82	91	90	88	86	91	89	89
3 month	84.5	92	90	88	82	90	88	87	85	91	88	88

4 month	84	91	90	88	82	90	87	86	85	90	87	86
SEd	0.57	0.62	0.65	0.31	0.41	0.43	0.61	0.83	0.67	0.61	0.51	77
CD (p=0.05)	1.118	1.124	1.13	0.082	0.84	0.86	1.21	1.68	1.32	1.32	1.1	1.48

Table 10: Effect of nano particles on pigeonpea seedling length (cm) during storage

Period	Var. BRG 2				Var. BRG 4				Var. CO 7			
	Control	Zinc oxide 500 ppm	Zinc oxide 750 ppm	Silver 1000 ppm	Control	Zinc oxide 500 ppm	Zinc oxide 750 ppm	Silver 1000 ppm	Control	Zinc oxide 500 ppm	Zinc oxide 750 ppm	Silver 1000 ppm
Initial	20.6	21.1	20.6	21.1	19.5	20.4	19.8	20.1	21.0	21.6	20.8	21.5
1 month	20.6	20.7	20.4	21.1	18.3	18.9	18.0	18.9	19.5	20.4	19.2	20.6
2 month	20.6	20.7	20.4	18.3	15.5	18.9	18.0	16.0	19.5	17.5	16.4	17.7
3 month	19.2	20.7	17.6	18.3	15.5	16.1	14.2	15.4	16.7	17.5	16.4	16.6
4 month	17.8	18.7	17.6	18.3	15.5	16.1	14.0	12.3	16.7	16.7	15.8	14.7
SEd	0.16	0.24	0.18	0.45	0.28	0.54	0.37	0.19	0.44	0.39	0.48	0.23
CD (p=0.05)	3.2	0.48	0.34	0.92	0.56	1.08	0.78	0.38	0.88	0.84	0.96	0.48

Table 11: Effect of nano particles on vigour index of pigeonpea in storage

Period	Var. BRG 2				Var. BRG 4				Var. CO 7			
	Control	Zinc oxide 500 ppm	Zinc oxide 750 ppm	Silver 1000 ppm	Control	Zinc oxide 500 ppm	Zinc oxide 750 ppm	Silver 1000 ppm	Control	Zinc oxide 500 ppm	Zinc oxide 750 ppm	Silver 1000 ppm
Initial	1750	1939	1873	1877	1620	1860	1785	1808	1804	1988	1894	1961
1 month	1750	1904	1856	1877	1520	1724	1616	1697	1679	1874	1732	1851
2 month	1750	1904	1856	1606	1269	1724	1616	1410	1679	1596	1461	1578
3 month	1620	1904	1580	1606	1269	1450	1248	1344	1418	1596	1444	1460
4 month	1491	1708	1580	1606	1269	1450	1217	1060	1418	1502	1371	1266
SEd	3.22	4.74	2.84	5.12	3.78	5.22	2.82	3.24	1.77	3.45	1.98	4.24
CD (p=0.05)	6.58	9.58	4.68	10.36	7.56	10.44	5.62	6.52	3.58	6.94	4.02	8.52

Centre: UAS, Bengaluru

Experimental details: The treatments which were found effective under sub-experiment I were taken for storage studies to know the effect of different Nano-particle s on seed quality during storage. The data was analysed using CRD.

Results: During the storage silicon dioxide in nano form @ 250 ppm concentration recorded higher seed quality parameters (Table 12-17 and Plate 4); germination (92%), field emergence (86%), seedling vigour index I (2953) and vigour index II (3353) followed by silicon dioxide at 100 ppm in nano form germination (91%), field emergence (82%), seedling vigour index I (2830) and vigour index II (3135) compared to other treatments up to six months of storage period. Effect of both nano and bulk form of zinc oxide, silver and silicon dioxide on electrical conductivity (EC) and total dehydrogenase activity of pigeonpea during storage was measured to assess the longevity potential of treated seeds. Electrical conductivity (µS/cm/g) in seeds treated with Silicon dioxide NP 100 ppm and 250 ppm measured at monthly interval revealed significantly less (Table 18) and total dehydrogenase activity was found significantly high (Table 19) than measured in all treatments over whole period of study, thereby suggesting that these two treatments could be further tested for their efficacy in maintaining the seed quality during storage. In silicon dioxide bulk form is also good when compare with other nano and bulk form of treatments. Experiment is in progress.

Table 12: Effect of both nano and bulk form of zinc oxide, silver and silicon dioxide on seed germination percentage of pigeonpea during storage

Treatments	Germination (%)						
	June	July	August	September	October	November	December
T_0	98.00	97.00	95.00	93.00	91.00	89.00	84.00
T_1	98.00	97.00	96.00	95.00	92.00	91.00	86.00
T_2	96.00	96.00	96.00	96.00	94.00	92.00	84.00
T_3	96.00	95.00	95.00	94.00	92.00	90.00	83.00
T_4	98.00	97.00	95.00	94.00	91.00	90.00	82.00
T_5	98.00	98.00	96.00	94.00	91.00	90.00	89.00
T_6	98.00	98.00	96.00	93.00	90.00	89.00	88.00
T_7	98.00	97.00	95.00	92.00	90.00	88.00	82.00
T_8	99.00	98.00	97.00	95.00	92.00	90.00	85.00
T_9	**99.00**	**99.00**	**97.00**	**95.00**	**92.00**	**91.00**	**91.00**
T_{10}	**99.00**	**98.00**	**98.00**	**96.00**	**94.00**	**92.00**	**92.00**
T_{11}	98.00	98.00	97.00	96.00	93.00	92.00	88.00
T_{12}	99.00	98.00	96.00	94.00	92.00	91.00	86.00
Mean	**98.00**	**97.00**	**96.00**	**94.00**	**91.00**	**90.00**	**86.00**
SEm(±)	**1.10**	**1.37**	**1.40**	**1.73**	**1.19**	**0.94**	**3.02**
CD (p=0.05)	**3.22**	**4.00**	**4.08**	**5.05**	**3.48**	**2.75**	**8.78**
CV	**1.99**	**2.51**	**2.50**	**3.14**	**2.20**	**1.71**	**6.14**

T_0 : Control	**T_4 :** ZnO B 100 ppm	**T_7 :** Silver B 100 ppm	**T_{10} : Silicon dioxide NP 250 ppm**
T_1 : ZnO NP 750 ppm	**T_5 :** Silver NP 250 ppm	**T_8 :** Silver B 500 ppm	**T_{11} :** Silicon dioxide B 500 ppm
T_2 : ZnO NP 500 ppm	**T_6 :** Silver NP 500 ppm	**T_9 : Silicon dioxide NP 100 ppm**	**T_{12} :** Silicon dioxide B 100 ppm
T_3 : ZnO B 250 ppm			

T_{10} - Silver dioxide NP 250 ppm

T_9 - Silver dioxide NP 100 ppm

T_0 - Control

Plate 4: Germination test of pigeonpea seeds with nano silver dioxide treatment

Table 13: Effect of both nano and bulk form of zinc oxide, silver and silicon dioxide on field emergence (%) of pigeonpea during storage

Treatments	Field emergence (%)						
	June	July	August	September	October	November	December
T_0	92.00	90.00	89.00	85.00	85.00	85.00	78.00
T_1	89.00	88.00	86.00	86.00	84.00	83.00	80.00
T_2	90.00	88.00	86.00	85.00	83.00	82.00	81.00
T_3	89.00	89.00	88.00	86.00	86.00	82.00	79.00
T_4	92.00	90.00	89.00	86.00	85.00	84.00	78.00
T_5	91.00	90.00	88.00	86.00	85.00	85.00	81.00
T_6	92.00	91.00	89.00	87.00	86.00	85.00	80.00
T_7	92.00	91.00	90.00	88.00	86.00	84.00	79.00
T_8	94.00	91.00	89.00	87.00	86.00	85.00	81.00
T_9	92.00	90.00	89.00	87.00	85.00	85.00	82.00
T_{10}	**94.00**	**92.00**	**90.00**	**88.00**	**87.00**	**87.00**	**86.00**
T_{11}	91.00	90.00	89.00	86.00	85.00	84.00	81.00
T_{12}	93.00	91.00	89.00	87.00	86.00	86.00	80.00
Mean	**91.00**	**90.00**	**88.00**	**86.00**	**85.00**	**84.00**	**80.00**
SEm(±)	**4.228**	**5.27**	**1.39**	**1.89**	**1.67**	**1.76**	**1.26**
CD (p=0.05)	**12.28**	**15.34**	**4.05**	**5.49**	**5.26**	**5.36**	**4.69**
CV	**7.50**	**8.59**	**2.89**	**4.36**	**2.62**	**3.45**	**3.59**

T_0 : Control	**T_4 :** ZnO B 100 ppm	**T_7 :** Silver B 100 ppm	**T_{10} : Silicon dioxide NP 250 ppm**
T_1 : ZnO NP 750 ppm	**T_5 :** Silver NP 250 ppm	**T_8 :** Silver B 500 ppm	**T_{11} :** Silicon dioxide B 500 ppm
T_2 : ZnO NP 500 ppm	**T_6 :** Silver NP 500 ppm	**T_9 : Silicon dioxide NP 100 ppm**	**T_{12} :** Silicon dioxide B 100 ppm
T_3 : ZnO B 250 ppm			

Table 14: Effect of both nano and bulk form of zinc oxide, silver and silicon dioxide on Mean seedling length (cm) of pigeonpea during storage

Treatments	Mean seedling length (cm)						
	June	July	August	September	October	November	December
T_0	37.95	34.91	32.02	30.51	30.45	29.53	28.80
T_1	35.01	34.06	33.32	31.52	30.38	29.30	28.59
T_2	36.90	36.08	31.25	30.62	31.91	30.76	30.51
T_3	35.60	35.75	33.10	31.99	30.90	30.82	30.64
T_4	38.22	36.10	32.86	31.91	31.78	30.41	28.08
T_5	36.83	37.80	34.73	32.56	31.21	30.10	29.13
T_6	36.94	34.70	33.02	31.55	30.46	30.52	31.05
T_7	36.69	34.38	30.42	29.63	30.51	29.98	30.78
T_8	36.97	33.76	31.28	30.43	30.43	30.42	30.60
T_9	**38.70**	**34.93**	**32.58**	**31.82**	**31.39**	**31.61**	**31.70**
T_{10}	**39.40**	**34.94**	**33.72**	**32.18**	**32.53**	**31.95**	**32.10**
T_{11}	37.88	33.30	30.04	30.50	32.98	31.66	31.49
T_{12}	37.89	32.65	31.74	30.35	31.43	30.20	30.28
Mean	**37.30**	**34.870**	**32.31**	**31.20**	**31.26**	**30.56**	**30.31**
SEm(±)	**0.96**	**0.59**	**1.51**	**0.61**	**0.95**	**0.87**	**1.16**

CD (p=0.05)	2.80	1.72	4.411	1.77	2.76	2.53	3.37
CV	4.63	4.16	7.17	2.84	4.13	4.61	6.10

T_0 : Control	**T_4 :** ZnO B 100 ppm	**T_7 :** Silver B 100 ppm	**T_{10} : Silicon dioxide NP 250 ppm**
T_1 : ZnO NP 750 ppm	**T_5 :** Silver NP 250 ppm	**T_8 :** Silver B 500 ppm	**T_{11} :** Silicon dioxide B 500 ppm
T_2 : ZnO NP 500 ppm	**T_6 :** Silver NP 500 ppm	**T_9 : Silicon dioxide NP 100 ppm**	**T_{12} :** Silicon dioxide B 100 ppm
T_3 : ZnO B 250 ppm			

Table 15: Effect of both nano and bulk form of zinc oxide, silver and silicon dioxide on Dry weight (mg/seedling) of pigeonpea during storage

Treatments	Dry weight (mg/seedling)						
	June	July	August	September	October	November	December
T_0	45.00	44.20	40.45	40.80	40.25	37.45	31.40
T_1	43.00	42.70	39.20	38.87	37.65	36.50	31.95
T_2	43.05	44.60	41.30	41.52	40.25	38.60	33.90
T_3	43.90	42.95	39.00	38.45	37.95	36.65	34.15
T_4	46.00	44.65	40.45	38.25	37.65	35.35	31.20
T_5	44.45	45.00	41.20	40.35	40.40	38.60	32.20
T_6	43.85	44.60	40.00	39.55	38.75	36.75	34.20
T_7	44.00	42.55	39.40	38.45	38.35	37.50	33.75
T_8	43.60	43.70	40.90	38.85	36.30	35.45	33.70
T_9	**45.05**	**44.35**	**41.80**	**39.75**	**38.75**	**36.45**	**34.45**
T_{10}	**46.10**	**44.30**	**42.60**	**40.45**	**40.80**	**39.10**	**36.45**
T_{11}	45.90	43.75	40.55	40.15	41.60	38.20	34.40
T_{12}	46.50	42.15	39.75	37.45	36.95	34.65	32.90
Mean	**44.64**	**43.800**	**40.50**	**39.45**	**38.90**	**37.02**	**33.43**
SEm(±)	**2.18**	**0.92**	**1.21**	**1.54**	**2.67**	**1.36**	**1.02**
CD (p=0.05)	**6.34**	**2.69**	**3.54**	**4.48**	**7.78**	**3.95**	**2.96**
CV	**8.81**	**6.74**	**5.73**	**6.73**	**9.59**	**7.59**	**5.71**

T_0 : Control	**T_4 :** ZnO B 100 ppm	**T_7 :** Silver B 100 ppm	**T_{10} : Silicon dioxide NP 250 ppm**
T_1 : ZnO NP 750 ppm	**T_5 :** Silver NP 250 ppm	**T_8 :** Silver B 500 ppm	**T_{11} :** Silicon dioxide B 500 ppm
T_2 : ZnO NP 500 ppm	**T_6 :** Silver NP 500 ppm	**T_9 : Silicon dioxide NP 100 ppm**	**T_{12} :** Silicon dioxide B 100 ppm
T_3 : ZnO B 250 ppm			

Table 16: Effect of both nano and bulk form of zinc oxide, silver and silicon dioxide on Seedling Vigour Index-I of pigeonpea during storage

Treatments	Seedling Vigour Index-I						
	June	July	August	September	October	November	December
T_0	3719	3386	3042	2837	2771	2628	2419
T_1	3431	3304	3199	2994	2795	2666	2459
T_2	3542	3464	3000	2940	3000	2830	2563
T_3	3418	3396	3145	3007	2843	2774	2543

T_4	3746	3502	3122	3000	2892	2737	2303
T_5	3609	3704	3334	3061	2840	2709	2593
T_6	3620	3401	3170	2934	2741	2716	2812
T_7	3596	3335	2890	2726	2746	2638	2524
T_8	3660	3308	3034	2891	2800	2738	2601
T_9	**3831**	**3458**	**3160**	**3023**	**2888**	**2877**	**2830**
T_{10}	**3901**	**3424**	**3305**	**3089**	**3058**	**2939**	**2953**
T_{11}	3712	3263	2914	2928	3067	2913	2771
T_{12}	3751	3200	3047	2853	2892	2748	2604
Mean	**3656**	**3395**	**3104**	**2944**	**2871**	**2762**	**2613**
SEm(±)	**94.21**	**69.64**	**165.19**	**80.29**	**72.75**	**94.96**	**153.09**
CD (p=0.05)	**273.87**	**202.44**	**480.21**	**233.14**	**211.48**	**276.04**	**445.02**
CV	**4.69**	**5.15**	**8.05**	**3.90**	**3.35**	**5.24**	**9.45**

T_0 : Control	**T_4 :** ZnO B 100 ppm	**T_7 :** Silver B 100 ppm	**T_{10} : Silicon dioxide NP 250 ppm**
T_1 : ZnO NP 750 ppm	**T_5 :** Silver NP 250 ppm	**T_8 :** Silver B 500 ppm	**T_{11} :** Silicon dioxide B 500 ppm
T_2 : ZnO NP 500 ppm	**T_6 :** Silver NP 500 ppm	**T_9 : Silicon dioxide NP 100 ppm**	**T_{12} :** Silicon dioxide B 100 ppm
T_3 : ZnO B 250 ppm			

Table 17: Effect of both nano and bulk form of zinc oxide, silver and silicon dioxide on Seedling Vigour Index-II of pigeonpea during storage

Treatments	Seedling Vigour Index-II						
	June	**July**	**August**	**September**	**October**	**November**	**December**
T_0	4410	4287	3843	3794	3663	3333	2638
T_1	4214	4142	3763	3693	3464	3322	2748
T_2	4133	4282	3965	3986	3784	3551	2848
T_3	4214	4080	3705	3614	3491	3299	2834
T_4	4508	4331	3843	3596	3426	3182	2558
T_5	4356	4410	3955	3793	3676	3474	2866
T_6	4297	4371	3840	3678	3488	3271	3010
T_7	4312	4127	3743	3537	3452	3300	2768
T_8	4316	4283	3967	3691	3340	3191	2865
T_9	**4460**	**4391**	**4055**	**3776**	**3565**	**3317**	**3135**
T_{10}	**4564**	**4341**	**4175**	**3883**	**3835**	**3597**	**3353**
T_{11}	4498	4288	3933	3854	3869	3514	3027
T_{12}	4604	4131	3816	3520	3399	3153	**2829**
Mean	4375	4266	3892	3724	3573	3346	2883
SEm(±)	**117.91**	**97.60**	**151.93**	**180.46**	**238.98**	**123.05**	**151.11**
CD (p=0.05)	**333.48**	**283.74**	**441.66**	**524.59**	**694.71**	**357.72**	**439.29**
CV	**6.13**	**7.48**	**7.36**	**8.23**	**11.00**	**7.18**	**9.92**

T_0 : Control	**T_4 :** ZnO B 100 ppm	**T_7 :** Silver B 100 ppm	**T_{10} : Silicon dioxide NP 250 ppm**
T_1 : ZnO NP 750 ppm	**T_5 :** Silver NP 250 ppm	**T_8 :** Silver B 500 ppm	**T_{11} :** Silicon dioxide B 500 ppm
T_2 : ZnO NP 500 ppm	**T_6 :** Silver NP 500 ppm	**T_9 : Silicon dioxide NP 100 ppm**	**T_{12} :** Silicon dioxide B 100 ppm

T_3 : ZnO B 250 ppm			

Table 18: Effect of both nano and bulk form of zinc oxide, silver and silicon dioxide on electrical conductivity (µS/cm/g) of pigeonpea during storage

Treatments	Electrical conductivity (µS/cm/g)						
	June	July	August	September	October	November	December
T_0	11.84	10.46	10.58	11.46	12.81	13.43	30.78
T_1	12.08	11.23	11.89	11.90	12.25	12.58	28.92
T_2	13.63	11.52	11.68	12.35	12.13	12.15	30.39
T_3	13.96	10.96	11.63	12.18	12.58	12.68	30.92
T_4	12.48	10.41	11.04	11.67	12.85	12.34	31.52
T_5	11.64	10.32	10.98	11.28	11.55	12.48	22.77
T_6	11.73	9.90	10.37	11.21	12.72	12.57	21.11
T_7	11.76	9.77	10.46	11.55	12.56	12.53	21.77
T_8	11.04	10.07	10.66	11.54	12.88	12.74	24.40
T_9	**11.19**	**10.29**	**10.81**	**11.16**	**12.28**	**11.83**	**19.71**
T_{10}	**10.98**	**9.11**	**10.80**	**11.01**	**11.89**	**11.99**	**17.92**
T_{11}	11.45	10.80	11.18	11.11	12.22	11.98	21.13
T_{12}	10.22	10.11	11.20	11.29	12.18	12.08	25.96
Mean	**11.84**	**10.380**	**11.02**	**11.52**	**12.38**	**12.41**	**25.18**
SEm(±)	**0.45**	**0.38**	**0.41**	**0.42**	**0.42**	**0.48**	**1.72**
CD (p=0.05)	**1.30**	**1.11**	**1.21**	**1.23**	**1.23**	**1.42**	**5.02**
CV	**4.58**	**6.51**	**7.08**	**7.74**	**7.51**	**8.02**	**10.73**

T_0 : Control	**T_4 :** ZnO B 100 ppm	**T_7 :** Silver B 100 ppm	**T_{10} : Silicon dioxide NP 250 ppm**
T_1 : ZnO NP 750 ppm	**T_5 :** Silver NP 250 ppm	**T_8 :** Silver B 500 ppm	**T_{11} :** Silicon dioxide B 500 ppm
T_2 : ZnO NP 500 ppm	**T_6 :** Silver NP 500 ppm	**T_9 : Silicon dioxide NP 100 ppm**	**T_{12} :** Silicon dioxide B 100 ppm
T_3 : ZnO B 250 ppm			

Table 19: Effect of both nano and bulk form of zinc oxide, silver and silicon dioxide on total dehydrogenase activity (OD 480nm) of pigeonpea during storage

Treatments	Total Dehydrogenase activity (OD 480 nm)						
	June	July	August	September	October	November	December
T_0	1.09	1.60	1.24	1.16	1.38	1.23	0.49
T_1	1.11	1.71	1.30	1.24	1.55	1.02	0.53
T_2	0.94	1.73	1.49	1.39	1.21	1.13	0.50
T_3	0.75	1.03	1.27	1.17	1.11	1.04	0.53
T_4	1.10	1.01	1.22	1.27	1.43	1.09	0.47
T_5	1.33	1.28	1.12	1.13	1.23	0.98	0.52
T_6	0.99	1.19	1.22	1.31	1.43	0.98	0.57
T_7	1.86	1.74	1.11	1.22	1.37	1.26	0.54
T_8	1.03	1.84	1.15	1.20	1.32	1.41	0.57
T_9	**1.10**	**1.64**	**1.24**	**1.27**	**1.41**	**1.39**	**0.71**
T_{10}	**0.90**	**1.88**	**1.25**	**1.34**	**1.25**	**1.13**	**0.80**

T_{11}	1.21	1.53	1.30	1.26	1.33	1.15	0.53
T_{12}	0.96	2.15	1.42	1.28	1.34	1.20	0.66
Mean	**1.10**	**1.560**	**1.25**	**1.25**	**1.34**	**1.15**	**0.57**
SEm(±)	**0.07**	**0.13**	**0.06**	**0.10**	**0.09**	**0.05**	**0.04**
CD (p=0.05)	**0.21**	**0.39**	**0.17**	**0.31**	**0.26**	**0.17**	**0.13**
CV	**7.82**	**5.69**	**6.93**	**8.04**	**7.53**	**9.12**	**13.76**

T_0 : Control	**T_4 :** ZnO B 100 ppm	**T_7 :** Silver B 100 ppm	**T_{10} : Silicon dioxide NP 250 ppm**
T_1 : ZnO NP 750 ppm	**T_5 :** Silver NP 250 ppm	**T_8 :** Silver B 500 ppm	**T_{11} :** Silicon dioxide B 500 ppm
T_2 : ZnO NP 500 ppm	**T_6 :** Silver NP 500 ppm	**T_9 : Silicon dioxide NP 100 ppm**	**T_{12} :** Silicon dioxide B 100 ppm
T_3 : ZnO B 250 ppm			

Experiment 5: Influence of terminal heat stress on seed set, seed yield and quality in field crops

Year of start: 2017

Note: This experiment was shifted from Seed Production and Certification programme (Year of start: 2013-14) and the respective centres as mentioned in that programme are retained.

Objectives: To evaluate the adverse effect of heat stress during reproductive phase in selected field crops and its mitigation.

Details of the cropstaken up by different centres for experiments

Crops		**Centres**
Wheat	:	ICAR-IARI, New Delhi; JNKVV, Jabalpur; PAU, Ludhiana; GBPUAT, Pantnagar; CCSHAU, Hisar; VNMKV, Parbhani; CSAUAT, Kanpur; MPKV, Rahuri and NDUAT, Faizabad
Sorghum	:	VNMKV, Parbhani and PDKV, Akola
Rice	:	ICAR-IIRR, Hyderabad; PJTSAU, Hyderabad; UAS, Bengaluru; TNAU, Coimbatore; ICARRC NEH Region - Manipur Centre; OUAT, Bhubaneswar; BSKKV, Dapoli; KAU, Thrissur and PAJANCOA&RI, Karaikal
Mustard	:	ICAR-CAZRI, Jodhpur; ICAR-IARI, New Delhi and CSAUAT, Kanpur

Proposed Technical Programme:

Methodology:

Experiment will be conducted with normal date of sowing and thereafter with 15 days intervals for 1½ months.

Set 1: in open field conditions
Set 2: in growth chamber with 5°C elevated temperature from anthesis onwards.

Mitigation treatments:

Spraying of chemicals during the anthesis with

1. Glycine betaine (600 ppm)

2. Cytokinin (100 ppm)
3. Salicylic acid (400 ppm)
4. Ascorbic acid (10 ppm)
5. KCl (1%)
6. Citric acid (1.5 %)

Observations:

- 1000 seed weight
- Evaluation of seed quality following ISTA protocol.

Crop-wise and centre-wise research findings during 2017-18

Crop: Wheat

Centre: JNKVV, Jabalpur

Experimental details: The experiment on wheat crop was conducted as per proposed technical programme (2016-17) to study the influence of terminal heat stress on seed set, seed yield and quality in field crops. The crop was raised in two different dates of sowings. During 2017-18 the experiment is on progress with wheat crop variety GW 322 which was sown in four dates of sowing viz; 12th Nov. 2017 (D1), 27th Nov. 2017 (D2), 12th Dec. 2017 (D3) and 27th Dec.2017, (D4) as per approved technical programme 2016-17. The standard package & practices was adopted for the sowing. The experiment was conducted in Factorial Randomized Black Design with three replications having plot size 5m x 2.70m (Plate 1). The crop is on different growth stages as per the sowing dates and the spraying treatment viz; T_1- Glycine betaine 600 ppm, T_2 Cytokinin in 100 ppm, T_3 Salicylic acid 400 ppm, T_4 Ascorbic acid 100 ppm., T_5- KCl (1%) & T_6 Citric acid (1.5%) will be applied at the time of ear emergence stage to observe the effect of treatments on different dates of sowing under the influence of terminal heat stress especially on seed set, seed yield and quality on wheat crop.

Plate 1: View of experiment during 2017-18

Results: Data on effect of elevated temperature mitigating treatments on seed set, yield and quality (Table 1&4), on enzymatic activities (Table 2&5) and of accelerated aging (Table 3&6) in wheat of first and second sowings, respectively during 2016-17 has been presented. Effect of elevated temperature mitigating treatments on seed yield and attributing traits in wheat of first and second sowing is also depicted in Figure 1 and Figure 2, respectively. Among all the treatments combinations tried during 2016-17, treatment including Glycine betaine @ 600 ppm (T_1) was found to be significantly superior for seed yield per plant as well as seed yield per plot in both the dates of sowing. However, in terms of seed set percentage and pollen viability (%) treatment including Salicylic acid @ 800 ppm (T_2)were observed superior in 1st and 2nd date of sowing.

Table 4: Effect of elevated temperature mitigating treatments on seed set, yield and quality in wheat of second sowing (2016-17)

Treatments	Chlorophyll index				Pollen viability %	Seed set percentage	100 seed weight (g)	Seed yield/ plant (g)	Seed yield/ plot (kg)	Initial germination of seed before storage (%)	Vigour of seed	Plant population/ m2	Biological yield/ plot (kg)
	Vegetative phase		Grain filling stage										
	BS	AS	BS	AS									
T_0	39.93	39.50	34.60	38.33	83.21	70.00	5.12	8.68	9.32	82.00	1966.67	48.67	4.33
T_1	38.00	36.37	36.20	39.87	89.84	82.00	5.44	17.88	2.20	92.00	2147.33	50.33	3.67
T_2	37.70	37.03	34.90	38.63	80.31	74.00	5.43	13.83	2.08	84.00	1892.13	57.67	4.33
T_3	38.40	39.87	35.67	39.30	80.68	80.67	5.78	13.61	1.89	82.00	1803.33	49.00	3.77
T_4	41.70	35.43	33.87	36.90	85.51	72.00	5.65	10.88	1.73	83.67	1911.83	53.00	3.00
T_5	40.40	35.13	40.00	43.13	86.16	78.33	5.50	14.02	1.80	82.67	1889.27	58.00	3.17
T_6	41.20	39.83	38.47	43.07	73.14	74.00	5.08	13.27	1.89	82.00	1790.00	55.67	3.50
SEd	1.44	1.57	1.33	1.19	3.61	1.12	0.03	0.37	1.34	1.16	43.05	4.36	0.32
CD(p=0.05)	4.31	4.72	4.02	3.59	10.83	3.36	0.09	1.19	4.04	3.47	129.07	13.09	0.96

BS=Before spray; AS=After spray

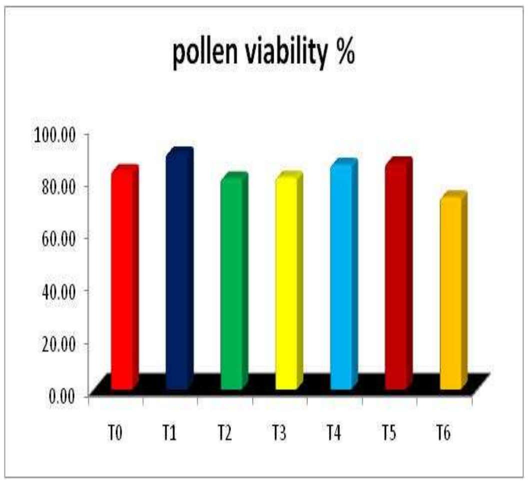
Table 5: Effect of elevated temperature mitigating treatments on enzymatic activities in wheat of second sowing (2016-17)

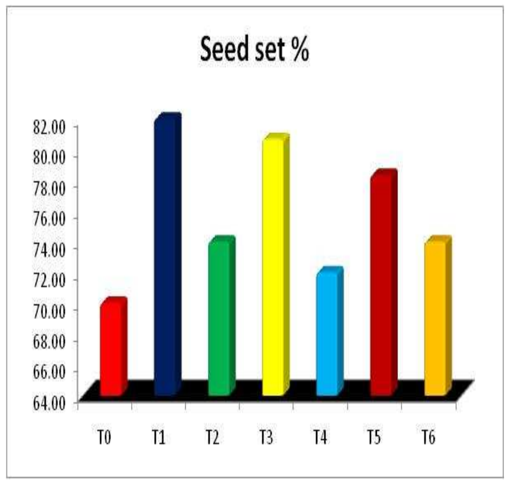
Treatments	Super oxide dismutase (SOD) Fresh Weight (mg-1)				Proline Content (µmole/g)				Activity of Nitrate Reductase (µmole NO_2^-/g)				Malondialdehyde Content (µmole/g FW)				Respiratory system Dehydrogenase activity
	VP		GFS		VP		GFS		VP		GFS		VP		GFS		
	BS	AS	BS	AS	BS	AS	BS	AS	BS	AS	BS	AS	BS	AS	BS	AS	
T_0	1.70	1.94	1.74	1.83	70.10	84.00	131.12	158.24	2.87	3.07	0.79	0.21	7.52	10.78	12.12	16.52	113.33
T_1	1.82	1.85	1.60	1.72	21.46	29.46	205.31	225.47	2.06	2.24	0.71	0.76	6.83	9.56	11.26	15.17	119.67
T_2	1.70	1.76	1.75	1.82	94.51	110.62	210.14	225.51	2.13	2.33	0.21	0.23	9.30	12.65	10.55	14.82	114.00
T_3	1.84	1.88	1.65	1.72	141.20	164.26	216.65	230.56	2.03	2.21	0.68	0.65	8.76	13.36	13.72	19.55	108.33
T_4	1.80	1.84	1.63	1.68	101.34	120.73	190.34	210.16	2.57	3.80	0.32	0.39	6.23	8.46	10.84	14.63	113.67
T_5	1.85	1.92	1.74	1.85	106.51	136.13	202.71	221.55	2.14	2.74	0.40	0.42	6.74	7.91	11.25	14.84	115.67
T_6	1.94	1.95	1.75	1.78	201.53	230.05	225.42	288.42	3.45	4.05	0.49	0.51	7.72	8.93	13.36	18.71	113.33
SEd	0.01	0.01	0.02	0.01	0.03	0.38	0.02	0.22	0.02	0.02	0	0	0.02	0.02	0.01	0.02	2.22
CD(p=0.05)	0.04	0.05	0.04	0.04	0.09	1.15	0.05	0.66	0.06	0.05	0	0	0.05	0.06	0.04	0.05	6.64

VP=Vegetative phase; GFS=Grain filling stage; BS=Before spray; AS=After spray

Table 6: Effect of elevated temperature mitigating treatments on accelerated aged wheat seed of second sowing (2016-17)

Treatments	24 hours		48 hours		72 hours		96 hours		120 hours		144 hours	
	First count	Final count	First count	Final count	First count	Final count	First count	Final count	First count	Final count	First count	Final count
T_0	74.67	79.67	63.33	67.33	62.67	64.00	59.33	61.00	51.67	54.67	34.00	34.67
T_1	70.00	77.33	59.00	73.00	69.00	64.67	59.33	61.00	50.00	52.33	37.67	40.33
T_2	87.00	90.00	73.67	77.67	73.33	75.00	69.67	71.00	61.67	63.67	38.00	40.00
T_3	84.00	90.00	73.33	77.00	73.00	74.33	68.67	70.33	52.00	56.00	37.00	39.67
T_4	82.67	87.33	71.33	74.67	69.33	71.00	65.00	66.33	49.67	51.67	37.67	40.33
T_5	81.67	85.00	65.67	70.00	68.00	68.67	62.67	64.67	47.67	50.67	31.33	33.67
T_6	73.67	80.00	61.33	66.00	62.00	63.00	56.00	59.67	46.67	50.00	33.33	36.33
SEd	2.06	1.75	1.87	1.94	1.97	1.77	1.99	2.04	2.48	2.12	1.45	1.39
CD(p=0.05)	6.18	5.24	5.62	5.81	5.92	5.29	5.96	6.14	7.44	6.36	4.34	4.19





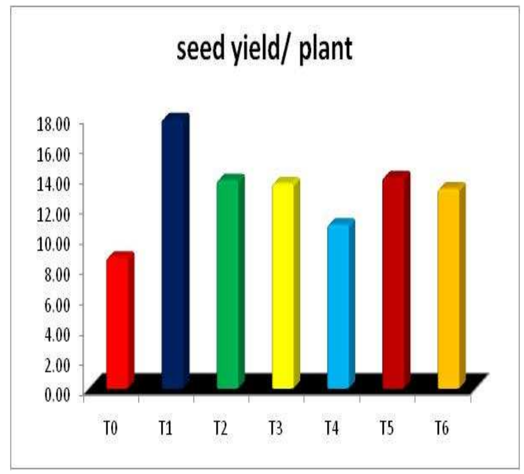


Figure 2: Effect of elevated temperature mitigating treatments on seed yield and attributing traits in wheat of second sowing (2016-17)

Plant population / plot recorded in plot size of 5m x 2.70m under different dates of sowing during 2017-18 have been given (Table 7). The rest of the observations will be recorded as the experiment approaches to maturity.

Table 7: Initial Observation on plant population in the experiment on influence of terminal heat stress on seed set, seed yield and quality in wheat crop at JNKVV, Jabalpur 2017-18

Treatment		Plant Population / plot under different dates of sowing			
		D1 (12-11-2017)	D2 (27-11-2017)	D3 (12-12-2017)	D4 (27-12-2017)
T1	Glycine Betaine 600ppm	1465.00	1445.00	1194.33	1032.33
T2	Cytokinin 100 ppm	1672.35	1477.33	1330.33	956.00
T3	Salicylic acid 400 ppm	1665.33	1272.00	1325.33	1077.66
T4	Ascorbic acid 100ppm	1648.33	1443.66	1295.00	1033.66
T5	KCL (1%)	1633.66	1503.00	1308.66	1134.00
T6	Citric acid (1.5%)	1662.33	1543.66	1299.00	1157.00
	Mean	1624.5	1447.4	1292.1	1065.1
	SEm(±)	41.83	20.48	13.67	29.42
	CD (p=0.05)	59.16	28.97	19.33	41.61

Centre: ICAR-IARI, New Delhi

Experimental details: To meet the objective (2017-18) two wheat varieties; HD3117 (late sown variety) and HD 3171 (timely sown variety) were shown in three dates of sowings(S); with normal date of sowing and thereafter with 15 days intervals for 1½ months under open field conditions (S1: 25.11.17, S2: 13.12.17 and S3: 05.01.18).

The experiment was laid in three replications in plots of 5 rows of 2m length each, thus a total of 18 plots for each variety (6 for each replication). Five plots in each replication were sprayed (Plate 2)during the anthesis with; Glycine betaine (600 ppm), Salicylic acid (400 ppm), Ascorbic acid (10 ppm), KCl (1%), and Citric acid (1.5 %) for mitigation of heat stress while one plot was kept as control (No spray).

Plate 2: Spaying chemicals for mitigation of heat stress

For meeting the objectives (2016-17) six wheat varieties; GW 322, HD 2967, HI 1544, HD 2932, HD 3059 and HD 3090 were sown twice (Normal: 26.11.16 and Late sown: 07.01.17) in three replications in 5 rows of 2m length each (Plate 3). To evaluate the adverse effect of heat stress during reproductive phase and its mitigation two treatments; Ascorbic acid (10ppm) + Citric acid (1.3%) and Salicylic acid (200ppm) were selected for sprays (Plate 4) based on previous years' results. Following observations were recorded:Days to 50% heading, Spike length, No. of seeds / spike, 1000 seed weight, Seed germination, Seed vigour index I, Electrical conductivity and Dehydrogenase activity.

Plate 3: Field layout of the experiment

Plate 4: Spay of chemicals at anthesis

Results: All the above chemicals sprayed at anthesis stage in three replications per variety. Phenology of wheat crop was significantly affected by higher temperature. Wheat varieties sown during the month of November took more time to reach maturity while late sown material (S_3) recorded lesser crop growth duration. The initial observations (Table 8), recorded after the completion of sprays at two stages for both varieties, revealed that there were no significant differences in spike characters. The overall trend across various sprays revealed that plant height and number of tillers showed a declining trend as the sowing was delayed from November to January, irrespective of the chemical sprayed. The data for various plant morphological traits is in progress and seed traits viz. 1000 seed weight and seed quality will be recorded after harvest.

Table 8: Selected plant morphological traits recorded till completion of anthesis*

Parameters	HD 3117			HD 3171		
	S_1	S_2	S_3	S_1	S_2	S_3
Plant height (cm)	119.0	97.0	75.0	122.0	95.0	86.0
Number of tillers per plant	15.0	10.0	8.0	16.0	12.0	9.0
Spike length	13.0	12.5	11.0	12.5	12.0	10.5
Number of spikelets per spike	21.0	20.0	19.0	21.0	20.0	19.0

*data in progress

The data (2016-17) on morphological parameters revealed that as compared to the control, salicylic acid was effective in significantly reducing the number of days to 50% heading (Figure 3). For control plots, the days to 50% heading ranged from 71 to 73 days which was reduced to 67 to 68 days for plots sprayed with salicylic acid, thereby inducing earliness. Similarly, improvement in spike length was also recorded for sprayed plots as compared to control (Figure 3).

The yield contributing parameters viz. 1000 seed weight (Figure 5) and number of seeds per spike (Figure 6) also recorded a significant improvement as compared to control. Improvement in the yield contributing traits can be attributed to earliness induced as a result of foliar sprays which increases the grain filling duration of the varieties. The seed quality parameters viz. germination percentage (Figure 7) and seed vigour index I (Figure 8) were also recorded. Due to heat stress, in the absence of any mitigation treatment for control plots, the germination percentage ranged from 77 to 84% which improved to 88 to 92% for plots sprayed with salicylic acid. Similar trend was observed for Seed Vigour Index 1.

The Electrical Conductivity (EC) was alsodone to assess thedamage of seed due to heat stress. Higher value of EC was recorded for control plots (Figure 9); which indicated low vigour of seed as compared to the treated ones which showed higher seed vigour. Due to heat stress, low dehydrogenase activity (Figure 10) was recorded since embryo activity is hampered. The study revealed significant effect of all the foliar treatments in increasing the dehydrogenase activity as compared to the control and thus, mitigating the heat stress effects as compared to control.

Figure 3: Effect of foliar sprays on Days to 50% heading

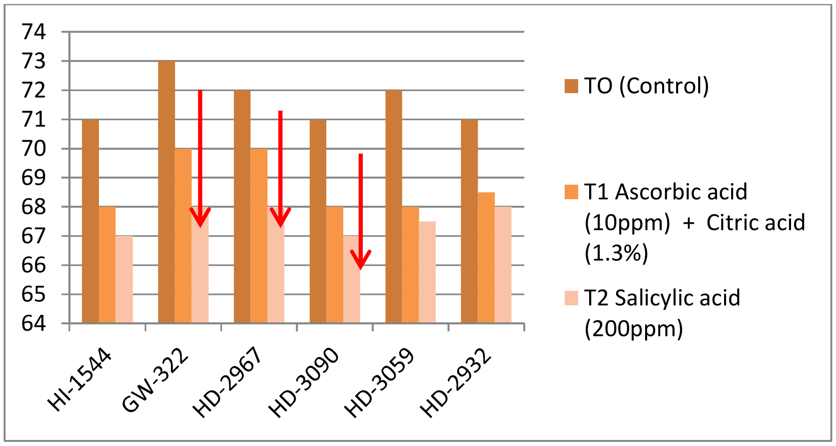


Figure 4: Effect of foliar sprays on spike length

[T0: control;T1: Ascorbic acid (10ppm) + Citric acid (1.3%);T2: salicylic acid (200 ppm)]

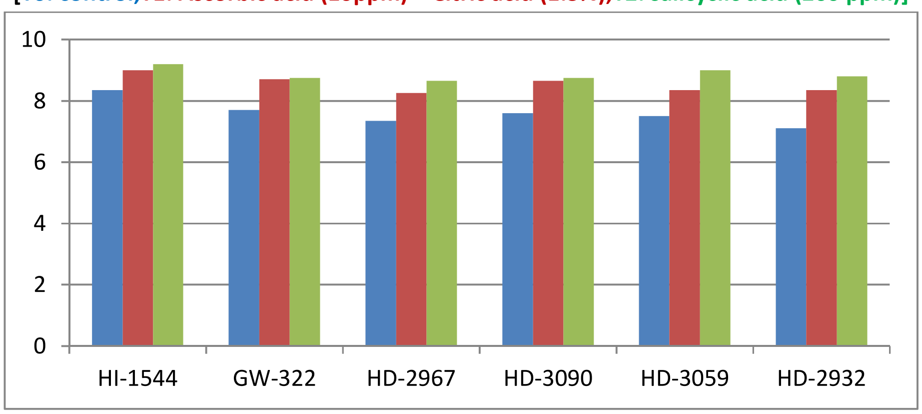


Figure 5: Effect of foliar sprays on thousand seed weight

[T0: control;T1: Ascorbic acid (10ppm) + Citric acid (1.3%);T2: salicylic acid (200 ppm)]

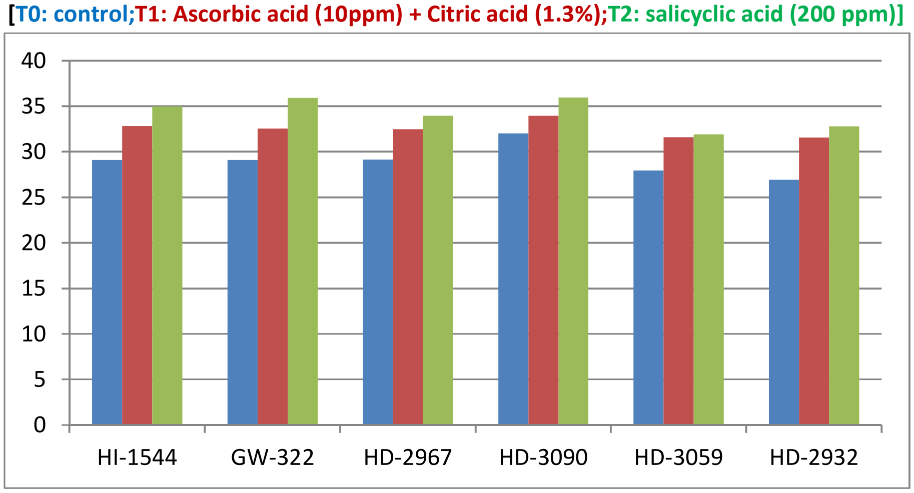


Figure 6: Effect of foliar sprays on number of seeds per spike

[T0: control;T1: Ascorbic acid (10ppm) + Citric acid (1.3%);T2: salicyclic acid (200 ppm)]

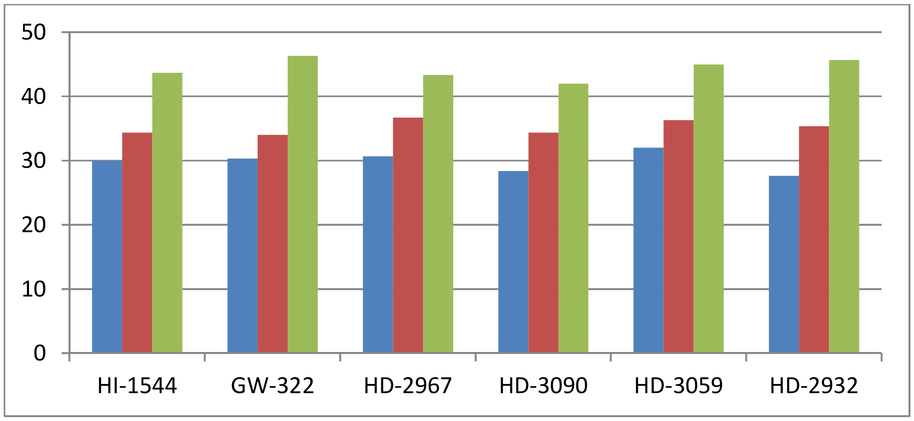


Figure 7: Effect of foliar sprays on germination percentage

[T0: control;T1: Ascorbic acid (10ppm) + Citric acid (1.3%);T2: salicyclic acid (200 ppm)]

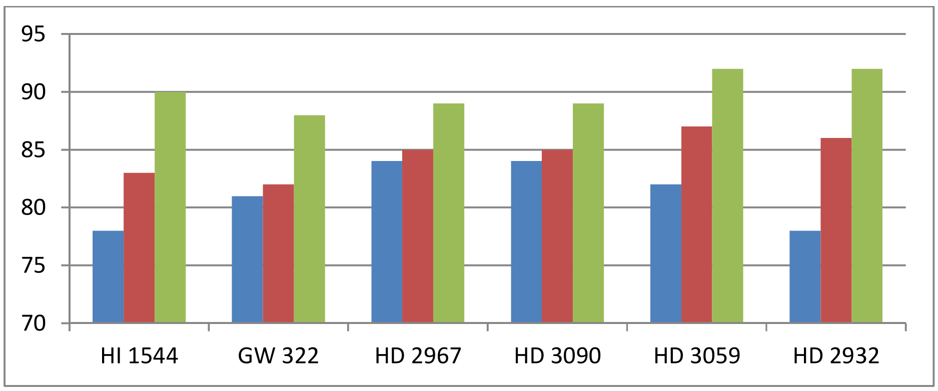


Figure 8: Effect of foliar sprays on Seed vigour index I

[T0: control;T1: Ascorbic acid (10ppm) + Citric acid (1.3%);T2: salicyclic acid (200 ppm)]

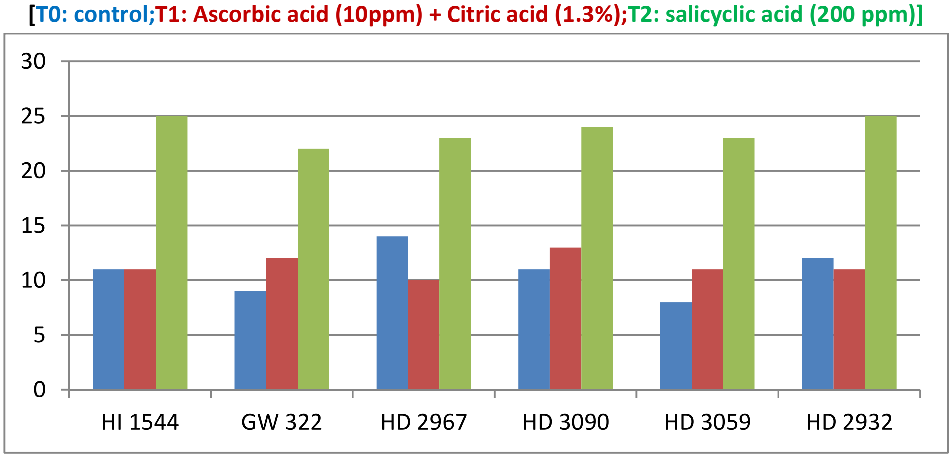


Figure 9: Effect of foliar sprays on Electrical conductivity

[T0: control;T1: Ascorbic acid (10ppm) + Citric acid (1.3%);T2: salicyclic acid (200 ppm)]

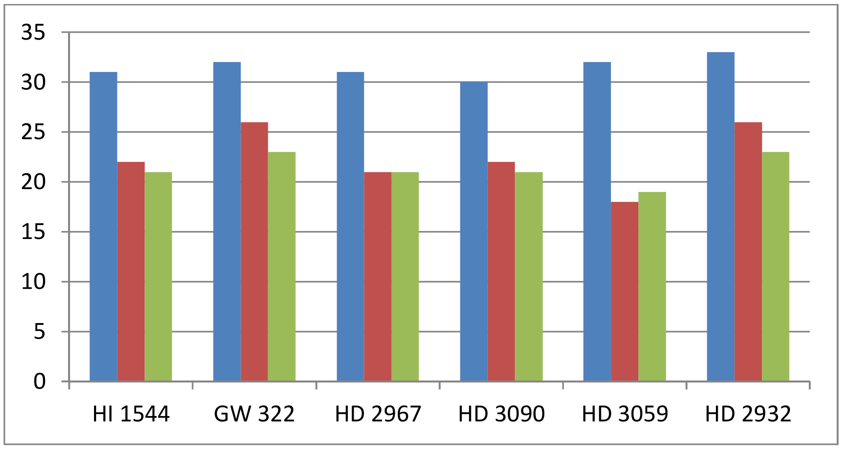
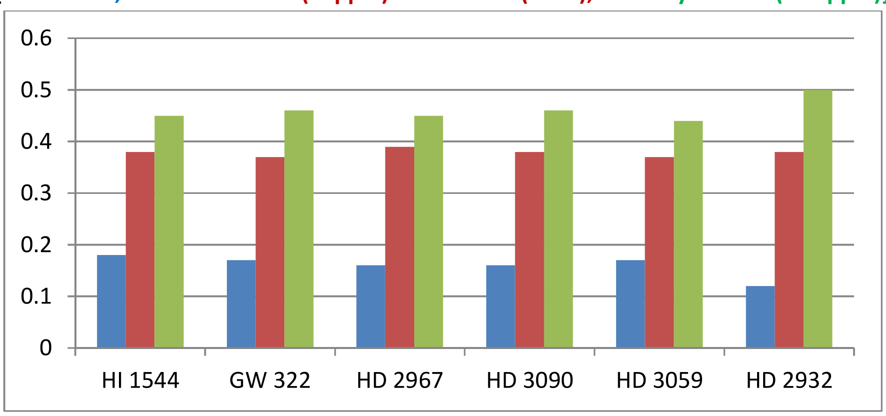


Figure 10: Effect of foliar sprays on Dehydrogenase activity

[T0: control;T1: Ascorbic acid (10ppm) + Citric acid (1.3%);T2: salicyclic acid (200 ppm)]



Centre: PAU, Ludhiana

Experimental details: The trial was sown with a single variety of wheat, HD 2967 on two dates of sowing, *viz.,* November 5 and December 15, 2015 to standardize the techniques to mitigate the effect of elevated temperatures on seed set, yield and quality by spraying chemicals; T1: Glycine betaine @ 600 ppm, T2: Salicylic acid @ 800 ppm, T3: Salicylic acid @ 400 ppm, T4: Ascorbic acid @ 10 ppm + Citric acid @ 1.3%, T5: α-Tocopherol @ 150 ppm, and T6: KCl @ 1% with T7: No treatment (Control). The impact of heat stress on various crop phenological parameters, pollen and stigmatic character/floral behavior, seed set, seed quality (germination, viability, vigour and seed health) of both freshly harvested as well as stored seed under both stressed and non stressed environments were observed.

Results: The study on the effect of spray of different chemicals on wheat crop to mitigate heat stress revealed that none of the traits recorded exhibited any difference for yield and different contributing parameters under different treatments. All the treatments are statistically at par with each other. Significant differences were recorded for seed set percentage and pollen viability for both the dates of sowing (Table 9, 10). The seed set percentage and pollen viability were highest for T5 (α-Tocopherol @ 150 ppm) followed by T3 (Salicylic acid @ 400 ppm).

Table 9: Effect of heat stress mitigating treatments on yield and other parameters of wheat (1st DOS)

Treatment	Chlorophyll index before first spray	Chlorophyll index after first spray	Chlorophyll index before second spray	Chlorophyll index after second spray	Pollen viability (%)	Seed set (%)	No of tillers/ plant	No of spikelets /spike	No of seeds /plant	Seed yield/ plot (kg)	Biological Yield/plot (kg)
T1 Glycine betaine@600ppm	36.6	32.0	36.5	29.28	92.8	98.9	5.5	30.6	46.6	12.3	24.4
T2 Salicylic acid @ 800 ppm	37.2	31.7	34.6	29.8	91.7	98.8	5.9	33.8	47.2	13.5	26.7
T3 Salicylic acid @ 400 ppm	35.8	32.3	34.1	29.7	96.9	99.1	5.6	32.2	49.1	13.8	28.9
T4Ascorbic@10ppm+Citric @1.3%	33.5	34.6	31.7	31.8	95.0	98.6	6.0	30.4	48.4	13.3	29.1
T5 α-Tocopherol @ 150 ppm	32.8	32.2	30.3	30.1	97.1	99.8	6.2	32.0	48.0	13.7	30.8
T6 KCl @ 1%	31.9	31.1	31.5	30.1	92.7	99.3	5.8	31.8	48.5	12.3	29.8
T7 No treatment (Control)	32.8	31.1	33.6	30.4	95.0	98.4	5.7	30.0	45.3	12.5	30.0
SEm(±)	**1.96**	**2.14**	**1.91**	**1.96**	**2.5**	**0.41**	**0.8**	**1.09**	**0.57**	**0.77**	**1.66**
CD (p=0.05)	**NS**	**NS**	**NS**	**NS**	**3.7**	**0.86**	**NS**	**NS**	**1.2**	**1.63**	**3.52**

Table 10: Effect of heat stress mitigating treatments on yield and other parameters of wheat (2nd DOS)

Treatment	Chlorophyll index before first spray	Chlorophyll index after first spray	Chlorophyll index before second spray	Chlorophyll index after second spray	Pollen viability (%)	Seed set (%)	No of tillers/ plant	No of spikelets /spike	No of seeds /plant	Seed yield/ plot (kg)	Biological Yield/plot (kg)
T1 Glycine betaine@600ppm	35.7	30.5	33.7	36.4	92.7	85.0	5.2	28.9	42.6	11.9	25.5
T2 Salicylic acid @ 800 ppm	37.1	29.1	36.1	32.6	93.0	85.3	5.5	31.3	45.5	12.1	25.9
T3 Salicylic acid @ 400 ppm	31.2	28.6	29.2	33.2	94.7	85.7	5.6	31.6	45.9	13.9	30.9
T4Ascorbic@10ppm+Citric @1.3%	31.3	29.1	28.6	30.4	89.0	85.3	5.9	31.0	46.2	13.0	28.7
T5 α-Tocopherol @ 150 ppm	33.3	33.1	34.2	32.5	97.3	85.7	5.8	32.4	47.0	12.9	31.0
T6 KCl @ 1%	31.4	32.8	30.9	31.9	90.6	85.0	5.7	30.8	47.5	12.5	29.9
T7 No treatment (Control)	36.5	32.1	33.7	37.5	91.0	84.9	5.7	30.0	45.0	12.0	29.0
SEm(±)	**3.31**	**3.4**	**2.33**	**4.1**	**3.1**	**0.74**	**0.09**	**1.3**	**1.32**	**0.24**	**1.29**
CD (p=0.05)	**NS**	**NS**	**NS**	**NS**	**1.7**	**NS**	**NS**	**NS**	**2.5**	**0.7**	**NS**

Centre: GBPUAT, Pantnagar

Experimental details: Wheat variety, UP 2565 was taken for the trial and sown in three different dates of sowing; D1= Nov. 22, 2017; D2= Dec. 07, 2017 and D3=Dec. 22, 2017 in Factorial RBD. To mitigate the adverse effect of heat stress during reproductive phase foliar spray at the time of anthesis with Glycine betaine (600ppm), Cytokinin (100ppm), Salicylic acid (400 ppm), Ascorbic acid 10 ppm, KCl (1%) and Citric acid (1.5%) will be done keeping one as control (no spray).

Results: The observations are being recorded as per technical programme and will be reported next year.

Centre: CCSHAU, Hisar

Experimental details: Wheat variety, WH 711 was sown in three replications of 5x4 m^2plot size ontwo dates of sowing; D_1- First date of sowing (Timely sowing- 28th November, 2016), D_2- second date of sowing (Late sowing-28th December, 2016) in RBD. To mitigate the adverse effect of heat stress during reproductive phase foliar spray at two stages; Vegetative and Seed filling with Glycine betaine (600ppm), Salicylic acid (800 ppm), Salicylic acid (400 ppm), Ascorbic acid 10 ppm+ Citric acid (1.3%), α-Tocopherol (150 ppm) andKCl (1%) will be done keeping T_0as control (no spray).

Results: Among the treatments studied, T_1 [Glycine betaine (600 ppm)] was found effective in enhancing seed yield (50.40, 44.74 q/ha), 100 seed weight (4.53, 4.25 g), germination (92.67, 91.33 %) and vigour index (2978, 2634) in normal and late sown conditions respectively (Table 11) followed by T_2-Salicylic acid (800 ppm). Biochemical studies indicated that treatment T_1 [Glycine betaine (600 ppm] increased germination enhancing enzyme activities *i.e.* POX, CAT and DHA whereas the reduction was observed in MDA level (Lipid peroxidation) in both the sowing dates (Table 12). The average maximum temperature during grain filling stage was 24.2 & 29 ^oC for first & second date of sowing respectively. The average temperature rose up to 4.8 ^oC during grain filling stage.

Table 11: Effect of chemicals on seed yield and quality parameters of wheat variety WH 711

Treatments	Chlorophyll index				Germination (%)		Vigour Index-I		Electrical conductivity (dS/cm/g seed)		100 seed weight (g)		Seed yield/ plot (kg)		Seed yield (q/ha)	
	Before spray		After spray													
	D_1	D_2	D_1	D_2	D_1	D_2	D_1	D_2	D_1	D_2	D_1	D_2	D_1	D_2	D_1	D_2
T_0	39.05	37.30	51.10	48.77	88.00	86.67	2620	2406	0.396	0.412	4.27	3.68	9.77	7.78	48.74	38.82
T_1	38.67	37.53	52.17	48.57	92.67	91.33	2978	2634	0.378	0.386	4.53	4.25	10.10	8.97	50.40	44.74
T_2	39.33	38.30	52.10	48.63	91.67	89.67	2915	2556	0.527	0.390	4.48	4.17	9.96	8.93	49.70	44.54
T_3	38.17	38.43	52.30	47.90	90.33	89.00	2855	2504	0.379	0.393	4.44	4.16	9.87	8.88	49.27	44.31
T_4	38.43	38.07	52.17	48.43	91.33	90.00	2907	2556	0.383	0.395	4.47	4.17	9.80	8.83	48.92	44.08
T_5	38.17	37.13	51.30	49.30	91.67	90.67	2930	2548	0.384	0.390	4.47	4.19	9.94	8.90	49.62	44.43
T_6	37.97	37.37	51.30	47.73	90.00	89.33	2865	2492	0.387	0.395	4.46	4.16	9.86	8.84	49.22	44.13
CD (p=0.05) Treat. (T)	0.350		0.307		0.425		17		0.002		0.016		0.012		0.057	
DoS (D)	NS		NS		0.996		40		0.005		0.038		0.028		0.135	
T x D	NS		1.02		NS		57		NS		0.054		0.040		0.191	

D_1- First date of sowing (Timely sowing- 28th November, 2016), D_2- second date of sowing (Late sowing-28th December, 2016)

T_0- Control, T_1- Glycine betaine (600 ppm), T_2-Salicylic acid (800 ppm), T_3-Salicylic acid (400 ppm), T_4-α-Tocopherol (150 ppm), T_5- Ascorbic acid (10 ppm) + Citric acid (1.3%), T_6- KCl 1%

Table 12: Effect of chemicals on enzymes activity of seed of wheat variety WH 711

Treatments	POX (Unit/min/g FW)		CAT (Unit/min/g FW)		DHA (OD/g/ml)		MDA (nmol/g FW)	
	D_1	D_2	D_1	D_2	D_1	D_2	D_1	D_2
T_0	7.50	7.07	4.88	4.13	0.247	0.237	5.153	6.187
T_1	12.40	10.17	7.28	6.88	0.369	0.360	3.180	3.350
T_2	11.34	9.95	7.07	6.79	0.361	0.348	3.537	3.667
T_3	11.11	9.85	6.94	6.75	0.353	0.339	3.633	3.737
T_4	10.05	8.86	6.79	6.73	0.354	0.341	3.703	3.840
T_5	11.23	9.90	7.03	6.77	0.356	0.344	3.610	3.723
T_6	9.79	7.78	5.82	5.14	0.284	0.266	5.027	5.443
CD (p=0.05) Treat. (T)	0.018		0.017		0.002		0.021	
DoS (D)	0.043		0.040		0.004		0.049	
T x D	0.061		0.056		NS		0.070	

D_1- First date of sowing (Timely sowing- 28th November, 2016), D_2- second date of sowing (Late sowing- 28th December, 2016)

T_0- Control, T_1- Glycine betaine (600 ppm), T_2-Salicylic acid (800 ppm), T_3-Salicylic acid (400 ppm), T_4-α-Tocopherol (150 ppm), T_5- Ascorbic acid (10 ppm) + Citric acid (1.3%), T_6- KCl 1%

Centre: CSAUAT, Kanpur

Experimental details: The experiment was conducted for one year (Rabi 2016-17) at New Dairy Farm (NDF), Kalyanpur Kanpur. The Breeder seeds of wheat variety K1006 were obtained from the processing plant of the University. The varietyK1006was sown in three replications of 5x4 m^2plot size ontwo dates of sowing;one at timely (D_1) & late sown at heat stress (D_2)in RBD. To mitigate the adverse effect of heat stress during reproductive phase foliar spray was done at two stages; Vegetative (S_1)and Seed filling (S_2)with T_1- Glycine betaine (600ppm), T_2- Salicylic acid (800 ppm), T_3- Salicylic acid (400 ppm), T_4- Ascorbic acid 10 ppm+ Citric acid (1.3%), T_5- α-Tocopherol (150 ppm) and T_6- KCl (1%) were done keeping T_0as control (no spray) was done at anthesis (as per technical programme).

Results: The performance ofsalicylic acid (800 ppm) at seed filling (S_1T_2) treatment with respect to chlorophyll intensity (50.50%), Numbers of effective tillers (16.33), Spike length (16.20 cm), Numbersof seeds per spike (52.66), Seed yield per plant (33.85g), Seed yield per plot (10.40kg), Seed yield q ha^{-1} (5200) was significantly better (Table 13). Whereas, 1000 seed weight (39.33) was found superior when salicylic acid (800 ppm)spraying was done at vegetative stage (S_1) than other chemicals. Maximum germination (80.66%) was found in S_2T_2, though seedling length (26.00cm) was recorded in S_1T_3 but maximum seed vigour index (2625.00) was found in S_1T_5 (Table 14). Experiment on wheat (2017-18) is in progressand have sown in November, 2017 and mid December (two dates of sowing) and observation will be recorded as per technical programme.

Table 13: Effect of sowing dates (S) and spray of various chemicals (T) on growth and yield attributing characters of wheat during Rabi (2016-17)

Treatments	Chlorophyll index (before sp.)			Chlorophyll index (after sp.)			Number of Effective Tillers.			Spike length (cm)		
	S_1	S_2	Mean	S_1	S_2	Mean	S_1	S_2	Mean	S_1	S_2	Mean
T_0	43.30	42.07	42.68	43.80	42.87	43.33	13.33	12.00	12.67	14.37	13.17	13.77
T_1	43.23	42.73	42.98	44.27	43.90	44.08	14.00	12.33	13.17	14.97	14.00	14.48
T_2	44.57	44.50	44.53	50.50	48.17	49.33	16.33	15.33	15.83	16.20	15.97	16.08
T_3	43.63	42.57	43.10	44.77	44.13	44.45	14.33	13.33	13.83	15.03	14.87	14.95
T_4	44.70	44.30	44.50	48.83	47.03	47.93	15.33	15.00	15.17	15.87	15.63	15.75
T_5	43.27	42.50	42.88	45.60	44.70	45.15	14.67	13.67	14.17	15.20	15.00	15.10
T_6	44.83	44.30	44.57	47.10	46.47	46.78	15.00	14.67	14.83	15.63	15.33	15.48
Mean	43.93	43.28		46.41	45.32		14.71	13.76		15.32	14.85	
	S	T	S × T	S	T	S × T	S	T	S × T	S	T	S× T
SEd	0.236	0.442	0.625	0.242	0.453	0.640	0.302	0.565	0.799	0.056	0.104	0.147
SEm(±)	0.167	0.312	0.442	0.171	0.320	0.453	0.214	0.400	0.565	0.039	0.074	0.104
CD(p=0.05)	0.485	0.908	N.S	0.498	0.931	N.S.	0.621	1.162	N.S.	0.115	0.214	0.303
Treatments	Number of seeds per spike			Seed yield /plant (g)			Seed yield / plot(kg)			Seed yield q ha^{-1}		
	S_1	S_2	Mean	S_1	S_2	Mean	S_1	S_2	Mean	S_1	S_2	Mean
T_0	48.66	47.33	48.00	21.62	17.23	19.42	9.13	8.16	8.65	45.66	40.83	43.25
T_1	49.33	47.66	48.50	24.45	18.60	21.53	9.33	8.40	8.86	46.66	42.00	44.33
T_2	52.66	51.66	52.16	33.85	29.33	31.59	10.40	9.83	10.11	52.00	49.16	45.58
T_3	50.00	48.66	49.33	26.02	22.10	24.06	9.43	8.76	9.10	47.16	43.83	45.50
T_4	51.33	51.00	51.16	29.66	27.03	28.34	10.07	9.43	9.75	50.33	47.16	48.75
T_5	51.00	49.66	50.33	26.87	23.98	25.42	9.60	8.90	9.25	48.00	44.50	46.25
T_6	50.66	50.66	50.66	28.66	26.52	27.59	9.83	9.06	9.45	49.16	45.33	47.25
Mean	50.52	49.52		27.30	23.54		9.68	8.93		48.42	44.69	
	S	T	S × T	S	T	S × T	S	T	S × T	S	T	S × T
SEd	0.25	0.47	0.67	0.63	1.18	1.67	0.03	0.06	0.08	0.20	0.37	0.53
SEm(±)	0.179	0.336	0.475	0.447	0.837	1.183	0.023	0.043	0.060	0.143	0.267	0.378
CD(p=0.05)	0.52	0.97	N.S.	1.30	2.43	N.S.	0.06	0.12	0.17	0.41	0.77	N.S.

Table 14: Effect of sowing dates (S) and spray of various chemicals (T) on seed quality attributes of wheat during Rabi (2016-17)

Treatments	1000 Seed weight (g)			Germination (%)			Root Length (cm)			Shoot Length (cm)		
	S_1	S_2	Mean	S_1	S_2	Mean	S_1	S_2	Mean	S_1	S_2	Mean
T_0	33.33	30.66	32.00	72.30	70.87	71.58	10.52	9.90	10.21	12.95	12.37	12.66
T_1	35.66	31.66	33.66	79.70	79.70	79.70	11.90	10.65	11.27	13.05	13.92	13.48
T_2	39.33	37.00	38.16	80.09	80.66	80.37	11.82	10.95	11.38	13.40	13.32	13.36
T_3	36.33	34.00	35.16	80.23	76.45	78.34	12.12	11.87	12.00	13.82	13.65	13.73
T_4	37.66	35.66	36.66	76.45	80.55	78.50	12.07	11.92	12.00	13.52	13.42	13.47
T_5	36.00	35.33	35.66	81.01	80.94	80.98	12.57	12.57	12.57	13.92	13.40	13.66
T_6	37.66	35.66	36.66	81.48	80.23	80.85	12.62	12.52	12.57	13.50	13.10	13.30
Mean	36.57	34.28		78.75	78.48		11.95	11.48		13.45	13.31	
	S	T	S × T	S	T	S × T	S	T	S × T	S	T	S× T
SEd	0.31	0.59	0.84	0.52	0.99	1.40	0.10	0.19	0.26	0.06	0.12	0.17
SEm(±)	0.225	0.422	0.597	0.374	0.700	0.990	0.072	0.135	0.190	0.048	0.089	0.126
CD(p=0.05)	0.65	1.22	N.S.	N.S.	1.99	2.82	0.20	0.38	0.54	0.13	0.25	0.35

Treatments	Seedling Dry Weight (g)			Total seedling length (cm)			Vigour Index-I			Vigour Index-II		
	S_1	S_2	Mean	S_1	S_2	Mean	S_1	S_2	Mean	S_1	S_2	Mean
T_0	0.125	0.111	0.118	23.57	22.25	22.91	2154.50	1985.50	2070.00	11.32	9.92	10.62
T_1	0.171	0.118	0.145	25.25	24.57	24.88	2237.75	2374.50	2406.12	16.58	11.41	14.00
T_2	0.133	0.116	0.125	25.37	24.27	23.82	2461.25	2323.75	2392.50	12.92	11.15	12.03
T_3	0.145	0.131	0.138	26.00	25.35	25.67	2521.75	2395.25	2458.50	14.01	12.42	13.21
T_4	0.176	0.146	0.161	25.65	25.32	25.48	2423.75	2462.50	2443.14	16.58	14.14	15.36
T_5	0.127	0.144	0.136	26.92	25.97	26.45	2625.00	2532.25	2578.62	12.40	14.03	13.21
T_6	0.118	0.135	0.127	26.62	25.82	26.22	2602.50	2480.75	2541.62	11.58	13.11	12.34
Mean	0.142	0.129		25.62	24.79		2460.92	2364.92		13.62	12.31	
	S	T	S × T	S	T	S × T	S	T	S × T	S	T	S × T
SEd	0.003	0.005	0.007	0.10	0.19	0.27	12.62	23.61	23.39	0.13	0.25	0.36
SEm(±)	0.002	0.004	0.005	0.073	0.137	0.194	8.924	16.696	23.612	0.097	0.181	0.255
CD(p=0.05)	0.006	0.010	0.015	0.21	0.39	N.S.	25.47	47.66	67.40	0.27	0.51	0.72

Centre: NDUAT, Faizabad

Experimental details: The experiment is being conducted as per technical programme in wheat cv. NW-1076. The normal date of sowing was on dated Nov. 25, 2017 and thereafter 3 dates of sowing with 15 days intervals for 1½ months have been followed in open field condition.The mitigation treatments were given as per technical programme.

Results: The experiment is at heading stage. Observations will be recorded as per technical program and will be submitted.

Centre (Volunteer Reporting): DRPCAU, Dholi

Experimental details: The experiment was conducted as per technical programme.

Results: Analysis revealed that the chemical treatments T_1(Glycine betaine)&T_2(Salicylic acid) significantly influenced 1000- seed weight, seed yield /plant, seed yield q/ha and vigour index while rest of the treatments had also observed significant effect on seed yield /plant, seed yield q/ha and vigour index (Table 15). Among date of sowing significant effect was observed for normal date of sowing (DS1) in all the characters except germination percentage while late sowing (DS2) had significant effect on seed yield /plant, seed yield q/ha and vigour index only. Among interaction effects, no significant contribution was recorded for any treatment combination.

Table 15: Effect of date of sowing & various chemical sprays on yield attributing characters of wheat during Rabi 2016-17 at DRPCAU, Dholi

Treatment	Chlorophyll Index before Spray(SPD)	Chlorophyll Index after Spray (SPD)	Seed set (%)	1000 Seed wt. (g)	Seed yield/plant(g)	Seed yield (q/ha)
Chemical treatments (A)						
T_0	38.64	40.953	66.91	36.58	1.32	30.04
T_1	45.54	46.608	72.51	43.24*	1.71*	39.70*
T_2	44.55	43.968	70.87	40.75*	1.63*	38.00*
T_3	43.09	42.478	68.53	38.57	1.54*	36.33*
T_4	41.65	43.373	69.97	36.87	1.53*	35.25*
T_5	43.58	44.543	70.65	39.22	1.62*	38.50*
T_6	41.64	42.837	68.74	38.38	1.54*	34.74*
SEm(±)	1.606	1.894	1.354	1.196	0.021	1.407
CD (p=0.05)	NS	NS	NS	3.725	0.064	4.383
Date of sowing (B)						
DS_1	45.24*	45.863*	71.57*	42.98*	1.605*	37.78*
DS_2	40.09	41.21	67.91	35.19	1.524*	34.38*
SEm(±)	0.768	0.987	1.139	0.604	0.017	0.979
CD (p=0.05)	2.352	3.024	3.489	1.849	0.054	2.997
CD (AXB)	NS	NS	NS	NS	NS	NS

Crop: Sorghum

Centre: PDKV, Akola

Experimental details: A total of three sorghum genotypes; G1 – CSH-14, G2 –SPH-1635, G3 –AKSV-181– 03 were sown in two dates of sowings to evaluate the adverse effect of heat stress during reproductive phase in sorghum. For its mitigation the crop was sprayed with chemicals; T1- Glycine betaine (600 ppm), T2- Cytokinin (100 ppm), T3- Salicylic acid (400 ppm), T4- Ascorbic acid (10 ppm), T5- KCL (1 %) and T6- Citric acid (1.5 %) with one control. The 1st sowing of the experiment was done on 01/07/2016 and 2nd sowing of the experiment was done on 21/07/2017.

Results: The weather data during the crop period is given in table 16. During 1st sowing three genotypes were sown and two foliar sprays of different chemicals were applied to the effect of elevated temperature (Plate 5). The observation of 1st sowing were recorded and presented in table 17.The significantly highest seed setting (84.49 %), 100 seed weight (2.99 g) and seed yield (21.04 qha-1) were recorded in G1 (CSH-14). Whereas among the chemical treatments, significantly highest seed setting (84.93 %) and seed yield (23.10 qha-1) was recorded in T3.In the data on interaction effect, the treatment G1 T3 i.e. Sorghum hybrid CSH-14 and foliar spray of salicylic acid (400ppm) was significantly superior in the seed setting (88.17 %) and seed yield (23.75 q/ha). In the2nd sowing of the experiment, severe attack of shoot fly was observed in the field. Control measures were undertaken to save the crop but it could not be controlled and the crop was severely damaged and hence the results could not be compared.

Plate 5: View of the sorghum experiment at Dr PDKV, Akola

Table 16: Monthly Weather data for the year 2017 recorded at Meteorological Observatory, Dr PDKV, Akola

	T MAX (°C)		T MIN (°C)		BSH (hrs)		Ws (km/hr)		RHI (%)		RHII (%)		Evap. (mm)		RF (mm)		Rainy Days		%RF (A/N)
	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	
January	29.8	29.4	11.6	10.8	8.5	7.5	4.5	0.8	68	81	28	35	4.75	3.9	9.8	0.0	0.8	0.0	0.00
February	32.6	33.7	13.9	14.6	9.0	8.7	5.4	1.9	56	67	22	23	6.62	6.6	7.9	0.5	0.6	0.0	6.36
March	37.2	37.1	18.4	18.4	9.2	8.9	6.4	2.9	43	39	17	13	9.66	9.5	13.1	0.0	1.0	0.0	0.00
April	41.2	41.9	23.6	24.7	9.6	9.7	8.3	5.9	36	30	14	10	13.24	14.3	3.3	0.0	0.4	0.0	0.00
May	42.4	41.9	27.4	28.9	9.5	8.7	13.3	7.3	46	37	18	18	16.37	15.5	11.7	0.3	1.2	0.0	2.55
June	37.4	36.8	25.7	25.4	6.7	6.4	14.0	8.1	70	72	41	42	11.12	9.6	142.4	87.0	6.7	8.0	61.10
July	32.1	32.1	23.7	24.0	4.2	3.0	11.2	9.6	84	82	61	58	5.60	6.4	200.9	190.8	10.6	12.0	94.97
August	30.4	31.0	23.0	23.7	3.8	3.7	10.4	6.8	87	86	68	67	4.38	5.0	204.8	123.3	9.8	11.0	60.21
September	32.2	32.2	22.4	23.3	6.3	5.3	7.2	1.9	85	90	57	61	5.19	4.2	115.7	54.2	6.0	7.0	46.86
October	33.5	33.7	18.7	19.8	8.1	7.1	4.0	0.8	77	80	39	42	5.30	5.4	51.1	62.0	2.6	5.0	121.28
November	31.6	31.5	14.3	14.5	8.4	7.6	3.9	0.8	72	80	31	32	4.82	5.3	20.9	0.0	1.0	0.0	0.00
December	29.5	29.2	11.3	12.4	8.4	6.8	3.8	1.9	71	80	29	33	4.24	5.4	7.4	0.0	0.6	0.0	0.00
Total															**789**	**518**	**41**	**43**	**66**
June to December (Growing season)															**743.1**	**517.3**			**70**

Table 17: Chlorophyll Index, Yield attributing characters and Seed quality parameters in Sorghum (1st Sowing)

Treatments	Chlorophyll Index before spray	Chlorophyll Index after spray	Seed setting (%)	100 seed wt. (g)	Seed yield/ Plant (g)	Seed yield (qha-1)	Germination (%)	Seedling length (cm)	Vigour Index
Hybrid/ Varieties (A)									
G1	47.81	46.74	84.49	2.99	24.44	21.04	85.17	26.60	2265.52
G2	45.24	44.95	81.73	2.40	24.25	20.58	85.68	26.67	2286.52
G3	41.49	39.72	81.01	2.65	22.95	19.42	83.79	25.92	2172.78
SEm(±)	2.08	2.06	0.26	0.11	0.02	0.17	0.30	0.38	31.94
CD (p=0.05)	N/S	N/S	0.78	0.34	0.07	0.51	0.90	N/S	95.63
Chemical treatments (B)									
T1	46.50	45.40	81.94	2.62	21.59	20.05	83.50	25.22	2106.26
T2	44.36	43.45	82.65	2.70	23.05	19.69	84.45	25.00	2111.78

T3	45.26	44.58	84.93	2.47	26.83	23.10	87.17	27.62	2407.75
T4	42.98	41.24	84.70	2.70	24.55	20.68	85.83	28.00	2404.17
T5	42.43	41.62	80.20	2.70	22.58	18.06	83.50	25.67	2140.67
T6	47.57	46.51	80.04	2.91	24.69	20.50	84.83	26.84	2279.02
SEm(±)	2.94	2.92	0.36	0.16	0.03	0.24	0.42	0.53	45.17
CD (p=0.05)	N/S	N/S	1.10	N/S	0.10	0.73	1.28	1.59	135.24
Interaction effect (A x B)									
G1T1	53.31	50.94	83.76	3.00	20.78	20.20	84.00	22.00	1847.00
G1T2	47.93	46.85	85.59	2.80	24.54	21.16	85.50	26.00	2223.50
G1T3	48.52	47.41	88.17	2.99	27.33	23.75	88.00	26.30	2313.40
G1T4	44.98	43.40	86.55	2.92	25.74	21.33	85.00	29.00	2465.00
G1T5	41.77	41.56	80.09	2.95	25.11	19.75	82.50	26.50	2185.75
G1T6	50.40	50.27	82.80	3.30	23.17	20.05	86.00	29.75	2558.50
G2T1	43.67	44.35	82.74	2.34	23.29	21.62	84.00	28.10	2360.40
G2T2	44.53	45.14	80.99	2.49	22.11	18.05	84.60	25.00	2115.10
G2T3	45.73	46.21	84.13	1.97	27.03	22.89	88.00	29.10	2560.80
G2T4	43.37	42.75	84.23	2.25	24.96	20.91	87.00	29.00	2524.00
G2T5	44.73	43.27	80.14	2.71	23.25	19.39	86.00	23.51	2021.24
G2T6	49.46	47.99	78.14	2.65	24.89	20.60	84.50	25.29	2137.59
G3T1	42.54	40.92	79.34	2.53	20.72	18.34	82.50	25.58	2111.37
G3T2	40.61	38.37	81.37	2.82	22.50	19.85	83.25	24.00	1996.75
G3T3	41.54	40.12	82.50	2.46	26.15	22.68	85.50	27.48	2349.05
G3T4	40.59	37.59	83.34	2.90	22.95	19.78	85.50	26.00	2223.50
G3T5	40.80	40.05	80.39	2.43	19.37	15.03	82.00	27.00	2215.00
G3T6	42.84	41.28	79.17	2.80	26.02	20.86	84.00	25.50	2141.00
SEm(±)	5.10	5.06	0.63	0.28	0.06	0.42	0.73	0.91	78.23
CD (p=0.05)	N/S	N/S	1.90	N/S	0.18	1.26	N/S	2.75	234.26

Centre: MPKV, Rahuri

Experimental details: Sorghum variety; Swati was sown in three dates of sowings; D1:30 October, D2: 15 November and D3: 30 November in two sets; Set 1 : In open field condition and Set 2 : In growth chamber with 5 ^{o}C elevated temperature from anthesis onwards to evaluate the adverse effect of heat stress during reproductive phase in sorghum. For mitigation, spraying of chemicals during the anthesis; T1- Salicylic acid (400 ppm), T2- Ascorbic acid (10 ppm), T3- KCL (1 %) and T4- Citric acid (1.5 %) with one control. Observations will be recorded as per technical programme.

Remarks: The experiment is in progress.

Crop: Rice

Centre: PJTSAU, Hyderabad

Experimental details: Three replications of rice varieties; JGL 18047, Tellahamsa and RNR 15048 were sown in plots of 33 m^2 (5.5 x 6 m^2) size in split plot design on two dates of sowings; First DOS: 16.12.2017 (First date of Transplanting: 18.01.2018) and Second DOS: 01.02.2018 (Second date of Transplanting: 28.02.2018). Chemical will be sprayed as per technical programme.

Remarks: Two sets transplanting were completed and data will be recorded as per the technical programme

Centre: UAS, Bengaluru

Experimental details: The field experiment was carried out during s*ummer* 2018 at Zonal Agricultural Research Station, VC Farm, Mandya. This experiment is being conducted on heat susceptible variety BR-2655 in Randomized Block Design under field condition with three replications by following all the recommended package of practices. The crop was sown on 12-01-2018 (Transplanting on 02-02-2018) in plot of 20m^2 (5.0 x 4.0 m^2) size. The chemicals spraying; T_{1-} Glycine betaine (600ppm), T_{2-} Salicylic acid (800 ppm), T_{3-} Salicylic acid (400 ppm), T_{4-} Ascorbic acid 10 ppm+ Citric acid (1.3%), T_{5-} α-Tocopherol (150 ppm) and T_{6-} KCl (1%) will be done keeping T_0 as control (no spray) will be used for the foliar spray at vegetative and seed filling stagesto mitigate the effect of elevated temperatures on seed set.

Remarks: The transplanting is done on 02-02-2018 as per the treatment details. The data will be collected during cropping period and will be compiled and submitted in future. The experiment is in progress.

Centre: TNAU, Coimbatore

Experimental details: Experiment was conducted with normal date of sowing and thereafter with 15 days intervals for 1½ months. The crop was raised under two sets; Set 1: in open field conditions (Plate 6) and Set 2: in growth chamber (Plate 7) with 5°C elevated temperature from anthesis onwards.

Plate 6: Field Trial in Vegetative Stage

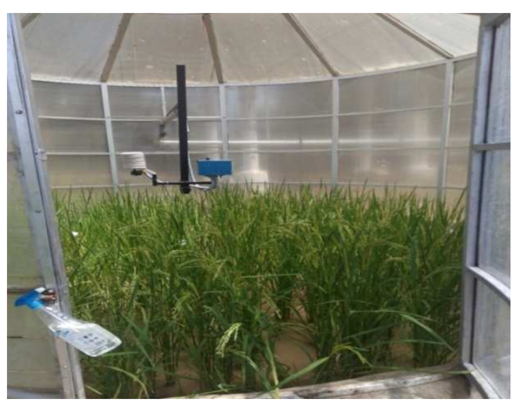


Plate 9: Inner view of the elevated

temperature chamber

Results: The trail conducted at ambient and 4 degree elevated temperature condition. The result revealed that the spray of ascorbic acid 10 ppm recorded significant difference in total number of spikeletsper panicle , number of seeds per panicle, percentage of filled seeds, percentage increase of filled seeds over the control and 100 seed weight (Table 18).The control under ambient condition recorded 284 numbers of spikelets and at elevated temperature of 4^{0}C, it recorded 258 number of spikelets. With the spray of ascorbic acid the number of spikelets increased up to 298 and 274 under ambient and elevated conditions respectively. This may be due the exposure of spikelets through panicle exertion and viability status of the spikelets to withstand the environment. Number of filled seeds per panicle increased significantly with the foliar spray. Ascorbic acid 10 ppm spray recorded 279 seeds per panicle under ambient condition compared to 254 seeds under elevated condition. Whereas, control under ambient condition recorded 239 and elevated condition recorded 201 numbers of seeds.The percentage increase of filled seeds under ambient and elevated condition with ascorbic acid 10 ppm spray was significantly high and it recorded 12 percent increase seed set under ambient condition and 14 per cent increase under elevated condition. This treatment is followed by salicylic acid 400 ppm, which recorded 11 percent increased seed set under ambient condition and 14 percent increased seed set under elevated condition.

Table 18: Effect of temperature and foliar spray on yield attributing parameters in rice var. CO 51

Treatment	Total no. of spikelets per panicle		Number of seeds per panicle		Number of ill-filled seeds per panicle		Percentage filled seeds		Percentage increase of filled seeds over the control		1000 seed weight (g)	
	Ambient	Elevated	Ambient	Elevated	Ambient	Elevated	Ambient	Elevated	Ambient	Elevated	Ambient	Elevated
T_1 Control	284	258	239	201	45	57	84	78	-	-	16.01	15.4
T_2 Glycine betaine (600 ppm)	284	253	256	220	28	33	90	87	6	9	16.86	16.97
T_3 Cytokinin (100 ppm)	285	260	256	221	29	39	90	85	6	7	16.74	16.82
T_4 Salicylic acid (400 ppm)	287	258	268	237	14	21	93	90	11	14	16.82	16.84
T_5 Ascorbic acid (10 ppm)	298	274	279	254	16	21	96	92	12	14	16.9	17.06
T_6 KCl 1%	278	251	245	213	33	38	88	85	4	7	16.81	16.85
T_7 Citric acid (1.5%)	275	248	242	210	30	35	85	82	6	8	16.8	16.76
Mean	285	258	256	223	28	34	90	86	7	10	16.67	16.74
SEd	3.2	3.7	5.8	4.6	4.3	3.9	0.22	0.37	0.47	0.32	0.21	0.17
CD(p=0.05)	6.5	7.1	11.8	9.2	8.8	7.8	0.46	0.78	0.96	0.66	0.44	0.35

Centre: ICAR RC NEH Region - Manipur Centre

Experimental details: During 2017-18, experiments in rice (variety: RC-Maniphou-7) were taken up at ICAR Research Complex, Manipur Centre as a new voluntary centre with treatments *viz*.;T_0-Control,T_1-Glycine Betaine (600ppm),T_2-Salicylic acid (800ppm),T_3- Salicylic acid (400ppm),T_4-Ascorbic acid (10ppm) + Citric acid (1.3)%,T_5-α-Tocopherol (150ppm),T_6 -KCL 1%. The objectives of this experiment were set as; to standardize the techniques to mitigate the effect of elevated temperatures on seed set, yield and quality, to study the impact of heat stress on various crop phonological parameters, pollen and stigmatic character/floral behaviour and seed set percentage and to study the impact of heat stress (Plate 8-12) on seed quality (germination, viability, vigour and seed health) of both freshly harvested as well as stored seed under both stressed and non-stressed environment. For accelerated ageing the Seeds were Stored at 40^{0}C and 90% RH for 7 days under seed germinator. Moisture content was tested by oven method (High constant temperature method) at 130^{0}C for 2hrs.

Results: Significant difference between the two conditions was found for all the parameters studied. Among the characters studied, Chlorophyll Index, grain yieldper plant, grain yield per plot, number of panicles, number of tillers were found to differ significantly (Table 19 and 20). Pollen viability was noticed in all the two tested condition. Among the treatment under two condition, T_5-α-Tocopherol (150ppm)of Non-stress condition had better performance in Pollen viability test.The highest grain yield (510.5gm/plot) was recorded in treatment T1–Glycine Betaine (600ppm) of non-stress condition and the lowest (119.9gm/plot) was recorded intreatment T_6(KCL 1%) of Stress condition. There is also significant differences in germination and vigour index among two conditions, T6(KCL 1%) had better performance in Germination and vigour index.

Plate 8: View of heat stress experimental field

Table 19: Growth and yield studies of RC Maniphou -7as influenced by different treatments

Treatment	Parameters							
	Chlorophyll index Vegetative stage (before application)		Chlorophyll index Vegetative stage (after application)		Chlorophyll index seed filling stage (before application)		Chlorophyll index seed filling stage (after application)	
	Non Stress	Stress	Non Stress	Stress	Non Stress	Stress	Non Stress	Stress
T0	26.3	24.3	22.3	19.7	25.2	26.5	30.2	24.5
T1	27.5	20.8	19.4	19.9	23.9	27.6	26.5	21.7
T2	27.1	23.2	21.4	20.6	25.6	23.0	29.7	25.3
T3	26.0	24.5	22.6	19.7	29.0	20.3	30.5	24.2
T4	23.0	21.9	23.9	20.5	26.7	25.0	29.2	23.3
T5	27.1	23.6	22.7	15.3	23.5	20.5	28.3	20.9
T6	25.3	25.2	22.4	18.0	24.7	25.0	29.1	24.6
T test value	**3.21**		**3.12**		**1.02**		**13.53**	

**Mean of three replications in each treatment*

Plate 9: Flowering Stage (Stress)

Plate 10: Flowering Stage (Non-Stress)

Plate 11: Mature stage(Stress)

Plate 12: Mature stage (Non-Stress)

Table 20: Growth and yield studies of RC-Maniphou -7 as influenced by different treatments

Treatment	Parameters													
	No. of panicles per plant		No. of Tillers per plant		Seed set (%)		Seed yield per plant (gm)		Seed yield per plot (gm)		100 Seed wt. (gm)		Pollen viability (%)	
	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S
T0	10.3	9.6	11.6	10.0	75.3	50.7	20.5	7.8	478.5	195.2	2.5	2.3	95.4	90.8
T1	11.8	11.6	10.0	9.0	77.7	47.5	20.0	6.7	545.4	138.9	2.5	2.4	98.1	81.9
T2	11.6	10.0	10.6	9.6	78.6	45.0	18.3	6.9	475.1	196.6	2.6	2.4	95.1	80.7
T3	10.4	9.6	11.3	10.3	85.1	42.0	19.0	10.8	466.5	175.3	2.8	2.3	98.1	92.7
T4	10.3	10.6	9.6	10.0	82.4	45.9	17.3	7.5	398.7	143.1	2.8	2.4	98.4	91.9
T5	11.0	10.3	11.6	10.6	75.5	48.5	17.5	6.1	377.0	164.2	2.7	2.2	100	90.4
T6	11.2	10.0	12.3	9.3	70.9	46.6	18.0	6.6	510.5	120.3	2.8	2.3	97.8	93.4
T test value	2.97		3.07		12.02		17.19		11.36		5.27		4.77	

NS= Non Stress and S= Stress **Mean of three replications in each treatment*

Table 21: Physiological Parameters studies Accelerated Ageing Test as influenced by different treatments

Treatment	Parameters			
	Germination Percentage (%)		Vigour Index	
	Non Stress	Stress	Non Stress	Stress
T0	86.6	26.6	3.2	0.92
T1	77.3	28.0	3.1	0.82

T2	76.0	29.3	3.1	0.82
T3	90.6	52.0	3.3	1.50
T4	73.0	44.0	2.7	1.20
T5	85.5	34.0	3.0	0.94
T6	93.3	28.0	3.7	0.85
T test value	**10.47**		**13.32**	

**Mean of three replications in each treatment*

Accelerated ageing treatment of Seed for seed viability resulted in significant differences in germination percentage between two conditions, among the two condition treatment T_2-(Salicylic acid (800ppm) and treatment T_3-(Salicylic acid (400ppm) showed high germination percentage (Table 21).A significant differencewas observed in moisture content (Table 22).under two conditions.Among two conditions T_1 (Glycine Betaine 600 ppm) of Stress condition was less moisture content percentage (10.0 %).

Table 22: Germination and Moisture Percentage studies as influenced by different treatments

Treatment	Parameters			
	Germination Percentage (%)		Moisture (%)	
	Non Stress	Stress	Non Stress	Stress
T0	86.6	76.6	13.5	13.0
T1	93.3	73.3	15.7	10.0
T2	96.6	76.6	14.3	15.6
T3	96.6	66.6	14.2	11.9
T4	90.0	73.3	15.7	10.2
T5	93.3	70.0	15.5	15.0
T6	90.0	73.0	12.5	12.3
T test value	**8.32**		**1.85**	

**Mean of three replications in each treatment*

Centre: OUAT, Bhubaneswar

Experimental details: As per the technical programme, the experiment has been taken up in Rabi-Summer 2017-18. Medium duration rice variety Naveen (NRRI release variety, 120 days duration) has been selected for the experiment. Four dates of sowing have been fixed at 15 days interval (D_1: 1st date of sowing (01.12.2017), D_2: 2nd date of sowing (16.12.2017), D_3: 3rd date of sowing (31.12.2017), andD_4: 4th date of sowing (15.01.2018). Transplanting of 26-day old seedlings has already been completed. The nursery and crop are in good condition.Foliar spray of chemicals.

Remarks: The experiment is in progress and data as per technical programme shall be included in the next year's Annual Report.

Centre: DBSKKV, Dapoli

Experimental details: The experiment was undertaken with the objectives; to standardize the techniques to mitigate the effect of elevated temperatures on seed set, yield and quality, to study the impact of heat stress on various crop phenological parameters, pollen and stigmatic character/floral behaviour, seed set percentage and to study the effect of heat stress on seed quality (germination, viability, vigour and seed health) of both freshly harvested as well as stored seed under both stressed and non-stressed environments. The paddy variety, Karjat -3 was sown in two dates of sowings in such a way that one set will not be caught in heat stress and another set will have flowering and seed setting taking place in heat stress.

Results: (Pooled Rabi-2016-17 & 2017-18)**:** The data are presented in table 23 and 23a. Main effects for Sowing time (S) revealed significant differences for all the characters under study while main effects for mitigation treatment (T) revealed significant differences for all the characters under study except pollen viability percentage and germination percentage after 9 months of storage whereas, interaction effects (S x T) were significant for all the characters except pollen viability percentage.

The data revealed significantly highest chlorophyll stability index before spray (0.26), chlorophyll stability index after spray (0.23), pollen viability (94.86 %), seed set (88.66 %), 100 seed weight (2.22 gm), seed yield/plant (26.05 g), seed yield/plot (4.93 kg), germination after harvest, 6 and 9 months after storage (91.72, 88.22 and 82.45 per cent, respectively) and vigour index after harvest, 6 and 9 months after storage (2982.11, 2612.84 and 2080.21, respectively) in 1^{st} sowing (Normal planting) as compared to stress condition.

Among mitigation treatments, T_2: salicylic acid (800 ppm) recorded significantly highest chlorophyll stability index before spray (0.33), chlorophyll stability index after spray (0.29), seed set (89.89 %), 100 seed weight (2.26 g), seed yield/plant (27.03 g), seed yield/plot (5.03 kg), germination after harvest, 6 and 9 months after storage (94.17, 91.83 and 84.08 per cent, respectively) and vigour index after harvest, 6 and 9 months after storage (3137.52, 2699.49 and 1964.21, respectively).

However, among interaction effects, S_1T_2 recorded significantly highest chlorophyll stability index before spray (0.35), chlorophyll stability index after spray (0.31), 100 seed weight (2.34 gm), seed yield/plant (31.97 g), seed yield/plot (5.21 kg), germination after harvest and 6 months after storage (96.00 and 92.67 per cent, respectively) and vigour index after harvest, 6 and 9 months after storage (3396.30, 3197.38 and 2276.53, respectively). However, significantly highest pollen viability (96.71 %) and seed set (85.51 %) was recorded by S_1T_3 and both were at par with S_1T_2.

Table 23: Effects of sowing time & chemical spray on yield and yield attributing traits and seed quality parameters in rice(Rabi-2016-17 & 2017-18)

Treatment	Chlorophyll stability index before spray	Chlorophyll stability index after spray	Pollen Viability %	Seed set %	100 seed weight (gm)	Seed yield/plant (gm)	Seed yield/plot (kg)	Germination (%) after harvest	Vigour index after harvest	EC (µS/cm)	Germination % at 6 MOS	Vigour index at 6 MOS	Germination % at 9 MOS	Vigour index at 9 MOS
S1- 1st Sowing	0.26	0.23	94.86 (76.90)	88.66 (70.36)	2.22	26.05	4.93	91.72 (73.29)	2982.11	35.24	88.22 (69.93)	2612.84	82.45 (65.23)	2080.21
S2- 2nd Sowing	0.22	0.20	92.89 (74.53)	87.16 (69.04)	2.08	19.98	3.81	87.81 (69.57)	2611.83	31.10	84.83 (67.08)	1840.65	79.36 (62.98)	1377.13
SEm(±)	**0.01**	**0.01**	**0.30**	**0.19**	**0.01**	**0.20**	**0.06**	**0.16**	**18.36**	**0.14**	**0.20**	**29.50**	**0.24**	**10.67**
CD (p=0.05)	**0.02**	**0.02**	**0.85**	**0.55**	**0.03**	**0.57**	**0.18**	**0.45**	**52.03**	**0.40**	**0.58**	**83.62**	**0.68**	**30.25**
T1-Control	0.26	0.23	92.69 (74.31)	84.98 (67.22)	1.92	18.72	3.66	87.25 (69.09)	2378.68	38.80	81.17 (64.28)	1710.51	77.75 (61.86)	1532.47
T2-Salycyclic Acid (800 ppm)	0.33	0.29	94.16 (76.01)	89.89 (71.51)	2.26	27.03	5.03	94.17 (76.06)	3137.52	30.72	91.83 (73.40)	2699.49	84.08 (66.49)	1964.21
T3-Salycyclic Acid (400 ppm)	0.20	0.17	94.42 (76.33)	88.00 (69.76)	2.23	25.38	4.80	92.42 (74.03)	3005.72	30.66	90.42 (71.97)	2553.91	81.47 (64.50)	1783.72
T4-Ascorbic acid (10 ppm) + Citric acid 1.3%	0.24	0.21	93.62 (75.37)	88.21 (69.96)	2.16	22.77	4.04	87.75 (69.53)	2603.66	34.87	84.17 (66.55)	2073.42	80.42 (63.74)	1672.97
T5-α-tocopherol (150 ppm)	0.21	0.19	94.90 (76.94)	88.44 (70.16)	2.15	20.96	4.28	87.34 (69.16)	2706.50	31.88	84.09 (66.49)	1958.41	78.92 (62.67)	1649.10
T6-KCL (1%)	0.23	0.20	93.47 (75.19)	87.95 (69.73)	2.21	23.24	4.43	89.67 (71.26)	2949.74	32.11	87.25 (69.08)	2364.72	82.75 (65.46)	1769.55
SEm(±)	**0.01**	**0.01**	**0.52**	**0.33**	**0.02**	**0.35**	**0.11**	**0.28**	**31.80**	**0.25**	**0.36**	**51.10**	**0.44**	**18.69**
CD (p=0.05)	**0.03**	**0.03**	**1.47**	**0.94**	**0.05**	**0.98**	**0.31**	**0.79**	**90.12**	**0.70**	**1.01**	**144.83**	**1.25**	**52.39**

(Figures in parenthesis are arc sine values)

Table 23a: Effects of sowing time & chemical spray on yield and yield attributing traits and seed quality parameters in rice (Rabi-2016-17 & 2017-18)

Treatment	Chlorophyll stability index before spray	Chlorophyll stability index after spray	Pollen Viability %	Seed set %	100 seed weight (gm)	Seed yield/plant (gm)	Seed yield/plot (kg)	Germination (%) after harvest	Vigour index after harvest	EC (µS/cm)	Germination % at 6 MOS	Vigour index at 6 MOS	Germination % at 9 MOS	Vigour index at 9 MOS
S_1T_1	0.28	0.25	94.67 (76.65)	81.90 (65.05)	2.02	19.37	4.42	88.84 (70.49)	2379.99	40.92	80.67 (63.91)	1911.18	78.17 (62.14)	1819.48
S_1T_2	0.35	0.31	95.25 (77.40)	85.45 (68.42)	2.34	31.97	5.21	96.00 (78.49)	3396.30	31.91	92.67 (74.29)	3197.38	85.67 (67.75)	2276.53
S_1T_3	0.22	0.17	96.71 (79.54)	85.51 (68.05)	2.30	30.23	5.09	93.67 (75.44)	3241.49	32.65	91.67 (73.22)	3025.79	82.67 (65.40)	2175.50
S_1T_4	0.24	0.21	95.29 (77.47)	84.81 (67.68)	2.23	25.63	4.84	90.17 (71.74)	2787.20	38.87	85.83 (67.89)	2446.51	81.33 (64.40)	2015.19
S_1T_5	0.22	0.19	94.50 (76.43)	82.29 (65.40)	2.21	23.30	4.96	90.00 (71.57)	2921.59	33.83	87.17 (69.03)	2274.17	80.34 (63.68)	2005.45
S_1T_6	0.28	0.24	92.76 (74.39)	81.63 (65.05)	2.28	25.82	4.91	91.67 (73.23)	3166.07	33.27	91.33 (72.90)	2821.99	86.50 (68.44)	2189.09
S_2T_1	0.25	0.21	90.70 (72.24)	79.05 (63.06)	1.82	18.07	2.72	85.67 (67.76)	2377.38	36.68	81.67 (64.65)	1509.83	77.33 (61.57)	1245.47
S_2T_2	0.30	0.26	93.06 (74.73)	82.05 (65.39)	2.18	22.10	4.86	92.33 (73.95)	2878.74	29.53	91.00 (72.55)	2201.60	82.50 (65.27)	1651.88
S_2T_3	0.18	0.15	92.13 (73.70)	80.68 (64.29)	2.17	20.53	4.52	91.17 (72.73)	2769.94	28.67	89.17 (70.78)	2082.03	80.34 (63.68)	1391.94
S_2T_4	0.22	0.20	91.95 (73.52)	80.48 (64.13)	2.09	19.90	3.24	85.33 (67.49)	2420.10	30.88	82.50 (65.27)	1700.31	79.50 (63.08)	1330.73
S_2T_5	0.20	0.18	95.30 (77.47)	84.67 (67.54)	2.09	18.62	3.60	84.67 (66.96)	2491.40	29.93	81.00 (64.17)	1642.64	77.50 (61.68)	1292.75
S_2T_6	0.18	0.17	94.18 (76.04)	83.10 (66.20)	2.14	20.67	3.95	87.67 (69.46)	2733.42	30.95	83.67 (66.17)	1907.45	79.00 (62.73)	1350.02
SEm(±)	**0.015**	**0.015**	**0.74**	**0.47**	**0.025**	**0.49**	**0.15**	**0.39**	**44.97**	**0.35**	**0.50**	**72.27**	**0.68**	**26.14**
CD (p=0.05)	**0.04**	**0.04**	**2.08**	**1.33**	**0.07**	**1.39**	**0.43**	**1.11**	**127.08**	**0.98**	**1.42**	**204.21**	**1.92**	**73.87**

(Figures in parenthesis are arc sine values)

Results (2017-18): The data are presented in table 24 and 24a. Main effects for sowing time and mitigation treatments both revealed significant differences for all the characters under study while interaction effects were significant for all the characters except chlorophyll stability index before and after spray and germination percentage after harvest.The data revealed significantly highest chlorophyll stability index before spray (0.24), seed yield/plant (28.15 g), seed yield/plot (4.71 kg), 100 seed weight (2.22 gm), pollen viability (94.87%), seed set (87.13%), germination after harvest, 6 and 9 months after storage (91.0, 88.78 and 82.39 %, respectively) and vigour index after harvest, 6 and 9 months after storage (2935.41, 2447.29 and 1963.33, respectively) in 1st sowing (Normal planting) as compared to stress condition.

Among mitigation treatments, T_2: salicylic acid (800 ppm) recorded significantly highest chlorophyll stability index before spray (0.30), seed set (88.36 %), 100 seed weight (2.27 g), seed yield/plant (29.13 g), seed yield/plot (4.84 kg), germination after harvest, 6 and 9 months after storage (93.33, 92.33, 84.50 %, respectively) and vigour index after harvest, 6 and 9 months after storage (3118.87, 2544.99, 1845.55, respectively). However, among interaction effects, S_1T_2 recorded significantly highest chlorophyll stability index before spray (0.32), chlorophyll stability index after spray (0.29), 100 seed weight (2.34 g), seed yield/plant (34.07 g), seed yield/plot (5.10 kg), germination after harvest and 6 months after storage (95.33 and 93.00 per cent, respectively) and vigour index after harvest, 6 and 9 months after storage (3280.27, 3068.76, 2180.56, respectively).To escape/mitigate the effect of elevated temperatures and to achieve better seed set, seed yield and seed quality (of freshly harvested as well as stored seeds) in paddy during Rabi 2016-17, treatment combination, S_1T_2 i.e.sowing of paddy on normal sowing dates along with mitigation spray of salicylic acid (800 ppm) at vegetative and seed filling stages was found to be effective among all the treatment combinations studied.

Table 24: Effects of sowing time, mitigation treatments & their interaction on yield, yield attributing traits and seed quality parameters in rice (Rabi-2017-18)

Treatment	Chlorophyll stability index before spray	Chlorophyll stability index after spray	Pollen Viability (%)	Seed set (%)	100 seed weight (g)	Seed yield/plant (g)	Seed yield/plot (kg)	Germination (%) after harvest	Vigour index after harvest
S1- 1st Sowing	0.24	0.21	94.87 (76.97)	87.13 (69.03)	2.22	28.15	4.71	91.00 (72.72)	2935.41
S2- 2nd Sowing	0.20	0.18	92.91 (74.62)	85.63 (67.74)	2.11	22.08	3.54	86.89 (68.88)	2682.27
SEm(±)	**0.006**	**0.01**	**0.14**	**0.06**	**0.01**	**0.09**	**0.08**	**0.26**	**17.75**
CD (p=0.05)	**0.01**	**0.03**	**0.40**	**0.17**	**0.02**	**0.27**	**0.24**	**0.75**	**52.39**
T1-Control	0.24	0.21	92.68 (74.41)	83.45 (65.97)	1.99	20.82	3.39	86.50 (68.47)	2358.61
T2-Salycyclic Acid (800 PPM)	0.30	0.27	94.16 (76.04)	88.36 (70.10)	2.27	29.13	4.84	93.33 (75.18)	3118.87
T3-Salycyclic Acid (400 PPM)	0.19	0.15	94.44 (76.63)	86.47 (68.43)	2.23	27.48	4.57	91.67 (73.27)	2980.43
T4-Ascorbic acid (10 PPM) + Citric acid 1.3%	0.22	0.19	93.65 (75.51)	86.68 (68.65)	2.16	24.87	3.81	86.83 (68.79)	2602.64
T5- α-Tocopherol (150 PPM)	0.18	0.17	94.92 (76.95)	86.90 (68.80)	2.15	23.05	4.00	86.50 (68.55)	2747.99
T6-KCL (1%)	0.21	0.18	93.49 (75.23)	86.42 (68.35)	2.21	25.33	4.16	88.83 (70.54)	3044.48
SEm(±)	**0.01**	**0.02**	**0.24**	**0.10**	**0.01**	**0.16**	**0.14**	**0.44**	**30.74**
CD (p=0.05)	**0.03**	**0.06**	**0.70**	**0.29**	**0.03**	**0.46**	**0.42**	**1.30**	**90.74**

Interaction	Chlorophyll stability index before spray	Chlorophyll stability index after spray	Pollen Viability (%)	Seed set (%)	100 seed weight (g)	Seed yield /plant (g)	Seed yield/plot (kg)	Germination (%) after harvest	Vigour index after harvest
S1 T1	0.26	0.23	94.63 (76.61)	84.13 (66.53)	2.00	21.47	4.33	88.00 (69.77)	2293.81
S1 T2	0.32	0.29	95.23 (77.39)	90.45 (72.00)	2.34	34.07	5.10	95.33 (77.54)	3280.27
S1 T3	0.21	0.16	96.73 (79.59)	88.36 (70.05)	2.30	32.33	4.89	93.00 (74.68)	3149.97
S1 T4	0.23	0.20	95.32 (77.52)	89.03 (70.66)	2.23	27.73	4.65	89.33 (70.95)	2753.40
S1 T5	0.19	0.17	94.52 (76.46)	85.05 (67.25)	2.21	25.40	4.68	89.33 (70.99)	2911.85
S1 T6	0.26	0.22	92.78 (74.44)	85.77 (67.84)	2.28	27.90	4.63	91.00 (72.54)	3223.13
S2 T1	0.23	0.19	90.72 (72.27)	82.77 (65.47)	1.98	20.17	2.45	85.00 (67.23)	2423.42
S2 T2	0.28	0.25	93.09 (74.76)	86.27 (68.25)	2.19	24.20	4.58	91.33 (72.88)	2957.47
S2 T3	0.16	0.13	92.15 (73.73)	84.57 (66.87)	2.17	22.63	4.24	90.33 (71.91)	2810.88
S2 T4	0.20	0.18	91.98 (73.55)	84.33 (66.68)	2.10	22.00	2.97	84.33 (66.69)	2451.87
S2 T5	0.18	0.16	95.32 (77.51)	88.76 (70.41)	2.09	20.70	3.32	83.67 (66.17)	2584.12
S2 T6	0.17	0.15	94.20 (76.07)	87.07 (68.92)	2.14	22.77	3.68	86.67 (68.59)	2865.83
SEm(±)	**0.027**	**0.014**	**0.33**	**0.14**	**0.02**	**0.22**	**0.20**	**0.63**	**43.47**
CD (p=0.05)	**NS**	**NS**	**0.99**	**0.41**	**0.05**	**0.65**	**0.59**	**NS**	**128.32**

Table 24a: Effects of sowing time, mitigation treatments & their interaction on yield, yield attributing traits and seed quality parameters in rice (Rabi-2017-18)

Treatment	EC (µS/cm)	Germination % at 6 MOS	Vigour index at 6 MOS	Germination % at 9 MOS	Vigour index at 9 MOS
S1- 1st Sowing	34.52	88.78(70.72)	2447.29	82.39(65.26)	1963.33
S2- 2nd Sowing	30.38	84.61(67.10)	1654.52	79.22(62.90)	1241.33
SEm(±)	**0.20**	**0.22**	**9.85**	**0.32**	**9.79**
CD (p=0.05)	**0.60**	**0.64**	**29.08**	**0.93**	**28.88**
T1-Control	38.08	81.50(64.51)	1561.88	77.67(61.79)	1414.88
T2-Salycyclic Acid (800 ppm)	29.99	92.33(73.93)	2544.91	84.50(66.83)	1845.55
T3-Salycyclic Acid (400 ppm)	29.94	90.50(72.09)	2373.15	81.10(64.27)	1653.47
T4-Ascorbic acid (10 ppm)+Citric acid 1.3%	34.15	84.17(66.58)	1881.30	80.17(63.56)	1543.33
T5- α-Tocopherol (150 ppm)	31.15	84.17(66.72)	1770.54	78.50(63.38)	1520.72
T6-KCL (1%)	31.40	87.50(69.64)	2173.64	82.83(65.64)	1636.05
SEm(±)	**0.35**	**0.38**	**17.07**	**0.55**	**16.95**
CD (p=0.05)	**1.03**	**1.11**	**50.37**	**1.61**	**50.03**
S1T1	40.20	80.67(64.41)	1809.62	78.33(62.27)	1735.22
S1T2	31.19	93.00(74.32)	3068.76	86.00(68.06)	2180.56
S1T3	31.93	92.00(73.25)	2847.85	82.33(65.15)	2073.37
S1T4	38.15	86.33(68.31)	2246.06	81.00(64.18)	1880.35
S1T5	33.10	88.33(69.77)	2085.76	80.00(63.45)	1868.00
S1T6	32.57	92.33(73.57)	2625.66	86.67(68.59)	2042.47
S2T1	35.95	82.33(65.15)	1314.13	77.00(61.37)	1094.53
S2T2	28.80	91.67(73.23)	2021.06	83.00(65.66)	1510.53
S2T3	27.94	89.00(70.34)	1898.45	80.00(63.45)	1233.57
S2T4	30.15	82.00(65.40)	1516.52	79.33(62.99)	1206.30
S2T5	29.20	80.00(63.92)	1455.32	77.00(61.36)	1173.43
S2T6	30.23	82.67(66.16)	1721.62	79.00(62.74)	1229.63
SEm(±)	**0.49**	**0.84**	**24.13**	**0.77**	**23.97**
CD (p=0.05)	**1.46**	**2.47**	**71.24**	**2.28**	**70.75**

(Figures in parenthesis are arc sine values)

Centre: RARS, KAU, Patambi (STR Voluntary centre)

Experimental details: Objective of the study is to evaluate the adverse effect of heat stress during reproductive phase in rice crop and its mitigation. Paddy variety Jaya was used for the study. The variety was sown during Rabi season at normal date of sowing as on 23/10/17 and thereafter 3 times at 15 days interval. The control was maintained in the field at ambient condition. Each set was transferred to elevated temperature under climate controlled chamber (Plate 15) facilities available at RARS, Pattambi at onset of flowering. First set started flowering on 16/1/2018. The plants were treated with Glycine betaine (600 ppm), Cytokinin (100 ppm), Salicylic acid (400 ppm), Ascorbic acid (10 ppm), KCl (1%) and Citric acid (1.5 %) during anthesis.

Remarks: The experiment is progressing.

Crop: Mustard

Centre: CSAUAT, Kanpur

Experimental details: The present investigation was conducted at New Dairy Farm (NDF) of CSA University Kalyanpur, Kanpur during the *Rabi* season 2015-16 on two sowing dates. The Breeder seed of Mustard variety Rohini was obtained from the seed processing plant of the University. The following treatments Control (T_1), Glycine Betaine-600ppm (T_2), Salicylic Acid 800ppm (T_3) & 400 ppm (T_4), Ascorbic Acid-10ppm+Citric Acid-1.3%(T_5), α-Tocopherol-150ppm(T_6), & KCL-%(T_7) were applied through foliar spray at two stages i.e. vegetative (S_1) & seed filling stage (S_2) The experiment was conducted in RCBD in 3 replications with Plot Size 4 x 2.25 m^2 and spacing 45 x 10 cm.

Results: The experiment results revealed that performance of D_1T_5 (Ascorbic Acid-10ppm+Citric Acid-1.3%) was found superior over D_2 and other chemicals with respect to chlorophyll intensity, while days taken to 50% flowering were maximum in control (65.50). The treatments T_5 and T_6 (α-Tocopherol-150ppm) resulted in maximum percentage of Pollen Viability, however T_3 gave significantly higher Number of Primary Branches (6.3) when sown (D_1) at normal sowing time (Table 25). The interaction effect for number of secondary branches and number of siliqua/plant was found to be non-significant (Table 25a). The maximum values for no. of seeds/siliqua (12.66) in T_5, seed yield/plant (10.37 g) in T_6, seed yield/plot (2.49 kg) in T_6 and test weight (5.15 g) in T_6 was recorded (Table 26). It can be concluded that the treatment α-Tocopherol-150ppm (T_6) was the best. The laboratory observations (2017-18) are in progress.

Table25: Effect of foliar spray during terminal heat stress on seed set, seed yield and Quality in Mustard (2016-17)

Treatments	Chlorophyll Intensity (after spray)			Days to 50% Flowering			Pollen Viability in percentage			Number of Primary Branches		
	D_1	D_2	Mean	D_1	D_2	Mean	D_1	D_2	Mean	D_1	D_2	Mean
T_1	50.36	N.S.	1.162	N.S.	10.90	20.39	N.S.	N.S.	1.162	N.S.	10.90	20.39
T_2	52.23	0.302	0.565	**0.80**	5.30	9.92	**14.02**	0.302	0.565	**0.80**	5.30	9.92
T_3	51.56	N.S.	1.162	N.S.	10.90	20.39	N.S.	N.S.	1.162	N.S.	10.90	20.39
T_4	47.86	0.302	0.565	**0.80**	5.30	9.92	**14.02**	0.302	0.565	**0.80**	5.30	9.92
T_5	52.26	N.S.	1.162	N.S.	10.90	20.39	N.S.	N.S.	1.162	N.S.	10.90	20.39
T_6	52.03	0.302	0.565	**0.80**	5.30	9.92	**14.02**	0.302	0.565	**0.80**	5.30	9.92
T_7	48.50	N.S.	1.162	N.S.	10.90	20.39	N.S.	N.S.	1.162	N.S.	10.90	20.39
	D	**T**	**DxT**	**D**	**T**	**DxT**	**D**	**T**	**DxT**	**D**	**T**	**DxT**
CD (p=0.05)	0.799	1.495	2.114	0.90	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	0.911	N.S.
SEd	0.389	0.727	1.028	0.438	0.189	1.159	0.429	0.802	1.134	0.237	0.443	0.627

Table25a: Effect of foliar spray during terminal heat stress on seed set, seed yield and Quality in Mustard (2016-17)

Treatments	Number of Secondary Branches			Number of Siliqua/Plant		
	D_1	D_2	Mean	D_1	D_2	Mean
T_1	13.03	13.60	13.31	265.00	264.00	264.50
T_2	14.80	15.16	14.98	316.66	302.33	309.50
T_3	17.13	17.53	17.33	350.00	328.66	339.33
T_4	15.33	15.16	15.25	326.33	320.33	323.33
T_5	18.53	18.23	18.38	348.00	329.00	338.50
T_6	18.93	18.13	18.53	364.33	331.66	348.00
T_7	16.10	16.76	16.43	332.33	321.33	326.83
	D	**T**	**DXT**	**D**	**T**	**TXT**
CD (p=0.05)	N.S.	1.162	N.S.	10.90	20.39	N.S.
SEd	0.302	0.565	0.80	5.30	9.92	14.02

Table 26: Effect of foliar spray during terminal heat stress on seed set, seed yield and Quality in Mustard (2016-17)

Treatments	Number of seeds/Siliqua			Days to Maturity			Seed Yield Plant^{-1} (gm)			Seed Yield Plot^{-1} (kg)			1000 Seed Weight (gm		
	D_1	D_2	Mean	D_1	D_2	Mean	D_1	D_2	Mean	D_1	D_2	Mean	D_1	D_2	Mean
T_1	9.66	9.33	**9.50**	129.33	128.66	**129.00**	7.63	8.06	**7.86**	1.82	1.93	**1.88**	4.00	3.8	**3.90**
T_2	11.33	11.33	**11.33**	133.00	129.66	**131.33**	8.60	8.50	**8.55**	2.06	2.04	**2.05**	4.60	4.48	**4.54**
T_3	12.33	11.00	**11.67**	132.00	129.66	**130.83**	8.96	9.00	**8.98**	2.15	2.15	**2.15**	4.23	4.68	**4.37**
T_4	11.00	12.00	**11.50**	132.33	129.66	**131.00**	8.58	9.41	**9.00**	2.05	2.25	**2.15**	4.85	4.83	**4.84**
T_5	12.66	10.66	**11.66**	133.66	130.00	**131.83**	9.73	9.75	**9.74**	2.33	2.33	**2.33**	5.13	5.16	**5.15**
T_6	13.66	11.66	**12.66**	132.33	128.66	**130.50**	10.48	10.26	**10.37**	2.53	2.46	**2.49**	5.13	5.10	**5.11**
T_7	11.33	10.33	**10.83**	130.66	129.00	**129.83**	10.05	9.48	**9.76**	2.43	2.27	**2.35**	4.93	4.70	**4.81**
	D	**T**	**DxT**	**D**	**T**	**DxT**	**D**	**T**	**DxT**	**D**	**T**	**DxT**	**D**	**T**	**DxT**
CD (p=0.05)	0.468	0.876	**1.238**	0.891	1.667	**N.S.**	N.S.	0.868	**N.S.**	N.S.	0.20	**N.S.**	N.S.	0.566	**N.S.**
SEd	0.228	0.426	**0.602**	0.433	0.811	**1.146**	0.226	0.422	**0.597**	0.054	0.101	**0.13**	0.147	0.275	**0.389**

Experiment 6: Demonstration of technology: On farm demonstration of seed priming technology.

Year of Start: 2008-09

Objective: To demonstrate seed priming technology in the farmers field for easy adoption.

Status: This experiment may be concluded after collecting the data for ongoing season in each crop conducted since 2008.

Details of the crops taken up by different centres for experiments

Crops		**Centres**
Wheat	:	NDUAT, Faizabad; RPCAU, Pusa; PAU, Ludhiana; GBPUAT, Pantnagar; HPKVV, Palampur; CCSHAU, Hisar and CSAUT, Kanpur
Pearl millet	:	RAU, Durgapura and CCSHAU, Hisar
Sorghum	:	PJTSAU, Hyderabad; UAS, Dharwad; MPKV, Rahuri and VNMKV, Parbhani
Chickpea	:	JNKVV, Jabalpur

Proposed Technical Programme:

The data will be compiled by the following centres / persons; Dr. (Mrs.) Omvati Verma, GBPUAT, Pantnagar for wheat, Dr. N.K. Gupta, SKNAU, Jobner for Pearl millet, Dr. S.K. Ramsingh, MPKV, Rahuri for Sorghum and Dr. R.K. Samaiya, JNKVV, Jabalpur for Chickpea.

Note: The above mentioned persons will make a common data sheet for the crop mentioned against their name and will supply it to other centres as mentioned. The data will be compiled in the form of Technical Bulletin, which may be presented in the next workshop.

Crop-wise and centre-wise research findings

Crop: Wheat

Centre: PAU, Ludhiana

Experimental details: Late sown wheat variety PBW 658 was grown during 2017-18 (DOS-13 Dec 2017) in the farmers' field of Sh Ram Singh, Vill. Gorsian Haakam Rai, Distt Ludhiana, with a plot size of 0.4 ha/treatment. Late sown wheat variety PBW 373 was grown during Rabi 2016-17 (DOS-7 Dec 2016) in the farmer's field of Sh Sher Singh Vill Mallakpur Distt Ludhiana, with a plot size of 0.4 ha/treatment.

Results: There was no significance difference in the yield, but uniform plant stand was observed in treated seed plots (Table 2).

Table 1: Effect of priming on seed quality of wheat variety PBW 658 sown during 2017-18

Treatment	Germination%	Speed of germination	Emergence%	SDW (g)	SL (cm)
T0 (Unprimed)	90	12.2	91.5	0.150	256
T1 (Hydro-primed)	98.5	19.8	92.2	0.158	262

*Data on tillers/plant, seed yield q ha^{-1}s is being recorded and will be reported after April, 2018.

Table 2: Effect of priming on seed quality of wheat variety PBW 373 sown during 2016-17

Treatment	Germination%	Speed of germination	Tillers/plant	Seed Yield q ha^{-1}
T0 (Unprimed)	91.6	11.6	13.4	43.2
T1 (Hydro-priming)	93.3	24	17.4	45.4

Centre: GBPUAT, Pantnagar

Experimental details: The experiment on seed priming was started in 2009-10 with two treatments viz. hydro-priming and without seed priming at farmer's field. Hydro-priming was done with soaking of wheat seed in tap water for 16 hours followed by shade drying .The seeds were dried up to original seed moisture content ranged from 11-13%. This methodology was used from 2009-14 and 2015-16. The variety used for this experiment was DBW16, DBW-17, UP 2565 and WH1021. The crop was sown in the last week of December after harvesting of tomato, potato, sugarcane and lahi. In 2014-15 the seed priming was done with 2.5 % KNO3. Wheat seeds were soaked in 2.5 % solution of KNO3 for 12 hours followed by shade drying.

Results: The maximum increase in yield 2.8 q/ha (9.03% increase) was recorded in 2014-15 when priming was done with 2.5% KNO_3 with the variety UP 2565 whereas, variety DBW16 recorded maximum 2.5q /ka (7.32 % increase) in yield with hydro-priming. The year wise reports are given below (Table 3).

Table 3: Percent increase in yield of primed and unprimed wheat seed varieties

S.No.	Year of start	Variety	Priming	Yield (Q/ha)		Yield increase	
				Without priming	Priming	Kg/ha	%
1.	2009-10	DBW16	hydropriming	34.3	34.6	Negligible difference	
2.	2010-11	DBW16	hydropriming	33.47	34.02	55	1.64
3.	2011-12	DBW16	hydropriming	28.31	29.38	107	2.79
4.	2012-13	DBW16	hydropriming	33.81	34.94	113	3.34
		DBW17	hydropriming	33.38	34.01	63	1.88
5	2013-14	DBW16	hydropriming	31.4	33.7	250	7.32
		DBW17	hydropriming	31.2	33.1	190	6.08
6	2014-15	UP2565	2.5% KNO_3	31.0	33.8	280	9.03
		WH1021		30.9	33.6	170	8.73
7	2015-16	DBW16	hydropriming	35.6	37.9	230	6.46
		UP2565		34.5	36.3	190	5.21

Year wise summary of results:

Year: 2009-10

Variety: DBW-16

Treatments: Unprimed and Hydro-priming (16 hrs followed by air drying)

Results: The hydro-priming treatment was given as per technical programme. The hydro-primed and non primed seed of wheat variety DBW-16 was supplied to the farmer. The crop was sown on December16, 2009. The final plant stand (m^{-2}) recorded in primed and non primed seed was169 m^{-2} and 167 m^{-2} respectively. The crop was harvested on April 23, 2010. The primed and non primed seed produced 34.3 q/ha and 34.6 q/ha yield respectively. Negligible difference in yield was observed between primed seed and non primed seed.

Year: 2010-11

Variety: DBW-16

Treatments: Unprimed and Hydro-priming (16 hrs followed by air drying)

Results: The hydro-priming treatment was given as per technical programme for wheat seed. The hydro-primed and non primed seed of wheat variety DBW-16 was supplied to the farmer. The crop was sown on December24, 2010. The final plant stand (m^{-2}) recorded in primed and non primed seed was 247 m^{-2} and 236 m^{-2} respectively. The crop was harvested on April 20, 2011. The primed and non primed seed produced 34.02q/ha and 33.47q/ha yield respectively. The difference in yield 55kg/ha was observed between primed seed and non primed seed.

Year: 2011-12

Variety: DBW-16

Treatments: Unprimed and Hydro-priming (16 hrs followed by air drying)

Results: The hydro-priming treatment was given as per technical programme for wheat seed. The hydro-primed and non primed seed of wheat variety DBW-16 was supplied to the farmer. The crop was sown in second fortnight of December, 2012 and harvested in second fortnight of April, 2012. The final plant stand (m^{-2}) recorded in primed and non primed seed was 225 m^{-2} and 208 m^{-2} respectively. Yield attributing characters was also superior in hydro-primed seeds. The primed and non primed seed produced 29.38q/ha and 28.31q/ha yield respectively. The difference between primed and unprimed seed yield was 107kg/ha.

Year: 2012-13

Varieties: DBW-16 and DBW 17

Treatments: Unprimed and Hydro-priming (16 hrs followed by air drying)

Results: The hydro-priming treatment was given as per technical programme for wheat seed. The hydro-primed and non primed seed of wheat variety DBW-16 and DBW17 were supplied to the farmers. The crop was sown on last week of December, 2012. Primed seeds of both the varieties showed higher plant population (m^{-2}) and number of ears/m2 than nonprime seeds. The crop was harvested in first week of May, 2013. The primed seeds of both the variety showed higher yields and 1000 seed weight. The primed seeds of variety DBW16 and DBW 17 produced 34.94 q/ha and 34.01 q/ha whereas non primed seeds produced 33.81q/ha and 33.38 q/ha respectively. The difference between primed and unprimed seed yield of variety DBW 16 and DBW 17 were 113kg/ha and 63kg/ha respectively.

Year: 2013-14

Varieties: DBW-16 and DBW 17

Treatments: Unprimed and Hydro-priming (16 hrs followed by air drying)

Results: The hydro-priming treatment was given as per technical programme for wheat seed. The hydro-primed and non primed seed of wheat variety DBW-16 and DBW17 were supplied to the farmers. The crop was sown in the first week of January, 2014 after harvesting of tomato, sugarcane and lahi. Primed seeds of both the varieties showed higher plant population (m^{-2}) and number of ears/m^2 than nonprime seeds. The crop was harvested in first week of May, 2014. The primed seeds of both the variety showed higher yields and seed weight. The primed seeds of variety DBW16 and DBW 17 produced 33.7 q/ha and 33.1 q/ha whereas non primed seeds produced 31.4 q/ha and 31.2 q/ha respectively. The difference between primed and unprimed seed yield of variety DBW 16 and DBW 17 were 2.5 q / ha and 1.9 q / ha respectively.

Year: 2014-15

Varieties: UP 2565 and WH 1021

Treatments: Unprimed and Halo-priming (2.5% $KNO_3$for 12 hrs followed by air drying)

Results: The primed and unprimed seed of wheat variety were supplied to the farmers. The crop was sown in the last first week of Dec, 2014 after harvesting of tomato, potato, sugarcane and lahi. Primed seeds of both the varieties showed higher plant population (m^{-2}). The crop was harvested in first week of May, 2015. The primed seeds of both the variety showed higher yields and seed weight. The primed seeds of variety UP 2565 and WH 1021 produced 33.8 q/ha and 33.6 q/ha whereas non primed seeds produced 31.0 q/ha and 30.9 q/ha respectively. The difference between primed and unprimed seed yield of variety UP 2565 and WH 1021 were 2.8 q / ha and 1.7 q / ha respectively.

Year: 2015-16

Varieties: DBW16 and UP 2565

Treatments: Unprimed and Hydro-priming (12 hrs followed by air drying)

Results: The seeds of wheat varieties DBW16 and UP 2565 were primed with water for 12 hours as per technical programme .The primed and unprimed seed of wheat variety were supplied to the farmers. The crop was sown in the last week of Dec, 2015 after harvesting of potato, tomato and lahi. Primed seeds of both the varieties showed higher plant population (m^{-2}). The crop was harvested in first week of May, 2016. The primed seeds of both the variety showed higher yields and seed weight. The primed seeds of variety DBW16 and UP 2565 produced 37.9 q/ha and 36.3 q/ha whereas non primed seeds produced 35.6 q/ha and 34.4 q/ha respectively. The difference between primed and unprimed seed yield of variety DBW16 and UP 2565 were 2.3 q / ha and 1.9 q / ha respectively.

Centre: CCSHAU, Hisar

Experimental Details: Seed priming in wheat (3 replications) was followed by soaking for 12 hours and drying under shade in a plot of 0.5 acre. The demonstration was conducted under rain dependent condition.

Results: There was 6.46% increase in final plant stand and 7.12% increase in seed yield over control was observed (Table 4).

Table 4: Effect of hydropriming on plant stands and grain yield in wheat

Locations	Final plant stand/m^2		Grain yield (q/ha)	
	Unprimed	Primed	Unprimed	Primed
1	279	294	52.5	56.5
2	260	280	51.0	54.0
3	268	285	51.5	55.0
4	238	255	48.0	52.0
5	255	270	50.0	53.0
Mean	260	276.8	50.6	54.2
% increase over control		6.46		7.12

Centre: CSAUT, Kanpur

Experimental details: Year of Commencement- 2008-09 seeds of wheat crop var. Mandakini were primed with tap water (T_1), 2.5% KNO_3) (T_2) and were sown according to prescribed methodology at 4 location of farmers field under rainfed conditions. The untreated seeds served at control (T_0) were also sown.

Year wise summary of results:

Year: 2014-15

Results: Seed priming with KNO_3 (2.5%) was found effective for both conditions of sowing i.e. rainfed and irrigated for getting yield of 51.00 and 52.33 q/ha with percent increase of 14.19 and 11.34 over the control, respectively. Along with seed yield, significantly highest final plant stand in per m^2 (93.00 and 96.66), harvest index (31.30 and 34.00), no. of effective tillers/plant (11.62 and 13.33), no. of seeds/spike (45.66 and 52.66), spike length (9.04 and 10.84 cm) and seed yield/plot (20.40 and 20.90 kg) were recorded under both conditions i.e. rainfed and irrigated (Table 5).

Year: 2015-16

Results: Seed priming with KNO_3 (2.5%) was found effective for all the locations. Yield of 35.27 q/ha followed by 31.47 q/ha, 30.98 q/ha and 28.47 q/ha were recorded in different locations, with average 31.54 q/ha over control 28.24 q/ha with an increase of 10.46%. Highest final plant stand in $1m^2$ (86.66, 82.66 and 53.66), harvest index (36.35, 35.23, 35.28, 38.65), no. of effective tillers/plant (17.66, 18.66, 18.0, 15.33 as compared to untreated (control) were also recorded in KNO_3 treatments in all the four locations (Table 6).

Table 5: Seed Priming Treatment in Wheat Var, Mandakini at Farmer's Field (2014-15)

Priming	Condition	M.C. of Seed	Days to 75% emergence (days)	Days to 75 % Flowering	Days to Harvest Maturity	Final Plant stand (m^{-2})	Harvest Index (%)	Number of effective tillers/plant	No. of Seeds/spike	Spike Length (cm)	Seed yield/plot (kg)	Seed yield (q/ha)
Control	Rainfed	11.0	18.00	90.00	132.00	90.33	30.08	07.33	36.33	7.03	17.86	44.66
	Irrigated	11.0	19.00	95.00	136.00	91.00	32.69	09.26	38.33	80.66	18.80	47.00
Hydro Priming	Rainfed	11.6	16.00	91.00	130.00	92.66	31.33	10.00	43.53	9.00	19.20	48.00
	Irrigated	11.6	15.00	94.00	134.00	95.03	33.97	12.00	45.00	9.71	19.80	49.66
Halo Priming	Rainfed	12.3	13.00	92.00	130.00	93.00	31.30	11.62	45.66	9.04	20.40	51.00
	Irrigated	12.3	13.00	93.00	133.00	90.66	34.00	13.33	52.66	10.84	20.90	52.33
SEm		0.36	0.45	0.51	0.46	0.35	0.26	0.14	0.21	0.15	0.16	0.17
CD (p=0.05)		1.10	1.35	1.54	1.40	10.04	0.79	0.44	0.63	0.45	0.47	0.50

Table 6: Seed priming treatment on wheat Var. Shatabadi (K-307) at farmer's field under rainfed condition (2015-16)

Name of farmer/Location Date of sowing	Field M.C. at Sowing	Treat.	M.C. Seeds at sowing	Day to 50% crop stand	Days to 50% anthesis	Day to harvest Maturity	Final Plant Stand (m^{-2})	Harvest Index	No. of effective/ plant	Spike Length (cm)	Seed yield/plot kg.	Seed yield q/ha
Ajay Pandey		T_0	12.8	14.66	86.33	123	71.00	55.41	14	7.3	29.04	29.04
Mandhana	14.6	T_1	14.3	13.33	84.33	123	78.00	35.69	15.66	8.36	32.34	32.30
12.12.2015		T_2	12.5	12.33	83.33	120	84.66	36.35	17.66	9.58	35.37	35.37
Surendra N		T_0	13.0	14.66	86.33	123	84.0	33.14	15.00	7.41	20.7	28.70
Mandhana	13.8	T_1	14.3	13.33	84.33	123	83.0	34.55	15.66	8.39	29.64	29.64
12.012.2015		T_2	12.8	12.33	83.33	120	83.33	55.23	18.66	9.53	30.98	30.98
Shiv Mangal		T_0	12.6	17.33	87.33	125	73.60	34.31	15.00	6.98	28.83	28.83
Raghav Bilhore	13.6	T_1	13.8	15.33	85.33	125	78.33	34.66	17.00	8.15	29.34	29.34
14.12.2015		T_2	12.8	15.00	84.00	124	82.66	35.28	18.00	9.34	31.47	31.47
Devi Deen		T_0	12.6	17.33	87.33	125	44.66	35.85	13.66	5.6	26.41	26.41
Manvada	12.8	T_1	13.6	15.33	85.33	125	45.33	31.1	14.66	6.00	27.02	27.02
16.12.2015		T_2	12.8	15.00	84.00	124	53.66	38.65	15.33	7.32	28.47	28.47
CD (p=0.05)				**0.53**	**0.38**	**1.16**	**4.05**	**1.32**	**0.87**	**0.28**	**0.94**	**1.00**

T_1 =Untreated, T2 =Tap water, T_3= 2.5% KNO_3

Centre: NDUAT, Faizabad

Result: The wheat crop variety PBW-373 has been taken and experiment was conducted at farmer's field. Seed germination was found to be enhanced by one and half days and seed yield was better in case of hydroprimed and treated with thiram @ 0.25% seed sowing (35.43 q/ha) as compared to unprimed seed sowing (3327q/ha). The seed yield increased 6.50% due to hydropriming technology (Table 7). This study indicated that priming technique is beneficial for poor farmers to wheat crop production.

Table 7: Performance of hydro-priming techniques in wheat crop at farmer's field

Sowing type	Final plan stand 1 m^2 Area Four Random Places				Total	Mean	Final seed yield (q/ha)
	Rep. 1	Rep. 2	Rep. 3	Rep. 4			
Unprimed (Normal seed sowing)	175	182	193	189	739	185	33.27
Hydropriming (Hydroprimed and treated with thiram seed sowing)	212	227	219	225	883	221	35.43

Crop: Pearl millet

Centre: CCSHAU, Hisar

Experimental Details: Seed priming in pearl-millet (3 replications) was performed by soaking in 2.5% KNO_3 solution for 6 Hrs and drying under shade in a plot of 0.5 acre. The demonstration was conducted under rain dependent condition.

Results: There was 4.92% increase in final plant stand and 5.55% increase in seed yield in pearl millet over control was observed (Table 8).

Table 8: Effect of hydropriming on plant stands and grain yield in pearl millet

Locations	Final plant stand/m^2		Grain yield (q/ha)	
	Unprimed	Primed	Unprimed	Primed
1	12	12	14.0	15.0
2	14	15	16.0	16.5
3	10	11	12.5	13.5
4	12	12	14.5	15.0
5	13	14	15.0	16.0
Mean	12.2	12.8	14.4	15.2
% increase over control		4.92		5.55

Crop: Sorghum

Centre: UAS, Dharwad

Experimental details: Seed priming with 2.5 % KNO_3 solution for 6 hours followed by shade drying was carried out in sorghum cultivar SPV-2217 in 3 replications with a plot size of 10X10m and spacing of 30X10cm (DOS 14 October 2017). RDF: 60:40:40 NPK kg/ha, Date of Harvesting: 20-02-2018

Results: Seed priming produced significantly positive effect compared to control by increasing the final plant stand in the field, by early flowering and higher seed yield per plot. Seed quality parameters were also affected positively and recorded increased germination percentage, shoot, root length and hence seedling vigour index (Table 9). The priming with KNO_3 could have also helped in better emergence under excess moisture at the time of emergence (123.8 mm and 10.4 mm rainfall during Oct. & Nov. 2018 respectively).

Table 9: Performance of priming on seed quality and Sorghum crop at farmer's field

Treatments Parameters	Priming	Control
Seed moisture (%)	13.6	11.57
Field emergence (%)	89.63	78.12
Final crop stand (Per m^2)	30.7	23.15
Days to flower initiation	45	49
Days to 50 % flowering	51	58
Grain yield (kg/plot)	16.53	13.51
100 seed weight (g)	3.1	3
Seed germination (%)	89.5	85
Root length (cm)	10.12	9.5
Shoot length (cm)	6.1	5.75
Seedling vigour index	1452	1296

Plate 1: View of experimental plot

Crop: Chickpea

Centre: JNKVV, Jabalpur

Experimental design: Three replications of primed seed of Chickpea Varity JG 16 were sown in RBD design on 10 November 2017 in a 10X10 Sqm plot with row to row spacing of 30cm and replication to replication distance of 1.5m with three treatments, T1: Control (Non-primed seed); T2: Primed seed in tap water (Priming treatment control); T3: Primed seed with 2.5% KNO_3 Solution.

Year wise summary of results:

Year: 2016-17

Results: Seed of chickpea variety JG16 was primed for 7hrs. in gunny bags with tap water and 2.5% KNO_3 solution. The seed were dehydrated under shed to bring the seed moisture content up to 11%. The primed seeds along with control (non-primed) were sown on Nov. 28.2016 in three replication after seed treatment with fungicide (Carbendazim 2.5Kg/ha) and Rhizobium culture during Rabi 2015 for demonstration at village Kajri, Tehsil Panagar in the Farmers field of Mr. Narad Patel. The various yield and yield attributing traits were recorded. The significant differences were existed for seed moisture (%) at sowing, days to 75% crop stand, days to 75% anthesis, days to harvest maturity, final plant stand/m^2, total biomass (g)/plant and per plot, yield (g)/plant, harvest index, plant height, No. of branches/plant, No. of pods/plant and 100 seed-weight. The highest yield (23.03q/ha) was recorded under priming with 2.5% KNO_3 solution followed by seed priming with tap water (21.86q/ha) as compared to control (14.83 q/ha). Whereas, Biomass (2325Kg/ha) was also noted maximum for Seed priming with 2.5% KNO_3 solution (Table 10). Therefore, it is indicated by the demonstration that Chickpea yield and yield attributes may be increased by the Adoption of Seed Priming with 2.5% KNO_3 solution significantly.

Table 10: Effect of seed priming technology through demonstration on enhancing seed yield in Chickpea variety JG-16 during rabi 2016-17 at JNKVV, Jabalpur

S. No.	Treatment	Control	Seed primed with tap water	Seed primed with 2.5% KNO_3	SEm±	CD (p=0.05)
1.	Seed moisture at sowing	10.38	13.04	10.69	0.077	0.254
2	Days to 75% crop stand	13.04	11.00	9.44	0.070	0.231
3	Days to 75% crop anthesis	57.8	45.2	52.8	0.469	1.529
4	Days to harvest maturity	129.60	126.80	119.60	0.824	2.689
5	Final stand /m2	26.00	39.80	45.20	0.925	3.018
6	Total Biomass(g/plant)	15.95	36.17	39.55	4.132	13.477
7	Plant yield (g/plant)	7.94	18.11	18.66	0.240	0.785
8	Plant height (cm)	31.44	38.20	41.05	0.546	1.782
9	No. of branches/plant	3.34	5.63	7.71	0.165	0.540
10	No. of pods /plant	44.66	71.22	86.05	1.027	3.351
11	100-seed weight	12.02	16.43	17.53	0.187	0.612
12	Yield (q/ha)	14.83	21.86	23.03	0.472	1.539
13	Biomass (q/ha)	45.56	49.37	52.76	0.944	3.078
14	Harvest index (%)	32.67	50.61	43.82	0.957	3.121

Year: 2017-18

Results: Seed of Chickpea variety JG 16 was primed for 7 hrs. in gunny bag with tap water and 2.5% KNO_3 solution. The seed were dehydrated under shed to bring the seed moisture content up to 11%. The primed seeds along with control (non-primed) were sown on 12.11.2017 in three replications after seed treatment with fungicide (Carbendazim 2.5 kg/ha) and Rhizobium culture during Rabi 2017-18 for demonstration (Plate 2). The observations on seed moisture %, days to field emergence and plant stand/ m^2 showed significant differences. (Table11). Seed moisture content (%) was recorded lowest (9.90%) under T_1 (Control) treatment than primed seed in tap water (T_2-10.22%). & primed seed with 2.5% KNO_3 (T_3 10.36%) Whereas, days to field emergence was recorded lowest in seed primed with 2.5% KNO_3 (T_2-9.63 days) followed by primed seed with tap water (T_2-10.80 days) whereas, the highest (13.40 days) was noted under control (T_1) treatment. The highest plants stand/ m^2 was registered under seed primed with 2.5% KNo_3 (69.0 plants/m^2) followed by primed seed with tap water (T_2-61.4 plants/m^2). The lowest plant stand /m^2 were recorded in control (39.20 plants/m^2).

The remaining observations will be recorded on 75% anthesis, plant height (cm), No. of branches / plant, No. of pods / plant, 100 seed weight days to harvest maturity, final plant stand / m^2, total biomass (g)/plant, total biomass per plot, yield (g) / plant, seed yield kg/ha and harvest index.

Table 11: Studies on seed priming technology in JG-16 demonstration JNKVV, Jabalpur 2017-18

Treatment	Seed moisture content (%) at the time of Sowing	Days to field emergence	Plant Stand / m2
T1 Control	9.90	13.40	39.20
T2 Prime Seed in Tap water (priming treatment control)	10.22	10.80	61.40
T3 Prime Seed with 2.5%KNO_3	10.36	9.63	69.00
SEm(±)	0.0928	0.4163	1.2675
CD (p=0.05)	0.3027	1.3577	4.1336

Plate 2: View of Demonstration on priming technology on chickpea during 2017-18

Crop: Pigeonpea

Centre: PDKV, Akola

Experimental design: Three replications of Primed seeds of Pigeon pea (Var. PKV Tara) were sown with three treatments, T0: Control (Non-primed seed); T1: Primed seed in tap water (Priming treatment control); T2 : Primed seed with 2.5% KNO_3 Solution and T_3-Primed seed in wetted gunny bag.

Results: The seed priming technology was demonstrated to the farmer's field (Plate 3). After priming, the primed seeds were dried back under shade to their initial seed moisture content and analyzed for different seed quality parameter (Table 12). It was observed that the seed primed with 2.5% KNO_3 exhibited higher seed germination (92.33%), seedling length (29.46 cm) seedling dry weight (0.64 g) and vigour index (59.08). The treated and untreated seed were sown in field in July 2017. The same primed seed was distributed among the farmers for sowing. The crop is still in field and relevant observation on seed yield parameters will be recorded.

Table 12: Effect of seed priming on seed quality parameters before sowing and plant stand of pigeon pea

Treatments	Seed germination (%)	Seedling length (cm)	Seedling dry wt. (g)	VI-I	VI-II	Days to 75% crop stand or emergence	Plant stand/ m^2	Days to anthesis (75%)
T_0	82.00	24.70	0.54	2025.23	44.27	6.33	6.92	118.33
T_1	91.33	27.20	0.57	2483.73	52.67	2.66	7.55	116.66
T_2	92.33	29.46	0.64	2720.00	59.08	4.66	8.25	115.33
T_3	87.00	28.56	0.58	2485.53	50.45	3.66	7.11	117.33
S.E(m±)	**0.83**	**0.50**	**0.01**	**43.21**	**0.96**	**0.37**	**0.16**	**0.33**
CD(p=0.05)	**2.90**	**1.75**	**0.03**	**149.61**	**3.32**	**1.29**	**0.57**	**1.15**

Plate 3: View of Pigeonpea field at STR, Dr. PDKV, Akola

C. Seed Pathology

S. No.	Experiment	Title
01	Experiment 01.	Monitoring and detection of rice bunt, false smut and bacterial leaf blight in processed, unprocessed and farmer's seed samples
02	Experiment 02.	Monitoring of emerging new diseases of seedborne nature
03	Experiment 03.	Studies on seed health status of farmers-own-saved seed
	Experiment 3A.	Studies on seed health status of farmers-own-saved seed (Wheat)
	Experiment 3B.	Studies on seed health status of farmers-own-saved seed (Soybean)
	Experiment 3C.	Studies on seed health status of farmers-own-saved seed (Rice)
	Experiment 3D.	Studies on seed health status of farmers-own-saved seed (Groundnut)
	Experiment 3E.	Studies on seed health status of farmers-own-saved seed (Chick pea)
	Experiment 3F.	Studies on seed health status of farmers-own-saved seed (Saffron)
04	Experiment 04.	Standardization of detection methods for seedborne pathogens of significance
05	Experiment 05.	Non chemical management of seedborne infection of bean anthracnose
06	Experiment 06.	Detection and molecular characterization of BCMV of mungbean
07	Experiment 07.	Monitoring of seedborne viruses in vegetables, pulses and soybean and standardization of methods for detection through biological, serological and molecular techniques
08	Experiment 08.	Standardization of bio priming technique for management of Fusarium wilt of safflower
09	Experiment 09.	Standardization of bio priming technique for management of *Alternaria helianthi* associated with sunflower seeds
10	Experiment 10.	Management of *Alternaria solani* through seed treatment and foliar application of new fungicides
11	Experiment 11.	Impact of different storage conditions and longevity on seed associated mycoflora of green gram
12	Experiment 12.	Detection, location and transmission of seedborne *Macrophomina phaseolina* in sesame
13	Experiment 13.	Management of purple blotch/Stemphylium blight of onion through fungicide and plant based products
14	Experiment 14.	Detection, location and transmission of seedborne *Alternaria sesami* in sesame

Seed Pathology (2017-18)

Significant observations

- As per the Indian Minimum Seed Certification Standards (IMSCS), bunt caused by *Tilletia barclayana* is the designated seedborne pathogen in rice seed production programme with certification standards of 0.10 & 0.50 % in Foundation & Certified seed, respectively. Continued monitoring in 16 States covering 89 districts and after testing 3857 seed samples of different varieties, 24.70% samples have been found infected with rice bunt pathogen. Maximum 84.14 % infected samples arereported from Tarantaran district, Punjab,with highest incidence.
- Rice bunt is continued to be the major widespread problem in seed samples from northern part of India, especially in Punjab, Haryana, Uttarakhand, Uttar Pradesh and Himachal Pradesh.
- *Tilletia sumatii* has been observed in Tamil Nadu, infecting rice crop.
- Investigations on analysis of seed health status of farmers-saved-seeds re-indicated the alarming association of Karnal bunt (*Tilletia indica*) of wheat in Punjab, Haryana, Himachal Pradesh and Uttarakhand, Ear cockle has not been reported from any region.
- Association of *Macrophomina phaseolina*, *Fusarium oxysporum* and *Colletotrichum dematium* with soybean seeds is wide spread in Madhya Pradesh, Maharashtra, Telangana and Rajasthan.
- Rice seed discoloration due to infection of a number of mycoflora is a nationwide problem. Dominant association of *Aspergillus flavus* in groundnut seeds has been recorded as a widespread problem in Telangana, Madhya Pradesh, Maharashtra, Gujarat and Odisha states. Wide spread infection of *Fusarium oxysporum* with chickpea seeds has been observed while no association of *Ascochyta rabiei* is reported.
- Seed health tests of tomato crop and hybrids, purchased by the farmers from different private sector companies, revealed the association of a bacterial pathogen ,*Clavibacter michiganense* pv. *michiganense*. The bacterial pathogen has also been noticed and isolated from the infected fruits from the badly infected farmers' field crop grown in Uttarakhand State.
- Need based innovative modifications in Standard blotter method (wetting of blotters with NaOH solution 0.6%) has been found superior for the detection of Mung bean and Urdbean seed associated *Macrophomina phaseolina, Fusarium oxysporum* and *Alternaria alternata.*
- Re-confirmation of the superiority of Standard Blotter method has been establishes for the detection of *Macrophomina phaseolina, Fusarium oxysporum, Colletotrichum dematium* (*Colletotrichum truncatum*)associated with soybean and sesame seeds.
- PCR based detection technique using the specific primers with known sequence, developed by earlier workers were used and validated for the detection of chilli seed associated anthracnose fungus, *Colletotrichum truncatum* (Ccap F; Ccap R.) ; *Colletotrichum gloeosporioides* (Cboncoll F; Cboncoll R.); *Colletotrichum coccodes* (Cco 1NF1; Cco2NR1) at HPKV , Palampur .

- PCR based protocol for the detection of Pepper Mild Mottle Virus (PMMoV) from seeds through RT-PCR using the viral Coat Protein (CP) specific primers. The seeds were harvested from the virus infected plants which were indexed through DAS-ELISA for the presence of the virus. The cDNA was amplified using the viral coat protein specific primers (F5'CCAATGGCTGACAGATTACG-3' and R5'CAACGACAACCCTTCGATTT-3') with initial denaturation of 94°C for 4 min followed by 35 cycles of 94°C for 15 sec, 48°C for 40 sec and 72°C for 1 min and final extension of 7 min at 72°C to confirm the presence of PMMoV. The PCR product was checked on 1.2% agarose gel along with a negative control (water used as template) and positive control (plasmid isolated from clone having CP gene used as template).The amplification of ~740 bp product was observed in both the seed sample and positive control while no band was observed in negative control.
- More than 50% seed surface area discolored due to infection of *Helminthosporium oryzae*, species of *Drechslera, Fusarium, Curvularia, Alternaria* in rice resulted in drastic reduction of seed germination, below the seed certification standards.
- Bio priming of safflower seeds with *Trichoderma harzianum* + *Pseudomonas fluorescens* @ 05 g each/kg of seed has resulted in least association (11.0%) of *Fusarium carthamii* with enhanced seed germination (94.0%), emergence(89.0%) and reduced wilt incidence (11.0%) and disease control over check (76.60%) as compared to 39.0% association , 78.0% germination , 75.0% emergence and 47.0% wilt incidence in control. Yield enhancement of 16.77% over check is recorded.
- Bio priming of sunflower seeds with *Trichoderma harzianum* + *Pseudomonas fluorescens* @ 05 g each/kg of seed has resulted in least association (14.0%) of *Alternaria helianthi* with enhanced seed germination (81.0%), emergence (67.0%) and reduced incidence of blight (44.0%) and disease control over check (45.0%) as compared to 46.33% association, 70.0% germination, 67.0% emergence and 80.0% incidence of blight.Yield enhancement of 22.42% over check is recorded, after two applicationof Mancozeb (0.25%).
- Extra-embryonic nature of the pathogen, *Alternaria sesami* is established employing Standard seed component plating technique. Pathogen could be recorded in all the seed parts except in embryo.
- Standard agar plate method is found most suitable for the detection of *Alternaria sesami*, associated with sesame seeds.
- Internal seedborne nature of *Macrophomina phaseolina* is established in sesame.
- Plant to seed and seed to plant nature of *Macrophomina phaseolina* has been established in sesame.

Experiment 1 : **Monitoring and detection of rice bunt, false smut and bacterial leaf blight in processed, unprocessed and farmer's seed samples**

Objective : To determine the status of pathogen in seed samples from farmers and processing plants

To prepare the distribution map in different locations

Year of start : 2002 (Concluded up to 2013-14)

Status : Continued 2017-18

Centre : All Centre (AAU, Anand; AAU, Jorhat; NDUAT, Faizabad; GBPUAT, Pant Nagar; OUAT, Bhubaneswar; PJTSAU, Hyderabad; PAU, Ludhiana; CCSHAU, Hissar; HPKV , Palampur; TNAU, Coimbatore; JNKVV, Jabalpur; MPKV, Rahuri; VNMKV, Parbhani; SKUAST, Srinagar; PAJANCOA& RI, Karaikal; ICAR-IARI, New Delhi; DRPCAU, Pusa , Bihar

Crop / Pathogen : Rice- Bunt (*Tilletia barclayana*); False smut (*Ustilaginoidea virens*); BLB

Results

Detection Technique : Standard NaOH seed soak method for rice bunt (*Tilletia barclayana*)
Visual inspection of seeds on Diaphanoscope

Analysis of Rice bunt (*Tilletia barclayana*)

Seed Category	Location covered	Sample tested	Sample Infected	Percent infected samples	Percent range of infection	Varieties tested
PJTSAU, Hyderabad						
Unprocessed	8 Distt/ 81Location	393	83	21.1	0.05-1.37	09
	Out of 393, 83 samples showed positive reaction to bunt (21.11%)					
	Maximum(52.30%) samples from Medak were infected					
	No infection from samples from Khammam and Nalgonda					
	Samples were collected from Karim Nagar, Khammam, Mehaboob Nagar, Medak, Nalgonda, Nizamabad, Ranga Reddy, and Warangal					
Processed	05 District	181	19	10.50	0.05-0.58	09
	Out of 181 samples 19 (10.50%) exhibited the bunt infection					
	All most all the farmers are purchasing the seed from either Public or Private sector.Farmers are not willing to save their own seed for future purpose.					
Farmer	8 Distt/ 81Location	24	0	0	0	BPT5204 MTU1010
CCSHAU , Hissar						
Farmer	08	298	56	18.79	0.05-0.25	05
Seed Processing Plant	03	140	25	17.85	0.05-0.10	03
	Highest infection of bunt was noticed in Pusa 44					
GBPUAT, Pant Nagar						
Farmer	05distt	80	14	17.40	0.05-0.10	12
Seed Processing Plant	-	-	-	-	-	-

	Maximum (33.33%) samples from Dehardun were infected . Dehardun and Khatima region are observed as Hot Spots					
HPKV , Palampur						
Farmer	05 Distt.	86	05	6.25	0.2-2.4	19
Seed Processing Plant	-	-	-	-	-	-
	Incidence of rice bunt is increasing					
MPKV , Rahuri						
Farmer	04 Distt. / 69Location	581	0	0	0	15
Seed Processing Plant	04	40	4	10.0	0.1-0.35	25
	Bunt has been intercepted in samples from coastal region including,Ratnagiri, Dapoli region					
VNMKV , Parbhani						
Farmer	-	-	-	-	-	-
Seed Research Station	03	08	0	0	0	05
NDUAT, Faizabad						
Farmer	07 Distt/	82	07	8.54	0.0-0.15	08
Seed Processing Plant	01 STL	65	19	29.23	0.0-0.45	26
OUAT, Bhubaneswar						
Farmer	06 Distt.	543	-	15	0.0-0.2	19
Seed Processing Plant	01STL	127	-	10.5	0.0-0.15	17
PAU, Ludhiana						
Farmer	16Distt.	895	762	85.14	0.0-0.995	22
Seed Processing Plant	-	-	-	-	-	-
	Highest infection (0995%) in seed sample of PR126 from Tarantaran dist.,145 samples (16.2%) were below MSCS; PR126as the most susceptible variety observed					
JNKVV, Jabalpur						
Farmer	06	90	07	7.7	0.01-0.02	11
Seed Processing Plant	03	45	03	6.6	0.01-0.02	06
AAU, Anand						
Farmer	08 Distt. 55 locations	220	19	8.6	0.2-0.40	36
Seed Processing Plant	-	-	-	-	-	-
SKUAST, Srinagar						
Farmer	-	324	0	0	0	05
Seed Processing Plant	-	-	-	-	-	-
AAU, Jorhat						
Farmer	01 Distt	104	0	0	0	47
Seed Processing Plant	SP Fields	92	0	0	0	15
TNAU, Coimbatore						
Farmer	03	26	0	0	0	13
Seed Processing Plant + Seed Company	19+27	120	0	0	0	11
ICAR- IARI New Delhi						
Farmer	3 Distt 14	46	0	0	0	06

	locations					
Seed Processing Plant	-	-	-	-	-	-
DRPCAU, Pusa Bihar						
Farmer	14	89	0	0	0	18
Seed Processing Plant	13	84	0	0	0	16
Summary						
Total geographical area covered in India	16 States					
Total districts covered	89 districts					
Number of rice varieties tested	372 in 16 states					
Number of samples tested (Farmers)	3857					
Infected	953					
Percentage	24.70%(84.14% samples from farmers infected in Punjab)					
Number of samples tested (Processing Plants)	856					
Infected	134					
Percentage	15.65					
Range of bunt infection in rice seeds	0.015-0.995(Highest infection (0.995%) in farmers sample obtained from Tarantaran (Punjab)					

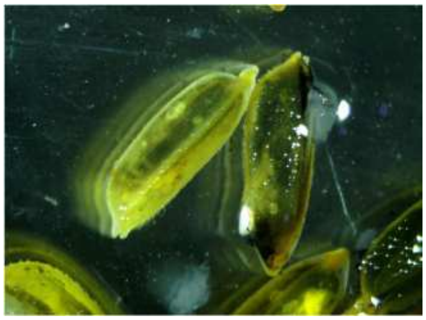
Results: The analysis of 3857 rice seed samples collected from farmers and 856 seeds samples from processing plants covering 89 districts of 16 States of India revealed the presence of rice bunt disease in the range of 0.015 to 0.995%.

In all, 24.70% seed samples from farmers were infected while only 15.65% samples collected from processing plants exhibited the infection of bunt (*Tilletia barclayana)*.

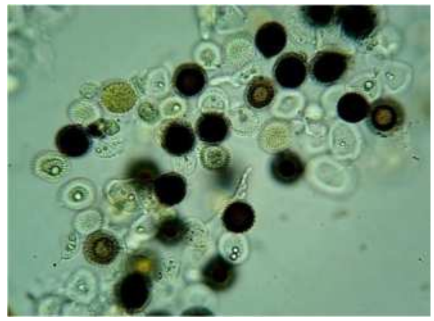
Highest infection (0.995%) was recorded in the sample from Tarataran. In Punjab maximum (85.14%) seed samples were found infected as confirmed by standard NaOH seeds soak method.

Infected rice seeds

Healthy rice seeds

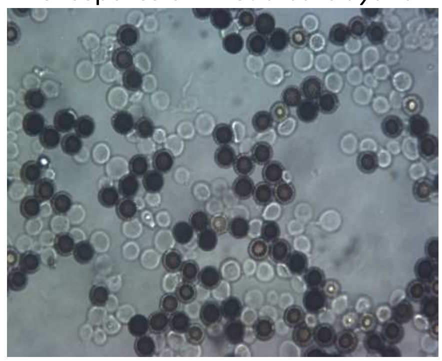


Bunt affected rice seed



Teliospores of *Tilletia barclayana*

Bunt affected seed



Teliospores of *Tilletia barclayana*

Analysis of False smut (*Ustilaginoidea virens*)

Field category	Locations covered	Field visited	Percent field infected	Percent infection	Scale Rating
MPKV, Rahuri					
Farmer Field	03 districts 72 villages	421	24.46	1.0-9.0	0-3
Seed Production Plots	02 districts 03 locations	11	65	0.1-0.40	1-3
AAU, Jorhat					
Farmer Field	03	57	13.2	-	0-3
Seed Production Plots	01 locations	72	26	-	1-3
OUAT, Bhubaneswar					
Farmer Field	01 district	125	35	-	1-3.0
Seed Production Plots	18 varieties	100	26	-	1-3
PJTSAU, Hyderabad					
Farmer Field	06 districts	101	4.7-7.5	1.0	0-1
Seed Production Plots	07 districts	0	0	0	0
PAU, Ludhiana					
Farmer Field	09 districts 26 locations	80	59 fields	-	1-3

Seed Production Plots	-	-	-	-	-
TNAU, Coimbatore					
Farmer Field	04 districts	10	-	13-25.0	1-3
Seed Production Plots	-	-	-	-	-
CCSHAU, Hissar					
Farmer Field	8 districts	55 locations	38.18	1.0-20.0	1-5
Seed Production Plots	31 locations	31	22.58	1.0-18.0	1-5
	HKR 127 and Govind var. have shown the resistant reaction				
JNKVV, Jabalpur					
Farmer Field	05 districts	50	30	1.0-22.0	1-4
Seed Production Plots	08 locations	24	02	1.0-15.0	1-3
AAU, Anand					
Farmer Field	06 district	220/66 var	-	0.5-5.0	1-3
Seed Production Plots	10 district	106 plots/ 23 var	0	0	0
NDUAT, Faizabad					
Farmer Field	-	-	-	-	-
Seed Production Plots	05 location 12 varieties	12	-	-	1-7
	BPT 5204 exhibited the highest intensity in Scale7				
HPKV , Palampur	Very low infection noted , due to changing climatic conditions in the region				
GBPUAT, Pant Nagar	Very low infection noted , due to changing climatic conditions in the region				
SKUAT, Srinagar					
Farmer Field	02 district	07	01	0.1	0 -1
Seed Production Plots	-	-	-	-	-
ICAR- IARI, New Delhi					
Farmer Field	03 districts	14	-	2-3	1-3
Seed Production Plots	14 locations	05	-	0	0
	Disease recorded in only Pusa Sugandha 5				
VNMKV, Parbhani					
Farmer Field	-	-	-	-	-
Seed Production Plots	02	04	0	0	0
DRPCAU, Pusa , Bihar					
Farmer Field	08	91	21.97	0-4.5	0-1
Seed Production Plots	02	36	30.55	0-0.6	0-1

PAJANCOA& RI, Karikal					
Farmer Field	02	10	10	-	1-3
Seed Production Plots	02	10	0	0	0

Results: Monitoring of false smut disease made in various fields of farmers in different districts spread over 15 States& 02 UT of India indicated that, all most all the places the disease was present in varying degree of infection under scale of 1-3.Incidence of false smut was quite low in seed production plots due to prophylactic measures adopted therein. In Haryana, HKR 127 and Govind var. have shown the resistant reaction where at Faizabad disease was noticed in the scale of 7(BPT 5204).


False smut (*Ustilaginoidea virens*)

Experiment 02 : **Monitoring of emerging new diseases of seedborne nature**

Objective : To keep a vigilant eye on the occurrence and development of diseases of seedborne nature

Year of start : 2013-14

Status : Continued in 2017-18

Centre : All Centre

Results

Kharif, 2012 — **Panicle blight of rice** caused by a bacterium, ***Burkholderia glumae*** was reported by Dr. Karuna Vishunavat. The seed associated disease initially came into the notice during a joint field visit with scientists from Japan at GBPUAT, Pantnagar while observing discolored grains of PR 113 and PR 16 variety during Kharif 2012.

Kharif, 2013 — New observation on the occurrence of **False Head Smut** caused by fungus, ***Ustilaginoidea virens*** (Cooke) Takashi was recorded on maize (*Zea mays* L.) in the tribal region of Panchmahal and Dahod district during Kharif 2013 by Drs.RN Pandey, Gohel and Parmar, AAU, Anand, Gujarat

Kharif , 2014 — **Mosaic disease**in mungbean caused by **Bean Common Mosaic Virus** was reported at Farmers field in Surendra Nagar, Mehsana , Patan and Banaskantha district with a incidence in the range of 15-46 % in 21 fields out of

	70 fields by Drs.RN Pandey , Gohel and Parmar , AAU , Anand , Gujarat. Incidence was again observed in Kharif 2015 at Vadodara, Anand, Vijapur, SK Nagar, and Jagudan.
Kharif , 2014	Varying degree of incidence of **Backnae or Foolish Disease** caused by a seed associated fungus, ***Fusarium fujikuroi*** was observed by Dr. Aflaq Hamid , SKUAST, Kashmir in Anantnag and Kulgam district of Kashmir valley affecting the rice crop.
Kharif, 2015	Seed health tests of tomato crop and hybrids, purchased by the farmers from different private sector companies, revealed the association of a **bacterial pathogen.** The bacterial pathogen has also been noticed and isolated from the infected fruits from the badly infected farmers' field crop grown in Bhabhar region of Uttarakhand State. Identification of the bacteria and standardization of detection technique is in progress.
Rabi , 2015	Incidence of **Septoria blotch of wheat** caused by ***Septoria nodorum*** was found affecting the wheat crop at Khudwanir, Anantnag (14.6%), Sinagar, Shalimar (16.5%), Sopore, and Baramula (11.3%) during 2014-15 by Dr. Zahoor Bhatt, SKUAST, Kashmir. *Septoria tritici* and *Septoria nodorum* of wheat have been reported elsewhere in the world, however, with the preliminary identification as *Septoria nodorum* the pathogen is reported and final identification and confirmation of species is under process. Typical lens shaped lesions with yellow green border surrounding the dead tissues and association of pycnidial bodies were observed on leaf and sheath.
Kharif, 2015	**Rice bunt** caused by ***Tilletia barclayana*** has been recorded to the level of 0.2% in the variety Co 50 collected from farmers saved seeds from Thanjavur district, Tamil Nadu by Dr Indira, Seed Centre, Tamil Nadu Agricultural University, Coimbatore (TN).The disease has not been recorded so far from Tamil Nadu.
Kharif 2016	**Rice bunt** caused by ***Tilletia barclayana*** has been recorded first time at Karim Nagar, Telangana State by STR Centre, PJTSAU, Hyderabad **Backnae disease of rice***(Fusarium* spp.) in ADT 38 at farmers field of Sirumgai & Kodumudi , Erode Distt (Tamil Nadu) in the range of 10-15% by STR Centre, Coimbatore (Tamil Nadu)
Rabi 2016	**Rice Udbatta disease** (*Ephelis oryzae*) in ADT(R) 49 and CR 1009 during Rabi 2016 at Karaikal Distt , Puducheri(UT) as reported by PAJANCOA &RI , Karaikal **False Smut of Rice** in BPT5204, CR1009 and White Poni at Karaikal Distt , Puducheri (UT) as reported by PAJANCOA &RI , Karaikal
Rabi 2017	**False Smut of Rice** at Karaikal Distt , Puducheri (UT) again reported by PAJANCOA &RI , Karaikal
Kharif 2016	DRPCAU, Pusa, Biharobserved the presence of **Rice Bunt** (*Tilletia barclyana*), in Pusa Sahbhagi collected from seed processing Plant which is new to the region (Dr. Ranjan **)**
Rabi 2016-17	**Black rot of mustard** (*Xanthomonas campestris* pv. *campestris*) associated with freshly harvested seeds. Pathogen has been isolated on selective bacteriological culture media and subsequently identified. Pathogen is responsible for stunted growth,however, rare mortality observed (Dr JP Shrivastava).
Kharif 2017	Investigation on etiology, epidemiology, serological detection methods for

	Panicle blight of rice caused by a bacterium, ***Burkholderia glumae*** reported by Dr. Karuna Vishunavat, in 2012, are continued .
Kharif 2017	**Stem rot of saffron** *(Crocus sativus)*observed, however, authentic identification of the pathogen is not done and under investigation based upon plant pathological parameters, at SKUAST, Srinagar
Kharif 2017	**Rice bunt** pathogenassociated with rice seeds of Co50, ADT(R) 46, collected during 2015-16, 16-17 has been identified as ***Telltia sumatii*** , based upon the morphological characteristics . The fungus was identified by National Fungal Collection of India, Agharkar research Institute, Pune, Maharashtra. The pathogen is new to state of Tamil Nadu and infecting Rice crop seed. This appreciable initiation was undertaken by Dr. Indira & coworkers at TNAU, Coimbatore. *At the same time, this also attracts the investigation possibilities for prevalence of different species, especially under north Indian condition of Haryana, Punjab and Uttarakhand.*

Experiment 3 : Studies on seed health status of farmers-own-saved seed

Objective : To determine the health status of seed samples from the farmers own saved seeds

Year of start : 2000

Status : Continued 2017-18

Crop : Wheat, Rice, Soybean, Groundnut, Chickpea, Saffron

Centre : All centre for 5 crops , Saffron (only J&K)

Experiment 3A : Studies on seed health status of farmers-own-saved seed

Crop : Wheat

Detection technique :
- Standard NaOH seed soak for Karnal bunt (*Neovossia indica*= *Tilletia indica*);
- Seed soak in water & visual inspection for Ear cockle (*Anguina tritici*) ;
- Visual inspection of plants for loose smut (*Ustilago segatum* var. *tritici*)

Year of start : 2000

Status : Continued 2017-18

Centre : PAU, Ludhiana; CCSHAU, Hissar; GBPUAT, Pant Nagar; HPKV, Palampur; SKNAU, Durgapura; AAU, Anand; ICAR-IARI, New Delhi; DRPCAU, Pusa, Bihar; MPKV, Rahuri

Results

<table>
<tr><th rowspan="2">Centre</th><th rowspan="2">Location</th><th rowspan="2">Sample</th><th rowspan="2">Variety</th><th colspan="3">Per cent range of pathogen association</th><th rowspan="2">Other crop seed</th></tr>
<tr><th>Loose smut</th><th>Karnal Bunt</th><th>Ear cockle</th></tr>
<tr><td>PAU, Ludhiana</td><td>09districts</td><td>300</td><td>14</td><td>-</td><td>0.01-0.25</td><td>0.0</td><td>Nil</td></tr>
<tr><td rowspan="4">Remark</td><td colspan="7">4% samples had germination below IMSCS(12 out of 300);</td></tr>
<tr><td colspan="7">62.67% samples were infected with Karnal bunt (188 out of 300);</td></tr>
<tr><td colspan="7">The disease is wide spread and prevalent in districts under study; 188 samples were found infected in the range of 0.1-0.25%</td></tr>
<tr><td colspan="7">Maximum Karnal bunt sample infected samples are from Ropar while minimum from Amritsar ; Ear cockle was not observed;</td></tr>
<tr><td>CCSHAU , Hissar</td><td>06districts</td><td>132</td><td>8</td><td>0.0-0.0</td><td>0.05-1.20</td><td>0.0</td><td>Nil</td></tr>
<tr><td rowspan="6">Remark</td><td colspan="7">All samples fulfilled the germination standard, 90.0-98.0% observed.</td></tr>
<tr><td colspan="7">No loose smut is reported. Absence of the disease is attributed due to use and sale of Tebuconazole fungicide treated seeds.</td></tr>
<tr><td colspan="7">59.10% samples found infected with Karnal bunt pathogen in the range of 0.05 - 1.20% (above the prescribed limit that is 0.25%) that resulted in rejection of 17.42% seed samples</td></tr>
<tr><td colspan="7">PBW 343, PBW 373, HD 2687, UP 2338 and HD 2329 had maximum infection;</td></tr>
<tr><td colspan="7">Yamuna Nagar is identified as Hot Spot having maximum infection of KB.</td></tr>
<tr><td colspan="7">Ear cockle was not observed.</td></tr>
<tr><td>GBPUAT, Pant Nagar</td><td>04districts</td><td>982</td><td>17</td><td>-</td><td>0.0 -0.25</td><td>-</td><td>Nil</td></tr>
<tr><td rowspan="3">Remark</td><td colspan="7">4.08% samples from 4 districts were infected with Karnal bunt (47 out of 982);</td></tr>
<tr><td colspan="7">Out of 47 infected samples 05 samples had infection above prescribed limit (0.25%); 42 samples had infection within range (0.25%)</td></tr>
<tr><td colspan="7">98% samples maintained germination above IMSCS</td></tr>
<tr><td>HPKV , Palampur</td><td>07districts</td><td>355</td><td>-</td><td>0.0-1.13% Loose smut</td><td>-</td><td>-</td><td>Nil</td></tr>
<tr><td rowspan="4"></td><td colspan="7">5.95% seed samples had infection of loose smut (20 out of 355) in the range of 0.0-1.13% collected from 8 districts; Maximum loose smut disease was noticed in region of Joginder Nagar (Mandi Dist.) on local cultivars</td></tr>
<tr><td>06 Distt.</td><td>161</td><td>-</td><td>-</td><td>0.1-2.8% Karnal Bunt</td><td>-</td><td>-</td></tr>
<tr><td colspan="7">Highest incidence of Karnal bunt (2.8%) was in samples from Bhalana (Hamirpur); 21.73% seed samples had infection more than prescribed limit 35 sample out of 161</td></tr>
<tr><td colspan="7">30.43% seed samples were infected with the Karnal bunt (44 sample out of 161)</td></tr>
<tr><td>SKNAU ,</td><td>03</td><td>188</td><td>05</td><td>0.0-0.06</td><td>0.0-0.2</td><td>0.0</td><td>Nil</td></tr>
</table>

Durgapura	districts 07 locations			(11 fields)	(6 samples)		
Remark	87.76% samples exhibited seed germination above IMSCS(12.23% below standards);						
	5.85% fields had infection of loose smut;						
	3.19% seed samples had infection of Karnal bunt in the range up to 0.20% from Kotputli, Sahapura						
	Ear cockle was not observed, however, in previous years it was recorded from Laxamgargh and Padampur in var.Raj3765.						
AAU Anand	07 Distt	169	07	0	0	0	0
	Out of 169 samples collected from 7 districts, none of the variety (HD 2189,Lok1 , GW 273,GW 496, GW366, GW1,Desi Punagari) had the infection of bunt in wheat seeds						
DRPCAU , Pusa , Bihar	15	42	11	0	0	0	0
	47.61% (20 out of 42)showed the seed germination below the IMSCS						

Summary: Farmers saved seed samples: wheat (2017-18)

07 State	54 districts	2329 samples tested	0.0-0.25 % range	% Samples infected	
				PAU, Ludhiana	62.67
				CCSHAU, Hissar	59.10
				GBPUAT, Pant Nagar	04.08
				HPKV, Palampur	30.43
				SKNAU, Durgapura	03.19
				AAU , Anand	00
				DRPCAU Pusa	00

Loose smut (*Ustilago segatum* var. *tritici*)

Experiment 3B : **Studies on seed health status of farmers-own-saved seed**

Crop : Soybean

Methodology : Standard Blotter method (ISTA,1996)

Year of start : 2000

Status : Continued 2017-18

Centre : MPKV , Rahuri; SKNAU, Durgapura; JNKVV, Jabalpur; VNMKV, Parbhani; PJTSAU, Hyderabad

Results

Centre	Districts	Samples	Varieties	Percent range of association of mycoflora				
				MP	CD	FO	CK	AF
MPKV , Rahuri	10	441	02	2.2-7.1	1.0-3.5	2.6-6.7	1.0-3.5	--
Remark	Out of 419 seed sample collected from 7 districts (Ahmad Nagar, Sangli, Satara, Pune, Nandurbar, Jalgoan, Dhule, Kolhapur, Nasik, Solapur) 85 samples (20.28%) have exhibited germination below MSCS (70%). The seed germination ranged between 33-98%.							
	Association of *Alternaria alternata* (2.0-6.3%), *Phoma medicaginis* (1.1-4.7%), soybean mosaic virus (SMV) (1.0-2.1%) and Fusarium *moniliformae* (1.1-6.8%) was also recorded.							
SKNAU , Durgapura	02	114	03	2.0-10.0	0.0-3.5	0.0	0.0-2.0	-
Remark	Out of 114 seed samples from 2 districts (Jhalawar and Kota) and 4 locations of 3 varieties (JS 335, NRC37 and Pratap Soya) 18 (15.78%) samples have shown germination below MSCS.							
	8.77% seed samples had shown the association of *Macrophomina phaseolina.*							
	5.26% seed samples have shown the association of *Colletotrichum* sp.							
JNKVV, Jabalpur	15	150	04	2.0-14.0	3.0-9.0	5.0-25.0	0-17.0	0-24.0
Remark	Out of 150 seed samples obtained from 15 major soybean growing districts of the State, germination ranged between 67-82 percent. Due to rains at pod filing stage reduction in seed germination was recorded; About 13.3% seed sample were below MSCS.							
	Association of *Macrophomina phaseolina* ranged from 2.0-14%; *Colletotrichum dematium* from 3-9% and purple seed stain up to 17% was recorded.							
VNMKV , Parbhani	05 distt. 14 Tahsil	125	03	1.2- 4.2	0.8-2.8	1.8-6.0	0.4-3.2	-
Remark	Out of 125 seed samples collected from Parbhani, Hingoli, Nanded , Osmanabad and Latur districts, 12.0% samples had germination below MSCS(70%).							
	Other mycoflora such as *Fusarium moniliformae*, *Phoma medicaginis*, *Alternaria alternata* and SMV were also recorded.							
PJSTSAU Hyderabad	03	127	01	00	1.0-26.2	4.5-32.0	0	0
Remark	22.94 % sample had germination below IMSCS;							
	Improper filling and discoloration of seed observed that is attributed to untimely rains, coincided at pod filling stage with combind infection.							
Summary								

06 States	% samples below MSCS germination		% Maximum infection		
35 districts	MPKV , Rahuri	20.28	*Macrophomina phaseolina*	14.0	JNKVV
957 samples	SKNAU, Durgapura	15.78	*Colletotrichum dematium*	26.25	JNKVV
	JNKVV, Jabalpur	13.30	*Fusarium oxysporum*	32.00	PJTSAU
	VNMKV , Parbhani	12.00	*Cercospora kikuchii*	17.00	JNKVV
	PJTSAU, Hyderabad	22.94			

Soybean seed mycoflora

Experiment 3C : **Studies on seed health status of farmers-own-saved seed**

Crop : Rice

Year of start : 2000

Status : Continued 2017-18

Centre : OUAT, Bhubaneswar; AAU, Jorhat; SKUAT, Srinagar ; TNAU, Coimbatore; HPKV, Palampur; NDUAT, Faizabad; PJTSAU, Hyderabad; ICAR-IARI, New Delhi; DRPCAU, Dholi, Pusa, Bihar

Detection : Standard NaOH seed soak for bunt (*Neovossia horrida* = *Tilletia*

technique *barclayana*);

Standard Blotter method (ISTA, 1996); Visual inspection of seeds

Results

Centre	Districts	Samples	Varieties	% infection Bunt	Seed Discoloration
OUAT, Bhubaneswar	01	165	18	0.0-1.0	Observed 5 fungal flora
Remark	Germination of seeds ranged from 64-98%,				
	37.5% seed samples were below the IMSCS				
	Rice bunt recorded in 10 varieties in a range 0.0-1.15%;				
	Trichoconis padwiciki, Curvularia sp., *Fusarium* sp., *Helminthosporium oryzae*, *Aspergillus* spp. were predominant				
AAU, Jorhat	01 district 02 subdivision	104	28	0.0	Observed 6 fungal flora
Remark	104 seed samples of rice were collected from farmers of 2 sub division of Districts Dibrugargh, Moran and Naharkatiya				
	Seeds were stored in jute bags and *Duli* a local structure made of bamboo, and at some places treated with powder of neem leaves; with a seed moisture ranged 12.0-14.6%				
	34.61% samples exhibited germination above MSCS; (36 out of 104)				
	No association of bunt pathogen was recorded; Species of *Aspergillus, Rhizopus, Penicillium, Drechslera, Curvularia* and *Fusarium* was noticed.				
SKUAT, Srinagar	02 districts	324	04	0.0	Observed 4 fungal flora
Remark	In all , 324 seed samples of rice from two districts(Pulwama and Budgam) comprising 04 varieties exhibited seed germination in the range of 82-88%				
	Association of *Bipolaris oryzae, Alternaria* spp., *Pyricularia oryzae* and *Fusarium* spp. was noticed				
	Bunt was not recorded in the samples tested				
TNAU, Coimbatore	09 districts	108	20	0.0-0.0	Observed 9 fungal flora
Remark	The seeds were collected from Coimbatore, Tirpur, Thanjavur, Thiruvarur Srivilliputhur, Virudhunagar, Erode, Namakkal and Nagapatinam districts; and seeds from 2-6 months were obtained				
	Seeds are stored in gunny bags, polythene bags, earthen pots, woven poly bags, thombai however, most of the farmers used gunny bags for storage of seeds; seed moisture ranged from 10.3 to 13.05%				
	Germination of collected seeds ranged from 0.0 (IR20) to 94.0% (NRL34449)				
	Bunt infection was not recorded ; however, it was noticed in 2015-16 in one sample from Thanjavur district;				
	Helminthosporium oryzae, Fusarium moniliformae, Aspergillus flavus,				

	Curvularia lunata, Pyricularia oryzae, Chaetomium globosum, Trichoconis padwiciki and *Penicillium* were found associated with discolored seeds				
NDUAT, Faizabad	08 districts	52	18	0.0-0.40%	Observed 5 fungal flora
Remark	30.76% samples (16 out of 52) showed the germination below MSCS;				
	Maximum (0.15%)association of rice bunt was recorded in Sarjoo 52				
	Pyricularia oryzae ,*Trichoconis padwiciki, Fusarium moniliformae, Chaetomium globosum, Helminthosporium oryzae*, *Curvularia lunata* and *Penicillium* were found associated with discolored seeds				
ICAR-IARI, New Delhi	03 districts	46	-	0	Observed 7 fungal flora
Remark	Seed samples collected from 03 districts (Noida, Baraut and Gurugram) exhibited germination in the range of 80-91%				
	None of the sample showed the association of bunt disease				
	Bipolaris oryzae,Phoma, Fusarium moniliformae, Aspergillus flavus, Curvularia lunata , Aspergillus niger and *Alternaria alternata* were found associated with discolored seeds				
PAU, Ludhiana	16 districts	895	22	0.0-0.995%	
Remark	Rice bunt was highest (0.9995%) in PR126 from Tarantaran followed by 0.995% in PR126 from Monga district;				
	85.14% samples were infected with bunt disease				
	Seed discoloration is a major problem; more than 90% samples were affected; Discoloration caused severe reduction in germination and vigour of seedling; when the intensity was more than 50%, the germination was below IMSCS 80%;				
	The discolored seeds resulted in weak and low vigour seedlings, on an average 55.16% seedling were normal while 17.22% stunted, 18.05% blighted with 9.15% seed could not germinated and rotted				
	Highest (26.0%) incidence of discolored seeds was observed in seeds from Fazilka distt (in PR 126) and least (0.4%) in PR 121 from Ropar				
MPKV , Rahuri	04 districts	274	-	0	Observed 7 fungal flora
Remark	All the samples had seed germination above certification standard ; Seed germination ranged from 80-96%				
	In all 54.74% samples were discolored				
	No bunt infection observed				
	Fusarium moniliformae (4.8-6.6%), *Alternaria alternata* (4.7-12.5%), *Drechslera oryzae* (1.2-8.4%), *Phoma* spp. (1.1-4.7%), *Aspergillus niger* (2.2-5.7%), *Aspergillus niger* (1.0-2.7%), *Curvularia lunata* (5.1-8.4%)				
HPKV, Palampur	03 districts	171	14 rice hybrids	0.1-0.4%	04 diseases on crop
Remark	The observations made on occurrence of diseases on hybrid rice and some improved varieties showed wide distribution of false smut (3-5 on 0-9 point scale); Hybrid PAC 807 showed high incidence of neck blast in some of the locations which used to be almost resistant previously and severity of neck blast was in the range of 3.5-62.50 per				

	cent				
PAJANCOA &RI Karaikal	03	51	20	0	100% 06 flora
Remark	Seed sample were collected from Puducheri, Karaikal and Mahe region of Puducheri (UT)				
	37% samples had moisture content more than 13% (range 10.3-21.1%)				
	63% samples fulfilled the germination standards IMSCS (80%)				
	Practically all the samples were infected, predominantly by *Aspergillus flavus* (88.2%); *Helminthosporium* (35.2%), *Curvularia lunata* (31.4%) and *Penicillium* (2%)				
DRPCAU, Dholi, Pusa Bihar	14	89	18	0.0	5.0-17.0% (5 fungal flora)
Remark	Seed germination ranged from 75-80%				
	4.49% samples were below IMSCS;				
	Association of *Fusarium moniliformae*, *Drechslera oryzae*, *Aspergillus niger, Curvularia lunata* observed				
	Bunt was not recorded in any of the sample tested				
PJTSAU, Hyderabad	08	417	25	0.12	(5 fungal flora)
Remark	Seed germination ranged from 91.0-96.0% ;				
	Seeds were collected from Karim Nagar , Nizamabad, Medak, Ranga Reddy , Mahbob nagar, Khammam, Nalgonda , Warangal				
	Association of species of *Fusarium* (6.45%), *Alternaria* (8.16%), *Helminthosporium* (0.03%),*Fusarium* + *Alternaria* (5.72%), *Fusarium* + *Alternaria* + *Curvularia* (2.2%), *Fusarium* + *Helminthosporium* (5.16%), was recorded				

Seed mycoflora of rice

Summary: Farmers saved seed (Rice)

	% samples below IMSCS		% rice bunt	Number of Mycoflora with discolored seeds
13 States 71+02 UT Districts 2696 Samples tested	OUAT	37.50	00.-1.0	5 (up to 35% samples discolored)
	AAU, Jorhat	65.39	00	6 (more than 95% samples discolored)
	SKUAT	00	00	4 (29-43% samples discolored)
	TNAU	00	00	9 (60-80 % samples discolored)
	NDUAT	30.76	0.0-0.4	5
	ICAR-IARI	00	0	7
	PAU	00	0.0-0.991	5 (16.40% average discolored)
	MPKV	00	00	7 (54.74% samples discolored)
	HPKV	00	00	4 (no discoloration on hybrids)
	PJTSAU	00	0.40	5 (25-30% samples discolored)

	DRPCAU	00	00	5 (5-17% samples discolored)
	PAJANCOA &RI	27.00	00	6 (100% samples discolored)
Mycoflora observed at places with discolored seeds	*Bipolaris (Helminthosporium) oryzae ,Phoma, Fusarium moniliformae, Pyricularia oryzae ,Trichoconis padwiciki, Aspergillus flavus, Chaetomium globosum, Curvularia lunata, Aspergillus niger,Alternaria alternata*			

Experiment 3D : **Studies on seed health status of farmers-own-saved seed**

Crop : Groundnut

Methodology : Standard Blotter method (ISTA,1996)

Year of start : 2000

Status : Continued 2017-18

Centre : AAU, Anand; MPKV , Rahuri; SKNAU , Durgapura; JNKVV, Jabalpur

Results

Centre	Districts	Samples	Varieties	% range of infection	
				Aspergillus flavus	***Aspergillus niger***
AAU, Anand	03	237	12	2.0-18.0	-
Remark	All the samples from Amreli, Junagargh, Rajkot, exhibited the seed germination above IMSCS.				
	None of the sample was free from infection of *Aspergillus flavus.*				
	Seed sample of Certified variety GG 20 resulted in maximum germination (90%) with less association of the fungus.				
SKNAU , Durgapura	02 districts	102	04	-	06.5-11.51
Remark	Out of 102 samples collected from Jaipur and Sikar 14(13.72%) exhibited the germination below IMSCS (below70%)				
	24% samples were found infected with *Aspergillus niger*				
JNKVV, Jabalpur	04 districts	60	02	3.0-17.0	2.0-7.0
Remark	Out of 60 samples from Sauasar, Pandhurna,Chhindwara and Seoni analyzed, 95% had germination above IMSCS in the range of 83-91%				
	31 samples were found infected with *Aspergillus flavus* and *Aspergillus niger*				
	Farmers seed sample that were stored for more than 150 days had higher association of *Aspergillus flavus* (up to 90 association) indicate the improper handling, storage and threshing mechanism.				
MPKV , Rahuri	06 districts	169	09	6.0-21.0	7.0-15.4
Remark	Seed collected from 6 major districts exhibited germination in the range of 53-88%; All most all the samples were infected				
	19 seed samples exhibited germination below the certification standards				

Summary: Farmers saved seed samples (Groundnut)

	% samples below IMSCS germination		*Aspergillus flavus*	*Aspergillus niger*
04 States 15 districts 415 samples	SKNAU , Durgapura	13.72	0.0	6.5-11.5
	JNKVV, Jabalpur	5.0	3.0-7.0	2.0-17.0
	MPKV, Rahuri	11.24	6.0-21.0	7.0-15.4
	AAU, Anand	0.0	2.0-18.0	0.0

Aspergillus flavus

Aspergillus niger

Experiment 3E : Studies on seed health status of farmers-own-saved seed

Crop : Chickpea

Methodology : Standard Blotter method (ISTA,1996)

Year of start : 2000

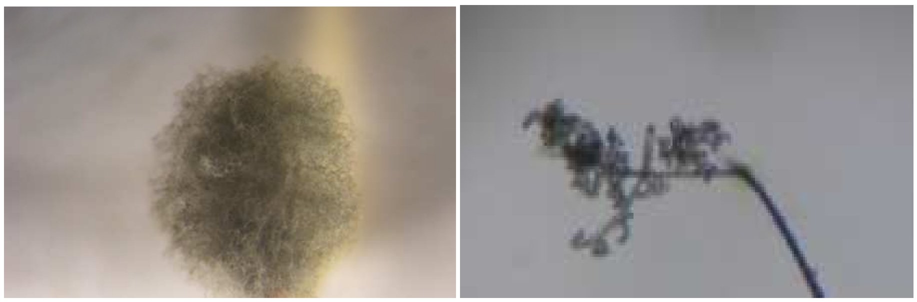
Status : Continued 2017-18

Centre : MPKV, Rahuri ; SKNAU, Durgapura

Results

Centre	Districts	Samples	Varieties	% range of infection		
				Botrytis cinerea	***Ascochyta rabiei***	***Fusarium oxysporum***
MPKV, Rahuri	06 districts 22locations	324	06	1.1-6.1	0.0	2.1-6.9
Remark	Out of 334 samples collected from Ahmad Nagar, Nasik, Solapur, Dhule , Jalgoan and Pune districts 13% samples had germination below IMSCS. The seed germination ranged from 60-98%.					
	Association of *Botrytis cinerea* ranged from 2.1-6.9% & *Fusarium oxysporum* 1.1-6.1%.Seedborne *Ascochyta rabiei* was not recorded.					
SKNAU , Durgapura	2 districts	110	04	0.0	0.0	0.5-6.5
Remark	14.54% seed samples (16) exhibited seed germination below (85%) the certification standards					
	Association of *Botrytis cinerea* & *Ascochyta rabiei was not recorded in any sample.*					

Association of *Fusarium oxysporum* with chick pea seeds



Association of *Botrytis cinerea* with chick pea seeds

Summary: Farmers saved seed samples (Chickpea)

02 States 08 districts 434 samples	% samples below IMSCS germination		*Fusarium oxysporum*	*Ascochyta rabiei*
	SKNAU , Durgapura	14.54	0.5-6.5	0.0
	MPKV, Rahuri	13.00	2.1-6.9	0.0

Experiment 3F : Studies on seed health status of farmers-own-saved seed

Crop : Saffron

Methodology : Standard Blotter method (ISTA,1996)

Year of start : 2017

Status : Continued 2017-18

Centre : SKUAST, Srinagar

Results Seed samples collected from Tehsil BK Pora (District-Budgam) and Tehsil Kakapora (District Pulwama) have been analyzed by (i) Naked eye observation (ii) Standard Blotter and (iii) Standard Agar plate method as per prescribed protocols

Associations of Fusarium spp., Penicillium spp., have been recorded.

Experiment 4 : Standardization of detection methods for seedborne pathogens of significance

Objective : To work out the efficacy of different techniques for the detection of seedborne pathogens of significance prevalent in a particular region

Year of start : 2008

Status : Continued 2017-18

Target crops : Rice, wheat, soybean, sesame, mungbean, Uridbean, tomato, onion , chilli, lentil, cumin

Target pathogens : *Drechslera oryzae, Helminthosporium oryzae, Bipolaris oryzae, Alternaria alternata, Alternaria solani, Alternaria porri, Alternaria burnsii, Macrophomina phaseolina, Colletotrichum dematium, Colletotrichum capsici, Fusarium oxysporum, Bipolaris oryzae*

Centre : AAU, Anand; AAU, Jorhat; NDUAT, Faizabad; GBPUAT, Pant Nagar; OUAT, Bhubaneswar; PJTSAU, Hyderabad; PAU, Ludhiana; CCSHAU, Hissar; HPKV, Palampur; TNAU, Coimbatore; JNKVV, Jabalpur; MPKV, Rahuri; MAU, Parbhani; SKUAST, Srinagar; SKNAU, Durgapura

Results

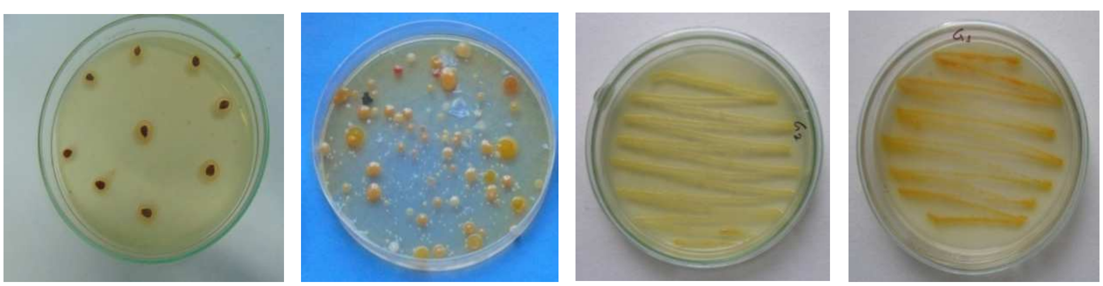
Centre	Crop	Target pathogen & disease	Suitable method identified
AAU, Anand			
	Cumin	*Alternaria burnsii* (Blight of cumin)	**Seed Wash Examination Technique** Relatively quick technique found effective, however, suitable for surface adhered spores (externally seedborne) (also in 2016-17)
			Seed wash was examined under compound microscope for inoculum load and transfer was watched on Potato dextrose agar medium for subsequent growth to verify the viable spores
		Detailed stepwise protocol is ready for submission (Action - AAU, Anand)	
NDUAT, Faizabad			
	Chickpea	*Ascochyta rabiei*	**Direct seed observation under Diaphanoscope** Infected seed can be identified based upon the seed morphology and subsequently by Standard Agar plate method
			Seeded plated were incubated at 22-24^0 C under alternate cycles of light and dark periods for 24hr
			Working sample 400 seeds with two replications; incubated seeds observed on 6th day.
		Detailed stepwise protocol is ready for submission(Action- NDUAT, Faizabad)	
	Rice	*Bipolaris oryzae* (Brown spot)	**Standard Agar Plate Method (Modified)** By the incorporation of Guaicol (0.2ml/L), using agar-agar (5g/L) and streptomycin sulphate (0.5g/L) after sterilization of culture media in an autoclave and before pouring in to the plate.
			Seeded plated were incubated at 22^{0}C under

			alternate cycles of light and dark periods for 24hr
			Working sample 400 seeds with two replications; incubated seeds observed on 6th day.
		Detailed stepwise protocol is ready for submission(Action- NDUAT, Faizabad)	
	Mustard	*Xanthomonas campestris* pv. *campestris*	**Use of selective bacteriological culture media** Among the various culture media tested , Sucrose broth and D-5, as selective media,resulted in maximum recovery of the causal bacterium from the seeds obtained from naturally infected plants
			The seeds were incubated at 25^{0}C on the culture media in glass Petridish for 7days under alternate cycle of light and dark period
			The validation is under progress
OUAT, Bhubaneswar			
	Rice	*Sarocladium oryzae*	**Standard Agar Plate Method (Modified)** Agar was replaced by *malt extract*, surface sterilized seeds were incubated at 22^{0}Cunder alternate cycles of light and dark periods; working sample of 400 seed with two-replications were used, 71.2% seeds exhibited infection (2016-17)
		Sarocladium oryzae	**Standard Blotter Plate Method (Modified)** Several combinations of pH of wetting agent (water) and solutions of CaCl2 were attempted
			Results revealed that blotter dipped with sterile water of pH6.5 resulted in maximum recovery of the pathogen from seeds obtained from naturally infected plants (2017-18)
AAU, Jorhat			
	Rice	*Drechslera oryzae*	**Standard Agar Plate Method** Other methods used (I) Standard Blotter method (II) 2,4-D method (III)deep fridge method (IV) Test Tube Water Agar, Seedling Symptom Test (2016-17)
		Drechslera oryzae	**Standard Agar Plate Method** Among the methods , Standard Agar plate method resulted in maximum 62.80% recovery (2017-18)
	Chilli	*Colletotrichum* spp.	**Standard Agar Plate Method** Among the methods , Standard Agar plate method resulted in maximum (70%) recovery (2017-18)

GBPUAT, Pant Nagar			
	Tomato	*Clavibacter michiganense* pv. *michiganense*	**Selective media SCM & D2ANX** recorded maximum recovery**;** Seeds were procured from naturally infected plants from epidemic fields from Bhabhar region, Uttarakhand State (2016-17)
			ELISA & PCR techniques Serological characterization of the different isolates was confirmed by Indirect ELISA
			Molecular characterization has been performed through genus specific and subspecies specific primers at 1.45Kb and 614bp, respectively (2017-18)
PJTSAU, Hyderabad			
	Moong bean and Urid bean	*Macrophomina phaseolina* *Fusarium oxysporum* *Alternaria alternata*	**Standard Blotter Method (Modified)** Instead of wetting (soaking) the blotters in sterile water, the method was modified by using NaOH (0.6%), that resulted in maximum recovery of the target fungi as compared to method where the water was used.
			Other methods used (I) Standard Agar Plate Method was modified, by incorporation and substituted by seed extract, (II) Seed Impregnation
		Detailed stepwise protocol is ready for submission(Action- PJTSAU, Hyderabad)	
PAU , Ludhiana			
	Chickpea	*Ascochyta rabiei*	**Standard Agar Plate Method (Modified)** Modified with incorporation of Streptomycin sulphate (2000ppm) in the agar-agar prior to pouring in the plates (2016-17)
	Rice	*Fusarium moniliformae*	**Standard Agar Plate Method (Modified)** Modified with incorporation of Streptocycline (1g/L) in the agar-agar prior to pouring in the plates, resulted in maximum recovery of the pathogen from seed (2017-18)
SKUAST, Srinagar			
	Chilli	*Colletotrichum capsici*	**Standard Water Agar Plate Method** (Modified) Direct placements of unsterilized capsicum seeds from infected fruits were placed and more than 85% recovery of the fungus recorded (2016-17)
		Detailed stepwise protocol is ready for submission(Action- SKUAST, Srinagar)	
	Saffron		Naked eye inspection and standard incubation

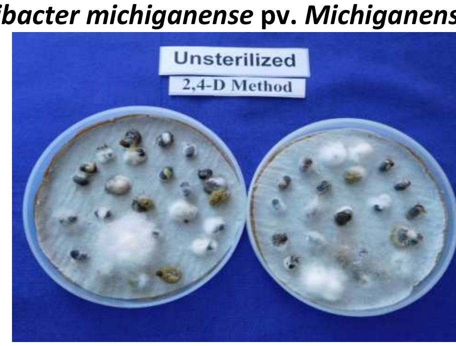
			method are being employed for the detection of associated pathogens (2017-18)
TNAU, Coimbatore			
	Black gram	*Fusarium oxysporum, Macrophomina phaseolina*	**Standard Blotter Method** (Modified) The alkali blotter soaking with solution of NaOH 0.4% and KOH 0.2% performed the best method for the detection of seedborne *Fusarium oxysporum* and *Macrophomina phaseolina* in black gram in both surface sterilized and unsterilized conditions, respectively.
DRPCAU, Pusa , Bihar			
	Rice	*Drechslera oryzae*	**Standard Blotter method** was found superior
CCSHAU, Hissar			
	Rice		**Standard Blotter method** was found superior
JNKVV, Jabalpur			
	Soybean	*Macrophomina phaseolina Fusarium oxysporum Colletotrichum dematium*	**Standard Blotter method & Test Tube Water Agar Seedling Symptom Test**, out of seven methods tried
	Moong bean ; Urid bean	*Macrophomina phaseolina Fusarium oxysporum Colletotrichum dematium*	**Standard Blotter method & Test Tube Water Agar Seedling Symptom Test**, out of seven methods tried
	Sesame	*Macrophomina phaseolina*	**Standard Blotter method**, out of seven methods tried
		Detailed stepwise protocol is ready for submission(Action- JNKVV, Jabalpur)	
VNMKV, Parbhani			
	Soybean	*Macrophomina phaseolina Fusarium oxysporum Colletotrichum dematium*	**Standard Blotter method**, out of five methods tried (2016-17 & 2017-18)
MPKV, Rahuri			
	Soybean	*Macrophomina phaseolina Fusarium oxysporum Colletotrichum dematium*	**Standard Blotter method**, out of six methods tried (2016-17 & 2017-18)
SKNAU, Durgapura			
	Sesame	*Macrophomina phaseolina* (Stem & root rot)	**Standard Blotter method**, out of six methods tried (2016-17 & 2017-18)
HPKV, Palampur			

	Chilli	*Colletotrichum truncatum* (=*C. capsici*)**;** *C. gloeosporioides; C. coccodes* (Anthracnose)	PCR based detection technique using the specific primers with known sequence, developed by earlier workers were used and validated for the detection of chilli seed associated anthracnose fungus.
			Colletotrichum truncatum : Ccap F; Ccap R.
			Colletotrichum gloeosporioides : Cboncoll F; Cboncoll R.
			Colletotrichum coccodes: Cco 1NF1; Cco2NR1.
		Detailed stepwise protocol is ready for submission(Action-HPKV, Palampur)	
	Chilli	Pepper Mild Mottle Virus (PMMoV)	PCR based protocol for the detection of PMMoV from seeds through RT-PCR using the viral Coat Protein (CP) specific primers.
		The seeds were harvested from the virus infected plants which were indexed through DAS-ELISA for the presence of the virus. The cDNA was amplified using the viral coat protein specific primers (F5'CCAATGGCTGACAGATTACG-3' and R5'CAACGACAACCCTTCGATTT-3') with initial denaturation of 94°C for 4 min followed by 35 cycles of 94°C for 15 sec, 48°C for 40 sec and 72°C for 1 min and final extensionof 7 min at 72°C to confirm the presence of PMMoV. The PCR product was checked on 1.2% agarose gel along with a negative control (water used as template) and positive control (plasmid isolated from clone having CP gene used as template) .The amplification of ~740 bp product was observed in both the seed sample and positive control while no band was observed in negative control, however, further validation of the protocol is needed (2016-17 & 2017-18).	

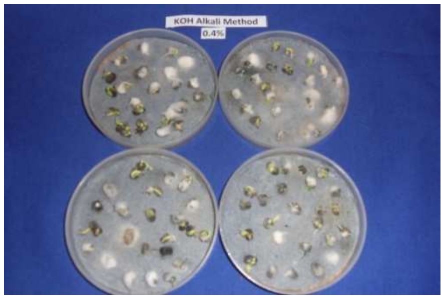


Growth of tomato seed associated *Clavibacter michiganense* pv. *Michiganense*

Blotter

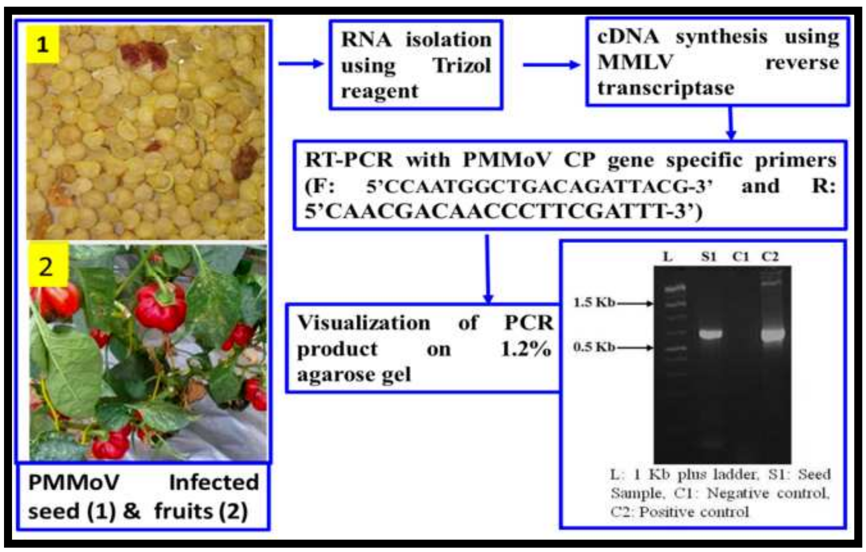


2,4-D



KOH 0.4%

KOH 0.8%



Methods of detection of seedborne pathogens in black gram in unsterilized condition

PCR based protocol for the detection of *Pepper mild mottle virus* (PMMoV) from chilli seeds

Experiment 05	:	**Non-chemical management of seedborne infection of bean anthracnose**
Objective	:	To manage seedborne infection and seed health through bio agents and organic inputs
Year of start	:	2015-16
Status	:	Continued 2017-18
Crop	:	Bean (*Phaseolusspp.*)
Pathogen	:	*Colletotrichum lindemuthianum*
Centre	:	HPKV, Palampur; SKUAST, Srinagar

Results

Seed treatment with combination of *Trichoderma harzianum* + *Trichoderma viride* (each 10g/Kg seeds) as T04 , resulted in 98.67% seed germination after 180 days , as compared to untreated control as infected seeds (T13)where 92% seed germination was observed.

Minimum(1.33%) seed rot and sedling rot was noticed in T04 (*Trichoderma harzianum* + *Trichoderma viride* (each 10g/Kg seeds)as comapred to 8% in check as infected seed.

No seedling rot was recorded in T14(Bijamrit)and T9 (Panchgabya +*Trichoderma viride* @10g)

Results

Table: Influence of seed treatment with organic inputs and bioagents on the incidence of bean anthracnose

Centre	Treatment	Progress
SKUAST, Srinagar	T01: *Trichoderma harzianum* @10g T02: *Trichoderma viride* @10g T03: *Pseudomonas fluorescens* @10g T04: *Trichoderma harzianum* @10g+ *Trichoderma viride* @10g T05: *Trichoderma harzianum* @10g+ *Pseudomonas fluorescens* @10g T06: *Trichoderma viride* @10g+ *Pseudomonas fluorescens* @10g T07: Panchgabya (alone) T08: Panchgabya+ *Trichoderma harzianum* @10g T09: Panchgabya + *Trichoderma viride* @10g T10: Panchgabya + *Pseudomonas fluorescens* @10g T11: Carbendazim 50WP@0.1% T12: Healthy seed (alone) T13: Infected seed (alone) T14:Bijamrit T15: Jeevanmrit	Seed germination was maximum (81%)in T9 Panchgabya +*Trichoderma viride* @10g as compared to untreated diseased (T13: Infected seed (alone) 42%;Disease incidence was least (20%) in T10 Panchgabya+*Trichoderma harzianum* @10g followed by 21.67% in T9 Panchgabya +*Trichoderma viride* @10g .
HPKV, Palampur		Among the non-chemical seed treatment, combination of T04: *Trichoderma harzianum* + *Trichoderma viride* each @10g resulted in 98.67% seed germination after 180 days as compared to T13: Infected seed (alone) with 92% seed germination ;Minimum(1.33%) seed rot and sedling rot was noticed in T04 (*Trichoderma harzianum* + *Trichoderma viride* (each 10g/Kg seeds)as comapred to 8% in check as infected seed; No sedling rot was reorded in T14 (Bijamrit) and T9: Panchgabya + *Trichoderma viride* @10g

Bean anthracnose

Experiment 06 : **Detection and molecular characterization of BCMV of mungbean**

Objective : To determine the location of virus in parts of the seed

To characterize the pathogen using molecular techniques

Year of start : 2015-16

Status : Continued 2017-18

Centre : AAU, Anand (as a Lead Centre)

Crop / Disease : Mungbean – Bean Common Mosaic Virus

Method : Serological detection through Enzyme Linked Immunosorbent Assay (ELISA) – Kit of LOEWE co.

(i) DAS-ELISA technique employed

(ii) PCR based technique detection process is under progress

Results

DAS-ELISA technique was employed for the detection of the virus present in the different parts of mungbean. The presence of BCMV was detected in seed coat and cotyledons of the seed with BCMV antisera under ELISA. The infected tissues exhibited positive reaction.

In cluster bean the virus could be identified in all the parte with strong reaction with antisera used.

Table: Detection of Bean Common Mosaic Virus in different seed parts of mungbean

Crop Variety	**Reaction &O.D. value at 405 nm**		
	Seed Coat	**Cotyledon**	**Embryo**
Mungbean			
GM 3	Positive	Positive	Negative
	3.590	0.808	0.340
GM 4	Negative	Negative	Negative
	0.175	0.333	0.217
K 351	Positive	Positive	Negative
	1.159	1.029	0.136
Meha	Negative	Positive	Negative
	0.464	0.724	0.574
Cluster bean			
Pusa NavBahar	Positive	Positive	Positive
	0.877	3.753	1.191

Experiment 07	:	**Monitoring of seed borne viruses in soybean and pulses and standardization of methods for detection through biological, serological and molecular techniques**
Objective	:	To identify the seed associated viruses in the samples obtained from various parts of the country To develop and standardize the nucleic acid based techniques for detection of seed associated viruses
Year of start	:	2009
Status	:	Continued 2017-18(Title modified in 2016-17)
Centre	:	AAU , Anand (as a Lead Centre)
Crop / Disease	:	Pulses and soybean



Bean Common Mosaic Virus **Uridbean Leaf Crinkle Virus**

Results

District / location / pathogen	Varieties observed	Field visited	Field Infected	% Incidence of virus	Remark
Mungbean	**Bean Common Mosaic Virus (BCMV)**				
Farmers Field 03 districts & 30 farmers	4	30	3	10.0-24.12	Maximum infection in var. Meha at Anand
Seed Production Plots 02 districts	3	5	0	0	-
	Uridbean Leaf Crinkle Virus (ULCV)				
Farmers Field 02 districts & 45 farmers	5	14	-	7.0-10.0	Maximum infection in var. GM 4 & GAM at Anand
Seed Production Plots 02 districts	2	12	0	0	-
Cluster bean	**Bean Common Mosaic Virus (BCMV)**				
Farmers Field 03 districts & 28 farmers	1	28	20	11.5-65.0	Maximum infection in var. Pusa Navbahar at Godhra

Cowpea	Cowpea Aphid borne Mosaic Virus (CaBMV)				
Farmers Field 03 districts & 17 farmers	7	17	3	3.0-7.3	Maximum infection in var. Pusa Phalguni at Ah'dbad
	Cowpea Bean Common Mosaic Virus(CpBCMV)				
Farmers Field 01 district	6	6	6	0.7-1.7	Max infection in var. GC5 at Anand
	Cowpea Golden Mosaic Virus (CpGMV)				
Farmers Field 01 district	6	6	6	0.5-1.4	Max infection in var. Phalguni at Anand
Soybean	**Soybean Mosaic Virus**				
Farmers Field 02 district & 14 farmers field	5	14	3	2.35-5.0	Max infection in var. NRC 37 at Tapi
Black gram	**Yellow Mosaic Virus disease (YMV)**				
University Farm 02 district	5	5	5	2.5-75.0	Max infection in var. VUG 32 at Panchmahal
	Uridbean Leaf Crinkle Virus (ULCV)				
University Farm 02 district	5	5	5	2.0-5.5	Max infection in var. VUG 32 at Panchmahal

Experiment 08 : **Standardization of bio priming technique for management of Fusarium wilt of safflower**

Objective : To standardize the technique for effective economical technique of bio priming

Year of start : 2015-16

Status : Continued 2017-18

Centre : MPKV Rahuri (as Lead Centre)

Crop / Disease : Safflower - Wilt (*Fusarium carthamii*)

Methodology : Bio priming biological agents and subsequent testing for germination , emergence and disease incidence in field

Results

Bio priming of safflower seeds with *Trichoderma harzianum* + *Pseudomonas fluorescens* @ 05 g each resulted in least association (13.0%) of *Fusarium carthamii* with enhanced seed germination (95.0%), emergence(90.0%) and reduced wilt incidence (13.0%),disease control over check (73.47%) and yield (15.54q/ha) as compared to in check,41.0% association,79.0% germination,76.0% emergence , 49.0% wilt incidence and yield (13.46q/ha).

Fusarium wilt of safflower

Table: Influence of bio priming on association of seedborne *Fusarium carthamii*and subsequent incidence of wilt of safflower under conditions ofRahuri, Maharashtra (2017-18)

Bio priming with per kg of seed	*Fusarium carthamii* Association*	Percent seed Germination	Percent field Emergence	Percent Wilt Incidence	Percent disease control	Yield q/ha
Trichoderma viride @10g	22 (27.97)	87 (68.90)	83 (66.19)	22 (27.33)	55.10	14.47
Trichoderma harzianum @10g	20 (26.56)	88 (69.74)	84 (66.45)	21 (27.27)	57.14	14.64
Pseudomonas fluorescens @10g	22 (27.96)	86 (68.44)	83 (65.70)	24 (29.29)	51.02	14.05
Bacillus subtilis @10g	25 (29.99)	86 (68.06)	81 (64.18)	25 (29.99)	48.98	13.84
Trichoderma viride + *Pseudomonas fluorescens*@ 05 g each	15 (22.76)	93 (74.68)	88 (69.88)	16 (23.57)	67.35	15.25
Trichoderma harzianum + *Pseudomonas fluorescens*@ 05 g each	13 (21.13)	95 (77.12)	90 (71.62)	13 (21.13)	73.47	15.54
Trichoderma viride + *Bacillus subtilis* @05 g each	18 (25.09)	91 (72.65)	85 (67.24)	19 (25.82)	61.22	15.25
Trichoderma harzianum + *Bacillus subtilis* @ 05 g each	16 (23.55)	92 (73.59)	87 (68.92)	18 (25.06)	63.27	14.72
Untreated control	41	79	76	49	-	13.46

	(39.81)	(62.78)	(60.68)	(44.43)		
SE±	0.66	1.44	1.72	1.85	-	0.43
CD at 5%	1.98	4.28	5.16	5.56	-	1.30
CV %	4.25	3.53	4.46	11.39	-	15.56

*Association of the fungus was determined with standard Blotter method (ISTA, 1996)

**Figures in parenthesis are arc sine transformed values

Experiment 09 : **Standardization of bio priming technique for management of *Alternaria helianthi* associated with sunflower seeds**

Objective : To standardize the technique for effective economical technique of bio priming

Year of start : 2015-16

Status : Continued 2017-18

Centre : MPKV Rahuri (as Lead Centre)

Crop / Disease : Sunflower- Leaf blight (*Alternaria helianthi*)

Methodology : Bio priming biological agents and subsequent testing for germination, emergence and disease incidence in field

Sunflower- Leaf blight (*Alternaria helianthi*)

Results:

Bio priming of sunflower seeds with *Trichoderma harzianum* + *Pseudomonas fluorescens* @ 05 g each resulted in least association (14.0%) of *Alternaria helianthi* with enhanced seed germination (81.0%), emergence (67.0%) and reduced incidence of blight (44.0%) and disease control over check (45.0%) as compared to 46.33% association, 70.0% germination, 67.0% emergence and 80.0% incidence of blight. Yield enhancement of 22.42% over check is recorded, after two application of Mancozeb (0.25%).

Conclusion

Based upon the three years data (2015-16,16-17,17-18), it is concluded that the bio-priming of seed of sunflower with *Trichoderma harzianum* + *Pseudomonas fluorescens* @ 5 g each/ Kg seed and two spary of mancozeb(0.25%) first spray at appaerance of disease and second at 15 days after first spray,significanltly reduce incidence of *Alternaria helianthi* (76.29%) over untreated control. Significantly higher seed germination (18.48%), seedling vigour index(15.98%), field emergence (15.38%), yield (19.36%) and reducing the blight incidence (50.00%) over untreated control followed by the treatment by bio-priming of seed of sunflower *Trichoderma viride* + *Pseudomonas fluorescens* @ 5 g each/ Kg seed, and two sprays of mancozeb (0.25%) was found effective for reducing the incidence of *Alternaria helianthi* in seed and blight incidence in field and higher seed germination, seedling vigour index, field emergence and yield over untreated control. This treatment also gave the highest monitory returns. The mean association of *Alternaria helianthi* with seed, seed germination ,seedling vigour index, field emergence, yield and blight incidence in untreated control was 45.0%, 68.55%, 1790, 65.0%, 16.87q/ha and 78.0%, respectively. The minimum seed certification standard for germination in sunflower is 70%.

Table: Influence of bio priming on association of seedborne *Alternaria helianthi* and subsequent incidence of blight in sunflower under conditions of Rahuri (2017-18)

Bio priming with per kg of seed	*Alternaria helianthi* Association*	Percent seed Germination	Percent field Emergence	Percent blight Incidence	Percent disease control	Yield q/ha
Trichoderma viride @10g	19.00 (25.84)	76.67 (61.15)	73.00 (59.57)	56 (48.91)	30.00	17.39
Trichoderma harzianum @10g	18.67 (25.60)	77.00 (61.36)	73.33 (58.95)	54 (47.36)	32.50	18.83
Pseudomonas fluorescens @10g	23.00 (28.65)	76.00 (60.68)	72.66 (58.49)	57 (49.02)	28.75	17.33
Bacillus subtilis @10g	23.66 (29.11)	75.66 (60.45)	72.33 (58.27)	59 (50.19)	26.25	17.14
Trichoderma viride + *Pseudomonas fluorescens* @ 05 g each	14.00 (21.96)	81.00 (64.18)	75.67 (60.45)	44 (41.56)	45.00	19.63
Trichoderma harzianum + *Pseudomonas fluorescens* @ 05 g each	12.00 (20.26)	83.33 (65.92)	77.00 (61.35)	41 (39.81)	48.75	20.09
Trichoderma viride + *Bacillus subtilis* @ 05 g each	18.33 (25.33)	79.00 (62.73)	74.00 (59.35)	49 (44.43)	38.75	19.40
Trichoderma harzianum + *Bacillus subtilis* @ 05 g each	17.00 (24.34)	80.00 (63.45)	74.33 (59.56)	48 (43.85)	40.00	19.21

Untreated control	46.33 (42.90)	70.33 (57.01)	67.00 (54.95)	80 (63.47)	-	16.66
SE±	0.49	0.78	2.38	3.73	-	0.94
CD at 5%	1.47	2.34	7.14	11.20	-	2.83
CV %	3.18	2.21	6.99	13.60	-	8.88

*Association of the fungus was determined with standard Blotter method (ISTA, 1996)

**Figures in parenthesis are arc sine transformed values

Experiment 10 : **Management of *Alternaria solani* through seed treatment and foliar application of new fungicides**

Objective : (i) To determine the influence of fungicide application on the quality of harvested seeds and fruits (ii) To determine the transmission of pathogen from seed to plant

Year of start : 2016

Status : Continued 2017-18

Centre : AAU , Anand; PAU , Ludhiana; SKUAST, Srinagar; MPKV , Rahuri; GBPUAT, Pant Nagar, JNKVV, Jabalpur

Crop / Disease : Tomato- *Alternaria solani*

Methodology : Basic seed treatment with Thiram @0.25% and later subsequent 2/3 foliar application of fungicides after first appearance of disease.

Treatments: Fungicides: 9+1, replications: 3 and design : RBD

Results: Application of Azoxystrobin (18.2%) + Difenconazole (11.4%) @0.03%) has been found most effective with maximum fruit yield.

Table: Influence of fungicide application on early blight of tomato

Centre	Treatment	Progress & Results
AAU, Anand	T1: Carbendazim (25%) + Mancozeb(50%) @ 0.15% T2: Azoxystrobin (11%)+ Tebuconazole(18.3%)@0.03% T3: Hexaconazole (4%) + Zineb(68%) @ 0.075% T4: Azoxystrobin (18.2%) + Difenconazole(11.4%) @0.03% T5: Trifloxysytrobin (25%) + Tebuconazole(50%) @0.075%	Application of Azoxystrobin (18.2%) + Difenconazole (11.4%) @0.03%) has been most effective
		Minimum disease intensity (13.7%) was observed inT4 (T4: Azoxystrobin (18.2%) + Difenconazole (11.4%) @0.03%), as compared to (41.17%) check (T10: Untreated check)
		Disease intensity was 2.73%and 4.12% after First and second application with corresponding to check,10.78 and 13.53%, respectively
		Maximum fruit yield was 34612 Kg/ha in T4 as compared to 20534 Kg/ha in Untreated check
GBPUAT,		Experiment is being conducted and

Pantnagar	T6:Metiram (55%)+ Pyroclostrobin (5%)@0.06% T7: Famoxadone (16.6%) + Cymoxanil(22.1%)@0.04% T8: Pyroclostrobin @0.02% T9: Azoxystrobin @ 0.025% T10: Untreated check	seedling are transplanted on 18.09.2017, however , the incidence was in traces , hence the effect of fungicide could not be concluded
MPKV, Rahuri		Experiment is being conducted and seedling are transplanted on 15.11.2017
SKUAST, Srinagar		Application of Metiram (55%)+ Pyroclostrobin(5%)@0.06% has been found the most effective
		Minimum (16.5%) disease incidence was noticed in T6 : Metiram (55%)+ Pyroclostrobin ; (5%) @0.06% as compared to 82.5% in check
		Application of Azoxystrobin (18.2%) + Difenconazole (11.4%) @0.03%) was also effective and resulted in 20.5% incidence as compared to check (82.5%).
PAU, Ludhiana		Experiment is being conducted and seedling are transplanted
JNKVV, Jabalpur		Minimum disease intensity (9.7%) was observed inT4 (T4: Azoxystrobin (18.2%) + Difenconazole (11.4%) @0.03%), as compared to (21.17%) check (T10: Untreated check)

Experiment 11. : **Impact of different storage conditions and longevity on seed associated mycoflora of green gram / black gram**

Objective : To determine the extent of association of mycoflora with freshly harvested seeds

: To determine the influence of fungicide treatment on development of mycoflora and its impact on seed quality parameters under different storage conditions and periods

Year of start : 2016

Status : Continued 2017-18

Centre : TNAU, Coimbatore; PANJCOA & RI, Karaikal; MPKV ,Rahuri

Crop / Disease : Black gram – species of *Macrophomina* ***and*** *Fusarium*

Methodology

Seeds of black gram (VBN 6) were tested for seed moisture, germination, seedling vigour and associated *Fusarium* sp. and *Macrophomina* sp. One portion of seed lot was treated (T) with Carbendazim @0.25% and other part was untreated (UT). Treated and untreated seeds were stored in cloth bags (CB), gunny bags (GB) and polylined gunny bags (PGB) and tested up to 150day of storage at 30day interval.

Results

Seeds from cloth bags

Freshly harvested seeds of black gram

Seeds from Gunny bag

Seeds from Polylined bags

Table: Impact of seed dressing with fungicide and containers

Parameter	**Range up to 180day of storage & Remark**	
Seed moisture	8.4 to 9.2% (Initial 18.9%)	Moisture content was higher in untreated seeds
		Moisture content was higher in CB & GB as compared to PGB
Seed germination	87 to 95% (Initial 95%)	Significantly higher in treated seeds; Treated (95%) untreated (91%)
Seedling emergence	85 to 89%	No significant difference observed among treatments
Vigour Index	2533 to 2952	Significant increase observed in treated seeds stored in PGB
		No difference in untreated seeds among storage containers
	PGB storage was superior over CB & GB	

Seed germination test

Seed health test

Table: Impact of seed dressing with fungicide

TNAU, Coimbatore	
Treated and untreated seeds stored in cloth bags (CB), gunny bags (GB) and polylined gunny bags (PGB) and tested up to 150day of storage at 30day intervals	
Seed treatment with Carboxin+ Thiram @0.25%	
Association of *Macrophomina*	10.2-2.0% in UT up to 60 day , later no infection
	No infection in Treated seeds till 150 day of storage
Association of *Fusarium*	No infection up to 60day in treated seeds ,later infection up to 3.3% in cloth bags , then increased upto30% in CB at 150 day
	No infection in PGB up to 150day
PAJANCOA & RI, Karaikal	
The effect of seed treatment was significant on seed germination, seed infection and seedling vigour in terms of dry weight of seedlings and vigour index I and II. The influence of container was significant on seed infection only. However, all the seed quality attributes were affected by the period of storage. Between treatments, seeds treated with Vitavax 200 @ 2g/kg of seeds had maintained significantly higher germination, vigour indices with reduced seed infection after four months of storage under ambient condition of coastal environment at Karaikal, the coastal district located in the Bay of Bengal. The influence of seed treatment was highly significant on seed infection as observed in terms of 2.1 per cent in treated seeds as against 36.9 per cent in untreated seeds. Among the containers, Polylined gunny bag registered the least seed infection (15.1%) followed by Cloth bag (17.7%).	

Experiment 12	:	**Detection, location and transmission of seedborne *Macrophomina phaseolina* in sesame**
Objective	:	To determine the transmission of seedborne target pathogen
Year of start	:	2016
Status	:	Continued 2017-18
Centre	:	TNAU , Coimbatore
Crop / Disease	:	Sesame- *Macrophomina phaseolina*

Results

Collection of sesame seeds

Seeds of 09 varieties (TMV 3, TMV4, TMV6, TMV7, VRI 1, VRI2, VRI 3, Co1, SVPR 1) were collected from Regional Research Station & Seed Production Farm.

Detection of *Macrophomina phaseolina*

Out of three methods employed, Standard Agar Plate method was the most suitable.Out of seed samples of nine sesame varieties tested, TMV 4 exhibited maximum (14.0%) association.

Table. Association of *Macrophomina phaseolina* as detected by three methods

Method	Range of infection (%)	Maximum infection	No infection

Standard Blotter	0.5-03.5	VRI 1	TMV6, VRI 3
Standard agar plate	1.0-14.0	TMV 4	
Test tube water agar	2.0-06.0	TMV 6	

Location of *Macrophomina phaseolina*

Seed component technique indicated the presence of the fungus in seed coat, cotyledon and embryo. Internally and externally seedborne nature is established, during the present investigation.

Transmission - seed to plant

Seed to plant transmission (up to 7.0% in VRI 1) of the pathogen was established (i) through sowing of the infected seeds in sterile soil &(ii) placement of seeds in standard rolled paper towel and subsequent isolation of the fungus from young infected plants

Transmission -plant to seed

Transmission was confirmed by artificial inoculation of the developing capsules and examination, later recovery of the pathogen from the extracted seeds.

Scattered pycnidia of *Macrophomina phaseolina*
on sesame seed surface

Experiment 13 : **Management of purple blotch/ Stemphylium blight of onion through fungicide and plant based products**

Objective : To determine the influence of fungicide application on the quality of harvested seed and development of diseases

Year of start : 2016

Status : Continued 2017-18

Centre : PAU, Ludhiana; SKUAST, Sri Nagar; MPKV, Rahuri (03)

Crop / Disease : Onion – *Alternaria porri*

Methodology : Basic seed treatment with Captan + Thiram and subsequent 2/3 foliar application of 9+1 treatment with incorporation of sticker using RBD with 3 replications

Treatments

	Application combination	Periodicity
T_1	Seed treatment with Captan / Thiram @ 3g/kg seed+ 4 spray of Mancozeb @ 0.3% + 0.11% Triton / Linseed oil as sticker	At 15 day interval after disease appearance
T_2	Seed treatment with Captan / Thiram @ 3g/kg seed+ 4 spray of Copper oxy chloride @ 0.25% + 0.11% Triton / Linseed oil as sticker	At 15 day interval after disease appearance
T_3	Seed treatment with Captan / Thiram @ 3g/kg seed+ 2 spray of Propiconazole @ 0.1% + 0.11% Triton / Linseed oil as sticker	At 15 day interval after disease appearance
T_4	Seed treatment with Captan / Thiram @ 3g/kg seed+ 2 spray of Hexaconazole @ 0.1% + 0.11% Triton / Linseed oil as sticker	At 15 day interval after disease appearance
T_5	Seed treatment with Captan / Thiram @ 3g/kg seed+ 2 spray of Tebuconazole @ 0.1% + 0.11% Triton / Linseed oil as sticker	At 15 day interval after disease appearance
T_6	Seed treatment with Captan / Thiram @ 3g/kg seed+ 4 spray of crude leaf extract of *Azardirachta indica* @ 0.5% + 0.11% Triton / Linseed oil as sticker	At 15 day interval after disease appearance
T_7	Seed treatment with Captan / Thiram @ 3g/kg seed+ *Lantana camera* @ 0.3% + 0.11% Triton / Linseed oil as sticker	At 15 day interval after disease appearance
T_8	Seed treatment with Captan / Thiram @ 3g/kg seed+ *Pongamia pinnata* @ 0.3% + 0.11% Triton / Linseed oil as sticker	At 15 day interval after disease appearance
T_9	Seed treatment with Captan / Thiram @ 3g/kg seed+ 4 spray of Mancozeb @ 0.3% + 0.11% Triton / Linseed oil as sticker	At 15 day interval after disease appearance
T_{10}	Check (No spray)	

Results

Purple blotch was not observed. Incidence of Stemphylium blight was recorded, however, due to increased atmospheric temperature and subsequent lower relative humidity, as compared to previous years, the incidence was comparative lower.

Centre	Progress & Results
PAU, Ludhiana	In T3 (Seed treatment with Captan / Thiram @ 3g/kg seed + 2 spray of Propiconazole @ 0.1% + 0.1% Triton / Linseed oil as sticker at 15 day interval)was the most effective treatment that provided 90% disease control over check
	Stemphylium blight disease incidence in treated plants was 2.5% as compared to untreated check plants (25.7%)
	Enhanced seed yield(49.2 Kg/ac) as compared to untreated 25.7kg/ac)
	Higher seed germination (82%) as compared to check (70%) and seed

	emergence in field (80%) as compared to check (70%)
SKUAST, Srinagar	Experiment has been laid down with basic seed treatment with Captan + Thiram @ 3g/kg.Observations are in progress
MPKV Rahuri	Experiment has been laid down with basic seed treatment with Captan + Thiram @ 3g/kg.Observations are in progress

Experiment 14 : **Detection, location and transmission of seedborne *Alternaria sesami* in sesame**

Objective : To determine distribution, methods of detection and transmission of the pathogen

Year of start : 2016

Status : Continued 2017-18

Centre : PJTSAU, Hyderabad (01)

Crop / Disease : Sesame - *Alternaria sesami*

Results

Association with seeds (2016-17)

Out of 32 seed samples which are collected from farmer's fields (26), experimental fields (5) and seed production plots (1), 18 samples (56%) were infected with *Alternaria sesami* as detected by standard blotter method. Seed germination was above IMSCS in all the samples

Table: Association of *Alternaria sesami* with seed samples from different sources (2016-17)

Source / field	Sample tested	Sample infected	Range of infection (400 seeds)		Percent seed germination
			Minimum	Maximum	
Farmers fields	26	14	0.25	5.5	86
Research fields	05	03	0.50	4.0	89
Seed production plots	01	01	0.00	0.0	87

Efficacy of detection methods (2017-18)

Results: Seeds were collected from naturally infected plants and 400 seeds were analyzed**.** Out of three methods used, Standard agar plate method resulted in maximum recovery of the fungus (23.12%) as compared to standard blotter method (12.37%) and Test tube water agar method (15.75%). The presence of the fungus was confirmed in all the seed parts except embryo. Association with seed coat (13%), pericarp (7%) and endosperm (4%) was noticed employing the seed component plating technique.

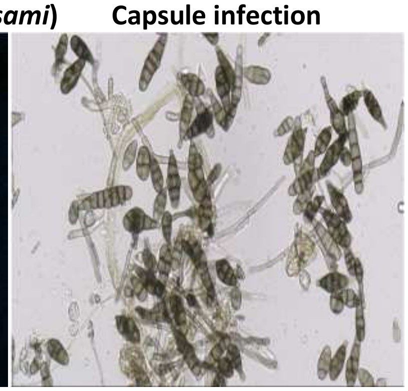
Transmission: Seed to plant (2017-18)

Results: Seed to plant transmission was confirmed, using seeds(400) from naturally infected capsules by employing standard paper towel method (10.17% infection) and sowing of seeds in sterile soil (15%). Seedling infection by *Alternaria sesami* was noticed and Koch's postulate was established for testing of virulence of the isolated fungus.

Transmission: Plant to seed (2017-18)

Results: Under field conditions, developing sesame capsules were inoculated with spore suspension of *Alternaria* (5X10 spores /ml).Typical symptoms of blight appeared on 8^{th} day of inoculation, which progressed with maturity. The seeds from infected capsules were analyzed and association of the target fungus was confirmed indicating the transmission of the fungus from plant to seed. In spray inoculation technique 33.50% infection was recorded as compared to natural infection (27.25%).


Seedling infection (*Alternariasesami*) **Capsule infection**

Standard Agar Plate Method **Conidia of *Alternaria sesami***

D. Seed Entomology

Experiment 1: Survey and evaluation of seed health status of farmers' saved seed with respect to insect infestation (to be combined with pathology / storage).

Objectives:

- To know the type and level of infestation by insects under storage condition.
- Impact of insect infestation on seed quality
- Farmer's practice, if any, to store / protect seeds from insect damage.

Date of start: 2006

All NSP centers including voluntary centers will do the experiment

Methodology: About 500g of seeds of crop/ variety will be collected from farmers / seed producers before sowing on payment or gratis. While collecting seed a questionnaire will also be filled to know crop / variety, period and conditions of storage, treatments, if any, source of seed, if it is not farmer's saved one. The following observations are to be recorded.

1. Seed moisture content (%)
2. Live insect, its species and storage period
3. Damage in 400 seed samples including internal infestation
4. Germination (%)
5. Vigour test

Results: (Tables 1.1 – 1.13)

MPKV, Rahuri

Total two hundred seventy two farmers' saved seed samples of various crops (soybean-62, pearl millet-43, sorghum-48, wheat-50 and chickpea - 69) were collected from Ahmednagar and Pune district for evaluation of seed health status. Among 272 seed samples, 60 seed samples (22.06%) were found infested with various insects like *Callosobruchus Spp, Rhizopertha dominica* and *Sitophilus oryzae*. About 19.1% seed samples were having insect damage beyond permissible limit. The moisture content of different seed samples ranged between 7.3 to 9.0%. About 75% samples were having seed germination above seed certification standard (table-1.1)

JAU, Jamnagar

For survey and evaluation of seed health status of farmer's saved seed with respect to insect infestation, total 119 groundnut seed samples were collected from four districts *viz.* Jamnagar (26 samples), Rajkot (10 samples), Devbhoomi Dwarka (35 samples) and Morbi (48 sample) district of Saurashtra region. Average moisture content was 4.68% whereas average seed germination was 88.6%. Seedling vigor index varied from 188 to 1308.6 with an average 655.9. Incidence of groundnut seed beetle, *Caryedon serratus* (Oliver) was observed in 65.5% samples and 54.6% samples were having insect damage beyond permissible limit. Average intensity of infestation was 2.95 % and maximum seed damage was 16%. Various life stages i.e. larvae, pupae and adults of *Caryedon serratus* and adults of *Tribolium* were observed in infested samples. About 96.6% seed samples recorded seed germination above IMSCS. The farmers usually stored the seed by treating with methyl parathion 2% on gunny bags, celphos fumigation, fenvalerate 0.4% dust on gunny bags, DDVP on gunny bags, mixing of neem leaves and sun drying once after storage. The average storage period was 7-9 months.

PDKV, Akola

During survey, four hundred six seed samples (Soybean-113, Pigeonpea-72, Green gram-41, Urd bean-52, Chick pea-83 and Wheat-45) were collected from Vidarbha region of Maharastra (table-1.3). Storage period of these samples ranged between 6-8months. About 22.4% seed samples were infested with various storage insects and 3.7% samples were having insect damage beyond permissible limit. The moisture content of seed samples ranged between 7.1 to 9.3%. About 49% seed samples recorded higher seed germination than IMSCS. However, all chickpea seed samples failed to meet seed germination standard under IMSCS. The insect damage in different samples varied from 0.10 to2.6%.

AAU, Jorhat

To study the seed health status of farmer's saved seeds with respect to insect infestation, 104 paddy seed samples (18 different varieties) were collected from Dibrugarh, Moran and Naharkatia subdivision of Assam. Out of 104 samples, 34.6% samples recorded seed germination above IMSCS. Per cent seed germination ranged between32 to 88. The storage period of most of samples varied from 7 to 9 months. Seed moisture contentranged between 12 to 15%. Overall 55.8% seed samples were infested by *Sitophilus oryzae, Sitotroga cerealella* and *Rhizopertha dominica*. Out of total seed samples 27.9% samples had insect damage beyond permissible limit under IMSCS. The insect damage ranged between 0.25 to 8.5%. The vigour index of the collected seed samples ranged from 417 to 1610.

OUAT, Bhubaneswar

During survey, 219 paddy seed sampleswere collected from farmers belonging to Cuttack, Jajpur, Sundargarh, Jagatsinghpur, Khurda, and Mayurbhanj districts of Orissa. Out of these samples, 49 seed samples were infested with angoumois grain moth and lesser grain borer and insect damage was beyond permissible limit in 13.24% samples. Insect damage level usually ranged between 0.5-7.0%.About 71.7% seed samples had seed germination above IMSCS (table-1.5).

NDUAT, Faizabad

During survey, 100 paddy seed samples were collected from farmers of different districts of eastern part of Utter Pradesh viz. Siddharthnagar, Faizabad, Sultanpur, Maharajganj and 98 wheat seed sampleswere collected from Barabanki, Bahariach, Gonda, Faizabad, Sultanpur and Maharajganj (table-1.6). About 94% paddy seed samples were infested with various storage insects (*Rhyzopertha dominica, Sitotroga cerealella, Sitophilus oryzae)*and about 83% samples were having insect damage beyond permissible limit (>0.5% ID). About87.7% wheat samples were infested with *Rhyzopertha dominica*, *Sitophilus oryzae* and insect damage was beyond permissible limit (>0.5% ID) in all infested samples.Per cent seed germination ranged between 36.0-93.6 in paddy and 52-94 in wheat. About 40% of paddy seed samples and 43.9% of wheat seed samples recorded seed germination above IMSCS.

TNAU, Coimbatore

A total of 87 farmer's saved seed samples were collected from kollihills of Namakkal district. The farmer's saved seed samples comprised of paddy (26), finger millets (14), cowpea (1), foxtail millet (13), little millet (14), pearl millet (5), horse gram (2), castor (2), blackgram (1), redgram (1) and lablab (6).

Most of the farmers were using jute and woven poly bags for seed storage. Some farmers were also using earthen structures *viz.,* thombai, kuruthu and pots for storing seeds. Nine species of insect pests *viz.,* lesser grain borer (*Rhyzopertha dominica*), angoumois grain moth (*Sitotroga cerealella*), rice weevil (*Sitophilus oryzae*), pulse beetle (*Callosobruchus maculatus*) red flour beetle (*Tribolium castaneum*), rice moth (*Corcyra cephalonica*), saw toothed grain beetle (*Oryzaephilus* sp), flat grain beetle (*Cryptolestes pusillus*) and grain lice (*Liposcelis divinatorius*) were recorded in the stored seeds.

Different seed storage practices followed by farmers were (i) sun drying (ii) red earth treatment for redgram and lablab and mixing leaves of *Azadirachta indica*, *Vitex negundo* and *Ocimum.*

Out of 26paddy seed samples, 23 samples showed insect infestation, mainly by angoumois grain moth, *Sitotroga cerealella*, lesser grain borer, *Rhizopertha dominica* and red flour beetle *Tribolium castaneum*. Seed damage level varied from 0.15 to 9.46% among the samples. About 88.5% of total collected samples were having seed damage beyond permissible limit. Moisture content of samples ranged between 10.63 to 13.05%. Seed germination ranged between 0.0 to 92%.About 26.9% of the seed samples collected was having seed germination above minimum seed certification standard.

Out of 48 millet samples (finger millets, foxtail millet, little millet, pearl millet) collected only 2 samples of pearl millet were infested and about 4.17% of total samples were having insect damage >0.5%. Per cent seed germination varied from 0.0-96 and 20.8% samples hadseed germinationabove IMSCS level.

Out of 13 seed samples of other crops (horse gram, castor, black gram, redgram and lab lab) only 3 samples were infested with various insects and about 15.4% samples were having insect damage beyond permissible limit. Per cent seed germination varied from 0 to 96 with 53.8% samples above IMSCS level.

UAS, Bangalore

To study the seed health status of farmer's saved seeds with respect to insect infestation, samples of various crops (paddy-9, cowpea-19, blackgram-9, ragi-8, field bean-18, maize-15, green gram-14, pigeon pea-7 and horse gram-1) collected from adjoining areas. About 66.7, 50.0, 46.7, 42.9 and 36.8% seed samples were having seed damage beyond permissible limit in paddy, green gram, maize, pigeon pea and cow pea respectively. Overall 37% seed samples were having seed damage beyond permissible limit whereas 81%seed samples had seed germination IMSCS. The insect damage ranged between 0.25 to 4.5%. The vigour index of the collected seed samples varied from 2095 to 2895.

PJTSAU, Hyderabad

A total of 125 seed samples were collected (paddy: 80, soybean:30 and Bengal gram:5) from Nizamabad, Nalgonda, Adilabad, Medak, Karimnagar and Ranga Reddy districts of Telangana State (table-2.8) for evaluation of seed health status of farmer's saved seed. Storage period of these samples ranged between 3 to18 months. About 92.5% paddy seed samples were infested by *Sitotroga cerealella*, *Rhyzopertha dominica* and *Tribolium* and about 86.3% seed samples were having insect damage beyond permissible limit. Seed germination of 76.3% paddy samples were above IMSCS. Moisture content of these seed samples varied from 7.1 to 14.2%. Soybean and Bengal gram seed samples collected from Nizamabad and Medak district. Storage period of these samples was twelve months but incidence of stored grain pests was not observed in any of these samples. However, only 16.7% samples of soybean seed samples recorded seed germination above IMSCS whereas 93% bengal gram seed samples maintained germination above IMSCS (85- 100%).

PAJANCOA & RI, Karaikal

Fifty one samples of paddy (20 varieties) were collected from three different regions of Puducherry (UT) viz., Puducherry, Karaikal and Mahe out of which 50 samples were infested with various insects. All infested samples had insect infestation ranging between 0.25 to 90%. About 94.1% of the samples had insect damage beyond permissible limit under IMSCS and only 60.8% of the samples fulfilled IMSCS for germination (80%). *Rhyzopertha dominica* was the insect predominantly found in the seed samples (49 samples) followed by *Sitotroga cerealella* (37 samples). Seed moisture content ranged between 10.3-21.1% (table 1.10).

ICAR-IISS, Mau

During survey,one hundred seed samples of wheat were collected from different districts (Kushmaur, Ohnaich, Rahajaniya, Kanderayapur, Gokulpura,) of Uttar Pradesh (table-1.11). Storage period of these samples wassix months. About 8% seed samples were infested with various storage insects and 7% samples were having insect damage beyond permissible limit. The moisture content of seed samples ranged between 9.6 to 14.7%. About 76% seed samples recorded seed germination above IMSCS. The insect damage in different samples varied from 0.25 to 6.25 %. Most of the farmers used ITKs like mixing of cowdung cake ash (@200g/Kg Seed), mixing with dry chilly @ 20 gm + garlic @ 100 gm/40 kg seeds, mixing with salt @ 200 gm + garlic @ 100 gm/40 kg seeds and stacked bags on straw for protecting wheat seed from storage insects.

CSAUA&T, Kanpur

One hundred ninety six (196) farmers saved paddy and wheat seed samples (table-1.12) were collected from Aligarh, Shahajanpur, Bareilly, Amethi, Mainpuri, Unnao and Hardoi distt. of U.P.

Fifty three seed samples out of 106paddy seed samples were infested by *Rhizopertha dominica, Sitotroga cerealella, Oryzaephilus surinamensis* and *Trogoderma granarium* and insect damage varied from 0.25-3.75% in these samples. Seed germination of these samples rangedbetween 3 to 96% whereas seed moisture content and vigour indexranged between 12.0-14.8 and 54-2470, respectively.

UAS, Dharwad

One hundred samples each of soybean and chickpea were collected from the farmers before sowing. In soybean about 35% samples had insect infestation and about 21% seed samples failed to meet the standard for insect damage. Seed moisture content ranged between 6.2 to 15.2% (table-1.13). Seed germination ranged between 56 to 90% and 90% samples had seed germination above standard. All chickpea seed samples were infested with various insects and 86% seed samples had insect damage above IMSCS. Moisture content ranged between 7 to 13.5% while seed germination ranged between 60 to 91%.Only 15% samples had seed germination above IMSCS.

Conclusion

The survey has been conducted in ten states and one union territory across the country and about 1954 farmers’ saved seed samples have been collected and analysed for seed quality. The survey revealed thatabout 45.5% seed samples were infested with various storage pests 40% seed samples were having germination bellow IMSCS and about33.2% samples were having insect damage beyond permissible limit. The intensity of damaged seed usually varied from 0.25-5.0%. Therefore,there is ample scope of improvement of seed health status of farmers’ saved seed.

Table 1.1: Survey and evaluation of seed health status of farmers saved seeds with respect to insect infestation (MPKV, Rahuri)

Sr. No.	Location	Crop/ variety	Storage period (Months)	Number of samples collected	Number of samples infected	Name of insects present	Per cent seed damage (range)	Per cent seed sample with seed damage beyond permissible limit	Seed Moisture (%) (range)	Mean Seed Germination (%) with range in parenthesis	Per cent seed sample with seed germination within permissible limit
1	A.Nagar &pune	Pearl millet	9	31	5	*Rhizopertha domonica, Sitophilus oryzae, Tribolium castaneum*	0-9	12.9	7.3-9.00	79 (72-91)	74.2
2	A.Nagar &pune	Soybean	9	43	0	Nil	Nil	0.0	7.1-8.9	74 (68-79)	69.8
3	A.Nagar &pune	Sorghum	9	44	13	*R. dominica, S. oryzae, T. castaneum*	0-16	22.7	7.5-8.8	79 (70-87)	75.0
4	A.Nagar &pune	Chickpea	9	72	21	*Callosobruchus* spp	0-22	25.0	7.6-9.11	88 (77-90)	77.8
5	A.Nagar &pune	Wheat	9	55	16	*R. domnica, S.oryzae, T.castaneum*	0-12	25.5	7.5-9.00	88 (79-91)	80.0

Table-1.2: Survey and evaluation of seed health status of farmers saved seed of groundnut with respect to insect infestation(JAU, Jamnagar)

Sr. no.	Districts/ Location	No. of samples collected	No. of samples infested	Crop & variety	Storage period in months (range)	Insect-pests observed	Per cent Seed damage (range)	Per cent seed sample with seed damage beyond permissible limit	Seed Moisture (%) (range)	Germination (%) in Lab. (range)	Seed sample with germination within permissible limit (%)	Vigour index (range)	Germination (%) in field (range)
1	Jamnagar	26	17	Groundnut (GG -20)	8-9	*Caryedon* & *Tribolium*	0.0-16.0	46.2	3.90-5.35	62.0-90.67	92.3	198.4-681.63	58.00-87.50
2	Morbi	48	30	Groundnut (GG-20 GJG-22)	7-9	*Caryedon* & *Tribolium*	0.0-13.00	54.2	3.53-5.65	75.0-98.67	100	502.27-1223.88	67.00-93.00
3	Devbhumi Dwarka	35	26	Groundnut (GG-20, GJG-22, GG-2)	7-9	*Caryedon* & *Tribolium*	0.0-12.0	62.9	3.96-5.45	62.33-98.00	94.3	188..0-1123.00	46.50-89.00
4	Rajkot	10	8	Groundnut (GG-20, TG-45)	7-8	*Caryedon*	0.0-.8.00	50.0	5.11-5.51	82.33-97.33	100	596.06-1308.58	74.50- 92.50

Table 1.3: Survey and evaluation of seed health status of farmers saved seeds with respect to insect infestation (PDKV, Akola)

Sr. No.	Location	Crop/ Variety	Storage period	Number of samples collected	Number of samples infected	Name of insects present	Per cent seed damage (range)	Per cent seed sample with seed damage beyond permissible limit	Seed Moisture (%) (range)	Mean Seed Germination (%) with range in parenthesis	Per cent seed sample with seed germination within permissible limit	Mean vigour index (with range)
1	Vidarbha region of Maharashtra	Mungbean	8 month	41	13	*Callosobruchus chinensis*	03-1.7	7.32	7.9-8.1	75 (71-79)	61.0	1735.39 (1590-1710)
2		Udidbean	7 month	52	17	*Callosobruchus chinensis*	0.8-2.6	5.77	8.3-8.5	73 (70-76)	61.5	1620.98 (1620-1710)
3		Pigeonpea	6 month	72	11	*Callosobruchus chinensis*	0.4-1.9	5.56	8.7-9.3	76 (73-79)	58.3	1691.30 (1530-1780)
4		Soybean	7 month	113	5	-	0.1-0.3	-	7.1-7.9	72 (68-76)	56.6	1678.25 (1591-1760)
5		Chickpea	8 month	83	31	*Callosobruchus chinensis*	0.5-2.1	3.61	7.6-8.3	78 (76-80)	0.0	2310.52 (1520-2590)
6		Wheat	7 month	45	14	*Rhyzopertha dominica*	0.5-1.6	4.44	8.3-8.7	85 (80-91)	80.0	2410.11 (1825-2910)

Table-1.4: Survey and evaluation of seed health status of farmer's saved seed with respect to insect infestation (AAU, Jorhat)

Sl. No.	Location	Storage period (months)	Number of samples collected	Number of samples infested	Name of insects present	Per cent seed damage (range)	Seed sample with seed damage beyond permissible limit (%)	Seed Moisture (%) (range)	Mean Seed Germination (%) (range)	Seed sample with seed germination above IMSCS (%)	Mean vigour index (range)
1	Dibrugarh subdivision	7-8	57	34	*SC,RD,SO	0.0-6.5	28.1	12.7-15.0	32.0-88.0	38.6	540-1610
2	Moran subdivision	7-9	29	13	SC,RD,SO	0.0-8.5	24.1	13.5-15.7	34.0-86.0	24.1	630-1431
3	Naharkatia subdivision	7-8	18	11	SC,RD,SO	0.0-4.0	33.3	12.0-14.8	64.0-88.0	38.9	417-1357

*SC- *Sitotroga cerealella;* SO-*Sitophilus oryzae;* RD-*Rhyzopertha dominica*

Location	Paddy varieties
Dibrugarh subdivision	Ranjit,Mashuri,Kopouguni,Punjub Sali, Mashuri, Kopouguni, Punjub Lahi, Punjub Sali, Jahingia, Khokuwa, Panindra, Pani Dhan, Buroi, Dolkosa, Dal Bao, Amona Bao, Dishang, Pasua Dhan, Boga Lahi, Bas Dhan, Solpona, Ranga Bas, Boga Bas, Jangaikhowa, Naga Jahingia, Nagaya, Bamun Dhan, Bora
Moran subdivision	Ranjit, Mashuri, Bora, Ranga Bora, Uttam Sali, Uttar Pariya, Joha, Ranga Sali, Kola Sali, Shree Sali, Gudumoni, Lahi, Malbhog, Nagaya, Pakhi Loga Dhan, Bihari Dhan, Kola Joha, Khamli Lahi, Badam Lahi, Ranga Ahu, Betguti
Naharkatia subdivision	Ranjit,Mashuri,Kon, Joha,Joha,Moinagiri,Arize,Mashuri, Kon Joha, Joha, Moinagiri, Arize, Kola Joha, Ranga Bas, Bor olpona, Nagaya, Bora

Table- 1.5: Survey and evaluation of seed health status of farmers saved seeds with respect to insect infestation (OUAT, Bhubaneswar)

S. No.	District/ Location	Crop-paddy/ variety	Storage period	Number of samples collected	Number of samples infected	Name of insects present	Per cent seed damage (range)	Seed sample with seed damage beyond permissible limit (%)	Seed Moisture (%) (range)	Mean Seed Germination (%) with range in parenthesis	Seed sample with seed germination within permissible limit (%)
Cuttack District											
1	Baramba Block	Laxisagar, Ajana, Nabin, Beta Dhan, Parbati,	5	20	3	AGM	0.5-3.5	10.00	9.9-11.5	87.0 (60.0-100.0)	80.0
2	Tigiria Block	Swarna, Pooja, Lalata, 1001, Latamahu,	6	36	9	AGM	0.5-4.0	19.44	10.1-12.3	83.0 (64.0-98.0)	66.7
3	Athgarh Block	Rangarai, 1025, Kalachampa, Kadambini,	5	40	12	AGM, LGB	0.5-5.5	12.50	10.5-13.2	86.0 (46.0-98.0)	80.0
Jajpur District											
4	Badachana Block	Pooja, BT 2, Pratikhya, Swarna, BT 1	6	19	4	AGM	1.0-5.5	21.05	11.0-13.5	63.0 (46.0-85.0)	68.4
Sundargarh District											
5	Kutra, Lathikata	Dhanigoda, Nabin, Raisiri, Soubhagi,	7	36	7	LGB	0.5-7.0	8.33	10.8-13.0	70.0 (40.0-95.0)	36.1
Jagatsinghpur District											
6	Jagatsinghpur Block	RGL, Sarala, Swarna sub 1, Mahalaxmi, Swarna, Sahabhagi, K 10, Khudrat,	6	16	4	AGM	0.5-1.5	12.50	10.2-10.8	88.0 (75.0-97.0)	87.5
Khurda District											
7	Begunia Block	Rani Dhan, Parijat, Khandagiri, Lalat, IR 36,	6	33	6	AGM	0.5-2.0	6.06	10.4-12.5	89.0 (63.0-98.0)	97.0
Mayurbhanja											
8	Udala Block	Lalat, Swarna, Masoori, Udayagiri, Ranidhan,	6	19	4	LGB	0.5-2.5	21.05	10.4-12.0	85.0 (63.0-96.0)	68.4

AGM: Angomois grain moth; LGB: Lesser grain borer.

Table 1.6: Survey and evaluation of seed health status of farmers saved seeds with respect to insect infestation (NDUAT, Faizabad)

Sl No.	Crop	Districts/ Location	Storage Period (Month)	Number of sample collected	Number of Sample infested	Name of sample Insect present	Percent Seed Damage (range)	Percent seed sample With seed damage beyond permissible limit	Seed moisture (%) range	Mean seed germination (%) with range	Percent seed sample with seed Germination above IMSCS	Mean vigour index (range)
1	Paddy	Faizabad	5-6	18	18	SC,RD,SO	1.88 (0.33-5.00)	83.33	11.37 (10.0-13.8)	71.29 (42.0-89.6)	50.14	1011.92 (532.79-1245.44)
2	Paddy	Sultanpur	5-6	23	21	SC,RD,SO	1.90 (0-4.66)	82.61	11.86 (10.0-12.6)	78.42 (65.3-83.1)	52.17	1238.15 (860.4-1536.0)
3	Paddy	Maharajganj	5-6	22	18	SC,RD,SO	2.02 (0 - 5.00)	72.72	11.54 (10.42-14.2)	75.17 (36.0-93.6)	36.36	1196.32 (734.8-1460.4)
4	Paddy	Siddharthnagar	5-6	21	21	SC,RD,SO	2.02 (0.33-4.33)	80.95	11.56 (10.5-14.2)	73.39 (65.3-83.3)	28.5	1213.35 (739.2-1400.5)
5	Paddy	Bahariach	5-6	16	16	SC,RD,SO	3.91 (1.33-6.0)	100	12.23 (10.8-14.8)	69.63 (55.0-88.2)	31..25	931.09 (664.1-1439.29)
6	Wheat	Faizabad	8-9	18	13	RD,SO	2.16 (0-4.33)	72.22	10.32 (10.1-11.7)	83.83 (72-88)	55.26	1004.31 (750-1430)
7	Wheat	Sultanpur	8-9	16	12	RD,SO	1.88 (0-4.0)	75	10.95 (9.5-12.0)	83.47 (65-94)	50.0	1140.13 (734-1426.8)
8	Wheat	Barabanki	8-9	15	12	RD,SO	3.07 (0.0-4.0)	80	11.7 (10.3-12.0)	78.8 (62.0-94.0)	40.00	1140.89 (639.6-1364.88)
9	Wheat	Maharajganj	8-9	18	18	RD,SO	4.06 (1.0-6.0)	100	11.81 (10.2-13.6)	77.22 (56-91)	33.33	1030.92 (736.8-1470.28)
10	Wheat	Bahariach	8-9	17	17	RD,SO	6.58 (1.67-6.33)	100	11.23 (9.1-13.5)	77.23 (52.0-91.0)	29.41	1022.9 (733.2-1360.0)
11	Wheat	Gonda	8-9	14	14	RD,SO	3.28 (0.67-5.0)	100	11.16 (10.2-13.5)	81.14 (53.0-91.0)	57.14	1073.5 (678.4-4123.24)

**SC- Sitotroga cerealella; SO-Sitophilus oryzae; RD-Rhyzopertha dominica*

Table-1.7: Survey and evaluation of seed health status of farmers saved seeds with respect to insect infestation (TNAU, Coimbatore)

Sample No.	Crop	Location	Variety	Storage period	Storage structure	Insect damage (%)	Insect species present	Moisture content (%)	Germination (%)	Vigour index	Treatment, if any
1.	Paddy	Sallakadu	IR 20	One and a half years	Thombai (Mud structure)	9.46	R.d, L.s, C.s, T.c	10.81	82	2301	*Azadirachta indica* leaves are mixed with seeds
2.	Finger millet	Sallakadu	Local	Two years	Earthen pots	0.0	R.d, L.s, O.s	13.86	0	0	
3.	Lablab	Sallakadu	Local	One year	Earthen pot	0.0	--	13.94	88	3361	Seeds are admixed with Malathion dust insecticide formulation
4.	Paddy	Setupallapatti	White Ponni	Two years	Earthen pot	1.6	S.c, S.o, L.s, R.d	10.95	90	2259	Seeds are sun dried and mixed with *Ocimum* leaves
5.	Paddy	Setupallapatti	ADT 36	Two years	Kuruthu (Mud structure), Jute bag	2.49	S.c, L.s, R.d, O.s	12.70	60	1387	
6.	Finger millet	Setupallapatti	Local	Three years	Kuruthu (Mud structure), Jute bag	0.0	C.s	14.94	34	112	
7.	Lablab	Setupallapatti	Local	One month	Jute bag	0.0	--	14.07	88	3396	
8.	Cowpea	Setupallapatti	Local	One month	Jute bag	3.39	C.m	16.61	74	2279	
9.	Paddy	Setupallapatti	IR 20	One year	Jute bag	1.07	S.c, R.d, L.s, T.c, O.s	12.77	64	1677	--
10.	Paddy	Setupallapatti	IR 20	Six months	Jute bag	2.52	S.c, S.o, R.d, C.s	13.05	0	0	--
11.	Paddy	Veerakanurpatti	IR 20	One year	Earthen pot	2.45	R.d, S.c	12.30	2	0	Seeds are sun dried
12.	Finger millet	Veerakanurpatti	Local	One year	Earthen pot	0.0	--	14.27	0	0	
13.	Lablab	Veerakanurpatti	Local	Six months	Jute bag	0.0	--	13.61	84	3141	--
14.	Finger millet	Veerakanurpatti	Local	One year	Jute bag	0.0	--	11.57	96	710	--
15.	Paddy	Veerakanurpatti	Vayanadu - 2	One year	Jute bag	1.12	R.d, S.c	10.63	62	1958	--
16.	Foxtail millet	Vendalapadi	Local	Nine months	Woven poly bags	0.0	L.s	13.13	72	694	--
17.	Paddy	Vendalapadi	Ponni	Three months	Woven poly bags	0.22	S.c, C.s, L.s	12.88	80	2296	--
18.	Finger millet	Vendalapadi	Local	Nine months	Woven poly bags	0.0	L.s, R.d	14.49	96	764	--
19.	Paddy	Vendalapadi	IR 20	Five months	Woven poly bags	3.84	S.c, S.o	12.92	68	2048	--
20	Foxtail millet	Vendalapadi	Local	Five years	Woven poly bags	0.0	--	12.47	0	0	--

Sample No.	Crop	Location	Variety	Storage period	Storage structure	Insect damage (%)	Insect species present	Moisture content (%)	Germination (%)	Vigour index	Treatment, if any
21.	Lab	Vendalapadi	Local	Three months	Woven poly bags	0.0	--	15.30	96	3302	--
22.	Little millet	Vendalapadi	Local	Two years	Woven poly bags	0.0	--	12.93	0	0	--
23.	Pearl millet	Keerakadu	Local	Three months	Woven poly bags	0.0	--	10.76	90	952	Seeds are admixed with malathion dust insecticide formulation
24.	Little millet	Keerakadu	Local	Three months	Woven poly bags	0.0	C.s, L.s, O.s	12.12	76	1521	
25.	Foxtail millet	Keerakadu	Local	Three months	Woven poly bags	0.0	L.s	11.43	0	0	
26.	Pearl millet	Keerakadu	Local	Three months	Woven poly bags	0.0	L.s, O.s	11.63	94	2441	
27.	Horse gram	Keerakadu	Local	Three months	Woven poly bags	0.0	--	10.21	94	2086	
28.	Little millet	Keerakadu	Local	Three months	Woven poly bags	0.0	--	11.47	0	0	
29.	Finger millet	Keerakadu	Local	Three months	Woven poly bags	0.0	L.s, R.d	13.30	0	0	
30	Paddy	Keerakadu	ADT 36	One year	Woven poly bags	1.56	S.c, R.d, T.c, L.s	12.07	90	3126	Seeds are admixed with *Vitex negundo* leaves
31.	Castor	Keerakadu	Local	Two years	Woven poly bags	0.0	--	6.71	0	0	
32.	Finger millet	Keerakadu	Local	Two years	Woven poly bags	0.0	O.s	13.03	0	0	
33.	Paddy	Keerakadu	Local	Five years	Woven poly bags	2.1	T.c, R.d, L.s, S.c	11.75	62	2012	
34.	Horse gram	Keerakadu	Local	Three years	Woven poly bags	0.0	--	13.45	0	0	
35.	Finger millet	Keerakadu	Local	Four years	Woven poly bags	0.0	L.s, O.s	13.88	42	96	
36.	Black gram	Keerakadu	Local	Two years	Woven poly bags	0.91	---	12.96	8	122	
37.	Little millet	Keerakadu	Local	One year	Woven poly bags	0.0	L.s	12.00	0	0	
38.	Finger millet	Keerakadu	Local	Six months	Jute bag	0.0	--	13.97	78	791	
39.	Little millet	Keerakadu	Local	Five years	Woven poly bags	0.0	L.s, R.d	12.14	0	0	
40.	Red gram	Keerakadu	Local	Six months	Woven poly bags	7.33	C.m	13.58	22	398	Seeds are treated with red earth
41.	Little millet	Thuvaraipalayam	Local	One year	Jute bag	0.0	C.s	13.97	0	0	--
42.	Foxtail millet	Thuvaraipalayam	Local	Six months	Jute bag	0.0	--	13.94	0	0	--
43.	Finger millet	Thuvaraipalayam	Local	One year	Jute bag	0.0	L.s	15.78	0	0	--
44.	Foxtail millet	Thuvaraipalayam	Local	One year	Jute bag	0.0	O.s	14.92	0	0	--
45.	Little millet	Thuvaraipalayam	Local	Six months	Jute bag	0.0	C.s, R.d	13.49	0	0	--
46.	Little millet	Thuvaraipalayam	Local	One year	Jute bag	0.0	--	13.60	0	0	--
47.	Finger millet	Chillary	Local	Two years	Woven poly bags	0.0	L.s, R.d	14.11	0	0	--
48.	Paddy	Chillary	IR 20	One year	Jute bag	2.51	S.c, T.c, C.s, R.d	12.18	90	2774	--

Sample No.	Crop	Location	Variety	Storage period	Storage structure	Insect damage (%)	Insect species present	Moisture content (%)	Germination (%)	Vigour index	Treatment, if any
49.	Paddy	Chillary	ADT 46	One year	Woven poly bag	4.22	S.c, O.s, C.s, R.d, T.c, L.s	12.34	78	2560	Seeds are sun dried
50.	Pearl millet	Chillary	Local	One year	Jute bag	1.07	C.s, S.o	13.22	36	517	--
51.	Paddy	Chillary	Ponni	Three years	Jute bag	2.62	S.c, S.o, T.c	11.91	88	2686	--
52.	Paddy	Chillary	Ponni	Six months	Woven poly bag	0.91	R.d	11.68	10	86	*Azadirachta indica* leaves are mixed with seeds
53.	Foxtail millet	Chillary	Local	Three years	Woven poly bag	0.0	L.s, R.d	10.94	0	0	--
54.	Little millet	Chillary	Local	Eight years	Earthen pot	0.0	C.s, O.s, R.d	11.94	0	0	--
55.	Foxtail millet	Chillary	Local	Three years	Earthen pot	0.0	L.s	9.72	0	0	--
56.	Paddy	Chillary	Ponni	Six months	Earthen pot	1.03	O.s, T.c, L.s, S.c, R.d	11.18	90	1821	--
57.	Foxtail millet	Palavazhi	Local	Two years	Jute bag	0.0	L.s, O.s	11.80	0	0	--
58.	Pearl millet	Palavazhi	Local	One year	Woven poly bag	0.0	O.s	11.43	92	2097	--
59.	Paddy	Palavazhi	J 13	One year	Woven poly bag	1.53	S.o, R.d, T.c, L.s, S.c	11.45	82	2315	--
60.	Paddy	Palavazhi	Ponni	Six months	Jute bag	0.83	S.c, T.c, L.s, R.d	11.80	0	0	--
61.	Pearl millet	Palavazhi	Local	One year	Woven poly bag	1.29	S.o, C.c	13.54	0	0	--
62.	Paddy	Palavazhi	IR 50	Three years	Jute bag	0.68	S.c, S.o, L.s, R.d, O.s, T.c	11.61	42	784	--
63.	Paddy	Palavazhi	J 13	Two years	Jute bag	2.51	S.c, T.c, O.s, L.s	10.70	78	2477	--
64.	Little millet	Naduvalavu	Local	Three years	Jute bag	0.0	--	12.77	0	0	--
65.	Finger millet	Puthuvalavu	Local	Two years	Jute bag	0.0	L.s	13.33	0	0	--
66.	Castor	Puthuvalavu	Local	One year	Woven poly bag	0.0	--	6.94	45	891	--
67.	Lablab	Puthuvalavu	Local	One year	Woven poly bag	0.0	--	17.40	76	2143	--
68.	Finger millet	Puthuvalavu	Local	One year	Woven poly bag	0.0	--	14.15	94	1141	--
69.	Little millet	Puthuvalavu	Local	Ten years	Woven poly bag	0.0	C.s	12.46	0	0	--
70.	Lablab	Puthuvalavu	Local	Three months	Woven poly bag	0.0	--	13.63	84	3444	--
71.	Finger millet	Puthuvalavu	Local	One year	Woven poly bag	0.0	L.s	14.16	28	1011	--

Sample No.	Crop	Location	Variety	Storage period	Storage structure	Insect damage (%)	Insect species present	Moisture content (%)	Germination (%)	Vigour index	Treatment, if any
72.	Paddy	Kelpapanam	Ponni	Six months	Jute bag	2.46	T.c, R.d, S.c, C.s	11.96	92	2448	--
73.	Finger millet	Kelpapanam	Local	Six months	Jute bag	0.0	C.s	15.54	70	828	--
74.	Foxtail millet	Kelpapanam	Local	Six months	Jute bag	0.0	C.s	11.98	16	162	--
75.	Little millet	Kelpapanam	Local	Six months	Jute bag	0.0	L.s	12.13	0	0	--
76.	Paddy	Kelpapanam	Ponni	Six months	Jute bag	3.28	S.c, C.s, S.o, T.c	11.78	12	108	--
77.	Paddy	Kelpapanam	Vayanadu - 2	Two years	Jute bag	1.43	S.c, T.c, L.s	11.51	56	1835	--
78.	Little millet	Kelpapanam	Local	Three years	Woven poly bag	0.0	C.s, S.o	12.37	0	0	--
79.	Paddy	Kelpapanam	Local	One month	Jute bag	0.15	R.d, T.c, S.c, C.s	12.04	92	3310	--
80.	Foxtail millet	Keelkalur	Local	Three years	Jute bag	0.0	--	11.87	0	0	--
81.	Finger millet	Keelkalur	Local	One year	Jute bag	0.0	C.s	14.45	94	1316	--
82.	Little millet	Keelkalur	Local	One month	Jute bag	0.0	--	12.25	74	1060	--
83.	Foxtail millet	Keelkalur	Local	Three years	Jute bag	0.0	C.s	12.79	0	0	--
84.	Foxtail millet	Keelkalur	Local	Three years	Jute bag	0.0	--	11.84	0	0	--
85.	Foxtail millet	Nechikadu	Local	One month	Jute bag	0.0	L.s	12.28	92	513	--
86.	Paddy	Nechikadu	Samba	Six months	Jute bag	1.42	S.c	11.41	64	1881	--
87.	Paddy	Nechikadu	ADT (R) 13	Six months	Jute bag	0.34	S.o, R.d, L.s	12.30	84	2560	--

R.d – Rhyzopertha dominica (Lesser grain borer)

S.c – Sitotroga cerealella (Paddy or Angoumois grain moth)

S.o – Sitophilus oryzae (Rice weevil)

T.c - Tribolium castaneum (Red flour beetle)

O.s - Oryzaephilus sp (Saw toothed grain beetle)

Cry - Cryptolestes pusillus (Flat grain beetle)

Cal. – Callosobruchus sp (Pulse beetle)

Psocids - Liposcelis divinatorius

Table-1.8: Survey and evaluation of seed health status of farmer's saved seed with respect to insect infestation (UAS, Bangalore)

Sl No.	Crop	Number of sample collected	Storage period (Months)	Number of sample infested	Percent seed damage (range)	Name of sample insect present	Percent seed sample With seed damage beyond permissible limit	Seed moisture (%) range	Seed germination (%) range	Percent seed sample with seed germination above IMSCS	Vigour index (range)	Mean vigour index
1	Paddy	9	2 to 12	9	0.5 to 4.5	R.d, S.o, S.c, T.c	66.7	11 to 14.6	54 to 98	44.4	2251 to 2551	2421
2	Cowpea	19	1 to 6	19	0.5 to 1.5	Cal.	36.8	8.1 to 11.5	52 to 96	89.5	2459 to 2895	2728
3	Black gram	9	3 to 4	9	0.5 to 1.5	Cal.	11.1	9.2 to 11.2	68 to 98	88.9	2558 to 2835	2722
4	Ragi	8	2 to 10	2	0.5 to 1.5	-	12.5	8.9 to 10.2	27 to 96	87.5	1894 to 2824	2289
5	Field bean	18	1 to 4	18	0.25 to 1.5	Cal.	22.2	9.2 to 11.5	69 to 96	94.4	2389 to 2864	2639
6	Maize	15	1 to 5	15	0.5 to1.75	S.z, S.o, R.d	46.7	9.2 to 11.2	88 to95	73.3	2095 to 2746	2490
7	Green gram	14	1 to 8	14	0.5 to 1.75	Cal.	50.0	9.2 to 10.8	31 to 96	71.4	2224 to 2852	2574
8	Pigeon Pea	7	2 to 3	7	0.5 to 1.75	Cal.	42.9	9.8 to 11.2	72 to 94	85.7	2309-2714	2598
9	Horse gram	1	4	1	1.75	Cal.	100	10.5	95	100.0	2445	

Insect Species:	
R.d - *Rhyzopertha domoinica* (Lesser grain borer)	S.c - *Sitotroga cerealella* (Paddy or Angoumois grain moth)
S.o - *Sitophilus oryzae* (Rice weevil)	T.c - *Tribolium castaneum* (Red flour beetle)
S.z - *Sitophilus zeamais* (Maize weevil)	Cal - *Callosobruchus sp.* (Pulse beetle)

Table-1.9: Survey and evaluation of seed health status of farmer's saved seed with respect to insect infestation (PJTSAU, Hyderabad)

Sl No.	Location	Crop/ variety	Storage period (Months)	No: of samples collected	No: of samples infected	Name of insects present	Per cent seed damage (range)	Per cent seed sample with seed damage beyond permissible limit	Seed Moisture (%) (range)	Mean Seed Germination (%) with range in parenthesis	Per cent seed sample with seed germination within permissible limit	Mean vigour index (with range)
1	Nizamabad	Paddy	3	4	NIL	NIL	NIL	NIL	11.2-11.8	95-98	100	1234-1354
2	Nizamabad	Paddy	12	11	9	A,R,T	0.35-1.35%	45.5	11.3-12.5	88-97	100	1124-1534
3	Adilabad	Paddy	12	11	11	A,R,T	6.24-10.89%	100	12.0-14.2	76-95	91	1089-1453
4	Nalgonda	Paddy	12	7	7	A,R,T	1.25-5.6%	100	11.8-14.2	84-92	100	1262-1489
5	Nalgonda	Paddy	18	2	2	A,R,T	4.38-4.65	100	11.5-12.5	80-82	100	989-1223
6	Medak	Paddy	12	5	5	A,R,T,RW, STB	2.34-7.25%	100	12.4-13.5	84-94	100	1161-1462
7	Medak	Paddy	18	18	18	A,R,T,RW, STB	2.56-15.24%	100	11.8-13.9	71-79	0	998-1284
8	Karimnagar	Paddy	12	12	12	A,R,T	0.21-8.98%	92.3	11.2-12.35	81-88	100	1335-1654
9	Ranga reddy	Paddy	12	10	10	A,R,T,RW, STB	1.02-6.45%	100	10.2-11.8	82-87	100	1145-1624
1	Nizamabad	Soybean	12	15	0	0	0	NIL	7.4-8.0	45-82	20	809-1764
2	Medak	Soybean	12	15	0	0	0	NIL	7.1-7.8	48-76	13	865-1146
1	Medak	Bengalgram	12	15	0	0	0	NIL	9.5-10.5	84-100	93	1524-2179

*R- *Rhyzopertha dominica;* A- Angoumois grain moth T-*Tribolium castaneum* RW-Rice weevil STB- Saw toothed beetle

Table-1.10: Survey and evaluation of seed health status of farmer's saved seed with respect to insect infestation (PAJANCOA, Karaikal)

Sl. No.	Location	Crop/ variety	Storage period (Month)	No. of samples collected	No. of samples infested	Name of insects present	Per cent seed damage (range)	Seed sample with seed damage beyond permissible limit	Seed moisture (%) (range)	Seed germination (%) (range)	Seed sample with seed germination above IMSCS	Vigour index
1	Puducherry	Paddy	**6-9**	30	30	R, S	0-90	96.7	10.3-21.1	85.3 (15-99)	70	1882
2	Karaikal	Paddy	6-9	16	16	R, S	2.75-61.50	100	12-14.3	82.3 (73-98)	62.5	2381
3	Mahe	Paddy	6-9	5	5	R, S	0.25-1.50	60	14.5-17.4	57 (43-77)	0	1372

**R- Rhyzopertha dominica; S- Sitotroga cerealella*

Table- 1.11: Survey and evaluation of seed health status of farmers saved seed of wheat seed with respect to insect infestation at IISS, MAU

S No	Location	Crop/ variety	Storage period (Month)	Number of samples collected	Storage structure used	Number of samples infected	Name of insects present	Per cent seed damage (range)	Per cent seed sample with seed damage beyond permissible limit	Seed moisture (%) (range)	Mean Seed germination (%) with range in parenthesis	Per cent seed sample with seed germination within permissible limit	Mean vigour index (with range)
1	Kushmaur	Wheat	6	27	Seed bin; HDPE bag, Gunny Bag	3	*Sitophilus oryzae*	0.5 to 6.25	7.41	9.7 - 14.3	86 (38 - 98)	66.7	2441 (715-3386)
2	Ohnaich	Wheat	6	31	Seed bin; HDPE bag; Gunny bag	3	*Sitophilus oryzae*	1.25 to 2.00	9.68	9.6 - 14.7	87 (62 - 95)	77.4	2594 (1645-3179)
3	Rahajaniya	Wheat	6	11	Seed bin; HDPE bag; Gunny bag	0	*Nil*	Nil	Nil	9.8 - 13.6	90 (71 -99)	90.9	2581 (2233-3180)
4	Kanderayapur	Wheat	6	12	Gunny bag	1	*Tribolium*	3	8.33	9.2-13.8	86 (61-96)	66.7	2215 (725-3090)
5	Gokulpura	Wheat	6	8	HDPE bag; Gunny bag	0	*Nil*	Nil	Nil	11.2 - 13.8	95 (93- 98)	100.0	2850 (2274-3363)

6	Others	Wheat	6	11	HDPE bag; Gunny bag	1	*Sitophilus oryzae*	2	9.09	9.8-12.6	88 (73-98)	72.7	2451 (694-3463)

ITKs practiced for seed storage
Seeds mixed with ash powder @ 2 kg/40 kg seeds and stacked bags on straw
Seeds mixed with salt @ 200 gm + Garlic @ 100 gm/40 kg seeds and stacked bags on straw
Seeds mixed with dry chilly @ 20 gm + garlic @ 100 gm/40 kg seeds
Seeds mixed with neem leaves in a seed bin

Table-1.12: Survey and evaluation of seed health status of farmer's saved seed with respect to insect infestation (CSAUA&T, Kanpur)

Sl. No.	Location	Crop/ varieties	Storage period (Months)	No. of samples collected	No of samples infested	Name of species present	Seed moisture range %	Seed damage % range	Seed germination % (range)	Vigour range
1.	Aligarh	Paddy	7	26	11	*Sitotroga cerealella, Rhizopertha dominica, Oryzaephilus surinamensis, Trogoderma granarium,*	13.2-14.5	0.25-2.0	3-96	54-2470
2.	Shahajahanpur	Paddy	7	30	18		12.8-14.4	0.25-1.0	44-88	666-2024
3.	Bareilly	Paddy	7	30	12		12.4-13.9	0.25-0.75	65-88	1201-1944
4.	Amethi	Paddy	7	30	12		12.1-14.3	0.25-1.0	21-95	306-2008
5.	Unnao	Wheat	7	25	37		9.9-12.9	0.25-30	67-96	1619-2123
6.	Hardoi	Wheat	7	15	10		9.7-11.9	0.25-3.75	65-92	504-2248
7.	Mainpuri	Wheat	7	15	11		10-12.9	0.25-1.0	88-97	1626-2208

Table-1.13: Survey and evaluation of seed health status of farmer's saved seed with respect to insect infestation (UAS, Dharwad)

Sl No.	District	Crop/ variety	No. of samples collected	Storage period (Month)	Moisture content (%)	Sample infested (%)	Percent Insect damage (range)	Seed sample with seed damage beyond permissible limit (%)	Seed germination (%) (range)	Per cent Seed sample with seed germination above IMSCS	Vigour Index
1.	Belagavi	Soybean	14	3 to 7	7.5 to 11	100	0.50 to 5.0	57.1	56 to 86	78.6	1025 to 2107
2.	Dharwad	Soybean	16	2 to 7	6.2 to 12.1	100	0.50 to 5.0	62.5	75.6 to 90.1	100.0	1438 to 2045
3.	Gadag	Soybean	24	2 to 8	9.2 to 15.2	0.0	-	0.0	60 to 85	75.0	1023 to 2195
4.	Haveri	Soybean	46	2 to 7	7.3 to 14.5	10.9	0.75 to 3.75	6.5	65 to 90	95.7	1000 to 1989
5.	Dharwad	Bengal gram	88	2 to 8	7 to 13.5	13.6	0.25 to 13.0	84.1	60.5 to 90.6	13.6	954 to 2955
6.	Belagavi	Bengal gram	12	2 to 7	9.5 to 13.5	100.0	1.25 to 10.25	100.0	63 to 89	25.0	1266 to 2857

Experiment 2: Effect of carbon dioxide (CO_2) treatment on the control of storage insect pests and the seed quality attributes under ambient conditions.

Year of start: 2010

Objectives:

- To assess the effect of carbon dioxide (CO_2) treatment on the mortality/survival of storage insect pest under ambient conditions.
- To monitor effect of carbon dioxide (CO_2) treatment on seed quality attributes particularly seed viability and vigour after 3, 6, 9 and 12 months of storage under carbon dioxide (CO_2) atmosphere.

Crop seed	Centre
Pearl millet	JAU, Jamnagar;(Rhyzopertha sp.)
Sorghum	TNAU, Coimbatore, (Sitophilus sp.)

Treatments:

A. Treatment:

T_1 : Normal air treatment (untreated control)
T_2 : Carbon dioxide (CO_2) @ 30% of the volume
T_3 : Carbon dioxide (CO_2) @ 40% of the volume
T_4 : Carbon dioxide (CO_2) @ 50% of the volume

B. Exposure period (P) in months:

P_1 : 03
P_2 : 06
P_3: 09
P_4: 12

Replication: 3 **Design:** FCRD

Observations to be recorded at the end of each storage period

- *Percent damaged seed (insect infestation).*
- *Germination of undamaged seed*
- *Seed moisture content*
- *Number of live/dead insects in the representative sample*

Results: (Table 2.1)

Sorghum

TNAU, Coimbatore

Results obtained after three months of storage showed that there was no insect damage in 50% CO_2 treatments whereas 40% and 30% CO_2 treatment also resulted very low insect damage (0.1% and 0.3%).All CO_2treatments maintained seed germination above IMSCS whereas normal air treatment recorded only 63% seed germination and 6.03% insect damage. After six months of storage only 50% CO_2 treatments restricted insect damage (ID-0.35%) within permissible limit but none of the CO_2 treatments was capable of maintaining seed germination above IMSCS (70-72%). Control recorded 18.3% seed germination and 44.1% insect damage after six months of storage.Although 50% CO_2 treatments restricted insect damage (ID-0.46%) within permissible limit up to 12 months of storage but seed germination was below IMSCS.

Conclusion:

Based on results obtained atTNAU, Coimbatore it is evident that 50% CO_2 treatment can provide effective protection against *R. dominica* up to twelve months of storage. However, drop in seed germination might be due to the initial poor quality of seed as seed germination deteriorated faster in normal air treatment also.

Table 2.1: Effect of carbon dioxide (CO_2) treatment on storage insect pests and seed quality attributes of sorghum under ambient conditions at TNAU, Coimbatore.

Storage duration	3 months		6 months		9 months		12 months	
Treatments	G (%)	ID (%)	G (%)	ID (%)	G (%)	ID (%)	G (%)	ID (%)
Control	63 (52.74)	6.03 (14.17)	18.3 (25.30)	44.13 (42.22)	0.0 (2.86)	100.0 (87.13)	0.0 (2.86)	100.0 (87.13)
30% CO_2	75 (60.2)	0.3 (3.11)	70.3 (56.99)	1.50 (6.75)	65.3 (53.93)	1.28 (6.47)	50.3 (45.19)	1.0 (5.70)
40% CO_2	76 (60.45)	0.1 (2.41)	72.0 (58.05)	1.26 (6.29)	65.3 (53.93)	0.94 (5.52)	51.7 (45.95)	1.0 (5.73)
50% CO_2	76 (60.45)	0.0 (2.87)	72.3 (58.26)	0.35 (3.19)	65.7 (54.13)	0.34 (3.29)	50.1 (45.38)	0.46 (3.73)
$CD_{0.05}$	1.06	1.59	2.19	3.22	0.98	1.24	0.53	1.53

G: Germination; ID: Insect Damage

Experiment 3: Efficacy of insecticides and botanicals against storage insects of seeds and their influence on seed viability during storage under ambient condition.

Crop	Centre
Wheat	SKNAU, Jobner; ICAR-IISS, Mau; NSRTC, Varanasi
Maize	TNAU, Coimbatore
Paddy	OUAT, Bhubaneswar; AAU, Jorhat;PJTSAU, Hyderabad; PAJANCOA,Karaikal
Pigeon pea	NDUAT, Faizabad; PDKV, Akola
Cowpea	UAS, Bangalore
Chickpea	PJTSAU, Hyderabad; JAU, Jamnagar;
Black gram	TNAU, Coimbatore;PAJANCOA,Karaikal
Field pea	CSAUAT, Kanpur

Objectives

- To evaluate insecticides/ botanicals against major storage insect-pests damaging seeds.
- Study of the storability of treated seeds.

Year of Start: 2015

Treatments:

A. Insecticides/botanicals

1. Emamectin benzoate @ 2ppm (40.0mg/kg seed)
2. Deltamethrin @ 1ppm (0.04 ml/kg seed)
3. NeemAzal 10000ppm @ 1.5ml/kg seed (=15 mg Azadirachtin/kg seed)
4. Karanj (*Pongamia pinnata*) oil @5ml/kg seed
5. Citronella oil @ 5 ml/kg of seed
6. *Acorus calamus* TNAU Formulation @10ml/kg
7. Untreated control

B. Packaging Material: Gunny bag-lets of 2 kg capacity

Replications: 3 **Design:** CRD

Results- (Tables 3.1 to 3.4)

A. Wheat

SKNAU, Jobner

After three months of storage, all the seed treatments maintained significantly better seed germination (94-98%) compared to control (54.7%) and chemical insecticides provided complete protection (ID-nil) against storage insects. Although tested botanicals recorded significantly low insect damage (1.33-2.66%) compared to control (ID-36%) but insect damage was beyond permissible limit after three months of storage. However, among the botanicals *Acorus calamus* TNAU formulation recorded lowest insect damage (1.33%) after three months of storage.

IISS, Mau

All the seed treatments except karanj oil maintained 85-87.6% seed germination (above IMSCS) up to six month of storage. Among the botanicals, *Acorus calamus* TNAU formulation andneemazal restricted insect damage within permissible limit up to six months of storage whilecontrol recorded 4.6% insect damage and 85.6% seed germination after six months of storage. However, *Acorus calamus* TNAU formulation recorded highest seed germination (87.3%) and lowest insect damage (0.31%) among the botanicals. Although only emamectin benzoate restricted insect damage (0.21%) within permissible limit after nine months of storage but all treatments failed to maintain seed germination (seed germination 72-74%) above IMSCS. All botanicals failed to meet both the standards of seed germination and insect damage.

NSRTC, Varanasi

All the seed treatments maintained 85.6-90.0% seed germination (above IMSCS) after three months of storage and restricted insect damage (0.0-0.3%) within permissible limit. Among the botanicals *Acorus calamus* TNAU formulation, karanj oil and citronella oil provided complete protection up to three months of storage while control recorded 0.3% insect damage after three months of storage.

B. Maize

TNAU, Coimbatore

After three months of storage all the treatments including control had insect damage within permissible limit (<1.0%) but none of the treatments maintained seed germination above IMSCS. After six months storage among the botanicals *Acorus calamus* formulation recorded least insect damage (1.17%) and was significantly better than other botanicals as well as control (ID 11.7%) in terms of insect damage.

C. Paddy

AAU, Jorhat

All the treatments except control maintained seed germination above IMSCS (80-81.7%) after nine months of storage. Among the botanicals only *Acorus calamus* TNAU formulation restricted insect damage within permissible limit. Control recorded 77.7% seed germination and 5.0% insect damage after nine months of storage. After twelve months of storage although *Acorus calamus* TNAU formulation recorded least insect damage (0.83%) among the botanicals but none of the treatments could maintain seed germination above IMSCS. Control recorded 64% seed germination and 8.4% insect damage after twelve months of storage.

PAJANCOA, Karaikal

All the treatments were significantly better than control and maintained seed germination above IMSCS upto four months of storage and all botanicals except neemazal restricted insect damage within permissible limit. Among the botanicals *Acorus Calamus* TNAU formulation maintained highest seed germination (86%) and recorded lowest insect damage (0.91%) while control recorded 75% seed germination and 10.2%insect damage after six months of storage.

PJTSAU, Hyderabad

All the treatments maintained seed germination above IMSCS after three months of storage. All the seed treatments except neemazal restricted insect damage (0.10-0.23%) within permissible limit while control recorded1.53% insect damage after three months of storage. Among the botanicals, only *Acorus calamus* TNAU formulation restricted insect damage after six months of storage and maintained seed germination above IMSCS. Control recorded 89.3% seed germination and 1.83% insect damage after six months of storage.

D. Pigeon pea

NDUAT, Faizabad

The results obtained after three months of storage revealed that all the botanicals restricted insect damage (0.66-1.0%) within permissible limit and maintained seed germination above IMSCS (83.3-86.7%) while control recorded 82% seed germination and 2.33% insect damage. Among the botanicals *Acorus calamus* TNAU formulation andneem formulation recorded least insect damage (0.66%) while and karanj oil and citronella oil recorded 1.0% insect damage after three months of storage. After six months of storage all the botanicals maintained seed germination above IMSCS but none could restrict insect damage (1.33-2.33%) within permissible limit. Control recorded 77.3% seed germination and 3.66% insect damage after six months of storage.

PDKV, Akola

All the seed treatments (botanicals and insecticides) restricted insect damage (0.33-0.83%) within permissible limit and maintained seed germination (76.3-83.7%) above IMSCS up to twelve months of storage. Among the botanicals *Acorus calamus* TNAU formulation recorded lowest insect damage (0.53%) and highest seed germination (81%) after twelve months of storage. Control recorded 71% seed germination and 1.23% insect damage after twelve months of storage.

E.Cowpea

UAS, Bangalore

All seed treatments except citronella oil maintained seed germination (92.3-95.7) above IMSCS after six months of storage. Among the botanicals neem formulation 10000 ppm @1.5ml/kg seed and *Acorus calamus* TNAU formulation provided complete protection (ID-nil) up to six months of storage. Control recorded 0.58 % insect damage after six months of storage. All the treatments except citronella oil maintained seed germination above IMSCS and all the botanicals restricted insect damage (0.08-1.0%) within permissible limit after twelve months of storage. Among the botanicals neem formulation recorded lowest insect damage (ID-0.17%) followed by *Acorus calamus* TNAU formulation (ID-0.33%) compared to control (ID-2.0%) after twelve months of storage.

F. Chick pea

PJTSAU, Hyderabad

All the seed treatments restricted insect damage within permissible limit up to twelve months of storage but among the botanicals only *Acorus calamus* TNAU formulation maintained seed germination above IMSCS (85%).Control recorded 80% seed germination and 0.78% insect damage after twelve months of storage.

JAU, Jamnagar

All the treatments maintained seed germination above IMSCS up to six months of storage. All seed treatments remained free from any insect damage while control recorded 3.3% insect damage after six months of storage. All the treatments maintained seed germination above IMSCS up to nine months of storage but none of the botanicals could restrict insect damage within permissible limit. However, among the botanicals *Acorus calamus* TNAU formulation recorded least insect damage (1.67%) compared to others (2.67-3.33%). Control recorded 76% seed germination and 14.3% insect damage after nine months of storage.

G. Black gram

TNAU, Coimbatore

All the treatments maintained seed germination (95-99%) above IMSCS and restricted insect damage (ID 0.0-0.02%) within permissible limit after three months of storage while control recorded 0.17% insect damage. After six months of storage, all the seed treatments maintained seed germination above IMSCS (91-95%) but none of the treatments was capable of restricting insect damage (ID 2.0-9.1%) within permissible limit. Control recorded 80% seed germination and 25.7% insect damage after six months of storage. However, *Acorus calamus* TNAU formulation (ID 2.4%) was significantly better than other botanicals in terms of insect control.

Cumulative mortality data of adults released on six months stored treated seeds revealed that among the botanicals, only *Acorus calamus* TNAU formulation and neemazal recorded 50-53% insect mortality within 7 days of release.

PAJANCOA, Karaikal

Acorus Calamus TNAU formulation and karanj oil as well as other chemical insecticides restricted insect damage within permissible limit and maintained seed germination above IMSCS up to eight months of storage. In control,almost all seeds were damaged by bruchid after eight months of storage.

H. Field pea

CSAUA&T, Kanpur

After nine months of storage, all treatments maintained seed germination above IMSCS and restricted insect damage within permissible limit. Control recorded 78% seed germination and 2.33% insect damage. Among the botanicals *Acorus calamus* TNAU formulation and karanj oil recorded least insect damage (0.66%) compared to other botanicals.

I. Mung bean

OUA&T, Bhubaneswar

All the seed treatments maintained seed germination (89.3-95.7%) above IMSCS after three months of storage. All the seed treatments except karanj oil restricted insect damage within permissible limit. Among the botanicals *Acorus calamus* TNAU formulation recorded least insect damage (0.50%) followed by neemazal and karanj oil (ID- 0.67%) while control recorded 82.3% seed germination and 3.17% insect damage after three months of storage. Among the botanicals, seed treatment with *Acorus calamus* TNAU formulation and neemazal recorded seed germination above IMSCS after six months storage but *Acorus calamus* TNAU formulation provided least insect damage (1.17%) significantly better than the control (ID 9.5%).

Cumulative mortality of adults released on six months stored treated seeds was 66.7% in case of *Acorus calamus* formulation and 50-60% in other botanicals within 7 days of release.

Conclusion: Various botanicals likekaranj oil, citronella oil and neem formulation (neemazal 10000ppm) were tested along with *Acorus calamus* TNAU formulation. Although there were variations in results from centre to centre, in most of the crops, *Acorus calamus* formulation recorded least insect damage among the botanicals and at par with neem formulation. Hence, *Acorus calamus* formulation @ 10 ml/kg seed can be used for management of storage insects up to 3-6 months in most of the crops without affecting seed germination.

Table 3.1: Effective seed treatment botanicals and storage periods for different crops at various centres

Crop	Centre	Safe period of storage (months)	Effective botanicals
Wheat	SKNAU, Jobner	-	None of the botanicals
	IISS, Mau	6	*Acorus calamus* TNAU formulation, neemazal
	NSRTC, Varanasi	3	All treatments
Maize	TNAU, Coimbatore	-	None of the botanicals
Paddy	AAU, Jorhat	9	*Acorus calamus* TNAU formulation
	PJTSAU, Hyderabad	6	*Acorus calamus* TNAU formulation
	PAJANCOA,Karaikal	4	All botanicals except neemazal.
Pigeon pea	NDUA&T, Faizabad	3	*Acorus calamus* formulation, neemazal karanj oil, and citronella oil
	PDKV, Akola;	12	All treatments
Mung bean	OUA&T, Bhubaneswar	3	*Acorus calamus* formulation and neemazal
Chick pea	PJTSAU, Hyderabad	12	*Acorus calamus* formulation
	JAU, Jamnagar	6	All treatments
Black gram	TNAU, Coimbatore	3	All treatments
	PAJANCOA,Karaikal	8	*Acorus calamus* formulation and Karanj oil
Field pea	CSAUA&T, Kanpur	9	All treatments
Cow pea	UAS, Bangalore	12	Neem formulation, *Acorus calamus* formulation and Karanj oil

Table 3.2: Effect of insecticides and botanicals against storage insects of seeds and their influence on seed viability during storage under ambient conditionin wheat, maize and paddy

Crop	**Wheat**								**Maize**				**Paddy**											
Centres	**SKNAU, Jobner**		**IISS, Mau**				**NSRTC, Varanasi**		**TNAU, Coimbatore**				**PAJANCOA, Karaikal**				**AAU, Assam**				**PJTSAU, Hyderabad**			
Storage duration	3 months		6 months		9 month		3 month		3 months		6 months		4 months		6 months		9 months		12 months		3 months		6 months	
Treatments	*G	*ID	G	ID	G	ID	G	ID	G	ID	G	ID	G	ID	G	ID	G	ID	G	ID	G	ID	G	ID
T_1: Emamectin benzoate 5 SG @ 2 ppm (40.0 mg/kg seed)	98.3	0.00	87.6	0.02	72.0	0.21	86.9	0.02	83	0.01	88	1.07	92	0.30	85	1.03	81.7	0.08	75.3	0.17	100	0.00	98.3	0.00
T2: Deltamethrin 2.8 EC @ 1.0 ppm (0.04 ml/kg seed)	97.0	0.00	87.3	0.38	71.6	4.22	88.2	0.00	85	0.00	85	0.93	91	0.55	79	2.97	81.0	0.00	75.3	0.08	99.7	0.00	97.7	0.10
T_3:Neem Azal 10000ppm @ 1.5ml/kg seed	95.3	2.00	85.0	0.50	72.6	5.46	88.4	0.03	86	0.03	76	4.07	89	0.97	82	2.30	80.7	0.67	74.0	1.08	99.3	0.67	98.3	0.83
T_4: Pongamia pinnata oil @5ml/kg seed	94.0	2.66	86.0	0.98	73.6	5.48	87.8	0.00	85	0.00	77	3.47	88	0.20	76	1.33	80.0	0.75	74.3	1.17	98.0	0.23	97.7	0.70
T_5: Citronella oil @ 5 ml/kg of seed	96.0	1.66	85.3	0.62	74.3	6.71	85.6	0.00	84	0.01	77	3.70	84	0.24	69	1.21	81.3	1.00	75.3	1.83	96.7	0.20	97.3	0.73
T_6: Acorus calamus TNAU Formulation @10ml/kg	97.0	1.33	87.3	0.31	72.0	2.32	88.1	0.00	85	0.01	85	1.17	95	0.30	86	0.91	81.7	0.33	74.0	0.83	98.7	0.10	97.0	0.33
T_7: Untreated control	58.7	36.0	85.6	4.60	72.3	4.53	90.0	0.05	88	0.12	69	11.7	89	3.64	75	10.2	77.7	5.00	64.0	8.40	95.3	1.53	89.7	1.83

***G- per cent seed germination and ID- per cent insect damage**

Table 3.3: Effect of insecticides and botanicals against storage insects of seeds and their influence on seed viability during storage under ambient condition in black gram, green gram, field pea and cowpea

Treatments	Black gram								Green gram				Field pea		Cow pea					
	TNAU, Coimbatore				PAJANCOA, Karaikal				OUAT, Bhubaneswar				CSAUAT, Kanpur		UAS, Bangalore					
	3 months		6 months		6 months		8 months		3 months		6 months		9 months		6 months		9 months		12 months	
	G	ID	G	ID	G	ID	G	ID	G	ID	G	ID	G	ID	G	ID	G	ID	G	ID
T_1: Emamectin benzoate (Proclaim 5 SG) @ 2 ppm (40.0 mg/kg seed)	98	0.01	92	2.00	92	0.42	86	0.24	95.7	0.00	83.0	0.67	88.0	0.66	95.7	0.00	94.7	0.00	93.0	0.08
T_2: Deltamethrin 2. 8 EC @ 1.0 ppm (0.04 ml/kg seed)	97	0.00	94	2.30	87	1.33	89	0.24	94.0	0.33	81.3	0.67	89.3	1.0	95.0	0.00	94.0	0.08	92.3	0.25
T_3: Neem formulation 10000 ppm @1.5ml/kg seed (=15mg azadirachtin/kg seed)	99	0.02	91	6.00	71	8.13	8	88	90.7	0.67	75.3	1.83	85.7	0.83	94.3	0.00	94.0	0.08	91.0	0.17
T_4: Karanj (Pongamia pinnata) oil @ 5 ml/kg seed	95	0.00	94	5.10	73	0.36	84	0.18	89.3	1.33	71.7	3.50	86.0	0.66	92.3	0.08	92.7	0.25	91.3	0.42
T_5: Citronella oil @ 5 ml/kg of seed	95	0.00	93	9.10	86	0.36	5	90	90.7	0.67	74.0	2.33	82.3	0.83	74.0	0.08	70.0	0.42	67.3	1.00
T_6: Acorus calamus TNAU formulation @10 ml/kg	97	0.00	95	2.40	90	0.55	90	0.42	93.0	0.50	80.7	1.17	90.0	0.66	93.7	0.00	93.3	0.08	91.7	0.33
T_7: Untreated control	94	0.17	80	25.70	34	48.4	2	100	82.3	3.17	68.0	9.50	78.0	2.33	90.3	0.58	91.0	1.08	90.3	2.00

G- per cent seed germination and ID- per cent insect damage

Table 3.4: Effect of insecticides and botanicals against storage insects of seeds and their influence on seed viability during storage under ambient condition in chickpea and pigeon pea

	Chickpea								Pigeon pea							
Treatments	**JAU, Jamnagar**				**PJTSAU, Hyderabad**				**NDUAT, Faizabad**				**PDKV, Akola**			
	6 months		9 months		9 months		12 months		3 months		6 months		9 months		12 months	
	G	ID	G	ID	G	ID	G	ID	G	ID	G	ID	G	ID	G	ID
T_1= Emamectin benzoate (Proclaim 5 SG) @ 2 ppm (40.0 mg/kg seed)	90.0	0.0	88.0	0.00	93.3	0.00	95.7	0.00	89.0	0.00	86.7	0.33	85.0	0.26	83.7	0.33
T_2= Deltamethrin 2. 8 EC @ 1.0 ppm (0.04 ml/kg seed)	89.7	0.0	87.7	0.00	92.7	0.00	90.0	0.00	87.0	0.33	85.3	0.66	83.3	0.36	81.7	0.5
T_3= Neem formulation 10000 ppm @1.5ml/kg seed (=15mg azadirachtin/kg seed)	89.3	0.0	86.0	3.00	84.7	0.00	83.3	0.00	86.7	0.66	85.0	1.33	81.0	0.53	79.3	0.66
T_4= Karanj (Pongamia pinnata) oil @ 5 ml/kg seed	89.3	0.0	86.3	2.67	81.7	0.00	80.3	0.00	85.0	0.66	83.7	1.66	78.7	0.63	76.3	0.80
T_5= Citronella oil @ 5 ml/kg of seed	89.0	0.0	86.7	3.33	85.0	0.00	83.7	0.00	83.3	1.00	81.7	2.33	80.7	0.66	78.7	0.83
T_6= Acorus calamus TNAU formulation @10 ml/kg	89.0	0.0	87.0	1.67	88.3	0.00	85.0	0.00	86.3	0.66	84.0	1.66	82.7	0.4	81.0	0.53
T_7= Untreated control	88.3	3.33	76.0	14.3	88.0	0.28	80.3	0.78	82.0	2.33	77.3	3.66	74.3	1.00	71.0	1.23

G- per cent seed germination and ID- per cent insect damage

Experiment 4: Management of groundnut pod borer (*Caryedon serratus*) in groundnut pods during storage

Objectives:

1. To know the sources of infestation and alternate host plants existing in groundnut growing areas of different states
2. Management by pod treatments with new insecticides molecules

Year of Start: 2014

Crop	Centres
Groundnut	JAU, Jamnagar, PDKV, Akola, MPKV, Rahuri, PJTSAU, Hyderabad

Treatments:

1. Emamectin benzoate (Proclaim 5 SG) @ 2ppm (40mg/kg pod)
2. Spinosad (Tracer 45 SC)@2ppm (4.4mg/kg pod)
3. Thiodicarb (Larvin 75 WP)@ 2ppm (2.7 mg/kg pod)
4. Rynaxypyr (Coragen 20 SC) @2ppm (0.01 ml/kg pod)
5. Profenofos (Curacron 50 EC) @2ppm (0.004 ml/kg pod)
6. Novaluron (Rimon 10 EC)@ 5ppm (0.05 ml/kg pod)
7. Deltamethrin 2.8Ec @ 1ppm (0.04 ml/kg pod)
8. Untreated control

Packaging material: Gunny baglets of 2 kg capacity

Replications: 3 Design: CRD

Results (Tables-4.1-4.2)

PJTSAU, Hyderabad

All the pod treatments provided complete protection up to nine months of storage and all treatments except novaluron maintained seed germination above IMSCS (71-81%) while control recorded 70.7% seed germination and 0.5% insect damage after nine months storage.

Although some of the treatments (emamectin benzoate, spinosad,thiodicarb, profenofos and deltamethrin) provided adequate protection up to 12 months of storage, but per cent seed germination (34-61%) was far below IMSCS. Control recorded 28% seed germination and 1.67% insect damage after 12 months of storage.

JAU, Jamnagar

Insect damage was not found in any of the pod treatments with insecticides up to nine months of storage and all these treatments maintained seed germination (75-79%) above IMSCS. Control recorded 71% seed germination and 15.3% insect damage after nine months of storage. Although emamectin benzoate, spinosad, profenofos and deltamethrin restricted insect damage (0.33-1.0%) within permissible limit up to 12 months of storage but only emamectin benzoate maintained seed germination above IMSCS. Control recorded 56.7% seed germination and 28.0% insect damage after 12 months of storage.

MPKV, Rahuri

All insecticidal tratments maintained seed germination above IMSCS and restricted insect damage within permissible limit up to six months of storage. Deltamethrin provided complete protection against groundnut pod borer up to nine months of storage and was closely followed by emamectin benzoateand spinosad (0.33%).Only these three treatments maintained seed germination (74-76%) above IMSCS up to nine months. Control recorded 62.0% seed germination and 7.33% insect damage after nine months of storage.After twelve months of storage all treatments failed to meet both the standards.

PDKV, Akola

All the treatments restricted insect damage within permissible limit (ID 0.63-0.97%) and maintained seed germination above IMSCS (81-85%) upto six months of storage while control recorded 73% seed germination and 1.7% insect damage. After nine months of storage some of the treatments maintained seed germination above IMSCS but all treatments failed to restrict insect damage within permissible limit.

Conclusion:

Groundnut pod borercauses great problem in storage of groundnut pods for seed purpose. The results indicated that almost all the insecticides were effective in managing pod borer but emamectin benzoate, spinosad and deltamethrin were highly effective as they provided better protection upto 6-9 months of storage and maintained seed germination above IMSCS.

Table 4.1: Effective pod treatment and safe storage period of groundnut pods at various centres

Centre	Safe period of storage (months)	Effective botanicals
PJTSAU, Hyderabad	9	All treatments
JAU, Jamnagar	12	Emamectin benzoate
MPKV, Rahuri	9	Deltamethrin, emamectin benzoate, spinosad
PDKV, Akola	6	All treatments

Table 4.2: Effect of pod treatment son per cent seed germination and percent insect damage by groundnut pod borer (*Caryedon serratus*) in groundnut during storage

Sl. No.	Centres	PJTSAU, Hyderabad				JAU, Jamnagar				MPKV, Rahuri				PDKV, Akola			
		9 months		12 months		9 months		12 months		6 months		9 months		6 months		9 months	
	Treatments	G	ID	G	ID	G	ID	G	ID	G	ID	G	ID	G	ID	G	ID
1	Emamectin benzoate (40 mg/kg)	77.7	0.0	52.3	0.00	79.3	0.00	70.7	0.67	83.3	0.00	75.0	0.33	82.7	0.63	74.3	1.5
2	Spinosad (4.4 mg/kg)	77.3	0.0	60.7	0.00	77.7	0.00	69.3	1.00	81.7	0.00	73.7	0.33	82.7	0.73	73.7	1.7
3	Thiodicarb (2.7 mg/kg)	76.3	0.0	34.0	0.55	75.3	0.00	68.3	1.33	77.0	0.33	68.0	1.67	83.0	0.97	69.0	1.9
4	Rynaxypyr (0.01 ml/kg)	71.0	0.0	44.7	1.15	77.0	0.00	68.7	1.67	76.0	0.33	67.0	2.67	81.7	0.97	69.7	1.9
5	Profenofos (0.004 ml/kg)	71.0	0.0	33.7	0.00	76.7	0.00	67.7	1.00	77.0	0.00	67.0	1.33	81.0	0.90	70.0	1.9
6	Novaluron (0.05 ml/kg)	68.0	0.0	46.0	1.23	75.0	0.00	66.7	2.33	75.0	0.33	66.0	1.33	81.3	0.80	67.7	1.9
7	Deltamethrin (0.04 ml/kg)	81.7	0.0	53.7	0.00	77.3	0.00	68.3	0.33	84.0	0.00	76.3	0.00	84.7	0.80	73.7	1.9
8	Untreated control	70.7	0.5	28.0	1.67	70.7	15.33	56.7	28.00	71.0	4.33	62.0	7.33	72.7	1.70	61.3	3.6

G- per cent seed germination and ID- per cent insect damage

Experiment 5: Evaluation of pre-harvest spraying of insecticides for management of pulse beetle (*Callosobruchus sp*)

Objective:

- To evaluate efficacy of pre-harvest spray of insecticides for management of field infestation of pulse beetle.

Year of Start: 2015

Crop	Centre
Green gram	OUAT, Bhubaneswar; JAU, Jamnagar
Black gram	TNAU, Coimbatore; PAJANCOA, Karaikal; AAU, Assam
Chickpea	MPKV, Rahuri; SKNAU, Jobner; NDUAT, Faizabad
Pigeon pea	UAS, Bangalore; PJTSAU, Hyderabad; PDKV, Akola

Treatments:

A. Insecticides/Botanicals

1. Emamectin benzoate @0.3ml/L (I_1)
2. Malathion dust @10kg/acre (I_2)
3. Profenofos 50EC @1ml/L(I_3)
4. Neemazal 10000ppm @1ml/L (I_4)
5. Control

B. Spraying schedule

1. Spraying at 50% pod maturity (S_1)
2. Spraying at Maturity (S_2)
3. Spraying at 50% pod maturity and maturity (S_3)

Replication: Three **Design:** Strip plot

Results (Table 5.1 - 5.11)

A. Green gram

JAU, Jamnagar;

Among the insecticides profenofos was the best treatment followed by emamectin benzoate, malathion dust and neemazal. Among the spraying schedule, sprayingat pod maturity (S_2) was better than spraying at 50%pod maturity (S_1) but both were outperformed by spraying at 50% pod maturity and maturity (S_3).There was no adult emergence within two months of storage in three treatments *viz.* one time spraying of profenofos at pod maturity(I_3S_2), twice spraying of profenofos at 50% pod maturity and maturity (I_3S_3) and twice spraying of emamectin benzoate at 50% pod maturity and maturity (I_1S_3).Control recorded 446.7 mean adult emergence within two months of storage period.

OUAT, Bhubaneswar

There were no adult emergence up to 5th week of seed storage in spraying of emamectin benzoate, neemazal and profenofos at 50% pod maturity and maturity (S_3). Spraying of emamectin benzoate at 50% pod maturity and maturity was the best treatment with 0.5% adult emergence on 8thweek of storage of green gram seed and was followed by spraying of neemazal at 50% pod maturity and maturity with 0.83% adult emergence. Spraying of profenofos at 50% pod maturity and maturity recorded 1.0% adult emergence on 8th week of storage of green gram seed while control recorded 7.7% adult emergence.

B. Black gram

TNAU, Coimbatore

Spraying of emamectin benzoate at 50% pod maturity and maturity (I_1S_3) was the best treatment with 52.3mean adult emergence within two months of storage of black gram seed and was followed by dusting of malathion at 50% pod maturity and maturity (62.3mean adult emergence) and spraying of profenofos at 50% pod maturity and maturity (73.7mean adult emergence). There was 191.7 adult emergence in control within two months of storage.

AAU,Assam

There was no adult emergence in three treatment schedule *viz.* spraying of profenofosat maturity (I_3S_2), twice spraying of profenofos at 50% maturity and maturity (I_3S_3) and dusting of malathion at 50% pod maturity and maturity (I_2S_3). Therefore,spraying of profenofos at maturity can be most economic and successful in controlling pulse beetle infestation during storage by controlling field infestation. Spraying of emamectin benzoate at 50% pod maturity and maturity (I_1S_3) was also effective in reducing adult emergence (0.08%).

C. Chickpea

MPKV,Rahuri

Spraying of profenofos at 50% pod maturity and maturity (I_3S_3) was the best treatment with no adult emergence within two months of storage of chickpea seed and was followed by spraying of profenofos at maturity (I_3S_2) with 2% mean adult emergence. Spraying of neemazal at 50% pod maturity and maturity (I_4S_3) also reduced adult emergence (2.0% adult emergence) within two months storage.

NDUAT, Faizabad

Twice spraying of insecticide at 50% pod maturity and maturity (S_3) was better than other spraying schedules irrespective of insecticide. Among the insecticides, emamectin benzoate (I_1S_3) was the best treatment with 2.3% mean adult emergence within two months of storage of chickpea seed and was followed by profenofos (2.7% mean adult emergence), neemazal (3.0%) mean adult emergence) and dusting of malathion at 50% pod maturity and maturity (3.7% mean adult emergence). There was 6.0% adult emergence in control within two months of storage.

D. Pigeon pea

UAS, Bangalore

There was no adult emergence in case of twice spraying (50% pod maturity and maturity) of emamectin benzoate (I_1S_3) up to 5 weeks of storage. Spraying of profenofos and neemazalat 50% pod maturity and maturity (S_3) recorded 0.08% and 0.17% mean adult emergence up to 6 weeks of storage. After 8 weeks of storage, twice spraying (50% pod maturity and maturity) of emamectin benzoate (I_1S_3) recorded significantly least per cent adult emergence (1.0%) followed by twice spraying (S_3) of profenofos (1.75%) and neemazal (2.58%). However, spraying of emamectin benzoate at maturity recorded 1.5% adult emergence although not significantly different from profenofos spraying.

PJTSAU, Hyderabad

Spraying of profenofos at 50% pod maturity and maturity(I_3S_3) was the best treatment with 1.13 mean adult emergence/kg seed within two months of storage of pigeon pea seed followed by spraying of emamectin benzoate at 50% pod maturity and maturity (9.44 mean adult emergence/kg seed)and dusting of malathion at 50% maturity and maturity (17.2 mean adult emergence/kg seed).Among other insecticides spraying of neemazal was also having very low adult emergence (26.6 mean adult emergence/kg seed) when spraying was done at 50% pod maturity and maturity. There was 70.7 mean adult emergence/kg seed in control within two months of storage.

PDKV, Akola

Spraying of emamectin benzoate at 50% pod maturity and maturity (I_1S_3) was the best treatment with 0.33% adult emergence within two months of storage of pigeon pea seed

Conclusion*:* There was variation in results due to difference in level of field infestation at various centres. However, in most of the centres,spraying of profenofos (50EC @1ml/L) and emamectin benzoate (5SG@0.3ml/L) at 50% pod maturity and maturity were effectivein controlling insect population during storage of pulses.

Field view of Pigeonpea

Seeds of pigeonpea infested with pulse beetle

Table 5.1: Effective pre-harvest spraying schedule of insecticides/botanicals for different crops at various centres

Crop	Centre	Insecticide/ Botanical	Spraying schedule	Remarks
Green gram	JAU, Jamnagar	Profenofos, emamectin benzoate	Profenofos at pod maturity and emamectin benzoate spraying twice at 50% pod maturity and maturity	No adult emergence
	OUAT, Bhubaneswar	Emamectin benzoate	Spraying at 50% pod maturity and maturity	Lesser no. of exit hole
Black gram	TNAU, Coimbatore	Emamectin benzoate / Malathion/ Profenofos	Spraying at 50% pod maturity and maturity	Lesser no. of exit hole
	AAU,Assam	Profenofos	Spraying of profenofos at maturity	No adult emergence
Chickpea	MPKV,Rahuri	Profenofos	Spraying at 50% pod maturity and maturity	No adult emergence
	NDUAT, Faizabad	Emamectin benzoate> Profenofos/ Neemazal	Spraying at 50% pod maturity and maturity	Lesser no. of exit hole
Pigeon pea	UAS, Bangalore	Emamectin benzoate	Spraying at 50% pod maturity and maturity	Lesser no. of exit hole

	PJTSAU, Hyderabad	Profenofos	Spraying at 50% pod maturity and maturity	Lesser no. of exit hole
	PDKV, Akola	Emamectin benzoate	Spraying at 50% pod maturity and maturity	Lesser no. of exit hole

Table 5.2: Effect of pre-harvest spraying of insecticides and botanicals on adult emergence of pulse beetle during 2 month of storage period in green gram at JAU, Jamnagar

Treatment	Adult emergence					
	Observation recorded after week of storage					
	3	4	5	6	7	8
$I_1 S_1$	0.0 (0.7)	0.00 (0.71)	1.00 (1.17)	1.67 (1.46)	3.00 (1.81)	5.67 (2.45)
$I_1 S_2$	2.0 (1.6)	6.00 (2.54)	17.33 (4.22)	29.67 5.48)	35.00 (5.92)	67.67 (8.24)
I_1S_3	0.0 (0.7)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)
$I_2 S_1$	0.0 (0.7)	1.33 1.29)	5.00 (2.34)	10.33 3.28)	15.33 (3.93)	25.67 (5.07)
$I_2 S_2$	0.0 (0.7)	2.67 (1.77)	9.33 (3.13)	20.67 4.58)	31.00 (5.59)	54.00 (7.37)
$I_2 S_3$	0.0 (0.7)	0.00 (0.71)	0.67 (1.00)	2.33 (1.68)	4.33 (2.18)	7.67 (2.84)
$I_3 S_1$	3.7 (2.0)	7.67 (2.85)	13.00 (3.66)	22.67(4.78)	32.67 (5.74)	46.67 (6.84)
I_3S_2	0.0 (0.7)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)
I_3S_3	0.0 (0.7)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)
$I_4 S_1$	0.0 (0.7)	7.33 (2.79)	17.67 (4.25)	29.33(5.45)	39.67 (6.33)	62.33 (7.90)
I_4S_2	0.0 (0.7)	5.33 (2.39)	11.33 (3.40)	25.67(5.10)	38.00 (6.18)	61.33 (7.84)
I_4S_3	0.0 (0.7)	1.33 (1.34)	6.33 (2.60)	15.00(3.89)	28.67 (5.35)	48.67 (6.97)
$I_5 S_1$	13.0 (3.7)	32.00 (5.69)	81.33 (9.04)	140.0 (11.85)	203.33 (14.27)	388.33 (19.70)
$I_5 S_2$	10.3 (3.3)	30.33 (5.55)	66.00 (8.15)	141.33(11.89)	194.33 (13.94)	356.67 (18.89)
I_5S_3	16.3 (4.1)	40.33 (6.39)	98.00 (9.92)	190.0(13.79)	299.67(17.29)	489.67(22.06)
S.Em.	0.94	0.14	0.20	0.27	0.38	0.51
C.D. at 5 %	0.27	0.41	0.60	0.79	1.11	1.47
CV %	11.24	10.43	9.77	9.39	10.99	11.21

Figures in parentheses are Square root transformed values.

I1	:	Emamectin benzoate @ 0.3 g / L	I2	:	Malathion 5 % DP @ 10 kg / acre	I3	:	Profenofos 50 EC @ 1 ml/ L
I4	:	Neemazal 10,000 ppm @ 1 ml/ L	I5	:	Control			
S1	:	Spraying at 50 per cent pod maturity	S2	:	Spraying at pod maturity	S3	:	Spraying at 50 per cent pod maturity and maturity

Table 5.3: Effect of pre-harvest spraying of insecticides and botanicals on adult emergence of pulse beetle during 8 weeks of storage in green gram at OUA&T, Bhubaneswar

Treatment		Adult emergence				
		Observation recorded after week of storage				
		4	5	6	7	8
$I_1 S_1$		0.83 (1.35)	1.33 (1.52)	2.50 (1.87)	3.67 (2.15)	4.33 (2.44)
$I_1 S_2$		0.17 (1.0)	0.33 (1.15)	0.83 (1.35)	1.5 (1.57)	2.5 (1.87)
$I_1 S_3$		0.0 (1.0)	0.0 (1.0)	0.17 (1.07)	0.33 (1.15)	0.5 (1.22)
$I_2 S_1$		1.67 (1.62)	2.33 (1.82)	3.0 (2.0)	4.83 (2.38)	5.67 (2.58)
$I_2 S_2$		0.5 (1.21)	1.0 (1.41)	2.0 (1.71)	3.17 (2.02)	4.17 (2.27)
$I_2 S_3$		0.0 (1.00)	0.33 (1.15)	0.83 (1.35)	1.5 (1.57)	1.83 (1.68)
$I_3 S_1$		0.5 (1.21)	1.33 (1.52)	2.17 (1.78)	3.33 (2.08)	4.33 (2.31)
$I_3 S_2$		0.33 (1.14)	0.67 (1.27)	1.50 (1.57)	2.33 (1.82)	3.17 (2.04)
$I_3 S_3$		0.0 (1.00)	0.0 (1.0))	0.67 (1.28)	0.83 (1.35)	1.00 (1.40)
$I_4 S_1$		1.00 (1.39)	1.83 (1.68)	3.0 (2.0)	4.0 (2.24)	5.33 (2.51)
$I_4 S_2$		0.17 (1.07)	0.50 (1.35)	1.83 (1.67)	2.67 (1.90)	3.67 (2.16)
I_4S_3		0.0 (1.0)	0.0 (1.0)	0.33 (1.15)	0.50 (1.22)	0.83 (1.35)
$I_5 S_1$		2.33 (1.82)	3.50 (2.12)	4.67 2.38)	6.0 (2.64)	8.0 (3.0)
$I_5 S_2$		2.17 (1.78)	3.33 (2.08)	4.33 (2.31)	5.33 (2.51)	7.33 (2.89)
$I_5 S_3$		2.33 (1.82)	3.17 (2.04)	4.67 (2.38)	6.0 (2.64)	7.67 (2.94)
$CD_{0.05}$	**I**	0.21	0.11	0.12	0.16	0.12
	S	0.12	0.11	0.12	0.15	0.12
	I*S	NS	0.2	0.23	0.28	0.2

Figures in parentheses are transformed values.

I1	:	Emamectin benzoate @ 0.3 g / L	I2	:	Malathion 5 % DP @ 10 kg / acre	I3	:	Profenofos 50 EC @ 1 ml/ L
I4	:	Neemazal 10,000 ppm @ 1 ml/ L	I5	:	Control			
S1	:	Spraying at 50 per cent pod maturity	S2	:	Spraying at pod maturity	S3	:	Spraying at 50 per cent pod maturity and maturity

Table 5.4: Effect of pre-harvest spraying of insecticides and botanicals on adult emergence of pulse beetle during 8 weeks of storage in black gram seed at TNAU, Coimbatore

Treatments	I1	I2	I3	I4	I5	Mean
S1	103.00*	128.33	117.00	129.00	185.67	132.60
S2	112.33	126.67	112.33	130.00	187.33	133.73
S3	52.33	62.33	73.67	103.33	202.00	98.73
Mean	89.22	105.78	101.00	120.78	191.67	121.69
	I	S	I at S	S at I		
S.Ed.	3.88	9.51	5.49	10.42		
CD (0.05)	10.78	40.92	23.22	44.82		

* - Mean of three replications
* - Total no. of adult pulse beetles emerged at weekly intervals for two months

I1	:	Emamectin benzoate @ 0.3 g / L	I2	:	Malathion 5 % DP @ 10 kg / acre	I3	:	Profenofos 50 EC @ 1 ml/ L
I4	:	Neemazal 10,000 ppm @ 1 ml/ L	I5	:	Control			
S1	:	Spraying at 50 per cent pod maturity	S2	:	Spraying at pod maturity	S3	:	Spraying at 50 per cent pod maturity and maturity

Table 5.6: Effect of pre-harvest spraying of insecticides and botanicals on adult emergence of pulse beetle in black gram during storage at AAU, Assam

Treatments	Adult emergence (%)					
	3rd week	4th week	5th week	6th week	7th week	8th Week
$I_1 S_1$	0.00	0.00	0.08	0.33	0.58	0.83
$I_1 S_2$	0.00	0.00	0.00	0.17	0.33	0.58
$I_1 S_3$	0.00	0.00	0.00	0.00	0.00	0.08
$I_2 S_1$	0.00	0.00	0.00	0.08	0.17	0.42
$I_2 S_2$	0.00	0.00	0.00	0.00	0.08	0.17
$I_2 S_3$	0.00	0.00	0.00	0.00	0.00	0.00
$I_3 S_1$	0.00	0.00	0.00	0.08	0.17	0.42
$I_3 S_2$	0.00	0.00	0.00	0.00	0.00	0.00
$I_3 S_3$	0.00	0.00	0.00	0.00	0.00	0.00
$I_4 S_1$	0.00	0.17	0.50	1.33	2.00	2.67
$I_4 S_2$	0.00	0.00	0.17	0.58	1.08	2.50
$I_4 S_3$	0.00	0.00	0.00	0.25	0.42	0.75
Control	0.17	0.67	2.33	4.00	7.67	11.67
CD 5 % (Insecticide)	-	0.125	0.177	0.520	0.626	0.79
CD 5 % (Time of Spraying)	-	0.122	0.173	0.508	0.612	0.77
CD 5 % (Insecticide x Time of spraying)	-	0.181	0.256	0.752	0.906	1.15

I1	:	Emamectin benzoate @ 0.3 g / L	I2	:	Malathion 5 % DP @ 10 kg / acre	I3	:	Profenofos 50 EC @ 1 ml/ L
I4	:	Neemazal 10,000 ppm @ 1 ml/ L	I5	:	Control			
S1	:	Spraying at 50 per cent pod maturity	S2	:	Spraying at pod maturity	S3	:	Spraying at 50 per cent pod maturity and maturity

Table 5.7: Effect of pre-harvest spraying of insecticides and botanicals on adult emergence of pulse beetle during 8 weeks of storage period in Chickpea at MPKV, Rahuri

Treatment	Adult emergence					
	Observation recorded after week of storage					
	3	4	5	6	7	8
I_1 S_1	0.00 (0.71)	2.33 (1.67)	3.33 (1.95)	4.00 (2.11)	4.67 (2.22)	6.00 (2.53)
I_1 S_2	0.00 (0.71)	1.67 (1.46)	2.67 (1.77)	3.00 (1.87)	4.00 (2.08)	5.33 (2.41)
I_1 S_3	0.00 (0.71)	1.0 (1.22)	2.33 (1.68)	2.67 (1.95)	3.00 (1.86)	4.33 (2.20)
I_2 S_1	0.00 (0.71)	2.33 (1.67)	3.00 (1.86)	2.67 (1.95)	4.33 (2.20)	4.67 (2.26)
I_2 S_2	0.00 (0.71)	1.67 (1.46)	2.33 (1.68)	3.00 (1.93)	3.67 (2.04)	4.00 (2.11)
I_2 S_3	0.00 (0.71)	1.33 (1.34)	1.67 (1.46)	2.00 (1.56)	2.67 (1.77)	3.33 (1.95)
I_3 S_1	0.00 (0.71)	0.00 (0.71)	0 .00 (0.71)	0.00 (0.71)	2.00 (1.56)	2.67 (1.77)
I_3 S_2	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	1.67 (1.46)	2.00 (1.56)
I_3 S_3	0 .00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)
I_4 S_1	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	2.33 (1.68)	3.33 (1.95)
I_4 S_2	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	1.33 (1.34)	2.33 (1.68)
I_4S_3	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	1.00 (1.22)	2.00 (1.58)
I_5 S_1	2.00 (1.56)	2.67 (1.77)	4.33 (2.20)	5.00 (2.34)	5.67 (2.48)	7.00 (2.73)
I_5 S_2	1.67 (1.46)	2.0 (1.56)	3.33 (1.95)	4.00 (2.11)	5.00 (2.33)	6.67 (2.68)
I_5 S_3	1.67 (1.46)	2.00 (1.56)	2.67 (1.77)	3.67 (2.04)	4.33 (2.20)	6.67 (2.67)
$CD_{0.05}$ I	0.11	0.16	0.14	0.17	0.25	0.21
$CD_{0.05}$ S	NS	NS	NS	NS	NS	NS

I1	:	Emamectin benzoate @ 0.3 g / L	I2	:	Malathion 5 % DP @ 10 kg / acre	I3	:	Profenofos 50 EC @ 1 ml/ L
I4	:	Neemazal 10,000 ppm @ 1 ml/ L	I5	:	Control			
S1	:	Spraying at 50 per cent pod maturity	S2	:	Spraying at pod maturity	S3	:	Spraying at 50 per cent pod maturity and maturity

Table 5.8: Effect of pre-harvest spraying of insecticides and botanicals on adult emergence of pulse beetle during 8 weeks of storage period in chickpea at NDUA&T, Faizabad

Treatments	No of adult emergence (Exit hole)					
	Observation recorded after week of storage					
	3	4	5	6	7	8
I_1 S_1	0.00	0.00	1.67	2.33	3.33	4.00
I_1 S_2	0.00	0.67	1.00	1.67	2.33	3.00
I_1 S_3	0.00	0.00	0.33	1.00	1.67	2.33
I_2 S_1	0.33	1.67	2.67	3.33	4.33	5.00
I_2 S_2	0.00	0.67	1.67	3.00	3.33	4.00
I_2 S_3	0.00	0.67	1.00	1.67	3.00	3.67
I_3 S_1	0.33	1.00	2.00	2.67	3.67	4.33
I_3 S_2	0.00	0.67	1.33	2.00	2.67	3.67
I_3 S_3	0.00	0.33	0.67	1.33	2.00	2.67
I_4 S_1	0.33	1.67	2.33	3.00	4.00	4.67
I_4 S_2	0.00	0.67	1.67	2.33	3.33	4.00
I_4S_3	0.00	0.33	1.00	1.67	2.33	3.00
I_5 S_1	0.67	1.67	3.00	3.67	5.00	6.33
I_5 S_2	0.67	1.67	3.00	4.00	4.67	5.67
I_5 S_3	1.00	2.00	3.33	4.00	5.00	6.00
$CD_{0.05}$Insecticides	0.56	0.71	0.56	0.56	1.01	0.71
Time of Spray	0.26	0.40	0.66	0.65	0.75	0.41
Insecticides **x** Time of Spray	0.45	0.87	1.05	0.92	1.26	1.44

I1	:	Emamectin benzoate @ 0.3 g / L	I2	:	Malathion 5 % DP @ 10 kg / acre	I3	:	Profenofos 50 EC @ 1 ml/ L
I4	:	Neemazal 10,000 ppm @ 1 ml/ L	I5	:	Control			
S1	:	Spraying at 50 per cent pod maturity	S2	:	Spraying at pod maturity	S3	:	Spraying at 50 per cent pod maturity and maturity

Table 5.9: Effect of pre-harvest spraying of insecticides and botanicals on adult emergence of pulse beetle during 8 weeks of storage in red gram at UAS, Bangalore

Treatment	Adult emergence					
	Observation recorded after week of storage					
	3	4	5	6	7	8
I_1 S_1	0.00	0.08	0.42	0.75	1.50	1.92
I_1 S_2	0.00	0.08	0.17	0.50	0.92	1.50
I_1 S_3	0.00	0.00	0.00	0.08	0.50	1.00
I_2 S_1	0.43	0.58	1.25	2.00	2.17	3.75
I_2 S_2	0.17	0.17	1.00	1.50	2.42	3.67
I_2 S_3	0.00	0.08	0.42	1.00	1.17	3.25
I_3 S_1	0.00	0.17	0.25	0.58	1.67	2.58
I_3 S_2	0.00	0.08	0.17	0.58	1.17	2.33

$I_3 S_3$	0.00	0.00	0.08	0.33	0.75	1.75
$I_4 S_1$	0.00	0.33	0.83	1.25	2.50	3.00
$I_4 S_2$	0.00	0.08	0.42	0.83	1.75	2.75
I_4S_3	0.00	0.08	0.17	0.58	1.25	2.58
$I_5 S_1$	1.00	2.42	3.17	3.92	4.58	6.17
$I_5 S_2$	1.25	2.17	2.92	3.50	4.50	6.33
$I_5 S_3$	1.00	2.25	2.75	3.25	4.42	6.00
S.Em+	0.07	0.09	0.03	0.13	0.16	0.17
CD at 5%	0.20	0.26	0.08	0.37	0.46	0.49
CV (%)	48.68	28.84	25.25	17.11	13.74	8.99

I1 : Emamectin benzoate @ 0.3 g / L
I2 : Malathion 5 % DP @ 10 kg / acre
I3 : Profenofos 50 EC @ 1 ml/ L
I4 : Neemazal 10,000 ppm @ 1 ml/ L
I5 : Control
S1 : Spraying at 50 per cent pod maturity
S2 : Spraying at pod maturity
S3 : Spraying at 50 per cent pod maturity and maturity

Table 5.10: Effect of pre-harvest spraying of insecticides and botanicals on adult emergence of pulse beetle during 8 weeks of storage in pigeonpea seed at PJTSAU, Hyderabad

Treatments	I1	I2	I3	I4	I5	Mean
S1	39.67	30.22	13.11	45.22	65.78	38.80
S2	51.22	37.67	18.56	56.11	74.00	47.51
S3	9.44	17.22	1.13	26.58	72.22	25.32
Mean	33.44	28.37	10.93	42.63	70.67	
	I	S	I at S	S at I		
S.Ed.	0.19	0.32	0.49	0.44		
CD (0.05)	0.44	0.9	1.04	0.96		

* - Mean of three replications
* - Total no. of adult pulse beetles emerged at weekly intervals for two months

I1 : Emamectin benzoate @ 0.3 g / L
I2 : Malathion 5 % DP @ 10 kg / acre
I3 : Profenofos 50 EC @ 1 ml/ L
I4 : Neemazal 10,000 ppm @ 1 ml/ L
I5 : Control
S1 : Spraying at 50 per cent pod maturity
S2 : Spraying at pod maturity
S3 : Spraying at 50 per cent pod maturity and maturity

Table 5.11: Effect of pre-harvest spraying of insecticides and botanicals on adult emergence of pulse beetle during 8 weeks of storage in pigeonpea at PDKV, Akola

Treatment	Adult emergence					
	Observation recorded after week of storage					
	3	4	5	6	7	8
$I_1 S_1$	0.13	0.17	0.20	0.33	0.36	0.40
$I_1 S_2$	0.17	0.20	0.26	0.40	0.46	0.53

$I_1 S_3$	0.07	0.10	0.16	0.23	0.30	0.33
$I_2 S_1$	0.20	0.20	0.30	0.36	0.40	0.46
$I_2 S_2$	0.23	0.23	0.26	0.36	0.43	0.50
$I_2 S_3$	0.13	0.17	0.27	0.37	0.40	0.46
$I_3 S_1$	0.13	0.17	0.20	0.30	0.36	0.43
$I_3 S_2$	0.13	0.13	0.23	0.33	0.36	0.40
$I_3 S_3$	0.10	0.13	0.20	0.36	0.40	0.46
$I_4 S_1$	0.23	0.27	0.33	0.43	0.50	0.56
$I_4 S_2$	0.17	0.27	0.37	0.47	0.53	0.56
I_4S_3	0.20	0.20	0.30	0.36	0.43	0.46
I_5 (Control)	0.26	0.31	0.40	0.48	0.56	0.66
S.Em$\pm$	0.12	0.15	0.18	0.22	0.10	0.30
CD at 1%	0.36	0.45	0.64	0.70	0.36	0.98

I1 : Emamectin benzoate @ 0.3 g / L
I2 : Malathion 5 % DP @ 10 kg / acre
I3 : Profenofos 50 EC @ 1 ml/ L
I4 : Neemazal 10,000 ppm @ 1 ml/ L
I5 : Control
S1 : Spraying at 50 per cent pod maturity
S2 : Spraying at pod maturity
S3 : Spraying at 50 per cent pod maturity and maturity

Experiment 6: **Effect of new packaging material (insecticide incorporated polypropylene bags - 'Zerofly') on storability of seed under ambient condition.**

Objectives:

1. To study the effect of new packaging material (insecticide incorporated polypropylene bags)on storability of seed
2. To evaluate the effectiveness of new packaging material (insecticide incorporated polypropylene bags) against major storage insect-pests damaging seed

Year of Start: 2015

Crop	**Centre**
Paddy	OUAT, Bhubaneswar; UAS, Bangalore, IISS, Mau
Mungbean	OUAT, Bhubaneswar; UAS, Bangalore
Sunflower	OUAT, Bhubaneswar; UAS, Bangalore
Wheat	SKNAU, Jobner;IISS, Mau
Chickpea	SKNAU, Jobner; IISS, Mau

Treatments

A. Seed treatment

1. Treated with Emamectin benzoate @ 2 ppm (40.0 mg/kg seed)
2. Untreated seed

B. Packaging material

1. Insecticide incorporated polypropylene storage bag
2. Untreated bag (same fabric i.e. PP Bag)

3. Gunny bag (control)

Replication: 3 Design: FCRD

Results: (Tables 6.1-6.11)

A. Paddy

OUAT, Bhubaneswar

Untreated seeds stored in ‘Zerofly’ bags maintained seed germination above IMSCS and restricted insect damage within permissible limit (<0.5%) after six months of storage. Other packaging materials recorded 71-76% seed germination and 4.33-9.33% insect damage after six months of storage. Both treated and untreated seeds stored only in ‘Zerofly’ bags maintained seed germination above IMSCS up to eight months of storage but failed to restrict insect damage (ID 0.67% and 1.0%) within permissible limit. However, insect damage in untreated seeds stored in ‘Zerofly’ bags recorded least insect damage and was significantly better than all other packaging materials up to ten months of storage.

UAS, Bangalore

New packaging material ‘Zerofly’ bag was significantly superior to other packaging materials in reducing insect damage of untreated seeds up to six months of storage and maintained high seed germination but failed to restrict insect damage within permissible standard (ID >0.5%) even after four months of storage. Treated seed stored in ‘Zerofly’ bags was significantly superior to other packaging materials in terms of both insect damage (0.08%) and seed germination (83%) up to eight months of storage. However,‘Zerofly’ bags were superior to other packaging materials with respect to insect dmage and seed germination up to ten months of storage in case of untreated seed.

ICAR- IISS, Mau

Untreated seeds stored in ‘Zerofly’ bags provided complete protection up to six months of storage and maintained seed germination (91%) above IMSCS whereas control recorded 2.33% insect damage and 83% seed germination. Untreated seeds stored in ‘Zerofly’ bags were significantly superior to other packaging materials in terms of insect damage (0.04%) after eight monhts of storage. Control recorded 80% seed germination and 9.12% insect damage after eight months of storage. After ten months of storage seed germination was bellow IMSCS in all packaging materials.

B. Wheat

SKNAU, Jobner

Treated seeds remained insect damage free up to four months of storage irrespective of packaging materials and maintained high seed germination. In case of storage of untreated seeds, ‘Zerofly’ bag and polypropylene bag of same fabric storage provided complete protection (ID-nil) after four months of storage while control recorded 84% seed germination and 11.7% insect damage.

After six months of storage, treated seeds stored in ‘Zerofly’ bag and polypropylene bag of same fabric remained insect damage free. Untreated seeds stored in ‘Zerofly’ bag maintained seed germination above IMSCS up to six months of storage butcould not restrict insect damage (8.0%) within permissible limit. However, ‘Zerofly’ bag remained significantly superior packaging material for storage in view of insect damage and seed germination up to twelve months of storage when untreated seed was stored in it.

ICAR- IISS, Mau

Untreated seeds stored in 'Zerofly' bags were significantly superior to other packaging materials in terms of insect damage (0.0%) and maintained seed germination (93%) above IMSCS after eight monhts of storage. Control recorded 88% seed germination and 11.0% insect damage after eight months of storage. After ten months of storage untreated seeds failed to meet both the standards in all packaging materials.

C. Chick pea

ICAR- IISS, Mau

Untreated seeds stored in 'Zerofly' bags maintained seed germination (91%) above IMSCS and restricted insect damage (0.10%) within permissible limit up to six months of storage whereas other packaging materials failed to meet the standard of insect damage. Control recorded 3.84% insect damage and 82% seed germination after six months of storage. Untreated seeds stored in 'Zerofly' bags were significantly superior to other packaging materials in terms of insect damage(0.31%) after eight monhts of storage but failed to maintain seed germination (84%) above IMSCS. Control recorded 68% seed germination and 10.5% insect damage after eight months of storage. Treated seeds stored in 'Zerofly' bags only met both the standards after eight months of storage.

D. <u>Green gram</u>

OUAT, Bhubaneswar

Treated seeds stored in different types of packaging materials maintained seed germination above IMSCS and insect damage was <1.0% after six months of storage but 'Zerofly' bag was significantly superior to other packaging materials in terms of both seed germination (85.3%) and insect damage (0.17%).Untreated seeds stored in 'Zerofly' bags only maintained seed germination (82%) above IMSCS and restricted insect damage (0.83%) within permissible limit after six months of storage. Other packaging materials recorded 70-73% seed germination and 3.7-10.7 % insect damage after six months of storage. After eight months of storage treated seeds stored only in 'Zerofly' bags met both the standards of seed germination and insect damage. Both treated and untreated seeds stored only in 'Zerofly' bags maintained seed germination above IMSCS up to ten months of storage but failed to restrict insect damage (ID 1.17% and 1.83%) within permissible limit. However, in case of untreated seeds 'Zerofly' bags recorded least insect damage and was significantly better than all other packaging materials throughout the storage duration.

UAS, Bangalore

Both treated seeds and untreated seeds stored in 'Zerofly' bags remained free from insect damage up to six months of storage while untreated seed stored in other packaging materials showed 0.08-0.16% insect damage.After eight months of storage untreated seeds stored only in 'Zerofly' bags restricted insect damage (0.83%)within permissible limit however all packaging materials maintained seed germination above IMSCS. Control recorded 84% seed germination and 1.42% insect damage after eight months of storage. Treated seeds stored in 'Zerofly' bags recorded 89% seed germination and 0.25% insect damage after eight months of storage.

E. Sunflower

OUAT, Bhubaneswar

Untreated seed stored in 'Zerofly' bags maintained significantly high seed germination (74%) compared to other packaging materials and insect damage (0.5%) was within permissible limit after six months of storage. Other packaging materials recorded 67-70% seed germination and 1.8-7.7% insect damage in untreated seeds after six months of storage. Both treated and untreated seeds stored only in 'Zerofly' bags maintained seed germination above IMSCS up to eight months of storage but failed to restrict insect damage (ID 0.83% and 1.0% in treated and untreated seed respectively) within permissible limit. However, 'Zerofly' bags recorded least insect damage and was significantly better than all other packaging materials throughout the storage duration.

UAS, Bangalore

All the packaging materials maintained seed germination above IMSCS up to twelve months of storage and insect damage was not observed in any of the treatments. 'Zerofly' bag was superior other packaging materials in terms of seed germination and seedling vigour irrespective of seed treatment.

Conclusion:

New types of packaging material (insecticide incorporated polypropylene bag) i.e. 'Zerofly' bags were tested for storability paddy, wheat, sunflower, green gram and chickpea seed at various centres. In most of centres,'Zerofly' bags were significantly superior to other packaging materials and highly effective in management of storage insects (insect damage –nil or within permissible) up to 6-8months. Seeds stored in 'Zerofly' bags alsomaintained seed germination above IMSCS in paddy,wheat,green gram, chickpea andsunflower up to 6-8 months.

Zerofly Bag

Untreated polypropylene Bag

Gunny Bag

Table 6.1: Effective packaging materials and storage periods for different crops at various centres

Crop	Centre	Safe period of storage (months)	Effective packaging materials	Remarks
Wheat	SKNAU, Jobner;	4	'Zerofly' bags	Insect damage -nil
	IISS, Mau	8	'Zerofly' bags	Insect damage -nil
Paddy	IISS, Mau	8	'Zerofly' bags	Insect damage <0.5%
	OUAT, Bhubaneswar	6	'Zerofly' bags	Insect damage <0.5%
	UAS, Bangalore	4	'Zerofly' bags	Insect damage <0.5%
Green gram	OUAT, Bhubaneswar	6	'Zerofly' bags	In untreated seeds insect damage <1.0%
		8	Zerofly' bags	In treated seeds insect damage <1.0%
	UAS, Bangalore	8	Zerofly' bags	Insect damage <0.5%
Chick pea	IISS, Mau	6	'Zerofly' bags	Insect damage <0.5%
Sunflower	OUAT, Bhubaneswar	6	'Zerofly' bags	Insect damage <0.5%
	UAS, Bangalore	12	All packaging materials	Insect damage- nil

Table 6.2: Effect of new packaging material (Insecticide impregnated bags-'Zerofly' bag) on storability of paddy seed at OUAT, Bhubaneswar

Treatment (T)	Packaging Material (P)	Storage duration 4 months		Storage duration 6 months		Storage duration 8 months		Storage duration 10 months		Storage duration 12 months	
		Seed Germination (%)	Insect damage (%)	Seed Germination (%)	Insect damage (%)	Seed Germination (%)	Insect damage (%)	Seed Germination (%)	Insect damage (%)	Seed Germination (%)	Insect damage (%)
Treated Seed (Emamectin benzoate @ 2 ppm)	Insecticide incorporated polypropylene storage bag **('Zerofly' bag)**	90.33 (9.50)	0.0 (1.0)	86.7 (9.31)	0.33 (1.15)	82.3 (9.07)	0.67 (1.28)	77.7 (8.81)	1.50 (1.57)	76.3 (8.74)	1.83 (1.68)
	Untreated bag (same fabric i.e. pp Bag)	88 (9.38)	0.17 (1.07)	83.3 (9.12)	0.67 (1.28)	78.7 (8.87)	1.33 (1.52)	74.3 (8.62)	1.83 (1.68)	73.3 (8.56)	2.17 (1.78)
	Gunny bag (control)	86.33 (9.29)	0.5 (1.21)	82.0 (9.05)	0.83 (1.35)	75.3 (8.68)	1.33 (1.52)	72.7 (8.52)	2.17 (1.78)	71.7 (8.46)	2.50 (1.87)
Untreated seed	Insecticide incorporated polypropylene storage bag **('Zerofly' bag)**	88.67 (9.42)	0.17 (1.07)	86.0 (9.27)	0.5 (1.22)	81.0 (9.00)	1.0 (1.40)	77.0 (8.77)	1.33 (1.51)	75.3 (8.68)	1.67 (1.63)
	Untreated bag (same fabric i.e. pp Bag)	84.33 (9.18)	1.0 (1.41)	75.7 (8.70)	4.33 (2.31)	71.7 (8.46)	5.67 (2.58)	68.0 (8.25)	7.67 (2.94)	66.7 (8.16)	8.67 (3.11)
	Gunny bag (control)	78.67 (8.87)	5.33 (2.51)	71.3 (8.45)	9.33 (3.21)	63.0 (7.93)	13.83 (3.85)	54.3 (7.37)	18.17 (4.37)	50.0 (7.07)	19.3 (4.51)
CD @5%		T=0.07,P=0.08,T*P=0.12	T=0.15,P=0.18, T*P=0.26	T=0.08,P=0.10, T*P=0.14	T=0.17,P=0.15, T*P=0.22	T=0.11, P=0.14, T*P=0.19	T=0.14, P=0.18, T*P=0.25	T=0.14, P=0.17, T*P=0.24	T=0.17, P=0.20, T*P=0.29	T=0.10, P=0.12, T*P=0.18	T=0.13, P=0.16, T*P=0.22

Table 6.3: Effect of new packaging material (Insecticide impregnated bags-'Zerofly' bag) on storability of green gram seed at OUAT, Bhubaneswar

Treatment (T)	Packaging Material (P)	Storage duration 4 months		Storage duration 6 months		Storage duration 8 months		Storage duration 10 months		Storage duration 12 months	
		Seed Germination (%)	Insect damage (%)	Seed Germination (%)	Insect damage (%)	Seed Germination (%)	Insect damage (%)	Seed Germination (%)	Insect damage (%)	Seed Germination (%)	Insect damage (%)
Treated Seed (Emamectin benzoate @ 2 ppm)	Insecticide incorporated polypropylene storage bag **('Zerofly' bag)**	89.67 (9.47)	0(1.0)	85.3 (9.25)	0.17 (1.07)	80.7 (8.98)	0.67 (1.28)	76.3 (8.73)	1.17 (1.47)	*75.3(8.68)*	1.50 (1.57)
	Untreated bag (same fabric i.e. pp Bag)	88.33 (9.40)	0.17 (1.07)	82.7 (9.09)	0.83 (1.35)	76.0 (8.71)	1.17 (1.46)	72.7 (8.52)	2.00 (1.73)	*71.7 (8.46)*	2.33 (1.82)
	Gunny bag (control)	87.67 (9.36)	0.33 (1.15)	81.0 (9.0)	1.0 (1.41)	73.7 (8.58)	1.67 (1.63)	69.3 (8.33)	2.83 (1.95)	*68.3 (8.27)*	3.17 (2.04)
Untreated seed	Insecticide incorporated polypropylene storage bag **('Zerofly' bag)**	87 (9.33)	0.33 (1.15)	82.0 (9.05)	0.83 (1.34)	78.3 (8.85)	1.33 (1.52)	75.0 (8.66)	1.83 (1.67)	*73.7 (8.58)*	2.67 (1.91)
	Untreated bag (same fabric i.e. pp Bag)	85.33 (9.24)	0.83 (1.350	72.7 (8.52)	3.67 (2.16)	68.0 (8.25)	5.17 (2.48)	62.7 (7.92)	6.50 (2.73)	*60.3 (7.76)*	8.00 (2.99)
	Gunny bag (control)	74.33 (8.62)	7.66 (2.94)	70.0 (8.37)	10.67 (3.41)	59.3 (7.70)	15.33 (4.04)	50.7 (7.11)	19.33 (4.51)	*46.7 (6.83)*	20.7 (4.65)
CD @5%		T=0.08, P=0.10, T*P=0.13	T=0.13, P=0.16, T*P=0.22	T=0.08, P=0.10, T*P=0.14	T=0.14, P=0.17, T*P=0.25	CD of T=0.16, P=0.20, T*P=0.28	T=0.14, P=0.17, T*P=0.24	T=0.14, P=0.18, T*P=0.25	T=0.16, P=0.19, T*P=0.28	T=0.13, P=0.15, T*P=0.22	T=0.13, P=0.16, T*P=0.22

Table 6.4: Effect of new packaging material (Insecticide impregnated bags-'Zerofly' bag) on storability of sunflower seed at OUAT, Bhubaneswar

Treatment (T)	Packaging Material (P)	Storage duration 4 months		Storage duration 6 months		Storage duration 8 months		Storage duration 10 months		Storage duration 12 months	
		Seed Germination (%)	Insect damage (%)	Seed Germination (%)	Insect damage (%)	Seed Germination (%)	Insect damage (%)	Seed Germination (%)	Insect damage (%)	Seed Germination (%)	Insect damage (%)
Treated Seed (Emamectin benzoate @ 2 ppm)	Insecticide incorporated polypropylene storage bag **('Zerofly' bag)**	79.7 (8.93)	0.17 (1.07)	75.7 (8.70)	0.50 (1.22)	72.3 (8.50)	0.83 (1.35)	68.7 (8.29)	1.33 (1.52)	67.3 (8.21)	1.67 (1.63)
	Untreated bag (same fabric i.e. pp Bag)	77.3 (8.79)	0.5 (1.22)	73.3 (8.56)	1.0 (1.40)	71.0 (8.43)	1.83 (1.68)	65.3 (8.08)	2.33 (1.82)	64.3 (8.02)	2.67 (1.91)
	Gunny bag (control)	75.0 (8.66)	0.67 (1.28)	72.0 (8.48)	1.17 (1.47)	68.3 (8.26)	2.5 (1.87)	62.7 (7.91)	3.17 (2.04)	61.3 (7.83)	3.67 (2.16)
Untreated seed	Insecticide incorporated polypropylene storage bag **('Zerofly' bag)**	78.7 (8.87)	0.50 (1.22)	74.0 (8.60)	0.50 (1.21)	70.7 (8.41)	1.0 (1.40)	67.0 (8.19)	1.50 (1.58)	66.0 (8.12)	1.83 (1.68)
	Untreated bag (same fabric i.e. pp Bag)	73.7 (8.58)	0.83 (1.35)	70.3 (8.39)	1.83 (1.68)	67.0 (8.18)	2.67 (1.91)	60.3 (7.76)	3.50 (2.11)	58.7 (7.65)	4.00 (2.23)
	Gunny bag (control)	72.0 (8.48)	4.0 (2.23)	67.3 (8.18)	7.67 (2.93)	62.7 (7.91)	9.5 (3.23)	52.0 (7.21)	12.33 (3.64)	49.0 (7.00)	13.00 (3.73)
CD @5%		T=0.09, P=0.11, T*P=NS	T=0.13, P=0.15, T*P=0.22	T=0.08, P=0.09, T*P=NS	T=0.19, P=0.24, T*P=0.34	T=0.15, P=0.18, T*P= NS	T=0.16, P=0.20, T*P= 0.28	T=0.13, P=0.15, T*P=0.22	T=0.15, P=0.19, T*P=0.27	T=0.13, P=0.16, T*P= 0.23	T=0.14, P=0.17, T*P= 0.24

Table 6.5: Effect of new packaging material (Insecticide impregnated bags-'Zerofly' bag) on storability of paddy seed at UAS, Bangalore

Treatment (T)	Packaging material (P)	2 months after storage			4 months after storage			6 months after storage			8 months after storage			10 months after storage			12 months after storage		
		G (%)	ID (%)	VG-I	G (%)	ID (%)	VG-I	G (%)	ID (%)	VG-I	G (%)	ID (%)	VG-I	G (%)	ID (%)	VG-I	G (%)	ID (%)	VG-I
Seeds treated with Emamectin benzoate @ 2ppm (40.0mg/kg of seed)	Insecticide incorporated polypropylene bag**('Zerofly' bag)**	87.3	0.00	2036	86.3	0.00	1506	85.0	0.00	1567	83.0	0.08 (0.95)	1483	81.7	1.50 (7.0)	1414	80.3	2.42 (8.93)	1317
	Untreated bag (same fabric i.e. PP bags)	86.7	0.00	2000	85.3	0.00	1452	84.7	0.00	1327	81.7	2.08 (8.27)	1401	79.3	3.42 (10.6)	1338	77.3	5.25 (13.24)	1142
	Gunny bag (Control)	86.0	0.00	1780	85.0	0.00	1224	83.3	0.75	1399	82.0	1.92 (7.92)	1386	81.0	3.42 (10.6)	1332	78.3	4.08 (11.64)	1205
Untreated seeds	Insecticide incorporated polypropylene bag**('Zerofly' bag)**	86.3	0.00	1853	85.7	0.58	1388	84.0	1.67	1326	82.0	3.12 (10.23)	1406	79.0	7.50 (15.9)	1332	77.3	8.25 (16.68)	1216
	Untreated bag (Same fabric i.e. PP bags)	85.3	0.67	1711	84.3	4.83	1415	82.7	3.08	1329	80.0	4.50 (12.24)	1321	76.0	9.75 (18.2)	1203	74.0	8.58 (20.48)	1103
	Gunny bag (Control)	84.7	1.25	1622	84.3	5.67	1238	83.0	4.17	1131	80.3	3.25 (10.4)	1263	77.0	8.75 (17.2)	1158	74.3	10.75 (19.13)	1152
SEm±		0.76	0.068	88	0.96	0.024	53.0	1.86	0.186	39.1	0.51		19.4	0.60		22.7	0.51		13.9
CD(0.05) TXP		0.76	0.20	221	0.96	0.06	134	1.86	0.47	98	1.6	0.55	60	1.8	0.40	70	1.6	0.55	43

G: Germination; ID: Insect Damage; VG-I: Vigour Index-I

Table 6.6: Effect of new packaging material (Insecticide impregnated bags-'Zerofly' bag) on storability of sunflower seed at UAS, Bangalore

Treatment (T)	Packaging material (P)	2 months after storage			4 months after storage			6 months after storage			8months after storage			10 months after storage			12 months after storage		
		G (%)	ID (%)	VG-I	G (%)	ID (%)	VG-I	G (%)	ID (%)	VG-I	G (%)	ID (%)	VG-I	G (%)	ID (%)	VG-I	G (%)	ID (%)	VG-I
Seeds treated with Emamectin benzoate @ 2ppm (40.0mg/kg of seed)	Insecticide incorporated polypropylene bag**('Zerofly' bag)**	89.3	0.0	2633	88.3	0.0	2386	87.0	0.0	2044	85.7	0.0	2035	82.3	0.0	1776	80.7	0.0	1646
	Untreated bag (same fabric i.e. PP bags)	89.0	0.0	2463	87.7	0.0	2265	87.0	0.0	1989	84.3	0.0	1869	80.7	0.0	1670	77.0	0.0	1459
	Gunny bag (Control)	88.0	0.0	2280	87.3	0.0	2261	86.3	0.0	2034	83.7	0.0	1852	81.7	0.0	1611	79.0	0.0	1483
Untreated seeds	Insecticide incorporated polypropylene bag**('Zerofly' bag)**	89.0	0.0	2548	87.7	0.0	2446	87.0	0.0	1870	84.7	0.0	1936	81.3	0.0	1674	78.7	0.0	1515
	Untreated bag (Same fabric i.e. PP bags)	88.3	0.0	2400	87.3	0.0	2238	86.0	0.0	1883	82.0	0.0	1777	80.3	0.0	1577	72.3	0.0	1277
	Gunny bag (Control)	88.3	0.0	2205	87.0	0.0	1947	86.3	0.0	1814	82.3	0.0	1698	80.7	0.0	1667	74.0	0.0	1325
	SEm±	0.41		47	0.30	-	38	0.45	-	62.9	0.38	-	38.59	0.33	-	53.13	0.53	-	27.91
	CD(0.05) TXP	1.25	-	141	0.93	-	117	1.39	-	193	1.17	-	119	1.01	-	164	1.63	-	86

G: Germination; ID: Insect Damage; VG-I: Vigour Index-I

Table 6.7: Effect of new packaging material (Insecticide impregnated bags-'Zerofly' bag) on storability of green gram seed at UAS, Bangalore

Treatment (T)	Packaging material (P)	2 months after storage			4 months after storage			6 months after storage			8months after storage		
		G (%)	ID (%)	VG-I	G (%)	ID (%)	VG-I	G (%)	ID (%)	VG-I	G (%)	ID (%)	VG-I
Seeds treated with Emamectin benzoate @ 2ppm (40.0mg/kg of seed)	Insecticide incorporated polypropylene bag**('Zerofly' bag)**	99.3	0.0	2910	98.7	0.0	2759	98.3	0.00	2733	89.0	0.25	2176
	Untreated bag (same fabric i.e. PP bags)	98.3	0.0	2820	98.0	0.0	2728	97.7	0.00	2657	86.0	0.58	1993
	Gunny bag (Control)	98.7	0.0	2765	98.3	0.0	2747	98.0	0.00	2671	87.0	0.33	1997
Untreated seeds	Insecticide incorporated polypropylene bag**('Zerofly' bag)**	99.0	0.0	2825	98.3	0.0	2729	97.7	0.00	2624	85.3	0.83	2035
	Untreated bag (Same fabric i.e. PP bags)	98.3	0.0	2782	98.0	0.0	2682	97.7	0.16	2591	83.7	1.58	1865
	Gunny bag (Control)	98.3	0.0	2805	98.0	0.0	2645	97.7	0.08	2600	84.0	1.42	1901
SEm±		0.38		33.14	0.23		41.9	0.30		29.55	0.51	0.08	51.9
CD(0.05) TXP		NS		102	NS		NS	NS		91	1.57	0.24	160

G: Germination; ID: Insect Damage; VG-I: Vigour Index-I

Table 6.8: Effect of new packaging material (Insecticide impregnated bags-'Zerofly' bag) on storability of wheatseed at SKNAU, Jobner

Treatment (T)	Packaging material (P)	2end Month		4th Month		6th Month		8th Month		10th Month		12th Month	
		G (%)	ID (%)	G (%)	ID (%)	G (%)	ID (%)	G (%)	ID (%)	G (%)	ID (%)	G (%)	ID (%)
Seeds treated with Emamectin benzoate @ 2ppm (40.0mg/kg of seed)	Zerofly Bag (Treated seed)	97.7 (81.53)	0.00 (0.00)	97.7 (81.43)	0.00 (0.00)	96.0 (78.52)	0.00 (0.00)	94.3 (76.19)	2.00 (8.13)	94.0 (75.82)	3.00 (9.98)	92.7 (74.21)	4.00 (11.54)
	Fabric Bag (Treated seed)	97.3 (80.91)	0.00 (0.00)	97.0 (80.11)	0.00 (0.00)	95.7 (78.00)	0.00 (0.00)	95.0 (77.08)	2.33 (8.72)	93.7 (75.00)	4.00 (11.54)	88.0 (69.73)	6.00 (14.18)
	Gunny Bag (Treated seed)	97.3 (80.73)	0.00 (0.00)	96.3 (78.98)	0.00 (0.00)	95.0 (77.12)	2.33 (8.74)	86.3 (68.28)	8.00 (16.43)	85.7 (67.70)	11.33 (19.61)	79.7 (63.15)	15.33 (23.01)
Untreated seeds	Zero Fly Bag (Untreated seed)	96.7 (79.59)	0.00 (0.00)	94.7 (79.13)	0.00 (0.00)	87.0 (68.87)	8.33 (16.73)	81.0 (64.16)	14.00 (21.97)	78.0 (62.03)	17.66 (24.80)	72.7 (58.44)	21.33 (27.49)
	Fabric Bag (Untreated seed)	96.3 (79.13)	0.00 (0.00)	95.7 (78.00)	0.00 (0.00)	87.7 (69.46)	7.00 (15.31)	63.7 (52.89)	31.00 (33.83)	57.3 (49.26)	38.00 (38.06)	13.3 (21.39)	80.00 (63.44)
	Gunny Bag (Untreated seed)	95.0 (77.12)	2.33 (8.74)	84.0 (66.44)	11.66 (19.89)	69.3 (56.39)	25.33 (30.19)	39.3 (38.82)	53.00 (46.72)	33.7 (35.43)	60.00 (50.77)	0.00 (0.00)	100.00 (100.00)
S. Em±		**0.96**	**0.18**	**0.72**	**0.38**	**0.54**	**0.50**	**1.83**	**0.52**	**1.69**	**3.81**	**1.85**	**1.93**
CD at 5%		**NS**	**0.546**	**2.23**	**1.17**	**1.67**	**1.54**	**5.72**	**1.61**	**5.25**	**11.88**	**5.78**	**6.01**

G: Germination; ID: Insect Damage

Table 6.9: Effect of new packaging material (Insecticide impregnated bags-'Zerofly' bag) on storability of paddy seed at ICAR- IISS, Mau

Treatment	**Packaging material (P)**	**Storage duration (D)**								
		4 months			**6 months**			**8 months**		
		G (%)	**ID (%)**	VG-I	**G (%)**	**ID (%)**	VG-I	**G (%)**	**ID (%)**	VG-I
Treated Seed (Emamectin benzoate @ 2 ppm) (T)	Insecticide incorporated polypropylene storage bag **('Zerofly' bag)**	95	0.00	3231	93	0.00	3020	89	0.05	2726
	Untreated bag (same fabric i.e. pp Bag)	93	0.00	2963	88	0.05	2773	82	0.48	2210
	Gunny bag (control)	91	0.00	2665	85	0.08	2396	81	1.19	2115
Untreated seed	Insecticide incorporated polypropylene storage bag **('Zerofly' bag)**	93	0.00	3022	91	0.00	2689	89	0.04	2855
	Untreated bag (same fabric i.e. pp Bag)	94	0.01	2928	87	0.23	2519	84	2.08	2654
	Gunny bag (control)	92	0.05	2738	83	2.33	2207	80	9.12	2435
$CD_{0.05}$ (Germination)		T=NS	P-1.35	D-1.56	T X P-NS	T X D-NS	P X D=2.7	T X P X D =NS		
$CD_{0.05}$ (Insect damage)		T=0.32	P=0.40	D=0.46	T X P=0.56	T X D=0.88	P X D=0.65	T X P X D=1.12		
$CD_{0.05}$ (VG-I)		T=100	P=122	D=141	T X P=173	T X D=245	P X D=200	T X P X D=346		

G: Germination; ID: Insect Damage; VG-I: Vigour Index-I

Table 6.10: Effect of new packaging material (Insecticide impregnated bags-Zerofly bag) on storability of wheat seed at ICAR- IISS, Mau

Treatment (T)	**Packaging material (P)**	**Storage duration (D)**											
		4 months			**6 months**			**8 months**			**10 months**		
		G (%)	ID (%)	VG-I	G (%)	ID (%)	VG-I	G (%)	ID (%)	VG-I	G (%)	ID (%)	VG-I
Treated Seed (Emamectin benzoate @ 2 ppm) (T)	Insecticide incorporated polypropylene storage bag **('Zerofly' bag)**	96	0.00	2946	90	0.00	2784	88	0.00	2562	70.0	0.16	2361.5
	Untreated bag (same fabric i.e. pp Bag)	94	0.01	2930	88	0.17	2624	83	0.78	2367	64.7	0.17	1900.5
	Gunny bag (control)	93	0.00	2918	89	1.31	2498	82	1.32	2086	65.7	0.16	2027.4
Untreated seed	Insecticide incorporated polypropylene storage bag **('Zerofly' bag)**	94	0.00	2803	91	0.05	2667	93	0.00	2576	63.7	3.32	1746.7
	Untreated bag (same fabric i.e. pp Bag)	93	0.41	2901	85	0.79	2457	89	2.70	2192	64.0	2.60	1813.7
	Gunny bag (control)	90	1.65	2702	84	3.48	2153	88	11.08	1817	64.0	89.7	1949.8
	$CD_{0.05}$ (Germination)	T=1.1	P=1.4	D=1.6	T X P=2.0	T X D=2.8	P X D=2.3	T X P X D=4.0					
	$CD_{0.05}$ (Insect damage)	T=0.42	P=0.52	D=0.60	T X P=0.73	T X D=1.03	P X D=0.84	T X P X D=1.46					
	$CD_{0.05}$ (VG-I)	T=NS	P=187	D=216	T X P=NS	T X D=NS	P X D=NS	T X P X D=NS					

Table 6.11: Effect of new packaging material (Insecticide impregnated bags-Zerofly bag) on storability of chickpea seed at ICAR-IISS, Mau

Treatment	**Packaging material (P)**	**Storage duration (D)**								
		4 months			**6 months**			**8 months**		
		Seed Germination (%)	Insect damage (%)	VG-I	Seed Germination (%)	Insect damage (%)	VG-I	Seed Germination (%)	Insect damage (%)	VG-I
Treated Seed (Emamectin benzoate @ 2 ppm) (T)	Insecticide incorporated polypropylene storage bag **('Zerofly' bag)**	94	0.00	4204	91	0.00	3898	87	0.00	3549
	Untreated bag (same fabric i.e. pp Bag)	92	0.00	3973	88	0.18	3759	80	1.39	2711
	Gunny bag (control)	90	0.00	3869	87	0.39	3579	76	4.07	2614
Untreated seed	Insecticide incorporated polypropylene storage bag **('Zerofly' bag)**	95	0.00	4031	91	0.10	3855	84	0.31	3373
	Untreated bag (same fabric i.e. pp Bag)	92	0.12	3777	87	1.22	3513	75	6.07	2598
	Gunny bag (control)	89	0.67	3661	82	3.84	3120	68	10.49	2282
$CD_{0.05}$ (Germination)		T=1.1	P=1.4	D=1.6	T X P=2.0	T X D=2.8	P X D=2.3	T X P X D=4.0		
$CD_{0.05}$ (Insect damage)		T=0.42	P=0.52	D=0.60	T X P=0.73	T X D=1.03	P X D=0.84	T X P X D=1.46		
$CD_{0.05}$ (VG-I)		T=NS	P=187	D=216	T X P=NS	T X D=NS	P X D=NS	T X P X D=NS		

Tribal Sub Plan (TSP)

With the objective of improving the livelihood of tribal farmers and, as per the direction received from council for formulation, implementation and monitoring of TSP, the following cooperating centres of AICRP-NSP (Crops) were provided with funds under TSP as detailed below for the year 2017-18.

(Rs. in lakhs)

S. No.	Centre	AICRP –NSP (Crops)
		Tribal Sub Plan
1	SKUA& T, Srinagar	3.00
2	HPKVV, Palampur	4.00
3	AU, Kota	3.00
4	AAU, Anand	3.00
5	MPKV, Rahuri	6.00
6	PDKV, Akola	4.00
7	UAS, Bangalore	8.00
8	TNAU, Coimbatore	8.00
9	CRIJAF, Barrackpore	3.00
10	CAZRI, Jodhpur	3.00
11	NRRI, Cuttack	3.00
12	IIRR, Hyderabad	7.00
13	IIMR, Hyderabad	9.00
14	CICR, Nagpur	3.00
	Total	**67.00**

Summary of physical achievements under Tribal Sub Plan of AICRP-NSP (Crops): 2017-18

Centres	Seed distributed (kg.)	Seed storage bins; sprayers, small farm implements (No's)	Training (No's)	FLDs (No's)	Exhibition (No's)	Exposure visit (No's)	Beneficiary (No's)
SKUA&T, Srinagar	4952	-	16	-	-	-	512
CSHPKV, Palampur	-	40	01	01	-	-	140
AAU, Anand	-	-	02	-	-	02	100
MPKV, Rahuri	6500	-	02	02	-	04	395
PDKV, Akola	450	-	06	-	-	-	657
UAS, Bengaluru	5700	350	04	-	-	-	302
TNAU,	688	267	03	-	-	-	231

Coimbatore							
JNKVV, Jabalpur	2040	-	03	03	-	-	152
CRIJAF, Barrackpore	-	40	01	-	-	-	50
CAZRI, Jodhpur	4800	-	01	-	-	-	120
IIMR, Hyderabad	2500	-	07	01	02	01	690
CICR, Nagpur	-	-	06	-	-	-	1685
Total	**27640**	**697**	**52**	**07**	**02**	**07**	**5034**

Note: In addition to above 3000 kg of fertilizers (Urea & DAP) were distributed by CAZRI, Jodhpur and 10 kg of *Trichoderma* culture was distributed by AAU, Anand to tribal farmers

Various activities carried for implementation of TSP program by selected centres of AICRP-NSP (Crops) along with details of the inputs provided to tribal farmers for taking up quality seed production, improving seed health & storage and other related activities in domain of seed were detailed below.

Sher-e-Kashmir University of Agricultural Sciences & Technology, Srinagar

Training programme conducted: 16 training programmes were conducted on the various aspects of seed *viz*. Quality seed production in oilseeds, oats, wheat, maize and paddy; Quality seed production and strategies for utilizing farmers saved seeds. Programme was implemented for the benefit of 512 tribal farmers in various districts of Jammu & Kashmir *viz*. Leh (Satanaka), Kargil (Padum, Ubarak, Satra, Salapi, Shilla, Nerok & Shillingskit), Bandipora (Markoot, Dawar, Buglander, Gurez Sumbler & Gujjar Patti) and Kupwara (Hajinar, Karnah, BaghiBala, Karnah, Baderhar & Handwara).

Input distribution: 4952 kg of quality seed were distributed among 412 tribal farmers during training (wheat- 1610 kg, oats- 1440 kg, R&M- 92 kg, maize- 160 kg, paddy- 1650 kg).

Training and distribution of quality seed under Tribal Sub Plan by SKUAST, Srinagar

Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishwavidyalaya, Palampur

Training programme conducted: One training programme was conducted on Seed production technology and processing in peas, rajmah & fagopyrum sp., benefiting 40 tribal farmers (33 women farmers) in Kinnaur district (Kuppa village) of Himachal Pradesh.

Input distribution: All 40 beneficiaries were provided with Knapsack sprayer and also trained them about handling of the sprayer in crop protection activities.

Field demonstrations/ field day/ seed day conducted: One front line demonstration was organized at wheat and rice research station, Malan for popularization of Basmati variety, 100 farmers participated in the demonstration.

Training and distribution of knapsack sprayers under Tribal Sub Plan by CSKHPKV, Palampur

Anand Agricultural University, Anand

Training programme conducted: Two training programmes were organized on Fungi and insect pests damaging seeds/ food grains during storage and their management benefiting 100 tribal famers from Anand and Dahod districts of Gujarat. Methods of seed biopriming, techniques for enrichment of FYM through *Trichoderma* and mushroom production were also demonstrated to farmers.

Input distribution: All beneficiaries were provided with*Trichoderma* culture (10 kg), AgriMedia VCDs on cultivation of maize and soybean.

Training conducted under Tribal Sub Plan at Anand & Dahod by AAU, Anand

Mahatma Phule Krishi Vidyapeeth, Rahuri

Training programme conducted: Two training programmes were organized on various aspects of quality seed production and general crop husbandry at Nandurbar district (Sahada & Navapur), benefitting 95 tribal famers.

Input distribution: 6500 kg of quality seed (chickpea cv. Vijay - 1500 kg, wheat cv. Phule Samadhan-5000 kg) was distributed to tribal farmers along with bio-control agents' viz. *Azatobacter* (125 liter) and *Rhizobium* (37.50 liter) benefiting 300 tribal farmers.


Training & FLD organized under Tribal Sub Plan by MPKV, Rahuri

Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Akola

Training programme conducted: Six training programmes were organized on Seed processing & safe storage technology and Seed production technology in pulse crops at Amaravati district (Aadanad, Borikheda, Bhilkheda, Manbhang & Sawariya), benefitting 627 tribal famers.

Input distribution: 450 kg of quality seed of redgram (cv. PKV Tara) was distributed among 30 farmers (15 kg each).

Tamil Nadu Agricultural University, Coimbatore

Training programme conducted: Three training programmes were organized *viz*. Seed production technologies and popularization of new varieties in pulses (Coimbatore district- Shembukarai and Dhumanur tribal village); Production technologies of flower crops (Salem district- Thumbalpatti and Adimalaipatti block) and Popularizing agricultural production technologies of pulses and vegetables suitable for hills regions (Nilgiris district- Allimayar tribal village) benefiting 231 farmers.

Input distribution:688 kg of quality seed was distributed to tribal farmers along with power weeder (6 No's), power sprayer (18 No's), spade (56 No's), plastic tub (56 No's), tarpaulin (56 No's), pheromone trap (75 No's), coconut seedling (150 No's), mango seedling (150 No's) and herbal wild animal repellent (135 liter).

Interventions: Bengal gram (JG 11) and recently released black gram variety VBN 6 were introduced and awareness was created on the seed production technologies among the tribal farmers. Awareness was created on the use of bio-control agents' *viz*. *Trichoderma viride* and *Pseudomonas fluorescens*. Pheromone traps was provided to the tribal farmers to manage fruit borer insect pests in vegetable crops and advanced *Nerium* cultivation technologies were taught to tribal farmers.


Training & input distribution under Tribal Sub Plan by TNAU, Coimbatore

Jawarhalal Nehru Krishi Viswavidyalaya, Jabalpur

Training programme conducted: Three training programmes were organized *viz*. Quality seed production technology of *Rabi* crops, Disease management in pulse crops and Weed management in *Rabi* crops at Umaria district of Madhya Pradesh benefitting 62 tribal famers.

Input distribution: 2040 kg of quality seed (wheat- 1020 kg, peas- 820 kg and chickpea) was distributed benefitting 90 tribal farmers in the Karkeli, Saliya, Dhourkoh and Kachharwar blocks of Umaria district.

Participatory seed production in tribal villages: JNKVV, Jabalpur organized seed production in tribal villages under participatory mode. *In toto*, 40 farmers (wheat- JW 3288, GW 366 and DBW 110), 41 farmers (peas- JM 6 & JP 885) and 09 farmers (chickpea- JG 74) were participated in quality seed production programme atKarkeli, Saliya, Dhourkoh and Kachharwar blocks of Umaria district.

Farmers Participatory seed production in tribal areas organized by JNKVV, Jabalpur

University of Agricultural Sciences, Bengaluru

Training programme conducted: Four training programmes were organized on various aspects of general crop husbandry at Mysuru district (Beerathammanhalli & Nagapura) and Chamarajanagar district (Melukammanahalli), benefitting 302 tribal famers.

Input distribution:5700 kg of quality seed (redgram- 750 kg, ragi- 2000 kg, fieldbean- 250 kg, cowpea- 200 kg, chickpea- 2500 kg) was distributed to tribal farmers along with storage bin (150 No's), sickles (150 No's) and tarpaulin (50 No's).

Training & input distribution at Nagapura&Melukammanahalliunder TSP by UAS, Bengaluru

Central Research Institute for Jute and Allied Fibres, Barrackpore

Training programme conducted: One training programme on Improved technologies for seed production of *Rabi* crops was organized for the benefit of 50 tribal farmers from Mankar Kuchidanga, SahebDanga, Kondaipur, Kuchidanga, Mirjapur and Deul Para villages of Burdwan district.

Input distribution: 40 knapsack sprayers were distributed among 50 tribal farmers in the training programme organized at Burdwan district.


Training & input distribution at tribal villages of Burdwan by ICAR-CRIJAF, Barrackpore

Central Arid Zone Research Institute, Jodhpur

Training programme conducted: One training programme was organized on Livelihood improvement of Scheduled Tribe farmers through improved agricultural interventions at Banswara district (Bakhatpura), benefitting 120 tribal famers.

Input distribution: 4800 kg of quality seed (wheat- Raj 4120) and 3000 kg of DAP was distributed among 120 tribal farmers in the training programme organized at Banswara district.


Training & input distribution at Banswara by ICAR-CAZRI, Jodhpur

Central Institute of Cotton Research, Nagpur

Training programme conducted: Six training programmes were organized on various aspects of Quality seed production and crop management in the districts of Nagpur (Ladai, Limboli, Budhla-Lohgod, Wathoda, Bela and Narhar) and Wardha (Belgaon, Ganeshpur, Dwalapur, Ambazari, Saleghat and Parsheoni), benefitting 1685 tribal farmers.

Indian Institute of Millets Research, Hyderabad

Training programme conducted: Seven training programmes were organized on Quality seed production of sorghum at East Godhawari district (Turpu Laxmhipuram), Bidar district (Shamshadinpur, Hulgera, Ibrahimpur, Chalki & Gangapur) and Guntur district (Attota, Siripuram & Nelapadu).

Input distribution: *in toto*, 2500 kg of quality seed of sorghum hybrid (CSH 16 & CSH 14) were distributed at East Godhawari, Bidar and Guntur districts benefiting 490 tribal farmers. For the first time 500 kg of sorghum hybrid seedwas distributed to tribal farmers of East Godhawari (Turpu Laxmhipuram) with the aim to popularize new hybrids in *podu* type of cultivation.

Demonstrations organized: Demonstrated mechanized sorghum sowing through seed dibbler under zero tillage condition in Attota, Nandivelugu and Nelapadu villages (10 clusters) of Guntur district, tribal farmers were motivated to adopt the technology.

Exhibition/ Exposure visit organized: Two exhibitions on high yielding sorghum cultivars and value addition on sorghum was organized and value added products were distributed to tribal farmers of East Godhawari and Guntur districts. One exposure visit was also organized at Guntur district on cultivation of sorghum in non-traditional coastal areas, about 200 tribal farmers participated in the exposure visit.

Training &demonstration in tribal villages of Andhra Pradesh by ICAR-IIMR, Hyderabad

Monitoring Team Report 2017-18

North Zone Group – I

Monitoring Team:

1	Dr. Laxmikant, ICAR-VPKAS, Almora	Convener
2	Dr. V.P.S. Sangwan, CCSHAU, Hisar	Member
3	Dr. Sandeep Lal, ICAR-IARI, New Delhi	Member

Date of monitoring: 10 – 14th October, 2017
Centres monitored: SKUAST, Jammu; SKUAST, Kashmir; CSKHPKV, Palampur & PAU, Ludhiana

S. No.	Items	SKUAST, Kashmir	SKUAST, Jammu	CSKHPKV, Palampur	PAU, Ludhiana
1	Achievements of Breeder Seed Production under AICRP-NSP (Crops) against GOI and State indents and problems faced if any.	No shortfall	NA	No shortfall	No shortfall
2	Discipline-wise progress of STR experiments – No. of experiments conducted, its status and results, reason for non-conduct of any experiments, problems faced, *etc*.	6 concluded, 1 in progress and 1 to be conducted during *Rabi* 2017-18.	NA	11 in progress	6- completed 1-in progress 5- to be conducted during *Rabi* 2017-18.
3	Status of revolving fund in AICRP-NSP (Crops) and ICAR Seed Project – profit generated, problems in utilization if any.	NSP- 4.0 lakhs CP -13.27 lakhs ISP- 25.0 lakhs CP-43.99 lakhs	NA	NSP- 6.0 lakhs CP-12.4 lakhs ISP- 20.0 lakhs CP-3.80 lakhs	NSP-15.0 lakhs
4	Progress of ICAR Seed Project - Breeder Seed, Foundation, Certified and Truthfully Labeled Seed.	BS- No Shortfall FS- meager shortfall TFL- Shortfall	BS- No Shortfall FS- No Shortfall CS- No Shortfall	BS- No Shortfall FS-No Shortfall	BS- No Shortfall FS- No Shortfall CS- No Shortfall
5	Participatory seed production programme especially under ICAR Seed Project (Quantity / quality / class).	Merged with Certified/TFL	Nil	No Shortfall	Undertaken
6	Status of Fund Utilization.	ISP- Fully Utilized; negative balance BSP-Fully utilized STR-Fully	ISP- Fully utilized TSP- Rs. 1.47 lakhs unutilized	Fully utilized; negative balance	BSP-Fully utilized STR- negative balance ISP- Rs. 4.90 lakhs unspent balance

		utilized Contingency need to be released.			
7	Land and Infrastructure Development.	Instituted as per EFC	Instituted as per EFC	Nil	Nil
8	Transfer of Technology – No. of trainings organized, Farm women participation.	15 trainings	6 trainings	1 trainings	7 trainings
9	Capacity Building – No. of trainings attended, etc.	Nil	6	Nil	Nil
10	Status of Submission of Audit Utilization certificate (AUC) and Statement of Expenditure.	Submitted	Submitted	Submitted	Submitted

Grading of each centre based on the performance by mentioning (i) Excellent, (ii) Very good, (iii) Good, (iv) Satisfactory, (v) Poor, (vi) Not Satisfactory

Name of the centre	**Performance of the center**			
	SKUAST, Kashmir	**SKUAST, Jammu**	**CSKHPKV, Palampur**	**PAU, Ludhiana**
BSP Unit	Excellent	NA	Good	Excellent
STR	Very Good	NA	Very Good	Excellent
ICAR Seed Project	Very Good	Very Good	Good	Excellent
TSP	Excellent	-	-	-

Monitoring of seed production plots at SKUAST, Jammu

Breeder seed production at CSKHPKV, Palampur

North Zone Group – II

Monitoring Team:

1	Dr. J.K. Sharma, HPKV, Palampur	Convener
2	Dr. G.K. Koutu, JNKVV, Jabalpur	Member
3	Dr. A.L. Jatav, CSAUAT, Kanpur	Member

Date of monitoring: 17 – 26 September, 2017

Centres monitored: CCSHAU, Hisar; GBPUAT, Pantnagar; ICAR-VPKAS, Almora; ICAR-IIWBR, Karnal; DSST, ICAR-IARI, New Delhi/Karnal and SVBPUAT, Meerut

CCSHAU, Hisar

S. No.	Items	Remark
1	Achievements of Breeder Seed Production under AICRP-NSP (Crops) against GOI and State indents and problems faced if any.	Majority of the seed crop was harvested; breeder seed plots of rice were well maintained. The GOI indent will be fulfilled and no problem reported.
2	Discipline-wise progress of STR experiments	All the experiments were conducted as per the programme. Experiments on seed pathology component were excellent.
3	Status of revolving fund in AICRP-NSP (Crops) and ICAR Seed Project – profit generated, problems in utilization if any.	AICRP-NSP and ICAR seed project revolving funds returned to ICAR-IISS. Profit generated is being utilized for seed production purpose only.
4	Progress of ICAR Seed Project - Breeder Seed, Foundation, Certified and Truthfully Labeled Seed.	Entire quantity of certified and truthfully labeled seeds of rice, wheat, blackgram, was made available to farming community.
5	Status of Fund Utilization.	Satisfactory
6	Land and Infrastructure Development.	Nil
7	Transfer of Technology – No. of trainings organized, Farm women participation.	6, women participation was comparatively less.
8	Capacity Building – No. of trainings attended, etc.	Nil
9	Status of Submission of Audit Utilization certificate (AUC) and Statement of Expenditure.	Submitted
10	Grading of each centre based on the performance by mentioning	
	Item	**Performance of Centre**
	BSP Unit	Very good
	STR	Very good
	ICAR Seed Project	Very good
	TSP	NA
11	Any other remarks by the committee.	

ICAR-IIWBR, Karnal and ICAR-IARI, RS, Karnal

S. No.	Items	Remark
1	Achievements of Breeder Seed Production under AICRP-NSP (Crops) against GOI and State indents and problems faced if any.	At IARI, RS, Karnal, the breeder seed plots of all the rice varieties were in excellent condition. Production was more than GOI indent and entire breeder seed was lifted by the indenters. However, seed crops at IIWBR were to be planted in *Rabi* season.
2	Discipline-wise progress of STR experiments – No. of experiments conducted, its status and results, reason for non-conduct of any experiments, problems faced, etc.	STR programme is not allotted to the centers.
3	Status of revolving fund in AICRP-NSP (Crops) and ICAR Seed Project – profit generated, problems in utilization if any.	AICRP-NSP and ICAR seed project revolving funds stands returned to ICAR-IISS. Profit generated is being utilized for seed production purpose only.
4	Progress of ICAR Seed Project - Breeder Seed, Foundation, Certified and Truthfully Labeled Seed.	Production achieved in different classes of seed in paddy, wheat and barley.
5	Status of Fund Utilization.	Satisfactory
6	Land and Infrastructure Development.	Nil
7	Transfer of Technology – No. of trainings organized, Farm women participation.	8
8	Capacity Building – No. of trainings attended, etc.	Nil
9	Status of Submission of Audit Utilization certificate (AUC) and Statement of Expenditure.	Submitted
10	Grading of each centre based on the performance by mentioning	
	Item	**Performance of Centre**
	BSP Unit	Excellent
	STR	NA
	ICAR Seed Project	Excellent
	TSP	-
11	Any other remarks by the committee.	

SVBPUAT, Meerut

S. No.	Items	Remark
1	Achievements of Breeder Seed Production under AICRP-NSP (Crops) against GOI and State indents and problems faced if any.	Breeder seed production of six crops is been take; the state and GOI indents will be fulfilled. Rice crop was excellent.
2	Discipline-wise progress of STR experiments	-
3	Status of revolving fund in AICRP-NSP (Crops) and ICAR Seed Project – profit	ICAR seed project revolving funds stands returned to ICAR-IISS. Profit generated is being

<table>
<tr><td></td><td>generated, problems in utilization if any.</td><td>utilized for seed production purpose only.</td></tr>
<tr><td>4</td><td>Progress of ICAR Seed Project - Breeder Seed, Foundation, Certified and Truthfully Labeled Seed.</td><td>No shortfall was observed in breeder and foundation seed production against the targets.</td></tr>
<tr><td>5</td><td>Status of Fund Utilization.</td><td>Satisfactory</td></tr>
<tr><td>6</td><td>Land and Infrastructure Development.</td><td>Nil</td></tr>
<tr><td>7</td><td>Transfer of Technology – No. of trainings organized, Farm women participation.</td><td></td></tr>
<tr><td>8</td><td>Capacity Building – No. of trainings attended, etc.</td><td>Nil</td></tr>
<tr><td>9</td><td>Status of Submission of Audit Utilization certificate (AUC) and Statement of Expenditure.</td><td>Submitted</td></tr>
<tr><td>10</td><td colspan="2">Grading of each centre based on the performance by mentioning
<table>
<tr><th>Item</th><th>Performance of Centre</th></tr>
<tr><td>BSP Unit</td><td>Very Good</td></tr>
<tr><td>STR</td><td>-</td></tr>
<tr><td>ICAR Seed Project</td><td>Good</td></tr>
<tr><td>TSP</td><td>-</td></tr>
</table></td></tr>
<tr><td>11</td><td>Any other remarks by the committee.</td><td></td></tr>
</table>

GBPUAT, Pantnagar

S. No.	Items	Remark
1	Achievements of Breeder Seed Production under AICRP-NSP (Crops) against GOI and State indents and problems faced if any.	Majority of the seed crop was harvested. The GOI indent will be fulfilled and no problem reported.
2	Discipline-wise progress of STR experiments – No. of experiments conducted, its status and results, reason for non-conduct of any experiments, problems faced, etc.	All the experiments were conducted as per the programme provided. Experiments on seed storage and seed pathology components were excellent.
3	Status of revolving fund in AICRP-NSP (Crops) and ICAR Seed Project – profit generated, problems in utilization if any.	AICRP-NSP and ICAR seed project revolving funds stands returned to ICAR-IISS. Profit generated is being utilized for seed production purpose only.
4	Progress of ICAR Seed Project - Breeder Seed, Foundation, Certified and Truthfully Labeled Seed.	Entire quantity of certified and truthfully labeled seeds of rice, wheat, blackgram, was made available to farming community.
5	Status of Fund Utilization.	Satisfactory
6	Land and Infrastructure Development.	
7	Transfer of Technology – No. of trainings organized, Farm women participation.	
8	Capacity Building – No. of trainings attended, etc.	
9	Status of Submission of Audit Utilization certificate (AUC) and Statement of Expenditure.	Submitted

10	Grading of each centre based on the performance by mentioning	
	Item	**Performance of Centre**
	BSP Unit	Very good
	STR	Excellent
	ICAR Seed Project	Good
	TSP	-
11	Any other remarks by the committee.	

ICAR-VPKAS, Almora

S. No.	Items	Remark
1	Achievements of Breeder Seed Production under AICRP-NSP (Crops) against GOI and State indents and problems faced if any.	Breeder seed plots of maize, upland rice and soybean varieties were excellent, properly isolated and true to type healthy plants. The GOI indent will be fulfilled and no problem reported.
2	Discipline-wise progress of STR experiments – No. of experiments conducted, its status and results, reason for non-conduct of any experiments, problems faced, etc.	STR component does not exist.
3	Status of revolving fund in AICRP-NSP (Crops) and ICAR Seed Project – profit generated, problems in utilization if any.	AICRP-NSP and ICAR seed project revolving funds stands returned to ICAR-IISS. Profit generated is being utilized for seed production purpose only.
4	Progress of ICAR Seed Project - Breeder Seed, Foundation, Certified and Truthfully Labeled Seed.	Entire quantity of certified and truthfully labeled seeds of maize, soybean, wheat, barley, linseed and rice was made available to farming community.
5	Status of Fund Utilization.	Allotted fund are properly utilized
6	Land and Infrastructure Development.	Satisfactory
7	Transfer of Technology – No. of trainings organized, Farm women participation.	Field day/ seed days and kisan mela were organized.
8	Capacity Building – No. of trainings attended, etc.	
9	Status of Submission of Audit Utilization certificate (AUC) and Statement of Expenditure.	Submitted
10	Grading of each centre based on the performance by mentioning	
	Item	**Performance of Centre**
	BSP Unit	Very good
	STR	-
	ICAR Seed Project	Very good
	TSP	Very good
11	Any other remarks by the committee.	

DSST, ICAR-IARI, New Delhi

S. No.	Items	Remark
1	Achievements of Breeder Seed Production under AICRP-NSP (Crops) against GOI and State indents and problems faced if any.	Breeder seed crops were yet to be sown during *Rabi* season.
2	Discipline-wise progress of STR experiments – No. of experiments conducted, its status and results, reason for non-conduct of any experiments, problems faced, etc.	All the STR experiments were conducted as per technical programme and were in excellent condition.
3	Status of revolving fund in AICRP-NSP (Crops) and ICAR Seed Project – profit generated, problems in utilization if any.	ICAR seed project revolving funds stands returned to ICAR-IISS. Profit generated is being utilized for seed production purpose only.
4	Progress of ICAR Seed Project - Breeder Seed, Foundation, Certified and Truthfully Labeled Seed.	Entire quantity of certified and truthfully labeled seeds of wheat, barley and rice was made available to farming community.
5	Status of Fund Utilization.	Allotted fund are properly utilized
6	Land and Infrastructure Development.	Satisfactory
7	Transfer of Technology – No. of trainings organized, Farm women participation.	Field day/ seed days and *kisan mela* were organized.
8	Capacity Building – No. of trainings attended, etc.	-
9	Status of Submission of Audit Utilization Certificate (AUC) and Statement of Expenditure.	Submitted
10	Grading of each centre based on the performance by mentioning	
	Item	**Performance of Centre**
	BSP Unit	Very good
	STR	Excellent
	ICAR Seed Project	Very good
	TSP	-
11	Any other remarks by the committee.	

Western Zone I

Monitoring Team:

1	Dr. M.B. Dhonde, MPKV, Rahuri	Convener
2	Dr. R.G. Parmar, AAU, Anand	Member

Centres monitored: ICAR-IGFRI, Jhansi; ICAR-DRMR, Bharatpur; SKNAU, Jobner; ICAR- CAZRI, Jodhpur

ICAR- IGFRI, Jhansi

S. No.	Items	Remarks
1.	Achievement of breeder seed production under AICRP – NSP (Crops) against GoI and State indents and problem faced if any	Against the indent of 2.55q, 25.30q breeder seed was produced during *Kharif* 2017
2.	Discipline wise progress of STR experiments – No. of experiments conducted, its status and results, reasons for non conduct of any experiments, problem faced etc.	NA
3.	Status of revolving fund in AICRP – NSP (Crops) and ICAR seed project- profit generated, problem in utilization if any	Revenue generated: Rs. 2607483/- (ISP) Rs. 1003198/- (NSP)
4.	Progress of ICAR seed project – breeder seed. Foundation seed, Certified and truthfully labelled seed	Produced 89.88q of TL seeds during *Kharif* 2017
5.	Participatory seed production programme especially under ICAR seed project (Quantity / quality/class)	15.10 ha. area is planted under participatory approach for fodder crops.
6.	Status of fund utilization	Money utilized
7.	Land and infrastructure development	Establishment of new seed testing laboratory
8.	Transfer of technology- No. of training organized, farm women participation	Training-02
9.	Capacity building, No. of training attended etc.	03 trainings have been attended by staff
10.	Status of submission of AUC and SOE	Submitted
11.	Grading of each centre based on the performance	
	Unit	**Performance of centre**
	BSP unit	Good
	STR unit	-
	ICAR seed project	Good
	TSP	-
12.	Any other remarks by the committee	Well managed seed crops.

ICAR- DRMR, Bharatpur

S. No.	Items	Remarks
1.	Achievement of breeder seed production under AICRP – NSP (Crops) against GoI and State indents and problem faced if any	Against the indent of 101.07 q breeder seed of 74 Rapeseed-mustard varieties, 212.67 q breeder seed including carry over was produced, indicating a surplus availability of 158.62q.
2.	Discipline wise progress of STR experiments – No. of experiments conducted, its status and results, reasons for non conduct of any experiments, problem faced etc.	NA
3.	Status of revolving fund in AICRP – NSP (Crops) and ICAR seed project- profit generated,	Available Profit: Rs. 12,62,191/- (ISP)

	problem in utilization if any	
4.	Progress of ICAR seed project – breeder seed. Foundation seed, Certified and truthfully labelled seed	Produced 1682.97 q against 715 q
5.	Participatory seed production programme especially under ICAR seed project (Quantity / quality/class)	--
6.	Status of fund utilisation	Money utilized and unspent money of 12th plan has been sent within stipulated time to ICAR-IISS, Mau, UP.
7.	Land and infrastructure development	NA (2016-17)
8.	Transfer of technology- No. of training organised, farm women participation	Training-02
9.	Capacity building, No. of training attended etc.	Two trainings have been attended by ACTO.
10.	Status of submission of AUC and SOE	Submitted
11.	Grading of each centre based on the performance	
	Unit	**Performance of centre**
	BSP unit	Excellent
	STR unit	-
	ICAR seed project	Excellent
	TSP	-
12.	Any other remarks by the committee	Well managed seed crops.

RARI, Durgapura, Jaipur (SKNAU, Jobner)

S. No.	Items	Remarks
1.	Achievement of breeder seed production under AICRP – NSP (Crops) against GoI and State indents and problem faced if any	NA
2.	Discipline wise progress of STR experiments – No. of experiments conducted, its status and results, reasons for non conduct of any experiments, problem faced etc.	2 experiments were not conducted, experiments on survey could not be conducted due to non availability of fund in TA head of the project.
3.	Status of revolving fund in AICRP – NSP (Crops) and ICAR seed project- profit generated, problem in utilization if any	NA
4.	Progress of ICAR seed project – breeder seed. Foundation seed, Certified and truthfully labelled seed	NA
5.	Participatory seed production programme especially under ICAR seed project (Quantity /quality/class)	NA
6.	Status of fund utilization	P&A : (-) 43.91 lakhs; Res. Exp. (-) 0.95 lakhs; TA: (-) 0.22 lakhs
7.	Land and infrastructure development	NA
8.	Transfer of technology- No. of training organized, farm women participation	03
9.	Capacity building, No. of training attended etc.	04
10.	Status of submission of AUC and SOE	Submitted

11.	Grading of each centre based on the performance	
	Unit	**Performance of centre**
	BSP unit	-
	STR unit	Very Good
	ICAR seed project	-
	TSP	-
12.	Any other remarks by the committee	Few programmes were not taken up due to non-availability of funds.

SKRAU, Bikaner

S. No.	Items	Remarks
1.	Achievement of breeder seed production under AICRP – NSP (Crops) against GOI and State indents and problem faced if any	Produced breeder seed more than GOI Indent of moth, guar, cotton & groundnut.
2.	Discipline wise progress of STR experiments – No. of experiments conducted, its status and results, reasons for non conduct of any experiments, problem faced etc.	Not allotted
3.	Status of revolving fund in AICRP – NSP (Crops) and ICAR seed project- profit generated, problem in utilization if any	Balance as on 01.04.2016 Rs. 3033239.95/- (NSP) Balance as on 01.04.2017 Rs. 5898396.95/- (ISP) Rs. 2000000/- refunded to ICAR
4.	Progress of ICAR seed project – breeder seed. Foundation seed, Certified and truthfully labelled seed	Production during 2016-17: BS - 1799 q TL- 2263 q
5.	Participatory seed production programme especially under ICAR seed project (Quantity/quality/class)	NA
6.	Status of fund utilization	Satisfactory
7.	Land and infrastructure development	Budget was not provided
8.	Transfer of technology- No. of training organized, farm women participation	Two trainings at 6 JMD and Beethnokh Village proposed in March 2017-18
9.	Capacity building, No. of training attended etc.	-
10.	Status of submission of AUC and SOE	Submitted
11.	Grading of each centre based on the performance	
	Unit	**Performance of centre**
	BSP unit	Good
	STR unit	-
	ICAR seed project	Good
	TSP	-
12.	Any other remarks by the committee	Needs permanent irrigation source

ICAR- CAZRI, Jodhpur

S. No.	Items	Remarks
1.	Achievement of breeder seed production under AICRP – NSP (Crops) against GoI and State indents and problem faced if any	GOI- 6.0 q against 5.8 q of CAZRI moth -2. Problem: Limited staff, non lifting
2.	Discipline wise progress of STR experiments – No. of experiments conducted, its status and results, reasons for non conduct of any experiments, problem faced etc.	01
3.	Status of revolving fund in AICRP – NSP (Crops) and ICAR seed project- profit generated, problem in utilization if any	Rs. 2,32,639/-(revenue generated)
4.	Progress of ICAR seed project – breeder seed. Foundation seed, Certified and truthfully labeled seed	Seed production of cumin, pearlmillet, moth bean, clusterbean, mustard and grasses were carried and 90 q seeds produced.
5.	Participatory seed production programme especially under ICAR seed project (Quantity /quality/class)	NA
6.	Status of fund utilization	Fully utilized
7.	Land and infrastructure development	3 ha
8.	Transfer of technology- No. of training organized, farm women participation	01 (TSP) 120 ST farmers participated
9.	Capacity building, No. of training attended etc.	Nil
10.	Status of submission of AUC and SOE	Submitted
11.	Grading of each centre based on the performance	
	Unit	**Performance of centre**
	BSP unit	Good
	STR unit	Good
	ICAR seed project	Very good
	TSP	Good
12.	Any other remarks by the committee	Excellent programme

Monitoring of STR experiments at RARI, Durgapura, SKNAU, Jobner

Quality seed production plots at ICAR-DRMR, Bharatpur

Western Zone – II

Monitoring Team:

1	Dr. P.S. Shukla, GBPUAT, Pantnagar	Convener
2	Dr. N.K. Gupta, SKNAU, Jobner	Member
3	Dr. Bhojaraja Naik K., ICAR-IISS, Mau	Member

Date of monitoring: 01 – 05, October 2017 and 05 – 08, March 2018

Centres monitored: AAU, Anand; JAU, Junagadh; ICAR-DGR, Junagadh; SDAU, SK Nagar; AU, Kota; NAU, Navsari

AAU, Anand

S. No.	Items	Remark
1	Achievements of Breeder Seed Production under AICRP-NSP (Crops) against GOI and State indents and problems faced if any.	The GOI indent was fulfilled. Total seed production was 652.72q against the indent of 667.09q in various crops. Failed to meet state indent in some of the crops viz., maize, wheat, pigeon pea and cotton
2	Discipline-wise progress of STR experiments	Pathology : Total nine experiments has been allotted, five experiments were conducted and three were in progress during *Kharif* and one will be conducted in *Rabi*, 2018
3	Status of revolving fund in AICRP-NSP (Crops) and ICAR Seed Project–profit generated, problems in utilization if any.	Rs. 1,55,000/- returned.
4	Progress of ICAR Seed Project - Breeder Seed, Foundation, Certified and Truthfully Labeled Seed.	A total of 4259.00q of foundation, certified, truthfully labeled seeds were produced.
5	Participatory seed production programme especially under ICAR Seed Project (Quantity / quality / class).	Participatory seed production of paddy (variety Gurjari & GAR-13) has been taken and expected production will be 250q and also planned for wheat in *Rabi*.
6	Status of Fund Utilization.	Satisfactory
7	Land and Infrastructure Development.	Nil
8	Transfer of Technology – No. of trainings organized, Farm women participation.	Two trainings were organized for progressive seed producing farmers
9	Capacity Building – No. of trainings attended, etc.	Nil
10	Status of Submission of Audit Utilization certificate (AUC) and Statement of Expenditure.	Submitted
11	Grading of each centre based on the performance by mentioning **Item** / **Performance of Centre** BSP Unit / Satisfactory STR / Excellent ICAR Seed Project / Satisfactory TSP / Good	
12	Any other remarks by the committee.	Processing unit and seed godown needs proper maintenance. Suggested to display uniform

		sized field boards

JAU, Junagadh

S. No.	Items	Remark
1	Achievements of Breeder Seed Production under AICRP-NSP (Crops) against GOI and State indents and problems faced if any.	The total breeder seed of 9.72q is produced against the GOI and state indent of 0.825 q for different varieties of bajra.
2	Discipline-wise progress of STR experiments – No. of experiments conducted, its status and results, reason for non-conduct of any experiments, problems faced, etc.	Could not able to conduct experiment on 'Standardization of isolation distance for seed production of cumin' because of non-availability of seeds. The experiment, 'Standardization of seed production technology in green manure crops', is been conducted with dhaincha, sunhemp and pillipesara was conducted as per technical programme. Entomology: five experiments were conducted as per the technical programme.
3	Status of revolving fund in AICRP-NSP (Crops) and ICAR Seed Project – profit generated, problems in utilization if any.	Under AICRP-NSP revolving fund Rs. 2.7 lakh was returned
4	Progress of ICAR Seed Project - Breeder Seed, Foundation, Certified and Truthfully Labeled Seed.	Production achieved in breeder seed of ground nut, sesame and pearl millet.
5	Participatory seed production programme especially under ICAR Seed Project (Quantity / quality / class).	Nil
6	Status of Fund Utilization.	Unspent balance of Rs. 32,02,709.00 for financial year 2016-17 was returned to ICAR-IISS, Mau
7	Land and Infrastructure Development.	Procured some of the minor equipments and implements.
8	Transfer of Technology – No. of trainings organized, Farm women participation.	Two trainings organized. One day training programme on 'Seed production technology in pearl millet'. Three day training on 'varietal characterization and seed production technology in pearl millet'.
9	Capacity Building – No. of trainings attended, etc.	Attended one training and participated in state level seminar
10	Status of Submission of Audit Utilization certificate (AUC) and Statement of Expenditure.	Submitted
11	Grading of each centre based on the performance by mentioning	

Item	Performance of Centre
BSP Unit	Good
STR	Very Good
ICAR Seed Project	Good
TSP	-

12	Any other remarks by the committee.	The average performance of the centre is good.

		It is better to shift some of the STR components from Jamnagar to Junagadh main station. The Breeder Seed production plot of Groundnut at Jamnagar is not up to the standard.

ICAR-DGR, Junagadh

S. No.	Items	Remark
1	Achievements of Breeder Seed Production under AICRP-NSP (Crops) against GOI and State indents and problems faced if any.	NA
2	Discipline-wise progress of STR experiments	NA
3	Status of revolving fund in AICRP-NSP (Crops) and ICAR Seed Project – profit generated, problems in utilization if any.	-
4	Progress of ICAR Seed Project - Breeder Seed, Foundation, Certified and Truthfully Labeled Seed.	Produced a total quality seed of 134.15 q of groundnut variety Girnar-2 and 72.35 q of Girnar-3.
5	Participatory seed production programme especially under ICAR Seed Project	Nil
6	Status of Fund Utilization.	Satisfactory
7	Land and Infrastructure Development.	Nil
8	Transfer of Technology – No. of trainings organized, Farm women participation.	One field day was organized for 164 farmers of Bikaner and one *kisan gosti* for 203 farmers of Junagadh
9	Capacity Building – No. of trainings attended, etc.	Nil
10	Status of Submission of Audit Utilization certificate (AUC) and Statement of Expenditure.	Submitted. Balance amount of Rs. 4,19,914 has been returned to ICAR-IISS, Mau.
11	Grading of each centre based on the performance by mentioning	
	Items	**Performance of Centre**
	BSP Unit	-
	STR	-
	ICAR Seed Project	Good
	TSP	-
12	Any other remarks by the committee.	

SDAU, SK Nagar

S. No.	Items	Remark
1	Achievements of Breeder Seed Production under AICRP-NSP (Crops) against GOI and State indents and problems faced if any.	During *Kharif* 2017 Breeder seed production programme was taken up in pulses (green gram black gram, pigeon pea, moth bean, cowpea, cluster bean and field pea) and in oilseed crops (castor). But could not fulfill the GOI and State indent in many crops, due to heavy and continuous rainfall.

		During *Rabi* 2017-18 Breeder seed production programme of wheat and mustard was taken in 109.20 ha.
2	Discipline-wise progress of STR experiments – No. of experiments conducted, its status and results, reason for non-conduct of any experiments, problems faced, etc.	Nil
3	Status of revolving fund in AICRP-NSP (Crops) and ICAR Seed Project – profit generated, problems in utilization if any.	Closing balance as on Feb 2018 is Rs. 241.12 lakhs
4	Progress of ICAR Seed Project - Breeder Seed, Foundation, Certified and Truthfully Labeled Seed.	Expected production of quality seed in green gram, black gram, guar, ground nut and castor is 350.00 q during *kharif* 2017 and 22.00 q in *Rabi* 2018 for the crops wheat, mustard and cumin.
5	Participatory seed production programme especially under ICAR Seed Project (Quantity / quality / class).	Nil
6	Status of Fund Utilization.	Satisfactory
7	Land and Infrastructure Development.	Nil
8	Transfer of Technology – No. of trainings organized, Farm women participation.	Organized Farmers Day entitled 'Uttar Gujarat Na Mukhya Kheti Pako Ma Beej Utpadan'.
9	Capacity Building – No. of trainings attended, etc.	Attended one training on Farm Journalism.
10	Status of Submission of Audit Utilization certificate (AUC) and Statement of Expenditure.	Submitted
11	Grading of each centre based on the performance by mentioning	
	Item	**Performance of Centre**
	BSP Unit	Very good
	STR	-
	ICAR Seed Project	Very good
	TSP	
12	Any other remarks by the committee.	The overall performance of the centre is good.

NAU, Navsari

S. No.	Items	Remark
1	Achievements of Breeder Seed Production under AICRP-NSP (Crops) against GOI and State indents and problems faced if any.	Very less quantity of GOI (0.1 q) and State indent (60.13) for Breeder seed (cotton lines, paddy and pigeon pea) and production is 79.29 q
2	Discipline-wise progress of STR experiments – No. of experiments conducted, its status and results, reason for non-conduct of any experiments, problems faced, etc.	Nil
3	Status of revolving fund in AICRP-NSP (Crops) and ICAR Seed Project – profit generated, problems in utilization if any.	After refunding of Rs. 15 lakhs the centre has Rs. 1,38,68,325 as revenue during 2016-17.

4	Progress of ICAR Seed Project - Breeder Seed, Foundation, Certified and Truthfully Labeled Seed.	Breeder Seed, Foundation, Certified and TFL seed of different crops *viz.,* cereals, oilseed, pulses (5628 q) and cash crops and planting material of sugarcane (335870 No's) and Banana (541 No's) is being produced. Due to unfavorable condition banana tissue plantlets has not survived and failed to meet the target (25000 No's)
5	Participatory seed production programme especially under ICAR Seed Project (Quantity / quality / class).	Foundation, Certified and TFL seeds of cereals, oilseed, pulses and cash crops were produced in cooperating centres.
6	Status of Fund Utilization.	Satisfactory
7	Land and Infrastructure Development.	Nil
8	Transfer of Technology – No. of trainings organized, Farm women participation.	Two on campus and two off campus trainings were organized. One Seed Mela was organized at Chausala, Kaprada, Valsad.
9	Capacity Building – No. of trainings attended, etc.	Nil
10	Status of Submission of Audit Utilization certificate (AUC) and Statement of Expenditure.	Submitted
11	Grading of each centre based on the performance by mentioning	
	Item	**Performance of Centre**
	BSP Unit	-
	STR	-
	ICAR Seed Project	Very good
	TSP	
12	Any other remarks by the committee.	The overall performance is good. Centre should maintain the data of nucleus seed.

AU, Kota

S. No.	Items	Remark
1	Achievements of Breeder Seed Production under AICRP-NSP (Crops) against GOI and State indents and problems faced if any.	As against the 1775.45 q and 510.00q of breeder seed indent of GOI in wheat & gram, 4139.14q and 1085.00q were produced in *Rabi* 2016-17 respectively. In *Kharif* 2017 Breeder seeds of paddy, soybean, urd bean and mung bean were produced but couldn't meet the complete GOI indent.
2	Discipline-wise progress of STR experiments – No. of experiments conducted, its status and results, reason for non-conduct of any experiments, problems faced, etc.	NA
3	Status of revolving fund in AICRP-NSP (Crops) and ICAR Seed Project – profit generated, problems in utilization if any.	NA
4	Progress of ICAR Seed Project - Breeder Seed, Foundation, Certified and Truthfully	NA

	Labeled Seed.	
5	Participatory seed production programme especially under ICAR Seed Project (Quantity / quality / class).	Not taken
6	Status of Fund Utilization.	-
7	Land and Infrastructure Development.	NA
8	Transfer of Technology – No. of trainings organized, Farm women participation.	NA
9	Capacity Building – No. of trainings attended, etc.	NA
10	Status of Submission of Audit Utilization certificate (AUC) and Statement of Expenditure.	Submitted
11	Grading of each centre based on the performance by mentioning	
	Item	**Performance of Centre**
	BSP Unit	Good
	STR	-
	ICAR Seed Project	-
	TSP	-
12	Any other remarks by the committee.	The overall performance of the centre is good. The centre should maintain produced required quantity of breeder seed.

	
Monitoring of BSP plots of Groundnut at JAU, Junagadh	**Quality seed production of paddy at AAU, Anand**

Central Zone – I

Monitoring Team:

1	Dr. Parashivamurthy, UAS, Bengaluru	Convener
2	Dr. P. Chakraborthy, BCKV, Nadia	Member
3	Dr. S.P. Jeevan Kumar, ICAR-IISS, Mau	Member

Date of monitoring: 08 – 13th September 2017

Centres monitored: PDKV, Akola; MAU, Parbhani; MPKV, Rahuri; ICAR-IISR, Indore; VSI, Pune; KKV, Dapoli

VSI, Pune

S No.	Items	Remarks
1	Achievements of Breeder Seed Production under AICRP-NSP (Crops) against GOI and State indents and problems faced if any.	NA
2	Discipline-wise progress of STR experiments – No. of experiments conducted, its status and results, reason for non-conduct of any experiments, problems faced, etc.	NA
3	Status of revolving fund in AICRP-NSP (Crops) and ICAR Seed Project – profit generated problems in utilization if any.	-
4	Progress of ICAR Seed Project - Breeder Seed, Foundation, Certified and Truthfully Labeled Seed.	In 2016-17, about 60.49 lakh two eye budded, 15.33 lakh single eye budded sets and one lakh tissue culture plantlets were distributed to farmers
5	Participatory seed production programme especially under ICAR Seed Project (Quantity / quality / class).	Nil
6	Status of Fund Utilization.	Satisfactory
7	Land and Infrastructure Development.	Drip irrigation, power tiller, tractor etc. have been purchased to facilitate seed production
8	Transfer of Technology – No. of trainings organized, Farm women participation.	In progress
9	Capacity Building – No. of trainings attended, etc.	-
10	Status of Submission of Audit Utilization certificate (AUC) and Statement of Expenditure.	Submitted
11	Grading of each centre based on the performance by mentioning	
	Item	**Performance of Centre**
	BSP Unit	-
	STR	-
	ICAR Seed Project	Very good
	TSP	Good
12	Any other remarks by the committee.	• The monitoring team suggested to identify the genuine tribal's and to visit the tribal area instead of selecting cane producers under TSP.

BSKKV, Dapoli

S No.	Items	Remarks
1	Achievements of Breeder Seed Production under AICRP-NSP (Crops) against GOI and State indents and problems faced if any.	Achieving the targeted seed production
2	Discipline-wise progress of STR experiments – No. of experiments	Satisfactory, all *Kharif* experiments have been conducted. Panhala (Kolhapur) area was

	conducted, its status and results, reason for non-conduct of any experiments, problems faced, etc.	identified as an alternative area for hybrid seed production of rice.
3	Status of revolving fund in AICRP-NSP (Crops) and ICAR Seed Project – profit generated, problems in utilization if any.	ICAR Seed Project: Rs. 4.0 lakhs returned to ICAR during 2016-17
4	Progress of ICAR Seed Project - Breeder Seed, Foundation, Certified and Truthfully Labeled Seed.	Achieving the targeted production
5	Participatory seed production programme especially under ICAR Seed Project (Quantity / quality / class).	2055 quintals of seed will be produced through participatory seed production programme during 2017-18.
6	Status of Fund Utilization.	In 2016-17 a sufficient amount remained unutilized under NRC head.
7	Land and Infrastructure Development.	Revolving fund is being used for various developmental activities.
8	Transfer of Technology – No. of trainings organized, Farm women participation.	10 trainings
9	Capacity Building – No. of trainings attended, etc.	-
10	Status of Submission of Audit Utilization certificate (AUC) and Statement of Expenditure.	Submitted
11	Grading of each centre based on the performance by mentioning **Item** — **Performance of Centre** BSP Unit — Very good STR — - ICAR Seed Project — Very good TSP — Good	
12	Any other remarks by the committee.	• Centre has capability to organize more experiments especially to address the local problems associated with coastal region. • Suggested to maintain uniformity in breeder seed production plots of paddy hybrid.

MPKV, Rahuri

S No.	Items	Remarks
1	Achievements of Breeder Seed Production under AICRP-NSP (Crops) against GOI and State indents and problems faced if any.	Achieving the targeted seed production, 1856.2 quintals of Breeder seed of 14 field crops to fulfill the indent of ICAR/GOI and State for was produced during 2016-17.
2	Discipline-wise progress of STR experiments – No. of experiments conducted, its status and results, reason for non-conduct of any experiments, problems faced, etc.	Satisfactory, 31 experiments representing six various aspects are in progress including the seed processing and DUS testing.
3	Status of revolving fund in AICRP-NSP (Crops) and ICAR Seed Project – profit generated, problems in utilization if any.	Rs. 1990241/- was total revenue generated under revolving fund in 2016-17.

4	Progress of ICAR Seed Project - Breeder Seed, Foundation, Certified and Truthfully Labeled Seed.	Achieving the targeted seed production
5	Participatory seed production programme especially under ICAR Seed Project (Quantity / quality / class).	-
6	Status of Fund Utilization.	NRC amount is being utilized efficiently for purchase of equipment
7	Land and Infrastructure Development.	Revolving fund is being used for various developmental activities.
8	Transfer of Technology – No. of trainings organized, Farm women participation.	-
9	Capacity Building – No. of trainings attended, etc.	One training programme was organised
10	Status of Submission of Audit Utilization certificate (AUC) and Statement of Expenditure.	Submitted
11	Grading of each centre based on the performance by mentioning	

Item	Performance of Centre
BSP Unit	Excellent
STR	Excellent
ICAR Seed Project	Excellent
TSP	Excellent

12	Any other remarks by the committee.	• Centre requested additional grants under head salary to meet the arrear liability of staff under NSP.

VNMKV, Parbhani

S No.	Items	Remarks
1	Achievements of Breeder Seed Production under AICRP-NSP (Crops) against GOI and State indents and problems faced if any.	Achieving the targeted seed production. Suggested to maintain processing hall in good condition.
2	Discipline-wise progress of STR experiments – No. of experiments conducted, its status and results, reason for non-conduct of any experiments, problems faced, etc.	All *Kharif* experiments conducted and are in progress. Centre needs considerable improvement under execution of experiment and management.
3	Status of revolving fund in AICRP-NSP (Crops) and ICAR Seed Project – profit generated, problems in utilization if any.	ICAR Seed Project: Around 324 lakhs profit was generated. ICAR revolving fund should be separated and should not be clubbed with university revolving fund.
4	Progress of ICAR Seed Project - Breeder Seed, Foundation, Certified and Truthfully Labeled Seed.	The targeted seed production of Foundation, Certified and Truthfully labeled seed are 1239 q, 40.0 q and 1906.38 q, respectively in 19 crops.
5	Participatory seed production programme especially under ICAR Seed Project (Quantity / quality / class).	-
6	Status of Fund Utilization.	NRC amount is being utilized efficiently for purchase of equipment.

7	Land and Infrastructure Development.	Revolving fund is not being utilized for development of infrastructure facilities.
8	Transfer of Technology – No. of trainings organized, Farm women participation.	-
9	Capacity Building – No. of trainings attended, etc.	One training programme was organized
10	Status of Submission of Audit Utilization certificate (AUC) and Statement of Expenditure.	Submitted
11	Grading of each centre based on the performance by mentioning	
	Item	**Performance of Centre**
	BSP Unit	Good
	STR	Good
	ICAR Seed Project	Good
	TSP	Not conducted due to non-availability of funds
12	Any other remarks by the committee.	• Management of ICAR seed project need to be improved.

Dr. PDKV, Akola

S No.	Items	Remarks
1	Achievements of Breeder Seed Production under AICRP-NSP (Crops) against GOI and State indents and problems faced if any.	Planning to produce 2087.65 quintals of breeder seeds of 11 field crops to fulfill the indent of ICAR/GOI in 2017-18. The seed production fields are not up to the mark especially in weed management.
2	Discipline-wise progress of STR experiments – No. of experiments conducted, its status and results, reason for non-conduct of any experiments, problems faced, etc.	All *kharif* experiments executed and are in progress. In 2017-18, this centre is conducting 10 research experiments.
3	Status of revolving fund in AICRP-NSP (Crops) and ICAR Seed Project – profit generated, problems in utilization if any.	ICAR Seed Project: Around 56 lakhs profit as on 1st April. An amount of Rs 11 lakhs is yet to be refunded to ICAR.
4	Progress of ICAR Seed Project - Breeder Seed, Foundation, Certified and Truthfully Labeled Seed.	In 2016-17, the total seed production is more than double of the targeted production.
5	Participatory seed production programme especially under ICAR Seed Project (Quantity / quality / class).	Seed production of soybean and redgram is taken up
6	Status of Fund Utilization.	-
7	Land and Infrastructure Development.	Revolving fund is not being utilized for development of infrastructure facilities.
8	Transfer of Technology – No. of trainings organized, Farm women participation.	-
9	Capacity Building – No. of trainings attended, etc.	One training programme was organised
10	Status of Submission of Audit Utilization certificate (AUC) and Statement of Expenditure.	Submitted

11	Grading of each centre based on the performance by mentioning **Item** / **Performance of Centre** BSP Unit: Good STR: Very good ICAR Seed Project: Good TSP: -	
12	Any other remarks by the committee.	• Lack of irrigation facilities, and absence/incomplete fencing are hampering the seed production programme. • Portion of fund particularly in TA is not utilized in 2016-17.

ICAR-IISR, Indore

S No.	Items	Remarks
1	Achievements of Breeder Seed Production under AICRP-NSP (Crops) against GOI and State indents and problems faced if any.	In 2017-18, targeted breeder seed production is 323.5 q.
2	Discipline-wise progress of STR experiments – No. of experiments conducted, its status and results, reason for non-conduct of any experiments, problems faced, etc.	One experiment on soybean polymer coating is under taken
3	Status of revolving fund in AICRP-NSP (Crops) and ICAR Seed Project – profit generated, problems in utilization if any.	-
4	Progress of ICAR Seed Project - Breeder Seed, Foundation, Certified and Truthfully Labeled Seed.	Achieving the targeted seed production.
5	Participatory seed production programme especially under ICAR Seed Project (Quantity / quality / class).	-
6	Status of Fund Utilization.	-
7	Land and Infrastructure Development.	-
8	Transfer of Technology – No. of trainings organized, Farm women participation.	Many
9	Capacity Building – No. of trainings attended, etc.	One
10	Status of Submission of Audit Utilization certificate (AUC) and Statement of Expenditure.	Submitted
11	Grading of each centre based on the performance by mentioning **Item** / **Performance of Centre** BSP Unit: - STR: - ICAR Seed Project: Excellent TSP: -	

	
Monitoring of STR experiments at Dr. PDKV, Akola	**Breeder seed production plots at ICAR-IISR, Indore**

Central Zone - II

Monitoring Team:

1	Dr. V. R. Shelar, MPKV, Rahuri	Convener
2	Dr. M. Sharma, SKUAST, Jammu	Member
3	Dr. Vijaykumar H.P. ICAR-IISS, Mau	Member

Date of monitoring: 20 – 26, September, 2017

Centres monitored: JNKVV, Jabalpur; ICAR-CICR, Nagpur; IGKV, Raipur; OUAT, Bhubaneswar; ICAR-NRRI, Cuttack.

CICR, Nagpur

S. No.	Items	Remarks
1	Achievements of Breeder Seed Production under AICRP – NSP (Crops) against GOI and State indents and problems faced, if any	Achieving the targets under BSP. Suggested to undertake breeder seed production of recently released Bt cotton varieties.
2	Discipline-wise progress of STR experiments - No. of experiments conducted, its status and results, reason for non-conduct of any experiments, problems faced, etc.	No Project
3	Status of Revolving Fund – AICRP -NSP (Crops) and ICAR Seed Project -profit generated problems in utilization, if any.	ISP: Out of total 10 lakhs provided as revolving fund, Rs. 4.0 lakhs was refunded.
4	Progress of ICAR Seed Project - Breeder, Foundation, Certified and Truthfully Labeled Seed.	Satisfactory
5	Participatory Seed Production Programme especially under ICAR Seed Project (Quantity /Quality / Class)	-
6	Status of Fund Utilization	-
7	Land and Infrastructure Development	Nil
8	Transfer of Technology - No. of trainings organized, farm women participation	Three *Kishan Gosti* were arranged.

9	Capacity Building - No. of trainings attended	Nil
10	Status of submission of Audit Utilization Certificate (AUC) and Statement of Expenditure.	Submitted
11	Grading of each centre based on the performance by mentioning	-
	Name of Centre	Performance of Centre
	BSP Unit	Good
	STR	-
	ICAR Seed Project	Good
	TSP	Good

JNKVV, Jabalpur

S. No.	Items	Remarks
1	Achievements of Breeder Seed Production under AICRP – NSP (Crops) against GOI and State indents and problems faced, if any	Suggested to license the recently released varieties of soybean *viz.* JS 2069 and JS 2098 which are resistant to *R. solani* and *R. botaticola,* so that the centre can earn revenue.
2	Discipline-wise progress of STR experiments - No. of experiments conducted, its status and results, reason for non-conduct of any experiments, problems faced, etc.	Centre has conducted all allotted experiments.
3	Status of Revolving Fund – AICRP -NSP (Crops) and ICAR Seed Project -profit generated problems in utilization, if any.	ISP: 65 lakhs provided as revolving fund, Rs. 26 lakhs was refunded.
4	Progress of ICAR Seed Project - Breeder, Foundation, Certified and Truthfully Labeled Seed.	-
5	Participatory Seed Production Programme especially under ICAR Seed Project (Quantity /Quality / Class)	-
6	Status of Fund Utilization	Good infrastructure has been developed under megaseed project.
7	Land and Infrastructure Development	Nil
8	Transfer of Technology - No. of trainings organized, farm women participation	One off campus training programme was organized.
9	Capacity Building - No. of trainings attended, etc.	Three
10	Status of submission of Audit Utilization Certificate (AUC) and Statement of Expenditure.	Submitted
11	Grading of each centre based on the performance by mentioning	-
12	Name of Centre	Performance of Centre
	BSP Unit	Excellent
	STR	Excellent
	ICAR Seed Project	Excellent

	TSP	Good

IGKVV, Raipur

S. No.	Items	Remarks
1	Achievements of Breeder Seed Production under AICRP – NSP (Crops) against GOI and State indents and problems faced, if any	The team inspected breeder seed production plots of paddy, soybean and pigeonpea. The crop stand was very good and uniform without any off-types. Centre has met the breeder seed indents of DAC except in varieties *viz*., Ranidhan of paddy and few varieties of mung, urd and sesame during 2016-17.
2	Discipline-wise progress of STR experiments - No. of experiments conducted, its status and results, reason for non-conduct of any experiments, problems faced, etc.	One STR experiment taken up i.e. “Integrated Approach for Enhancing Seed Yield and Quality in Millets” though it is voluntary centre.
3	Status of Revolving Fund – AICRP -NSP (Crops) and ICAR Seed Project -profit generated problems in utilization, if any.	All the money refunded.
4	Progress of ICAR Seed Project - Breeder, Foundation, Certified and Truthfully Labeled Seed.	During *Kharif* 2016-17, Sufficient quantities of breeder, foundation and certified seed will be produced and the target will be fulfilled.
5	Participatory Seed Production Programme especially under ICAR Seed Project (Quantity /Quality / Class)	Satisfactory
6	Status of Fund Utilization	Good infrastructure has been development under Megaseed project.
7	Land and Infrastructure Development	Nil
8	Transfer of Technology - No. of trainings organized, farm women participation	Six off campus trainings were organized.
9	Capacity Building - No. of trainings attended, etc.	Two
10	Status of submission of Audit Utilization Certificate (AUC) and Statement of Expenditure.	Submitted
11	Grading of each centre based on the performance by mentioning	-
	Name of Centre	Performance of Centre
	BSP Unit	Excellent
	STR	-
	ICAR Seed Project	Excellent
	TSP	Excellent

OUAT, Bhubaneswar

S. No.	Items	Remarks
1	Achievements of Breeder Seed Production under AICRP – NSP (Crops) against GOI and State indents and problems faced, if any	Satisfactory, minor shortfalls were seen in few crops.
2	Discipline-wise progress of STR experiments - No. of experiments conducted, its status and results, reason for non-conduct of any experiments, problems faced, etc.	Centre has taken only 3 experiments; work load is very less compared to staff strength.
3	Status of Revolving Fund – AICRP -NSP (Crops) and ICAR Seed Project -profit generated problems in utilization, if any.	Revolving fund is maintained by Dean/Director of Research and recommended that it should be maintained by Nodal officer of the project.
4	Progress of ICAR Seed Project - Breeder, Foundation, Certified and Truthfully Labeled Seed.	Satisfactory
5	Participatory Seed Production Programme especially under ICAR Seed Project (Quantity /Quality / Class)	Satisfactory
6	Status of Fund Utilization	Good infrastructure has been developed under Megaseed project.
7	Land and Infrastructure Development	Nil
8	Transfer of Technology - No. of trainings organized, farm women participation	Five off campus trainings were organized.
9	Capacity Building - No. of trainings attended, etc.	Two
10	Status of submission of Audit Utilization Certificate (AUC) and Statement of Expenditure.	Submitted
11	Grading of each centre based on the performance by mentioning	-
	Name of Centre	Performance of Centre
	BSP Unit	Good
	STR	Good
	ICAR Seed Project	Good
	TSP	Good

NRRI, Cuttack

S. No.	Items	Remarks
1	Achievements of Breeder Seed Production under AICRP – NSP (Crops) against GOI and State indents and problems faced, if any	Centre is fulfilling the indents. Excellent maintenance breeding programme is being followed.
2	Discipline-wise progress of STR experiments - No. of experiments conducted, its status and results, reason	No Project

	for non-conduct of any experiments, problems faced, etc.	
3	Status of Revolving Fund – AICRP -NSP (Crops) and ICAR Seed Project -profit generated problems in utilization, if any.	All the seed money refunded.
4	Progress of ICAR Seed Project - Breeder, Foundation, Certified and Truthfully Labeled Seed.	Sufficient quantities of breeder and truthful labeled seed will be produced during *Kharif* 2017.
5	Participatory Seed Production Programme especially under ICAR Seed Project (Quantity /Quality / Class)	Satisfactory
6	Status of Fund Utilization	Good infrastructure has been developed under Megaseed project.
7	Land and Infrastructure Development	Nil
8	Transfer of Technology - No. of trainings organized, farm women participation	Two off campus trainings were organized.
9	Capacity Building - No. of trainings attended, etc.	Three
10	Status of submission of Audit Utilization Certificate (AUC) and Statement of Expenditure.	Submitted
11	Grading of each centre based on the performance by mentioning	-
	Name of Centre	Performance of Centre
	BSP Unit	Excellent
	STR	-
	ICAR Seed Project	Excellent
	TSP	-

North Eastern Zone

Monitoring Team:

1	Dr. K. Madhusudan, UAS, Bengaluru	Convener
2	Dr. C.S. Kar, ICAR-CRIJAF, Barrackpore	Member
3	Dr. Prabir Bhattacharya, BCKV, Nadia	Member
4	Dr. Govind Pal, ICAR-IISS, Mau	Member

Date of monitoring: 05 – 14 October, 2017

Centres monitored: UBKV, Pundibari; AAU, Jorhat; ICAR RC NEH Barapani; and CAU, Imphal.

ICAR RC NEH, Barapani (Umiam, Manipur, Agartala Center)

S. No.	Items	Remarks
1	Achievements of Breeder seed production under AICRP- NSP (Crops) against GoI and State indents and problem faced if any	Total breeder seed production during 2016-17 was 331.26 q as against an indent of 280.65 q.
2	Discipline-wise progress of STR experiments- No. of experiments	STR experiments have been conducted as per the approved technical programme.

	conducted, its status and results, reasons for non-conduct of any experiments, problem faced, etc.	
3	Status of revolving fund in AICRP- NSP (Crops) and ICAR Seed project- profit generated, problem in utilization if any	Not applicable
4	Progress of ICAR Seed project- Breeder seed, Foundation seed, Certified and Truthfully labeled seed	• Foundation seed of 9.50 q of various crops was produced during 2016-17. • Certified seed of 949.53 q of various crops was produced during 2016-17.
5	Participatory seed production programme especially under ICAR Seed project (Quantity/ quality/ class)	Truthfully labelled seed of 4498.90 q of various crops was produced against the target of 6504.30 q on farmer's field during 2016-17.
6	Status of fund utilization	• Under ICAR Seed project, the available balance as on 31st March, 2017 was Rs. 14,01,466 • Under AICRP- NSP (Crops) - BSP project, the available balance as on 31st March, 2017 was Rs. 84,78,634. • Under TSP, the available balance as on 31st March, 2017 was Rs. 9,00,780.
7	Land and infrastructure development	One number each of seed grader, seed drier, seed blower, seed divider, air screen cleaner cum grader and reaper were been procured under the project.
8	Transfer of technology- No. of training organized, Farm women participation	• 21 training programme have been organized for 2141 participants • Four field day / seed day have been organized
9	Capacity building- No. of training attended, etc.	Nil
10	Status of submission of AUC and SOE	AUC and SOE submitted
11	Grading of each centre based on the performance	Unit: Performance of centre BSP unit: Very Good STR unit: - ICAR Seed project: Very Good TSP: Very Good
12	Any other remarks by the committee	• More funds may be released in capital and contingencies for smooth functioning of the programme. • Support may be extended in the form of revolving fund scheme for further strengthening of seed programmes.

CAU, Imphal

S. No.	Items	Remarks
1	Achievements of Breeder seed production under AICRP- NSP (Crops) against GoI and State indents and problem faced if any	Not applicable
2	Discipline-wise progress of STR experiments- No. of experiments	Not applicable

	conducted, its status and results, reasons for non-conduct of any experiments, problem faced, etc.	
3	Status of revolving fund in AICRP- NSP (Crops) and ICAR Seed project- profit generated, problem in utilization if any	RFS under ICAR Seed project- the available balance on 31st March, 2017 was Rs. 15,58,899.
4	Progress of ICAR Seed project- Breeder seed, Foundation seed, Certified and Truthfully labeled seed	• Around 2.0 ha area is cultivated under breeder seed production of paddy (2017).
5	Participatory seed production programme especially under ICAR Seed project (Quantity/ quality/ class)	• Around 31.0 ha area is cultivated under certified / TFL seed production in *kharif* crops (2017).
6	Status of fund utilization	• Under ICAR Seed project, the available balance on 31st March, 2017 was Rs. 12,88,029.00/- • Under TSP, the available balance as on 31st March, 2017 was Rs. 1,30,574/-
7	Land and infrastructure development	One pick-up Van and One Rain gun procured under the ICAR seed project.
8	Transfer of technology- No. of training organized, Farm women participation	• Two training programmes have been organized for 147 participants
9	Capacity building- No. of training attended, etc.	Nil
10	Status of submission of AUC and SOE	AUC and SOE submitted
11	Grading of each centre based on the performance	Unit: Performance of centre BSP unit: - STR unit: - ICAR Seed project: Very Good TSP: Very Good
12	Any other remarks by the committee	• More funds may be released under contingencies for smooth functioning of the programme.

AAU, Jorhat

S. No.	Items	Remarks
1	Achievements of Breeder seed production under AICRP- NSP (Crops) against GoI and State indents and problem faced if any	The total breeder seed production was 547.90q of various crops during the year 2016-17.
2	Discipline-wise progress of STR experiments- No. of experiments conducted, its status and results, reasons for non-conduct of any experiments, problem faced, etc.	All the STR experiments have been conducted as per approved technical programme.
3	Status of revolving fund in AICRP- NSP (Crops) and ICAR Seed project- profit generated, problem in utilization if any	Gross income under revolving fund during the year 2016-17 was Rs. 20.08 lakhs
4	Progress of ICAR Seed project- Breeder seed, Foundation seed, Certified and Truthfully labeled seed	• Foundation seed of 3868.40q of various crops was produced during 2016-17. • Certified seed of 2382.90q of various crops was produced during 2016-17.
5	Participatory seed production programme	• Truthfully labelled seed of 6858.80 q of

	especially under ICAR Seed project (Quantity/ quality/ class)	various crops was produced during 2016-17.
6	Status of fund utilization	• Under AICRP- NSP (Crops)- BSP, the available balance as on 31st March, 2017 was Rs. 9,39,530. • Under AICRP- NSP (Crops)- STR, the available balance as on 31st March, 2017 was Rs. 25,51,389.53 • Under ICAR Seed project, the available balance on 31st March, 2017 was Rs. 846. • Under TSP, the available balance as on 31st March, 2017 was Rs. 200.
7	Land and infrastructure development	Nil
8	Transfer of technology- No. of training organized, Farm women participation	• Fourteen training programme were organized for more than 500 participants • Nine field days were organized for more than 300 farmers including tribal's and women farmers.
9	Capacity building- No. of training attended, etc.	Nil
10	Status of submission of AUC and SOE	AUC and SOE submitted
11	Grading of each centre based on the performance	Unit: Performance of centre BSP unit: Very Good STR unit: Very Good ICAR Seed project: Very Good TSP: Very Good
12	Any other remarks by the committee	Funds may be released in time for effective implementation of the programme.

UBKV, Pundibari

S. No.	Items	Remarks
1	Achievements of Breeder seed production under AICRP- NSP (Crops) against GoI and State indents and problem faced if any	Not applicable
2	Discipline-wise progress of STR experiments- No. of experiments conducted, its status and results, reasons for non-conduct of any experiments, problem faced, etc.	Not applicable
3	Status of revolving fund in AICRP- NSP (Crops) and ICAR Seed project- profit generated, problem in utilization if any	ICAR Seed project- the available balance as on 31st March, 2017 was Rs. 1,01,18,931/-
4	Progress of ICAR Seed project- Breeder seed, Foundation seed, Certified and Truthfully labeled seed	• Foundation seed target for the year 2017-18 for various crops was 825 q. • Certified seed target for the year 2017-18 for various crops was 2210 q.
5	Participatory seed production programme especially under ICAR Seed project (Quantity/ quality/ class)	• Truthfully labelled seed target for the year 2017-18 for various crops was 1310 q.

6	Status of fund utilization	• Under ICAR Seed project, the available balance as on 31st March, 2017 was Rs. 29,71,877. • Under TSP, the available balance as on 31st March, 2017 was Rs. 4,92,278.
7	Land and infrastructure development	Nil
8	Transfer of technology- No. of training organized, Farm women participation	• Three training programme have been organized for 100 participants
9	Capacity building- No. of training attended, etc.	Nil
10	Status of submission of AUC and SOE	AUC and SOE submitted
11	Grading of each centre based on the performance	Unit: Performance of centre BSP unit: - STR unit: - ICAR Seed project: Very Good TSP: Very Good
12	Any other remarks by the committee	-

Paddy breeder seed production at ICAR RC NEH Manipur centre

Farmers participatory seed production at UBKV, Pundibari

Southern Zone I

Monitoring Team:

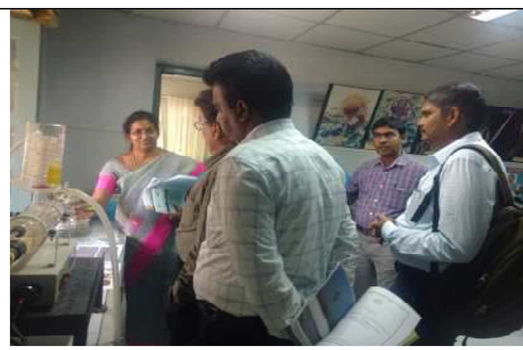
1	Dr. Narayana Kutty, KAU, Thrissur	Convener
2	Dr. T. Ramanadane, PAJANCOA&RI, Karaikal	Member
3	Dr. Arul Prakash, TNAU, Coimbatore	Member

Date of monitoring: 10 - 11 December, 2017
Centres monitored: PJTSAU, Hyderabad.

PJTSAU, Hyderabad

S. No.	Items	Remarks
1	Achievements of Breeder Seed Production under AICRP-NSP (Crops) especially GOI indents and problems faced if any	Breeder seed production targets for 2017-18 achieved for 74 varieties under 11 crops.
2	Implementation of STR experiments –their	16 experiments allotted. All taken up as per

	status and problem	the technical programme.
3	Status of revolving fund - AICRP-NSP (Crops) and ICAR Seed Project	Rs 1.64 crores available under ICAR Seed Project. Profit of Rs. 60,898/- made up to November. Refunded corpus provided by ICAR.
4	Progress of ICAR Seed Project – Breeder Seed, Foundation, Certified and truthfully labeled seed	Production targets were achieved in all classes of seed.
5	Participatory Seed Production programme (Quantity/quality/class)	During 2017-18, FS of 10 varieties in 3 crops, CS of one variety each in 2 crops and TLS of 6 varieties in 4 crops have been produced under participatory mode.
6	Tribal Sub Plan	TSP was implemented in two villages of Vikarabad dist. with 100 tribal farmers. Seeds, inputs and plant protection equipments were distributed.
7	Utilization of funds, Infrastructure development, Transfer of Technology and capacity building	Infrastructure development done using Rs.2,07,800/- from NRC of NSP (Crops) and ICAR Seed Project. Organized two trainings and one On Farm Trial.
7	Audit utilization certificate (AUC)	Submitted
8	Grading of each centre based on the performance	Excellent
9.	Remarks	• Centre is putting efforts to promote use of *Acorus calamus* extract for seed treatment. • Requested modification in technical programme of seed validity period revalidation experiment.

Monitoring of seed production activity and STR experiments at PJTSAU, Hyderabad

Southern Zone–II

Monitoring Team:

1	Dr. Basave Gowda, UAS, Raichur	Convener
2	Dr. K. Kanaka Durga, PJTSAU, Hyderabad	Member
3	Dr. T.R. Shashidhar, UAS, Dharwad	Member
4	Dr. Ramesh K.V., ICAR-IISS, Mau	Member

Date of monitoring: 23 – 29 October, 2017
Centres monitored: UAS, Bengaluru; TNAU, Coimbatore; KAU, Thrissur; PAJANCOA & RI, Karaikal.

UAS, Bengaluru

S. No.	Items	Remarks
1.	Achievements of Breeder Seed Production under AICRP-NSP (Crops) against GOI and State indents and problems faced if any	Achieving more than indented breeder seed production both in *Kharif* and *Rabi*.
2.	Discipline-wise progress of STR experiments - No. of experiments conducted, its status and results, reason for non-conduct of any experiments, problems faced, etc.	Satisfactory, experiments implemented 10 and other two experiment will be initiated during summer 2017-18.
3.	Status of revolving fund in AICRP-NSP (Crops) and ICAR Seed Project - profit generated problems in utilization if any.	Under profit
4.	Progress of ICAR Seed Project - Breeder Seed, Foundation, Certified and Truthfully Labeled Seed.	Satisfactory
5.	Participatory seed production programme especially under ICAR Seed Project (quantity / quality / class).	Implemented
6.	Status of Fund Utilization.	Satisfactory
7.	Land and Infrastructure Development.	-
8.	Transfer of Technology - No. of trainings organized, Farm women participation	Promoting super grain bag and co_2 storage for pulses
9.	Capacity Building – No. of trainings attended, etc.	Conducted
10.	Status of Submission of Audit Utilization certificate (AUC) and Statement of Expenditure.	Submitted
11.	Grading of each centre based on the performance by mentioning	BSP: Excellent STR: Excellent ISP: Very good TSP: Good
12.	Others if any	Maintenance breeding programme needs to be improved further. Centre can be advised to utilise the amount generated under revolving fund for strengthening STR lab, land development and

		rain water harvesting etc.

TNAU, Coimbatore

S. No.	Items	Remarks
1.	Achievements of Breeder Seed Production under AICRP-NSP (Crops) against GOI and State indents and problems faced if any	Achieving the targeted seed production
2.	Discipline-wise progress of STR experiments - No. of experiments conducted, its status and results, reason for non-conduct of any experiments, problems faced, etc.	Satisfactory, implemented all the approved experiments
3.	Status of revolving fund in AICRP-NSP (Crops) and ICAR Seed Project - profit generated problems in utilization if any.	Under profit and refunded seed money
4.	Progress of ICAR Seed Project - Breeder Seed, Foundation, Certified and Truthfully Labeled Seed.	Satisfactory
5.	Participatory seed production programme especially under ICAR Seed Project (quantity / quality / class).	Involved in farmers participatory seed production programme
6.	Status of Fund Utilization.	Satisfactory
7.	Land and Infrastructure Development.	-
8.	Transfer of Technology - No. of trainings organized, Farm women participation	Involved in promotion co_2 storage for pulses
9.	Capacity Building – No. of trainings attended, etc.	Conducted
10.	Status of Submission of Audit Utilization certificate (AUC) and Statement of Expenditure.	Submitted
11.	Grading of each centre based on the performance by mentioning	BSP: Excellent STR: Very good ISP: Very good TSP: Good
12.	Others if any	• Advised to concentrate on participatory seed production depending on the demand for seeds of new varieties and hybrids. • Human resources especially at ARS, Bhavanisagar can be most effectively utilised for conducting regular training programmes for unemployed youths on quality seed production and seed entrepreneurship development.

KAU, Thrissur (RARS, Pattambhi)

S. No.	Items	Remarks
1.	Achievements of Breeder Seed Production under AICRP-NSP (Crops) against GOI and State indents and problems faced if any	Achieving the targeted seed production
2.	Discipline-wise progress of STR experiments - No. of experiments conducted, its status and results, reason for non-conduct of any experiments, problems faced, etc.	Voluntary centre implemented five experiments
3.	Status of revolving fund in AICRP-NSP (Crops) and ICAR Seed Project - profit generated problems in utilization if any.	Under profit and refunded seed money
4.	Progress of ICAR Seed Project - Breeder Seed, Foundation, Certified and Truthfully Labeled Seed.	Satisfactory
5.	Participatory seed production programme especially under ICAR Seed Project (quantity / quality / class).	Involved in farmers participatory seed production programme
6.	Status of Fund Utilization.	Satisfactory
7.	Land and Infrastructure Development.	-
8.	Transfer of Technology - No. of trainings organized, Farm women participation	Involved in promotion co_2 storage for pulses
9.	Capacity Building – No. of trainings attended, etc.	Conducted
10.	Status of Submission of Audit Utilization certificate (AUC) and Statement of Expenditure.	Submitted
11.	Grading of each centre based on the performance by mentioning	BSP: Excellent STR: Very good ISP: Very good TSP: Good
12.	Others if any	• Centre involved in maintenance and seed production of many paddy varieties, should be supported further both in man power and budget. • Involved in STR programme as volunteer centre and need to be upgraded as regular centre with necessary budget and man power.

PAJANCOA& RI, Karaikal

S. No.	Items	Remarks
1.	Achievements of Breeder Seed Production under AICRP-NSP (Crops) against GOI and State indents and problems faced if any	Achieving the targeted seed production

2.	Discipline-wise progress of STR experiments - No. of experiments conducted, its status and results, reason for non-conduct of any experiments, problems faced, etc.	Conducted all the experiments including three voluntary experiments
3.	Status of revolving fund in AICRP-NSP (Crops) and ICAR Seed Project - profit generated problems in utilization if any.	Under profit and refunded seed money
4.	Progress of ICAR Seed Project - Breeder Seed, Foundation, Certified and Truthfully Labeled Seed.	-
5.	Participatory seed production programme especially under ICAR Seed Project (quantity / quality / class).	Involved in farmers participatory seed production programme
6.	Status of Fund Utilization.	-
7.	Land and Infrastructure Development.	Implemented as per provisions under EFC
8.	Transfer of Technology - No. of trainings organized, Farm women participation	Involved in promotion of super grain bags for seed storage
9.	Capacity Building – No. of trainings attended, etc.	Participated
10.	Status of Submission of Audit Utilization certificate (AUC) and Statement of Expenditure.	Submitted
11.	Grading of each centre based on the performance by mentioning	STR: Excellent ISP: Very good
12.	Others if any	• Budget for infrastructure development like seed godown, irrigation and soil health improvements needs to be provided. • Provision of seed money to encourage farmers' participatory seed production may be made.

Monitoring of STR experiments at TNAU, Coimbatore

Monitoring of seed production plots at KAU, Pattambhi

32nd AGM of AICRP-NSP (Crops) held at SKRAU, Bikaner 22-24 April 2017

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