



भारतीय चेतना को कृषि में लाना

ICAR- INDIAN INSTITUTE OF SEED SCIENCE

NEWSLETTER



XXXI Annual Group Meeting of AICRP-NSP

XXXI Annual Group Meeting of AICRP-NSP (Crops) was organized during 19-21 April, 2016 in Cochin, Kerala under the chairmanship of Hon'ble Secretary, DARE & Director General, ICAR Dr. T. Mohapatra by ICAR - Indian Institute of Seed Science in collaboration with Kerala Agriculture University, Trissur. In the meeting, status of breeder seed production in the country and research in different disciplines of seed technology were discussed. The Director General, ICAR emphasized the need to map the seed requirement of the country and development of seed hubs to achieve the targeted seed replacement rate (SRR). He also accentuated the time to promote pulses and oil seed production to attain the self-sufficiency in the near future. The Vice Chancellor, Kerala Agricultural University, Thrissur Dr. P. Rajendran highlighted the necessity of enhancing the productivity up to 50 % to meet the food requirement of expected population of 141 crores in 2025 and 164 crores in 2050. The ADG (Seeds), ICAR Dr. J.S. Chauhan stressed the need for systematic seed storage and hygienic seed production to meet the growing demand of



seed. Dr. S. Rajendra Prasad, Director, ICAR – IISS, Mau emphasized inevitability of achieving seed security to attain food security and nutritional security. He also mentioned that the breeder seed production under AICRP – National Seed Project (Crops) reached the tune of 1.25 lakh quintals in all the crops during 2014-15 and highlighted the need of barcoding of seeds to develop efficient seed production system in the country. In the meeting, the frontier areas of seed science viz. use of Ultra-thin Layer Isoelectric Focusing (UTLIEF), mitigation of climate effect on seed production, development of hydrogel for dry lands / rainfed conditions, etc. The three seed

scientists viz. Dr. M. Bhaskaran, Vice Chancellor, TNOU, Chennai; Dr. Vilas A. Tonapi, Director, ICAR – IIMR, Hyderabad and Dr. R. C. Agrawal, Registrar, PPVFRA, New Delhi were awarded for the outstanding contributions made for seed science. AICRP – NSP (Crops) consist of two main components viz. breeder seed production and seed technological research. The Indira Gandhi Agricultural University (IGKV), Raipur awarded as best centre for breeder seed production and University of Agricultural Sciences (UAS), Bengaluru awarded as best centre for seed technological research during the year 2015-16. In addition, three books on seed production and seed pathology were released in the function.



Network Projects

11th Annual Review Meeting of ICAR Seed Project – Seed Production in Agricultural Crops

XI Annual Review Meeting of ICAR Seed Project – “Seed Production in Agricultural Crops” was organized in liaison with GBPUA&T, Pantnagar during 17-18th August, 2016 at GBPUA&T, Pantnagar. Inaugural session was graced by Hon’ble Governor, Uttarakhand Dr. K. K. Paul; Dr. Mangala Rai, Vice-Chancellor, GBPUA&T, Pantnagar; Dr. J. S. Chauhan, ADG (Seed), ICAR and Dr. J. P. Singh, Director, Exptl. Station, GBPUA&T, Pantnagar. Dr. Mangala Rai, Vice-Chancellor, GBPUA&T welcomed the august gathering and highlighted the importance of seed in Agriculture. Dr. J. S. Chauhan, ADG (Seed) highlighted the role of seed during green revolution and post green revolution regimes.

He stressed upon the role of seed security for food security *per se*. Dr. K. K. Paul, Hon’ble Governor, Uttarakhand in his inaugural address stated that agriculture is the focal point of country. He highlighted the successful saga of TSDC and subsequent institution of number of seed enterprises. He exhorted for development of drought resistant varieties/hybrids in vegetables and research pertinent to yield augmentation under organic farming. Dr. S. Rajendra Prasad, Director, ICAR-IISS, Mau welcomed the dignitaries and briefed the gathering about progression of ICAR Seed Project and future thrust areas of ICAR Seed Project. He exhorted that 5.36 lakh quintals of quality seed has been produced during 2015-16 and also presented the progression of technology development component in novel theme areas. He mentioned that addressing VRR & SRR, model deployment by enabling partnership with private sector, SHGs, NGOs and varied community based organizations, roping organized communities, institutional technical backstopping, normalization of seed research and standards on par with international benchmark, and infusing corporate modeling are the future prospective areas.

1. AICRP-National Seed Project (Crops)

The total breeder seed production under AICRP-NSP (Crops) reached the level of 127823 q against the indent of 122520 q during 2015-16.

2. ICAR Seed Project-Seed Production in Agricultural Crops

During the year 2015-16, total production of quality seed including all classes was 536593 quintals against the target of 472063 quintals. Production comprises 149331 quintals of foundation seed, 118824 quintals of certified seeds, 127545 quintals of truthfully labelled seed and 37054 quintals of planting material of field crops. In addition, 272 lakh planting material and 13 lakh tissue culture plantlets

were produced against the targets of 298 and 14 lakh, respectively.

Research Highlights

Seed Molecular Biology

Assessment of genetic purity in major crops including hybrids through molecular tools and techniques

- A total of 100 rice SSR markers were selected covering all 12 chromosomes of the rice genome. Out of which 31 markers were analysed, of which 31 % (31) markers were found to amplify a total of 512 different alleles. Out of which, 26 % of the bands are found to be monomorphic in nature and indicated the substantial homogeneity in rice genome. Only one marker was found to produce polymorphism ranging 60 %, with an average of 1.66 allelic variants per SSR locus. In the present study, SSR marker RM228 was found to be able to differentiate DRRH3 rice hybrid from 23 major paddy hybrids and its parental lines cultivated in India and the same was revalidated among 46 major rice varieties cultivated in Uttar Pradesh (Fig.1). In addition, some other markers such as RM 505, RM 519, RM 565, RM 169, RM 286 and RM 251 were identified to assess the genetic purity of thirty two rice varieties cultivated and processed in IISS farm (Fig.2).

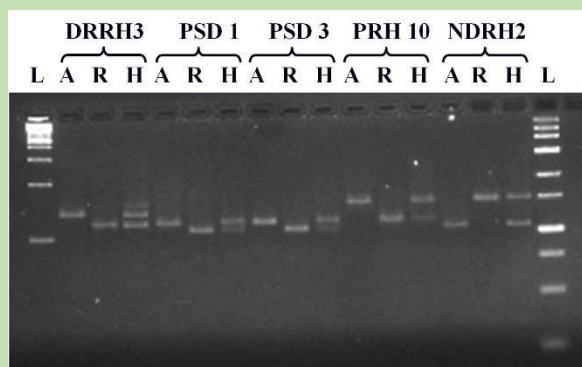


Fig.1: Molecular characterisation of rice hybrids using SSR Marker (RM228)

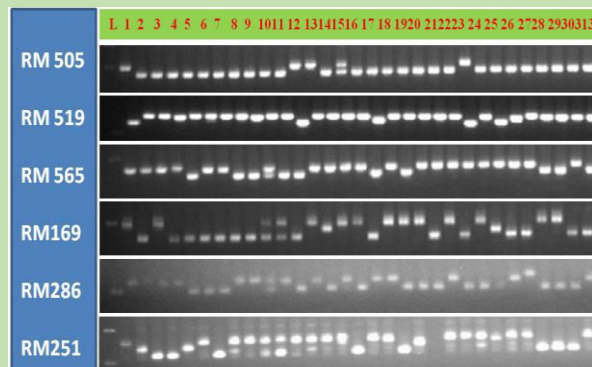


Fig.2: Molecular Characterisation of rice varieties cultivated at IISS, Mau

Molecular mapping of quantitative trait loci (QTL) for bruchids resistance in chickpea (*Cicer arietinum* L.)

In this project, molecular mapping of quantitative trait loci (QTL) for bruchids resistance in chickpea (*Cicer arietinum* L.) is being taken up.

In 2015-16 *Rabi*, 238 lines comprising of 215 chickpea accessions and 23 varieties from International Crops Research Institute for the Semi Arid Tropics (ICRISAT), Hyderabad were field grown under two replications for maintenance and evaluation. Three chickpea accessions found to be resistant against three species of bruchid namely *Callosobruchus chinensis*, *C. maculatus*, *C. analis* and the susceptible lines were sown under staggered planting in pots in net house for hybridization for developing mapping population (RILs). The development of mapping population through hybridization is in progress.

Seed production & certification

Impact of genotypes and conservation tillage on seed quality and productivity of wheat in the eastern-UP

The research project was instituted with 18 treatment combinations of three tillage operations (Zero tillage (FIRB), Conventional tillage (CT) and Furrow Irrigated Raised Bed (FIRB) with six genotypes (PBW 502, KRL-213, HD-2733, HD-2967, DBW-39 and PBW-

550) in a split plot design with three replications. It was found that ZT practice significantly enhances the yield attributes (biological, seed and straw yield) as well as harvest index as compared to CT and FIRB. The wheat genotype HD 2967 recorded significantly higher biological, seed and straw yield as compared to other genotypes.

Effect of various bioactive chemicals on traits favouring out crossing and their molecular characterization in hybrid rice (*Oryza sativa* L.)

Under referred project, effect of bioactive molecules on traits favouring out crossing with respect to parental lines of two hybrids i.e. PRH10 and DRRH2 was being evaluated. After treating with bioactive molecules (5-10% panicle emergence stage), the various floral traits contributing out-crossing were recorded. The present study revealed that hybrid seed setting was increased by 4-6% in both hybrids in all treatments over control. This increase in yield can be attributed to increase in the panicle exertion (4-6%), stigma exertion (4-10%), spikelet opening angle (2-4°) and flag leaf angle (2-5°).

Hydropolymers : As regulatory switch for germination and smart delivery system in hybrid seed production of maize

In this project, nanofibre synthesis with the use of biodegradable polymer was carried out at ICAR -CIRCOT, Mumbai. Standardization of cellulose acetate polymer for electro spinning of nanofibres was done.

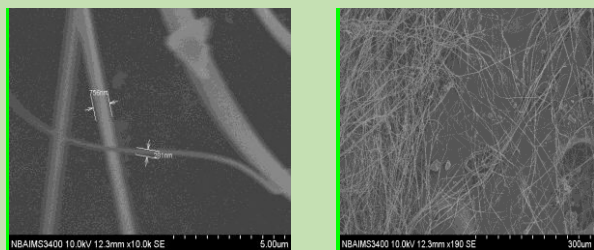


Fig. 3: SEM images of Nano fibres synthesized for seed coating

Scanning Electron Microscopy facility of ICAR - NBIAM, Mau was utilized for characterization of synthesized nano-fibres.

Seed protection

AMAAS project: Role of potential microorganisms in seed and crop health of rice, wheat and mustard.

Under AMAAS project (*Role of potential microorganisms in seed and crop health of rice, wheat and mustard*), a total of 300 bacterial strains were isolated from rhizosphere, endosphere and phylloplane of rice, wheat and mustard from various places of different agro-climatic zones of India. All the strains were tested for the bio-control assay against several pathogens causing diseases in rice, wheat and mustard. Dual culture test for antagonistic activity were performed for screening of potential strains within isolated bacterial strains. A total of 35 bacterial strains were found potential against *Fusarium oxysporum* sp. *ciceri*, *Ustilaginoidea virens*, *Magnaporthe oryzae*, *Drechslera teresa* and *Sclerotium rolfsii* pathogens. Further, four potential bacterial strains were identified for control of paddy diseases, two (URR7 and LWR19) were against *Magnaporthe oryzae* (blast of rice) and other two (BRR10 and BRR15) were against *Ustilaginoidea virens* (false smut of rice). These strains were chosen for pot and field trial analyses using susceptible rice variety Pusa Sugandh (PS-5) with five different treatments i.e. biopriming with bacteria, biopriming with bacteria and pathogen, biopriming with consortia, root dipping and soil application. Seed and seedling quality parameters and other quantitative attributes were recorded during *kharif*-2015 at ICAR-IISS, Mau. The present investigation revealed that under the pot trial, treatment with biopriming and soil application along with bacterium LWR 19 strain showed higher root length, shoot length and germination per

cent as compared to bioprimering with bacteria & pathogen and control.



Field trial of rice (PS-5) treated with URR7, LWR19, BRR10 and BRR15 strain

Improving hybridization efficiency, seed set and development of male sterile lines for hybrid seed production in Finger millet (*Eleusinecoracana* L. Gaertn)

Floral characteristics and floral behaviour of finger millet were determined among 40 genotypes, which included 20 cultivars with distinct morphological characteristics & maturity durations, 1 partial male sterile line (PS-1) and 19 wild accessions from 5 different species of *Eleusine* (*africana*, *indica*, *tristachya*, *multiflora* and *jaegeri*) genera. Wide variations were observed in flowering behaviour of *Eleusinespecies*. Flowering proceeded from top of the panicle to downwards among all the strains studied. Emergence of inflorescence from flag leaf was alike among 5 species of genus *Eleusine*, except for the species *E. multiflora*, which showed extra early emergence of inflorescence. Wide difference in flowering period was observed in cultivated *E. coracana* as compared to rest of the wild species. Wild species took more days (7 - 10) to attain full blooming than the domesticated *E. coracana* (3 - 4). The time of anther dehiscence was earlier among wild species (1.30 AM - 4.00 AM) with peak anther dehiscence around 2.30 AM, whereas among domesticated cultivars it was between 3.00 AM - 6.00 AM, with a peak anther dehiscence around 4.00 AM (Fig. 23).

Analysis of variance revealed significant differences among germplasm accessions and improved varieties for all the floral as well as other morphological characters. The accessions were highly variable as indicated by higher estimates of PCV and GCV (>20%) and higher broad sense heritability, except for No. of spikelets/ Head and plant height. Based on floral characteristics and other morphological characters 40 accessions were clustered into six distinct groups.

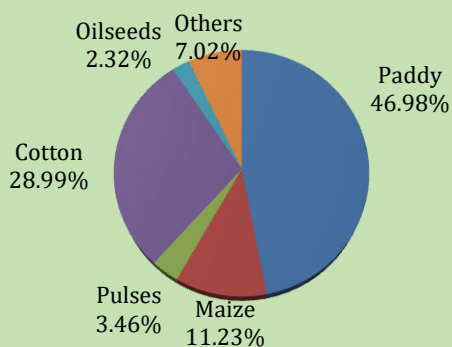


Anther dehiscence of *Eleusinesp.*

Seed economics & policy research

Impact assessment of quality seed production: addressing scope and efficiency of certified seed production among seed growers

Telangana state was chosen and survey has been conducted among one hundred farmers of paddy (commercial grain producer and certified seed producer). Primary data was collected by personal interview with the respondents using a well-structured and pre-tested interview schedule. The analysis of data shows that majority of seed farmers belongs to small category (1-2 ha) followed by semi-medium (2-4 ha) and marginal (< 1 ha) category. The overall average land holding size of paddy seed farmers was 2.04 ha followed by grain farmers (1.27 ha) and district average (1.03 ha). The study area is dominated by paddy, cotton and maize. The area under different crops shows that paddy ranked 1st (46.98 % of gross cropped area) followed by cotton (28.99 %), maize (11.23 %), pulses (3.46 %), oilseeds (2.32 %) and others (7.02 %). The cropping intensity of the study area was 159.



Cropping pattern of study area

Reasons for adopting paddy seed production technology

The major reasons for choosing the seed production are presented in below referred table. Farmers selected enterprises based on several criteria, one of the most important criterions as the surveyed farmers assigned first rank was higher profit. The other reasons for adoption of paddy seed production technology were better yield, suitability of climate, easy marketability of produce and technical know-how.

Criteria for adoption of paddy seed production technology

| Particulars | Number of farmers | Percentage |
|-------------------------------|-------------------|------------|
| Higher profit | 38 | 76 |
| Better yield | 32 | 64 |
| Suitability of climate | 26 | 52 |
| Easy marketability of produce | 24 | 48 |
| Technical know-how | 21 | 42 |

Meetings / Trainings

ICAR-Indian Institute of Seed Science, Mau Successfully Conducted Six Months International Certificate Course for Nigerian Nationals

International certificate course on “Requisites of Seed Production, Processing, Testing and

Quality Assurance” for eight participants from Nigeria have been concluded at ICAR-Indian Institute of Seed Science, Mau. This training programme was scheduled during **20th July, 2015 to 20th January, 2016**. The international certificate course was executed in three phases: first phase began in ICAR-IISS, Regional station, GKVK Campus, UAS Bengaluru; second phase focused on exposure visits to various institutions and private seed enterprises at Hyderabad and Delhi; and third phase was instituted at ICAR-IISS, Mau. The training programme focused on expert talks and practical sessions on varied aspects of seed science and technology viz., seed production technology in field and horticultural crops; seed processing; seed testing and certification; seed storage and handling; seed quality enhancement; seed health management and seed economics, marketing and management. Trainees were also exposed to methodology of seed production through hands-on training in seed production technology, wherein trainees were engaged in seed production of OPV/Hybrid of varied crops. As a part of project appraisal, four project proposals were brought up by trainees targeting seed entrepreneurship for the holistic upliftment of seed sector in major crops of Nigeria. *In toto*; 462 expert talks, 128 practical sessions, 68 field visits and 52 exposure visits covering five states were instigated during six months period.



Cropping pattern of study area

Advanced training on “Fodder Seed Production”

ICAR-IISS, Mau in collaboration with GBPUA&T, Pantnagar and National Dairy Development Board organized an advanced training programme on Fodder Seed Production from 15th-19th March, 2016 at Pantnagar. A total of 20 officials representing milk unions of states such as Bihar, Gujarat, Karnataka, Maharashtra and Rajasthan attended the programme. Hon'ble vice Chancellor, GBPUA&T, Pantnagar Dr. Mangala Rai presided the inaugural session of this training on 15.3.2016 in the presence of Shri A.K. Garg, DGM (AN), NDDDB, Dr. S. Rajendra Prasad, Director ICAR-IISS, Mau along with the distinguished faculty of the university. Trainees were given a wide exposure to various aspects and technologies involved in quality seed production among fodder crops through well designed classroom lectures & practicals as well as field visits.



KisanMela 2016

ICAR-Indian Institute of Seed Science (ICAR-IISS) organized *KisanMela* on 12th March, 2016 under the theme of “Quality seed and healthy soil: Better harvest”. *KisanMela* was inaugurated by Dr. J.S. Chauhan, Assistant Director General (Seed), ICAR, New Delhi

whereas, as special invitees Dr. A.K. Saxena, Director, NBAIM, Mau, Dr. V. K. Pandey, Deputy Director, Uttar Pradesh State Seed Certification Agency, Mau; Dr. Ashutosh Mishra Deputy Director of Agriculture, Mau District, U.P. and Sh. PrabhuNath Mal, Progressive farmer were present and graced the occasion. Chief guest Dr. J.S. Chauhan, Assistant Director General (Seed), ICAR, New Delhi in his address emphasized on second green revolution through use of quality seeds. Dr. A.K. Saxena, Director, NBAIM, highlighted key role of microorganisms in agriculture and emphasized on use of liquid bio-fertilizer. A number of dignitaries including specialist from ICAR Institutes, KVKs, State Govt. Departments, private firms (input and farm machinery) and different banks and NGOs exhibited respective products/services in the Mela and actively participated in the deliberations. More than 32 organizations have displayed their product / materials in the stalls.



Programmes participated

| S. No. | Name of programme/ Meeting/ Training | Date/ duration | Venue | Participants |
|--------|---|--------------------------------|---|---|
| 1 | International Extension Education Conference on Education, Research and Services | 27.01.2016 - 30.01.2016 | IAS, BHU, Varanasi | Dr.Govind Pal |
| 2 | Participated in "Seed Industry Programme" organized by Sathguru Management Consultants, Hyderabad and Cornell University | 19.01.2016 - 22.01.2016 | Bengaluru | Dr. Dinesh K. Agarwal Dr. Vijay Kumar HP |
| 3 | Attended 19 th Annual Breeder Seed Review Meeting and presented the Breeder Seed Production status for the year 2014-15 and 2015-16 | 27.01.2016 | Dr. B.P. Auditorium, ICAR-NBPGR, New Delhi | Dr. S. Rajendra Prasad Dr. Dinesh K. Agarwal Dr.Sripathy K.V. |
| 4 | <i>RashtriyaKisanMelaevamSabjipradars</i> hniorganised by Indian Institute of Vegetable Research, Varanasi | 30.01.2016 | IndianInstitute of Vegetable Research, Varanasi | Dr. A.N. Singh |
| 5 | KisanMahotsav organized by UP-State Agriculture Department | 25.02.2016 - 27.02.2016 | Community centre, Mau | Dr. Hardev Ram |
| 6 | Participated and presented the paper in Conference on National Priorities in Plant Health Management | 04.02.2016 - 05.02.2016 | S V Agriculture College, Tirupati, A.P, India. | Dr. A.N. Singh |
| 7 | National workshop on "Current Trends in Agricultural Bioinformatics" | 15.02.2016 - 17.02.2016 | NAARM, Hyderabad | Dr. S.P. Jeevankumar |
| 8 | 18th Indian Agricultural Scientists and Farmers' Congress on "Prospects of Skill Development in Agriculture and Rural Development | 20.02.2016 | BiovedKrishiProdyogi ki Gram, Moharab, Sringeripur, Allahabad | Dr. S. Rajendra Prasad Dr. Rajiv K. Singh |
| 9 | Attended "International Year of Pulses" and Scientists Farmers' interaction meeting | 13.03.2016 | IIPR, Kanpur | Dr. S. Rajendra Prasad Dr. A.N. Singh |
| 10 | Attended Training Programme on Science Governance & Management during | 29.02.2016 - 04.03.2016 | Administrative Staff College of India, Hyderabad. | Dr. S. Rajendra Prasad |
| 11 | Attended & delivered a talk on "Institution of Seed Enterprise in Demanding Domains: NEH Context" in National Seminar on "Integrating Agri-Horticultural and Allied Research for food and nutritional security in the Era of Global Climate Disruption" | 06.03.2016 | Imphal, Manipur | Dr. S. Rajendra Prasad |
| 12 | Attended variety identification committee meeting of rice Attended 51 st Annual Rice Group Meeting. Visited & reviewed the progress of AICRP-NSP (Crops)- Breeder Seed Production & Seed Technology Research and ICAR Seed Project | 02.04.2016 to 03.04.2016 | IGKV, Raipur | Dr. S. Rajendra Prasad |
| 13 | Attended meeting on Pulses about creation of seed hub/biofertilizer units | 12.04.2016 | ICAR Committee Room, KrishiBhawan, New Delhi | Dr. S. Rajendra Prasad |
| 14 | Participated in the interaction meeting of FAOs of ICAR Institutes | 13.05.2016 | ICAR RC for NEH Region, Barapani | Dr.Govind Pal |

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| | (East Zone) with Secretary, DARE & DG, ICAR and AS&FA, DARE/ ICAR on 13 th May, 2016 at ICAR RC for NEH Region, Barapani. | | | |
| 15 | Attended National Workshop on OECD Seed Certification on 4 th July, 2016 at Hotel the Park, Hyderabad, act as a Lead Speaker for presentation on “Indian Seed Certification Systems vis-a-vis OECD Seed Certification” organized by Telangana State Seed Certification Agency, Hyderabad in collaboration with DAC, Govt. of India, New Delhi. | 04.07.2016 | Hotel the Park, Hyderabad | Dr. S. Rajendra Prasad |
| 16 | Attended the meeting on “Implementation of Seed Project in NEHR” on 22 nd July, 2016 at ICAR Research Complex for North Eastern Hill Region, Imphal. | 22.07.2016 | ICAR Research Complex for North Eastern Hill Region, Imphal | Dr. S. Rajendra Prasad |
| 17 | Attended a 21 days ICAR sponsored Winter School on “Recent Trends in Seed Production, Post-Harvest Handling and Value Addition Techniques for Effective Seed Supply Chain” organized during 14 September to 04 October, 2016 at Tamil Nadu Agricultural University, Coimbatore. | 14.09.2016 to 04.10.2016 | Tamil Nadu Agricultural University, Coimbatore | Dr. Somasundaram G. |
| 18 | Attended IRRI sponsored International Training on Quality Rice Seed Production as Resource Person on 12 th October, 2016 at BHU, Varanasi. | 12.10.2016 | BHU, Varanasi | Dr. Dinesh K. Agarwal |
| 19 | Attended “International Agro-Biodiversity Conference” at New Delhi during 6-7 th November, 2016. | 6-7.11.2016 | New Delhi | Dr. Dinesh K. Agarwal |
| 20 | Performed monitoring of breeder seed production plots of paddy at PRDF, Gorakhpur during 08.11.2016 | 08.11.2016 | Gorakhpur | Dr.Sripathy K.V. |
| 21 | Participated in the 76 th Annual Conference of Indian Society of Agricultural Economics at AAU, Jorhat during November 21-23, 2016 and presented (oral) a paper. | 21-23.11.2016 | AAU, Jorhat | Dr.Govind Pal |
| 22 | Attended two days National level workshop on OECD Varietal Certification at Hyderabad during 30 th November – 1 st December, 2106. | 30.11.2016 to 01.12.2106 | Hyderabad | Dr. Dinesh K. Agarwal |
| 23 | ISTA Workshop on Sampling, Purity and Germination at Hyderabad from 05.12.16 to 09.12.16 | 05.12.2016 to 09.12.2016 | Hyderabad | Dr.Udayabhaskar K. |
| 24 | Participated in the International Conference on Climate change adaptation and biodiversity: Ecological sustainability and resource management for livelihood security during December 08-10, 2016 at ICAR- CIARI, Port Blair and presented (oral) a paper. | 08-10.12.2016 | ICAR- CIARI, Port Blair | Dr. Govind Pal |

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| 25 | Participated and presented poster in National Conference of Plant Physiology held during 08-10 th December, 2016 at GKV, UAS Bengaluru. | 08-10.12.2016 | GKV, UAS Bengaluru | Dr. Ramesh K.V. |
| 26 | Participated and presented research paper entitled “Genetic diversity amongst turf grasses as assed by ISSR markers” by Ajai Kumar Tiwari, Govind Pal TN Tiwari and Dinesh K. Agrawal in National Conference on Innovative and Current Advances in Agriculture and Allied Sciences (ICAAAS-2016) was held on 10–11 December, 2016 at Prof. Jayashankar Telangana State Agricultural University, Rajendranager, Hyderabad (Telangana). | 10-11.12.2016 | Prof. Jayashankar Telangana State Agricultural University, Rajendranager, Hyderabad | Dr. Ajai K. Tiwari |
| 27 | Attended contingency plan meeting to mitigate shortfall of soybean breeder seed during kharif 2016 at ICAR-Indian Institute of Soybean Research, Indore on 19 th December, 2016. | 19 th December, 2016 | IISR, Indore | Dr. Dinesh K. Agarwal Dr. Sripathy K.V. |

Publications

Publication in Research Journals

- A.K. Sinha, D.K. Agarwal, S.P. Jeevan Kumar, T.N. Tiwari and Arun Kumar Chaturvedi (2016) Novel technique for precluding hybrids necrosis in bread wheat. *International journal of Tropical Agriculture*. Volume 34. ISSN: 0254-8755.
- Amrit Lamichaney, PK Katiyar, S. Natarajan and KV Sripathy (2016) Relationship among some seed characters, laboratory germination and field emergence in chickpea genotypes differing testacolor. *Journal of Food Legumes* 29(1): 29-32.
- Amrit Lamichaney, Sripathy KV, Umesh Kamble, Natarajan S, PK Katiyar and Abhishek Bohra (2017) Differences in seed vigour traits between desi (pigmented) and kabuli (non-pigmented) ecotypes of chickpea (*Cicer arietinum* L.) and its association with field emergence. *Journal of Environmental Biology*, 38:1-12.
- Dhandapani Raju, P. Avinash, H. P. Vijayakumar, Ambika Rajendran, G. Somasundaram, S. Natarajan & S. Rajendra Prasad (2016). Comparative protein fraction analysis for commercial hybrid seed purity testing in cotton (*Gossypium hirsutum* L.). *Journal of Natural Fibers*, 13 (3): 268–276.
- Dipti Kamal, Yashodhara Verma, T.N. Tiwari (2016) Relative efficacy of seed priming with vermiwash, growth regulators and bio-controlling agents in response to germination and invigoration of okra (*Abelmoschus esculentus* L.). *Bio Sciences, Bio Technology research Asia*. 13(4), 2143-2146.
- Govind Pal, Radhika C, R. K. Singh, Udaya Bhaskar K, H. Ram, S. Rajendra Prasad (2016) Comparative economics of seed production vis-à-vis grain production of pigeonpea in Karnataka. *Legume research* 39 (5):806-809.
- Govind Pal, Radhika C., R. K. Singh, Udaya Bhaskar K., H. Ram, and S. Rajendra Prasad (2016) An Economic Analysis of Pigeonpea Seed Production

Technology and its Adoption Behavior: Indian Context. *The Scientific World Journal*, 2016, 1-7.

- Govind Pal, Radhika C., UdayaBhaskar K, H. Ram, S. Rajendra Prasad (2016) A study on comparative economics of grain and seed production of Groundnut in Karnataka, India. *Journal of Experimental Agriculture International* (American Journal of Experimental Agriculture) 14 (5): 1-9.
- Rajiv K.Singh, D.K.Agarwal, T.N.Tiwari, Hardev Ram, S.R.Prasad and Renu (2016) Effect of Seed treatments using plant growth regulators on wheat (*Triticumaestivum* L.) seedling establishment, growth, seed yield and quality. *Annals of Agriculture Research*, 37(1):43-48.
- RohitDwivedi, K.K. Srivastava and Govind Pal (2016) Socio-economic profile of lac growers in Bastar district of Chhattisgarh State. *The Indian Forester* 142 (4): 336-338.
- S. P. Jeevan Kumar, S. Rajendra Prasad, Madan Kumar, Chandu Singh, A.K. Sinha, Avinash Pathak (2016) Seed Quality Markers: A review. International and National reviews in Journal of Botanical Sciences. (In Press).
- S. P. Jeevan Kumar, S. Rajendra Prasad, Ramesh K. V, Kalyani S. Kulkarni (2016) Green solvents and methods for oil extraction from oilseeds: a review. Sustainable Chemical process, (Under review). Springer open publishers.
- Sripathy KV, Monika A. Joshi, SS Parihar, CT Manjunath Prasad (2016) Comparative seed morphology among four taxa of genus commelina. *Bioinfolet* 13: 570-573.
- T. N. Tiwari, Dipti Kamal, A. K. Sinha, Rajiv K. Singh (2016) Relative performance of seed priming with tap

water and inorganic salts on germination, invigoration, growth and yield of wheat (*Triticumaestivum* L.)". *International journal of Agricultural Sciences*. 12 (2):167-175.

- T.N. Tiwari, Dipti Kamal, S. Rajendra Prasad (2016) Seed priming with growth regulators ameliorates salt stress in wheat (*Triticumaestivum*). *Indian Journal of Agricultural Sciences*. 86(8): 980 -983.
- Tiwari A K, Tiwari T N, Prasad S R (2016) Seed dormancy in ornamental plants: A review. *Indian Journal of Agricultural Sciences*, 86(5): 580–92.
- Vijayakumar, H. P and A. Vijayakumar(2016) Screening of soybean varieties for seed storability using accelerated ageing test. *International Journal of Agricultural Science and Research*, 6(1), 93-98.

Annual Reports & Proceedings

- Sripathy K.V., D. K. Agarwal, Ramesh K.V., Chandu Singh, Madan Kumar, S. P. Jeevan Kumar, T. N. Tiwari, A. K. Sinha, Govind Pal, A. N. Singh, Udayabhaskar K. and Sudhir K. Singh (2016) 31st Annual Group Meeting of AICRP-NSP (Crops) held during 19-21st April, 2016 at Cochin, Kerala.
- Udayabhaskar K., S. Rajendra Prasad, Ramesh K.V., Somasundaram G., Sripathy K.V., A.N. Singh, Radhika C., Govind Pal and Dinesh K. Agarwal (2016) Annual report of ICAR Seed Project, published at 11th Annual meeting of ICAR Seed Project at GBPUAT, Pantnagar during 17-18 Aug, 2016.
- Udayabhaskar K., Radhika C., Sripathy K.V., Somasundaram G. Dinesh K. Agarwal (2016) Proceedings of 11th Annual Review Meeting of ICAR Seed Project "Seed Production in Agricultural

Crops” held during 17-18th Aug, 2016 at GBPUA&T, Pantnagar.

- Vilas A. Tonapi, Rakesh Seth, P. C. Nautiyal, M. S. Bhale, Amit Bera, S. Rajendra Prasad, G. Somasundaram, K.V. Sripathy, D.K. Agarwal and K. Udayabhaskar (2016) Proceedings of XXXI Annual Group Meeting of AICRP – NSP (Crops) held during 19-21 April, 2016 at KAU, Thrissur.

Awards

1. Dr. S. Rajendra Prasad, Director, ICAR-Indian Institute of Seed Science, Mau was bestowed with Honorary Fellowship Award 2016 for his outstanding contributions in the field of Seed Science & Technology by Bioved Research Institute of Agriculture, Technology and Sciences, Allahabad on the occasion of 18th Indian Agricultural Scientists’ and Farmers’ Congress, 20th-21st February, 2016.



2. Dr. Rajiv Kumar Singh, Senior Scientist (Agronomy), ICAR-IARI, Pusa, New Delhi has received Young Scientist Associate Award-2016 in the 18th Indian Agricultural Scientist and Farmers’ Congress on “Prospects of Skill Development in Agriculture and Rural Development-A step towards make in India” during 20-21 February, 2016 at Allahabad by Bioved Research Institute of Agriculture, Technology & Sciences, Allahabad.

Personnel: ICAR-IISS, Mau

| Staff | Designation | Joining / Promotion / Transfer |
|---------------------|---------------|--------------------------------------|
| Dr. Dhandapani | Scientist SS | 20.01.16 (Transfer) |
| Dr. Rajiv K. Singh | Sr. Scientist | 28.01.16 (Transfer) |
| Dr. Hardev Ram | Scientist | 15.03.16 (Transfer) |
| Smt. Ranjana Kumari | LDC | 20.08.16 (Promoted to UDC) |
| Sh. A. K. Tripathi | LDC | 20.08.16 (Promoted to UDC) |
| Dr. Govind Pal | Sr. Scientist | 13.09.16 (Promoted to Pr. Scientist) |
| Dr. Elayaraja K. | Scientist | 17.12.16 (Transfer) |

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