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PULSES Newsletter

ICAR-Indian Institute of Pulses Research, Kanpur

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Dr Trilochan Mohapatra, Secretary (DARE) & DG (ICAR) Inaugurates Laboratory-cum-Office Building of ICAR-IIPR Regional Centre at Dharwad

The newly constructed Laboratory-cum-Office building of ICAR-Indian Institute of Pulses Research-Regional Centre, Dharwad and a Scientist-Farmer Interface Meeting were inaugurated by Dr. Trilochan

Mohapatra, Secretary (DARE) & Director General (ICAR) on June 17, 2019 at Dharwad. Shri. N.H. Shivashankar Reddy, Hon'ble Minister of Agriculture, Govt. of Karnataka; Prof. M.B. Chetti, Hon'ble Vice Chancellor, University of Agricultural Sciences, Dharwad, Dr. J.H. Kulkarni, Ex-Vice Chancellor, University of Agricultural Sciences and Shri Prasad Abhayya, MLA, Hubli, Dharwad were present on the occasion. Dr. N.P. Singh, Director, ICAR-IIPR was Chairman of the function. During the function, all dignitaries visited the laboratories and other facilities of Regional Centre, Dharwad and interacted with Director of the Institute and staff members of the Regional Centre. Around 150 farmers participated in the inaugural function. Mungbean and urbean seeds were also distributed to the farmers. Four sets of Institute published folders were also released on the occasion.

In his inaugural address, Dr. Mohapatra lauded the efforts of ICAR-IIPR achieving near self-sufficiency in pulses production and its contribution in Pulses Revolution in the country. While reiterating the role of varieties and technologies in gaining stability in pulses and other foodgrain production, he opined that the novel technologies should reach to the farming community in time and called upon scientists to work in integration involving multiple for the benefits of farmers. Prof. M.B. Chetti, Hon'ble Vice Chancellor, UAS, Dharwad while describing the role of pulses and the centre in the region, advised pulses scientists of University and scientists of IIPR to work in synergy for the benefit of farming community of the region. He assured for all kind of support and cooperation in development of IIPR - Regional Centre at UAS, Dharwad.

Mr. Shivashankar Reddy, Hon'ble Agril. Minister, Karnataka and Mr. Abbayya Prasad, Hon'ble MLA, Hubli-Dharwad district asked farmers to take full benefits of scientific technologies and varieties developed by ICAR-IIPR They appreciated the efforts of ICAR-IIPR team in establishing the centre within short period to serve the farming community of the state and the region. Dr. J.H Kulakarni, Ex-VC of UAS, Dharwad also joined Hon'ble VC, UASD in congratulating ICAR-IIPR team for opening a Regional Centre of IIPR at Dharwad and offered his best wishes for a bright future for the centre. Dr. N.P. Singh, Director, ICAR-IIPR, welcomed all the dignitaries and farmers on this special and unique occasion. He

thanked Dr. Trilochan Mohapatra, Prof. M.B. Chetti, Hon'ble VC, UASD and others for their support and guidance for establishment of the centre. Dr. M.S. Venkatesh, Principal Scientist & Incharge, Regional Centre, Dharwad proposed vote of thanks. In farmers-scientists interface meeting, varietal information, crop production and protection technologies for pulses were disseminated to the farmers by the Scientists from the Centre and IIPR Head quarters, Kanpur. Farmers also shared their experiences of cultivation of pulse crops in their fields.

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Vice- President of India Inaugurates the Annual Group Meet on Mungbean, Urdbean and Arid legumes

The Hon'ble Vice President of India, Shri M. Venkaiah Naidu inaugurated the 24th Annual Group Meet on Mungbean and Urdbean under All India Coordinated Research Project on MULLaRP (Mungbean, Urdbean, Lentil, Lathyrus, Rajmash and Pea) and Cowpea, Clusterbean and Mothbean under All India Network Project on Arid Legumes which was held at Acharya N.G. Ranga Agricultural University, Guntur , Andhra Pradesh during May 19-21, 2019. Addressing the participants of group meet, he emphasized the need of paradigm shift in agricultural research using innovative science, alternative policies and institutional changes for increasing productivity and production of crops in the country. A bilingual android–based smartphone application was also launched on the occasion which aims at larger masses of farmers in providing them latest technical-how of mungbean cultivation. Hon'ble Chief Guest awarded the research centres of mungbean and urdbean with the 'Best AICRP Centre Award'.

Dr. V. Damodar Naidu, , Hon'ble Vice-Chancellor of the University advised to make pulses production remunerative that would attract farmers to grow more pulses. Dr. D.K. Yadav, ADG (Seeds), ICAR, in his speech briefed the efforts made by ICAR in increasing pulses area and production in the country. Dr. Sanjeev Gupta, Project Coordinator (MULLaRP) briefed the audience about the progress made in MULLaRP crops. He informed how the new varieties and technologies helped to attain the record production of pulses in recent times.

Dr. N.P. Singh, Director, ICAR-IIPR, Kanpur briefed about the national priorities and programmes in pulses research and urged the group to reorient the research activities at respective centres to address the problems of the region. The results of *Kharif* experiments 2018 were discussed and the technical programme for *Kharif* 2019 was finalized. Improved varieties of urdbean for rice- fallow cultivation, VBN 9 & for *Rabi* cultivation, VBN 10, mungbean variety for NEPZ and NWPZ, MH 1142 and of cowpea variety for summer cultivation PGCP 24 were also identified for release by CVRC.

Mung Advisor: An Android based Application for the Farmers in India

A need was felt since long for an information and communication technology (ICT) based platform for farmers, which could act as a one-stop solution to all their queries related to mungbean cultivation. The ICAR-Indian Institute of Pulses Research, Kanpur developed an interactive application tool, "Mung Advisor" which is now available on Android smartphones through Google play store. This app is currently bilingual in English and Hindi and is free to download. This app covers all the three seasons (Spring/Summer, *Kharif* and *Rabi*/Rice fallow) and provides information on improved varieties, cultural practices, insect-pest and disease management, post-harvest technology, marketing, *etc*. The app also provides information on plant architecture, weather advisories, latest statistics and nutritional profile of mungbean besides having an

integrated seed calculator.

Mung Advisor was dedicated to farmers by the Hon'ble Vice-President of India, Shri M. Venkaiah Naidu ji on 19 May 2019 during the 24th Annual Group Meet on Mungbean and Urdbean held at Acharya NG Ranga Agricultural University (ANGRAU), Lam, Guntur, Andhra Pradesh, India. This app is supported by ACIAR through International Mungbean Improvement Network (IMIN) and will be upgraded to cover all IMIN partner countries and be multi-lingual for each region in future.

Mung Advisor can be accessed on Google Play store at the following link:

https://play.google.com/store/apps/details?id=com.mungadvisor&hl=en

Aditya Pratap, Uma Sah, Sanjeev Gupta and N.P. Singh

24th Annual Pigeonpea Group Meet

The 24th Annual Group Meet of All India Coordinated Research Project on Pigeonpea was held during May 25-27, 2019 at Agriculture University, Kota, Rajasthan. About 125 delegates from cooperating centres of SAUs and ICAR Institutes attended this group meet. In Inaugural session, Dr.Neelima Singh, Hon'ble Vice-Chancellor, AU Kota, Rajasthan; Dr. G. L. Keshwa, Ex Vice Chancellor, AU, Kota; Dr.

D.K. Yadav, ADG (O&P); Dr. N.P. Singh, Director, ICAR-IIPR; Dr. Pratap Singh Director Research, (AU, Kota); Dr. R.K. Singh, Head, ICAR-IISWAR, Kota; Dr. I. P. Singh, Project Coordinator (Pigeonpea) were present.

While giving welcome address, Dr. Pratap Singh, Director of Research, AU, Kota highlighted the importance and scope of pigeonpea in Rajasthan and the country. Dr. I.P. Singh, (Pigeonpea) briefed the progress of AICRP pigeonpea and highlighted the rise in pigeonpea productivity over the years. He informed that poor rainfall, uneven distribution, early withdrawal of precipitation and no rain during the reproductive phase resulted in lesser productivity (832 kg/ha). Dr. Singh also added that irrigation at pre-flowering stage resulted in significantly higher yield as compared to podding stage and

nipping in pigeonpea was found promising when performed at 45 days after sowing.

Dr. N.P. Singh, Director, ICAR-IIPR deliberated on the latest break throughs that were achieved in terms of pulse production over the last five years. He informed that increasing adoption of modern pulse technologies led to a quantum jump in pulses production. The efforts were complemented with Government policy support of enhaceed MSP. Recent progress in seed system also contributed significantly to this and resulted in significant improvement in seed replacement rate (SRR) and variety replacement rate (VRR) Dr G.L. Keshwa, Ex. VC, AU, Kota highlighted the challenges of feeding burgeoning Indian population in the phase of alarmingly declining resources like arable land, irrigation water *etc*. Dr. R.K. Singh, Head, IISWR, Kota stressed upon the need to long-term impacts on land use system in addition to seeking immediate economic gains at farmers' field. Dr. D.K. Yadav, ADG (O&P) highlighted the increasing relevance of climate resilient and nutrient rich pulse crops. Dr. Neelima Singh, Vice Chancellor, AU, Kota, emphasized up on the quality improvement parameters including cooking and milling qualities of pulses.

Six new varieties and one hybrid of pigeonpea were identified in the Varietal Identification Committee meeting.

Farmer's Day on Summer Mungbean organized

A 'Farmer's Day' on summer mungbean was organized on June 14, 2019 at ICAR-IIPR, Kanpur on this occassion Scheduled Caste Sub Plan (SCSP) was also implemented for increasing their socio-economic conditions through pulses production. The farmers were provided with critical inputs such as seeds of urdbean and mungbean along with literature related to improved production and management practices in pulses. In this programme, 130 farmers Fatehpur and Unnao districts participated. Farmers also visited mungbean field in the Institute. While

highlighting role of pulses in food and nutritional security, Director of ICAR-IIPR, Kanpur, Dr. N.P. Singh reiterated for cultivation and promotion of pulses. Dr. Nand Kishore, Deputy Director Agriculture, Unnao explained the role of quality seed and its production for higher income realization. Earlier in the meeting, Dr. Rajesh Kumar, Principal Scientist and Head, Social Science Division welcomed the dignitaries and farmers and briefed about the purpose of Farmers day and SCSP programme. The meeting ended with vote of thanks by Dr. Awinendra Kumar Singh.

Honourable Cabinet Minister, Sadhvi Niranjan Jyoti, Minister of State Ministry of Rural Development had also provided seed as a critical input under Farmer FIRST project and SCSP plan to the woman farmers of Karchalpur and Shahpur Village of Fatehpur district on June 30, 2019.

Best Centre Award in Mungbean

ICAR-IIPR Kanpur received Best Centre Award-2018 for 'Outstanding contribution in development of high yielding varieties of greengram' jointly with CCS Haryana Agricultural University, Hisar during the Annual Group Meet on MULLaRP and Arid Legumes. The award was given by Shri M. Venkaiah Naidu ji, Hon'ble Vice President of India during the inaugural session of the Group Meet on May 19, 2019. It is noteworthy that till now ICAR-IIPR, Kanpur has developed 10 high yielding and widely adaptable varieties of mungbean including the landmark varieties *viz*., IPM 205-7 (Virat), IPM 2-3, Samrat and IPM 2-14. IIPR varieties currently meet more than 40% of the breeder seed indent in the country. CCS HAU Hisar has also developed outstanding varieties such as MH 421 and Sattya which are highly popular among the farmers. Both these centres have also developed several other superior lines which have been shared among different NARS partners. The award was received by Dr. Aditya Pratap from ICAR-IIPR, Kanpur and Dr. Rajesh Yadav from CCS HAU, Hisar.

Research Highlights

Identification of Extra Small Seeded Genotypes from IIPR Common Bean Gene Bank

Genetic resources at IIPR comprising of 1300 accessions of cultivated common bean (*Phaseolus vulgaris* L.) and 10 wild accessions of runner bean (*Phaseolus coccineus* L.) of lima bean (*Phaseolus lunatus* L.) and four wild of Tepary bean (*Phaseolus acutifolius* L.)were collected from the ICAR-NBPGR and CIAT gene bank units, Colombia. These accessions were characterized during 2018-19. Seeds of each accession were evaluated for six quantitative characteristics. All seed characteristics measured quantitatively or assessed qualitatively show wide range of variation among all accessions.

Based on the morphological seed characterization studies,it was found that two gene pool (Andean & Mesoamerican) are distinct in terms of seed traits From this investigation, identified extra small seeded common bean accessions *viz*., EC 931132, EC 931110, EC 931121, EC 931152, EC 931154, EC 931148, EC 931342 and EC 931193. These accessions could be used for breeding programme in development of new common bean varieties for small to medium seed type and other desired seed characteristics.

Basavaraja, T., Manjunatha, L., Rahul Chandora, Mohar Singh, Shiv Sweak and N.P. Singh

Molecular Characterization of Kanpur Isolate of Bean Common Mosaic Virus Infecting Common bean

Bean Common Mosaic Virus (BCMV), the type species of the genus *Potyvirus* of the family Potyviridae, is an important plant virus, which infects many legume plants and causes quantity and quality losses. BCMV incites various symptoms like light and dark green mosaic patterns of leaves, downward curling, mosaic mottling, puckering, blistering, distortion, and rolling of infected leaves. For virus characterization, total RNA was isolated from leaves of infected plants and used in reverse transcriptase polymerase chain reaction with a primer set designed in the BCMV poly protein region. Viral amplicons of the expected 820 bp size were obtained from infected plants. No viral amplicon was obtained from healthy control plants. Viral amplicons were sequenced. Phylogenetic relationship was determined by the comparison of poly protein gene nucleotide and amino acid sequences with other BCMV isolates reported from India and worldwide. The varities close relationships was revealed with the NL-1 strain of BCMV common in Himachal Pradesh and other parts of India. This would help in development of strain specific BCMV resistant varieties in common bean for effective control of bean common mosaic disease.

Manjunatha, L., Basavaraj, T., Shailendra Singh, Jyotirmayi Dubey, Krishna Kumar and N.P. Singh

Exploration for the Collection of Landraces/Germplasm of Pulses

An exploration trip was undertaken during October 22-31, 2018 for collecting the land races/germplasm of pulses in Karnataka. Ninety accessions of landraces/germplasm of different pulses mainly cowpea, mungbean and urdbean were collected from farmers of Belgaum and Bagalkot of Karnataka. These landraces shown variations for seed colour, seed size, pod length and plant type. Prominent landraces of horsegram, pigeonpea and black seeded chickpea from pulse growing farmer's field were also collected. These landraces will be evaluated for yield, biotic and abiotic stresses during *Kharif/Rabi* season and will be utilised in breeding programme of pulses.

Revanappa SB and MA Nizar (*Scientist, ICAR-NBPGR, Regional station, Thrishur)*

Isolation of Zinc Solubilizing Bacteria from Tannery Soil

Zinc is a vital constituent of various metabolic enzymes and it's essential for optimum plant growth. Indian agroecosystem specially in arid and semiarid regions are often zinc deficient. In this context, ability to solubilize zinc in rhizospheric soil and increase its plant availability by microorganisms proves to be beneficial and economical. A total of 8 bacterial isolates capable of zinc solubilization were isolated from tannery soil and river sand pol luted with tannery effluent. Among them, bacterial isol ates most efficient in zinc solubilization. All the bacterial isolates were characterized for PGPR activity like production of ammonia, HCN, IAA, ACC Deaminase and Siderophore. Bacterial isolates ZSBR4 and ZSBR3 were found positive for IAA production.

Fig. Zinc solubilizing bacteria

Kalyani Singh, Krishnashis Das and Senthilkumar M

IPH 15-03: Pigeonpea Hybrid for Cultivation in North-Western Plain Zone

The pigeonpea hybrid IPH 15-03 based on CMS technology has been identified by the Variety identification Committee (VIC) on 25th May, 2019. It is based on the cross PA 163A X AK 250189R and has been identified for cultivation in the North western plain zone (NWPZ). The hybrid was evaluated for four years [Initial hybrid Trial (IHT) 2015, Initial Hybrid Trial (IHT) 2016, Advanced Hybrid Trial 1 (AHT 1) 2017 and Advanced Hybrid

Trial 2 (AHT 2) 2018] in NWPZ under AICRP Pigeonpea. Averaged over four years of evaluation, Its yield of 1595.6 kg/ha has shown 28.3%, 55.2% and 31.91% superiority over the checks Pusa 992 (1243.6 kg/ha), PAU 881 (1028.07 kg/ha) and ICPL 88039 (1225.03 kg/ha), respectively. The hybrid matures in 153 days and has a 100 seed weight of 8.54 g. It has shown 94.31 per cent plant fertility.

Bohra A, Singh IP, Naik SJ Satheesh, Singh F, Datta D, Kumar A and Singh NP

Identification of mating types of *Ascochyta rabiei* using Multiplex Polymerase Chain Reaction (PCR)

Ascochyta blight, caused by a fungus *Ascochyta rabiei* is an important foliar disease of chickpea with worldwide occurrence. Wind-borne ascospores produced by the teleomorph of *A. rabiei* play a significant role in spread of disease and pathogen survival in many chickpea growing regions. The teleomorph stage (Sexual reproduction), however, has not been reported in India. For sexual reproduction, pairing of 2 compatible mating types (MAT1-1 and MAT1-2) is required. The mating types such as MAT1-1 and MAT1-2 are important for development of telomorphic stage, which may contribute to increased genetic variability of the *A. rabiei*. Study was conducted to determine the mating type of *A. rabiei* sampled from chickpea fields of Kanpur and Ludhiana *using* MAT-specific PCR 3 primers such as Common 3' flanking region, MAT1-1 and MAT1-2 in a multiplex PCR assay. The mating types of *A. rabiei* were differentiated from each other. PCR assay revealed that both the isolates belong to MAT1-2 amplified to an expected size of ≈ 400bp (Figure 1) and absence of MAT 1-1 with a 700 bp fragment, in accordance with the discrimination of mating type groups. This mating type identification will be valuable in breeding for blight-resistant varieties, prediction of high genetic variability in different regions and developing essential control measures to mitigate this disease.

Manjunatha, L., Shailendra Singh, Dixit, G.P., Krishna Kumar and N.P. Singh

Identification and Physiological Characterization of Pigeonpea [*Cajanus cajan* (L Millsp.)] Genotypes for Cold Tolerance

102 genotypes of pigeonpea were evaluated including checks (IPA 203, Bahar, NDA 1, ICPL 7035) against the cold stress during *Kharif* 2018. Morphological and yield characters including plant canopy structure with branching pattern with stature, scoring of cold injury at the apical meristems in exposed plants (3 each for every genotype), number of flower/pod drop and pod set during cold period in tagged plants (3 plants each), post –regenerative capacity of meristems in exposed plants and survival % were recorded. Meteorological observations during cold stress like minimum and maximum temperature, relative humidity % and rainfall and cloudy weather were also recorded from November, 18 to February15, 2019. The genotypes IPA 15F, Dhule-D, JBT46/27, IPACT-6, IPACT-14, IPAC 1-17, IPACT-68, IPACT-22 were found highly sensitive to cold stress retaining only 0-10% flowers/pods. Whereas genotypes like NDA 2, MAL 13, ICP 2275, IPACT 2 were able to retain 60-80% flowers/pods and are considered as tolerant.

T.N. Tiwari

Variety-wise Grain Yield Performance of Chickpea Farmers Participatory Varietal Selection (FPVS) Trials

Rainfed rice fallow lands (RRFL) offer ample opportunities for the cultivation of chickpea and *Rabi* pulses. Therefore rice farmers are advised to take up chickpea after the harvest of the rice crop. Five chickpea varieties including three *desi* (JG 14, RVG 202 and RVG 203) and two *Kabuli* types (Shubhra and

Ujjawal) were demonstrated in 12 targeted villages during *Rabi* 2018-19 covering a total of 32.42 ha area in Fatehpur (10.97 ha), Mahoba (12.6 ha) and Jalaun districts (8.85 ha) of Uttar Pradesh for enhancing cropping intensity and ensuring livelihood security. A total of 25.90 q of quality seed of chickpea varieties JG 14 (3.90q), RVG 202 (8.0q), RVG 203 (2.0q), Shubhra (8.4q) and Ujjawal (3.6q) was distributed among 94 farmers during *Rabi* 2018-19 under Genetic Gain project (DAC II). 106 Farmer's Participatory Varietal Selection (FPVS) trials were conducted in a cluster by forming groups of farmers including 55, 30 and 21 farmers in each village of Fatehpur, Mahoba and Jalaun districts, respectively.

After compilation of variety-wise grain yield performance data, the highest average yield was recorded by *desi* chickpea variety RVG 203 (20.98 q/ha) followed by JG 14 (20.77 q./ha), RVG 202 (18.63 q/ha), Shubhra (18.15 q/ha) and Ujjawal(17.34 q/ha). The grain yield of chickpea ranged from 18.48 to 23.88 q/ha, 12.69 to 15.93 q/ha and 18.53 to 22.63 q/ha in Fatehpur, Mahoba and Jalaun districts, respectively.

Yogesh Kumar, Biswajit Mondal, AK Srivastava, UC Jha, Rajesh Kumar, Awnindra Kumar Singh, Suhel Mehandi, RKS Yadav, Shiv Sevak, GP Dixit and NP Singh

IPA 206: Long Duration High Yielding Pigeonpea Variety for Cultivation in Uttar Pradesh State

IPA 206 The new variety pigeonpea was developed by pedigree method from the cross (Bahar × AC 314-314). This variety offers 13.80 % yield superiority over the best check variety Bahar. The Variety has been identified by the State Variety Identification committee (SVIC) on 6th October, 2018.

This variety was evaluated for four years in Uttar Pradesh under state varietal testing programme, coordinated by Uttar Pradesh state agricultural department. The variety has recorded 13.80%, 13.32% and

16.55% yield superiority over the popular pigeonpea cultivar Bahar, NDA 1 and NDA 2, respectively. A field view and brief morphological detail of the variety are shown in the Figure. The variety is indeterminate, flowers are yellow with dense dark red streaks and immature pods are green with purple streaks. The seeds are purple in colour with smooth seed surface.

I.P. Singh, Farindra Singh, Dibendu Datta, Abhishek Bohra, Satheesh Naik SJ, A.K Choudhary and N.P. Singh

Characterization of *Pigeonpea Sterility Mosaic Virus* on differential cultivars

Pigeonpea Sterility Mosaic Virus (PPSMV) causes sterility mosaic disease in pigeonpea belonging to genus *Emara* virus. Two different species are reported in genus *Emara* virus *viz.*, Pigeonpea Sterility Mosaic *Emaravirus*1 and Pigeonpea Sterility Mosaic *Emaravirus* 2 under the family Fimoviridae of the order Bunyavirales. These two viruses are transmitted in a semi-persistent manner by a Eriophyid mite *Aceria cajani.* In India it was estimated to cause yield losses worth of ₹ 750 million alone due to various strains of PPSMV. At Dharwad, pigeopea sterility mosaic nursery was established by leaf stapling technique on a susceptible variety ICP 8863 for large scale screening of germplasm. Hence, it is prerequisite to know the strain of virus present in the area before screening. Considering reactions, genetic background of genotypes, eleven differentials were constituted in AICRP pigeonpea *viz.*, Bahar, BDN 1, BRG 1, BRG 2, BSMR 736, ICP 2376, ICP 7035, ICP 8863, IPA 8F, Purple1 and BRG 3 to identify the strains of a virus. Based on a reaction on these differential cultivars set, five strains of PPSMV reported from India (AICRP Pigeonpea Report, 2018-19). At Dharwad, reactions on these differential sets were recorded. The disease incidence was highly variable ranging from 0 to 66.7% and 9 genotypes were found resistant, 2 were susceptible. Based on which, the PPSMV of Dharwad belonging to strain 3. Knowledge generated will be utilized in resistance breeding programme.

Saabale PR, Revanappa SB, Kodandaram MH, Venkatesh MS and Nikhil M

Establishment of Pre-breeding Garden at IIPR Regional Centre, Dharwad

Wild species of pulses are the novel sources of genes for biotic and abiotic stresses which can be utilised in pre-breeding activities of pulses. Hence, maintenance and evaluation of wild species is essential Pre-breeding garden was established at ICAR-IIPR, Regional Research Centre, Dharwad (Karnataka) to maintain and utilize wild *Vigna* species in distant hybridization programme of *Vigna* crops. Wild

Vigna species such as *V. umbellata* (IC-251442), *V. aconitifolia* (LRM-2013-01), *V. trilobata* (LRM-2013-30, LRM-2013-34) and *V. stipulacea* (LRM-2013-36, LRM-2013-37) were rejuvenated and evaluated for different morphological traits during *Rabi* 2018-19. Fresh crosses were also attempted in mungbean with *V. umbellatta* during spring summer season 2018-19.

Revanappa S.B. M.S Venkatesh., P.R. Saabale. M.H. Kodandaram, Nikhil Mohite and B. Manu

प्रौद्योगिकी हस्तांतरण

Frontline Demonstration Programme for Additional Income

Summer mungbean variety Virat demonstrations were conducted under FLD programme in Kanpur Nagar, Kanpur Dehat, Hamirpur, Unnao, Kanauj, Fatehpur and Etawah district of Uttar Pradesh. Total 21 farmers were covered for additional income and nutritional security.

In *Kharif* season, FLD was conducted on pigeonpea and cowpea in Kanpur Nagar, Kanpur Dehat, Fatehpur, Kanauj and Unnao districts of Uttar Pradesh. Total 35 farmers were covered under pigeonpea crop and 25 farmers covered under cowpea crop.

धान की सघनता पद्धति या श्री विधि से धान लगाना

फार्मर फर्स्ट परियोजना के द्वारा किसानों को धान लगाने की 'श्री विधि' का प्रशिक्षण कृषक वैज्ञानिक परिचर्चा के दौरान भाकृअनुप–भारतीय दलहन अनुसंन्धान संस्थान के वैज्ञानिक डा. राजेश कुमार एवं डा. सी.पी. नाथ के द्वारा दिया गया। पहले किसान परम्परागत तरीके से धान की स्थानीय प्रजातियों को ही उगाते थे। जिससे 60–65 क्विंटल प्रति हेक्टेयर के औसत से ही धान की उपज होती थी। सर्वप्रथम श्री रज्जन पासवान इस विधि से धान लगाने के लिए तैयार हो गये और ***फार्मर फर्स्ट*** की टीम के सहयोग एवं मार्गदर्शन से धान की उपज 80–90 क्विटंल प्रति हेक्टेयर पाई जो कि सामान्य विधि से 20–30 क्विंटल प्रति हेक्टेयर अधिक थी। श्री रज्जन पासवान ने बताया की इस विधि से धान की पौध (नर्सरी) तैयार होने में 12 से 14 दिन जबकि परम्पारगत विधि से धान की नर्सरी तैयार होने में 21 से 25 दिन का समय लग जाता है।

इस तकनीक से उगाए धान को पानी के बहुत कम प्रयोग से भी बढ़ाया जा सकता है। जहां पारंपरिक तकनीक में धान के पौधों को पानी से लबालब भरे खेतों में उगाया जाता है, श्री विधि से पौधों की जड़ो में नमी बरकरार रखना ही पर्याप्त है। यद्यपि सिंचाई का इन्तजाम होना भी जरूरी है जिससे जरूरत पड़ने पर समय से सिंचाई की जा सके। इस तकनीक से धान की खेती में जहां बीज की बचत होती है। वहीं भूमि, श्रम, पूंजी कम लगता है। वहीं प्रति इकाई क्षेत्रफल में उत्पादन भी अधिक होता है और इस प्रकार से उपज में दोगुनी से तिगुनी वृद्धि देखी जा सकती है। यह सब देखते हुये किसान लगातार श्री रज्जन पासवान से तथा ***फार्मर फर्स्ट टीम*** के सम्पर्क में है, जो अगले साल इसी विधि से धान लगाने के लिए तैयार है। और फार्मर फर्स्ट टीम भी लगातार किसानों को अपनी आय बढ़ाने हेतु इस विधि से धान लगाने के लिए जागरूक कर रही है।

राजेश कुमार, सी.पी. नाथ, चन्द्रमणि त्रिपाठी, प्रदीप कुमार एवं देवराज

Distinguished Scientist Award-2019

Dr. Rajesh Kumar, Principal Scientist participated in the 2nd International Conference on Global Initiative for

Sustainable Development: Issue and Strategies during 23-27 June 2019 at Bangkok, Thailand. He was awarded with the Distinguished Scientist Award-2019 by the Gochar Education and Welfare Society during the Conference.

Appointments, Promotions, Transfers, *etc.*

Promotions

Name	Promoted to	W.e.f.
Sh. Ravi Ranjan Singh	Sr. Technician	10.12.2017
Sh. Indra Bahadur	Sr. Technician	28.05.2017
Sh. Anand Kumar Yadav	Sr. Technical Assistant	20.10.2017
Sh. Babulal	Sr. Technician	17.06.2018
Sh. Amar Nath	Sr. Technician	10.06.2018
Sh. Devi Prasad	LDC	22.05.2019

Transfer

Name	Designation	From	To	Date
Dr. Manu B.	Scientist	IIPR, Kanpur	IIPR-RRC, Dharwar	27.06.2019

Obituary: Sh. K.A. Chaturvedi, UDC left for Heavenly abode on May 21, 2019. May the soul rest in peace.

Director's Desk

Dear Readers,

Globally, the harvest index (HI) of grain legumes is variable, while in cereals, it is generally considered to be relatively stable. Cereals have high levels of carbohydrates while pulses are rich in proteins and amino acids, though they have lower contents of carbohydrates. Pulses being high nitrogen harvest index, as a result, most of the nitrogen in pulses is converted into protein and less carbohydrates in seeds. In terms of energy index including carbohydrate and nitrogen accumulation both, pulses are considered to be superior to cereals that too are also at the cost of low agricultural inputs and management. The harvest index of many pulse species and varieties tends to be low in all seasons. Extension of the harvest index concept to express the partitioning of mineral nutrients as well as dry matter (*e.g.* the nitrogen harvest index) has provided a range of responses whose implications for production and breeding remain to be explored. It is concluded that even though the principal cereal crops appear to be approaching the upper limit of harvest index, and future yield gains will have to be sought by increased biomass production, there will still be a need for the concept of harvest index as a tool in interpreting crop response to different environments and climatic change. Pulses may have more variable HI than cereals for a number of reasons. In cereals, improvements have generally been made through stem shortening and increased diversion of assimilates to grain production. On the other hand, restructuring of plant types in major pulses has to be conceptualized towards enhanced transport of assimilates to grains. Apart from this, the legumes, which generally fix their own N through the process of N fixation, may have problems with their symbiotic process. A large genetic variation in nodulation, and nitrogen fixation ability and nitrogen harvest index (NHI) have been reported in pulses but these unique attributes were given less importance or little exploited for pulse improvement programme. Legumes supply the nodules with carbohydrates, which can reduce above ground dry matter. The distribution of nitrogen in various parts in pulses needs to be investigated and contribution of each part towards nitrogen mobilization to developing grains are important areas of further research and improving those vital parts is to be strengthened under breeding programme. These crops are often indeterminate and flower over long periods. This can give a greater change of the plant experiencing adverse growing conditions. Irrigation can also affect HI because of increased total dry matter production with no corresponding increase in seed yield. Lodging, which occurred in irrigated plots, reduced HI because seed yield was reduced in lodged crops Grain legumes have also been reported to have poor partitioning of dry matter to seed production. However, pulses play a significant role in nitrogen cycling as they fix atmospheric N_2 through symbiosis. The study on few grain legumes such as chickpea (*Cicer arietinum* L.), dry bean (*Phaseolus vulgaris* L.), faba bean (*Vicia faba* L.), field pea (*Pisum sativum* L.), and lentil (*Lens culinaris* Medik.) revealed different biological nitrogen fixation (BNF) ability and its effect on crop yield. Pulses have a higher BNF in the wetter season, and a lower BNF in the drier season. The faba bean and chickpea have the highest BNF at 106 kg N ha, followed by lentil, field pea, and dry bean at 87, 69, and 12 kg N/ha, respectively. Among all, field pea has the most stable BNF ability, fixing 55 kg N/ha with an average seed yield of 2 to 2,5 t per hectare. There are large differences in BNF and yield among cultivars within a species and the magnitude of the difference varied with years. Large genetic variability in BNF and yield suggest the possibility that pulse cultivars with a higher N_2-fixing ability and seed yield can be

developed through selection of the N_2-fixing trait.

Current cropping systems heavily rely on high input of inorganic N-fertilizer, which requires large amounts of non-renewable energy. Application of N-fertilizer can be detrimental to the environment, potentially leaching nitrate into water sources and contributing to elevated nitrous oxide concentrations in the atmosphere. Therefore, achieving high crop yields with reduced inputs of inorganic fertilizer is one of the main goals for sustainable farming systems. One method to increase crop yield with minimized use of N fertilizer is to include pulse crops in cropping systems to capitalize on their biological nitrogen fixation (BNF) ability. Symbiotic N_2 fixation is the major route of fixing atmospheric N_2, and thus contributes to agriculture sustainability. The inclusion of pulse crops in cropping systems can increase the grain yield of subsequent crops, mitigate nitrogenous greenhouse gas emissions, and reduce the carbon footprint of grain products. In addition, the use of annual pulses in a crop sequence can improve soil properties by the increased availability of nutrients and soil moisture. Furthermore, the biologically fixed-N_2 can be used directly by the crops and is less susceptible to volatilization, denitrification or leaching than inorganic fertilizer N applied to crops. It is estimated that BNF contributes 50^{12} to 70^{12}gram of N annually in agricultural systems, accounting for about 16% of global N supply. In comparison, mineral N fertilizers contribute about half of the global N input while manures, recycled crop residues, and atmospheric deposition each may contribute 8% to 13% of the total N input. A detailed analysis of the effect of pulse species and cultivars on biological nitrogen fixation and its relationship to seed yield showed that, in general, field pea had consistent biological nitrogen fixation ability with the highest seed yield in diverse climatic condition, suggesting that field pea is more suitable for cultivation across the semi-arid regions than other pulses evaluated. However, at the cultivar level, considering biological nitrogen fixation ability and seed yield, the chickpea, pigeonpea and lentil are more preferable to other pulses species for a semi-arid environment. More research is required to evaluate the BNF ability and yield potential for these pulses in the future in terms of the importance of environmental factors affecting BNF, and particularly the negative effect of low rainfall on BNF grain yield. A large variation among pulse species and cultivars in BNF and emphasize the importance of selecting appropriate species and cultivar to exploit the potential of BNF in a semi-arid environment and develop sustainable pulse production systems. It is a well-established fact that, when legumes are grown in soils high in available nitrogen, the nitrogen fixation rate is reduced. However, when legumes are grown in mixed or multiple cropping systems, it is often still necessary to add nitrogen fertilizers to the nonleguminous component of the systems. Thus, it is necessary to identify legume species or varieties which continue to fix atmospheric nitrogen even when fertilizer nitrogen is added. Comparing the effects of 20 and 100 kg N/ha on the field bean (*Vicia faba*) and chickpea, it was found that the nitrogen fixation by chickpea was reduced much more than that of *Vicia faba*. This suggests that *Vicia faba* may be a much better choice in multiple cropping systems than chickpeas. The effectiveness of different legume species and their microsymbionts has been investigated in faba bean (*Vicia faba*), lupin (*Lupinus spp.*), and pigeon peas (*Cajanus cajan*). The effectiveness has been found to be very high in soybean (*Glycine max*), groundnut (*Arachis hypogaea*) and cowpea (*Vigna*) while it is to be average in case of common bean (*Phaseolus vulgaris*) in fixing atmospheric nitrogen. Biological nitrogen fixation of leguminous crops is becoming increasingly important in attempts to develop sustainable agricultural production. However, these crops are quite variable in their effectiveness in fixing nitrogen. Methods for increasing N_2 fixation are therefore of great importance in any legume work. Biological nitrogen fixation is important from the point of view of saving of N fertilizer and reducing the cost of crop production. Also, the use of nitrogen fixing crops will reduce ground water pollution in comparison to cereal crops, which have to be fertilized; enhance protein production due to the high protein content of legume crops; contribute N for succeeding crops and build up soil fertility. It is therefore urgent to promote further use of the legume/*Rhizobium* symbiosis. The importance of the *Rhizobium*-legume interaction is not limited to their symbiotic nitrogen fixation activity or several other activities in the soil, possibly improving soil fertility and plant growth, but some strains of rhizobia can be used to protect plants against attack by pests and pathogens. However, further studies on the precise mode of action and adaptation to the different ecophysiological conditions of these microorganisms may help to maximize the benefits of rhizobia for improving plant growth and health.

(N.P. Singh)

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