2016 INTERNATIONAL YEAR OF PULSES

PULSES Newsletter

Indian Institute of Pulses Research, Kanpur

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Union Minister of Agriculture and Farmers Welfare Visited IIPR

Hon'ble Union Minister of Agriculture Shri Radha Mohan Singh visited ICAR-Indian Institute of Pulses Research, Kanpur on March 13, 2016 to give impetus to activities in the International Year of Pulses-2016. His proclivity was to stimulate scientific community and pulse growers for increasing pulse production in the country to eradicate malnutrition. Dr. Trilochan Mohapatra, Secretary DARE and Director General, ICAR, and Dr. J.S. Sandhu, Deputy Director General (CS) also accompanied the Minister during the visit. Hon'ble Minister and the dignitaries were given a warm welcome by Dr. T. Mohapatra, DG, ICAR and Dr. N.P. Singh, Director of the Institute. Hon'ble Minister laid the foundation stone of Scientists Apartments in the Institute. He visited the experimental fields and took ardent interest in development of new varieties, particularly hybrids and transgenic containment facility.

In his welcome address, Dr. Mohapatra presented before the Hon'ble Minister the pulse production scenario in the country, keeping in foreground the importance and significance of International Year of Pulses. He highlighted the achievements of the Institute in development of new high yielding varieties and matching production technologies.

In his address, Hon'ble Minister called upon the scientists to develop short duration varieties of pulse crops to foster multiple cropping systems. He stressed upon developing high yielding varieties insulated with pest and disease resistance keeping in mind the changes in climate

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Dr. Trilochan Mohapatra Takes Over As New Director General, ICAR

Dr. Trilochan Mohapatra took over the charge of Secretary, Department of Agricultural Research and Education & Director General, ICAR on February 22, 2016.

Dr. Mohapatra was holding the position of Director-cum-Vice Chancellor of the prestigious Indian Agricultural Research Institute, New Delhi. Prior to this, he worked as the Director of National Rice Research Institute (formerly CRRI), Cuttack. He served National Research Centre on Plant Biotechnology, IARI, New Delhi as researcher and teacher for about 20 years. He is a scientist of global repute working in the area of molecular genetics and genomics.

Dr. Mohapatra has over 145 research papers in national and international journals of repute and several books, reviews and book chapters to his credit. His research accomplishments include development of first high yielding *Basmati* rice variety resistant to bacterial leaf blight through molecular marker assisted selection, and physical mapping and genome sequencing of rice and tomato.

Dr. Mohapatra is a Fellow of the Indian National Science Academy, National Academy of Sciences-India, Allahabad and the National Academy of Agricultural Sciences, New Delhi.

IIPR family welcomes the new Director General and wishes him all success in future.

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and seasons. He called for minimizing the post-harvest losses. At this occasion, a farmers' friendly bulletin on *Unnat Dalhan Utpadan Prodikiyon ka Sarwajanikaran* was also released by the Hon'ble Minister.

Addressing the pulse growers the Hon'ble Minister said that cultivable area is shrinking due to urbanisation and industrialization, while the population of the country is increasing. So farmers and scientists should go with hand-in-hand to produce sufficient food for the growing population. In this endeavour Govt. will provide all help and assistance to make the country self sufficient in pulses. Hon'ble Minister honoured Sri Rajendra Prasad Savita, farmer of village Vidokhar, Distt. Hamirpur with *Pandit Deen Dayal Upadhyaya Krishi Antyoday Puraskar*.

While delivering vote of thanks to Hon'ble Minister, other dignitaries and farmers present, Dr. N.P. Singh assured all that with immense support of the Government and massive scientific and technical strength, the production of pulses will achieve all targets. He also assured that in the International Year of Pulses, scientists and pulse growers will leave no stone unturned to make the country self reliant.

Inauguration of Building at ICAR-IIPR Regional Station, Phanda, Bhopal

On February 24, 2016 inauguration of Farm Services Building and foundation stone laying ceremony of Laboratory-cum-Administrative Building at Regional Station of ICAR-IIPR (Kanpur), at Phanda, Bhopal, was solemnized by the new Secretary, DARE and Director General, ICAR, Dr. T. Mohapatra and DG, ICARDA, Dr. Mahmaud Solh, in presence of Dr. J.S. Sandhu, DDG (CS), Dr. B.B. Singh, ADG (O&P), ICAR and Dr. N.P. Singh

Director, IIPR. Dr. N.P. Singh, while welcoming the guests and dignitaries, elaborated the importance and scope of the new Research Station at Phanda in catering the research needs of central India.

Dr. Mohapatra, DG ICAR emphasized on achieving the target of 24 million tons pulses production by 2020 to make the country self sufficient. He was much concerned about the strengthening the communication network between the researchers and farmers for dissemination of technologies. He appreciated the efforts of ICAR scientists towards development of new varieties of pulses and eradication of malnutrition.

Dr. Mahmoud Solh, DG ICARDA conveyed his gratitude to ICAR for needful collaboration and support for development and spread of new varieties of pulses. Dr. J.S. Sandhu desired that the deficit in pulses production should be compensated within a time span of 2-3 years to fulfil the dream of Hon'ble Prime Minister. Dr. B.B. Singh emphasized on production of sufficient quality seed of pulses through farmers participatory approach and purchasing the seed by buy-back policy. A farmers' training programme on seed production technique in pulses was also organized at this occasion.

Congratulations

Dr. S.K. Singh, Principal Scientist and Acting Head, Division of Social Science at IIPR joined as Director, Agriculture Technology Application Research Institute (ATARI), Jodhpur (Rajasthan) on February 3, 2016. Widely travelled nationally and internationally, Dr. Singh has very good reputation in farming community.

Rabi Pulses Scientists' Meet organized

Rabi Pulses Scientists' Meet was organized at ICAR-IIPR, Kanpur on February 19-20, 2016 to provide an opportunity to researchers to share information on basic and applied aspects of pulses research and to share breeding material and genetic resources. Total 43 scientists including scientists from ICRISAT and ICARDA participated in the meet. Dr. N.P. Singh, Director IIPR, highlighting its importance, suggested to take advantage of the meet to explore areas for future collaborations and called for providing feedback on

material received and its utilization. Dr. S.K. Chaturvedi, Head, Crop Improvement and Convener extended warm welcome to the participants and presented his views on resetting research priorities in *rabi* pulses. Dr. P.M. Gaur of ICRISAT highlighted accelerated breeding with special reference to transfer hot spot QTLs to impart drought tolerance. Dr. Kiran K Sharma from ICRISAT suggested to develop consortium to generate required data to address bio-safety issues in transgenic pulses. Dr. G.P. Dixit, Project Coordinator (Chickpea) suggested sharing of segregating populations and utilization of off-season nursery for rapid generation advancement. Breeders had special interest in material generated through interspecific hybridization in chickpea and lentil that exhibited large variations for seeds per pod, pods per plant and primary/secondary branches per plant. A large number of breeding lines, germplasm accessions and donors were selected by the participants from different centres.

Promotion of Pulse in Bundelkhand

Scientists from ICAR-Indian Institute of Pulses Research, participated in *Bundelkhand Krishi Pradarshini and Kisan Mela* organized by ATARI, Zone IV, Kanpur on March 29-30, 2016 at Lalitpur, Uttar Pradesh.

Hon'ble Union Minister for Water Resources, River Development and Ganga Rejuvenation, Govt. of India, Ms. Uma Bharti was Chief Guest of the function. She unveiled 'Prime Minister's Crop Insurance scheme'. A special session on 'Strategies for Promotion of Pulses in Bundelkhand' was also organized wherein Dr. S.K. Chaturvedi of IIPR eleborated technologies and strategies for enhancing pulses production in the region. Dr. Purushottam highlighted income generation through pulse enterprising activities to check migration of rural youth to urban areas. Dr. U.C. Jha shared information on suitable heat and drought tolerant chickpea cultivars for the region. A farmers' friendly extension bulletin *Bundelkhand Main Chana Utpadan Ki Unnat Takniki* was also released by the Hon'ble Minister.

Non-availability of quality seed of recommended varieties and timely arrangements of pesticides emerged as main constraints faced by pulse growers of the region. Later, Dr. A.K. Singh, Deputy Director General (Agril. Extn.), ICAR, New Delhi visited the ICAR-IIPR stall and took keen interest in latest varieties of pulses. Hundreds of farmers including farm women and youth visited IIPR stall and enquired about pulses. Literature on package of practices for various pulse crops was distributed among farmers and mobile numbers of visiting farmers were also collected for follow up.

National Science Day Celebrated

National Science Day was celebrated on February 29, 2016 at the Institute with great enthusiasm on the theme 'Make in India: Science and Technology Driven Innovation'. Dr Renu Jain, Director, University Institute of Engineering & Technology, CSJMU, Kanpur was Chief Guest and Dr D.K. Srivastava, Joint Director, Council of Science & Technology, UP, Lucknow was Guest of Honor on the occasion. Dr. S.K. Chaturvedi, Head, Division of Crop Improvement welcomed the guests and audience. Dr. Chaturvedi highlighted the science and technology driven innovation in agriculture to make India self-sufficient in food production. Dr. Renu Jain called upon youngsters to come forward to accept the challenges and solve them scientifically. She also expressed need for popularization of scientific inventions among the common masses. Dr. Srivastava recalled the inventions by the common people of the country. Vote of thanks was given by Dr. Krishna Kumar, Head, Division of Crop Protection. The programme was jointly conducted by Dr. Mohd. Akram and Dr. R.K. Mishra.

Director Visited Regional Station, Phanda, Bhopal

Dr. N.P. Singh, Director visited the IIPR Regional Station, Phanda, Bhopal on March 29, 2016 to review the on-going research and developmental activities of the station. He appreciated the work done to

create basic facilities at the station. He also emphasized that collective efforts should be made to develop the landscape, roads, seed stores and levelling of fields, *etc*. At this occasion, Director inaugurated the newly constructed Sehore Gate (Sehore side at Bhopal-Indore Highway) of the farm for easy movement of farm workers and visitors.

IMC Meeting Held

The 38th Institute Management Committee meeting was held on January 6, 2016 under the chairmanship of Dr. N.P. Singh, Director. The meeting was attended by Ram Awatar Sharma, Principal Scientist, CAZRI, Jodhpur, Dr. C. Bhardwaj, Principal Scientist, IARI, New Delhi, Dr. S. Natarajan, Principal Scientist, IARI-RBGRC, Aduthurai (TN), Dr. A.N. Sharma, Principal Scientist, Directorate of Soybean Research, Indore, Mr. T.C. Sharma, F&AO, PDFSR, Modipuram (Meerut), Dr. Ram Sharan Katiyar, Billhaur, Kanpur, Mr. Shiv Pujan Chandel, Buwar, Mirjapur and Mr. Vijay Kumar, Dy. Director (PP), Govt. of U.P. All Heads of Divisions and Project Coordinators along with Finance & Accounts Officer and Administrative Officer also participated in the meeting. Besides deliberations on various agenda items, the Members appreciated the progress made by the Institute.

RAC Meeting Held

The 22nd Research Advisory Committee (RAC) meeting of the Institute was held on March, 18-19, 2016 under the chairmanship of Dr. J.H. Kulkarni, Former Vice-Chancellor, UAS, Dharwad, Karnataka. The meeting was attended by Dr. N.P. Singh, Director, IIPR, Dr. B. Venkateswarlu, Vice Chancellor, MKV, Parbhani (M.S.), Dr. U.P. Singh, Former Head, Genetics & Plant Breeding, Institute of Agricultural Sciences, BHU, Varanasi and Dr. V.V. Ramamurthy, Ex. Principal Scientist IARI, New Delhi. Project Coordinators of Chickpea, Pigeonpea, MULLaRP, Nodal Scientist (Arid Legumes) and all Heads of Division participated in the meeting.

Dr. N.P. Singh, Director, while welcoming the Chairman and other members briefed about the progress in research and development at IIPR during the period. He informed that eight high yielding varieties of different pulse crops were released/identified in the last one year. All India Network Programme on Arid Legume was shifted from ICAR-CAZRI to this Institute. New building and other infrastructure at IIPR Regional Station, Bhopal was inaugurated by the DG, ICAR on February 24, 2016. Several externally funded projects such as three CRP projects, one each on Agro-biodiversity, Molecular breeding and Hybrid pigeonpea, two international projects, one on international mungbean research consortium and another on tropical legumes sponsored by Bill and Melinda Gates Foundation, two projects funded by DBT, one project on Centre for Agricultural Bio-informatics were started at the Institute. A Summer School was also organized on 'Novel genomic tools and modern breeding approaches for enhancing productivity and nutritional quality of pulse crops' wherein participants from across the country participated.

Chairman, RAC and other members appreciated the on-going research programmes and also congratulated the scientists for achievements made during the last year. Thereafter, Heads of Divisions and the Project Coordinators presented brief reports of the work being carried in their respective Divisions/AICRPs. Elaborate discussions were held on different issues related to various research programmes and recommendations were made by RAC for improving the R&D activities of the Institute.

Promotion of Summer Pulses in Non-traditional Niches

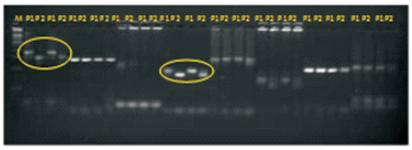
Brainstorming meeting on 'Promotion of pulses in non-traditional niches: Summer cultivation' was organized on February 9-10, 2016 at ICAR-IIPR. The meeting was attended by 119 participants from all stakeholders including scientists, farmers, extension personnel, policy makers from U.P., M.P., Rajasthan, Karnataka, West Bengal, Punjab, Delhi, J&K, Telangana and Directorates of different crops under DAC, Ministry of Agriculture and Farmers Welfare, GoI.

While inaugurating the meeting, Dr. B.B. Singh, ADG (O&P), ICAR applauded mungbean varietal development programme which led to bring additional area under non-traditional niches. The success of new cultivars like IPM 02-3 and IPM 02-14 of mungbean in non-traditional niches clearly demonstrates the greater scope of pulses in summer cultivation. Dr. A.K. Tiwari, Director, Directorate of Pulses Development, Bhopal opined that new innovations are further needed to promote summer pulses. Dr. D.P. Malik, Additional Commissioner (NFSM), DAC, GoI informed that summer pulses could be promoted in the states where assured irrigation facilities exist. Dr. N.P. Singh, Director, IIPR, pointed out the difficulty in conducting cluster demonstrations of summer pulses as production areas are very scattered. The demonstrations need to be planned in accordance to cropping pattern of the region. Dr. Masood Ali, Former Director, IIPR while highlighting the further scope of pulses in non-traditional niches suggested for more funding support to improve research infrastructure and capacity building required to develop new technologies. Dr. Sanjeev Gupta, PC, MULLaRP and Nodal Officer of the Brainstorming Session stressed on micro-irrigation, mechanization, creation of village level seed hubs and effective IPM strategy for promotion of summer pulses cultivation. Besides inaugural session, there were four technical sessions in which deliberations were held by subject matter specialists on topical themes.

Research Highlights

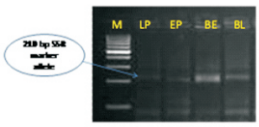
Parental Polymorphism and Gene Tagging for Heat Tolerance

To investigate association of SSR markers for heat stress tolerance in chickpea, parental polymorphism study was conducted in DCP 92-3 (sensitive) and ICC 92944 (tolerant) parents. Total 200 SSR markers were screened and 15 SSR markers were found to be polymorphic.



Parental polymorphism survey for heat tolerance in chichpea
P1:DCP 92-3, P2 : ICC 92944, M : 100 bp DNA Ladder
Polymorphic markers : TR31, TR43, TA135 and TA46

Bulk segregation analysis was used to tag genes for early flowering/podding in a F_2 mapping population (DCP 92-3 x ICC 92944) comprising of 248 individuals in chickpea. Based on segregating behaviour, bulks were prepared from 10 early and 10 late flowering/podding individuals from the above population. Fifteen polymorphic SSR markers were screened on early and late bulks along with late/sensitive (DCP 92-3) and early/tolerant (ICCV 92944) parents. One TR31 SSR marker amplified an allele of 210 bp in late parent and late bulk indicating association of this marker with heat tolerance in chickpea.



Linkage of TR31 SSR marker with heat stress tolerance gene in chickpea on the basis of bulk segregant analysis. LP : Late flowering parent
EP : Early flowering parent
BE : Bulk early
BL : Bulk late
M : 100 bp DNA ladder

Uday Chand Jha, Paresh Chandra Kole, Khela Ram Soren, Rintu Jha, and N.P. Singh*
**CIHAB division, Visva Bharati University, Bolpur Santiniketan*

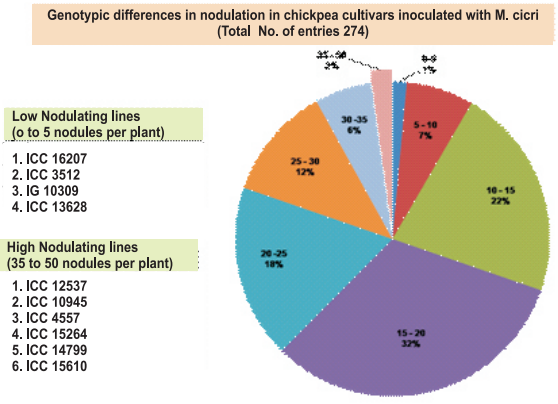
Native *Trichoderma* Spp against Root Knot Nematode

Beneficial fungus in the genus *Trichoderma* has been known since 1920s for their ability to act as bio-control agents against plant pathogens and nematode pests. Locally isolated five potential isolates IIPR T1, T2, T4, T25 and T26 of *T. Harzianum*, two isolates IIPR T21 and T22 of *T. Viride* and two isolates IIPR T23 and T24 of *T. virens* were tested against hatching of *Meloidogyne javanica* egg masses under laboratory conditions. All isolates of *T. Harzianum*, *T. Viride* and *T. Virens* reduced about 75% hatching as compared to water. One isolate of *T. Harzianum* was very effective wherein hatching of 83 juveniles was recorded as compared to 1163 juveniles hatched in control. This isolate can be exploited as biocontrol agent for management of root knot nematode *M. javanica*.

M. Devindrappa, R.K. Mishra and Bansa Singh

Variations in Nodulation in Chickpea Mini-core

Total 274 mini-core accessions of chickpea including 5 checks *viz.,* JG 16, Shubra, BG 256, RSG 888 and JAKI 9218 were evaluated under greenhouse condition in pots filled with pasteurized soil : sand mixture to study genotypic variation in nodulation and plant growth. Seeds were inoculated with *Mesorhizobium ciceri* strain IC 76 before sowing. Plant growth parameters and nodulation in roots assessed after 45 days of growth showed only 2% of total lines with high nodulation ranging from 35-50/plant due to inoculation with *M. ciceri*. Low number of nodules was observed in ICC 16207, ICC 3512, IG 10309 and ICC 13628, while highest nodule number/plant was recorded in ICC 12537, ICC 10945, ICC 4567, ICC 15264, ICC 14799 and ICC 15610.



The mini-core lines of chickpea were categorized based on nodulation capability into 6 categories (nodule rating 1-6, 1= no nodules, while 6= maximum nodules). Lines with nodule ratings of 1-2 produced low plant dry weight of 0.27 g/plant, while lines with high rating of 5-6 produced about 40% higher biomass within 45 days of growth. A direct correlation was noticed between nodule number and plant dry weight. It is concluded that even under P deficiency in soil, there was genotypic dependent variations in nodule formation due to inoculation with *M. ciceri* in chickpea.

Mohan Singh and Ambreesh Kumar Shukla

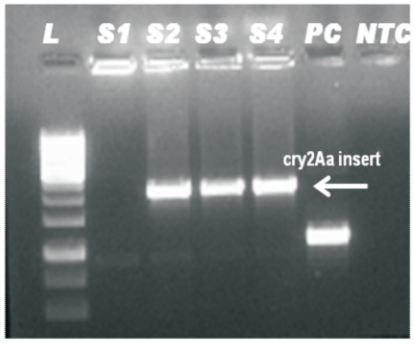
Our New Colleague

Dr. Krishna Kumar has joined the Institute on January 1, 2016 as Head, Division of Crop Protection.

Cloning of Insecticidal *Cry*2Aa Delta-Endotoxin Gene

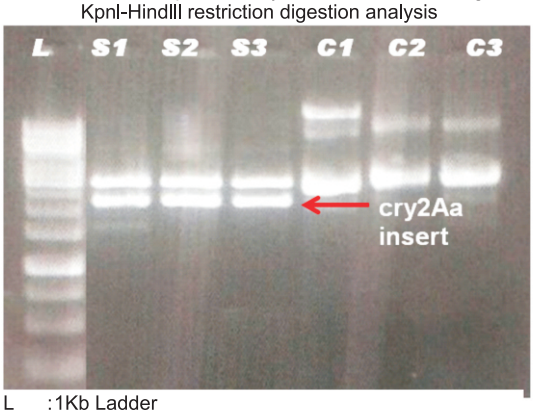
For enunciating tissue specific expression of *Bt* genes in chickpea, recombinant vectors bearing *cry* genes with tissue specific promoter has been constructed. The *cry*2Aa gene sequence was retrieved from NCBI with accession EU109565 and restriction analysis was performed for developing the cloning strategy. As a part of the strategy, pBin-*cry*2Aa construct and pTZ19R vector (destination vector) were digested with KpnI-HindIII, fast digest restriction enzymes (1FDU/µl) and *cry*2Aa gene along with *ocs* terminator was released. The digested products were separated on a 1% agarose gel using standard electrophoresis (5-10 v/cm^{-1}) and eluted using gel elution kit (Qiagen). The eluted DNA fragments were ligated, transformed and screened through blue-white selection. Screened transformants were further analyzed by performing colony PCR using M13 primers and subsequently confirmed through KpnI-HindIII double digestion.The recombinant vector developed can be used for developing other gene constructs in future.

Screening of pTZ19R-cry2Aa transformants through colony PCR using M13 primers



L :1Kb Ladder
S : pTZSR19-cry2Aa Transformants
PC : PCR Control
NTC :Non Template Control

Confirmation of pTZR19-cryAa recombinants using KpnI-HindIII restriction digestion analysis

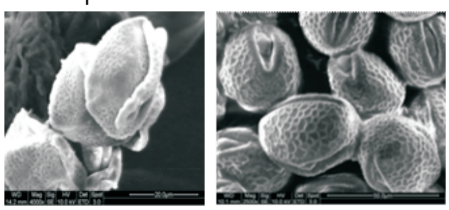


L :1Kb Ladder
S : pTZSR19-cry2Aa recombinants (KpnI-HindII digested)
C : Control (Undigested plasmid)

Aravind Kumar Konda, Aniruddha Kumar Aginihotri, Alok Das, K.R.Soren, and N.P. Singh

Scanning Electron Microscopy Confirms Male Sterility in Pigeonpea

Sterility-inducing cytoplasms were placed into the nuclear backgrounds of Pusa 992, ICP 88039 and DPP 3-2 in pigeonpea. Scanning Electron Microscopy analysis of the anthers collected from these CMS lines and their cognate fertile lines showed a clear-cut distinction between the pollen morphology of male fertile and sterile lines. CMS lines were characterized by the presence of shrivelled pollen grains. These pollen grains mostly appeared as amorphous mass, which corroborated with earlier experiments based on standard pollen-staining techniques.



CMS line (Pusa 992 A) Fertile line (Pusa 992 B)

SEM analysis of pollen grains

A. Bohra, I.P. Singh, S. Pareek, G. Pandey, R. Jha, S.K. Chaturvedi and N.P. Singh

Genetic Variability for Herbicide Tolerance in Fieldpee

Field screening of 828 fieldpea genotypes against popular post-emergence herbicide Metribuzin @ 500g/ha revealed ample genetic variation for tolerance. Based on visual observation and toxicity genotypes *viz.*, P 729, P 637, P 1297-35-1, P 2016 and P 706 were identified as highly tolerant against Metribuzin. The genotypes were categorized as highly tolerant (5), tolerant (21), moderately tolerant (133), susceptible (369) and highly susceptible (300). The susceptible lines showed different magnitude of leaf burning within 7 days of herbicide application. Highly tolerant genotypes can be used as donors in breeding programme and in mapping of genes/QTLs controlling herbicide Metribuzin tolerance in pea.

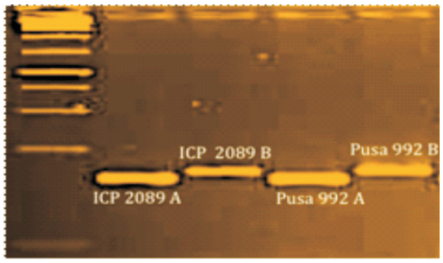
Before herbicide spray

After herbicide spray

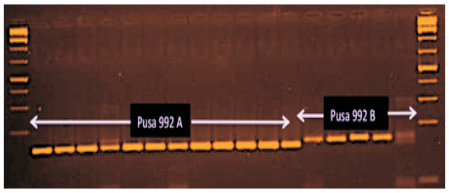
A.K. Parihar, G.P. Dixit, Narendra Kumar, V.D. Mishra and S.K. Chaturvedi

Mitochondrial DNA Marker Assay

Of the several models that adequately describe the mechanism of male sterility in crop plants, energy deficiency model is the most widely accepted and it accounts CMS to impairments in the mitochondrial genes of electron transport chain (ETC). Recently, a 10-bp deletion in a mitochondrial gene has been reported to cause A_4-CMS in pigeonpea. Twenty four mitochondrion derived microsatellites and '*nad7a_del*' marker were assayed on the available CMS and corresponding maintainer (B) lines. Interestingly, polymorphic fragments were obtained between Pusa 992 A and Pusa 992 B using marker *nad7a_del*. Genomic DNA was extracted from 25 additional plants of Pusa 992 A, and recovery of the same 150 bp amplicon in all these replicates corroborated the effective placement of ICP 2089 A cytoplasm (pollen sterile seed parent) into Pusa 992 nuclear background.



Difference between A- and B-lines carrying A_4 cytoplasm



Analysis of additional plants of Pusa 992 A and Pusa 992 B

Marker assay on CMS (A)- and fertile maintainer (B)-lines

A. Bohra, I.P. Singh, G. Pandey, R. Jha, S.K. Chaturvedi and N.P. Singh

Post-emergence Herbicides for Chickpea

Performance of some novel post-emergence (POE) herbicides was evaluated at ICAR-DWR, Jabalpur to assess their efficacy and phytotoxicity in chickpea. Although the phytotoxicity of oxyfluorfen (150 g/ha), topramezone (40 and 60 g/ha) and clodinafop propargyl + Na- acifluorfen (300 and 500 g/ha) were evident immediately after application even at lower doses, yet crop recovered fully after 25 days of application of herbicides. Contrarily, phytotoxicity of imazethapyr + imazamox (60 g/ha) continued even up to flowering stage with partial recovery by the crop.

Major weed flora observed in chickpea included broad leaf weeds *viz. Sonchus arvensis* (L.), *Chenopodium album* L., *Euphorbia geniculata* (L.), and *Vicia hirsuta* (L.) Gray. Significantly lower weed count (and its biomass) by 66 % and 54 % were recorded in topramezone 60 g/ha and clodinafop propargyl + Na-acifluorfen 500 g/ha, respectively, over the unweeded control. Weed control efficiency (WCE) was higher in topramezone 60 g/ha (71.6%) and oxyfluorfen 150 g/ha (71.6%) in comparison to two hand weedings (56 %). The study suggested that topramezone, oxyfluorfen, clodinafop propargyl + Na- acifluorfen as POE may be efficient in controlling the weed flora in chickpea under black soils.

Performance of chickpea under topramezone 60 g/ha vis-à-vis unweeded control

Chaitanya Prasad Nath, R.P. Dubey, A.R. Sharma**, S.S. Singh, Narendra Kumar, C.S. Praharaj and Kali Krishna Hazra*
**Principal Scientist, **Director, ICAR- Directorate of Weed Research, Jabalpur (M.P.)*

Potential of Fieldpea Cultivation in Karnataka

Fieldpea (*Pisum sativus* L.) cultivation has now become a reality in southern parts of Maharashtra. More recently, farmers of southern Karnataka in general and of Belgaum and Dharwad districts in particular, have started cultivating fieldpea. Farmers in the area are using local varieties which are highly susceptible to powdery mildew disease, hence are poor yielding. Varieties released from IIPR, Kanpur for different agro-climatic zones of country were evaluated for yield and other traits at Regional Station-*cum*-Off-season Nursery, Dharwad. Green seeded variety IPFD 10-12 was earliest to mature (72 days), followed by Aman (74 days) and Prakash (76 days). Tall variety having tendrils (Aman) produced higher yield (1580 kg/ha), followed by Adarsh (1050 kg/ha) indicating potential of promotion of fieldpea in Karnataka. There is need for multilocation evaluation of early maturing and high yielding varieties to assess their suitability for Karnataka. Such varieties can also be evaluated in parts of Tamilnadu (Coimbatore and adjoining areas). Through large scale demonstrations on improved varieties and matching production technologies, fieldpea cultivation can be promoted in southern India. It will ensure more availability of pulses for consumption as green immature grains and other diversified uses (*dal* and flour).

Aman

Revanappa S.B., A.K.Parihar, G.P. Dixit, M.S. Venkatesh and S.K.Chaturvedi

New Donors for Wilt Resistance in Pigeonpea

Fusarium wilt caused by *Fusarium udum* Butler, is a major biotic constraint in pigeonpea production. Total 13 promising lines of pigeonpea were evaluated in sick field under natural epiphytotic conditions consistently for four years (2012–16) in crop season to identify and ascertain their resistance against wilt.

Wilt sick plot

Wilt resistant genotypes

Six lines *viz.*, DPPA 85-1, DPPA 85-3, DPPA 85-7, DPPA 85-8, DPPA 85-12 and DPPA 85-13 showed high degree of resistance (<10% mean disease incidence), while susceptible check (cv: Bahar) exhibited 100% mortality. These wilt resistant lines can be useful genetic resource for prospective resistance breeding in pigeonpea.

R.K.Mishra, Naimuddin, P.R.Saabale, Satheesh Naik S.J, Abhishek Bohra, Prakash Patil, Farindra Singh and I.P. Singh

Sustained Release of Granular Formulation of Imazethapyr

A sustained release granular formulation was prepared by binding the imazethapyr molecules with sodium alginate and making beads of approximately 40-60 mesh size by dropping the mixture of alginate and imazethapyr drop by drop in calcium chloride solution. These chemical manipulations in the formulations were made to enhance its efficacy by increasing its effective time, reduced toxicity to crop plants and to make it viable under receding soil moisture because moisture is also recognized as a limiting factor for its chemical action. This granular formulation when applied in chickpea field at the time of sowing was found to cause no damage to the plants up to concentration of 200 g/ha and minimal damage at 250 g/ha was recovered after some time. Bio-efficacy evaluation was done by recording the density and biomass of the major weed flora on 50×50 cm quadrate in the plot. Phytotoxicity observations on leaf injury on tips/surface, necrosis, wilting, vein clearing, epinasty and hyponasty on plants were recorded at 40 and 50 DAS. In addition to decreased damage to the crop, the granules also prove beneficial in reducing pesticide spike concentrations in the environment, prolonging residual activity and reducing the number of applications. The granular formulation was found highly effective in reducing total weed population and their biomass by more than 80% as compared to control at single application concentration of 200 g/h.

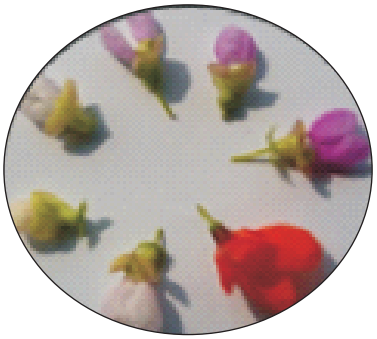
Plot treated with granular formulation

Untreated plot (Control)

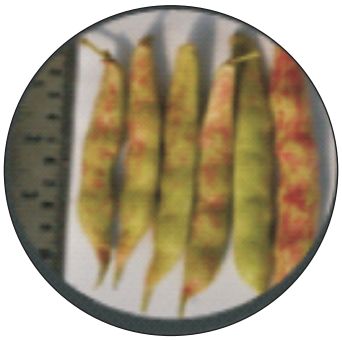
Lalit Kumar, Jagdish Singh and G.K. Srivastava

Phenotypic Diversity in Rajamsh

Total 270 accessions of rajmash (*Phaseolus vulgaris* L) were evaluated for phenotypic traits including plant growth habit, vegetable types, stem anthocyanin colouration, flower colour, pod colour, *etc*. Sixty two accessions were identified as determinate types and rest were indeterminate types. Three accessions *viz.*, IC 341337, IC 391488 and IC 391410 were vegetable type. Most of accessions showed green pigmentation except IC 341389, IC 341406, IC 382691, IC 360839, IC 430341 and IC 360850 which showed purple stem pigmentation. There was wide variation for flower colour and based on flower colour the accessions were grouped in five different classes *viz.*, yellow (IC 340834, IC 340835, IC 340831, IC 340863), white (IC 356025, IC 356028, IC356051), purple (IC 356072, IC 360831, IC 341345), deep red (IC 340902, IC 341406) and violet (IC 362265, IC 360839). Thirty four accessions had mottled purple colour pods and 6 accessions *viz.*, IC 356067, IC 337291, IC 34189, IC 341435, IC 430341 and IC 419890 had purple pods.



Variation for flower colour in rajmash



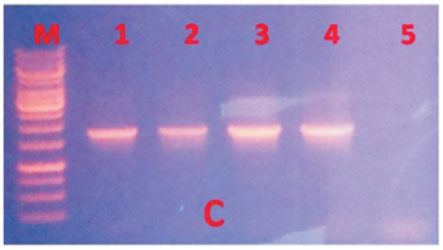
Purple mottled colour pods with bold seeds

Basavaraja, T. and S. K. Chaturvedi

Phytoplasma Causing Phyllody of Chickpea

Phytoplasmas are known to cause phyllody disease in a large number of economically important plant species worldwide. The typical symptoms include conversion of floral parts into leafy structures. In chickpea, phyllody affected plants also show proliferation of shoots, reduction of internodes, leaf curling/cupping and swollen veins. The causal phytoplasma was identified using phytoplasma specific universal primer pairs (P1- AAA GAG TTT GAT CCT GGC TCA GGA TT /P7- CGTCCTTCATCGGCTCTT) in PCR. The PCR products analyzed in gel revealed DNA fragments of expected size (~1800bp) indicating the association of phytoplasma in affected plants. Amplicons were cloned and sequenced. These sequences were subjected to the software available online at http://plantpathology.ba.ars.usda.gov/cgi-bin/resource/iphyclassifier.cgi to generate virtual RFLP pattern. Phytoplasmas involved in causing phyllody disease in chickpea at different places are in fact similar to the members of 16SrII.

Symptoms of chickpea phyllody



Amplification of phytoplasma 16S rDNA using universal primers pair (P1/P7) from infected chickpea plants
Lane 1-4: ~1800bp, Lane 5: healthy chickpea samples
Lane M=1Kb DNA marker

Mohd. Akram, Naimuddin, [1]D.K.Patil, [2]G.P.Deshmukh, [1]R.A.Chavan, [1]P.L.Sontakke and Deepak Kumar Sachan
[1]Agricultural Research Station, Badnapur, [2]MPKV Pulse Research Station, Rahuri

Identification of Desirable Trait in Pigeonpea

Selection of branching pattern on main stem in pigeonpea is an important trait and focus has been made on plant type having branching from base. Genotype IPAC 74-3 has been identified with basal branching with an average of 13.5 numbers of basal branches, 121.52 cm of height, 64.32 cm of fruiting length and 4.45 seeds per pods. This genotype has shown the trait consistency over the years. The results have revealed that the genotype has potential to inherit the trait and stood as valid option for remodelling the growth habits of pigeonpea.


Base branching erect standing genotype IPAC 74-3


Top erect lodging variety NA 1

Satheesh Naik S.J., Farindra Singh, R.K. Mishra, Abhishek Bohra, I.P. Singh and S.K. Chaturvedi

प्रौद्योगिकी हस्तान्तरण

प्रक्षेत्र दिवस मनाया गया

डीएसी–इकार्डा–आई.सी.ए.आर. सहयोगी परियोजना के अंतर्गत, उत्तरप्रदेश के हमीरपुर जिले के सुमेरपुर एवं मौदहा ब्लॉक में चार उन्नत प्रजातियों–आई.पी.एल. 81, आई.पी.एल. 406, आई.पी.एल. 315 और डी.पी.एल. 62 के साथ मसूर पर पैकेज प्रौद्योगिकियों पर आधारित सहभागी प्रदर्शन किए गए। दिनाँक 16 मार्च, 2016 को हमीरपुर जिले के पाटनपुर गाँव में मसूर के बीज उत्पादन सम्बन्धी सहभागी कार्यक्रम में किसानों के दृष्टिकोण को समझने के लिए प्रक्षेत्र दिवस का आयोजन किया गया। लगभग 200 किसानों ने इसमें भाग लिया। इस कार्यक्रम का उद्देश्य था किसानों के अपने खेतों पर नवीनतम प्रौद्योगिकियों की सफलता को प्रदर्शित करना। ताकि वे उसको अपना सकें और ''पहले देखें फिर विश्वास करें'' के आधार पर किसानों को विश्वास हो सके।

मेरा गाँव मेरा गौरव कार्यक्रम

'मेरा गाँव मेरा गौरव' कार्यक्रम के सफल क्रियान्वयन हेतु संस्थान में 16 बहुविषयक दल बनाए गए हैं। विभिन्न जनपदों (फतेहपुर, कानपुर देहात, कानपुर नगर और जालौन) के 36 गाँवों का सर्वेक्षण किया गया। किसानों से मूलभूत जानकारी प्राप्त की गई एवं सुधार हेतु कारगर प्रौद्योगिकी की योजना को अंतिम रूप दिया गया है।

इस कार्यक्रम के अंतर्गत दिनाँक 2 जनवरी, 2016 को कानपुर देहात (उ.प्र.) के अंगदपुर में एक वैज्ञानिक–कृषक परिचर्चा का आयोजन किया गया। परिचर्चा के दौरान डा. एस.के. चतुर्वेदी ने बताया कि परस्पर सहयोग से किस प्रकार बीजों का उत्पादन किया जाए। साथ ही उन्होंने उच्च उपज वाली प्रजातियों, रोग एवं कीट प्रबन्धन एवं किसानों की तरक्की में संस्थान के सहयोग/भूमिका पर महत्वपूर्ण जानकारी दी। डा. उम्मेद सिंह ने दलहनी एवं अन्य फसलों की खेती के सम्बन्ध में नवीनतम जानकारी उपलब्ध कराते हुए बीजोपचार, खरपतवार नियन्त्रण, जल प्रबन्धन तकनीक, उर्वरक प्रयोग आदि जैसे महत्वपूर्ण विषयों पर किसानों को महत्वपूर्ण जानकारी दी। श्री एस.के. मीणा ने किसानों को दलहनी खेती की वर्तमान समस्याओं से निपटने के कारगर उपाय बताते हुए सरकार की कृषक कल्याणकारी योजनाओं से परिचित कराया।

उक्त कार्यक्रम में 200 से अधिक किसानों ने भाग लिया। कृषकों ने वैज्ञानिकों

को रोगग्रस्त पौधे, खरपतवार एवं मृदा के नमूने दिखाये और अपनी खेती सम्बन्धी समस्याओं को विस्तार से बताया। वैज्ञानिकों ने सभी समस्याओं का समाधान और निराकरण बताया। संस्थान के वैज्ञानिकों ने किसानों के खेतों का भ्रमण किया। इस अवसर पर 18 किसानों को मृदा स्वास्थ्य कार्ड का भी वितरण किया गया।

मॉडल प्रशिक्षण कार्यक्रम का आयोजन

कृषि एवं सहकारिता विभाग, कृषि एवं किसान कल्याण मंत्रालय, भारत सरकार द्वारा प्रायोजित 'दलहन उत्पादन को बढ़ाने के लिए जैविक नियन्त्रण कारकों का

उत्पादन एवं प्रचालनः पर्यावरण अनुकूल दृष्टिकोण' विषय पर संस्थान में 22–29 फरवरी, 2016 को आठ दिवसीय माडल प्रशिक्षण कार्यक्रम का आयोजन किया गया। इस अवसर पर प्रो. ए.एन. मुखोपाध्याय, पूर्व कुलपति, असम कृषि विश्वविद्यालय, जोरहट ने अपने उद्घाटन भाषण में रोग एवं कीटों से होने वाले नुकसान को कम करते हुए दलहनी फसलों के उत्पादन को बढ़ाने में जैविक नियत्रंकों की भूमिका पर महत्वपूर्ण जानकारी दी। उन्होंने बताया कि जैविक नियन्त्रण कारक, रासायनिक कीटनाशकों का सर्वोत्तम विकल्प हैं और यह पर्यावरण एवं जैव मण्डल के लिए सुरक्षित भी हैं। संस्थान के निदेशक डा. नरेन्द्र प्रताप सिंह ने बताया कि दलहन उत्पादन में आत्मनिर्भरता प्राप्त करने के लिए *बायोइन्टेसिव* एकीकृत कीट प्रबन्धन अति आवश्यक है। डा. एस.के. जलाली, विभागाध्यक्ष, आणविक कीट विज्ञान, एन.बी.ए.आई.आर. बंगलूरू, ने बताया कि यह आवश्यक है कि किसानों को जैन नियंत्रण कारकों की पर्याप्त जानकारी हो और उनका इस प्रौद्योगिकी में पूर्ण विश्वास हो।

इस कार्यक्रम में देश के विभिन्न 10 राज्यों के राज्य कृषि एंव उद्यान विभागों के प्रतिनिधियों ने भाग लिया। प्रशिक्षण के दौरान भिन्न–भिन्न विषयों पर अतिथि विशेषज्ञों ने 10 व्याखान प्रस्तुत किए एवं संस्थान के वैज्ञानिकों द्वारा 25 व्याख्यान दिए गए। डा. डी.के. श्रीवास्तव , संयुक्त निदेशक विज्ञान एवं प्रौद्योगिकी परिषद, लखनऊ एवं डा. रेनू जैन, निदेशक, यूनिवर्सिटी इन्स्टीट्यूट ऑफ इंजीनियरिंग एण्ड टैक्नोलाजी, सी.एस.जे.एम. विश्वविद्यालय, कानपुर इस प्रशिक्षण के समापन समारोह के मुख्य अतिथि थे।

प्रशिक्षण कार्यक्रमों का आयोजन

प्रशिक्षण का नाम	तिथि	कहाँ से	कृषकों की संख्या
आत्मा परियोजना, सहायक निदेशक	जनवरी 4–6, 2016	भोपाल (म.प्र.)	34
दलहन उत्पादन पर प्रशिक्षण	जनवरी 27, 2016	जालौन (उ.प्र.)	44
चना पादप संरक्षण प्रौद्योगिकी – प्रक्षेत्र प्रशिक्षण	फरवरी 4, 2016	जालौन (उ.प्र.)	47
अरहर एवं उसकी पौध सुरक्षा प्रबन्धन प्रौद्योगिकी पर प्रशिक्षण कार्यक्रम	फरवरी 9, 2016	जालौन (उ.प्र.)	30
प्रज्ञा ग्रामोत्थान सेवा समिति : दलहन की उत्पादन प्रौद्योगिकी	फरवरी 24–25, 2016	फतेहपुर (उ.प्र.)	44
दलहन उत्पादन प्रौद्योगिकी : आत्मा परियोजना	मार्च 28, 29, 2016	जालौन (उ.प्र.)	44

विभिन्न जनपदों की महिला कृषकों का संस्थान प्रक्षेत्र भ्रमण एवं प्रशिक्षण

मेला एवं प्रदर्शनी में संस्थान की सहभागिता

मेला / प्रदर्शनी	अवधि	स्थान
किसान मेला	जनवरी 30, 2016	आई.आई.वी.आर., वाराणसी
किसान मेला	फरवरी 26–28, 2016	च.शे.अ. कृषि विश्वविद्यालय, कानपुर
किसान मेला एवं कृषक–वैज्ञानिक परिचर्चा	मार्च 13, 2016	आई.आई.पी.आर., कानपुर
कृषि उन्नति मेला	मार्च 19–21, 2016	आई.ए.आर.आई., नई दिल्ली
बुन्देलखण्ड में कृषि मेला	मार्च 29–30, 2016	के.वी.के., ललितपुर

Personnel

Promotions

Name	Promoted to	W.e.f.
Mr. Rajeev Nigam	Asstt. Administrative Officer	3.3.2016
Dr. M.P. Singh	Chief Technical Officer	1.7.2015
Dr. Ved Ram	Chief Technical Officer	1.7.2015
Mr. S.P.S. Chauhan	Chief Technical Officer	15.4.2014
Mr. Ved Prakash	Asstt. Chief Technical Officer	27.8.2015

Retirement

Mr. Vijendra Singh, Asstt. Chief Technical Officer retired form his service on superannuation on February 29, 2016.

Honours and Awards

- Dr. Ummed Singh, Senior Scientist was honoured with Scientific and Educational Research Society (SERS) Fellow-2015 for his outstanding

contribution in the field of Agronomy and was awarded Best oral presentation in the International Conference on 'Innovative Approaches in Applied Sciences and Technologies' held on February 1-5, 2016 at Kasetsart University, Bangkok, Thailand.

- ICAR-IIPR, Kanpur team bagged First Prize in Best Poster Award Category for poster entitled "Intellectual property rights in context of food security in India"

authored by Sunil Tripathi, Bansa Singh and R.K.Mishra in National Symposium on 'Transforming Indian agriculture towards food and nutritional security (IAFNS-2016)" held on February 20-21, 2016 at ICAR-IGFRI, Jhansi.

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Director's Desk

Dear Readers,

Chickpea is one of the major pulses consumed in India either as *dal* or various processed forms. It plays major role in supplementing protein in Indian diets. Being rainfed crop grown on conserved moisture under marginal soil during *rabi* (post-rainy season), chickpea often experience multiple abiotic stresses *viz*., drought and heat causing yield losses upto 40% depending upon the severity of the stress. Most of the rainfed crops in the country are at great risk now-a-days due to more frequent occurrence of sub-optimal rainfall throughout the crop growing season. Therefore, new strategies need to be evolved to improve productivity of chickpea under rainfed situation. Yield evaluation of chickpea under diverse rainfed situations has revealed that rainfed agro-ecologies are not the same across the country. The rainfed climate in the Malwa regions of central India and parts of NWPZ covering Ganganagar, Hanumangarh, Kota, Bara, Ajmer and Churu of Rajasthan usually register very high chickpea yield, while on the other hand rainfed situation of Bundelkhand region of central India, Telangana and northern Karnataka happen to be harsher and often lead to forced maturity and poor yield.

Various factors responsible for high yield in the rainfed situations where consistently high productivity of chickpea has been recorded for past several decades need to be critically analyzed. These include locally available varieties that play major role in impacting yield, soil types having more moisture retention capacity, soil compactness, availability of mist/dew water in the atmosphere, photoperiod, cropping systems being followed, year to year variation in rainfall, maximum/minimum temperature during crop period. We need to have a model rainfed climate for analyzing multiple factors, so that more potential areas of similar nature can be explored. Except varietal influence, other factors can be monitored in a single crop season across diverse situations through satellite based remote sensing which will provide live data on soil moisture, water depth, crop health, disease and pest incidence, soil surface temperature, cloud coverage and other climatic data. These data will be useful for comparison of chickpea yield in single year considering all factors that influence yield variation across different rainfed situations. One factor that negatively affected chickpea yield in northern India could be cultivation of long duration varieties that were bred keeping in view long winter which has now changed to shorter spell with more severe terminal drought and heat at reproductive stage. Our breeding

programme should now re-orient more towards development of short duration chickpea compatible with existing cropping system for relatively warmer North India. Advent of many short duration chickpea varieties has revolutionized expansion of chickpea in Andhra Pradesh, Telangana, Maharashtra and Karnataka.

Extensive studies on chickpea adaptation in diverse climatic conditions indicate that varieties evolved from North India are more of locally adapted in nature that means they showed maximum yield potential only in their location of origin, while varieties originated from South and central zone registered high yield in many diverse agro-climatic zones apart from their location of origin and have virtually no geographical barrier towards wider adaptation. Two varieties *viz*., ICCV 10 and Annegiri originated from CZ/SZ recorded higher yield not only in their location of origin but also in North India, Mynamar and under various Australian environments. Deciphering the underlying physiological mechanisms of this unusual behaviour of these two varieties in terms of their wider adaptability, it was observed that these varieties are largely photo-thermo-insensitive and have no other exceptional or unique physiological attribute contributing to high yield in different locations.

Most of the chickpea varieties originated from central and South zones are photo-thermo-insensitive. Contrary to this, North Indian varieties mostly fall under photo-sensitive category. Selection of breeding lines and advancement of breeding population has taken place under cool climate of northern India similar to that of Turkey - the origin of chickpea. Therefore, varieties developed in North India retain, carry and express the characters as inherited from ancestral eco-habitat. Photo-sensitivity is one such primitive character retained by North Indian varieties. Selection under warm peninsular India causes a significant deviation from the original cool climate and as a result selection pressure forced to lose this primitive character "photo-sensitivity" and net outcome was variety developed with less photo-sensitivity. The above facts may sensitize breeders to explore possibilities to develop photo-thermo-insensitive varieties and this could be the vital physiological tool towards stabilizing yield and at the same time remain insulated from environmental fluctuations as well.

Not only chickpea, most of the pulses or legumes are very sensitive to environmental fluctuations such as extreme temperatures, amount and intensity of light, day length, *etc*. In the process of domestication, we have restructured plant types, modified source-sink relation, shorten the crop duration and insensitized the response to light and temperature.

One should consider the merits and demerits of the domestication and selection through breeding approaches for high yield. Almost we are motivated or moving towards single direction that is increasing yield for safeguarding the food security of the nation, as a result pulses are losing many vital characters which otherwise have immense evolutionary importance. Deriving benefits from some sort of fixed approaches will always call for compensating heavily, may be in long term that we are not realizing at this stage. Domestication had been always a threat to biodiversity. Natural variation in the existing germplasm is the strong base for developing new varieties. One should keep in mind that we need to preserve our genetic wealth for making our future safe as nobody can assume the necessity of particular genes of interest with reference to time.

Developing pulse varieties with higher productivity is call of the day, as long term demand of pulses can only be met by increasing productivity *per se* and enhancing stability to sustain genetic gains.

(N.P. Singh)