PULSES Newsletter

Indian Institute of Pulses Research, Kanpur

VOLUME 23, No. 2 APRIL - JUNE 2012

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EDITORIAL COMMITTEE

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Dr. P.S. Basu	Member
Dr. M.S. Venkatesh	Member
Dr. Jitendra Kumar	Member
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Mr. D. Upadhyaya	Member Secretary

Empowered Committee Reviewed Transgenic Project

To review the progress of the NFBSFARA funded project on "Development of pod borer resistant transgenic pigeonpea and chickpea" the Empowered Committee (EC) of National Fund for Basic, Strategic & Frontier Application Research in Agriculture (NFBSFARA), ICAR, visited the Institute on June 27, 2012. Dr. Mangala Rai, Chairman, EC and former Director General (ICAR), Dr. Swapan K. Datta, Deputy Director General (CS), ICAR, Prof. S.K. Sen, IIT-Kharagpur, Dr. P. Ananda Kumar, Project Director, NRCPB, New Delhi, Dr. A. Bandyopadhyay, National Coordinator, NFBSFARA, New Delhi and project partners from IIPR participated in the review meeting.

Dr. Mangala Rai, Chairman, EC, appreciated the efforts being made by different core groups and suggested for more sincere efforts for development of transgenic events and emphasized upon effective interactions between and within groups for streamlining a unified genotype independent transformation protocol for both the pulses. Efforts towards identification of potential insecticidal genes of proven efficacy should be at top priority. He reiterated that any back cross breeding programme in pulse transgenics should be taken up only after detailed characterization of the events at IIPR, Kanpur using both molecular techniques and insect bioassay. Dr. Swapan Datta, exhorted the need for gene pyramiding strategies, containment facility for year round activities in chickpea and pigeonpea and formation of biosafety group for transgenic biosafety evaluation, as component of transgenic development programme. He also added that all the transgenic chickpea and pigeonpea lines developed by the collaborating

institutions should be made available to IIPR, Kanpur for further evaluation and confirmation of their reaction against gram pod borer.

Dr. N. Nadarajan, Director IIPR, (PI, Core Group 1) presented the detailed progress of the project and narrated the advances made by IIPR towards development of transgenic chickpea and pigeonpea using synthetic *cry* gene. Total 78 and 159 putative primary transgenic plants of chickpea and pigeonpea, respectively have been established successfully in Transgenic Containment Facility at IIPR. Dr. Nadarajan also informed about transfer of transgenic chickpea seeds from Assam Agricultural University, Jorhat to IIPR, for confirmation and evaluation. Similar initiatives are underway with UAS, Dharwad for transfer of transgenic pigeonpea seeds. Dr. S.K. Sen of IIT-Kharagpur (PI, Core Group 2) presented strategies for over-expression of *cry* gene(s), removal of antibiotic selection marker and gene pyramiding strategies using viral elements. Dr. P. Ananda Kumar, Director, NRCPB (PI, Core Group 3) presented the current status of transgenic development in pulses. He stressed the need of pod-specific promoter to ward off gram pod borer attack. Dr. A. Bandyopadhyay, National Coordinator, commented that molecular characterization of the transgenic events should be done in collaboration with NRCPB, New Delhi. The Committee appreciated the work progress and laboratory facilities developed at IIPR, Kanpur.

Annual Group Meet on Pigeonpea

The Annual Group Meet on AICRP on Pigeonpea was held at UAS, Bangalore on May 13-15, 2012. In the inaugural session Dr. K. Narayana Gowda, Vice-Canceller, UAS, Bangalore, Dr. S.K. Datta, DDG (CS), ICAR, Dr. H. Shivanna, Director of Research, UAS, Bangalore, Dr. N. Nadarajan, Director, IIPR and other dignitaries were present. Dr. K. Narayana Gowda in his address said that pigeonpea is becoming important crop in Karnataka as it is gaining popularity over other crops, such as ragi, groundnut, *etc*. He pointed out that many farmers are switching over to perennial crops and there is possibility of having intercropping of pigeonpea in this type of system.

Dr. Swapan K. Datta stressed upon the need to find out good plant types, efficient pest management practices and post-harvest management techniques and advised to identify germplasm lines for various characters.

Dr. N. Nadarajan, Director, IIPR presented the scenario of pigeonpea in the country along with Project Coordinator's report. He stressed on using the genomic resources developed through whole genome sequencing of pigeonpea, wide hybridization for widening the genetic base, identification of new genetic resistance sources of SMD and storage grain pests, development of transgenic for *Helicoverpa* resistance and development of typical plant types for different agro climatic conditions. He also emphasised on refinement of micro irrigation technology, identification of post-emergence herbicides, development of efficient intercropping system, IPM modules, forecasting system of pests and mechanization of pulses production.

Later in the technical sessions, programmes of various disciplines were discussed and finalized. Three new varieties were identified in the group meet.

Annual Group Meet on Mungbean and Urdbean

The 17th Annual Group Meet on Mungbean and Urdbean (MULLaRP) was held on May 4-6, 2012 at Orissa University of Agriculture and Technology, Bhubaneshwar. The inaugural session was chaired by Prof. Debi Prasad Ray, Vice-Chancellor, OUAT, Bhubaneshwar, while Dr. B.B. Singh, ADG (O&P), ICAR, was the chief guest and Dr. N. Nadarajan, Director, IIPR was the guest of honour. The Group Meet was attended by Dr. Sanjeev Gupta, PC, MULLaRP, Prof. J.M.L. Gulati, Dean of Research, OUAT, Dr. J. S. Sandhu, ADG (Seeds), ICAR and about 100 *Vigna* researchers from different AICRP centres and other organizations of the country. Dr. D.P. Ray in his address appreciated the efforts of *Vigna* researchers and emphasized upon the need to develop improved cultivars in these important crops.

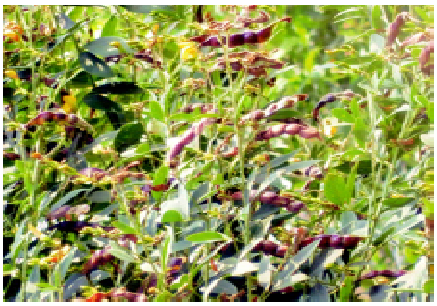
Dr. N. Nadarajan presented an overview of the pulse production scenario in the country and deliberated upon major researchable issues like, widening genetic base through distant hybridization and utilization of wild species, development of genomic tools, new markers and studying cross transferability of markers, development of linkage map in mungbean and urdbean, suitable plant types for maximum efficiency, varieties for specific niches such as rice fallows,

photo-thermo-insensitive cultivars. Dr. B.B. Singh appreciated the research efforts of *Vigna* workers towards increasing productivity and quality and called for using the unique germplasm and wild species for broadening the genetic base of these crops.

Dr. Sanjeev Gupta, PC, MULLaRP presented the salient research findings of the last year *kharif* season. He made special mention about research efforts in *Vigna* improvement through distant hybridization and genomic tools and development and registration of unique germplasm, especially extra early genotypes, for their possible use in hybridization programme. He informed that 17 MULLaRP crop varieties were registered with PPV&FR authority. On this occasion the website of AICRP on MULLaRP crops was also launched by the chief guest. Later in the technical sessions, programmes of various disciplines were discussed and finalized.

New Varieties Identified

IPH 09-5 (Hybrid): This cytoplasmic genetic male sterility (CGMS) based early duration pigeonpea hybrid developed at IIPR, Kanpur from a cross between PA 163 A (CGMS line or 'A' line or female parent) and 261322 R (restorer line or 'R' line or male parent) has been identified for eastern Uttar Pradesh, Bihar, Jharkhand, Orrisa, West Bengal and Assam. This hybrid possesses >33% yield superiority over



the best existing variety UPAS 120 and matures 8-10 days earlier than it. Its average yield is 1864 kg/ha. It is resistant to *Fusarium* wilt and sterility mosaic diseases. Its seed colour (Brownish red), shape (round) and size (9.3 g/100 seed) is more attractive.

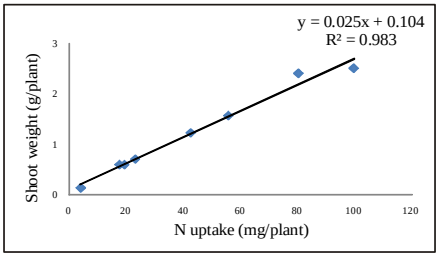
IPA 203: This long duration pigeonpea variety has been developed at IIPR, Kanpur, from a cross Bahar x AC 314-314. It showed yield superiority by 11.2% over the best check MA 6, 15.5% over Narendra Arhar 1, 24.9% over Bahar and 28.5% over MAL 13. Its average yield is 1949 kg/ha and matures in 246 days. Its seed colour is brown and attractive, seed size is extra large (12.4 g/100 seed) and seed protein content is 23.02%. It is resistant to sterility mosaic disease, tolerant to *Phytophthora* stem blight and resistant to most of the variants of *Fusarium* wilt. It has been identified for eastern Uttar Pradesh, Bihar, Jharkhand, Orrisa, West Bengal and Assam.

Phule T 0012: This pigeonpea variety has been developed from the cross ICP 332 x BSMR 736. It is early maturing (150 days) and 100 seed weight is 10.7g. Its average yield is 1547 kg/ha with yield superiority of 22.6% over the best check UPAS 120. It is moderately resistant to wilt, SMD and tolerant to pod borer and pod fly. It has been identified for Madhya Pradesh, Bundelkhand region of Uttar Pradesh, Rajasthan, Gujarat and Maharashtra.

Research Highlights

Host-Genotypic Influences on Rhizobial Symbiotic Performance and Chickpea Growth

To identify chickpea genotypes with superior biological nitrogen fixation (BNF) potential, nine different chickpea genotypes were tested against *Mesorhizobium ciceri* (F 75) under the phytotron conditions. The genotype × strain interaction was evident on the symbiotic performance. The N-fixing potential based on nitrogenase activity varied from 8 nmol C_2H_4 mg^{-1} dry weight nodule h^{-1} (cv. ICC 4948) to 161 nmol C_2H_4 mg^{-1} dry weight nodule h^{-1} (cv. JG 14). Positive correlation between

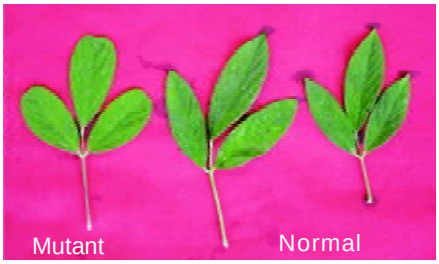


N- uptake and shoot weight was observed. The variability observed in the symbiotic performance among genotypes could be due to differences in quantity and quality of root exudates, which determine the nodulation process of *Mesorhizobium*.

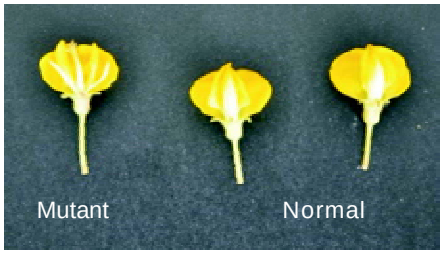
Swarnalakshmi, K., Ramakrishnan B. and Anil Kumar Saxena
IARI, New Delhi

A Spontaneous Mutant in Pigeonpea

A naturally occurring mutant was identified in a population of long duration pigeonpea genotype IPA 11-1. This mutant had retuse type leaflets and rolled and tightly closed flower buds. Flowers were completely open after blooming and stigma and stamens were uncovered due to structural changes in the wing and keel. Inheritance of mutant traits studied in F_1 plants derived from cross made between mutant (as female) and normal (as male) showed that leaflet, flower shape and structure in mutant are controlled by recessive gene(s).



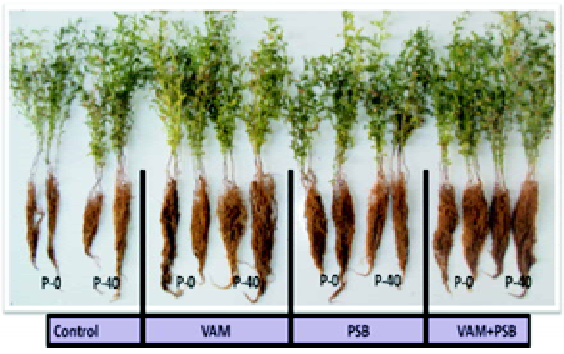
Retuse leaflet shape can be used as marker for rapid discrimination between male sterile and male fertile lines, whereas open flower morphology may result in easy out-crossing by honey bees in hybrid seed production.



Suhel Mehandi, Anand Kumar Yadav, Abhishek Bohra and I.P. Singh

Mycorrhiza Enhanced Root Biomass and P-uptake in Lentil

Significant plant growth and yield enhancement have been reported in legumes inoculated with VAM as compared to non-mycorrhizal inoculants. VAM fungi like *Glomus intraradices*, *G. mosseae* and *Scutellospora castanea* enhanced plant biomass and nutritional status and help in increasing uptake of several ions like sulphur, zinc, calcium, magnesium and iron. Application of VAM along with nitrogen fixing bacteria, P-solubilizers, *etc*., showed the synergistic effect on legume growth. VAM dependency of lentil for enhanced phosphorus (P) uptake was determined through a pot experiment. The result showed that use of VAM mobilized the P and enhanced the development of root biomass even under P-sufficient conditions, while phosphate solubilizing bacteria (PSB) only helped to promote root biomass (upto 95%) under P-deficient condition. Combined use of PSB and VAM also maximised the root biomass and P-uptake (13-27%). These results clearly suggested the VAM dependency of lentil under P-deficient as well as P-sufficient conditions.

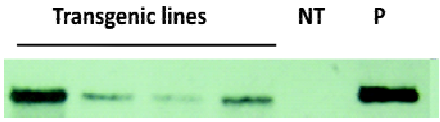


Effect of VAM and PSB on root and shoot biomass development in lentil

Senthilkumar M., Mohan Singh and Jagdish Singh

Non-radioactive Based Detection of Transgenes in Chickpea

Southern analysis is a routinely used method for confirming the presence (copy number) and integration of transgene during development of transgenic plants. Southern blotting along with non-radioactive digoxygenin (DIG) based labelling and detection system have detected successfully the presence of transgene (*cry1Ac*) in chickpea lines developed at the Institute. The standardised procedure can be routinely used to detect integration and transmission of transgene in subsequent advanced generations.



Southern blotting of transgenic chickpea lines (**NT**: Non-transgenic, **P**: Positive control)

Alok Das, Manoj Yadav, Jamal Ansari, K.R. Soren, Prakash G Patil, S.K. Chaturvedi and N. Nadarajan

Induction of Embryogenetic Potential from Callus of Chickpea

Induction of somatic embryogenesis was studied in chickpea cultivar DCP 92-3. Mature embryonic axes from overnight soaked seeds were initially incubated on callus inducing modified MS media consisting of the auxin, 2, 4-D (3.0 mg/l), followed by incubation in lower auxin media for 12-14 days in dark. Developed calli were then sub-cultured in auxin free media for 4 weeks for induction of embryogenetic potential. This resulted in formation of different stages of somatic embryos.

Alok Das, Alok Shukla, K.R. Soren, Prakash G Patil, S.K. Chaturvedi and N. Nadarajan

Long-Term Effect of Nutrient Supply Systems on Soil Carbon Sequestration and Yield of Mustard

A long-term field experiment was initiated at IIPR, Kanpur to evaluate the impact of nutrient management strategies on C- sequestration in soil and its impact on crop growth, nutrients uptake and grain yield under three distinct nutrients supply systems *viz*., chemical fertilizer alone (CF), integrated use of chemical and organic sources of nutrients (OINM) and only organic sources (OS) in a two year crop rotation involving fodder sorghum, chickpea, mungbean and mustard.

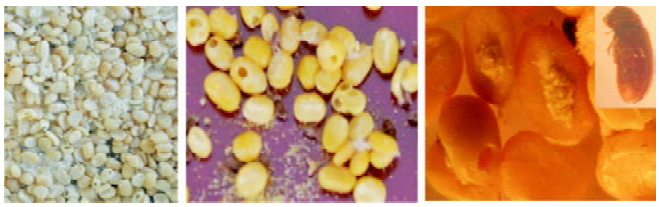
Soil analysis showed significant improvement in microbial biomass –C and total organic carbon content (OCC) in soils under OINM practices as compared to CF alone. Similarly, nitrification rate of soil was almost ten fold higher under OINM system as compared to CF treated soil. Higher soil OCC is an indication of increased sequestration of carbon in soil which in turn increased soil microbial biomass and its activity measured as rate of nitrification. Higher carbon sequestration in soil benefited the crop growth (four fold higher biomass accumulation) and nutrient uptake by the mustard crop. Improved growth and nutrient uptake resulted in higher mustard yield under organic (13 q/ha) and integrated systems (11.5 q/ha) as compared to the chemical system (8.7 q/ha).

Production system	C-sequestration (Mg C ha^{-1} Yr^{-1})
Chemical	0.19
Integrated	0.95
Organic	1.63

Mohan Singh, M.P. Singh and Archna Mishra

Infestation of *Rhyzopertha Dominica* in Stored Mungbean and Urdbean

Seed beetle, *Callosobruchus* spp. was observed as a major pest of whole grains of mungbean and urdbean in the farmers' storage structures, stored pulses in the household and market places during a survey in Jalaun and Kanpur districts. However, lesser grain borer, *Rhyzopertha dominica* (Fabricius) (Coleoptera: Bostrichidae), a common pest of cereal grains in storage was also found to infest broken grains (*Dal*) of mungbean and urdbean. Its adults beetles are very small (2 to 3 mm) and brown to black in colour with cylindrical bodies. The head is directed downward and covered by the prothorax. Adult and larva feed in and on broken grains by making tunnels and holes. Prevention is the most economical and efficient method of controlling the pest. Regular monitoring and discarding of infested grains is important to control this storage pest.



P. Duraimurugan[1], Kavita Gupta[2], S.K. Singh[1] and C. Chattopadhyay[1], [1]IIPR, Kanpur; [2]NBPGR, New Delhi

Occurrence of Predatory Coccinellids in Lentil Ecosystem

During *rabi* season of 2011-12, abundance of coccinellids were recorded on black aphid *Aphis craccivora* coinciding with flowering and pod formation stages in lentil. *Coccinella septempunctata* Linnaeus was predominant species of coccinellids, followed by *Cheilomenes sexmaculata* (Fabricius). During the peak occurrence period (first fortnight of March), a population of 2-5 beetles of *C. septempunctata* per five plants was recorded, while the larvae aggregated at a common place during pupation. Regular monitoring of aphid infestation, spraying of Azadirachtin 0.03% or NSKE 5% at threshold and avoiding highly toxic foliar sprays helps in conserving coccinellids for management of aphids.

C.septempunctata *C. sexmaculata*

P. Duraimurugan and C. Chattopadhyay

Personel

Appointment

Name	Post	Date of joining
Dr. Ummed Singh	Sr Scientist (Agronomy)	21.4.2012
Dr. Pramod Kumar	Scientist (Agronomy)	02.5.2012
Dr. Revanapa	Scientist (Plant Breeding)	02.5.2012

Retirement

Name	Post held	Date of retirement
Mr. M.R. Tripathi	Technical Officer (T-7-8)	30.4.2012
Mr. S.P.Kushwaha	Technical Officer (T-5)	31.5.2012

Dal Analogue from Pigeonpea Milling By-product

Pigeonpea milling by-product contains about 25% husk, 50% grit and husk and 25% cotyledon powder. First fraction is rich in phenols and fibers, hence, has pharma/neutraceutical value. Second fraction (50% of by-product) which includes inseparable grits of husk and powder contains about 20% protein and can be used for making fortified snacks and biscuits. Third fraction is powder of cotyledons

and has protein content equivalent to *dal* (about 22%). This fraction was used for making *dal* analogue. *Dal* analogue is unheated extrusion of powder fraction to make grits for ease of handling. Shape and size of grits can be manipulated by extruding unit. It gets dissolved while cooking in water. Powder fraction can directly be poured into boiling water to make *dal*. Alternatively it can be used for soup, gravy thickener and protein enhancer. In a country like India, which depends heavily on pulses for protein, recovery of cotyledon powder from milling by-product will make more protein available for human consumption.

Prasoon Verma and R.P. Srivastava

Grow more pulses for nurtitional security & soil health.

Utilizing Furrows with Leafy Vegetables to Enhance Income in Maize-Chickpea under Permanent Raised Beds

The permanent raised beds of 75 cm width prepared during *kharif* 2011, were reshaped during *rabi* season, with same tractor drawn raised bed planter. Rainfed chickpea was grown on these raised beds, while leafy vegetables (*e.g.*, spinach and fenugreek) were sown simultaneously in furrows on residual soil moisture. Harvesting of leaves at 35-40 days after sowing, resulted in bonus crop of 1008 kg/ha spinach and 479 kg/ha fenugreek. Also, higher chickpea equivalent yield was recorded under maize - chickpea + spinach (3568 kg/ha) and maize - chickpea + fenugreek (3513 kg/ha) system as compared to maize-chickpea (3381 kg/ha) system.

Intercropping of spinach in furrows with chickpea

Narendra Kumar, M.K. Singh and P.K. Ghosh

Outbreak of Aphids in Summer Irrigated Blackgram of Tamil Nadu

Summer irrigated blackgram has been raised in more than 10,000 ha in New Delta region of Tamil Nadu (Thanjavure, Trichy, Pudukottai and Thiruvarur districts) The yield of the crop (800-1000 kg/ha) is usually more than the crop raised in rainfed or irrigated condition in other parts of the state. Extensive field surveys were made in farmers' fields for two years (2010-2012) on the incidence of insect pests and diseases during the season. During 2010-2011, the incidence of aphids, *Aphis craccivora* (G.) was recorded 12% in the farmers' fields. But during 2011-2012, the incidence of sucking pests particularly aphid has alarmingly increased. Aphid incidence was recorded 63% at farmers' fields and the sucking pest was recorded both in vegetative as well as maturity stage of the crop. Usually the aphid colonies are noticed in the vegetative stage on the leaf, leaf axis and flower buds. But during this season, plants at reproductive stage were also affected by the aphid species and most of the maturing pods in the plants had

colonies of these insects. The incidence of aphids leads to shrivelled and unfilled pods, seeds in the pods are not well developed and small in size. Heavy honeydew secretion and ants associated with aphids lead secondary problems. The plants became stunted in growth and crops were in poor stand. The yield of the crop was reduced upto 20% in several farmers' fields where proper management practices were not followed.

R.P. Soundararajan, S. Geetha, N. Chitra and D. Dinakaran
National Pulses Research Centre
Vamban

प्रौद्योगिकी हस्तान्तरण

कृषकों-दाल निर्माता एवं वैज्ञानिकों की संयुक्त बैठक आयोजित

संस्थान में दिनांक 23 जून 2012 को उद्योग दिवस के दिन, कृषकों, दाल निर्माताओं एवं वैज्ञानिकों की संयुक्त बैठक हुई। इस बैठक का प्रमुख उद्देश्य था दलहनी फसलों से जुड़े विषयों जैसे प्रजाति विकास, *डिलीवरी सिस्टम*, मिलिंग से होने वाली प्राप्ति, विपणन, किसानों को मिलने वाला लाभ, आदि पर संयुक्त रूप से सभी की राय एकत्र करना। डा. एन.पी. सिंह, परियोजना समन्वयक (चना) एवं कार्यकारी निदेशक ने विभिन्न राज्यों में हो रहे दलहन उत्पादन पर नवीनतम जानकारी प्रस्तुत की। उन्होंने दाल उत्पादकों को सलाह दी कि वे सहभागिता पर आधारित परियोजना चलायें जिससे की देश की विशाल जनसंख्या को समुचित मात्रा में दालें उपलब्ध करायी जा सकें। श्री मिथिलेश कुमार, अध्यक्ष दल मिल एसोसिएशन एवं अन्य ने बाजार में दालों की स्थिति, न्यूनतम समर्थन मूल्य (एम.एस.पी.), गुणवत्ता आधारित मूल्य निर्धारण एवं आपूर्ति में एकरूपता लाने जैसे विषयों पर अपने विचार रखे। संस्थान के वैज्ञानिकों ने संस्थान की उपलब्धियों पर प्रकाश डाला साथ ही विभिन्न मण्डियों/ बाजारों में दालों की उपलब्धता की जानकारी दी। फतेहपुर, रमाबाई नगर और कानपुर जनपदों से आये 36 कृषकों एवं 18 मिल मालिकों ने उक्त बैठक में भाग लिया। डा. एस.के. सिंह, प्रधान वैज्ञानिक (कृषि प्रसार) उक्त बैठक के समन्वयक थे।

कृषक प्रशिक्षण आयोजित

संस्थान में दिनांक 15-16 मई, 2012 को ''दलहनी फसलों की उत्पादन प्रौद्योगिकी'' विषय पर एक कृषक प्रशिक्षण का आयोजन किया गया। इस प्रशिक्षण कार्यक्रम को कृषि विभाग, झारखण्ड एवं ग्रामीण विकास एवं कृषि केन्द्र, नई दिल्ली द्वारा संयुक्त रूप से आयोजित किया गया था। इस प्रशिक्षण में, झारखण्ड के पश्चिम सिंहभूमि जनपद से आए 32 जनजातीय कृषकों ने भाग लिया। प्रशिक्षण के दौरान, फसल सुधार, उत्पादन एवं सुरक्षा, कटाई उपरान्त प्रबन्धन जैसे विभिन्न विषयों पर व्याख्यान दिए गए। प्रशिक्षुओं को संस्थान के प्रौद्योगिकी पार्क, बीज उत्पादन प्रक्षेत्रों एवं प्रयोगशालाओं का भ्रमण भी कराया गया। सिंचित दशाओं में बसंतकालीन मूँग की चार प्रजातियों पी.डी.एम. 139, आई.पी.एम. 99-125, आई.पी.एम. 2-3 एवं आई.पी.एम. 2-14 का प्रदर्शन देखकर किसान विशेष रूप से प्रभावित हुए और इन्हें अपनाने को प्रेरित हुए। कृषकों को संस्थान द्वारा प्रकाशित साहित्य भी उपलब्ध कराया गया।

जनजातीय परियोजना के अंतर्गत सामुदायिक आदानों का वितरण

मध्य प्रदेश के छः, छत्तीसगढ़ के चार एवं उ.प्र. के एक जनपदों में ''प्रदर्शन एवं प्रशिक्षण के माध्यम से भोजन, पोषण सुरक्षा एवं जनजातीय समुदायों की जीविका हेतु दलहन उत्पादन को बढ़ाना'' पर आई.आई.पी.आर., कानपुर द्वारा चलाई जा रही परियोजना के अन्तर्गत एक प्रशिक्षण कार्यक्रम 5-7 मई, 2012 को कृषि विज्ञान केन्द्र, बस्तर में आयोजित किया गया। डा. एस. के. पाटिल, कुलपति, इन्दिरा गांधी कृषि विश्वविद्यालय, रायपुर, डॉ. अनुपम मिश्रा, क्षेत्रीय परियोजना निदेशक (क्षेत्र VII), स्थानीय विधायकगण एवं डा. एस. के. सिंह, प्रधान वैज्ञानिक आदि उक्त कार्यक्रम में सम्मिलित हुए। कीट एवं रोगों के उचित प्रबन्धन हेतु 100 कीट नाशक छिडकाव यंत्र एवं 650 स्टील भण्डारण बिन (2 कुन्तल क्षमता वाले) जनजातीय कृषकों को वितरित किये गये। किसानों ने रबी मौसम के लिए चना, मसूर, मटर आदि के 50-50 कि.ग्रा. बीज सुरक्षित रखने का आश्वासन दिया। कृषि विज्ञान केन्द्र कावर्धा, काँके, बस्तर, दांतेवाड़ा (छत्तीसगढ़), झाबुआ, बदवानी, धार, शहडोल, डिंडोरी एवं मण्डला (म.प्र.) इस परियोजना के मुख्य भागीदार हैं।

Director's Desk

Dear Readers,

Self-sufficiency in pulse production in the country has been one of the major objectives of the Indian agriculture. This was partially achieved through development of many high yielding, disease and pest resistance varieties matching with diverse climatic conditions across the country. Extensive breeding strategies have been made in the past to conceptualize high yielding plant types with improved source-sink relation. Nevertheless, this was possible mainly through over-exploitation of primary gene-pool present mainly in the existing germplasm which eventually has led to narrowing of genetic base. This has also left limited opportunities for selection besides making pulse crops vulnerable to resistance breakdown as well as increasing their susceptiblity to biotic and abiotic stresses. Yield losses in pulses caused by various fungal, bacterial and viral diseases are enormous. Being rich in protein, several insect pests also cause yield loss both under field conditions and in storage. Among abiotic stresses, drought, temperature extremities and edaphic problems (salinity and mineral toxicities) have great bearing on their harvestable yield. Therefore, despite several improved crop management practices being followed, productivity of pulses tends to be saturated unless new genes are integrated in the cultivated species to widen the genetic base.

There is an urgent need to widen the cultivated gene pool of these crops by incorporating genes for economically important traits from diverse sources. To diversify and broaden the genetic base of cultivated germplasm, introgression of alien genes from wild species needs to be persuaded vigorously not only to minimize the risk of stress epidemics but also to make discernible yield advances in these crops. Therefore, pre-breeding efforts are urgently required involving particularly those wild species which carry useful genes for improving yield, quality and stress resistance. Wild species have been proved to be an important reservoir of new and useful genes and offer great potential to incorporate such genes into commercial cultivars through pre-breeding. The efforts towards screening wild species of food legumes under field

and controlled conditions have resulted in identification of valuable sources of resistance to key diseases and insect pests in addition to useful traits such as protein content, cytoplasmic male sterility, fertility restoration and yield attributes.

Recently, QTLs have also been identified for yield traits in wild species of pulse crops which may enhance agronomic values of cultivated varieties. Development of molecular marker technique can also be used for authentication of the interspecific hybrids. Identification of high crossability genes in food legumes as in case of wheat cultivars like Chinese Spring can bring non-crossable species within the ambit of alien gene transfer technology. Major gaps in germplasm collection and evaluation of wild species of food legumes need to be closed for making further inroad in alien gene introgression. Continuing advances in distant crossing techniques such as embryo culture, use of bridge species and development of novel crossing strategies are making the wild gene pools of many crops even more accessible. The success rate of gene transfer in such wide crosses can be increased by knowledge of the chromosome pairing mechanisms and their genetic control. The modern tools of molecular biology such as monoclonal antibodies and *in situ* hybridization using various DNA probes may soon make it possible to study the switching on/off of various genes in diverse tissues of the fertilized ovules. It is likely that continuing advances in structural genomics and genetic engineering will result in new strategies for alien gene introgression.

IIPR has felt the need of broadening the genetic base of pulses and has initiated the pre-breeding in major pulses. Wild accessions of chickpea, pigeonpea, lentil and *Vigna* species have been collected from different sources and established under local field condition. Promising wild accessions are being utilized in generating pre-breeding lines which will be used for development of promising breeding materials. Besides using the pre-breeding lines at IIPR, materials will also be shared amongst different pulses research centres for strengthening the pulse breeding programme of the country. I hope that the initiatives taken by IIPR on pre-breeding will go a long way in development of superior varieties of pulses with multiple resistances as needed in future synergestic with agricultural sustainability, dynamic changes of climate and meeting the pulse demand of ever increasing population of the country.

(N. Nadarajan)

Published by Dr. N. Nadarajan, Director, Indian Institute of Pulses Research, Kanpur-208 024
Tel. : 0512-2570264; EPBAX Lines : 0512- 2572464, 2572465; Fax : 0512-2572582
E-mail : director@iipr.ernet.in ; n.nadarajan@gmail.com; Website; http://www.iipr.res.in

Printed at Army Printing Press, 33, Nehru Road, Sadar Cantt. Lucknow-226 002. Tel. : 0522-2481164, 6565333