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ICAR

PULSES Newsletter

Indian Institute of Pulses Research, Kanpur

VOLUME 21, No. 4 OCTOBER - DECEMBER, 2010

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EDITORIAL COMMITTEE

Dr. N. Nadarajan	Chairman
Dr. C. Chattopadhyay	Member
Dr. P.S. Basu	Member
Dr. M.S. Venkatesh	Member
Dr. Aditya Pratap	Member
Mr. D. Upadhyaya	Member Secretary

RAC Applauded Institute's Achievements

The 16th Research Advisory Committee (RAC) meeting of the Institute was held on October 27-28, 2010 under the chairmanship of Dr. S.C. Modgal, Former Vice Chancellor of G.B. Pant University of Agriculture and Technology, Pantnagar. Dr. V.D. Patil, Assistant Director General (O&P), Dr. O.P. Dubey, Ex. ADG (O&P), ICAR, Dr. Shanker Lal, Ex. Director, IIPR, Dr. M.N. Khare, Ex. Dean, JNKVV, Jabalpur, Dr. N. Nadarajan, Director, IIPR and Dr. Mohan Singh, Member Secretary participated in the meeting along with all HoDs, PCs and I/C Sections of the Institute.

Dr. N. Nadarajan apprised the house about the progress in R&D activities of the Institute during the period, new initiatives and major achievements in collaborative programmes with national and international organizations. He informed that two new varieties *viz.*, IPCK 2004-29 (*kabuli* chickpea) and IPF 4-9 (fieldpea) were released during the period. In addition, new varieties of chickpea, mungbean, lentil and pigeonpea have been identified for different zones. In pigeonpea, one short duration genotype was identified, which flowered in 60 days and attained maturity in 95 days.

Significant progress has been made in identifying profitable pulse based production systems. For example maize-wheat-mungbean gave the highest system productivity under upland conditions, while rice-wheat-mungbean gave the highest productivity in lowland conditions. Residue incorporation along with inclusion of pulses in the system was most beneficial, both in terms of increasing system productivity and improving soil quality. Application of weedicide Imazethapyr was found effective against major weeds in different pulses during *kharif* season. Dr. Nadarajan highlighted the impact of the technology developed by the Institute

on farmers' income. He informed that a farmer of Fatehpur district, Mr. Rajesh Patel earned a profit of Rs. 2.1 lakh from 4.2 ha land by growing mungbean during summer 2010.

The RAC appreciated the on-going programmes and applauded the whole scientific community of IIPR for demonstrating the positive impact of these technologies at farmers' fields.

IIPR Connects Global Climate Network

The Institute has recently installed an advance automatic weather station with a state-of-art, robust and completely wireless climate monitoring system. The probes are capable of data acquisition at very high speed and transmit/upload signals through global system mobile or GPRS to the website www.fieldclimate.com. The incredible

Automatic weather station

amount of climate data stored in the system are being utilized to monitor the long-term impact of climate change on pulses productivity, weather-based crop modelling, disease and pest incidence, irrigation scheduling and frost forecasting.

Canadian Scientist Visits IIPR

Dr. Joyce Irene Boye, Research Scientist from Food Research and Development Centre, Qubec, Canada visited IIPR on October 12, 2010 to explore opportunities of scientific collaboration between Canada and India in the areas of value addition and post harvest technology of pulses. The visit was a follow-up action of the agreement signed between Agriculture Ministers of India and Canada in January, 2010. Dr. Joyce had a detailed discussion with Dr. N. Nadarajan, Director and Dr. Prasoon Verma regarding pulse milling and value addition. Areas such as increasing milling efficiency, breeding technologies to reduce anti-nutritional factors, utilization of pulse by-products and blending of pulse flour for value addition were identified for possible bilateral collaboration.

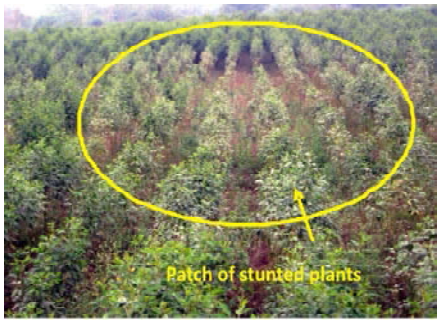
Sudden Incidence of Mango Mealy bug *R. iceryoides* in Pigeonpea

The mango mealy bug *Rastrococcus iceryoides* (Green) is known to be notorious insect pest in mango. There was a sudden incidence of the mango mealy bug *R. iceryoides* in pigeonpea during November, 2010 at the National Pulses Research Centre, Vamban, Pudukkotai. The infestation was observed on the base of the main stem initially @ 5-10 colonies/5 cm in the vegetative stage of the crop. In each ovisac, 300-355 eggs were observed on an average. From the main stem the mealy bug infestation spread to the leaves. The nymphs were found on the ventral side of the leaves. Their feeding resulted in premature leaf drying and severe infestation led to drying of the young plants. Owing to the potential of causing damage, detailed bio-ecology of the pest is required to be studied.

N. Chitra, R.P. Soundararajan, S. Geetha and S.Suresh
National Pulses Research Centre, Vamban (T.N.)

Heavy Infestation of Root-knot Nematode in Pigeonpea

Pigeonpea variety Bahar was found severely infested with root-knot nematodes in a large patch during 2010-11 at the New Research Farm of IIPR, with characteristic symptoms of stunted growth, yellow leaves, thin stem, few branches and no flowering. The reduction in overall growth of affected plants was over 50% and root system was found heavily galled with high gall index (5.0) recorded on the roots. The galled roots were stained in acid fuchsin and observed under microscope. The root-knots were full



Stunted growth of infested plants

of *Meloidogyne* females of *javanica* species. This level of root-knot nematode infestation calls for proper management of the same in such sandy soils. Deep summer ploughing, crop rotation with non-host crops such as mustard, sorghum, wheat, maize, *etc*., use of trap crops and application of organic matter or neem cake @ 500 kg/ha or neem seed powder @ 50 kg/ha helps to minimise nematode infestation especially in pigeonpea.

Bansa Singh, A. K. Choudhary and R. Jagdeeswaran

Research Highlights

Unique Genotypes Developed in Mungbean

A yellow-podded genotype, IPM 9-143-K, derived from an interspecific cross between IPM 03-1 (*V. radiata* L. Wilczek) and SPS 5 of urdbean (*V. mungo* L. Hepper) has been developed at IIPR. This genotype is semi-erect, indeterminate and has green, medium-sized leaves with greenish purple veins. Its stem colour is green, while the

IPM 9-143-K

petiole is green with purple splashes. The pods are straight, non-pubescent, short and are borne intermediate on the plant. The seeds are small, oval, green and shiny. Interestingly, both the parents involved in developing this genotype have black coloured pods. The pod colour in mungbean may be attributed to the involvement of many loci for this trait. This genotype may serve as a useful genetic resource as a morphological marker in future breeding programme and the varieties possessing such distinct pod colour may help in quality seed production.

Two extra-early maturing genotypes have been developed at IIPR. Genotype IPM 409-4, derived from a cross PDM 288 x IPM 03-1, is short-statured, erect, determinate, leaves are dark green, ovate and medium-sized with greenish purple veins, and flowers are light yellow. The pods are borne above the canopy and are short, black and curved, while the seeds are

IPM 409-4 IPM 205-7

green, shiny and oval in shape. Another genotype, IPM 205-7, derived from a cross IPM 02-1 x EC 398889, has short statured erect plants with green, ovate leaves, a green stem with purple splashes and yellow flowers, while the pod habit is intermediate and these are short, straight and black on maturity. Its seeds are also green and shining. Both the genotypes mature in 46-48 days and have synchronous maturity besides being resistant to MYMV.

Aditya Pratap, Debjyoti Sen Gupta, B.B. Singh and Shiv Kumar

Promising Lentil Genotype Identified for Cultivation in UP

A new lentil genotype IPL 313 developed at IIPR from a three-way cross [(ILL7659 × DPL-58) × KL-178] has performed well over three years in normal shown conditions in UP State Adaptive Research Trials. The average yield of the variety is 1226 kg/ha and it

is resistant to wilt and rust diseases. This is medium-bold seeded variety having 2.6 g/100-seed weight. The variety is suitable for cultivation in Uttar Pradesh.

Jitendra Kumar

Residue Retention Conserves Soil Moisture for Summer Mungbean

An experiment was conducted for three years at IIPR at fixed site on integrated management of crop residue and fertilizer in rice-wheat–mungbean system. In residue retention, the biomass of rice and mungbean (5 ton/ha in rice and 1.6 ton/ha in mungbean on dry weight basis) were incorporated

Residue removal Residue retention

Effect of residue retention on summer mungbean

in soil, while wheat stubbles of about 25 cm height were kept in the field before sowing of summer mungbean. In the residue removal plot, the entire above-ground biomass of all the three crops was removed from the field. Mungbean yield was 9% higher (900 kg/ha) in residue retention plot than the removal treatment (825 kg/ha). The soil moisture data also showed that residue retention helped in conserving 44% and 13.8% more soil moisture at 0-15 and 15-30 cm soil depth, respectively, which could be the possible reason for higher seed yield of summer mungbean. Visual observation showed that summer mungbean crop was dark green and vigorous in residue retention than the removal treatment.

K.K.Singh

Ribozyme Technology for Developing Yellow Mosaic Resistant Pulses

With the aim to develop yellow mosaic resistant urdbean (*Vigna mungo),* a ribozyme gene has been designed against the conserved RNA region of replication initiation protein (rep) of MYMIV at IIPR, Kanpur. *In-vitro* analysis of the synthetic ribozyme has

Transformed urdbean plant

shown promising results in catalyzing the rep-mRNA into desired fragment size of 309 and 211 nucleotides. After successful *in-vitro* analysis, this gene has been cloned into binary vector and *V. mungo* is being transformed using *Agrobacterium* method which will be screened for ribozyme expression and virus inhibition.

Annika Singh and Subhojit Datta

Pulses Restore Soil Organic Carbon

Growing pulses in place of cereal crops could potentially influence both carbon addition and humification process and affect the magnitude of soil organic carbon (SOC). Results of long-term experiments at IIPR indicated the improvement of C-pool in maize-wheat- mungbean system over maize–wheat system (6.25 % increase in active carbon pool). It is definite that continuous growing of pulses as cover/ catch /inter crop or relay crop will pay better returns in long-run in terms of SOC restoration. Water use efficiency, nutrient acquisition and C-sequestration of some of the pulse genotypes are being tested for SOC restoration in cereal based system so that farmers can maintain their farm productivity without any additional cost.

P.K. Ghosh, M.S. Venkatesh, K.K. Hazra and K.K. Singh

Edible Products from Pigeonpea Milling By-product

An effort has been made at IIPR to develop few products from pigeonpea milling by-product (husk and *dal* powder). Cleaned and washed pigeonpea was dehusked in abrasive dehusking device. Husk and cotyledon powder obtained from milling was utilized as an ingredient in various recipes like *barfi, ladoo, sev, kachri*, sweet *puries, kachauri masala, etc*. The edible products developed from milling waste were evaluated for taste and were found satisfactory. Eatables made of the by-product show scope for utilization of complete grain and development of neutraceuticals from the products normally considered as milling waste. Utilization of low protein and high fibre of pigeonpea or pulse milling by-product in the form of edible products will open new vistas for dietary supplements and several indigenous cuisines.

Prasoon Verma and R.P. Srivastava

Natural Parasitization of Leaf Webber in Late Pigeonpea

Leaf webber or leaf tier, *Grapholita* (*Cydia*) *critica* Meyrick is a common pest of pigeonpea throughout the vegetative stage. During a survey in the Bundelkhand area, a solitary hymenopteran parasitoid was recorded on the larvae of leaf webber from August

Pupa of parasitoid emerging from the parasitized larva

to November, 2010 and highest parasitization (22.4%) was recorded during first week of October, coinciding with the peak activity of the pest. The adult parasitoid was black in colour and measured about 2-3 mm in size. Identification of the parasitoid is in progress.

P. Duraimurugan, Hem Saxena, S.K. Singh and C. Chattopadhyay

Evaluation of Vertical Thresher for Urdbean

At IIPR, a vertical thresher has been developed and evaluated for stripped pigeonpea and chickpea without any kind of adjustment in the thresher, though there is wide difference in grain size of the two crops. The thresher was also evaluated for urdbean crop. Urdbean has sturdy plant structure, which takes much time to thresh manually. About 2 kg of grain is recovered per 10 kg of harvested urdbean biomass by manual threshing. By using the above vertical thresher for urdbean biomass, capacity of about 200 kg/h was observed, with corresponding seed recovery of 13.85 kg seed/60 kg biomass. As blower is situated at upper portion of the thresher, therefore chances of grain loss through winnowing are minimum. With 8% chaff (<5 cm) and bruising percentage of 1.7%, this vertical thresher can be efficiently used without any machine adjustment for urdbean.

Prasoon Verma and S. K. Garg

Predators for Insect Pests in Early Pigeonpea

Insect pests are major biotic constraints in pigeonpea production in India. Among several predators in early pigeonpea ecosystem, lady bird beetle, *Coccinella septempunctata* L. and *Cheilomenes sexmaculata* (Fab.), sting bug, dragonfly, *Crocothemis servilla* Drury, green lace wings, *Chrysoperla zastrowi arabica* Henry, common wasp, *Vespa orientalis* L., spider, *Clubiona* sp., *Araneus* sp., Indian myna, *Acridotheris tristis* L. and house crow, *Corvus splendens* Vieillot help in restricting the population of insect pests considerably. For sustainable management of insect pests *in-situ* conservation and maintenance of these predators is important to reduce the pesticide load in early pigeonpea ecosystem.

Lynx spider | *Clubiona* sp. | Yellow crab spider | *Araneus* sp.

Predators of pigeonpea insect pests prevailing in the early pigeonpea ecosystem

S. D. Mohapatra and S.K. Singh

Transfer of Technology

Skill Oriented Farmers' Training

Farmers' training on 'Improved Production Technology of Pulse Crops' sponsored by Pulse Development Project, Tal Area, Patna (Bihar) was organised at IIPR during October

20-23 and December 24-28, 2010, to create awareness, upgrade knowledge and improve skills of participatory farmers on major pulse crops. Dr. N. Nadarajan, Director urged the participants to adopt situation specific technological packages in the prevailing cropping system for maximization of productivity and harnessing better income. All production and post-harvest related aspects of pulse crops were thoroughly discussed through interaction, lectures, demonstrations, *etc*. Total 52 farmers from Mokama, Lakhi Sarai and Patna districts of Bihar took active part in the programme.

State Level *Dalhan* Seminar

State level *Dalhan* Seminar sponsored by Directorate of Agriculture, U.P. was organized at the Institute on December 16, 2010. Dr. N. Nadarajan, Director, IIPR while inaugurating the programme emphasized on inclusion of pulse crops in different cropping systems at least once every alternate year, which will help in improving and sustaining the soil health as well as annual income of the farmers. Interactive lectures were arranged on different production, protection and post-harvest management aspects related to pulse crops. Total 58 farmers from the identified districts participated in the programme.

Field Days Organised by KVK Bikaner

Under harnessing of pulse productivity programme of ICAR, demonstrations on mungbean variety IPM 02-3 were laid in 10 ha area during *kharif* 2010 in Bikaner district (Rajasthan) in the villages Meghasar, Akhasar, Bholasar, Surdhana, Ambasar, Deshnok and Bikaner. The technological interventions including balanced use of fertilizers (NPK) and proven agronomical technologies were adopted to maintain plant population and weed control. Bacterial leaf blight and thrips incidence at initial seedling stage were controlled by

foliar application of copper oxychloride @ 2 g/l of water and spraying dimethoate @ 1.5 ml/l of water, respectively. The performance of IPM 02-3 was excellent with no incidence of MYMV. Farmers appreciated the variety because of its high yield performance and synchronous maturity. Uniform maturity significantly reduced the cost of labour incurred in picking of pods as compared to other varieties of mungbean.

Exposer Visits Organized

Date	Programme	District/ State	No. of farmers
19.10.2010	ATMA	Basti (U.P.)	40
22.10.2010	Dalhan Development Programme	Patna (Bihar)	28
27.10.2010	Educational Tour	Lucknow (U.P)	50 B.Sc. (Ag.) students
10.11.2010	Harit Kranti Yojna	Sant Kabir Nagar (U.P)	65
07.12.2010	ATMA	Sitapur (U.P)	95
13.12.2010	Sugarcane Development	Muzaffarnagar (U.P)	40
14.12.2010	ATMA	Hamirpur (U.P)	70
15.12.2010	National Horticulture	Morena (M.P.)	100
16.12.2010	DASP	Lucknow (U.P)	78
18.12.2010	ATMA	Basti (U.P)	50
27.12.2010	Dalhan Development Programme	Patna (Bihar)	30

Personnel

Appointment

Name	Post	Date of joining
Sh. Deen Dayal Kumar	Technical Assistant (T-3)	01.11.2010

Promotions

Name	Promoted to	w.e.f.
Dr. Shiva Kant Singh	Principal Scientist	14.11.2008
Sh. Shiv Saran Singh	Assistant	04.11.2008
Smt. Reeta Mishra	UDC	04.11.2008

Transfer

Sh. Rajeev Nigam was relieved from the Institute on 04.12.2010 to join as Asstt. Administrative Officer at Zonal Project Directorate, Kanpur.

Our New Colleague

Dr. Jagdish Singh has joined the Institute on October 12 , 2010 as Head, Division of Crop Physiology, Biochemistry and Microbiology.

Award/ Recognition

➢ Dr. P.K. Ghosh, Head, Division of Crop Production, has been elected as Fellow of the National Academy of Agricultural Sciences.

➢ In recognition of his significant research contributions, Dr. Sanjeev Gupta, Principal Scientist (Crop Improvement Division), was honoured with SAP Recognition Award 2010 by the Society of Agricultural Professionals during National Symposium on Food Security in context of Changing Climate held on October 30, 2010, at CSA University of Agriculture and Technology, Kanpur.

➢ Dr. C. Chattopadhyay, Head, Division of Crop Protection, delivered the prestigious Prof. V.P.Bhide Memorial Award Lecture at 32nd Annual Conference of the Indian Society of Mycology and Plant Pathology held at Junagadh Agricultural University, Junagdh on November 24, 2010, as an honour bestowed upon him by the society.

Important Meetings Attended by Dr. N. Nadarajan, Director

S. No.	Date	Place	Event
1.	October 4, 2010	Delhi	Attended special meeting of VCs of Agricultural Universities at NASC Complex as special invitee.
2.	October 7-9, 2010	Ranchi	Attended 20th Regional Committee Meeting of ICAR under the chairmanship of Secretary, DARE and Director General, ICAR at BAU, Ranchi
3.	October 25, 2010	Durgapura	Attended inaugural function of the Group Meet on solving the pulses crises through crop diversification.
4.	November 9, 2010	S.K. Nagar	Attended inaugural session of national training on “Maintenance breeding and purification of existing varieties of pulses”.
5.	November 25, 2010	Bhopal	Met Principal Secretary, Agriculture, Additional Chief Secretary and Hon’ble Agriculture Minister of M.P. state regarding transfer of land for regional station of IIPR, Kanpur at Bhopal.
6.	November 29, 2010	Mohali (Chandigarh)	Attended brainstorming session for growing soyabean and *kharif* pulses in Punjab, chaired by Dr. G.S. Kaikat, Chairman, Punjab State Farmers' Commission.
7.	December 13, 2010	Delhi	Attended project presentation meeting held under the chairmanship of the Director General, ICAR and presented project proposal on “Development of transgenics against gram pod borer in chickpea and pigeonpea”.
8.	December 23, 2010	Delhi	Attended 58th Meeting of Central Sub-Committee on crop standard, notification and release of varieties at NBPGR, New Delhi.
9.	December 27, 2010	Delhi	Attended preliminary QRT meeting with DDG (CS), ICAR & Chairman, QRT. Explained about the achievements during XI plan period.
10.	December 29-30, 2010	Dharwad and Banglore	Regarding off-season nursery for IIPR at Dharwad.

Director's Desk

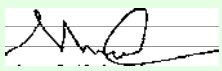
Dear Readers,

Transgenic research is impacting crop improvement options by way of providing resistance against major insect-pests, herbicide tolerance, increasing shelf life of vegetables and fruits, and fortification of food with vitamins and minerals. In India, transgenic crops have been successfully produced in several laboratories. Cotton, brinjal, tomato and rice are major crops in which the transgenics have been field tested in India. Though, first transgenic was approved in cotton for commercial cultivation in India in 2002. Since then, transgenic cotton is gaining ground in most of the cotton growing areas of the country. This has stimulated the transgenic work considerably and it is expected that such plants will soon become available in other crops. Programmes are underway to develop transgenic pulse crops especially chickpea and pigeonpea.

Development of insect resistant crops has been a major area of transgenic research in agriculture sector. At present, *Bt* transgenics have proved to be highly effective in management of lepidopteran pests of several crops. The lepidopteran pest, pod borer (*Helicoverpa armigera*) causes extensive loss to chickpea and pigeonpea. Since classical methods were not successful due to non availability of donors for recombination breeding, transgenic research has become increasingly important for developing pod borer resistance in chickpea and pigeonpea. ICAR has made sincere efforts in this direction by providing network project on transgenic development against pod borer in chickpea and pigeonpea during 2003 with an outlay of Rs. 135.78 lakh involving IIPR, NRCPB and ICAR-NEH as collaborators. This project aimed at standardizing transformation system with *Bt* gene. IIPR has well standardized system for regeneration and genetic transformation of chickpea and pigeonpea. Efforts have also been made at IIPR, NRCPB, ICRISAT, NBRI and Assam Agricultural University for transferring several versions of *Bt* genes like *Cry 1Ab*, *Cry 1Ac* and *Cry 1Aabc*. IIPR has transgenic events in both these crops that are in T_1 or T_2 generations. Efficient bioassay protocols have been developed for confirmation of events. Recently, a project has been approved under ICAR-National Fund Project on development of pod borer resistant transgenic pigeonpea and chickpea with an outlay of Rs. 795.30 lakh involving IIPR, NRCPB and IIT, Kharagpur. Apart from development of *Bt* transgenics, research efforts should also be directed for transgenic development using other genes such as lectins, protease inhibitors, *etc*. Transgenic development in pulses for drought and salinity should also be attempted. These efforts will lead to development of functional transgenics in pulses. Efforts are also needed towards commercialization of transgenics in pulse crops.

Transgenic crops are subjected to elaborate tests to assess the risks and to ensure safety, before they are approved for commercial cultivation. If the produce is not eaten (*e.g.* cotton), the concerns are minimum. But the products from chickpea and pigeonpea are consumed by human beings and animals, therefore, transgenics in these crops would need highest assurance from biosafety point of view. In this context, the genes used and methods employed assume significance from biosafety perspective. Current methods of transformation require the use of selection markers (mainly antibiotic resistance) to eliminate untransformed cells. However, the marker genes have no utility in cultivation or in the commercial products. In fact, constitutive expression of marker gene products is a drain on plant metabolism. Therefore, utmost efforts are needed to employ strategies for marker free transformation process or the removal of markers from transgenic plants when produced.

Transgenic cultivar development requires large scale trials under strict containment facilities. For conducting large scale transgenic trials, P II level transgenic containment facility is available at IIPR. This facility can be utilized by all those who are involved in developing transgenics in chickpea and pigeonpea. I call upon all the scientists engaged in transgenic research to join hands in a consortium mode for development of commercial transgenics in pulses.



(N. Nadarajan)

Published by Dr. N. Nadarajan, Director, Indian Institute of Pulses Research, Kanpur-208 024
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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