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PULSES Newsletter

Indian Institute of Pulses Research, Kanpur

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CONTENTS

Union Minister of Agriculture Visited IIPR

Hon'ble Union Minister of Agriculture Shri Sharad Pawar visited Indian Institute of Pulses Research, Kanpur on January 29, 2011 along with Mr. P.K. Basu, Secretary, DAC, Ministry of Agriculture, GoI and Dr. S. Ayyappan, Secretary, DARE and Director General, ICAR, New Delhi. Mr. Raja Ram Pal, Hon'ble Member of Parliament, Dr. T.P. Rajendran, Asstt. Director General (PP) and Dr. B.B. Singh, Asstt. Director General (O&P) also accompanied the Minister during the visit.

Hon'ble Minister inaugurated the Pulse Genetic Resource Centre. He visited Genetic Stock Management Farm and experimental fields of the Institute and took keen interest in the development of new varieties and hybrids. The dignitaries appreciated the upkeep and maintenance of the experimental plots and the farm.

In the interaction meeting, Dr. N. Nadarajan, Director highlighted the achievements of the Institute in development of new high yielding varieties and matching crop production technologies. In his address the Hon'ble Minister called upon the scientists to develop short duration varieties of pulse crops to foster multiple cropping system. He stressed upon developing high yielding varieties insulated with pest

industrialization, followed by ever increasing population of the country. He called upon the scientists for close interaction with farmers to produce sufficient food for the growing population. In this endeavour Govt. will provide all help and support to make the country self sufficient in pulses. The Hon'ble Minister honoured five progressive farmers of the area at this occasion.

and disease resistance, with matching crop production and protection technologies keeping in mind the anticipated changes in climate and seasons. He called for minimizing the post-harvest losses. He provided the road map for increasing pulse production through short, medium and long term research efforts.

Addressing the pulse growers the Hon'ble Minister expressed his concern over shrinking cultivable area due to rapid urbanisation and

QRT Meeting Held

The Institute Quinquennial Review Team (QRT) meeting was held at IIPR on January 30-31, 2011 under the chairmanship of Dr. V.S. Tomar, Vice-Chancellor, RVS KVV, Gwalior. The other members Dr. R.P. Sharma, Dr. K.B. Wanjari, Dr. P.S. Deshmukh, Dr. N.B. Pawar, Dr. O.M. Bambawale and Dr. I.P.S. Ahlawat also attended the meeting. Research activities of the Institute, particularly development of transgenics and good number of varieties released coupled with matching production technologies were appreciated by the members. The team suggested many important researchable issues which will be taken care during XIIth plan. This was followed by review meeting of all AICRPs on MULLaRP, Chickpea, Pigeonpea and Arid Legumes centres of Central Zone

on February 27-28, 2011 at CIAE, Bhopal and of South Zone on March 5-6, 2011 at TNAU, Coimbatore.

Group Meet on Spring/ Summer Mungbean and Urdbean

Group Meet on Spring/Summer mungbean and urdbean was held at IIPR on January 24-25, 2011. In his address, Dr. B. B. Singh, Project

Coordinator (MULLaRP) highlighted the importance of short duration summer/ spring mungbean and urdbean and informed that efforts are underway to develop still earlier varieties of almost 50 days maturity. The impact of these short duration varieties is visible on farmers' fields as they have been able to harvest upto 1.5 ton per ha yield.

Dr. N. Nadarajan, Director, IIPR expressed his concern over low productivity of mungbean and urdbean and articulated the scope of further expansion of the area under these crops in Indo-Gangetic plains and peninsular India. Quoting the success story of mungbean in U.P., he expressed strong hope that cultivation of summer mungbean can be a rewarding enterprise. He called on the scientists to work on MYMV, drought, weeds, insect-pests and high temperature insensitivity in these crops. The results of spring/summer 2010 were reviewed and technical programme for spring/summer 2011 was finalized in the meeting.

RAC Focused on Development of Transgenics in Pigeonpea and Chickpea

The 17th meeting of Research Advisory Committee (RAC) was held on February 14-15, 2011 under the chairmanship of Dr. S.A. Patil, Former Director, IARI, New Delhi. The meeting was attended by Dr. B.B. Singh, Assistant Director General (O&P), ICAR; Dr. D.P. Singh, former Director Research, GBPUA&T, Pantnagar; Dr. S.V. Sarode, Director Research, PDKV, Akola; Dr. Karabi Datta, Coordinator, Biotechnology Support Programme (DBT), Calcutta University, Kolkata; Dr. N. Nadarajan, Director, IIPR and Dr. Mohan Singh, Member Secretary. All Project Coordinators, Heads of Divisions and Sectional Incharges took part in this meeting.

Dr. N. Nadarajan, while welcoming the Chairman and members of RAC apprised the house about the progress in R&D activities, new initiatives, major achievements and developments in collaborative programmes with national and international organizations. The RAC appreciated the on-going programmes and congratulated the scientists of IIPR for successful demonstration of technologies on farmers' fields. The Chairman appreciated the breeder seed production programme of the Institute.

After critical review of the on-going research programmes and thorough deliberations, major focus of the RAC was on development of transgenics in pigeonpea and chickpea against pod borer and development of hybrids in pigeonpea to break the yield plateau. The RAC also stressed upon DNA finger printing of all newly evolved varieties. The experts suggested for gene pyramiding for tolerance against abiotic and biotic stresses. Efforts should be made to acquire genes of advantageous traits from different sources. Research on photo-insensitivity, introduction of moisture conservarion technologies, improving C-sequestration in soils of pulse growing areas and nutritional biofortification of pulses with essential minerals was stressed upon by the RAC. They also suggested that wild types of pigeonpea should be screened for resistance or tolerance against podfly or pod borer. Dissemination of these technologies among farmers using latest information technology should be attempted.

Dr. B.B. Singh Joined as Asstt. Director General (O&P)

Renowned pulses breeder Dr. Brij Bhuwan Singh has joined the ICAR Head Quarters as Assistant Director General (Oilseeds and Pulses) on January 27, 2011. Before joining the new assignment, Dr. Singh was serving as Project Coordinator (MULLaRP) since August, 2005. Dr. Singh has developed ten varieties of different pulses (four of mungbean, two of urdbean, two of lentil and two of pigeonpea) and has more than 120 publications to his credit.

Dr. Singh has visited several countries including Syria, Nepal, Bhutan and Bangladesh.

New Projects

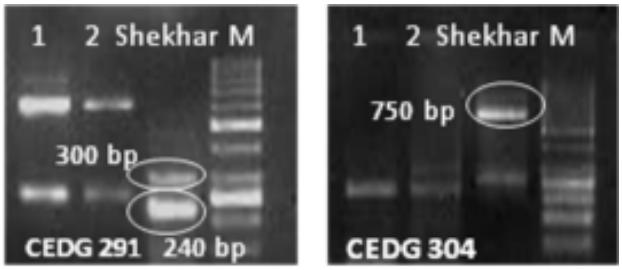
- With a view to develop suitable technologies to resist negative impacts of climate change, the ICAR has sanctioned a project on "Climate resilient agriculture" for the period 2010-12 with budgetary provision of Rs. 567 lakh. IIPR is entrusted to identify promising material of urdbean, mungbean and pigeonpea for tolerance to climate stresses (drought and heat) and genetic enhancement of such tolerance. IIPR is the lead centre and Dr. N. Nadarajan, Director is the overall Coordinator. NPRC Vamban, ARS Gulberga, ARS Badanapur, ARS Durgapura, PAU Ludhiana and RARS Khargone are participating centres.

- Launch meeting of National Fund project on "Development of pod borer resistant transgenic pigeonpea and chickpea" was held on February 21, 2011 at NRC on Plant Biotechnology, New Delhi. The project has been sanctioned for the period 2011-13 with total budget allocation of Rs. 795.30 lakh for three core groups. Dr. N. Nadarajan, Director, IIPR is Principal Investigator of the project for core group I with a budget of Rs. 238.86 lakh. Core group II is led by IIT, Kharagpur with four partners and core group III is led by NRCPB, New Delhi with two partners.

Research Highlights

Molecular Analysis of Genetic Diversity in Urdbean

Thirty seven urdbean germplasm accessions comprising of released varieties, landraces and other collections were assessed for genetic diversity using microsatellite markers. These markers are mapped microsatellite markers in *azuki* bean (*Vigna angularis*) linkage map. Total 51 primer pairs were screened, out of which 49 primers amplified in urdbean and 18 primers showed polymorphism indicating 96.07% transferability and 37% of polymorphism. Forty nine transferable markers were amplified for 96 alleles with an average of 1.96 alleles per marker. Genotypes were grouped in two major clusters following jacquard similarity coefficient. Maximum genetic similarity (90%) was observed between genotype JU 2 and GU 2, while Shekhar 2 and Pant U 19 shared the least (68%) genetic similarity. Two markers (CEDG 291 and CEDG 304) were of particular importance as they produced genotype specific bands. CEDG 291 produced two unique alleles of 240 bp and 300 bp, whereas CEDG 304 amplified 750 bp fragment specific only to Shekhar 2. These specific markers if sequenced and developed into diagnostic markers will have tremendous impact on conclusively establishing the identity of cultivars in case of admixture. The cross genera transferability of *azuki* bean markers to urdbean indicated the conservation of the microsatellite regions among these genotypes.

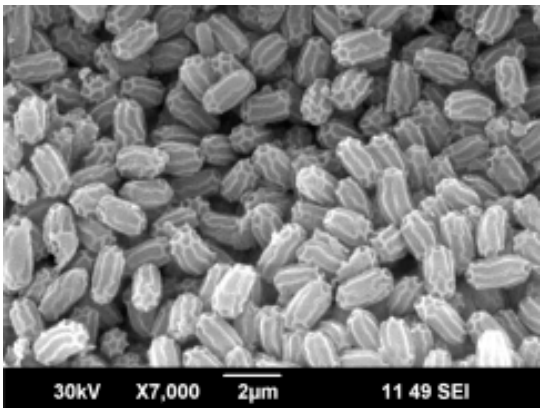


Genotype specific amplification profile in urdbean genotypes with SSR markers

K.R. Soren, G. Pandey, S. Datta, B.B. Singh, P.G. Patil, A. Das and S.K. Chaturvedi

Rhizobacteria Enhances Tolerance to Drought

Plant growth promoting bacteria (PGPB) elicit physical and chemical changes in plants through a process referred as 'induced systemic tolerance' (IST) that result in enhanced tolerance to drought. Influence of rhizobacteria on enzymatic antioxidant systems that include superoxide dismutase, peroxidase, ascorbate peroxidase, catalase, polyphenol oxidase and glutathione reductase provide induced resistance against oxidative damage of plant tissues.



Scanning electron micrograph of *Paenibacillus polymyxa*

Accelerated production of stress ethylene in plants causes inhibition of seed germination, root elongation and senescence response. The strains of rhizobia with ACC (1-amino cyclopropane 1-carboxylate) deaminase activity can reduce the ethylene levels in their host-specific legumes and overcome some of the negative effects of ethylene on nodulation.

Co-inoculation of *Bradyrhizobium* and PGPB isolates with ACC deaminase activity enhanced the nodulation in mungbean compared with inoculation of *Bradyrhizobium* alone. Inoculation of peas with PGPB containing ACC-deaminase significantly decreased the effects of water stress on growth and yield of peas and increased the grain yield up to 62% over control. Under drought stress, co-inoculation of bean (*Phaseolus vulgaris* L.) with *Rhizobium tropici* and two strains of *Paenibacillus polymyxa* resulted in augmented plant height, shoot dry weight, and nodule number. This information may promote the development of microbial consortium for better management of drought stress in pulse production.

Senthilkumar M. and Mohan Singh

Pests Incidence Scenerio in Uttar Pradesh

During the survey conducted in and around Bundelkhand region during January-March, 2011 moderate infestation of *Helicoverpa* was observed in pigeonpea at different locations in Kaushambi, Chitrakoot, Fatehpur and Banda districts, where 4-5 larvae per pigeonpea plant and 15 moths were trapped per pheromone trap per week. In chickpea crop, 5.9 (4-9) larvae per metre row length which were mostly second to fourth instars and damage up to 20% was observed in Mahoba, Kaushambi, Banda, Chitrakoot and Jalaun districts. Jhansi and Fatehpur recorded minor infestation of the pest on chickpea crop. Infestation of *Spodoptera* on pods of pigeonpea was also recorded in Kaushambi district. Podfly (*M. obtusa*) attained moderate proportion on pigeonpea crop, but the farmers seemed unaware about this devastating insect in their farms. More or less 15% infestation of podfly in pigeonpea was observed in Fatehpur, Mahoba, Chitrakoot, Kaushambi and Banda districts with some fields having up to 30% infestation. Minor infestation of black aphid was recorded in pigeonpea, fieldpea and chickpea crops in Banda, Chitrakoot, Kaushambi, Jhansi, Fatehpur and Mahoba districts, while it was at moderate level on lentil crop in Banda, Jhansi, Mahoba and at minor level in Fatehpur. Minor infestation of Jewel beetle, *Sphenoptera indica* was recorded in pigeonpea in Fatehpur district. The larva was found to tunnel the pigeonpea stems at the ground level resulting formation of gall. The infested plants wilted and dried up.

In pigeonpea, wilt incidence ranged up to 37% with mean incidence of 1.6%. In chickpea, mainly wilt and black root rot were observed. Their combined incidence ranged up to 32% with mean incidence of 3.5%. Similarly, it was up to 37% with 4.3% mean incidence in lentil. In field pea, it was primarily black root rot and the incidence was up to 18% with the mean incidence of 1.9%.

Soil and root samples collected from chickpea fields of Banda, Mahoba, Chhattarpur, Jhansi and Jalaun showed 38% infestation of lesion nematode (*Pratylenchus* spp.). The infested chickpea fields were having sparse and patchy growth. The soils were mostly heavy and black. Similarly, the samples collected from pigeonpea had about 60% infestation of pigeonpea cyst nematode.

Grub, adult of Jewel beetle in pigeonpea at Fatehpur

Black aphid on fieldpea at Jhansi

Chickpea roots damaged by lesion nematode at Banda

R.G. Chaudhary, A. Ghosh, S.D. Mohapatra, H. Saxena, B. Singh, P. Duraimurugan, U. Sah and C. Chattopadhyay

Potential of Improved Varieties and Packege Technology Demonstrated

Conduct of 6000 technology demonstrations on various pulse crops in different states were planned under the aegis of the ICAR with technology back up by Indian Institute of Pulses Research. Krishi Vigyan Kendra (KVKs) working in the targeted states were given the responsibility of organizing these demonstrations. During summer 2010, 90 demonstrations on high yielding varieties along with package technology showed that mungbean yield can be enhanced by 46.7% with average grain yield of 1100 kg/ha. Net return of Rs. 35700 per ha with short duration crop maturing in less than 65 days has encouraged farmers to cultivate summer mungbean. Similarly, encouraging incremental yield achieved during *kharif* from short duration pulse crops like mungbean (1040 kg/ha), urdbean (810 kg/ha) and pigeonpea (1200 kg/ha) showed that popularization of high yielding and disease resistant varieties along with matching package technology can enhance the present level of summer and *kharif* pulses productivity from 670 kg/ha to 1035 kg/ha.

Yield in technology demonstrations

Crop	No. of demonstrations	Average yield (kg/ha)	% Increase over local	Net profit (Rs./ha)
Summer				
Mungbean	90	1100	46.7	35700
Kharif				
Pigeonpea	348	1200	34.3	26440
Mungbean	808	1040	40.4	23940
Urdbean	529	810	43.3	17986
Total	**1775**	**1037.5**	**-**	**-**

High Temperature Tolerance in Chickpea

Long day or high day temperature exceeding 32^{0}C hastens flower formation in chickpea. However, anthesis and pod setting are adversely affected when day time maximum temperature reaches to 35^{0}C or above. The *per se heat* tolerance mechanisms include ability to pollen tube growth at higher temperature, stability of the membrane and photosynthesis in chickpea. Selected genotypes were physiologically characterized for heat tolerance based on chlorophyll fluorescence, membrane stability, pollen germination, stigma receptivity and sucrose synthase activity. Due emphasis was also given to faster canopy growth, high photosynthesis, early flowering/pod setting and rapid

ICC 1205 (Heat tolerant) ICC 10685 (Heat sensitive)

grain development during high temperature (>35^{0}C). A chickpea genotype ICC 10685 is identified as highly sensitive to heat stress that failed to set pods even below 35^{0}C. In this genotype anthesis did not take place in more than 98% flowers. This sensitive line was compared with heat tolerant lines viz., ICCV 92944, ICC 1205 and ICC 15614. The length of the pollen tubes and rate of germination up to 35^{0}C temperature were higher and faster than the 41^{0}C and growth of pollen tube almost ceases at 43^{0}C. Significant variations in the growth of pollen tubes at higher temperature were noticed among the genotypes under test. The sucrose synthase activity in large seeded genotypes was higher and plays crucial role in rapid bulking of the grains before onset of the critical temperature 35^{0}C. These germplasm accessions with high degree of thermo-tolerance can be used in breeding programme to improve heat tolerance of desirable varieties.

P.S. Basu, S.K. Chaturvedi,
P.M. Gaur and Rinki Devi

Our New Collegues

Dr. M. Senthilkumar has joined as Sr. Scientist (Microbiology) on 03.1.2011

Mr. Amalendu Ghosh has joined as Scientist (Entomology) on 10.1.2011

Mr. Ashok Kumar Parihar has joined as Scientist (Plant Breeding) on 10.1.2011

Mr. K.N. Gupta has joined as Finance & Accounts Officer on 15.3.2011

Dr. Asit B. Mandal has joined as Principal Scientist (Plant Breeding) on 11.2.2011. Earlier, he was Director, DSR, Mau.

Award/Honour

Dr. P.K. Ghosh has been conferred with ISA Fellow 2008 by the Indian Society of Agronomy.

Promotion

Mr. Satish Chandra has been promoted as Assistant w.e.f. 30.3.2011.

Transfer of Technology

Trainings Organised under Collaborative Projects

● A collaborative training programme on Production Technology of Pulse was organized at the Institute on February 27-28, 2011 jointly with ICARDA South Asia Office, New Delhi. While inaugurating the training programme Dr. N. Nadarajan, Director emphasized

on incorporation of pulses under different cropping system(s). Dr. A. K. Singh, Zonal Project Director (Zone VI), Kanpur suggested for development of close linkage among stakeholders to achieve targeted production of pulses. Dr. Ashutosh Sarkar, Regional Coordinator, ICARDA presented in brief about mission, objective and activities to be carried under DAC funded project on "Enhancing lentil production". Exposure visit was arranged to Fatehpur district. Total 27 participants from Assam, West Bengal and Uttar Pradesh, including Drs. Seid A. Kamel, Abdoul Aziz Naine, S.K. Agrawal and Dr. Ravi Gopal from ICARDA, Syria actively participated in this training course.

● Another training programme on Integrated Pest Management was organized at the Institute on January 14-15, 2011 with collaboration of NCIPM, New Delhi. Total 24 participants from Madhya Pradesh, Jharkhand and Uttar Pradesh took active part in the training. Minikits related to IPM components were given to all participants. Both the training courses were coordinated by Dr. S. K. Singh, Principal Scientist.

राष्ट्रीय प्रशिक्षण का आयोजन

"दलहनी फसलों की उन्नतशील उत्पादन प्रौद्योगिकी" विषय पर एक तीन दिवसीय

राष्ट्रीय प्रशिक्षण कार्यक्रम का आयोजन भारतीय दलहन अनुसंधान संस्थान में दिनांक 9-11 मार्च, 2011 को किया गया। कृषि एवं सहकारिता विभाग, भारत सरकार द्वारा वित्त पोषित राष्ट्रीय खाद्य सुरक्षा मिशन-दलहन के अन्तर्गत इस प्रशिक्षण कार्यक्रम में प्रतिभागियों को क्षेत्र विशेष के लिए संस्तुत एवं उपयोगी प्रौद्योगिकी को समझने, सीखने और अपनाने का अवसर प्राप्त हुआ तथा उसके त्वरित विस्तारीकरण के बारे में जानकारी प्राप्त हुई। इस अवसर पर संस्थान के निदेशक डा. एन. नदराजन ने अपने उद्बोधन में मृदा स्वास्थ्य को टिकाऊ बनाये रखने और दलहन उत्पादन बढ़ाने के लिए विभिन्न फसल पद्धतियों में दलहनी फसलों के समावेश पर बल दिया। प्रशिक्षण कार्यक्रम में पंजाब, उत्तर प्रदेश, दिल्ली, मध्य प्रदेश, छत्तीसगढ़, पश्चिम बंगाल एवं तमिलनाडु राज्यों के 23 प्रतिभागियों ने सक्रिय भागीदारी की। प्रशिक्षण में पारस्परिक व्याख्यान तथा बीज उत्पादन प्रक्षेत्र एवं प्रदर्शन प्रक्षेत्रों का भ्रमण सम्मिलित था।

फली भेदक कीट प्रबंधन में जैविक उत्पादों के प्रयोग पर प्रशिक्षण

● भारत सरकार के जैव प्रौद्योगिकी विभाग द्वारा वित्त पोषित परियोजना के अन्तर्गत "फली भेदक कीट के प्रबंधन में जैविक उत्पादों के प्रयोग" पर एक प्रशिक्षण कार्यक्रम का आयोजन भारतीय दलहन अनुसंधान संस्थान में दिनांक 22-23 फरवरी, 2011 को किया गया। प्रशिक्षण में जालौन जनपद के कटौरा ब्लॉक के ग्राम काशीखेड़ा तथा कासीरामपुर और महेवा ब्लॉक के ग्राम बराई के 39 कृषकों ने भाग लिया। प्रशिक्षण में किसानों को फली भेदक कीट की खेत में उपस्थिति और संख्या की निगरानी के लिए यौन रसायन आकर्षण जाल (फेरोमोन ट्रैप) के प्रयोग तथा जनसंख्या नियंत्रण के लिए चिड़ियों के अड्डों के बारे में प्रदर्शन और विस्तृत जानकारी दी गई। फली भेदक के नियंत्रण हेतु स्थानीय स्तर पर उपलब्ध पर्यावरण हितैषी संसाधनों जैसे निबौली का सत तथा न्यूक्लीयर पॉली हेड्रोसिस विषाणु तैयार करने तथा इनके प्रयोग करने की विधि पर किसानों को प्रशिक्षित किया गया।

● "फली भेदक कीट के प्रबंधन हेतु जैविक उत्पादों के प्रयोग" पर एक अन्य प्रशिक्षण कार्यक्रम दिनांक 7 मार्च, 2011 को जालौन जनपद के कदौरा ब्लॉक के नेवारी ग्राम में आयोजित किया गया। प्रशिक्षण का आयोजन निबौली का सत् बनाने की विधि तथा फली भेदक कीट के नियंत्रण हेतु इसके सामयिक प्रयोग के संबंध में किसानों में जागरूकता लाने के उद्देश्य से किया गया था। खेतों में फली भेदक कीट की निगरानी के लिए यांत्रिक विधियों का प्रदर्शन भी किया गया, जिससे किसान फसल सुरक्षा के उपाय समय पर अपनाकर अपनी फसल से अधिक उत्पादन ले सकें।

कृषक प्रशिक्षण कार्यक्रम आयोजित

दिनांक	प्रतिभागियों की संख्या	जनपद	राज्य
10-12 जनवरी, 2011	26	छतारा	झारखण्ड
17 जनवरी, 2011	56	कानपुर और रमाबाई नगर	उत्तर प्रदेश
17-18 फरवरी, 2011	42	औरैया और फर्रूखाबाद	उत्तर प्रदेश
23-24 फरवरी, 2011	20	भोजीपुर	बिहार
4-5 मार्च, 2011	41	सहरसा	बिहार
10-12 मार्च, 2011	30	झाँसी	उत्तर प्रदेश
14-15 मार्च, 2011	37 (नाबार्ड)	हमीरपुर	उत्तर प्रदेश
17 मार्च, 2011	20	गुना	मध्य प्रदेश
23 मार्च, 2011	43 (महिला कृषक)	अजमेर	राजस्थान
24-25 मार्च, 2011	20	कन्नौज	उत्तर प्रदेश

Director's Desk

Dear Readers,

Climate change is likely to threaten the food and livelihood security of millions of people globally. In recent decades consistent warming trends and more frequent and intense extreme weather events have been observed across India also. This will have negative impact on production and productivity of major crops in the country. Therefore, it is imperative to enhance resilience of Indian agricultural production system to resist the negative impacts of climate change and also the capacity to recover quickly after damage.

The predicted changes in temperature and their associated impact on rainfall and consequent availability of water to crops and extreme weather events are all likely to affect substantially the potential of pulse production. The most worrying part of the prediction is the estimated increase in winter and summer temperatures by 3.2^0 and 2.2^0 Celsius, respectively, by 2050. Such abnormal rise will surely have an adverse impact on pulse production in the form of a reduction in total crop cycle duration. Most of the pulses like mungbean and urdbean are short duration crops (65-75 days). Further reduction in crop duration will amount to a lower yield per unit area. Similarly, pigeonpea is very sensitive to abrupt fluctuations of temperature either lower or higher extremes leading to massive flower drop. This negative impact of temperature extremities is, however, largely compensated by regular fresh flush of flowers that keep on appearing during the developmental stages concomitant with favourable temperatures. However, at extreme temperatures the serious adverse impact is observed on pod setting. This in turn adversely effects the production and productivity of pigeonpea and other pulse crops. During the last five years, the country has experienced severe droughts posing problems to the farmers, agricultural scientists and extension workers. Fall in yield and consequent shortage lead to price rise and inflation affecting the poor masses. Therefore it is utmost important to enhance the resilience of pulses production to climate change with use of modern scientific methods and tools.

In view of the challenges posed by climate changes, the Government of India decided to implement a project at national level to enhance the capacity of Indian agricultural scientists and other stakeholders in climate resilient agricultural research and its application through conduct of strategic research, technology demonstration and capacity building. As the follow up action on the announcement made by Government of India, a project on National Initiative on Climate Resilient Agriculture has been sanctioned by the ICAR for the period 2010-12 with budgetary provision of Rs. 567 lakh. IIPR is entrusted to identify promising material of urdbean, mungbean and pigeonpea for tolerance to climatic stresses (drought and heat) and genetic enhancement of such tolerance.

I trust and believe that necessary efforts will be made by the scientists and other stakeholders for national commitment of making Indian agriculture resilient to climate changes.

(N. Nadarajan)

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