PULSES Newsletter

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CONTENTS

Natural Parasitization of *Maruca vitrata* (Geyer) by *Bracon hebetor*

Spotted pod borer, *Maruca vitrata* (Pyralidae : Lepidoptera) is a major insect pest that attacks the reproductive parts of grain legumes including pigeonpea and cowpea, thus drastically reduces the yield. During November 2008, a survey was conducted at New Research Farm of IIPR to know the natural enemies associated with *M. vitrata* in short duration pigeonpea. Among the 143 larvae of various instars, 6 late instar larvae were parasitised by *Bracon* (*Habrobracon*) *hebetor*. This ecto-parasitoid formed 5 to 9 cocoons per larvae of *M. vitrata* and the total life-cycle was completed within 8

to 10 days. The female to male ratio was 1:2. This is the first report of natural parasitism of *M. vitrata* by *Bracon hebetor* in short duration pigeonpea ecosystem.

S.D. Mohapatra,
P. Duraimurugan and Hem Saxena

Leaf Curl/ Necrosis – An Emerging Disease

Leaf curl/ necrosis of mungbean and urdbean has emerged as an important disease. The disease has potential to cause enormous loss as it often results in the death of affected plant part(s) or whole plant. The characteristic symptoms include appearance of chlorosis around some lateral veins and its branches near the margin of a leaflet and downward twisting of leaflets. Symptomatic leaves are brittle and whole trifoliate can fall down from the plant on giving a jerk. The vein shows brown

Affected plant of mungbean showing leaf curl/ necrosis

discolouration which also extends to petioles. The disease is caused by *Groundnut bud necrosis virus* (GBNV), a member of Tospovirus genus which is one of the ten most important viruses affecting crops worldwide. The causal virus is transmitted by thrips. During *kharif* 2008, the incidence of leaf curl disease in mungbean varieties Samrat and Meha was 15% and 13%, respectively, whereas in urdbean varieties Uttara and Shekhar-1, it was 7% and 5%, respectively. The causal virus was detected by reverse transcription-polymerase chain reaction (RT-PCR) using NSm and NP genes specific primers.

Naimuddin and Mohd. Akram

New Projects Launched

Shuttle Breeding in Pulses

Recognizing the importance of pulses for nutritional security in the region and to strengthen cooperation among the SAARC nations, a new project on "Shuttle breeding for development and identification of high yielding varieties of pulses for sustainable agriculture in South Asia" under the aegis of Ministry of External Affairs and Ministry of Agriculture, GoI, has been sanctioned for a period of three years with financial outlay of Rs. 119.01 lakh. According to the work plan, Dr. Masood Ali, Director, Dr. Shiv Kumar, HoD (Crop Improvement) and Dr. B.B. Singh, PC (MULLaRP) were deputed to visit Bangladesh, Bhutan and Nepal during October 10-20, 2008. On the basis of visit at different sites and discussions held with senior officers and pulse scientists of the participating countries, shuttle sites, target crops and genotypes were finalized for conducting yield evaluation trials. Lentil, lathyrus, rajmash, mungbean and urdbean were identified as target crops.

Promotion of *Trichoderma*

A project entitled "Promoting the use of *Trichoderma* sp. an eco-friendly approach for management of wilt and root rot complex in major pulse crops in Bundelkhand region" funded by Department of Biotechnology (DBT), Govt of India was launched in October, 2008 in three selected villages Baank, Baanki and Bilahri in Bharuva Sumerpur block of Hamirpur district in Bundelkhand region of Uttar Pradesh. The specific objectives of the project are to enhance awareness, knowledge and skills of farmers for adoption of *Trichoderma*. The duration of the project is three years with a financial outlay of Rs. 13.15 lakh. Chickpea and lentil in *rabi* and pigeonpea in *kharif* were chosen, as these crops are severally affected by wilt and root rot diseases in the region.

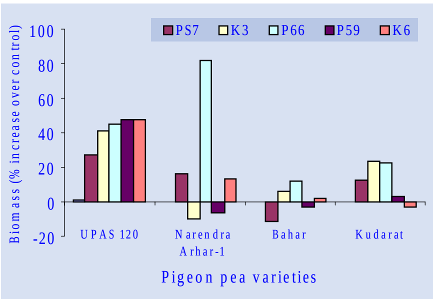
Post-emergence Herbicides for Pulses

Recognizing the need for post-emergence herbicides in pulse crops, a screening trial was conducted to evaluate quizalofop-ethyl, imazathapyr and chlorimuron to control weeds in *rabi* pulses. Three doses of quizalofop-ethyl (40, 50 and 60 kg/ha) and imazathapyr (25, 37.5 and 50 g/ha) were used in fieldpea and lentil, whereas two doses each of quizalofop-ethyl (40 and 50 g/ha) and imazathapyr (25 and 40 g/ha) and chlorimuron (4 g/ha) were used in chickpea at 20 and 30 DAS. The initial results showed effective control of weeds like *Chinophdium Anagellis, etc.*, with the application of imazathapyr at 37.5 and 50 g/ha. Yellowing and growth reduction was also observed in *Cyperus rotundus*. Quizalofop-ethyl did not show any toxicity either to pulse crops or weeds at any application rate. However, chlorimuron showed 100% toxicity to chickpea.

Narendra Kumar

Differential Response of Pigeonpea Genotypes to PGPRs

Plant growth promoting rhizobacteria (PGPR) isolated from soils showed variable growth response to inoculation with different varieties of pigeonpea. Five PGPR strains were tested for their growth promoting effect in four pigeonpea varieties *viz.*, UPAS 120, Narendra Arhar-1, Bahar and Kudarat. All the strains of PGPR improved growth of UPAS 120 and



Interaction of PGPRs with different varieties of pigeonpea

the order of increase over control was 27 to 47 per cent. In Narendra Arhar -1, only two strains P 66 and K 6 improved plant growth, while strain PS 7 and P 59 showed depressing effects. Similarly, in varieties Bahar and Kudrat, growth response was highly variable due to inoculation with these five strains of PGPR. This differential response to inoculation with PGPR showed a strong host bacteria interaction(s) mediated by differences in quantity and quality of root exudates.

K. Swarnalaxmi and Mohan Singh

Pathogenic Variability in *F. oxysporum* f.sp. *lentis*

Lentil wilt caused by *Fusarium oxysporum* of sp. *lentis* (L) Medik (FoL) is the most important and widely spread disease in India. Studies were conducted at IIPR under Wilt Network Project during 2004-08. Based on the variable reactions against wilt over the locations, 14 lentil genotypes *viz.,* Vipasa, DPL 62, JL 3, K 75, ILL 7657, L 4147, NDL 1, Vidokhar local, Sehore 74-3, IPL 204, DPL 59, PL 77-2, IPL 304 and L 9-12 were tentatively selected as differentials. Studies with 30 representative isolates of FoL collected from Uttar Pradesh and Bihar on above differentials at 10% solid substrate inoculum load (w/w) during 2006-08 showed very high differential variability in their pathogenic response and no grouping was possible. Therefore the number of differential lentil genotypes was reduced to 7 based on their genetic (RAPD) similarity and reaction to FoL. Hierarchical cluster analysis of differential wilt data indicated following two major clusters, one minor cluster and one isolate as independent:

I : FoL isolate nos. 3, 33,37, 44, 47, 55, 55-2, 59, 64, 71, 72, 73, 74, 77

II : FoL isolate nos. 32, 35, 39, 40, 55-3, 55-4, 62, 66, 67, 68

III : FoL isolate nos. 34, 36, 49, 63

IV : FoL isolate 28

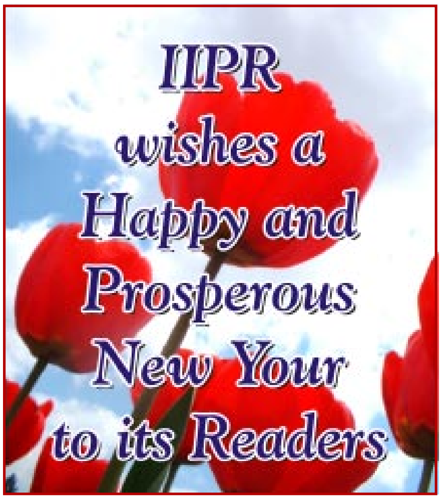
In view of such a wide variability observed, it is imperative to persue the study further involving all representative isolates of FoL.

R.G. Chaudhary

Enhancing Crossing Efficiency through Bud Pollination in Pigeonpea

Like other crops, emasculation forms an integral component of crossing programme in pigeonpea [*Cajanus cajan* (L.) Millsp.]. The percentage of pod setting upon crossing in such emasculated flowers is very low. This may be due to greater injury caused to ovary during the process of emasculation itself. Available literature reveal that upon pollination native pollen tube grows slowly down the style compared to foreign pollen tube. This leads to an unconditional advantage of foreign pollen over the native ones in effecting fertilization. Keeping this in view, an experiment was designed to attempt two sets of crosses: one with emasculation, and the other without emasculation taking advantage of bud pollination. Parents which were selected for this study differed in marker traits such as petal (standard) colour (red *vs* yellow), growth habit (indeterminate *vs* determinate), and days to flowering. In both sets, a total of seven and ten crosses was attempted during 2006-07 and 2007-08, respectively. For each cross in each set, fifty flower buds were selected. In general, the extent of pod setting was remarkably greater in bud-pollinated flowers than in emasculated ones. The resulting F_1s were raised in the succeeding years. It is interesting to note that all the individuals of eight out of seventeen crosses (bud-pollinated) were true hybrids. In the other five crosses, the percentage of *selfs* was less than 25%. However, in the remaining four crosses, *selfs* accounted for more than 25% of the total individuals in the respective crosses. The higher proportion of *selfs* could be ascribed to selection of advance buds. The study indicated that emasculation is unnecessary for making crosses in pigeonpea. For attaining a higher degree of success, emphasis should be placed on stage of buds *vis-a-vis* prevailing mean temperature during the period of crossing.

A. K. Choudhary



Revitalizing Chickpea Cultivation in North India- Farmers' Experience

A shift in area under chickpea cultivation from North to Central and South India has been witnessed in the past decades due to tremendous increase in irrigation facilities and farmers' bent to grow cereal crops for more profitability. But, continuous cultivation of rice-wheat resulted in depletion in soil fertility. It has been established by the researchers that to restore the soil health and fertility, inclusion of pulse crops in different cropping systems is the need of the day. This fact, supported by recent advancements in pulses research has given a new footage to pulse cultivation in North India. In the states like Punjab, farmers have shown interest in pulse cultivation.

In chickpea, development of improved high yielding and input responsive varieties and matching crop production and protection technologies has reposed faith in farmers for higher yields and greater monetary benefits. Mr. Sohan Singh, a progressive farmer of Village Dhatt, Distt. Ludhiana, who came in contact with scientists of Punjab Agricultural University, Ludhiana, has developed great interest in chickpea cultivation. He says that on the advice and technical guidance of the scientists he grew chickpea on one acre land after harvest of rice. No irrigation or fertilizer was applied to the crop, but two hoeings were done to control the weeds and timely plant protection measures were taken. He obtained 1.0 ton/acre yield. This encouraged him to take up chickpea cultivation on a large area. In 2006-07, he obtained 1.2 ton yield per acre. The net return was about Rs. 14-16 thousand per acre. Mr Sohan Singh believes that input requirement in chickpea cultivation is very low and returns are quite attractive. Besides, the chickpea cultivation also clearly shows improvement in physical properties of the soil. The farmers of neighbouring villages are motivated for chickpea cultivation after rice, which is also contributing in the diversification of cereal based cropping system in North India.

Promoting Use of *Trichoderma* at Farmers' Fields

Efficient native strain of *Trichoderma harzianum* (6.8-7.2 x 10^9 CFU/g formulation) formulated at IIPR, Kanpur was supplied to the farmers in adopted villages Baank, Baanki and Bilahri in Hamirpur district of Bundelkhand with an objective to demonstrate this technology. The bench mark survey of adopted villages showed 25- 40 per cent and 20-35 per cent yield loss due to wilt and root rot diseases in lentil and chickpea, respectively. Majority (95%) of

farmers were not aware about *Trichoderma*. The local availability of *Trichoderma* was very poor and the technology did not motivate the farmers for its adoption due to the doubts on quality and performance. Two training programmes of farmers were organised in collaboration with line department, where total 300 farmers participated. Farmers were educated on identifications of wilt and wet root rot in chickpea and lentil and their management. Total 60 hectares area (20 ha under lentil and 40 ha under chickpea) was covered under demonstration involving 120 farmers. The incidence of wet root rot in chickpea after 30 - 40 days of sowing under soil application of *Trichoderma* was in traces as against untreated plots having 3 to 15 per cent root rot with mean incidence of 9%. Farmers observed higher plant height, better root growth, dark leaf colour, higher nodulation and more plant vigour in chickpea treated with *Trichoderma.*

Purushottam, R.G. Chaudhary, K. Swarnalakshmi and Iqubal Singh

Novel Variants Recovered in Urdbean

Genetic improvement in urdbean is often limited with the lack of genetic variability for important traits. Interspecific hybridization is an important means of extending the range of variation beyond that displayed by the parental species. However, the inherent problem of interspecific introgression is limitation for its frequent use in routine breeding programme. Systematic efforts have been made at the Institute to attempt interspecfic hybridization and gene introgression in *Vigna* species for recovery of novel variants in urdbean. Following interspecific gene introgression , novel variants recovered in urdbean include increased number of seeds per pod and shorter reproductive phase from *Vigna radiata*, and increased number of clusters, number of primary branches and resistance to foliar diseases from *Vigna silvestris*.

Successful attempts have been made in making interspecific hybrids using IPM 99-125 (*Vigna radiata*) and SPS 5 (*Vigna mungo*). It has been found that *Vigna radiata* produced successful hybrids as seed parent with *V. mungo*. However, the reciprocal hybrids were not viable. The F_1s so obtained were advanced to F_2 generation. In F_2, 75% plants were similar to urdbean type, while 25% plants remained as urdbean type in F_3. The proportion of urdbean types decreased upto 4-6 % in subsequent generations. Further the early segregants of urdbean types were displayed with poor pod filling and ovule abortion. Attempts were also made to make interspecfic hybrids using DPU 88-31 (*Vigna mungo*) and IPUW 04 (*Vigna silvestris*). Early segregants of this cross in F_2 generation displayed greater variability for most of the agronomic traits like number of pods per cluster, number of clusters per plant, number of pods per plant , resistance against MYMV and powdery mildew. Further, these segregants will be evaluated for novel variation like resistance against bruchids and root knot nematodes. Such variants are not available in existing germplasm of urdbean.

Early generation segregant of Vigna radiata x Vigna mungo

Sanjeev Gupta, B.B.Singh and Shiv Kumar

Trainings Organized

For capacity building of extension officers involved in pulses development, following training progrmmes were organized :

Model Training on Production Technology for Pulse Crops

A Model Training Course was organized on 18-25 November 2008 at IIPR for state level extension officers on production technology for pulse crops. The training course was sponsored by Directorate of Extension, DAC, MoA, New Delhi. Total 26 officers representing the states of U.P., Punjab, Kerala, Gujarat, Rajasthan and Orissa participated in the training programme. The programme was designed to provide the participants exposure to the improved varieties of *rabi*, *kharif* and spring/summer pulses, improved agronomic practices, improved protection technologies like integrated disease and insect pest management, improved post-harvest technologies including processing aspects.

National Training on Protection Technologies of Pulse Crops

A 3-day national training programme on protection technologies of pulse crops was organized under National Food Security Mission on 15-17 December, 2008. The training was attended by 23 extension officers from seven states *viz.*, U.P., M.P., A.P., Bihar, Chhatisgarh, Haryana and Orissa.

State Level Training under NFSM-P

A 2-day training on improved production technology for spring/ summer pulses was organized for state level official of Uttar Pradesh on 30-31 December, 2008. This training was organised with the financial assistance from Directorate of Agriculture, Government of U.P., under National Food Security Mission-Pulses (NFSM-P) component. Joint Directors (Agriculture), Deputy Directors of districts of U.P., District Agriculture Officers and State / Divisional/ District level consultants participated in this training course.

State Level Interaction Programme

A state level workshop sponsored by the Department of Agriculture, Uttar Pradesh was organized by the Institute on 15 October, 2008. Strategies for inclusion of pulse crops in different cropping systems for crop diversification were discussed. Total 60 participants including Joint Director (Agriculture), Kanpur Division, Deputy Directors of eight districts, Sub-divisional Agril. Extension Officers (SDAEOs), and 32 farmers of different districts of U.P. participated in the workshop.

Farmers' Trainings Organized

Farmers' training programmes were organized at IIPR during 20-21 October and 3-4 November, 2008 under Agriculture Technology Management Agency (ATMA) Programme for Etah and Jhansi districts of U.P. In each training programme, 60 farmers took active part. Training courses were mainly focused on technological packages related to pigeonpea, chickpea, lentil and fieldpea. Group discussions were arranged to ascertain various problems associated with pulses and find out appropriate solutions.

ICAR Sports Meet

In the ICAR Inter-Zonal Tournament held at NAARM, Hyderabad on 17-20 November, 2008, Mr. Yashwant Singh won Bronze Medal in Shot-put.

Transfer

Dr. (Mrs.) Nirupma Singh, Scientist (Crop Improvement) was relieved from this Institute on 29.11.2008, upon transfer to Directorate of Maize Research, New Delhi.

Promotion

Name	Promoted to	w.e.f.
Mr. Brahm Prakash	T-7/8	01.7.2007
Dr. M.P. Singh	T-7/8	01.7.2008
Mr. Chandra Pal	SSG-IV	31.10.2008
Mr. Jhinku	SSG-III	31.10.2008
Smt. Angoori	SSG-III	31.10.2008

Retirement

Dr. N.B. Singh, Principal Scientist and Head, Crop Production Division retired from his services on 31.12.2008.

Our New Colleagues

Dr. S.D. Mohapatra has joined the Institute on 01.11.2008 as Senior Scientist, Entomology.

Dr. Khela Ram Soren has joined the Institute on 03.11.2008 as Scientist, Bio-technology.

Dr. Mohd. Akram has joined the Institute on 15.11.2008 as Senior Scientist, Plant Pathology.

Director's Desk

Dear Readers,

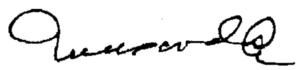
Climate change is one of the most important global concerns. To address this issue, the Inter-governmental Panel on Climate Change (IPCC) was set up by the World Meteorological Organization and by the United Nations Environment Programme. In its Fourth Assessment report published in 2007, the IPCC projects that if trend continues, temperature is likely to rise by further 2-6°C this century. This will lead to a rise in sea levels between 18 and 59 cm and will endanger coastal areas and small islands, and a greater frequency and severity of extreme weather events.

The weather-data of Indian sub-continent compiled by Indian Meteorological Department, Pune for the past several decades, the satellite image interpretations in ISRO for climatic shift influencing crops/ vegetation of the different agroclimatic zones and different weather-based crop models developed at IARI, ICAR, unequivocally concluded that India, is a country most vulnerable to climate changes.

The climate modelling systems envisage that as the twenty-first century progresses, there will be higher levels of warming in the northern part of India than in the southern parts with rapid increase in night temperatures which will in turn adversly affect the agricultural productivity.

Major impact of climate change will be on rainfed crops which accounts for nearly 60% of crop land area of India. The different weather forecasting models predicted that *rabi* crops will be more adversely affected by both increase in temperature by 4°C and decrease in rainfall by the year 2050. The winter legumes under rainfed condition in northern plains are altogether experiencing a different kind of hidden stress that is atmospheric drought, associated with insufficient or lack of dew precipitation, as a result of high night temperature. The moisture available in the air termed as "Invisible water reservoir of nature" which can be easily accessed by the crops provided nights are cool to form dew. With changing climate, the phenomenon of dew precipitation is gradually diminishing in the northern rainfed regions, consequently crops are subjected to more dry weather and high evapotranspiration. The increased CO_2 concentration will have a positive effect on productivity, however, the beneficial effects of CO_2 enrichment is largely nullified by increase in the temperature abruptly which is often detrimental to crop growth and grain yield. The new crop varieties for large parts of the country, including the Indo-Gangetic plains and west-central regions, will have to be tolerant to high temperature throughout their life cycle.

In view of above, crop breeding programmes should be directed towards developing temperature- and drought-tolerant high yielding cultivars, so as to have suitable varieties in hand when climate change effects are experienced widely. The genetic resources, especially land races sustaining environmental extremities could serve as the starting genotypes for building the genes for tolerance, and yield features. Chickpea lines adapted to warmer climates carrying genes for thermotolerance have been identified, and they are performing well under northern climates. Considerable progress has been made in the genetic dissection of flowering time, inflorescence architecture, temperature and drought tolerance in certain pulse crop systems and by comparative genomics in crop plants. A combination of conventional, molecular marker directed, mutational and transgenic-breeding approaches will be required to evolve the desired kinds of crop cultivars.



(Masood Ali)

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