Summary and Recommendations: 2007

AAPP organises National Symposium on 'Plant Protection-Technology Interface'

The much awaited first National Symposium organized by the AAPP came of smoothly after much ups & downs and some hiccups that accompanies most firsts. The participation was exceptional and the interactions meaningful. Here is a gist of what transpired.

The Inaugural session took off in time and was chaired by the President of AAPP, *Dr. Dipak Bagchi***.** *Dr. Santanu Jha*, Secretary AAPP welcomed the Guests and participating Scientists while identifying the whys of the AAPP and the Symposium. The Chief Guest, *Sri Naren De*, MIC of Agriculture, GoWB inaugurated the Symposium by lighting the traditional lamp. He identified some of the transitional phases that agriculture is going through in the State given the contract farming, organic farming and retail marketing scenario and reiterated the possible impacts of climate change and land shrinkage on agriculture. He welcomed as well as coaxed the Scientists to meet head on the impending challenges presented by the changing scenario through the new technologies that are coming in their hands. The Chief Guest, *Dr. R. K. Samanta*, Vice Chancellor, BCKV, delved on the role the University is playing and will continue to play in facing the complex of issues that are clouding the agriculture scenario today. Dr. Bagchi, in his Presidential address traced the chequered performance of AAPP since its inception in 2006. As ex-Vice Chancellor of BCKV he felt AAPP, given the right opportunity could play a major role in bringing all the stakeholders in Agriculture together.

The participants and guests were also addressed by two honoured Guests on the dias, viz., *Dr. H. K. Majumdar*, Working Chairman, WBSCS &T and *Dr. A.N. Basu*, Chairman, WBPCB.

Two keynote addresses set the tone for the rest of the Symposium. The first delivered by ***Dr. C.D. Mayee***, Chairman, ASRB (ICAR) elaborated on the technology interface of newly bred lines and the various nuances of the IPR (Intellectual Property Rights) that cloud the agricultural development today, the barriers in use of private sector - produced genetically engineered seed material (cotton, mustard, okra, brinjal etc.) and the future outlook in plant protection lucidly thru an excellent 3P. Most of these tech-driven varieties, he said, were related to pest resistant lines. The success of management, he said, was related to our ability for rapid diagnosis and this front has taken rapid strides in recent years through molecular diagnostics to which the Symposium has rightly devoted a full session. The second keynote address delivered by ***Dr. Swapan K. Dutta***, Rashbehari Professor of Molecular Biology, CU, explored the potentials and possibilities in the use of genomics and proteomics for developing resistant lines particularly where traditional breeding programmes have largely failed to provide stable resistant lines (Sheath blight of rice, c.o. *R. solani*). Genomics-based strategies for gene discovery, coupled with validation of the transgenes by transgenesis have accelerated the identification of functional profile of the candidate genes.

The session was terminated with a vote of thanks addressed by Director of Research, BCKV, *Dr. S. K. Sanyal*.

The first technical session of the Symposium was devoted to molecular diagnostics. Chaired by *Dr. T. Chakraborty* IMTEC, Chandigarh. Dr. Chakraborty elaborated on the broad canvass of the microbial world rich in its diversity, while tracing their unity. *Dr VK Gupta* from PAU, Ludhiana emphasized on random markers based upon RAPD profile and polymorphic markers that provide sufficient opportunities for development of more specific SCAR markers for monitoring prevalence and spread of potentially dangerous biotype of sweet potato/cotton whitefly, *Bemisia tabaci*. *Dr Sudarshan Ganguli* emphasized on a combination of molecular approach involving sequence information of rDNA and RFLPs of ITS regions with morphological data for authenticated identification of IPN species. Using similar approach, she has described new species of EPN (*Steinernema thermophilum*) and its bacteria (*Xenorhabdus indica*), both being first and the only species of there genera from India. *Dr. A. Ganguli* also emphasized on the track being followed at the IARI for molecular diagnostics of nematodes.

Dr. DK Ghosh pointed out the precision that has been achieved in budwood certification programme of citrus through use of sequencing tools while *Dr. P. K. Chakraborty* elaborated on the nucleic and protein based diagnosis of pathogens of cotton. Among nucleic acid based methods both PCR and non-PCR based approaches can be used, he said. A ready to use PCR kit for detection of *X. malvacearum* strains was developed and submitted for patenting. PCR primers for diagnosis of fungal pathogens namely *Ramularia areola*, *Rhizoctonia* species and *A. macrospora* were developed based upon the diverse sequences within the ITS regions of rRNA genes. Finally, *Dr. A. Samad* observed that phytoplasma is emerging as an important plant pathogen infecting agricultural, ornamental, vegetables, medicinal and aromatic plants. Phytoplasma can be detected by using PCR and nested-PCR.

The concluding session of the first day was primarily presented through courtesy of Crop Life India who focused on the view point of the pesticide industry when plant protection is at cross roads, and was chaired by ***Mr. P. K. Majumder***, Director, Syngenta. Two lead lectures were presented by Mr. P. K. Majumder and Mr. S. Kumarswamy, Chairman, Agrochemicals Policy Group. Six invited lectures by Dr. P. K. Guha (Isagro Asia Agrochemicals), Dr. Rajendra Prasad (Dhanuka), Dr. Preethi Rath, Mr. K. S. Thyagarajan (GM, BASF Agro), Dr. N. S. Butter (PAU) and Dr. A. Bhattacharya (BCKV) and one oral presentation by Dr. K. Banerjee. All elaborated on the theme that chemical pesticides are indispensable to increase crop production vis-a-vis trends of increasing population. They emphasized that farm lands can not be increased and land producing food has gone up by only 2%. Plant protection is an important tool in crop production. as pest/diseases losses of about 26% in terms of quality and quantity is known. All of them suggested that improved pest control tools should be developed through IPM for better quality and safety in food production (cereals, horticultural crops and others) which ensures eco-friendly nature of management approaches. For this purpose plant protection needs cultural, mechanical, biological and chemical control measures sequentially.

Industry should support continuous research and development for searching of new and safer plant protection chemicals which will be specific in target pest, long duration effect, low use, prevent and delay resistance building capacity and improved formulation. *Dr.A. Bhattacharya* made an elaborate presentation of a variety of new molecules that are on the anvil. *Dr. Rajendra Prasad* of Dhanuka Group focused on a success story regarding industry and public partnership in agricultural extension in the heart of Madhya Pradesh. *Dr Thyagarajan* in his brief,

emphasized on horticultural crops and recommended use of polymers in innovative packaging of such crops to avoid huge losses in the F & V segment. While *Dr. Butter* cautioned on the flip side of the use of pesticides, *Dr Bannerji* focused on multiresidue analysis of pesticides for simultaneous confirmation. The Chairman concluded that the pesticides are here to stay but the Industry is constantly working on their safety, on their reduced used through precision application technology while making them cost effective. At the same time Industry should support the research and development on genetically modified crop for drought resistance, pest tolerance etc. Regarding genetically modified crops there was a deficiency in technical personnel for field demonstration, to understand and standardize the process to develop internal competency.

The second day started with a session on biological control, chaired by the illustrious ***Dr. A.N. Mukhopadhyay***. Dr. Mukhopadhyay presented an overview of the research on *Trichoderma* clearly demonstrating the fact that *Trichoderma* based biopesticides have tremendous potential for management of large number of plant diseases including nematodes. *Dr. M. A. Ansari* (Univ. Swansea, UK) reported control of white grub and black vine weevil insects in horticultural crops by entomopathogenic nematode and fungi particularly with *Metarhizium anisopliae*. It acts synergistically with chemical pesticides and neem cakes. *Dr. S. Pan* (BCKV) informed the house about the changes in efficacy of *T. harzianum* and *T. viride* in Tsunami affected islands of Andaman and Nicobar. The Tsunami affected strains lost much of their efficacy. *Dr. K. Karmakar* (BCKV) explored the possibility of biological control of phytophagous mites that causes serious damage on chili plants with predatory mites specifically *Agritemus fleschneri*. *Dr. D. K. Chakrabarti* (NDUAT) reported the application of bioagent *T. viride* through seed and soil application in controlling diseases of opium while tracing excellent back up information on the life cycle of *Peronospora arborescens*. Dr. M. Alam (CIMAP, Lucknow) presented experimental results on effects of mycorrihza (*Glomus aggregatus*) on different crop diseases like lethal yellow disease of citronnela, pyrethrum wilt and diseases of safed musli, *Rauwolfia serpentina*. Dr. V. K. Dhingra (Biocon, ND) added a different dimension by elaborating on the regulatory mechanism of marketing, rules of registration and market potential of bioagents.

The session emphasized the need for a clear cut policy on the production and marketing of *Trichoderma* based products. The Government should formulate guidelines for fast track registration of such products since *Trichoderma* is native to soil and does not require stringent regulations like chemical pesticides. However, Prof. Sen questioned the veracity of this given the significant reports of COPD due to its spores.

The fourth session on IPM and other innovative pest management strategies was chaired by ***Dr. OM Bambawalle*** **(**Director, NRC for IPM). *Dr. M. K. Dasgupta* (Viswa Bharati) set the tone through a critical evaluation of epidemiological parameters contributing to development of site specific IPM strategy that included AUDPC, loss modeling and forecasting. Potato leaf blight, apple scab, DNA sequencing, synoptic analysis on field problems were taken as examples. The influence of PA was conceived as an IT strengthened agriculture management system, using GIS for nematode sampling. *Prof. S. K. Mukhopadhay* (Viswa Bharati) presented an overview covering a wide agenda that included biotechnology, herbicide resistance, development and use of bioherbicides, microbial toxins and allelochemicals genetically engineered microbes as softeners, site specific weed management, remote sensing, GIS and GPS for their use in mapping the weed population. *Dr. Abraham Vergheese* (IIHR, Bangalore) gave a detailed view on picture on farm level implementation of IPM on fruit fly. He emphasized on area wide IPM instead of individual farmer based one. Jaggery and banana were found to be best baits for fruit flies. The economics of this technology was reported to be highly promising with a Cost Benefit Ratio of 1: 7. He also reported development of an indigenous bottle trap named "**IIHR bottle trap".**

Dr. C. Chattopadhyay (NRC Mustard, Bharatpur) presented forecasting models for major diseases and aphids of oilseed brassicas based on the pest incidence data of various regions and their correlation with abiotic factors data from near surface of Advanced Very High Resolution Radiometer TIROS (Television and Infrared Operational Satellites). Garlic (*Allium sativum*) bulb aqueous extract (1% w/v) application based on forecast of the aforesaid parameters helped in tackling the pest menace. Similarly, *Dr. D.K. Das* (NRC-IPM) discussed the weather based forewarning of gram pod borer, *Helicoverpa armigera* in chick pea and pigeon pea. His team has developed thumb rules using the pest population and monthly rain fall data collected during 1983–1995 at ICRISAT, Hyderabad. Similar models for this pest were also developed for other Agro-climatic zones like Punjab (cotton–chickpea), Central and Western Uttar Pradesh (chickpea). *Dr. Amitava Banerjee* (BCKV) discussed incidence pattern of pulse aphid, *Aphis craccivora* and its natural enemies on green gram in lower gangetic plains of West Bengal. He observed that highest incidence of syrphid and Chilomenes predators were coincided with peak population of aphid.

Prof. Ramesh Chand (BHU) narrated how to exploit slow disease development traits for IPM. He has found that the traits responsible for slow disease development are component based and highly heritable with the genes regulating the slow disease development being limited to 2-4 genes in most cases. This will help plant breeders select for yield traits with slow disease components from a segregating population. These factors have been successfully identified in wheat rust. He emphasized the need for molecular markers to provide an added advantage for the pyramiding slow disease components under one head. *Dr. N.A. Khandekar*, BCSIR, Bangla Desh narrated the role of biopesticides in the suppression of major insect pests and yield of oilseed crops under different climatic conditions in Bangladesh. He found that the treatment of the mixture of Neem seed oil and sesame oil has controlled sunflower pests, viz., *Spilosoma obliqua, Heliothis armigera* and *Epilachna septima* and yielded highest. *Dr. P.P. Ghosh* (Viswa Bharati) discussed disease management options against bacterial wilt of potato in red and lateritic region of West Bengal. Whole tuber planting and supervised management with well decomposed cow dung at land preparation, seed piece treatment with carbendazim + streptocycline and eradicative bleaching powder drenching along with eradicative banding with cow dung manure, oil cake, SSP and MOP (20:5:3:1) were the best treatment in terms of their responses to yield, disease management and higher returns. *Dr. AK Bajpai* (Director, CSTRI, Berhampur) elaborated on IPM of mulberry pests as deviced at their Institute.

Dr. A.K.Chowdhury (UBKV, Cooch Behar) reported the serological changes that are associated with induction of resistance in soybean plants following treatment with phytoalexin inducers. *Dr. R. Goswami* (RMVU, Narendrapur) elaborated the role of Farmer Field Schools (FFS) in implementing IPM and their role in providing sustainable livelihoods. He narrated the changing trend and present status of FFS functioning, experiences drawn from all over the world. He detailed the concept of sustainable livelihoods framework and tried to incorporate the FFS functioning within it. Finally, the Chairman *Dr. Bambawalle*

elaborated on the need for promoting biopesticides through development of adequate R & D facilities failing which the products in the market are quality poor, cost ineffective and have variable performance making development of meaningful IPM systems difficult. To cap it pest monitoring systems are often grossly inadequate; so are CIB registration and IPR related parameters of secrecy protocols. Finally, the synergies between Ministry of Agriculture, CIPMCs, SADs, SAUs and ICAR Institutes and Research Centres within and with private sector industries, entrepreneurs, KVKs, NGOs etc. need to be strengthened for promotion of biopesticides in IPM systems.

Session V on Biotechnological approaches to plant pest management was albeit brief yet loaded with quality output. Chairing the session, ***Dr. Indranil Dasgupta*** (DU) described a strategy for combating Rice tungro virus, using the DNA sequence of RTBV–ORF for generating RNA Cassette. He clearly established the low accumulation of RTBV and RTSV in transgenic plant which can also reduce the GLH–mediated spread of the viral complex. To develop transgenic RNAi mediated against RTBV, the ORF IV encoded by the virus was cloned in both sense and antisense orientation under a constitutive promoter in a binary vector. *Dr. Sampa Das* (Bose Inst., Kolkata) also working with rice tungro described how a leaf lectin of *Allium sativum* inhibits a endogenous bacterial protein symbionin of green leaf hopper which ultimately restricts the transmission of RTBV into rice plants. A chimeric construct of 25kDa *A. sativum* leaf lectin coding gene (ASAL) when transformed into IR64 inhibited detrimental effects of several insects in 2 lines. *Dr. S.K. Chakraborti* (CPRI, Simla) described several molecular methods for virus diagnosis in the laboratory. He also presented several important findings of their Institute related to differential degree of resistance in potato by using RB gene and PR proteins. Finally, *Dr. Amitava Mitra* (Univ. of Nebraska, USA) elaborated on the importance of broad spectrum resistance against multiple pathogens using the phenomenon of innate immunity and PR proteins as the target gene to be transferred. He described a powerful gene silencing method, DRIGS (Direct-Repeat-Induced-Gene-Silencing) which can bypass the use of cloning of sense and antisense strands of a gene in the same cassette. The discovery of DRIGS, he claimed has significance for dissecting the gene silencing mechanism and for efficient generation of silenced phenotypes useful for research and agricultural biotechnology products. Dr. Mitra said that they have used the DRIGS technology for obtaining simultaneous resistance against 8-10 viruses by linking small virus sequences to a silencing locus.

Posters: A stupendous 71 papers were placed under Posters divided into two sessions. To do justice to those excellent presentations, a competition was instituted for those willing and nearly 52 of them were assessed by a team of 3 experts, *Prof. M.R. Ghosh, Dr. N.S. Butter* and *Prof. N. Mukherjee.* The adjudged presentations were :

Gold Medal (First): *Sekharappa:* Biological control of earhead caterpillar, *Helicoverpa armigera* in sorghum.

Silver medal (Second): *Santhakumar, M.V. et al*. Development of weather-based forecasting models for major mulberry pests in Murshidabad district of West Bengal.

Bronze medal (Third*): Dutta, S. et al*.: Evaluation of biocontrol potentiality of native plant growth promoting bacteria against *Rhizoctonia solani* mediated damping off disease of tomato.

All winners were given a medallion and a certificate.

Plenary: *Dr. Satyabrata Maiti* (Director, NRCMAP, Boriavi) chaired the plenary & co-chaired by Dr. OM Bambawalle. They summed up the salient features as presented in the plenary session and pointed out following recommendations. It was to be hoped that the relevant authorities will give due cognizance to these recommendations and action thresholds defined for future improvement in our existing pest management systems:

A: The developments in molecular diagnostics of plant pests be given due recognition through generation of facilities and adequate training at all relevant Centres where plant protection is immanent.

B: More practical liaison with the Industry be established if necessary through NGOs to develop a synergy that will provide proper guidance to the end stakeholders of Agriculture – the farmers.

C: .More, stringent parameters be set for quality marketing of biopesticides. For this, scale up procedures may be developed skillfully identifying quality markers and provided to business groups and monitored on site.

D: Plant disease managers may look for something more from our rich, biodiverse strata and give up there overdependence on Trichodermas that are normally poor competitive saprophytes and hence require a very high cfu to be effective – a cfu that is difficult to maintain in the soil microbial milleu for any significant period.

E: IPMs may continue to be deviced with minimal use of pesticides till better options of biopesticides become available.

F: Biotechnological possibilities of harvesting resistance may be explored more intensely in the laboratory while developing systems of tracking the gene flow in nature for their untoward impacts, if any and keeping the people's perception in view.

It was agreed that the Symposium has been very timely and meaningful and has helped significantly in delineating areas of plant protection that needs to be attended to on a long term basis and there be an annual re-evaluation of the sectors achieved while defining more emerging problems as they become apparent.

The Session and the Symposium ended with a word of thanks from the secretary, AAPP, Dr. Santanu Jha.