
Proceedings of National Symposium on “Plant Pathology in Genomic Era”

held at IGKV, Raipur during May 26-28 2014

The 66th Annual meet of Indian Phytopathological Society and National Symposium on Plant Pathology in Genomic Era was held from 26.05.2014 to 28.05.2014 at Indira Gandhi Krishi Vishwavidyalaya, Raipur. The inaugural ceremony commenced with the National Anthem followed by invocation and lightening of the lamp by honorable dignitaries. The Honorable Vice Chancellor of IGKV, Dr. S. K. Patil who presided the inaugural session welcomed the august gathering of delegates from all over India. Thereafter Prof. Pratibha Sharma Secretary, IPS enlightened the gathering about history and legacy of IPS and also some stalwarts who have been torchbearers of Plant pathology igniting and inspiring the whole generation with scientific temper for years. The theme of the Symposium was brought before the audience by Dr. U. S. Singh, Senior Scientist and South Asia Regional Project Coordinator IRRI Phillipines.

IPS recognition award 2013 was conferred to Dr. D. V. Singh, Dr. S. J. Kolte and Dr. V.S. Trimurthy for their immense contributions in the field of Plant Pathology.

The keynote address on Recent Advances in Integrated Disease and Pest Management was given by Dr. Peter Kenmore, Representative of FAO, UN. He exemplified the examples of Mizoram and Meghalaya as states wherein there has been a huge decline in the use of insecticides without compromising with the yield *per se*. Near about 65% use of insecticides in India is unnecessary from crop yield point of view which could be brought down to reduce the production cost in farming.

Dr. U.S. Singh in his presidential lecture stressed on the management of plant diseases by developing high yielding varieties coupled with resistance against biotic stresses through intense resistance breeding programmes led by advances in biotechnology and genomic research. The need of the hour is to bring a decline in dependence of pesticides and insecticides.

Post inaugural session the series of memorial award lectures were delivered.

Professor B. B. Mundkur Memorial award lecture was delivered by Dr. T. R. Sharma on the topic “Decoding Plant Genomes for Mining Disease Resistance Genes”. He emphasized on use of genome sequences for in silico identification of SSR and SNP markers, mapping of different genes as well as designing gene specific primers for the cloning of genes and allele mining in related wild species and land races. Rice blast resistance gene Pi54 mapped in Tetep rice line and linked with specific DNA markers has been introgressed in mega varieties of rice using MAS.

Professor S. N. Dasgupta Memorial award lecture was delivered by Dr. H. S. Prakash, on the topic “Perspectives of seed health in genomic era”. The change in seed health testing procedures with time from conventional to serological and nucleic acid based methods was highlighted. Nuclear Internal transcribed spacer (ITS) as fungal barcode and 16S rRNA as bacterial barcode could be one of the major identification tool. Viral diagnostics should be based on serology complemented with amplification of specific genes.

Professor J. M. Dastur Memorial Lecture was delivered by Dr. Prasoon K. Mukharji on the topic “Trichoderma Genetics, Genomics and Beyond”. He emphasized on the importance of diversity of Trichoderma at species level wherein about 200 species have been reported. Different mutants can be induced by radiation. Genomics driven future research for identification of traits associated with particular strain, development of molecular markers for early screening, and identification of novel secondary metabolites with their far-reaching role in agriculture and medicines. He also compared the genome of *T. virens*, *T. reesi* and *T. atroviridae*. *T. virens* and *T. reesi* has two siderophore gene clusters while *T. atroviridae* has only one siderophore gene cluster. *T. virens* endochitinase induce defence pathways in plants.

Professor A.K. Sarbhoy memorial award lecture was presented by Dr. M.K. Naik on the topic “Exploring broad spectrum antibiotic genes of fluorescent *Pseudomonas* in sustainable disease management. He emphasized the application of bio-control agents and PGPR as the most important “green approach” for food security. He also explored various antibiotic producing fluorescent *Pseudomonas* for crop disease control. More particularly “phenazine” isolated from *Pseudomonas aeuroginosa* was effectively applied against sheath blight disease rice. He elaborated about different formulations of *P. putida*, compatibility of bioagents with fungicides, insecticides and botanicals. The IPM schedule developed by him for chilli disease and its success story impressed the gathering immensely.

Furthermore on 27.05.2014 the symposium commenced with the lead lecture by Dr. S.J.Kolte on the topic “Opportunities and challenges to plant pathologists: the past and future prospects in sparking newer green revolution”. He revisited the classical era of plant pathology and the pioneering work done by Stalkman and Harrar which led the foundation of resistance breeding. He stressed on the preparedness of plant pathologists so that they can be a step ahead to combat the biotic stresses.

Thereafter Professor **M.J. Narasimhan Merit Award Contest was held wherein participants selected from different zones contested**. The session on Merit Award Contest has moderated by Dr. D.V. Singh, Rtd. Head, Div. of Plant Pathology, Dr. Dinesh Singh, IARI, New Delhi and Dr. A. Kumar, IARI, New Delhi.

The candidates who contested for the merit medal were Mr. G.S. Arun Kumar, UAS, Dharwad, Mr. Sandeep Kumar, IARI, New Delhi, Mr. Kuldhar, D.P. VNMKV, Parbhani, Miss Pushpanjali Wagh, JNKVV, Jabalpur and Miss Sanghmitra Baghel, IGKVV, Raipur. All five contestants observed the time limit of 15min. Diverse research findings ranging from slow rusting mechanism and variability in wheat leaf rust pathogen, grapevine leaf roll viral disease, management of Sclerotium rot, selection of Alternaria resistant callus of *Lepidium sativum* and Tricoderma formulations were presented. The presentation came to an end at 13.22 hrs with the remarks by Dr. D.V. Singh who complimented all the students for their scientific merit and quality of presentations were evaluated by a panel of judges.

Post M.J. Narasimhan Merit Award Contest a series of oral presentations were delivered.

The session was started with a lecture given by Dr. V.G. Malathi, Adjunct faculty. TNAU, Coimbatore on Host/Virus genomics: harnessing data for better productivity. The concept of genome block buster of next generations sequences (NGS) of DNA was explained thoroughly. The advantages of NGS being cheapest, CG cost of 8000 in 2013 capacity. Time saving (45 hrs). She also explained how genomics are useful in *Vigna radiata* (Mung bean). She also explained about application of genomics to meet challenges of plant viral disease management. Metagenomics are going to be very important especially in viral populations. She also explained about some disease of unknown etiology like citrus chlorotic dwarf (ds RNA) where new genes in virus was isolated, etiology of pigeon pea sterility mosaic (established as Emaravirus). Totally unknown virus like gay feather mild mottle virus, etc. have also been reported. She also explained about Ecogenomics i.e. about air borne viral diversity. Air samples collected from residential/industrial complex and rain water from Korea contains ssDNA geminivirus. Similarly sewage from Nepal, USA, Thailand was analysed and found that they contain 29 eukaryotic virus viz. alpha-flexiviridae, Beta-flexiviridae, sobemo, secoviridae, Tombusviridae, Tymoviridae, Virgaviridae. Further viroid pathogenicity was also discussed especially in Hopstunt viroid and Grape yellow spot viroid involved in methylation of siRNA in negative strand of viroid resulting in altered host genome expression and abnormalities.

The second lecture was given by Dr. Praveen Verma, NIPGR, New Delhi on the topic "Genomics of Phytopathogens: fungal effection and beyond". He explained the immunity in plants. Effectors as pathogen weapons, and how effector innovations lead to enhanced pathogenicity, host jump & modification host cell structures, metabolism & functions. These effectors suppress plant immunity by suppress defense signalling and preventing recognition of other effectors.

He also explained genomics of biotrophs and necrotrophs. The chickpea genome as a good model system. *Aschochyta rabei* (*Aschochyta* blight) is a necrotrophic pathogen when studied thoroughly studied organism. The movement of Ar 93 EFP (Effector yellow fluorescent protein) is in response to H₂O₂ & causes hypersensitive response. The yeast secretion trap

analysis of Ar93, construct for root uptake assay of Ar 93 and translocation of Ar 93 by *Plasmodium beghei* was explained. The knockdown and knockout of Ar.93 effector in *Aschochyta rabie* virulence was studied. The Plant specific ATH transcription factor & Ar.93 interact with each other. Beyond effectors host-induced gene silencing (HIGS) is also useful in controlling diseases.

The third lecture was delivered by Dr. Anil Kumar Vivision of Plant Pathology, IARI, NewDelhi on topic entitled “Pathogenomics : genome sequencing of nationally important Plant Pathogens. He explained about importance of Pathogenomics, it’s international status and national status etc. The microbe life as a pathogen was discussed and their genomics studies have contributed immensely towards the understanding. More than 40,000 (42,000) genomes have been sequenced from 1995-2014, mostly bacterial genes because they are cheap. He stated that in prokaryotes 1608-Bacillus, 1032-Pseudomonas, 206- Xanthomonas, 55- Agrobacterium, 45- Ralstonia, 29-Erwima have been sequenced. In eukaryotes, 81- Puccinia, 55- Phytophthora, 43- Colletotrichum, 38-Fusarium, 16- Cochliobolus, 15- Magnaporthe, 11, Rhizoctonia was sequenced. Yeast genera was studied by 7600 scientists in >100 labs in the world. The cost of sequencing a bacterial genome is only 1 Lakh. Hence it was suggested that every M.Sc. student in Molecular Pathology must analyse atleast one pathogen. At national level 153 projects are going on, duplication of projects as in case of Redgram has to be ended. In this omics era, (i.e. genomic Proteomics, Metabolomics, Transcriptomics), the pathogen virulence genes are important targets in future. He finally suggested that, writing of pathogenomic projects profusely, culture deposition, sharing of resource and deposition of information of data in public place and without back up culture in Public domain is of no use. Clear cut post genome strategies for usage of data must be in place. Pathogenomic as a course curriculum in order to prepare younger generations should also be in place. Greater collaboration among handlers of organism and handlers of sequence data is very essential.

The fourth speaker was Dr. R. Aggrawal, National fellow, IARI, New Delhi on the topic entitled “Genome wide analysis of *Cochliobolus* sp to understand host specificity/non host specificity of these pathogens to different cereal crops”. She explained the host range of *Cochliobolus* viz Corn, Oat, Barley, Sugarcane etc. Race T-in 1970 devastated 50% of maize crop. In Victoria oats Pc2-victorin acts as elicitor. *Cochliobolus sativus* earlier used to be necrotroph-but now it is hemibiotroph. She also explained about SNPs between *C. heterophorus* (ch) strain C5 & other strains the barley strain NQ93-1 Avr strain etc. Inbreds of *C. heterostrophus* strain has fewer SNPS i.e. 1584. She further discussed abot *C. heterostrophus*.

As fifth speaker Dr. G.P. Rao, Principal scientist, Division of Plant Pathology, IARI, New Delhi explained on Mixed Injection and national spread of *Phytoplasma asteris* – and identification of *Phytoplasma* by using Primer PI/PG in Nested PCR Analysis.

As a 6th speaker Dr. Rajan Trivedi, Dupont stated that 20-40% of Potential food production are being lost due to diseases. He explained the mode of action of Azoxystrobin, Picoxystrobin thoroughly.

As last speaker Dr. T. Maakesh Kumar, CTCRRI, Trivendrum explained on Mining of complete genome of Dasheen Mosaic virus & traces of other viruses from *Amorphophallus paeonifolius*, Complete nucleotide sequence of Dasheen Mosaic virus (DSMV) was 10023bp.

The session was concluded by remarks from Dr. Pratibha Sharma, Secretary, IPS who thanked all the distinguished speakers.

Post lunch there was poster session wherein posters of all the themes were clubbed together and evaluated by a panel of judges. A total of 58 posters were presented from 13 technical sessions including new generation of fungicides & genomics, epidemiology and plant disease forecasting, microbials as potential drugs, emerging plant disease, resistance breeding, molecular diagnostics, mushrooms and disease management. Out of 58 poster presented there are five posters selected for prize as follows: SSR PO6: Kale Sonam suresh rao (IGKV, Raipur Efficiency of different *Trichoderma*. isolates on plant growth promoting activity in rice. TS10 PO4: A Jeevalatha (CPRI, Whukla) SYBR green based duplex q RT- PCR detection of tomato leaf curl new delhi virus-potato with potato virus X and PLRV. TS3 PO2: G.S. Arun Kumar (UAS, Dharwad) Performance of wheat genotypes over years against leaf rust caused by *Puccinia triicina*.

Consolation prizes were also judged to TS9 PO7 :Kadutanvi Pradeep Rao (IGKV) In-silico analysis for Xa13 and its introgression in Poornima by marker assisted breeding. TS9 PO4: Vaibhav Singh (IARI) Identification of wheat genotypes resistant to yellow rust at seedling and adult plant stages.

Post Poster session again a series of oral presentations were delivered.

The first presentation was made by Dr. Saktivel, Scientist from CARI, AGN. He elaborately presented the host range of 14 isolates of *Ralstonia solanacearum* belonging to biovar 3 and biovar 4. All the isolates belonged to pathotype I. The sequencing of housekeeping genes brought out new alleles of these genes. Phyloanalysis of the isolates in relation to available database, floated a hypothesis that the pathogen may have moved from Kerala/Chennai to A&N islands.

Second presentation was delivered by Dr. A.N. Tripathi, on the detection and characterization of *Sclerotium* affecting *Hibiscus sabdariffa*. Different bioagents were evaluated against the pathogens by dual plate method and the effective *Trichoderma* isolates were NBA II TV 23 R MTCC 3144.

Next presentation was made by Dr. J.J. Nageswar on the advances in sorghum mold research. He told that though more than 40 fungal genera are associated with the disease, *Fusarium* sp are

the most important one. He reported spraying of plain water on ears at maturity stage as a very easy and effective method to induce disease, for screening programmes. He also reported refined 1-9 scale for disease screening. He stressed on development of white grain varieties. New Az cytoplasmic hybrids hold the promise for the future. Further, another method of harvesting at physiological maturity stage, followed by artificial drying was also proposed for reduce the disease. Variety PVK 801 can act as source of resistance for future resistance breeding work.

Dr. Robin Gogoi, presented next lecture on Nanoform of triazole fungicide, Nanohexaconazole against *R. solani*. He told that besides being highly effective at lower concentration the formulation was compatible with bioagent *Trichoderma*.

Dr. Dinesh Singh, made on elaborate presentation on the occurrence of bacterial wilt in India. Biovar 3 is found to be more prevalent than biovar 4, and can be detected through multiplex PCR, ERIC, MLST etc. The disease can be managed by integrated use of cultural practices, biofumigation, use of resistant varieties, avoidance, use of antibiotic bacterial antagonists alone or in combination with bleaching powder.

Next presentation was made by Dr. R.K. Sharma on the detection and characterization of causal agent of false smut of rice. 12 isolates cultured on Potato sucrose medium was standardized at 6.0-6.5 pH. The pathogen diversity has been characterized based on microscopy & SEM and through RAPD. Standardization of artificial inoculation technique "injecting spore suspension" is also reported.

Dr. R. Ramesh, presented the next lecture on screening of 8 crops from 6 states, against different biovars of *Ralstonia solanacearum* causing bacterial wilt. He screened 57 lines and found Utkal Madhuri, Swetha and Surya as resistant ones, through soil drenching method. Segregating F4 generation population have been achieved through crossing of surya (R) and Agassaim (S) varieties .

Next presentation was made by Dr. TSSK Patro on the prevalence of different disease on small millets occurring all over India. The major diseases like finger millet brown spot and blast, banded blight, ragi mosaic, foxtail rust, kodo head smut, udbatta disease in kodo millet and leaf blight of barnyard millet were emphasized for the future research for their management.

The next presentation was delivered by Dr. P.N. Reddy, who enlightened the house on the performance of an elite *Pseudomonas fluorescens* strain Pf-I for management of major disease in dryland crops in A.P. especially against pathogens like *Rhizoctonia*, *Fusarium* and *Sclerotium*. The bioagent could be mass multiplied in FYM, paddy straw, sorghum burk etc. The seed treatment combined with folial spray; and application of booster dose of bioagent with FYM after seed treatment gave better disease control.

Dr. Deepa Khulbe, elaborately presented the etiology and characterization of causal organism of grain smut of barnyard millet, its microscopic characterization. The disease could be controlled by seed treatment with bavistin and mancozeb, and by manipulating the date of sowings.

Dr. P. Srinivas, enlightened the audience on the possible impact of climate change on emergence of diseases of fruit crops of uncertain and unknown etiology especially powdery mildew cracks, malformation, preharvest anthracnose in mango, fruit crack symptoms in guava and pre harvest anthracnose in banana. It was emphasized that prediction models based on favourable weather parameters for minor diseases should be prepared to identify susceptible area and preventive measures be taken up.

The next presentation was made by Dr. Vinod Kumar on diagnosis and characterization of leaf spot cum blight disease in litchi caused by *Alternaria alternata*. Seasonal incidence and pathogenic diversity has also been studied. This was the first report of the disease in litchi.

The final presentation of the day was made by Dr. D.B. Parakh, who explained in detail the significance of cryotherapy as a novel biotechnological tool. He also stressed upon the cryopreservation methods. He explained in detail the elimination process of infection cells by cryotherapy of short tips.

The session ended with thanks from the chairman of the session Dr. Dipankar Maiti

On 28.5.2014 some more oral presentations were made

Dr. (Prof.) R.M. Gade, Akola presented on the topic "Phytophthora diseases as threats to citrus industry". He explained the status of phytophthora incidence in citrus all over India, causing 10-30% losses. 20-50% loss in Nagpur mandarin and 62.5% seedling mortality in Coorg mandarin is reported. Three spp of Phytophthora are causing more than seven different symptoms. (*P. palmivora*, *P. parasitica*, *P. citrophthora*). Management can be achieved by soil solarization with LDPE 100 micron sheets. Tolerant root stock like Rangpur lime, selection of disease free propagation material, application of bioagents especially *Pseudomonas* sp. *Trichoderma* sp., have to be used for management of disease. He presented detailed characterization of bio agents and combination treatment modules.

Dr. C. Gopalakrishnan, IIHR Bengaluru presented a lecture detailing the significance of bacterial blight of pomegranate. In India the disease is prevalent in at least seven states, Maharashtra leading the list of most severely affected, causing 30-50% losses and up to 80-100% losses under congenial conditions. The management module developed under network project include clean cultivation, application of bactericides and botanicals giving rest period of five months, while providing bacterial treatment during this period, by BM 1%+streptocidre500 ppm+Coc 0.3%

Dr. R.P Pant presented a lecture on development of lateral flow device for easy detection of Cymbidium mosaic virus from field samples, utilizing polyclonal antibodies against coat protein gene of the virus, using recombinant technology. The PCAc were also used for DAS ELISA. Lateral flow immuno assay is user friendly and can be used in field for detection o the virus.

Dr. Pratibha Sharma in her lecture emphasized on “Commercialization of biocontrol perspectives in agents:” She presented the national and international scenario of microbial biocontrol agent production and utilization. She also explained the trends in Trichoderma research in India, which has been used in more than 87 crops. The requirement of commercialization are mainly practical technology, efficacy against pathogen, cost, and environment and health concerns. Proper bioformulation, and labeling is required too for the legal and effective commercialization. There is a urgent need of communication among the researches involved in development and commercialization of the biocontrol agents. For future, purity of strain, specificity of the strain, formulation methods, ecosystem analysis for the native climatic condition and application methodology have to be worked out extensively.

Mr Jyotishankar Prasad Rao, Insecticide (India) Ltd., presented the efficacy of the PULSOR against the rice sheath blight disease caused by R. solani. The active ingrediant Thifluzamide 24% SC is a new carboxynilide fungicide, which has a systemic action, inhibiting succinate dehydrogenase complex in the respiratory chain. There has to be prophylactic spray and at early infection stage for curative effect.

Post presentations a brain storming session on Plant Health Clinics: importance and scope” was organized on May 28, 2014.

Dr. M. Anandaraj finally concluded the session and emphasized on bringing out white papers.

Post brain storming session the new zonal presidents and counselors were appointed.

A new zone North east zone was proposed to be created for ensuring maximum participation of the scientific fraternity working in those areas.

Thereafter results of the M. J Narshimhan Award contest was announced which was given to Dr. Sandeep Kumar for his work on “Studies on virus(es) associated with grapevine leaf roll disease in India ”

Proceedings of Brain Storming Session on “Plant Health Clinic: Importance and Scope”

Post presentations a brain storming session on Plant Health Clinics: importance and scope” was organized on May 28, 2014.

Dr. Pratibha Sharma, Secretary, IPS welcomed the senior plant pathologists and all the participants and initiated the discussion on the topic.

Dr. U.S. Singh, President, IPS (2013)

Remote area farmers are most constrained to get their samples diagnosed. Most of the times scientists also get confused with the correct identification of disease. Can the plant disease diagnosis mimic the medical diagnosis? What may be the scope of mobile plant clinic? Through IPM modules are available it is different to be followed at field crops. There has to be ETL based recommendations for disease management. Five years programme on Plant Doctor Programme can be a possible strategy to develop a cadre to cater the need of disease diagnosis and management. There has to be some accreditation programme to accreditate the cadre (Plant doctors). May be few universities can start the programme and the IPS or similar societies can accreditate the passed out cadre.

Dr. M. Anandaraj, President IPS (2014)

In India despite having best of the talent pool of scientists and technologies the same do not reach the farmers. Targeting the market (Haat) place for interaction with the farmers coming from different villages could be one possible avenue. ‘Agropedia’ is a new initiative where farmer users can contribute his concerns and practices. Factors starting from soil nutritional states to climatic conditions and pathogen dynamics affect the plant health. Nutritional deficiency may also aggravate the disease. Besides developing the pool of cadres the idea of PDC be including ADG (PP), all AICRIPs, Director T.P. Rajendran.

Open discussion followed wherein inputs flowed from delegates.

Dr. M.K. Biswas, Visva Bharati, West Bengal: He shared his experience that plant chemical dealers are more accessible to farmers. Also some of the diseases are of unknown etiology and some of them are related to soil nutrition deficiency. So a team of scientists be included in plant doctor team.

Dr. M.P. Thakur, IGKV, Raipur: The research organizations based on a specific crops have several diagnostic tools especially for viruses, these tools are needed to be pooled at national level by IPS. Rather than training the farmers the pesticide dealers can be trained for being the advisory

point in the villages,. The dealer can call the expert when farmer raises a concern to the dealer. Use of ICT can be utilized for identification and recommendations.

Dr. P. Narayan Reddy, Hyderabad: IIIT Hyderabad already documented the diseases and developed the tools to take the symptoms from the field and send to expert to get recommendation. In India we have poor documentation of different diseases in different parts which may serve. We have lost the basics of diagnostic methodology so we have to modify the UG and PG curriculum with proper practical training. We do not have the basic diagnostic facilities even at premier institutes. CABI, DBT, ICAR – based project for plant diagnosis (2010) plant disease clinic for delivering diagnostic services to farmers though initiated has lost its sheen. PDC should have person with long field exposure. A. P. Govt came up with a programme to establish real time diagnostic services. We all should sharpen our diagnostic skill, under guidance.

Dr. C. Gopala Krishnan, IIHR, Bangalore: Pomegranate affected by BLB was diagnosed and treated by IIHR at farmers field. GKVK, UAS, state Dept, have PDCs sponsored by NHM, But there are not having very well trained personnel.

Dr. Pratibha Sharma, IARI, New Delhi: The PDC concept has to be totally oriented towards the farmers. The society can come with a white paper on diagnostic services which may go to the govt. for policy decisions. The PDC, also will create job opportunities.

Dr. A.K. Saxena, IIHR, Bangalore: Most of the scientists/researchers are not moving to field. Farmers are cheated by touts and they come in the scientist when the problem in aggravated. New molecular tools are now available and should be recommended to farmers. Networking of people may be initiated.

Dr. V.S. Trimurthy, IGKV, Raipur : Diagnostic and forecasting should go hand in hand.

Dr. Anil S. Kotasthane, IGKV, Raipur: We have to diagnose the disease before the disease sets in.

Dr. R.S. Mishra, NDUAT, Faizabad: A regulatory authority should be there to regulate the PDC

Dr. R.K. Sharma, IARI, New Delhi : We should concentrate only on detection and diagnosis.

Dr. T. Makesh Kumar, CTCRI, Thiruvananthapuram, Kerala: The information on disease pictures be put on the web by the expert institutes which can be linked to PDC call centres. Training programme on disease diagnosis has to be done. Persons from traditional universities may be brought in to the network of specialists.

Dr. T. G. Nageswar Rao: Post of extension pathologists can be created

Dr. M. Anandaraj, IISR, Calicut: KVKs have to be integrated in the system involve CIB

Dr. R.M. Gade, PDKV, Akola: Krishi doot yojna one person from a village trained for pest and diseases, seed treatment and disseminate the technology (Ratan Tata funded). The Krishi doot serves as the link person between scientists and farmers.

Dr. Dipankar Maiti, CRURRS, Hazaribag: Village level PDC personnel are needed. APDC course/diploma can be initiated.

Dr. S.J. Kolte, Pune: Agricultural practices have regular problems which may not be very easily diagnosed. Bench mark survey of agricultural practices should be undertaken.

Dr. B. Pushpavathi, ANGRAU, Hyderabad: Network project on diagnosis is the need of the hour. Plant health clinic and plant disease clinic distinction has to be done. Specialists on different crop/disease be identified. The consultancy provided at PDC should be free of cost.