Eighth international congress on plant pathology – solving problems in the real world – A report

J K Johri

Plant Protection & Quarantine, National Botanical Research Institute, Lucknow 226 001

Keywords: Plant pathology, Horticulture, Crops

A six-day Congress was organized at Christchurch, New Zealand from February 2-7, 2003 under the aegis of International Society of Plant Pathology (ISPP). The Conference was associated with Second Biennial Conference of Australasian Plant Pathology Society. The Congress was divided into five major sessions:

1. Key-note sessions;
2. Evening sessions;
3. Concurrent sessions;
4. Plenary sessions; and
5. Poster presentation sessions.

On 2 February, 2003 the Conference was inaugurated by the Mayor of Christchurch, Mr Garry Moore. While speaking on the occasion the Mayor stated that the New Zealand, being an important exporter of horticultural and allied products, has its own significance since only healthy crops provide the best benefits. Dr Ian Harvey, Chair of ICPP Organizing Committee, described in brief the Island Nation’s specific position in the world.

Key-note Sessions

Five key-note sessions one each day were as follows:

- Plant pathology in the Asia and Pacific.
- Towards integrated control of soil-borne diseases.
- Host-pathogen interactions and molecular plant pathology.
- Towards integrated control of air-borne diseases.
- Knowledge transfer for plant pathology.

Inaugural Session

The Conference started with Plenary session on 03 February, 2003 and chaired by Dr Peter Scott, President ICPP. Speaking on the occasion, Hon. Peter Hodgson; Minister for Research Science and Technology stated that it is an honour for New Zealand to host this conference. Dr Ian Harvey, welcomed the delegates, followed by Presidential Address on: “Bio-security Trade and Plant Pathology” by Prof. Lester Burgess, Sydney University, Australia. (President, Australasian Plant Pathology Society). He stated the fact that the significant changes in the World Trade had enhanced the importance of bio-security, which means protecting our natural ecosystem, crop and live stock.

He started that in the institutional framework bio-security means: (a) Legislation’s; (b) Administrative infrastructure, and (c) Research and extension.

The infrastructure is the crucial basis of surveillance and diagnostic capabilities. He stated that most countries are having large number of taxonomists which is an important problem. The major steps in this direction are: Pre-border protection; Border Protection; Research extension and surveillance; Incursion response and herbarium; and Risk analysis and trade.

According to Dr Burgess, geographic spread, detection, feasibility of eradication, and cost-benefit analysis are very important. New diseases can threaten the viability and economy of a country. This is also potential threat to natural ecosystems. The citrus canker, and sigatoka diseases entry in Florida and Australia are the main examples of such a problem. The key elements to success of bio-security are:

- Early detection;
- Prompt decision to eradicate;
- Molecular diagnostics; and
- Commitment of researchers.

He concluded with the remark that it is imperative to enhance the regional co-operation and trade liberalization while ensuring the bio-security.
Later, while concluding the session Dr Peter Scott, President, ICPP stated that the bio-security is important to obtain global food security.

Key-note Session 1—Plant Pathology in Asia and Pacific

The session I was chaired by Dr Peter Scott, President, ISPP. Prof. Changyao Shen, Regional Plant Protection Director and Executive Secretary FAO Regional Office for Asia and Pacific presented the status of plant diseases and progress in improving plant disease management of Asian farmers. The presentation was made by Dr John Hadley of Christchurch on his behalf. In his address, Dr Shen stated that problems caused by plant diseases are represented in terms of economic losses. The diseases can survive in the germplasm and the disease management specifically has three major components, i.e., (i) Genetic recombination; (ii) Regulatory measures; and (iii) Integrated disease management.

The role of educating farmers is quite important in Asian regions as many of them do not understand a difference between a pest and predator. The ISPP has set several international standards for disease management which involve phytosanitary measures, conceptual standards, transparency of regulatory measures, emergency prevention system. There is an urgent need of declaring an alert list of plant diseases for the Asian farmers. Lastly, he said that IPM activities have lead more countries and farmers to develop IPM for plant disease. The emergency prevention system for trans-boundary animal and plant pests helps to improve the efficiency and timeliness disease control.

Prof. Thira Sutabutra, President Kaestart University, Thailand detailed about educating Asian Plant Pathologist to meet the challenges of the twentyfirst millennium. He stated that there is an urgent need to educate Asian farmers. It is unfortunate that GMO’s which are the future of plant diseases are not known to Asian farmers. Asia is a paradise for plant diseases because of its tropical climate. The diversity of the pathogens is quite high. The inputs are very low and farming is a profession of small farmers. The twenty first century needs to be global. There is an urgent need for educating the farmers about the new tools, holistic approach, and intelligent practicum management (IPM) instead of old ways, i.e., producer-market and consumer-oriented. There is a need to search for pathogen derived genes and natural resistant genes for sustainable agriculture. The Asian Plant Pathologists should be well versed about plant diversity with a developed information network which can only solve the problems.

Paul Teng, Vice-President of World Fish Centre, Malaysia detailed about the partnership to meet the challenges of research and technology development for the disease management in the Asia. He discussed about the challenges the partnerships for Research and Technology Developments and issues of successful partnership. He informed the ratio of labour: land has declined sharply. In 1960, whereas it was 1:2, it declined to 1:4 by the year 2000 and by the year 2050 it is expected to go down to 1:7. It, therefore, means that we will have not only to reduce losses to meet the challenges of growing population but also to manage the environment too. The intensification has resulted in pest outbreaks since the minor pests have become the major problem. Intensification problems can only be solved by modern technologies which accounts for biotechnology and information technology. The stakeholders in the agriculture and food scenario are Government, Private Sector and Information Sector i.e. (NGO’s). There is a need for partnerships between government and private sector and government and NGOs only then the problems of Asian Plant Pathologists can be solved.

Key-note Session 2

‘Towards integrated control of soil-borne diseases’, was the session, chaired by Dr R James Cook which was quite informative. Prof Matteo Laito’s talk on genes from mycoparasitic fungi as source for improving the resistance to plant root pathogens was also useful. India, having a rich diversity of root pathogens, has a pool of new genes which can be attempted for improving the crops by biotechnological applications. The role of organic farming for the management of diseases was described by Prof. Asiana Van Bruggan of Wageningen University, the Netherlands.

India had it right from the ages and the west is now transferring us the same. We must resort to our ancient traditions and culture along with modern biotechnological tools which can help us in a big way.

Key-note Session 3

The session on ‘host-pathogen interactions and molecular plant pathology’ was chaired by Prof. Richard
Oliver and supported by Dr David Guest and Dr Barbara Howell. There were in all three presentations in this session. First speaker, Dr B A McDonald of Institute of Plant Sciences, Zurich described that how the pathogen genetic diversity can be used for disease management. He stated that five evolutionary forces interact to affect the “risk” that a pathogen population will evolve to overcome the central methods. The durability of the resistance genes is due to nature of the pathogen population, rather than to nature of resistance genes. The framework can be used for breeding for disease resistance. The next speaker was D P Klessig of Cornell University, USA, who detailed about key enzymes in salicylic acid (SA) and nitrous oxide mediated signal transduction in plant defense responses to pathogens. The experiments were done with tobacco as the host. The effect of the pathogens on the activity of these variants was considered and related with the pathogenesis. It was concluded that the variant P is the pathogen-inducible NOS (iNOS) of plant is provided by demonstration that inhibitor of P-protein of glycine decarboxylase block iNOS activity and that the Arabidopsis variant P protein produced in E. coli or baculovirus infect cells has NOS activity. The last speaker of the session Dr E Lam of New Brunswick, USA detailed about the hypersensitive response (HR) and defense coordination. He justified that HR is a complex phenotype which is manifested on the activation of plant defense against invading pathogens. It is actually expression of chemical and molecular markers of plant defenses. It includes the signaling molecule salicylic acid (SA) and synthesis of pathogenesis-related proteins (PR), some of which have the gluconases and chitinases activity. He stated that more recently there is evidence of caspase-like protease (CLP) activity to induce the cell death which expresses itself in the form of necrosis as a phenotypic symptom.

Key-note Session 4

The session titled 'Towards integrated control of air-borne diseases' was chaired by Prof. Larry Madden and supported by Mark Braithwaite. The session had three presentations. Dr M L Gleason of IOWA state University, USA, detailed about the disease warning systems based on the site specific weather data. These are mostly used to eliminate the estimated crop risk. Although many systems have been worked out but only few are used by the growers. The labour inconveniences and unreliability of do it yourself weather monitoring are the major barriers to the wider implementation of warning systems. The detailed relation to spray of fungicides for management of sooty black and flyspeck on apples were discussed and presented.

Dr H Scheem of Oregon State University, USA detailed about the plant pathogens in the changing world. He stated that the emphasis is always on the analysis of time series data to document changes in species phenology or distribution in response to the climatic changes that have occurred during the past five decades in the area. In addition to the search for climatic change related signals in ecological data sets, broader indicator of bio-sphere changes such as, non-indigenous species invasion and biodiversity loss, have received increased attention recently.

As such the new pathogen invasions take place in the new hybrid species. Thus, understanding interaction between changing global conditions and biological yield constraints will aid in the development of sustainable systems. Dr M C Roberts of Scottish Agricultural College, the UK discussed the integrated approaches to understanding and control of diseases and pests in field crops. He described that ecological view of crop disease management is very important in IPM strategies but it all together depends on what constitutes the niche and to what extent the decision makers can choose the manner and extent of exploitation of niche which they wish to protect? Thereafter he suggested that it is important to consider the farmers and their wider socio-economic circumstances as part of the niche which is exploited by the pests and diseases. This view is based on several studies in tropical and temperate climates.

Key-note Session 5

Session on 'Knowledge-transfer for plant pathology' was chaired by Dr Nigel Hardwick. There were three presentations in this session. The first speaker of the day, Dr Stewart discussed about the issues and challenges for plant pathology education and extension. Dr Stewart stated that in 2001, an ISPP sponsored online symposium brought plant pathology teachers and extension personnel together to discuss information technology as it applies to their activities. There was a difficulty in teaching plant pathology in the developing countries. He stated that publishing the information via web and DVD/CD-ROM is less expensive as compared to traditional print media. These are particularly useful for the developing countries where the computers may be available but the communication infrastructure is meager. As the connectivity increases, there may be more sharing of knowledge and problems.
Dr M P Srivastava from India discussed and co-related the plant pathology knowledge for rural prosperity. It is a fact that the volumes of cultivable lands are shrinking and therefore there is greater need for sustainable agriculture. Diseases account for almost 30 percent losses and if these can be managed than one can except rural prosperity. Dr Srivastava pleaded that the training forms the initial point in information transfer. Emphasis is needed in diagnostics and integrated disease management through well organized plant clinics. Since seeing is believing the technology transfer may be demonstrated with great impact. Seed treatment, a low input technology, must be popularized. Technology information centers may be established where farmers can visit frequently. A regular feed back from the farmer too may greatly augment agricultural production in a developing country like India.

The last speaker, R Ausher presented the new concept of Areawide Pest Management (APM) in Israel to overcome the deficiencies of commodity based-integrated pest management. APM can address large spatial dimensions and affecting systematically numerous pest generations, can devise more selective control practices. APM address a multiple pest - multiple crop situations and incorporates a regularly monitored insect management strategy to reduce the alternative exposures to pesticides. According to Dr. Ausher, second generation of project was launched in 1996 and he concluded that defining annual pest control policy, selecting and training scouts, setting up trapping stations, and launching weekly meeting with growers, APM is really a new extension strategy.

**Evening Session**

Evening session, held on 03 February 2003, was meant for Global Food Security which was also chaired by Dr Peter Scott. The deliberation of the sessions were useful specially from Indian point of view. In this section speakers were Paul Teng, Dr Renweng, Prof. Zhanghing Chan Dr R Glen Andersen lecture was also delivered by Dr M. Velytham on behalf of Dr M S Swaminathan of Swaminathan Research Foundation, Chennai. Dr Velytham detailed the problem of resource poor farmers from India who have a key contribution for the global food security. He stated that there are many types of challenges, viz., Demographic challenges, Technological challenges, Ecological challenges, Economic challenges, Ethical challenges and Equity challenges infront of Indian farmers where more than 70 per cent of farmers have a holding of less than 2 ha. and these farmers make the need fulfillment to the tune of 62 per cent of production. Therefore these people need the institutional support, viz., supply of quality seeds and replenishment of the seed.

The vision for establishment of seed villages for the same was shown by Dr M S Swaminathan. These farmers also need to be well versed with modern technological developments.

Water resource augmentation is another grey area for these farmers and we know that various aspects of the diagnostics can benefit the developed as well as the developing countries.

The farmers need to be trained about the water saving technologies, judicious use of rain water and ground water, participatory irrigation management to obtain more crop for each drop. It can be achieved by community watershed planning and development, water resources augmentation, and micro-irrigation.

The last but not the least the farmers need to know about the judicious fertilizer uses which needs to be affordable facilities for their soil testing and soil health care system for the availability of proper plant nutrient supply.

The farmers need to be taught about the diversification of farming systems and value addition, viz. (i)Crop livestock integration; (ii)Food and Fodder security; (iii)Animal health management; and (iv)Group farming etc. With adequate credit facilities at soft terms.

Lastly, he stated that "the earth revolves round the plough".

**Evening Session 2** — This session held on 04 February 2003 had the following major sessions:

(a) The molecular and cellular biology of mutualistic fungal association.

(b) *Phytophthora* on tropical food crops.

(c) Teaching plant pathology.

(d) Karnal bunt.

(e) Common names of plant diseases.

(f) *Allium* diseases.

(g) Post-harvest pathology.

All these sessions were concurrent and the author participated in *Phytophthora* on tropical food crops which...
was chaired by Dr David Cook. There were many presentations relating to phytophthora diseases of Cocoa, potato and other related tropical food crops. The session concluded that the Phytophthora has lot of ecological variability and the weather plays an important role. Its management need to be based on prophylactics and disease forecasting because the diseases after infection progress so effectively and fast that the chemical management becomes tough and least effective.

The last evening session was on February 06, 2003 and following topics were discussed:

(a) Plant pathology extension for resource poor farmers;
(b) Post-harvest pathology;
(c) Phytoplasmas, spiroplasmas and xylella;
(d) New fungicides;
(e) Current topics in Biology and management of Verticillium;
(f) Epidemiology of plant pathogenic bacteria with broad host ranges;
(g) Downy mildews;
(h) GMO’s for plant disease resistance;
(i) Phytophthora in forests and natural ecosystems;
(j) Amateur growers and plant pathology;
(k) Crop-bio-terrorism.

There were useful discussions in the session specially the new fungicides which was chaired by Prof. T.S. Thind from Punjab Agriculture University, Patiala.

**Plenary Session 2— Daniel MC Alpine memorial address**

The session was chaired by Prof. Lester Burgees and the lecture was delivered by Prof. Mike Wingfield of University of Pretoria, South Africa on ‘Exotic Plantations Forests in the Southern Hemispheres’, increasingly threatened by the diseases wherein the impact of diseases leading to threatening plant species was described.

**Plenary Session 3 — Challenges of plant pathology in twentyfirst Century**

This session was chaired by Prof. Richard Fallon Prof. Mike Jegger of Imperial College (UK), presented tactical, strategic and policy based decisions in disease management. He stated about the remarkable advances in the fields of molecular plant pathology, computer sciences, and information technology that have been made in last two decades. The disease management is also influenced by developments in epidemiology. The studies on genomics of phytopathogenic fungi has great impact on the disease management strategies. This also depends on renewable out put and sufficient return can be expected out of these (a) Predictable and sustainable disease management is less dependent on ‘fossil carbon’ and (b) Translation of new knowledge and proof of concepts from these model systems to practical impact on 1000 diseases which humans are facing since ancient times. Lastly, the stated that science creates knowledge and commerce creates wealth. There is a need for development of collective vision to support an unassailable case for elevated public support to R & D with particular reference to crops and reasons beyond horizons of the translational commercial sector.

Dr IR Crute of Rothamstead Research Station Herpenden, the UK presented his views that will we have the healthier crops in the post-genomic world?

The challenges of diagnosis and control of plethora of crop diseases was taken up by those with their origin in agricultural sciences. Today the prospects of revealing answers to intriguing questions about intimate interactions between plants and their pathogens is strongly motivating for many plant and microbial scientists. At present, there is a primary challenge to align our two traditions so that the practical opportunities presented by progresses in technology and fundamental scientific understanding are gasped with vigour. To deliver these we must navigate the morass of regulations and protected intellectual property as well as confront the conflicting agendas of different nations and trans-national enterprises.

In the last presentation by Dr M N Infante, Department of Agriculture, Philippines the discussion was about the challenges for plant pathology in the twentyfirst century: People and plants. She stated that the NGOs and government together can reach masses and contribute effectively for the management of the diseases.

There were five quite informative poster sessions. The deliberation and participation in the concurrent
session, biological control of plant pathogens, was also informative and presented an opportunity to learn about the strategies for biological control of sclerotial pathogen which are of great significance from Indian standards, where these are the major constraints. The commercialization of biological control can also immensely benefit the world.

Concurrent session on molecular diagnostics for plant pathogen which was chaired by Dr John Marshall on 07 February, 2003 provided a deep insight into the problems and provided a great opportunity to learn a consortium of the biocontrol agent with the fungicide which may help in the long run to reduce the consumption of the hazards chemicals and reduction in the cost. It will help the environment management and the resource crunch farmers in their potential for their economic status.

**Recommendations**

(i) Plant pathology plays a key role in food security and therefore there is a need for biosecurity which will stop the unwanted movement from one place to another.

(ii) There is an urgent need for educating the farmers in Asian Countries.

(iii) Research and industry should join hands for better results.

(iv) IPM should be rightly defined as “Integrated Pest Management”/Intelligent Practical Management since the situations vary from place to place.

(v) NGOs, scientists and farmers should come closure to meet the challenges for “Solving the problems in the real world”.