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## MEETING REPORT

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### FIRST NATIONAL SEMINAR ON MOLECULAR PLANT PATHOLOGY

The recent advances in molecular plant pathology, a new discipline of plant molecular biology, have provided insight into the fundamentals of how plants interact with bacteria, fungi and viruses. Besides, studies of the response of genetically engineered plants to phytopathogens are a serious new development. The recognition of the molecular basis of virus infection resulted in a great burst of research activity, which is still on the upswing. Viruses provide much fascinating information and represent the ideal model system in molecular plant pathology. To take stock of research done in India in this area a national seminar sponsored by UGC and the University of Madras was convened at the centre for Advanced Studies in Botany, University of Madras, on 17 and 18 February 1989. Most of the lectures in the seminar were essentially 'stock-taking' and presented a shopping list of problems for the country.

Prof. A. Mahadevan, Director, CAS in Botany, University of Madras, drew attention to problems in molecular plant pathology relevant to India, and to the urgent need for research in areas such as molecular mechanisms of regulation of toxin and enzyme production in infected plants, hormonal regulation in infected plants, and plasmids and their role in infection. Structure-activity relationships in biocides, electron microscopic studies of plant pathogens and infected plants, use of gene cloning techniques in biological control of pathogens, and use of monoclonal antibodies for rapid identification of plant pathogens were also emphasized. Prof. Mahadevan also cautioned against the dangers of transgenic plants creating new races of pathogens and proposed a careful programme to evolve transgenic plants.

The first session, on molecular virology, was chaired by Prof. M. V. Nayudu, Department of Virology, S.V. University, Tirupati. He highlighted the necessity of biochemical and molecular investigations to explain some of the physiological and other effects seen in virus-infected plants and spoke about the production of resistant transgenic plants. Dr H. S. Savithry, Department of Biochemistry, Indian Institute of Science, Bangalore, elucidated the

structure-function relationships of icosahedral plant viruses and mechanisms of particle stability and assembly. Dr N. Verma, Lucknow University, discussed the non-phytotoxic natural antiviral protein (CA protein) extracted from *Clerodendrum aculeatum* leaves and its role in virus disease management through inducing susceptible cells to produce more antiviral protein. Frequent spraying of the same plant provided protection against virus infection and also improved crop yield. Dr M. Ramachandraiah, A.P. Open University, Hyderabad, gave a brief account of the natural occurrence of tobacco necrosis virus (TNV) in brinjal, tomato and Deccan hemp in various parts of South India. Dr T. V. Ananthanarayanan, Indian Institute of Horticultural Research, Bangalore, presented data on virus purification and isolation of double-stranded RNA from bunchy top virus of banana plants for use as a sensitive and powerful diagnostic probe. Mr K. Ulaganathan, CAS in Botany, spoke about plasmids in phytopathogenic bacteria and their characterization with respect to virulence, symptom development, and toxin and enzyme production, and about electron microscopic studies. Prof. R. N. Swamy, CAS in Botany, stated that other than in saprophytic fungi such as *Aspergillus* and *Neurospora* little work has been done on the molecular aspects of sporulation in phytopathogenic fungi.

The second session, on molecular aspects of disease resistance, was chaired by Prof. R. P. Purkayastha, Calcutta University. He advocated use of approaches involving monitoring phytoalexins and phytoimmunological plant substances in studies of disease resistance and for screening germ-plasm material for disease resistance. Dr R. Sridhar, Central Rice Research Institute, Cuttack, reviewed various mechanisms of resistance against blast in rice and reported a novel terpenoid phytoalexin in rice. Secondary products in plants and their toxicity to microorganisms were discussed by Dr P. T. Kalaichelvan, CAS in Botany. Prof. D. Lalithakumari, University of Madras, dealt with the molecular mechanisms of fungicide resistance. Single-gene or multigene-encoded resistance in phytopathogens to fungicides, and involvement of chromosomal and

extrachromosomal DNA in fungicide resistance were discussed. These findings have practical implications for the control of plant diseases.

The session on phytotoxins was chaired by Prof. K. R. Samaddar, Kalyani University, who presented the effects of elevated temperature on pathogen, host and the host-pathogen system. Elevated temperature induced susceptibility in rice bean to infection by *Macrophomina phaseolina*. Synthesis of pathogen-related (PR) protein, which is produced in infected tissues at lower temperature (25°C), was completely inhibited at elevated temperature (37°C), and this was discussed with reference to defence mechanisms. Prof. K. Manibhushan Rao, CAS in Botany, discussed the effect of the low molecular weight, non-enzymatic toxic metabolites, phenylacetic acid (PAA) and its derivatives, produced by *Rhizoctonia solani* the rice sheath blight pathogen. At low concentrations the toxins imparted resistance to rice against sheath blight by causing the accumulation of phenols and their biosynthetic and oxidative enzymes. Dr R. K. Arora, Central Potato Research Station, Ooty, reported the effect of endotoxins of *Phytophthora infestans* on the fungus and potato and on secretion of cytokinin in culture and by infected tubers. Prof. P. Vidhyasekaran, Tamil Nadu Agriculture University, Coimbatore, highlighted the role of genetic engineering and tissue culture in crop disease management and stressed the importance of tissue culture in developing disease-resistant plants.

Dr A. K. Sarbhoy, Department of Mycology, Indian Agricultural Research Institute, New Delhi, chaired the final session, on ultrastructure. He described the use of the scanning electron microscope in taxonomic studies of fungi. Dr N. Raman, CAS in Botany, discussed the importance of ultrastructure research on mycorrhizae, the methodology, and its status in India. Dr K. Murugesan, CAS in Botany, stressed the need for ultrastructural studies

of infected plants and its status in India.

Prof. R. Srinivasan, Department of Biophysics and Crystallography, University of Madras, spoke on developments in crystallography and X-ray diffraction studies of biologically important molecules, and suggested the need for the application of crystallographic techniques in plant pathological research. Prof. A. Gnanam, Vice-Chancellor, University of Madras, in his valedictory address, discussed the involvement of the transcriptionally regulated heat shock proteins (HSP) induced in *Vigna sinensis* by heat stress and the need for studies on the role of HSP in thermoprotection as well as the molecular mechanisms of induction of HSPs in higher plants.

The seminar proposed the following areas of research for investigation: i) mechanism of regulation of toxin and enzyme production in infected plants, ii) plasmids and their role in disease development in infected plants, iii) molecular biology of plant viruses, iv) use of gene cloning techniques in biological control of plant pathogens, v) application of antagonistic microbes as 'hyperparasites', vi) ultrastructure of microorganisms and infected plants, vii) molecular aspects of disease resistance. The need to train plant pathologists in the emerging areas of molecular plant pathology, the role of national agencies in funding research in molecular plant pathology, and a change in the teaching of plant pathology, with emphasis on molecular plant pathology, were also stressed.

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