

## Innovations in biosciences as applied to biotechnology\*

S. Krupanidhi (SSSIHL) in his welcome address stated that recent innovations in biosciences included somatic cell cloning, stem cell therapy, nanotechnology, etc. Presently, there is an exponential growth in the understanding of the subject of biology – gradually replacing chemical technology with biotechnology.

The keynote address was delivered by V. Mohan (Madras Diabetes Research Foundation, Chennai) on 'Genomics and proteomics in the field of diabetes'. Genomics facilitates preventive strategies in type 1 diabetes by identifying individuals at risk through a combination of genetic and auto antibody markers. According to Mohan, genomics also helps through gene therapy, which involves introduction of novel genes into cells, using gene transfer vehicles. Currently, complexity of diabetes pathogenesis is being closely studied and unravelled by proteomic studies. After the sequencing of the human genome, it is now clear that much of the complexity of the human body resides at the level of proteins rather than DNA sequences. It is estimated that on an average, human proteins exist in ten to fifteen different post-transcriptionally modified forms, all of which presumably have different functions. Much of the information processing in the healthy and diseased human cells can only be studied at the protein level, and there is increasing evidence to link minor changes in expressions of some of these modifications with specific molecular defects in diabetes, he further added.

In technical session I, Ramamurthy Rallapalli (Robert Wood Johnson Medical School, University of Medicine and Dentistry, New Jersey, USA) spoke on 'Immunodiagnosics and immunotherapy psoriasis: current trends in biotechnological interventions'. Psoriasis, according to the speaker, is a chronic, disfiguring T-cell-mediated skin disease. Extensive recent studies have shown that activated T-cells are involved in formation and maintenance

of psoriatic plaques. Administration of anti-CD 11a (hu-1124) antibody, anti-CD 80 antibody and anti-TNF-alpha (Infliximab) antibody to patients with moderate to severe psoriasis showed considerable improvement as reflected by decreased number of CD-positive T-cells, decreased keratinocyte iCAM-1 and k16 expression and dramatic reduction of epidermal thickness. Another speaker in this session was K. V. Sastry (S. N. Vanita Pharmacy Mahavidyalaya, Hyderabad). He spoke on 'Edible vaccines – the biotechnology marvel'. Vaccine means a painful experience with shots. If administration of vaccines is not proper, there may be inflammation at the site of administration. Biotechnology, according to the speaker, is answering this problem through edible vaccines. Plant-based vaccines are a safe alternative to using live attenuated or mutated pathogenic strains, because the subject is not exposed to any living organisms. Sastry discussed advantages of edible vaccines, like low cost of the vaccines, ease of producing large quantities in a short time, reduced processing technology, no storage or transportation problems, reduced risk of transmission of disease, better mucosal immunity, etc.

In technical session II, Ganesh Iyer (Ramanarayan Ruia College, Mumbai) spoke on 'Enzyme immobilization'. Immobilization of an enzyme, as he defined, is 'the imprisonment of an enzyme in a distinct phase that allows exchange with, but is separated from the bulk phase in which substrate, effector or inhibitor molecules are dispersed and monitored'. The advantages of immobilized biocatalysts, including reusability, stability improvement, making continuous process possible even at higher dilution rates, prevention of product contamination and so on, were discussed. Methods of immobilization like adsorption, covalent bonding, ionic bonding, co-polymerization, encapsulation, liposome entrapment, etc. were detailed in the lecture. The effect of immobilization of an enzyme on stability, various parameters and detailed application, failures as well as simple protocols for laboratory work were given by the speaker. K. S. Jagannath Rao (CFTRI, Mysore), another speaker in this session talked about 'DNA dynamics in brain: current and fu-

ture strategies in molecular biotechnology'. Rao said that there are new data on DNA stability, repair failure in aging brain, a few new findings like z-DNA, repair problems in neurodegenerative brain, and new fundamental data on gene-expression pattern in neurodegenerative brain. He tried to link DNA-brain behaviour and focussed on the following aspects – DNA damage and repair dynamics in aging brain, DNA topology in brain, mapping of gene-expression studies, etc.

In technical session III, Bharat B. Chattoo (M. S. University, Baroda) spoke on 'Genomics and proteomics in the study of plant disease'. Analysis of genomes, according to him, is being greatly facilitated by the availability of new methods of isolating mutations and carrying out experiments on gene functions. While traditional methods rely on isolating genes based on the information on their gene products, it is now becoming possible to isolate genes that are responsible for interesting characters, based on the information on their map location. Chattoo stated that methods of gene activation and gene disruption, and more recently, RNAi are being used to analyse gene functions. These techniques have provided a major impetus to studying problems that have remained intractable. In addition, proteomic-based methodologies are also being used to study functional aspects of genes predicted from various genome-sequencing initiatives. All biological processes depend on interactions between proteins and the mapping of such interactions on a global scale is providing interesting functional insights. One of the techniques that has proved itself invaluable in the mapping of protein-protein interactions is the yeast two-hybrid system. This system provides a sensitive molecular genetic approach for studying protein-protein interactions *in vivo*. Chattoo illustrated with examples, some of these tools related to the study of plant disease.

On the third day of the seminar, in technical session IV, there were four talks on mushroom biodiversity and cultivation by leading experts in the field. A dozen local farmers participated to learn the technical know-how of mushroom cultivation. T. N. Lakhanpal (Himachal

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Pradesh University, Shimla) talked about mushroom biotechnology. He said that there are around 2000 species of mushrooms which are reported to be edible from all over the world. About 350 have also been reported from India. Of these, cultivation technology has been developed for around 25 species. But only button mushrooms, oyster mushrooms, Japanese shiitake, jelly fungus and milky mushrooms are being cultivated on commercial scale. Button and oyster mushrooms and shiitake occupy the top place regarding production. The technology for their cultivation has been standardized and modified from time to time according to the needs. Different types of substrates have been tried

to make it an economically feasible venture. He discussed in detail the cultivation technology of a few mushrooms so that it can become a household activity throughout the country. Not only does it provide good nutrition, but is also a profitable economic activity. Meera Pandey (Indian Institute of Horticultural Research, Bangalore) spoke on 'Many facets of mushrooms'. According to her, mushroom culture is a biotechnological process which recycles ligninocellulosic wastes that can be converted to protein-rich food source (edible mushrooms), important source of many medicinal products (medicinal mushrooms), bioremediation (all basidiomycetes), lignocellulosic

degradation (white and brown rot basidiomycetes), for organic manure production, cattle feed and as a source for bioagent multiplication (mushroom spent substrate). India produces about 306.6 million tonnes of crop residue per annum. About 70% of the crop residue is burnt in the fields. This huge availability of crop residue and cheap labour are reason enough to have an efficient mushroom production programme, she added.

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## MEETING REPORT

### Guava symposium\*

Ashok Bajpai, Honourable Minister of Agriculture, Government of Uttar Pradesh, inaugurated the opening sessions of the First International Guava Symposium at Lucknow. In his opening remarks, he appreciated the efforts of the Central Institute for Subtropical Horticulture, Lucknow and welcomed the delegates from India and abroad.

About 200 delegates participated in the symposium. The scientists who participated from abroad represented Israel, France, Malaysia, Mexico, Venezuela, Germany, South Africa and USA. The deliberations of the symposium were divided into ten technical sessions, viz. current scenario in the guava industry, genetic resources and varietal improvement, biotechnology, integrated production system, organic farming, nutrient and water

management, integrated management of pests, integrated management of diseases, post-harvest technology and value addition, and transfer of technology and government programmes for guava development for domestic and export marketing.

G. Kalloo (ICAR) delivered a lead paper on global scenario of guava production, utilization and trade. The talk was mainly targetted on genetic resources and improvement, inter-specific hybridization, varieties, propagation planting density, pruning and rejuvenation. He also emphasized on researchable issues, particularly seedlessness, molecular breeding, gene tagging and genomics. The second presentation was by D. S. Rathore (HPKV, Palampur). He discussed the current status of propagation methods, micro-propagation, cropping pattern, planting density, training, pruning and leaf nutrient status.

During the second session on genetic resources and varietal improvement, S. S. Negi suggested the future line of work for widening the genetic base for effective breeding through inter-varietal hybridization involving less seeded triploid varieties with those of high yielding, better keeping quality and less seed content. He stated that emphasis should also be given to breed scion and rootstock separately for abiotic/biotic stress situations.

The variety TRY(G)1 of Tamil Nadu needs to be tried for diversification under sodic soil conditions.

The second day of the symposium, started with a technical session on biotechnology. There were three oral presentations during this session. The lead lecture was delivered by V. S. Jaiswal with emphasis on cryo-preservation, synthetic seed production, selection to screen salt-tolerant varieties as well as somatic embryogenesis for rapid plant multiplication. R. Chandra dealt with the need to engineer genes controlling ethylene biosynthesis for better shelf-life and insertion of genes encoding hydrolytic enzymes, viz. chitinase and glucanase for controlling fungal disease of guava. Rohde gave a detailed account for molecular characterization of 62 Cuban guava germplasm using AFLP and microsatellite DNA markers.

In the session on integrated production system, two papers were presented on forecasting harvest using spectral indices leaf-to-fruit ratio, rejuvenation and variation in fruit quality in relation to tree age and position on the tree. Fast multiplication of guava through wedge grafting, high-density plantation, canopy management and crop regulation was also emphasized by Gorakh Singh. The need to integrate

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\*A report on the First International Guava Symposium of the Society for Development of Subtropical Horticulture (SDSH), Lucknow held during 5-8 December 2005 at Hotel Taj Residency, Lucknow. The symposium was organized by SDSH and Central Institute for Subtropical Horticulture, Lucknow in collaboration with International Society for Horticulture Science, Mandi Parishad, and Agricultural Processed Food Products Export Development Authority.