

Plant biodiversity and its conservation*

A National Symposium on Plant Biodiversity and its Conservation was organized to make an overall assessment of plant diversity, identify the particular species of plants and suggest measures to conserve the rare and threatened species.

Nearly 150 scientists belonging to 50 institutions participated and presented their findings in three technical sessions: (i) Plant Biodiversity and its Conservation Strategies, (ii) Genetic Diversity including Physiological Diversity; (iii) Microbial Diversity. There were nine plenary lectures in addition.

In his keynote address, P. K. Khosla (Himachal Pradesh Agricultural University, Palampur) stressed the importance of biodiversity and its conservation. Biodiversity included all organisms and species, their genetic variations as well as their complex assemblages of communities and ecosystems.

Delivering the presidential address, Jasbir Singh Ahluwalia (Punjabi University, Patiala) said that ecological crisis is becoming so acute, that it has put a question mark on the very existence of life on earth. This was a phenomenon caused by man, being the by-product of urbanization and industrialization. Ahluwalia stated that the environmental concerns were well reflected in the 1992 Rio Earth Summit, but the blitzkrieg of globalization was moving fast in the opposite direction. What was needed was not merely new biotechnologies that would ensure 'sustainable development' using and still replenishing natural resources, but an attitudinal change towards nature of the kind enshrined in Indian philosophical and religious traditions that recognize nature as a living organism, with integral, inter-department bonds amongst man, flora and fauna on earth. Ecology and environment should be seen not merely as the external physical conditions for the survival of life on this planet, but add the constituent of life in all its forms.

In the first of the series of plenary lectures, D. N. Sen (J. N. V. University, Jodhpur) elaborated on biodiversity and ecological adaptations of desert plants. According to him, Rajasthan desert is among the ecologically important regions of India in the diversity of its biological species. The western Indian Thar desert represents a characteristic environment where plants have adapted to arid conditions. Sand dunes comprising vast mounds of shifting sand, devoid of plants and human habitats are very common. A considerable part of the Rajasthan desert contains some salt basins or lakes. The high soil salinity allows only a sparse cover of salt-tolerant species. He emphasized the need for plantation of native desert plant species on a large scale, for conservation and stabilization of sand dunes and plains and also to maintain native biodiversity. T. R. Sahu (H. S. Gour Vishwavidyalaya Sagar, MP) spoke on 'Biodiversity: Basic concepts and strategies for conservation'. Plant diversity as a global resource remains poorly understood, inadequately documented and often wasted, but still possesses immense potential for further development of natural products. With the explosive growth of human population, the life support system of earth is becoming increasingly threatened as the rate of global change accelerates. T. Pulliah (Sri Krishnadevaraya University, Ananthapur) highlighted the Pteridophytic flora of Andhra Pradesh (AP), while laying emphasis on endangered plants in AP, which need immediate conservation strategy for protection. S. P. Vij (Panjab University, Chandigarh) focused on the orchid diversity, which deserves the pride of place amongst flowering plants. Mentioning various aspects of orchid diversity, threats and succours, he stressed on proper understanding of ecology and reproductive biology of orchids to conserve them and for their proper management. S. P. Khullar (Panjab University) discussed diversity in Himalayan ferns, which is an integral part of the forests. S. S. Bir (Punjabi University) mentioned about the natural plant resources of India, which is endowed with a rich heritage of plant re-

sources. These plant resources grow and flourish in highly variable climatic and soil conditions. He emphasized on the urgent need to adopt the 'Indian tradition of conservation', i.e. religious practices of protecting specific plants or entire ecosystem along with *in situ* and *ex situ* methods for regeneration of natural vegetation. I. S. Dua (Panjab University) called for understanding biodiversity and conservation of plant species outside the forest. There is an urgent need to understand first the physiological behaviour of a plant which it adapted while acclimatizing outside the forest. He discussed the origin of protocity in ancestral archaeoflora and its evolution among different plant groups and regarded physiological biodiversity as a life-sustaining tool for plants to conserve outside forests or in national parks, wildlife sanctuaries and in biosphere reserves. B. S. Gill (Punjabi University) dwelt with issues and priorities for conservation of Indian forest genetic resources. He pointed out that special attention should be paid for recalcitrant tree seeds for *ex situ* conservation. Conservation of tree genetic resources should be integrated into basic framework of sustainable forest management. K. G. Mukerji (University of Delhi, Delhi) elaborated on the ecology and distribution of vesicular arbuscular mycorrhizal fungi which are the most widespread in their distribution among the plant species and geographically are believed to be disseminated inter-continentially prior to continental drift, as supported by fossil record of earlier plants. Because most economically-important plants form this type of mycorrhiza, this area of research has attracted much attention.

In Technical Session I, papers relating to various aspects of plant biodiversity and conservation strategies were presented and discussed. R. S. Dhanda (Department of Forestry and Natural Resources, College of Agriculture, PAU, Ludhiana) presented data relating to the degradation of forest diversity and its conservation strategy in Punjab. The tiny segment of land under forest cover, has been usurped by the ever-growing expansion of agriculture to meet the increasing demand for food,

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along with various development activities. The aspects relating to biodiversity which are protected well by use of biotechnology were discussed by M. L. H. Kaul (Kurukshetra University, Kurukshetra). Biotechnology entails the technological applications that use biosystems, the living organism or derivatives thereof, to make, modify and manufacture the products or processes for specific uses. The same aspect was elaborated by Sanjeev Kumar (Centre for Biotechnology, Faculty of Science, Hamdard University, New Delhi). He concentrated specifically on conservation strategies for medicinal and aromatic plants by biotechnology. B. D. Sharma (National Bureau of Plant Genetic Resources, Regional Station, Shimla) discussed the agro biodiversity found in the Indian Himalayas. The status of agro biodiversity in this region is under threat due to adaptation of modern developmental techniques and lifestyle of consumerism. He also dealt with genetic erosion caused due to these reasons and various strategies for conservation to counter this depletion in diversity.

Technical session II dealt with genetic diversity in the plant kingdom, including physiological diversity. I. A. Hamal (University of Jammu, Jammu) argued that continuous environmental degradation and over-exploitation in different parts of the world, particularly ecologically-fragile Himalayas and Shivaliks, have considerably affected

the population status of many plant species. He mentioned this while discussing the particular case of *Scaligeria stewartiana*. Sunil Pabbi (National Centre for Conservation and Utilization of Blue-Green Algae, Indian Agricultural Research Institute, New Delhi) discussed the molecular approaches for identification and conservation of cyanobacterial genetic diversity. Diversity in heterocysts pattern formation in the nitrogen fixation-defective mutants of the cyanobacterium *Anabaena* PCC7120 was presented by D. N. Tiwari (Banaras Hindu University, Varanasi). Based on the pattern formation characteristics of mutants, maintenance of heterocyst spacing pattern seems to depend on interaction of proteins, encoded by the *Pat A* gene in vegetative cell and inhibitor, emanating from heterocysts. Jaswinder Kaur and G. S. Virk (Guru Nanak Dev University, Amritsar) dealt with a successful culture protocol, developed for the production of synthetic seeds in *Azadirachta indica* (Neem), as neem seeds are recalcitrant in nature and lose viability within 3–4 weeks. In the same technical session related to physiological diversity in plants, Geetika Sirhindi (Punjabi University) monitored the physiological diversity through total sugars during cone development in *Thuja* and *Juniperus*. These two species acclimate well and their sugars diversified to the level that these can help the plant to show shifting of their vegetative centres to reproductive

centres. Similar diversification in relation to various growth manifestations were observed in gymnosperms by Hardip Kaur (S. D. Barnala College, Barnala).

Technical session III dealt with microbial diversity. Various aspects and prospectives dealing with chemosystematic study in bacteria, algae, fungi, mushroom, etc. were discussed. J. S. Dargan (Punjabi University) discussed the species diversity in genus *Xylaria* Hill ex Schrank in western Himalayan forests. He also discussed in another paper, the pathological problems of *Dalbergia sissoo* which is a very important multipurpose tree of Punjab. Genetic resources of mushroom in Punjab were highlighted by N. S. Atri (Punjabi University). T. A. Sarma (Punjabi University) presented a paper on sensitivity of blue-green algal virus N-1 towards five heavy metal ions. Cynophage N-1 seemed to be more sensitive to Cu.

Group discussions which followed technical sessions identified key issues under themes to be taken upon priority. These were further discussed in a final round of group discussions to facilitate the identification of action points and certain recommendations were put forward. Interested persons may write to the authors for details.

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Indo-French workshop on climate and environment*

The Indo-French Centre for Environmental Research (IFCER) is now being developed as a multi-institutional platform for sustained collaboration between Indian and French scientists in a resource-sharing environment. The goal is to develop synergy in critical areas of climate and environmental research leading to scientific advancement and societal benefits. The Indo-French Workshop held at CSIR Centre for

Mathematical Modelling and Computer Simulation (C-MMACS), Bangalore was to develop the various research actions identified during the Paris meeting held in June 2000. A school on Recent Advances in Climate and Environment (RACER) was also organized, concurrent with the workshop, to introduce advanced topics to young Indian scientists from various institutions.

IFCER is multi-institutional. While C-MMACS is the co-ordinating organization in India, the framework allows for a network of institutions to partici-

pate in the programme. The coordinating node in France is at Institut Pierre Simon Laplace (IPSL). During its previous scientific meetings, several projects were identified for immediate implementation; a brief description of these projects is given in Box 1. A schematic representation of the interconnectivity of these projects and their applications are given in Figure 1.

The Chief Guest, V. K. Gaur, emphasized the complex interactions and the delicate balance among a number of processes that make our life-bearing environment possible, and the need for

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