

KEY-NOTE ADDRESS	page
Knowledge Explosion In Conservation And Utilization Of Plant Genetic Resources M.N.V. Prasad	I - III

PLENARY LECTURES

<i>Plenary Lecture 1</i> Lathyrus Sativus (Khesari Dal), A Nature`S Gift To Mankind Prof. S. L. N. Rao	IV - VI
<i>Plenary lecture 02</i> Altitudinal Fluxes Of Biodiversity In Similipal Biosphere Reserve Prof R. C. Mohanty	VI - VII
<i>PlenaryLecture 03</i> Biodiversity Of Pollen, Pollinators And Conservation Sudhendu Mandal	VII - IX
<i>PlenaryLecture 04</i> Aerial Fungal Diversity And Allergic Diseases A.B Singh	X - XI

INVITED LECTURES

<i>Invited Lecture 01</i> Plant Biodiversity In Three Prominent Protected Areas Of India : A Review Prof. A.K. Kandyia	XI - XII
<i>Invited Lecture02</i> Microbial Diversity And Their Conservation N. C. Talukdar	XII - XIII
<i>Invited Lecture03</i> Biodiversity Resources : Potential Source Of Biomass To Utilize As Alternative Fuels For Renewable Energy Debabrata Paul	XIV
<i>Invited Lecture04</i> Urbanization And Biodiversity S. B. Chaphekar	XV
<i>Invited Lecture05</i> Patenting In Biosciences W. M. Dhumane	XVI – XVII

Keynote Address

**KNOWLEDGE EXPLOSION IN CONSERVATION AND UTILIZATION
OF PLANT GENETIC RESOURCES**

M.N.V. Prasad

Department of Plant Sciences, University of Hyderabad, Hyderabad 500 046

Keywords: Bioprospecting, phytodrugs, germplasm, traditional knowledge, molecular diversity, conservation

Conservation of plant resources is a subject of global concern. Due to climate change and urbanization we are losing biodiversity. Very few medicinal plants can be cultivated and most of the raw material required for herbal industry is often collected from the wild habitat. Therefore, there is an enormous pressure on medicinal plants. Realizing the richness of the wealth of the healing plants in Deccan ecoregion, we have initiated bioprospecting and applications of medicinal and aromatic plants in the year 2000 with the startup financial support by the Department of Biotechnology, Government of India. In this presentation Tribal pharmacopoeia, the knowledge capital for phytomedicine discovery is presented.

Tribal and rural people in Andhra Pradesh have the rich information about plant wealth for human health (Hemadri, 1994; Parrotta, 2001). This traditional knowledge is the short-cut method for contemporary drug discovery and development. The branch of phytodrugs is expanding globally. Conservation Biotechnology aims at biodiversity preservation, maintenance, sustainable utilization, restoration, protection and enhancement of quality and variety of life in an area for continued coexistence (Olorode, 2004; Rao, 2004) (Figure 1). The National Biodiversity Strategy and Action Plan (NBSAP), Ministry of Environment and Forests, Government of India, has recognized twelve ecoregions and Deccan ecoregion is one amongst them. The boundaries of Deccan ecoregion are Coromandal coast towards east, Western Ghats on west side, Cauvery delta to the south and Narmada river to north. Andhra Pradesh is the primary constituent of the Deccan ecoregion apart from Tamil Nadu, Karnataka, Kerala and

Maharashtra states. Plant genetic resources, traditional knowledge as capital for phytomedicine discovery: opportunities and challenges in the field of bioprospection and conservation are discussed in this lecture.

The primary step for conservation of plant genetic resources is collection and establishment of a database. Coordination is needed to collect reasonable samples of plant genetic resources and to establish field gene banks. The sampling scheme should be based on the level and distribution of genetic diversity within a species and its partitioning within and among individuals and populations. The genetic structure of some species is homogeneous across its wide range, and its detectable genetic variation is near zero. Here few collections might be sufficient for genetic conservation and few locations might be sampled as a precaution against missing genetic variants. Some species have high levels of genetic diversity, and extreme populations may differ extensively in their genetic resources. In such cases, larger samples should be collected to capture the species genetic resources. The germplasm samples should be stored in core and active collections. Seeds from each individual plant should be maintained separately in active collections. Core or base collections are intended for use only in extreme cases with the hope that they will never be needed for active breeding or reforestation. Active collections provide materials needed to enable testing or evaluation of the resource, facilitate breeding programs, and to provide materials that can be multiplied to reintroduce key populations to the forest in the event of catastrophes

Conservation of the plant resources is a subject of national and international concern because we don't know what we are losing and what we will need in future. The fact that plant species are disappearing before we determined their possible uses and role, suggests that it is wise to take a precautionary approach to conserve them. An integrated conservational approach (Collection, conservation and characterization) needs to be followed for saving the remaining plant genetic resources. The key to overall success will lie in the development of programs aimed at balancing conservation and sustainable utilization without further loss (Goel and Mangain 2001; Miller and Libby, 1989; Miller *et al.*, 1989). The two commonly used strategies for conserving plant genetic resources are *in situ* conservation, which allows evolution to continue

within the area of natural occurrence and *ex situ* conservation, which provides higher degree of protection to germplasm compared to *in situ* conservation by conserving out side the natural habitats.

In *ex situ* conservation, germplasm was conserved outside their natural habitat. Here the samples of species, sub-species or variety of red listed taxa are transferred from its original location and conserved as living collections in field gene banks, seed banks and botanical gardens. The germplasm is also maintained as seeds, ovules, tubers, tissue explants, pollen or DNA. *Ex situ* conservation programs supplement *in situ* conservation by providing live materials for the long-term storage, analysis, testing and propagation (Macropropagation and micropropagation). Among the various *ex situ* conservation methods, seed storage is the most convenient for long-term conservation of plant genetic resources.

Impediments to conservation:

Decline in species richness (over exploitation + natural catastrophe); deletion of plant systematics in educational curriculum, lack of agro technology for red listed plant resources, insufficient tools for preserving traditional knowledge, very little or no financial support for long term conservation biological research.

***LATHYRUS SATIVUS* (KHESARI DAL), A NATURE'S GIFT TO MANKIND**

Prof. S. L. N. RAO

Prof of Biochemistry (Retd.), Osmania University, Hyderabad,500007

In this international year of biodiversity there is an urgent need to do everything possible not only to prevent the unprecedented loss of the world's flora and fauna especially due to human activity but also to utilize the full potential of the vast biological capital. This plenary talk is to illustrate how a positive thinking and approach could change our entire perception of an accused pulse crop *Lathyrus sativus* (Khesari dal) and lead towards a sustained crop germplasm preservation and enhancement and use.

It is now an established fact that the disease Neurolathyrism is only the result of an excessive consumption (a staple diet) of *L. sativus* for prolonged period. Also, people world wide have been consuming *L. sativus* as part of their diet for very many years without any associated symptoms of the disease and the ban on its cultivation and sale are being relaxed (in India). The benefits that might result from the use of *L.sativus* as a part of a regular cereal based diet will be reviewed in the context of some recent findings.

Human beings alone are endowed with some yet uncharacterized but unique mechanism to detoxify/metabolise orally ingested ODAP and may well be the reason for the low incidence of Neurolathyrism. Humans excrete only less than 1% of ingested ODAP compared to animals. Metabolic oxidation of ODAP may be a likely pathway in humans and thus a natural detoxifying mechanism.

Homoarginine was one of the first unusual non-protein amino acid to have been characterized from *L. sativus* seeds in particular, and 30 other species of *Lathyrus* well before the discovery of ODAP was reported. However, since it was quite innocuous to experimental animals its importance in human nutrition and health never got its due recognition. Homoarginine is also, now an established normal metabolite in humans.

It is only during the past decade or so that Nitric oxide has emerged as the most important signaling molecule both in the cardiovascular system and cerebral metabolism and its medical applications in health and well-being became a reality especially after its discoverers received the Nobel Prize in 1998.

The presence of L-Homoarginine in *L.sativus* should make it the most prized pulse as it is the only known natural source for this valuable amino acid. L-Homoarginine is a substrate for NOS and also Inhibits liver arginase and is itself a poor substrate and thus stays in circulation much longer than arginine and may contribute to a sustained Nitric oxide (NO) generation in addition to providing essential Lysine. Though NO is both a good and bad messenger, endogenous overproduction of NO is a remote possibility in humans and thus, *L. sativus* in limited quantities as part of a normal diet may in fact be beneficial to the general vasculature and overall performance. Hard physical labor is in fact a hall mark of lathyrus consumers. *L.sativus* may be an effective natural alternative in dietary management and control of cardiovascular health and performance instead of the numerous arginine and citrulline formulations and allied products in the market. Homoarginine also inhibits the synaptosomal uptake of glycine and may even benefit LTP at the synapse.

HIF-1 α is an inducible transcription factor and a master regulator of cellular oxygen homeostasis and very recent findings show that L-ODAP stimulates the stabilization and nuclear translocation of HIF-1 α in SK-N-MC human neuroblastoma and MCF7 cells under normoxic conditions and also in chick brain in a time dependent manner as shown by transient transfection and western blot analysis. The nuclear translocation of HIF-1 α is inhibited by staurosporine indicating the involvement of PKC. Since HIF-1 α is a global regulator of hypoxic gene expression and a transcription factor for more than a dozen target genes and its activation however, could be both prosurvival and proapoptotic .

HIF-1 is increasingly studied for its perceived therapeutic potential as it promotes angiogenesis by up-regulating VEGF and enhancement of this gene within ischemic patients could promote vessel proliferation very much needed for oxygenation. PKC activation by ODAP could be a target for amelioration of hypoxia faced at high altitudes and also of

cognitive impairment in Alzheimer's disease.

L. sativus is an efficient nitrogen fixer and is also a very heavily nodulated legume. ODAP is reportedly a derepressor of nitrogenase in certain nitrogen fixing bacteria and selectively enhances GSII activity and can derepress nitrogen fixation in free living Rhizobia. The potential role of ODAP in plant nitrogen fixation needs to be explored further and could be commercially exploited.

These novel approaches to both ODAP and homoarginine might entirely change our perception of this poor man's pulse and consumption of *L. sativus* as a pulse and not as a sole diet could benefit mankind. I hope this talk would inspire a few others also to think positive and transform *L. sativus* from a "poor man's pulse" into a Nature's gift indeed.

Plenary lecture 02

ALTITUDINAL FLUXES OF BIODIVERSITY IN SIMILIPAL BIOSPHERE RESERVE

Prof R. C. Mohanty

Emeritus Scientist, Department of Botany, Utkal University, Bhubaneswar

Similipal forests are located in the district of Mayurbhanja at 21° 16' to 22° 08' N latitude and 86° 04' to 86° 37' E longitude. The highest peak is Meghasani at 1165.5 m. It was declared as a Biosphere Reserve in June, 1994. A hotspot of biodiversity in the state, it comprises of around 1100 plant species. The Similipal forests need to be considered typical eco-systems for we find difference in plant forms and species richness in relation to altitude. The concentration of dominance, species evenness, floristic density and basal area could too be well co-related with altitude. Above all, the soil composition and quality are quite different in continuum. Number of parameters is considered to examine the variation in the nature of plant forms. The analytical and synthetic parameters have been studied. Species composition is important biological parameters in terms of the value index. Notwithstanding the presence of the most dominant species, typical

trees and shrubs are found located at altitudes between 100 m and 900 m. For example, *Securinega virosa*, *Diospyros melanoxylon* are present in low elevation only, while *Bauhinia malabarica*, *Pterocarpus marsupium* and shrubs like *Miliusa velutina* and *Hyptis Anthera Sticta*, etc can be seen in heights.

The distribution pattern of life forms is not similar in the altitudes. The density of the increasing order with decrease of elevation in case of trees and herbs does not hold good for shrubs. The pattern is partially true in case of the basal area. Different variables are considered to show the non uniformity that exists among them. All these along with the conceptual mindset of the foresters are challenged in the paper with field experiences in the perspective of forest management.

PlenaryLecture 03

BIODIVERSITY OF POLLEN, POLLINATORS AND CONSERVATION

Sudhendu Mandal

UGC Professor of Botany, Visva-Bharati University, Santiniketan -731235 and

Former Director, National Library (Govt. of India), Kolkata

Keywords: Pollen, phylogenetics, pollinator decline, environmental degradation, plant population, conservation.

Pollen, the male partner in the fertilization process of flowering plants, because of its unique structure and haploid nature, provides an excellent material for several physiological and biochemical studies of fundamental and applied nature, which can give interesting clues regarding storage, longevity, viability, different phases of pollen development, biogenesis of wall, polysaccharides of pollen tubes, etc., thus enabling scientists to elucidate certain basic patterns and mechanisms of plant growth, giving an improved understanding of many basic cell processes and insights to improve the yields of desired crops.

Pollen has also proved to be an excellent tool in taxonomic studies. The application of pollen characters in solving controversial taxonomical and phylogenetic problems has now been widely recognized all over the world. Application of pollen characters and constituents in

understanding plant affinity and phylogeny is also well documented. However, these studies have been largely confined to major morphological characters of pollen grains, including apertural form, number, distribution and position, exine ornamentation and stratification patterns and pollen association and pollen nuclear number, all of which have provided the best taxonomic criteria, being least variable. A central problem of Phylogenetics has been to distinguish between the component of biological similarity due to descent from common ancestry (homology), and that due to convergence from different ancestors (analogy), i.e. evolutionary classification should reflect only true homologies. But morphological characters and behavioural patterns which have till recently provided the major guidelines to classification, can sometimes evolve independently in unrelated species in response to common environmental challenges.

Pollination is a basic force for gene recombination in flowering plants, plays a key role in plant breeding programmes. In angiosperms the pollination mechanism is typically developed in three phases: (a) release of pollen from anther, (b) transfer of pollen from anther to stigma, and (c) finally successful placement of the pollen on the receptive stigma surface, followed by germination of pollen grains which begins the next phase of fertilization. Each of the three phases shows great diversity (Faegri & van der Pijl, 1980). Pollination, pollen germination and stigma receptivity must be analyzed critically on a species by species basis, as it reflects the basic criteria for breeding programmes. Besides, pollen viability and nutrient requirements differ from species to species. Structural, physiological and cyto-chemical features of the stigma is of prime importance in the biology of sexual reproduction and seed formation, but the pollination biology of most tropical plant species is still unknown. As such, a detailed knowledge about pollination, pollen germination and stigma receptivity will be helpful to produce genetically superior stocks.

Globally, of the estimated 1330 crop plants grown for food, beverages, fibers, spices and medicines, approximately 1000 (75%) are pollinated by animals (Raven, 1987). It has been calculated that pollinators deliver one out of every three mouthfuls of food we eat, and beverages we drink. Pollinators are essential components of the habitats and ecosystems that many wild animals rely on for food and shelter. Approximately 25 percent of birds include fruit or seeds as a major part of their diet. Plants provide egg laying and nesting sites for many insects.

Despite the importance of pollinators, the ever-expanding conversion of landscapes to human

uses adversely affects their habitats. A growing body of evidence indicates that these beneficial creatures are in serious decline, due to loss, modification, and fragmentation of habitat, and the excessive use of pesticides. The risk of losing the essential role of pollinators, required for the successful propagation of plant communities and wildlife habitats is real. As plantings have grown larger, the need for concentrated pollinators at bloom time has grown. At the same time populations of many pollinators has been declining, and this decline has become a major environmental issue today. The study of pollinator decline is also interesting to some scientists, as pollinators have the potential to become a keystone indicator of environmental degradation. Any changes in their abundance and diversity may influence the abundance and diversity of the prevailing plant species. Today, it seems that pollination systems are threatened by the inadequacy of sustainable managed, indigenous, or imported pollinators. Pollinator shortages can adversely affect the plant population.

More than 218,000 of the world's 250,000 flowering plants, including 80% of the world's species of food plants, rely on pollinators for reproduction (Emblidge and Schuster 1999). For over a decade, biologists have been concerned about apparent declines in pollinators, especially those that migrate between regions, and the concomitant declines in seed production of flowering plants. This concern over plant-pollinator interactions has contributed to a paradigm shift from protecting individual species to protecting inter-specific relationships and landscape-level ecological processes. While an awareness of these relationships and processes is not new to conservation biology, the recent attention given to these topics by resource managers, policy-makers, environmental educators, and the press has been unprecedented. The ultimate goal of the pollinator conservation system is to ensure healthy and self-sustaining populations of pollinator resources in botanic gardens.

The present paper will highlight the recent problems and future prospects of plant and pollinator resources in the context of environmental degradation and global warming for biodiversity conservation.

AERIAL FUNGAL DIVERSITY AND ALLERGIC DISEASES

A.B Singh

Aerobiology and Allergy Lab., Institute of Genomics & Integrative Biology

Delhi University Campus, Delhi – 110007

KeyWords: Bioallergens, fungal diversity, respiratory allergy, recombinant allergen, meteorological factors

Distribution of microbial spores and other microbial components in the air are of great interest for diagnosis and management of allergic diseases such as allergic asthma, rhinitis, atopic dermatitis etc. An understanding of periodicity and quantity of fungal spores in air gives an idea of the disease occurring in the area. Respiratory allergy is prevalent all over the world. Among important biocomponents pollen grains and fungal spores are most predominant allergens in air. Therefore, for effective diagnosis and therapeutic management of these ailments, detailed information on daily, seasonal and annual variations of these bioallergens is essential.

Allergy to fungi has not drawn the same attention as pollen grains inspite of their numerical predominance in indoor and outdoor air. The prevalence of respiratory allergy to fungi is estimated to be 20 -30 % in atopic individuals and about 6% in general population. Fungal spores are present in both indoor and outdoor environment and contribute major suspended particulate matter of the air.

The monitoring of air-borne fungi in air has revealed rich fungal diversity. However, their concentration is influenced by various meteorological factors. Important fungi reported from different parts of indoor and outdoor air are *Alternaria*, *Cladosporium*, *Aspergillus sp.*, *Curvularia*, *Mucor* and *Basidiomycetes etc.* Among the fungi inhabiting indoor air are *Aspergillus niger*, *A. flavus*, *A. fumigatus*, *A. nidulans*, *Alternaria*, *Cladosporium*, *Penicillium* and *Rhizopus spp.* Many of the working environments are greatly influenced by organic raw materials being used eg- sugar factories , bakeries, poultries and granaries etc. The detailed results will be presented.

Since 1980s a large number of major allergens of fungi are isolated, identified and their

amino-acid sequence. The allergenic epitope have also been analysed using human cells. The cloning and production of recombinant allergen has allowed better standardization of fungal extracts and more effective mode of treatment of allergy.

Email: singha49@hotmail.com

Invited Lecture 1

PLANT BIODIVERSITY IN THREE PROMINENT PROTECTED AREAS OF INDIA: A REVIEW

A.K. Kandya

Department of Botany, Dr. H.S. Gour University, SAGAR

Key Words : Protected Areas, Silent Valley, Amarkantak Biosphere Reserve, Kanha National Park, Plant Biodiversity

Protected areas like Natural Heritage Site, National Biotic Areas, Biosphere Reserve, Resource Reserves, Scientific Reserve, Anthropological Reserves, National Parks, Wildlife Sanctuaries, Strict Nature Reserves and National Monuments and Landmarks, are the best places to preserve the whole ecosystem of the area. The paper describes in brief, The salient features of the phyto-diversity of tropical rain forests of Silent Valley, a natural heritage site at Kerala; Kanha National Park in Madhya Pradesh and Achanakmar – Amarkantak Biosphere Reserve in Chhattisgarh State.

Out of the total 40 hot spots of Indian Biodiversity, three prominent ones lying in the Protected Areas viz. Silent valley located in Nilgiri Hills, Kerala; Kanha National Park and Achanakmar – Amarkantak Biosphere Reserve located in Central India have been investigated for their vegetational elements and forest flora. In Achamakmar – Amarkantak Biosphere Reserve total 864 species of Angiosperms, 17 species of Gymnosperms, 25 Pteridophytes, 16 Bryophytes, 41 Fungi, 6 Algae and 3 Lichens were identified from 21 different habitats. Out of these 864 species of Angiosperms, 575 were herbs, 78 shrubs, 122 tree species and 89 were climbers, The 864 species belong to 483 genera and 120 plant families, out of which 96 are Dicotyledons (365 genera; 629 species) and 24 are Monocotyledons (118 genera: 235 species). In the Silent Valley tropical rain forests, three localities were surveyed viz. Panthanthode,

Walakkad and Valiyaparathode, where from 72, 78 and 58 species of trees, shrubs and herbs were identified respectively. Out of these only 6 species of trees, 6 species of shrubs and 3 species of herbs are common to all the three localities. Density of *Pallaquium ellipticum* (4220 plants/ha) was highest followed by that of *Cullenia exarillata* (1490 plants/ha). Natural regeneration of *P. ellipticum* (1:52) was also maximum followed by that of *Garcinia morella* (1:25).

In Kanha National Park (MP), meadows (grassland among the forest) are a common feature. In an extensive survey, 38 grassland were found in the 4 forest ranges viz. Kanha (10), Mukki (4), Bhaisanghat (9), and Supkhar (15). Sixteen types of plant communities were observed in these grasslands. Number of herbaceous plant species were maximum (52) in Kanha range whereas in Supkhar range number of herbaceous species was 40. In Mukki and Bhaisanghat ranges, 35 species of herbs were present in each. The herbaceous species could be categorized in grasses, legumes and forbs. In Kanha forest range 33 species of grasses and 19 species of forbs were recorded while in Supkhar range 17 species of grasses, 19 species of forbs and 4 species of legumes were present.

All the three protected area showed a rich biodiversity.

E-mail : anand_kandya@rediffmail.com

Invited Lecture 2

MICROBIAL DIVERSITY AND THEIR CONSERVATION

N. C. Talukdar

Division of Microbial Resources, IBSD, Imphal, Manipur

Key Words: Microbial diversity, metagenomic approach, novel antibiotics, Indo-burma biodiversity hotspot

Microorganisms are of profound utility and importance in all ecosystem functions and to all biological system. Earth's prokaryotes contain equal amount of C as in plants and 10 fold more N and P than do plants. Therefore, assessment characterization, preservation/conservation and exploitation of microbial biodiversity have assumed importance in research and development.

Proportion of total described (based on cultural method) biodiversity comprised by microorganism is very less (~1%). For example, there are only 6000 species of the important microbial group bacteria described so far. However, recent surge of research in molecular microbial ecology provide compelling evidence for existence of many novel types of microorganisms in the environment, in number and varieties, that dwarf those of the comparatively few microorganisms obtained by culture based techniques. Based on molecular method or metagenomic approach of diversity study, the total number of bacteria division has swelled to 36 in 2003 compared to only one division known in 1969 although many of the current divisions are represented by sequence data only. Although sequence based taxa appear to have no immediate values, they might contribute to knowledge on metabolic design for their cultivation. Recently, using metagenome library, great advance has been made in synthesis of novel antibiotics.

Assessment of magnitude of microbial diversity and their characterization need to be backed up by robust conservation strategy. Currently 481 collection centres of microorganisms are registered with world data center for microorganism (WDCM) which holds at best 26% of described species of bacteria and fungi. Among the collection centers/Institutes, 10 hold 35% of all strains available in the entire collections suggesting an uneven distribution in conservation or collection effort. Similarly, microbial diversity study in rich biodiversity hotspot inhabited by economically poor people is very limited. Preservation of natural habitats of these hotspots is essential for conservation of microbial gene pools. Extension of the diversity study to the unexplored areas holds the promise of new organisms and novel application. From a recent study, a new genus of bacteria has been reported to occur in the hot water pool of Nambar reserve forest of Assam which is located in the Indo-burma biodiversity hot zone and many more new taxa are likely to occur in the undisturbed ecosystems of NE India for which a strategic approach is very essential.

E-mail: nctalukdar@yahoo.com

Invited Lecture 3

BIODIVERSITY RESOURCES : POTENTIAL SOURCE OF BIOMASS TO UTILIZE AS ALTERNATIVE FUELS FOR RENEWABLE ENERGY

Debabrata Paul

Automobile Engineering Dept., Dr. Sudhir Chandra Sur Degree Engineering College,
740 Dum Dum Road, Kolkata

Keywords: Sustainable Development, biomass resources, energy efficiency, alternative fuel, briquetting

Energy is one of the major inputs for economic development of any country. For developing countries, the energy assumes a sector in view of the ever increasing energy needs requiring high investment. In India the major concern for environmentally sound sustainable development is fast depletion of fossil fuels. Besides, climate change is the most challenging threat faced ever by the human civilization. The present energy scenario depicts serious concern for depleting energy sources and associated environmental issues like global warming, green house gas emission leading us to contemplate on alternative sources of energy. Among the alternatives, biomass energy appears promising as renewable energy source being abundantly available and ensures effecting recycling of waste derived from crop residues, forestry resources and other bioresources.

Biomass resources include all forms of organic matters derived from waste & residues of plant, animal, forestry and municipal waste. In India and other developing countries biomass is one of the major energy sources in the form of fuel wood, agricultural and forest crop residues, cattle dung etc. and about two thousand million people depend almost entirely on biomass fuels for their energy needs. The biomass fuels represent the second largest source of energy used after fossil fuels all over the world. Studies have shown that such biomass can be conveniently utilized as alternative fuels with improved thermal efficiency by briquetting into a solid fuel. Besides, gasification of such briquettes would generate producer gas which can run IC engine substituting diesel oil and produce electrical power thereby.

E-mail: dpaul20032004@yahoo.com

URBANIZATION AND BIODIVERSITY

S. B. Chaphekar

Indian Institute of Environmental Medicine, Mumbai

India is recognized as one of the Biodiversity-rich countries. Western Ghats range is known to be one of the biodiversity hot spots, because of a variety of ecological conditions that prevail in the region. Part of Western Ghats that falls in Maharashtra state, called as Sahyadri, can boast of high biodiversity in the hills and valley regions that also form watershed areas of several rivers. Heavy monsoon rains, though for only a quarter of the year, ensure conditions suitable for the prosperity of mixed deciduous type of vegetation. The narrow coastal strip of land is fractured in several places by rivers, and supports rich littoral vegetation, the highly productive mangrove ecosystems.

Mumbai is the most developed city in the country, in terms of industrial and commercial establishments, as well as infrastructure and human population density. The development has taken place at the cost of environment and biodiversity contained therein. Presently, a roughly triangular region of Mumbai-Pune-Nasik has been identified for planned urbanization and industrialization. Whereas Mumbai city is coastal in location, both Pune and Nasik are at the beginning of the Deccan Plateau above the Ghats. Urbanization of this triangular region from coast to plateau across the hills bodes ill for the rich biodiversity of the big zone of Western Ghats. Establishment of new hill cities with modern infrastructural facilities and amenities adds to the concern of sustainability of biodiversity. Some examples of erosion of biodiversity in urbanized areas, near hill stations, and coastal mangrove vegetation are discussed in the presentation.

PATENTING IN BIOSCIENCES

W. M. Dhumane

Senior Joint Controller of Patents & Designs, Patent Office, Mumbai

Intellectual Property Rights (IPRs) are legal and institutional devices to protect creation of minds such as inventions, work of art, literature and designs. The concept of the IPRs mainly includes patents, designs, trademarks and geographical indication and copyright. IPRs are tools for industrial and economic development that is derived from inventive activities and creativity.

The actual purpose of the IP rights is to reward the creators of Intellectual Property so that one IP becomes the stepping stone and motivation for others. IP is not a secret document at all as through standard legislative measures IPs are published and are accessible by all which can be used by the people. For instance, all patent applications are published before patents are granted. Granted patent documents are freely available to the users so that the patent information can be easily retrieved and utilized for planning further R & D and industrial activities. Patents are granted for twenty year term in all fields of technology for new, inventive and industrially applicable products and processes including bio-sciences with some exceptions for the patent subject matter. Exclusion from patentability includes plants and animals in whole or any part thereof including seeds, varieties, species and essentially biological process thereof. Similarly, an invention which in effect is traditional knowledge is prohibited from patenting. In bio-sciences, patents can be granted for compositions based on herbal products, genetically modified microorganisms, recombinant proteins/ peptides/ polynucleotides, bio-fertilizers, etc which meets the prescribed criteria of patentability.

As per the Biological-diversity Act 2002, permission shall be obtained from the National Bio-diversity authority for applying for a patent in or outside India for an invention based on any research or information on a biological resource obtained from

India. While applying for a patent, the source and Geographical origin of the biological material is required to be disclosed in the Patent specification when it is used in an invention. Value added products obtained from the biological materials are excluded from the permission national biodiversity authority. The Patents Act provides for comprehensive provisions for protection of public interest including public health and national security. Thus, the Patent Right in India effectively balances Intellectual Property protection and public health, national security and public interest concerns.

Patents can greatly boost up the competitiveness of industries, R & D activities and economic development but patents cannot be used to stop the further R & D and adopt monopolistic attitude. Appropriate measures are provided in the Patents Act to prevent abuse of patent rights. India has the best brain pool in the whole world and is a power house of scientific, technological and industrial base with vast bio diversity resources, rich in traditional knowledge. This advantage can play a major role in achieving IP-based industrial and socio-economic growth for India.