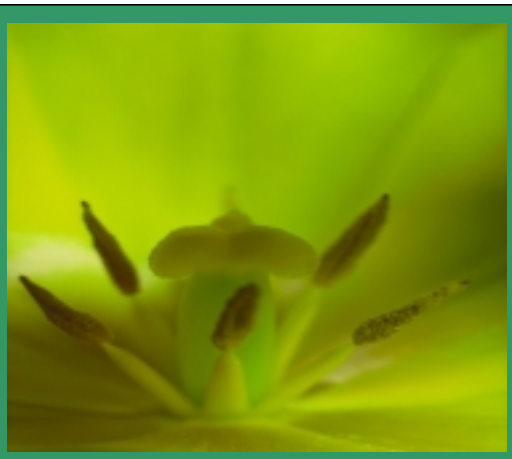
NEWSLETTER



ON
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Department of Environmental Science
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Editorial

Bioremediation is the biological treatment and removal of pollution from the environment. The use of microorganisms for the removal of pollution is not new, as biological sewage treatment has been practised for decades. The principal organisms are bacteria and fungi which have the ability to degrade hydrocarbons such as oil, coal tar, and chlorinated compounds such as pesticides. Althouth metals cannot be degraded, they can be accumulated by micro-organisms and therefore removed from the environment. Various types of bioremediation strategies have been developed to treat polluted land and water, although there is only a limited knowledge of the processes involved, as mixed populations of microorganisms are used and the dynamics of such populations are complex. In addition, the affected other factors such as toxic agents, temperature, nutrient bioavailability and oxygen limitation. Considering these facts in the present Volume attempts has been made to highlight the activities various Institutions of India those are involved in research on Environment Biotechnology. I believe this will help the reader to get some valuable information.

Prof. S. C. Santra

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ACTIVITIES OF INDIAN INSTITUTES ENGAGED IN ENVIRONMENTAL BIOTECHNOLOGICAL RESEARCH

❖ *NATIONAL ENVIRONMENTAL ENGINEERING RESEARCH INSTITUTE (NEERI) :*

The Institute was established in the year 1958, as Central Public Health Engineering Research Institute(CPHERI). The Institute was renamed in 1974 as National Environmental Engineering Research Institute (NEERI) by Late Shrimati Indira Gandhi, the then Prime Minister of India and President, CSIR.

The main campus at Nagpur is spread over 108 acres where the laboratory buildings and demonstration plants are located. Green stretches of land are liberally scattered over the campus and nearly 40 percent of the land is under forest cover.

Discernible positive movement towards the overall aspirational goal of sustainable development warrants pursuance of an effective R &D program in environmental science and technology to enable solutions to backlog and future environmental problems emanating from development imperatives in various socio-economic sectors. Accordingly, the Institute, while fulfilling its commitment towards the Societal Missions, has made significant contributions in identified thrust areas of R & D, viz.

- Environmental Monitoring
- Environmental Biotechnology
- Hazardous Waste Management
- Environmental Systems Design, Modeling & Optimization
- Environmental Impact & Risk Assessment and Audit
- Environmental Policy Analysis.

The mix of activities includes:

- Sponsored Research Projects
- Developmental Projects
- Societal Missions (including advice to the Judiciary)

In-house research projects

ENVIRONMENTAL BIOTECHNOLOGY

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- Multplex PCR for assessment of bacteriological quality in environmental samples
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- Bacterial Diversity in soil : Generation of "Microbial Inocula" for clean-up of contaminated sites
- Development of biosensors for on-line monitoring of substrate concentration, intermediate products, and by-products in biotechnological processes
- Application of recombinant DNA technology to oil spill degradation and pollution control
- PCR , a tool for monitoring of microorganisms in environmental samples
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- Development of biosensors and microbial tracking tools for nitrophenolic waste waters
- Development of user friendly water analysis protocol for enteropathogens based on genetic determinates
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- Multiple discriminant analysis to classify dominating bacterial groups in effluent treatment plant

❖ ***DEPARTMENT OF BIOTECHNOLOGY, Govt. of India, New Delhi :***

The setting up of a separate Department of Biotechnology (DBT)**,** under the Ministry of Science and Technology in 1986 gave a new impetus to the development of the field of modern biology and biotechnology in India. In more than a decade of its existence, the department has promoted and accelerated the pace of development of biotechnology in the country. Through several R&D projects, demonstrations and creation of infrastructural facilities a clear visible impact of this field has been seen. The department has made significant achievements in the growth and application of biotechnology in the broad areas of agriculture, health care, animal sciences, environment, and industry.

The impact of the biotechnology related developments in agriculture, health care, environment and industry, has already been visible and the efforts are now culminating into products and processes. More than 5000 research publications, 4000 post-doctoral students, several technologies transferred to industries and patents filed including US patents, can be considered as a modest beginning. Department of Biotechnology (DBT) has been interacting with more than 5,000 scientists per year in order to utilise the existing expertise of the universities and other national laboratories. A very strong peer reviewing and monitoring mechanism has been developed. There has been close interaction with the State Governments particularly through State S & T Councils for developing biotechnology application projects, demonstration of proven technologies, and training of human resource in States and Union Territories. Programmes with the states of Gujarat, Rajasthan, Madhya Pradesh, Orissa, West Bengal, Haryana, Punjab, Jammu & Kashmir, Mizoram, Andhra Pradesh and Uttar Pradesh have been evolved. Biotechnology Application Centres in Madhya Pradesh and West Bengal have already been started.

A unique feature of the department has been the deep involvement of the scientific community of the country through a number of technical task forces, advisory committees and individual experts in identification, formulation, implementation and monitoring of various programmes and activities.

In India, more than a decade of concerted effort in research and development in identified areas of modern biology and biotechnology has given rich dividends. The proven technologies at the laboratory level have been scaled up and demonstrated in field. Patenting of innovations, technology transfer to industries and close interaction with them have given a new direction to biotechnology research. Initiatives have been taken to promote transgenic research in plants with emphasis on pest and disease resistance, nutritional quality, silk-worm genome analysis, molecular biology of human genetic disorders, brain research, plant genome research, development, validation and commercialization of diagnostic kits and vaccines for communicable diseases, food biotechnology, biodiversity conservation and bioprospecting, setting up of micropropagation parks and biotechnology based development for SC/ST, rural areas, women and for different States. Necessary guidelines for transgenic plants, recombinant vaccines and drugs have also been evolved. A strong base of indigenous capabilities has been created. The field of biotechnology both for new innovations and applications would form a major research and commercial endeavor for socio-economic development in the next millennium.

❖ ***CENTRE FOR BIOTECHNOLOGY, JNU, New Delhi :***

The special Centre of Biotechnology was established in the year 1985 under joint sponsorship of the UGC and the Department of Biotechnology, Government of India. Realizing the importance of availability of trained manpower in the area of Biotechnology in the country a Master of Science programme in Biotechnology was started at the Centre in JNU in the same year with funding from the Department of Biotechnology, This programme aimed at generating skilled manpower in different areas of biotechnology which would not only feed the Biotechnology related industries but also would provide trained and motivated persons required by other institutions. With a modest beginning of two faculty members and eleven students in the year 1985-86 the Centre now has 8 faculty members and two research associates to help in the teaching programme and 35 students in the Masters programme. Over the years the Centre has established a very successful M.Sc. programme which selects the best of the students from the merit list prepared on the basis of an All India Entrance Test conducted by JNU.

❖ *INSTITUTE OF GENOMICS & INTEGRATIVE BIOLOGY :*

Institute of Genomics & Integrative Biology (Formerly known as Centre for Biochemical Technology), a constituent Laboratory of the **Council of Scientific and Industrial Research (CSIR),** Govt of India, was setup to translate concepts developed in basic biological research to commercially viable technologies for health care. IGIB pioneers in research leading to generation of new knowledge and development of technologies in various areas of Modern Biotechnology with a special focus on Genomics and Genome informatics.

The Centre was established with the core competence in preparative biochemistry for isolation of fine biochemicals from natural resources viz., proteins, lipids, enzymes; synthesizing bioorganic compounds like peptides, oligonucleotides and preparing reagents required for recombinant - DNA research. As biochemical technology enters the genomics era, the Centre is in the process of transforming from a singular laboratory working in the area of biochemical research to a network laboratory, leading to the formation of a virtual institute of new biology.

IGIB has emerged as a full-fledged laboratory in the CSIR setup from a modest beginning. It started as "Biochemicals Unit" a Grant-in-aid project of the CSIR in 1966,with the objective of providing rare biochemicals and reagents for biomedical research in India. The efforts then were mainly directed towards import substitution and competence building in making available reagents and biochemicals indigenously. The team of scientists and technicians standardized preparatory methods for a number of important biochemicals and reagents which were until then being imported. The competence building experience was well recognized by the funding agency and the Biochemical Unit was taken up as a Laboratory under the CSIR in 1977 and was renamed 'CSIR Centre for Biochemcials' which was situated at Vallabhbhai Patel Chest Institute, Delhi University Campus.

During the following period the Centre continued to make available the products standardized earlier and a thrust was made to increase the research component. Hence, Indian experts who had gained experience in foreign countries were inducted to strengthen the areas of activities of this Centre.The Centre then directed its focus on taking up application oriented projects and developing technologies for transfer to industry instead of continuing production of products at laboratory scale. In keeping with the research and development activities being pursued the laboratory was rechristened as 'Centre for Biochemical Technology' in 1993. By the time, the Centre moved to its new 7 storeyed centrally air conditioned, 70,000 Sq feet, building in a new location within Delhi University Campus. The Centre is now housed in the premises of its own well equipped laboratories, library and animal house facility.

In August 1997 the Centre got new leadership. The Centre is now rapidly transforming from a singular laboratory working in the area of biochemical research to a network laboratory leading to the formation of a virtual institute of modern biology. At this juncture an interactive programme involving molecular biologists, cell biologists, immunologists, bioorganic chemists, molecular geneticists and information technologies along with the medical scientists from various institutions in the country is envisaged to make use of the knowledge derived from new biology of genomics

❖ *INDUSTRIAL TOXICOLOGY RESEARCH CENTRE :*

Established in 1965, the Industrial Toxicology Research Centre (ITRC), Lucknow, a constituent laboratory of Council of Scientific & Industrial Research (CSIR) is dedicated to provide health safeguards to industrial and agricultural workers through its rich knowledge base, created painstakingly over the years. The main campus is located on Mahatma Gandhi Marg in the city, while the other campus is in village Gheru on Lucknow-Kanpur highway about 22 km from the main campus. The centre has contributions significant in elucidating the mechanisms by which pesticides, heavy metals, monomers, plasticizers and other plastic additives, solvents, food colours and dye intermediates act and elicit deleterious effects on human health. Method for early diagnosis of manganese poisoning; a peripheral model for monitoring the neurological disorders caused by neurotoxic substances and test kits for the detection of toxic food adulterants have been developed.

Ability of some chelating agents in abrogating the toxicity due to metals and immunomodulators in case of solvents and monomers in animal models have been demonstrated. Vitamin B complex supplementation has been found to diminish susceptibility to lead and cadmium intoxication.

The centre has contributed significantly to Drinking Water Mission, Ganga Action Plan, Technology Mission on Edible Oils and Pulses, Global Climatic Change programme and All India co-ordinated programmes on food colours, pesticides and metal exposure assessment.

Microorganisms have been isolated which have the potential of degrading pesticides such as DDT, Endosulfan and lindane in the sites contaminated with them.

The institute has undertaken the challenging assignment on testing of newer products reaching the markets including bio-engineered products.

❖ AGHARKAR RESEARCH INSTITUTE, Pune

The Institute is engaged in basic and applied research in biological sciences, with special emphasis on (a) microbial technology for industrial effluents, (b) fermentation of compounds of interest to industry, (c) plant biodiversity, conservation and medicobotany, (d) fungal taxonomy, (e) crop improvement, (g) human nutrition and development, (h) animal developmental biology, (i) organic synthesis of chemicals for insect control and (j) palaeo-environmental studies using fossil plants and animals. These activities form the research programme in the three areas, viz. Microbial, Plant and Animal Sciences.

In the Microbial Sciences, new applications of metal biosorption technology were identified in removing contaminated heavy metals like lead and cadmium from herbal medicine extracts and fruit juices, as well as in the removal and recovery of metal cyanide complexes from industrial wastes. Several microbial cultures were isolated from sediments of lakes, dams and creaks that can reduce metals like selenium, tellurium and manganese. A culture of *Pseudomonas mendocina* from MACS culture collection was found to degrade basic dyes like Basic Fuchsin and Brilliant Green, which can be used for treating waste water containing these dyes. Three bacterial cultures were identified which can detoxify ethylenethiourea, a breakdown product of fungicide Mancozeb. The role of enzyme phosphatase in microbial degradation of organophosphorus pesticides like monocrotophos and dimethoate is being investigated. Optimal cultural conditions for an anaerobic lipolytic bacterium *Selenomonas lipolytica* sp. nov. which degrades the saturated and nonsaturated vegetable oils were determined. Three anaerobic bacteria capable of degrading C14 to C19 alkanes were identified from Arabian sea. A novel species of *Methanobrevibacter* was isolated from distillery waste anaerobic digester. The fibrinolytic enzyme Actinokinase from thermophilic bacterium, *Streptomyces megasporus* could be used as a cheaper substitute to urokinase, if clinical studies are successful. The enzyme protease from the alkaliphilic strain *Arthrobacter ramosus* was characterized and has application in detergent industry. A strain of *Candida pulcherrima* capable of mineralizing 1,3-dinitrobenzene has been deposited in American Type Culture Collection.

In Plant Sciences, programme on biodiversity analysis and conservation of plants was continued on the underexploited plant *Carissa*, Medicobotanical plants like Bruhat-panchmula, *Aloe* and *Asparagus*, and the versatile socio-economic species *Azadirachta* (Neem). Comparative pharmacognosy of two components of Bruhut-panchmula was carried out. Seed oil content, Azadirachtin content and seed protein profiles of 80 samples of neem indicated diversity with respect to phenology, fruiting period and chemical constituents. Distribution maps of 10 less known trees are being plotted. Pharmacological evaluation of *Jatropha curcus* root extract revealed antidiarrhoeal activity in mice model. Seasonal variation in crude bark drugs of *Alstonia scholaris*, *Saraca asoca* and *Terminalia arjuna* were investigated using macroscopic and microscopic observations, physical constants and phytochemical analysis. In the studies on lichens of Andaman and Nicobar Islands, nine species of *Coccocaprina* from main land India and six of *Pannaria* from Andaman and Nicobar Islands were found to be new taxa. The lichen *Bulbothrix setschwanensis* has been brought into culture using *in vitro* methods. Rare and interesting species were identified from collections of forest fungi. Thirty-six fungal isolates of Xylariaceae were brought into culture and some of these are being studied for physiological parameters affecting biomass production and enzyme elaboration. The mushroom *Hohenbuehelia atrocaerula* was found to exhibit anti-nematicidal activity. The crop improvement programmes were continued on wheat, soybean and grapes. Nearly 600 quintals breeder seed of soybean and wheat varieties was supplied on the Government of India demand. Soybean varieties developed at this Institute and the wheat variety MACS 2496 continue to be in great demand among the farmers, as evidenced by the indent for seed. Two *durum* wheat varieties MACS 3075 and MACS 3125 have been considered for final year's testing in All India coordinated trials, before they are considered for release for cultivation. Grape hybrids have been evaluated for disease resistance and fruit quality and the promising hybrids were supplied for multi-location testing. Rootstocks like Digraset and *Berlanderi riparia* were confirmed for their drought resistance. In plant molecular biology, efforts are underway to identify molecular markers for wheat stem rust resistance gene Sr30, using microsatellite markers. Markers are also being identified for *durum* wheat grain quality characters like grain weight and b -carotene content. The grape germplasm is being screened by RAPD and microsatellites in an effort to identify polymorphic markers, which could be used for finger printing of Indian grape germplasm.

Three patents related to production of Actinokinase, Bioremediation of triphenylmethane dyes and repellent formulation for Indian honeybees were filed with provisional specifications.

❖ *BOSE INSTITUTE, KOLKATA:*

The institute has evolved over the years into a multi-disciplinary research organization with stress on

fundamental research in its pursuit of advancement of knowledge in Science and technology and at the same time developing highly competent and able scientific manpower for the country. The institute has on its staff highly qualified and experienced scientists working in the field of Biological, biochemical, Chemical and Physical sciences placed in long established departments of Physics, Chemistry, Botany, Microbiology, Biochemistry, and Biophysics, and the research sections on plant Molecular & Cellular Genetics, Animal Physiology, Immunotechnology and Environmental science. Besides, there are service centres such as Regional Sophisticated Instrumentation Centre (RSIC), Central Instrumentation Facility, DIC, Library, Workshop etc. The wide ranging and comprehensive base of available scientific infrastructure also comprises of the Acharya J. C. Bose High Altitude Research Centre at Darjeeling and experimental field stations at Falta and Madhyamgram in West Bengal catering to the need and requirements of scientists in their researches. Bose Institute has thus, very effectively and successfully achieved the major objectives for which it was established and continues to grow in its scientific excellence contending with the best in biochemical, biophysical and physical sciences.

Bose Institute is one of the few multi-disciplinary institutions in the country that has succeeded in developing a vast intellectual resource in areas ranging from astrophysics, radiation physics, quantum mechanics to the frontline areas of contemporary biology such as bioinformatics & computational biology, structure and functional dynamics of biomolecules, drug modeling, molecular genetics of microbes, development of transgenic plants etc. Based on the enduring development of scientific expertise for 85 yrs, the institute has scripted a programme of research for 10th five year plant that will allow it to retain the competitive edge in the 21st Century. Moreover, the steady high rate of peer reviewed publications from the institute and individual achievements of scientists in their respective area of specialization is a testimony of the excellent overall performance and thus warrants continuation of the research activities of the Institute.

As regards the IT and Communication facilities, Bose Institute has an excellent LAN system in place which allows uninterrupted means of transfer of large date pools from one laboratory to another as well as between research institutions. The establishment of DIC has made it possible for the scientists to have convenient access to a wide range of data. The DIC has become the main source of information related to bioinformatics. The centre works as the backbone of the research and development activities in various fields like genetic engineering, biocrystallography, biocomputing, molecular modeling etc. The main areas of research using this facility are genome analysis, molecular modeling, plant genomics and proteomics, protein folding and threading, and biomolecular structure and recognition. Several steps have been recently initiated to further improve accessibility and connectivity to internet services as well as computerization of accounts and management information at the institute. In addition efforts are underway to develop a digital library to improve access to scientific literature search and exchange of data. The high quality of basic research in different areas at Bose Institute has attracted considerable extramural funding from both national and international agencies (app. Rs. 2.5 crores per year).The scientific programmes at Bose Institute attract considerable extramural funding from outside agencies, which has witnessed a dramatic increase during the past few years. The overhead charge received from extra-mural projects averaged about Rs. 10.00 lakhs per year. Now a mechanism has been developed to generate overhead charge from those schemes also where such allocation is not earmarked as such. In addition, efforts are being made to invite and attract more time-bound contractual R & d projects from the industry to enhance internal revenue. The current drive to explore additional resources of income for the institute are expected to yield at least 20% higher revenue generated from extra-mural and contractual research.

- ***SCHOOL OF BIOTECHNOLOGY, Devi Ahilya University, Indore :***

The School of Biotechnology was established in 1989 at Devi Ahilya Vishwavidyalaya, Indore. In 1990-91 School got recognition from the Department of Biotechnology, Ministry of Science & Technology, Government of India, New Delhi. Since 1990 to 1997 School was running its classes at the first floor of Vigyan Bhawan at Takshshila Campus of the University. In 1997 the School moved to its own Biotechnology Building in the same campus. The School of Biotechnology has its own double storied building with a total surface area of about 7000 Sq. feet. School has well sophisticated laboratory facilities for Enzyme technology, protein and nucleic acids, Genetic Engineering, Microbiology, Plant Tissue Culture, Biochemical Engineering and Environmental Biotechnology. School of Biotechnology is also having Bioinformtics Sub-centre, which is involved in high-level research work and software development in the field of Bioinformatics.

Biopesticides/Biocontrol Agents

Grasserie is a devastating disease of silk worms and to produce botanicals for controlling this disease, a farmers' mela was organized in a village of Coimbatore district to popularize the package on use of botanicals for grasserie disease management. The soya flour-based formulations of *Psoralea coryleifolia* and *Trivulus terrestris* were found to be effective as they reduced the incidence of grasserie by 73.53% and 64.74% respectively. Training and demonstration were conducted at Pudupatti and Alanganallur Block and Vadipatti Taluk of Madurai District in production and application of neem and other plant-based biopesticides to control crop and storage pests of pulses. The unemployed graduates belonging to weaker sections in two villages have already been trained in biopesticide production along with collection and preservation of plant material, large-scale extraction, partial purification and formulation. Another training programme for farmers has been conducted at village Mirwat and Nirpana in Beed district of Maharashtra on the use of bio-control agents in integrated pest management system in relation to specific crops.

Krishi Vigyan Kendra, Parbhani, Maharashtra has trained around 100 persons from 10 villages on the production and use of various biological control agents.

Field demonstrations, extension oriented activities and research in biological control of crop pests was implemented at KVK, Ahmednagar. Group discussion were held at farmers level to generate awareness about the production and use of biopesticides and botanical pesticides. Application of these technologies on various crops namely sugarcane, cotton, red gram, Bengal gram, tomato, pomegranate, vegetables were demonstrated to control insect pests. 273 farmers have been benefited through this activity.

Promotion of integrated management using Biocontrol Agents (BCA) in spices crops was carried out by Peeramade Development Society, Idukki, Kerala. To popularize the effective control measure with the use of bio control agents, 25 farmers from different villages were trained in use of biocontrol agents. The technology has been popularized among the SC/ST farmers for adoption for its large use as bio control measures in the field conditions.

Biofertiliser

SC/ST Communities in Imphal East District, Manipur were trained for mass production of Azolla in their own production by Manipur University, Imphal. Field demonstration on the efficacy of Azolla biofertiliser as partial substitution of chemical nitrogen fertilizer was conducted in the farmers' fields as duel culture technique using local rice variety, KD-2-6-3.

Technologies/Products

The application of biotechnology techniques in the agriculture sector can potentially improve food and nutritional security by raising crops tolerant to adverse weather and soil conditions, by enhancing adaptability of crops to different climates and by improving yields, pest resistance and nutrition, particularly of staple food crops. Over the past decade, the application of biotechnology to the problems in world agriculture has yielded significant productivity gains to the producers. Various programmes of the Department have been directed in this direction. With advancements in GM technologies, these benefits are expected to increase in Indian scenario.

New initiatives for the 10th plan

The rice genome-sequencing programme with present commitment of gap filling and annotation shall be given high priority.

"Bio-remediation of Arylonatule contaminated soil : A Programmed Attenuation Approach "

The National Environment Engineering Research Institute Nagpur has recently completed a comprehensive study on bioremediation of soil contaminated with at M/s. J. K. Enterprises (JRE), Gandhidham (Dist, Kentch Gujarat). The earthquake that occurred on January 26, 2001 resulted in development of cracks at the bottom of a storage tank containing arylonatule (AN) which led to release of about 2500kl of AN to the surrounding soil.

The comprehensive study carried out by the Institute reconnaissance survey, site characterization, assessment of extent of contamination, and remediation of the contaminated site. The preliminary, studies on site charactensation & assessment, followed by laboratory studies indicated the feasibility of bio-remediation at the contaminated site. The studies here carried out to enrich acrylonitub degrading bacterial culture from contaminated soil. The studies showed that a crylonitub in contaminated soil decreases. However, under a programme attenuation approach, the contaminated field was amended with diammonium phosphate, and was ploughed with farmyard manner and acrylonitub deguding culture. The contaminated soil could be completely remediable to the level of below detectable limit for a crylomituile within two months from the date of soil amendment.

Source : Annual Report 2001-2002, NEERI, Nagpur

S Asia to replicate energy park success

Kolkata, Jan.1- Till a few months ago, Kolkatans hardly knew about the West Bengal Rural Energy Development Authority's energy education park on the Eastern Metropolitan Bypass. The recreation center shot into prominence when the CM inaugurated a new ride in August. And now, its fame has spread to foreign countries.

Scientists from South Asian countries visited the park recently to learn a few things to help them build similar parks in their countries. " Japan and Vietnam are interested in utilizing solar power as it is pollution-free. They have sought technical expertise from us to build similar parks in their countries. We have extended our help. We plan to send scientists to their countries in the near future," said MR. SP Gon Chowdhuri, director, WBREDA.

Energy education parks are coming up other states as well. While construction has been completed in Delhi, Pune and Bangalore will follow suit in a short time.

The energy park in Kolkata is the first of its kind in the country. Its 'Journey to Space' ride has received immense response during this festive season. Everyday, about 500 visitors are taking the 20-minute virtual space shuttle ride costing Rs. 40 each.

The construction of the park cost around Rs. 1.5 crore, and was jointly funded by the Centre and the state government. It was opened to the public in 2000.

Oxalic acid-free tomatoes developed

Chandigarh, PTI: After creating protein-rich potato, Indian scientists have succeeded in producing tomatoes which are free of oxalic acid, a compound that causes kidney stones.

The tomato was produced by incorporating a gene from an edible mushroom into the plant by scientist of Delhi National Centre for Plant Genome Research (NCPGR), Dr. Shubra Chakrabarty, who led the research, told a plenary secession at the 91st Science Congress here. The institute has patented the mushroom gene and also plans to use the same technology to create 'kesari' dal which will be free of nurotoxin that causes nervous system disease in people who consume this dal, she said. Human beings cannot degrade oxalic acid present in many plants like tomatoes, spinach, ground nut and soybean. Oxalic acid reacts with calcium in the body and gets accumulated in the kidney causing stones. Dr. Chakrabarty said in a session on the research work of young women scientists.

The team isolated a gene 'Oxalate Decarboxlase' from edible mushroom and transferred it to tomatoes, leading to production of oxalic acid free plants.

Agri-scientists estimate record production of maize and wheat in 2004 :

Country's agriculture scientists have estimated record production of maize and wheat in the current year. India is poised to be the topmost wheat producer in the world within coming years, they said. Scientists have achived a breakthrough in reducing the oxalyi di-amino propionic (ODAP) acid in kesari pluse (dal). Excess presence of ODAP causes athirus.

Addressing the media in Capital on Thursday, the director of India Agriculture Research Institute (IARI), Dr. S. Nagarajan said, " in the current year maize output is likely to touch a record level of 15 million tonne and in the rabi (winter) season wheat output will also be a bumper at 76 to 78 million tonne. The area coverage under wheat has increased by 1.5 million hectare. Prospects for mustard and other rabi crops are also bright". He said that the prevailing cold weather has been beneficial to the standing wheat crop. There has been a good presence of soil moisture after the monsoon season and there has been intermittent rains over central India. All these factors are likely to contribute towards a bumper rabi crop.

The former director-general of India Council of Agricultural Research (ICAR), Dr. RS Paroda said ":India is now poised to be the topmost wheat producer in the world, by overtaking China which is now the number one wheat producer. India has already excelled US in wheat production and is now ranked second. As area under wheat crop in China and US are not likely to expand, India can become the topmost wheat producer with its expending are under the crop". Maize scientist, Dr. Surinder K Vasal said that single crop hybrid quality protein maize (OPM) namely 'Shaktiman 1' and Shaktiman 2' has been released for commercial cultivation in the country. He called for public private sector cooperation in production and multiplication of seeds.

Source : ENS Economic Bureau, New Delhi, January 15, 2004

Biotech crop acreage up by 100 pc : agency

The biotech agency has painted a rosy picture on a global scale but is not disclosing the methods it had adopted in making that estimation.

Without disclosing the methodologies, an international biotech association claimed on Tuesday that biotech crop hectare in India has grown by cent per cent from last year's total area of cultivation. So far, Bt cotton, developed and marketed by Mahyco-Monsanto, is the only biotech crop in India that has entered into its second season.

"In India, biotech hectare grew by 100 per cent as a result of significant gains in the Bt cotton area, which has been almost doubled in 2003 to touch 100.000hectares in 2003", said Dr Randy Hauteau, director of the south-east Asia center of International Service for the Acquisition of Agri-biotech. application (ISAAA), a non-profit organization.

Talking to reporters in a teleconference from Hong Kong, Dr.Hauteauu also said that within the next five years, according ISAAA's forecast, ten million farmers in 25 or more countries would plant 100 million hectares of biotech crops, primarily genetically modified cotton, canola, soybean, corn and maize.

IPR IN BIOTECHNOLOGY IN ADDTION TO PATENTS

The biotech industry worldwide has revolutionized the understanding of the medical sciences and disease, enabling scientists and clinicians to develop new therapies for ailments like coronary heart disease, stroke, cancer, arthritis, diabetes and AIDS. The momentum of developments in these areas is reflected in the fast coming of new technologies bringing along

with it the urgent need to understand intellectual protection. Through importance of patents in protecting inventions in biotechnology was well understood but in India and in some other countries full range of protection for biotechnology is not yet available through patents. There is thus a need to deal with this through alternative forms of IPR that can be taken advantage of. Three recognized systems are used in protecting biotech inventions. The rapid advances in biotechnology have pushed the frontiers of intellectual property protection. However, a state of equilibirium is still away. For the time being patents, trade secrets and copyrights are commonly used and a sui generis system is developed to meet situations that emerge from time to time.

Z-Tag Transgenic Zebrafish Technology

Zygogen, a grug discovery that uses transgenic zebrafish technology to build models of human disease and screen for drug candidates, announced on June 5, 2002, that the United States Patent and Trade Office awarded patent (No 6380458) entitled "Transgenic Fish with Tissue Specific Expression" to the Medical College of Georgia Augusta Ga. with Zygogen as the exclusive licensee.

The patent covers composition and methods of making and using transgenic zebrafish with tissue specific expression of a gene. Corresponding patent applications have been filed in major international markets, including Europe and Asia. The patent was initially filed in 1997 by Zygogen's scientific founder, Shuo Lin, PhD, the sole inventor of this patent.

The company claims that this is the first in a series of patent applications that covers transgenic zebrafish with tissue specific gene expression, including quantitative methods for drug screening, target identification and validation, and the Z-tag fish combine the power of Zebrafish's transparent organogenesis with fluorescent markers, allowing the development of quantitative zebrafish assays for rapid compound screening.

Through the use of its proprietary fluorescent tagging technology, Z-Tag ™, Zygogen designs transgenic Zebrafish with organs and specific cell lineages that fluoresce, broadening the use of zebrafish for disease models and screening of small molecules. Zebrafish have demonstrated strong relevance to human disease and shown potential to provide more accessible and effective alternative to mice- the current industry standard.

(Zygogen Press Release, June 5, 2002)

Recycle and Reuse of Treated Grade II Effuent from Paper Mill

The average production of paper in Orient Paper Mills (OPM), which is located near Sone river is around 225 tonnes/day. During the production process, effluents generated are segregated into two main categories of Gr II and Gr III. Gr II effluent is bio-degradable and is relatively less polluted. Final treated Gr II effluents were collected on monthly basis to analyze detailed physico-chemical characteristics for considering reuse/ recycle of the treated wastewater.

The treated Gr II effluent can be recycled for industrial purposes after mixing with the Sone river water in the upsteam side of the intake well. Mixing model studies were applied to know the level of dilution feasible in the Sone river and subsequent average pollutant concentrations at the meeting point. Water quality mixing model is used to derive the final average concentration of pollutants after mixing different streams together. Computer modeling studies indicated the possibility of recycling treated Gr II effluent for industrial use with appropriate dilution with Sone river water.

Transgenic Chickens with Monoclonal Antibodies

Monoclonal antibodies are an important potential new class of drug candidates. They can be difficult and expensive to be produced in large quantities as they are complex proteins comprising two light and two heavy chains. The chains are encoded by two distinct genes. However, a US biotechnology company TranXenoGen, has announced the successful production of monoclonal antibodies in the albumen of chickens. The monoclonal antibodies expressed were the company's CD4 research antibody and a human antibody of one if its partners. Other research group are also attempting to express monoclonal antibodies in the milk of transgenic mammals, however transgenic chicken nay provide a cheaper and quieker solution it is claimed.

The chimaeric chickens were developped utilizing a proprietary direct-egg transfection technology for which a patent application has been filed. The direct egg transfection method used was a non-viral gene transfer technique that allows the transfection of transgene fragments and multiple transgenes simultaneously, which is required for the production such as antibodies. The transgenes were injected into the developing chicken embryo to produce a chimaeric chicken which were then grown to sexual maturity and then bred to generate transgenic founder chickens. The transgenic hens were screened for expression of the desired protein in their eggs. The company is continuing to develop transgenic chickens for generic biologicals, Insulin and Human Serum Albumin and for three other strategic partners' monoclonal antibody products.

Biodegradable Resorbable Stent Patent

Endovasc Ltd, Inc. is a biotechnology company focused in the area of cardiovascular disease, pioneering drug delivery technology designed to deliver and released drugs to their intended targets in an efficient and controlled manner. The company's products and processes include: Liprostin (TM), ANGIOGENIX (TM) (Nicotine Receptor Antagonist), PROStent(TM) stent-coating technology, and a biodegradable resorbable prosthesis.

Endovasc announced on June 5, 2002, that the USPTO had granted it its second biodegradable drug delivering

stent patent titled, “Prosthesis with Bidoegradable Surface Coating and Method for Making Same” (No 6,395,023 B1) on May 28, 2002.

Endovase recently licensed its sent coatings and biodegradable stents to MIV Therapeuitcs, Inc. for US $2.2 million plus royalties, and this new patent is included in the license.

The company’s proprietary technologies are covered by 7 US patents with over 50 patents pending worldwide pertaining to the cardiovascular field of medicine.

Toxicity of cypermethrin: hsp70 as a biomaker of response in transgenic Drosophila

(Source: Biomakers, 2002, Vol. 7(6), 501-510 by Indranil Mukhopadhyay, Aamir Nazir, D.K. Saxena and D.Kar Chowdhuri)

Heat shock protein induction is often associated with a cellular response to a harmful environment or to adverse life conditions. The main aims of the study were (I) to evaluate the cytotoxic potential of cypermethrin; and (2) to investigate the suitability of stress induced heat shock protein Hsp70 as a biomaker for environmental pollutants in transgenic Drosophila melanogaster. Different concentrations of cypermethrin (0.002, 0.2. 0.5 and 50.0p.p..m.) were mixed with food. Third instar larvae of transgenic Drosophila melanogaster were to feed on these mixtures for different time intervals (2,4,6,12,24 and 48h). following feeding hsp70 induction and tissue damage were evaluated. In the highest concentration treatment group (50 p.p.m). 100% larval mortality was recorded after 12 h exposures. HSP70 was found to be induced even at the lowest concentration (0.002 p.p.m.) of the insecticide while tissue damage was observed in the larvae exposed for 48 h. while an insignificant decline in hsp70 expression was observed in the larvae exposed to cypermethrin at a dietary concentration of 0.002 p.p.m. after 48 h compared with those exposed for 24 h. in the next two higher concentrations of the toxicant, a similar but significant decline in hsp70 expression was evident in the exposed larvae after 48h. the study reveals the cytotoxic potential of cypermethrin and further proposes that hsp70 induction in transgenic Drosophila melanogaster could be used as a sensitive biomaker in risk assessment.

- **Developing Genetic Transformation**

A US Patent (No 6392125) has been awarded to The Nara Institute of Science and Technology in Japan. The inventors are Hiroshi Sano and Tomonobu Kusano. The patent covers transformation techniques for coffee describing an Agrobacterium based method for transforming embryogenic callus in the patent, method for producing the transformants of coffee plants and transgenic coffee plants.

The technique covered by the patent involves the induction of embryogenic calli from leaf plants on McCown’s Woody plant medium supplemented with 5 m M2-iP. These calli were co-cultured with Agrobacterium tumefacience EHA101 with the plasmid pIG121-Hm, containing beta glucuronidase (GUS), hygromycin phosphotraferase (HPT) and neomycin phosphotransferase II genes. They selected transgenic callus by a gradual increase in hygromycin concentrations (5,50,100mg/1). The calli surving on a medium containing 100 mg/1 hygromycin showed a strong GUS positive reaction with X-glue solution. Somatic embryos were formed and germinated from these putative transgenic callion WPH medium with 5 m M2-iP. Regenerated small plantlets with shoots and roots were transferred to a medium containing both 100 mg/1 hygromycin and 100 mg/1 kanamycin for final selection of transgenic plants. GUS and HPT presence were confirmed by various screens.

Various species of coffee plants can be transformed using this method. Caffeine synthetase, herbicide resistance, pest resistance gene and disease resistance genes were cited by NAIST as specific.

Section – III

FORTHCOMING EVENTS

International Society of Environmental Biotechnology Conferencet

Begins: June 18, 2004 City: Chicago Country: USA

SOLAR2004: A Solar Harvest-Growing Opportunitiers
Begins: July 10, 2004 City: Portland Country:USA

10th Annual Industrial Wastes Technical and Regulatory Conference

Begins: August 22, 2004 City: Philadelphia Country: USA

Midwestern States Risk Assessment Symposium

Begins: August 25, 2004 City: Indianapolis Country: USA

8th International Global Atmospheric Chemistry Conference (IGAC)

Begins: September 4, 2004 City: Christchurch Country: New Zealand

32nd Conference of the European Teratology Society

Begins: September 19,2004 City: THESSALONIKI Country: Greece

Littoral 2004: Delivering Sustainable Coasts: Connecting Science and Policy

Begins:September20, 2004 City: Aberdeen Country: United Kingdom

Contaminated and Hazardous Waste Site Management - Theory, Practice & Outdoor Field Demonstrations

Begins: September 20, 2004 City: Toronto Country: Canada

International Workshop on Synchrotron Applications in Environmental Sciences

Begins: October 18, 2004 City: Aix-en-Provence Country: France

The IASTED International Conference on Environmental Modelling and Simulation
Begins: November 22, 2004 City: St. Thomas Country: USA

Heritage, Globalization and the Built Environment
Begins: November 29, 2004 City: Manama Country: Bahrain

Hope2005

Begins: November 3, 2005 City: Mumbai Country: India

Published by S. C Santra, Incharge EMCB-ENVIS Node on Environmental Biotechnology, Dfepartment of Environmental Science, University of Kalyani, Nadia 741235, West Bengal. Email: envbiotech@vsnl.net, Phone No:033-25808749, URL: http://www.kuenvbiotech.org