

## 1. RESEARCH ROUND-UP

### A NOVEL GENE FOR INDUCING MALE STERILITY IN PLANTS

Production of hybrids between diverse and desirable parents is the basis for almost all the modern breeding programmes. Hybrid plants have become increasingly important in various commercial food crops around the world. In crops, such as maize, sunflower, sorghum, sugar beet, cotton and many vegetables, hybrids account for a large share of the market. Hybrid plants show increased performance in comparison to the parents e.g. higher yield and better disease resistance because of heterosis or hybrid vigour. The efficient development of hybrids is limited by the mating system in a species. Twenty to fifty per cent of all extant plant species (including many cultivated plants) are autogamous (have both functional male and female organs within the same flower). The key to the successful commercial production of hybrid seeds is sufficient control of the pollination process that is male sterility. Male sterility is defined as the failure of plants to produce functional anthers, pollen, or male gametes.

Many current commercial hybrid seed production systems for field crops rely on a genetic means of pollination control. Plants that are used as females either fail to make pollen, fail to shed pollen, or produce pollen that are biochemically unable to affect self-fertilization. Of more widespread interest

for commercial seed production are systems of pollen-control-based genetic mechanisms causing male sterility. There are two main types of male sterilities observed in nature : cytoplasmic male sterility and nuclear male sterility. Both the types of male sterilities are used in commercial breeding programmes to ensure cross-pollination to produce hybrid seeds in different crops, but commercial utility of these sterility systems is limited. Cytoplasmic male sterility involves maintenance of three breeding lines : male-sterile line, maintainer line and restorer line. In case of nuclear male sterility, female line contains both male sterile and male fertile plants; latter must be identified and removed before pollen shedding during hybridization programme.

Discovery of dominant negative genes, which would alter plant development, would be particularly useful in developing genetic methods to induce male sterility. In the present description, the dominant negative gene is applied to a gene coding for a product that disrupts an endogenous genetic process of a host cell which receives the gene, and that is effective in a single copy or may produce an effect due to overexpression of the gene by increased production of the gene product. Biotechnology has enabled the development of several new pollination control systems that could be useful for hybrid seed production. There has been significant interest in

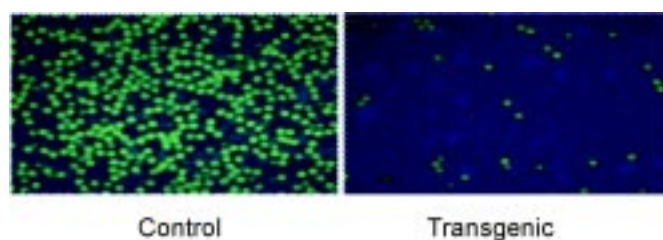


using an ablation system for controlling reproductive development in plants. Reproductive control has been achieved in several plant species by genetic ablation, which entails linking a reproductive-preferred promoter with a dominant negative gene to ablate reproductive cells. There are a number of dominant negative genes used for creating male sterility such as barnase gene, ribosome inactivating protein, diphtheria toxic gene, mammalian uncoupling gene and mammalian bax gene. They all are from bacterial or mammalian origin. Disadvantageous effects and ethical problems related to these genes are reported. Plant Transgenic Group has used a dominant negative gene from plant itself to avoid all these problems.

In anthers, microspores are surrounded by tapetum. The tapetum is known to provide nutrition to developing microspores especially exine of pollen grains, the main structural components of the pollen wall. The tapetum degenerates during the later stages of pollen development. The proper timing of cell death in the tapetum is essential for normal microsporogenesis. The group identified an autophagy related gene, *ATGx* from *Arabidopsis*, the expression of which into anther tapetum of transgenic tobacco (*Nicotiana tabacum*) induces cell death. These transgenic plants showed considerable

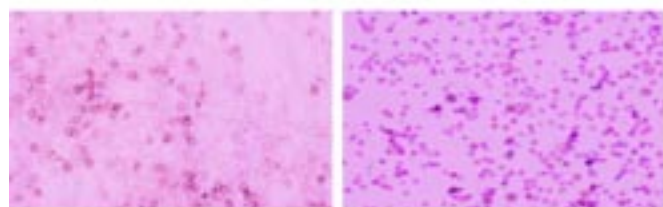
reduction in pollen viability as confirmed by FDA test (Fig. 1) and *in vitro* pollen germination test (Fig. 1) conferring male sterility. Pollen samples were collected at blooming time and their quality was tested by the fluorocromatic procedure (FCR), which principally tests the integrity of the plasmalemma of the vegetative cell. This integrity seems to be closely correlated with viability. Several transgenic lines expressing *ATGx* into anther tapetum were raised (Table 1). Most of the pollens of the transgenic plants were not viable as shown in Table 1.

The aim is to induce early degeneration of tapetum which results abnormal pollen development. The pollen of most of the transgenic lines lack pollen pore from which pollen tube germination occurs, as shown in scanning electron micrographs of transgenic pollen (Fig. 2). Pollen of control plants were colpate (having both colpa and pore) whereas pollen of transgenic plants were modified into colpate (having colpa only). This could be the reason of failure of pollen germination in latter case. *In vitro* pollen germination test was performed using artificial liquid media proposed by Kwack (1964). Extensive pollen germination was observed in the cultured pollens of one anther of control plants (Independent transgenic lines for an expression cassette comprising GUS reporter gene driven by tapetum



Control Transgenic

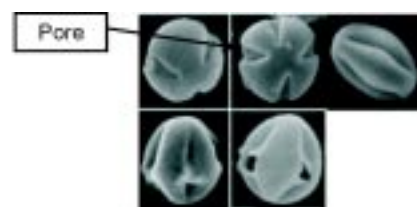
Pollen Viability Test



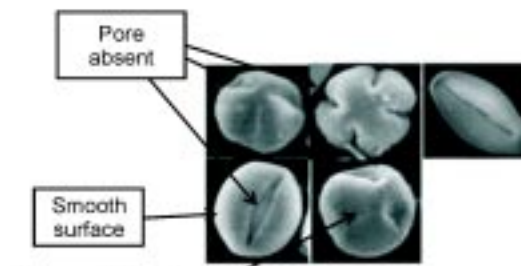
Control Transgenic

*In Vitro* Pollen Germination Test

Figure 1



SEM of Control Pollen (Colpate)



SEM of Transgenic Pollen (Colpate)

Figure 2

**Table 1. Evaluation of pollen viability and pollen germination in control and transgenic plants**

Control#	Pollen Viability%	Pollen Germination %	Transgenic Lines*	Pollen Viability%	Pollen Germination %
Control (1)	85-90	65-75	Transgenic (1)	2-6	0-0.03
Control (2)	80-90	65-70	Transgenic (2)	2-7	0-0.09
Control (3)	80-92	62-71	Transgenic (3)	9-14	0-1
Control (4)	84-96	72-77	Transgenic (4)	5-8	0-0.06
Control (5)	80-92	74-79	Transgenic (5)	7-10	0-0.08
Control (6)	81-96	73-77	Transgenic (6)	7-12	0-0.18
Control (7)	78-93	71-80	Transgenic (7)	9-16	0-1
Control (8)	88-97	77-82	Transgenic (8)	11-20	1-1.5
Control (9)	80-92	67-74	Transgenic (9)	10-18	0-1
Control (10)	81-90	65-76	Transgenic (10)	8-14	0-0.7

\*Independent transgenic lines for the expression cassette comprising *ATGx* gene driven by tapetum specific promoter.

#Independent transgenic lines for the expression cassette comprising *GUS* reporter gene driven by tapetum specific promoter.

specific promoter) however, pollens of transgenic lines either failed to germinate or if germinated showed severely retarded pollen tube growth. Fruit set was normal in the transgenic plants of all the 10 lines but the bulbs were of smaller size. Seed setting was severely affected in bulbs of the transgenic plants in comparison to control plants (Table 2). The transgenic plants grew well to visible maturity and showed normal flowering. Expression of the autophagy gene in anthers did not lead to any morphological abnormality except non-viable pollens and very poor or no seed setting.

All the above reasons are responsible for male sterility of the transgenic tobacco lines having the said gene expressed in tapetum. The other major advantage of using this cytotoxic gene is that it is plant in origin and thus circumvents biosafety problems associated with expressing other bacterial, viral, mammalian proteins for the same purpose. The said gene has no product which is harmful outside the target cell. This gene, as a male sterility DNA mimics natural systems and is less destructive than for example ribonuclease, diphtheria toxin if `leakage` occurs into other cells.

**Table 2. Seed setting in control and transgenic plants**

Control#	Seed Weight (gm)	Total Number of Pods	Seed Weight Per Pod (mg)	Transgenic Lines*	Seed Weight (gm)	Total Number of Pods	Seed Weight Per Pod (mg)
Control (1)	1.7382	45	38.62	Transgenic (1)	Nil	9	-
Control (2)	0.3815	6	63.58	Transgenic (2)	0.0522	37	1.41
Control (3)	1.7134	29	59.08	Transgenic (3)	0.7102	42	13.9
Control (4)	1.9002	29	65.08	Transgenic (4)	Nil	23	-
Control (5)	0.440	12	36.6	Transgenic (5)	0.210	18	11.6
Control (6)	0.336	7	48.07	Transgenic (6)	0.822	49	16.7
Control (7)	1.064	12	88.67	Transgenic (7)	0.370	28	13.21
Control (8)	1.182	17	69.52	Transgenic (8)	0.834	26	32.07
Control (9)	0.680	6	113.34	Transgenic (9)	0.228	10	22.8
Control (10)	2.085	22	94.77	Transgenic (10)	0.658	68	9.67

\*Independent transgenic lines for the expression cassette comprising *ATGx* gene driven by tapetum specific promoter.

#Independent transgenic lines for the expression cassette comprising *GUS* reporter gene driven by tapetum specific promoter.

## NEW CULTIVAR REGISTERED

'Aruna', a gamma ray mutant of 'Palekar' with drooping branching habit; leaves 6.8 x 3.8 cm, light green, margin curled inward; mature bracts - Azalia Pink (523/1), young bracts – Orange (12/1); recurrent bloomer; good for 'standard', cascade, hanging basket, mound and pot plant.



'Aruna' in flowering

This new cultivar of *Bougainvillea*, developed by the Institute in 2002, has been registered with The International Registration Authority for Bougainvilleas, Division of Floriculture and Landscaping, IARI, New Delhi.

## NBRI RECOGNISED AS REPOSITORY

The Ministry of Environment and Forests, Government of India, New Delhi, has designated NBRI to act as a repository for biological resources viz. Angiosperms, Gymnosperms, Pteridophytes, Bryophytes, Lichens, Macrofungi and Macroalgae under the Biological Diversity Act 2002. According to the Act, the Institute shall keep in safe custody the representative samples as voucher specimens of the biological material accessed in accordance with provisions of section 19 of the Act, along with relevant information related to material, such as DNA finger prints, if so required by National Biodiversity Authority (NBA). NBRI shall also keep in safe custody the type specimen deposited by any person who discovers a new taxon, in accordance with sub-section (3) of section 39 of the Act.

## MOSS HOUSE

In order to enhance the existing plant diversity and to make it more diversified, educative and purposeful, a **Moss House** has been developed in the Institute's Botanic Garden. It was inaugurated by Prof. VL Chopra, Member, Planning Commission, Govt. of India, New Delhi on September 22, 2008 in the presence of Director and scientists of the Institute.



Glimpses of inauguration of Moss House

Bryophytes are highly significant and phylogenetically important group of plants which occupy systematic position between algae and pteridophytes. They grow in specific microhabitats, mostly on hills (between 1000 m to 3000 m above sea level). About 14,500 species have been known throughout the world, out of which India has nearly 850 liverworts, 40 hornworts and 1600 mosses. Some of the bryophytes also have commercial value due to their therapeutic and medicinal properties. It is the first moss house in India, which will conserve the bryophytic wealth from various parts of the country. It has been fabricated with an objective to disseminate the knowledge about bryophytes among students, researchers & common people and to introduce the bryophytic wealth at one place from various parts of the country. It will also help to acclimatize and conserve the Rare, Endangered & Threatened (RET) and endemic taxa. Their use as peat for fuel, as moss grass, moss sticks and bags in horticulture is very common. At present, about 14 taxa viz. liverworts like *Asterella angusta* (Steph.) Kachroo, *Cyathodium cavernarum* Kunze, *Marchantia linearis* Lehm. et Lindenb., *M. paleacea* Bertol., *Plagiochasma appendiculatum* Lehm. et Lindenb., *P. intermedium* Lindenb. et Gott., *Riccia*

*billardieri* Mont. et Nees, *R. discolor* Lehm. et Lindenb. and mosses like *Fissidens splachnobrioides* Broth., *F. taxifolius* Hedw., *Hyophila comosa* Dix. et P. Vard., *Semibarbula orientalis* (Web.) Wijk. et Marg, *S. ranuii* Gangulee and *Vesicularia montagnei* (Bel.) Broth., etc. are growing in the house.

### TECHNOLOGY TRANSFER

The Institute signed the Technology Transfer Agreement for 'Herbal Gulal' and 'Herbal Sindoor' technologies with M/s Shri Ganesha Herbal Colours Pvt. Ltd., Raipur on September 3, 2008.

### PATENT AWARDED

Health promoting functional foods fortified with herbs (0384 NF/2004/US).

### NEW PROJECTS

1. A project entitled, "Studies on relationship between ecogeography of the chemotypic variation of nine important but highly

threatened medicinal plant species and prospects of their cultivation", has been sponsored by NAIP/ICAR, Govt. of India, New Delhi, for a period of four years with Dr. AKS Rawat, Scientist, NBRI, Lucknow as PI and Drs. P Manivel, Scientist, National Research Centre for Medicinal & Aromatic Plants, Gujarat, KS Negi, Scientist, NBPGR, Nainital; SK Tewari, S Srivastava and S Rastogi, Scientists, NBRI, Lucknow, as Co-PIs.

2. A project entitled, "Study of herbal acaricides as means to overcome the development of resistance in ticks to conventional acaricides", has been sponsored by NAIP/ICAR, Govt. of India, New Delhi, for a period of four years with Dr. S Ghosh, Indian Veterinary Research Institute, Izatnagar as PI and Drs. R Ravindran, Kerala Agriculture University, Kerala, AKS Rawat, Ch V Rao and S Srivastava, Scientists, NBRI, Lucknow as Co-PIs.

## 2. PUBLICATIONS

### RESEARCH PAPERS

1. Abhilash PC, Jamil S, Singh V, Singh A, Singh N and Srivastava SC – Occurrence and distribution of hexachlorocyclohexane isomers in vegetation samples from a contaminated area. *Chemosphere*, 2008, **72** : 79-86.
2. Abhilash PC and Singh N – Distribution of hexachlorocyclohexane isomers in soil samples from a small scale industrial area of Lucknow, North India, associated with lindane production. *Chemosphere*, 2008, **73** : 1011-15.
3. Abhilash PC and Singh N – Influence of the application of sugarcane bagasse on lindane mobility through soil columns : Implication for bio-treatment. *Bioresource Technol.*, 2008, **99** : 8961-66.
4. Bhargava A, Shukla S and Ohri D – Implications of direct and indirect selection parameters for improvement of grain yield and quality components in *Chenopodium quinoa* Willd. *Int. J. Pl. Prod.*, 2008, **2**(3) : 183-91.
5. Dwivedi S, Srivastava S, Mishra S, Dixit B, Kumar A and Tripathi RD – Screening of native plants and algae growing on fly-ash affected areas near National Thermal Power Corporation, Tanda, Uttar Pradesh, India for accumulation of toxic heavy metals. *J. Hazard Mater.*, 2008, **158**(2-3) : 359-65.
6. Govindarajan R, Singh DP and Rawat AKS – Validated RP-LC method for standardization of ashokarishta : A polyherbal formulation. *Chromatographia*, 2008, **68** : 873-76.
7. Pandey MM, Rastogi S and Rawat AKS – Indian herbal drug for general healthcare : An overview. *Internet J. Alternative Med.*, 2008, **6**(1), ISSN No. 1540-2584.



8. Rai A, Kulshreshtha K and Chandra P – Vanishing aquatic flora of Lucknow – A status report. *Phytotaxonomy*, 2007, **7** : 13-17.
9. Rai UN, Dubey S, Shukla OP, Dwivedi S and Tripathi RD – Screening and identification of early warning algal species for metal contamination in fresh water bodies polluted from point and non-point sources. *Envir. Monit. Assess.*, 2008, **144** : 469-81.
10. Rathi A, Srivastava AK, Shirwaikar A, Rawat AKS and Mehrotra S – Hepatoprotective potential of *Fumaria indica* Pugsley whole plant extracts, fractions and an isolated alkaloid protopine. *Phytomedicine*, 2008, **15** : 470-77.
11. Rawat KK and Srivastava SC – Some interesting species of *Plagiochila* from India. *Indian J. For.*, 2008, **31**(1) : 141-46.
12. Roy RK – Grow Amherstia : Queen of flowering trees. *Indian Hort.*, 2008, **53**(4) : Inside cover page.
13. Sahai K – Note on the multipurpose economical status of *Canavalia Adans Emend. DC. J. econ taxon. Bot.*, 2008, **32**(2) : 298-301.
14. Sharga AN, Sachan JN and Roy RK – Grow new canna flowering varieties. *Indian Hort.*, 2008, **53**(4) : 35.
15. Tandon PK, Garg VK, Shukla S, Bano T, Singh PK, Rastogi A and Bhargava A – Relative selection efficiency for fennel grown on sodic soil. *J. med. Arom. Pl. Sci.*, 2007, **29** : 216-20.
16. Tewari A, Singh R, Singh NK and Rai UN – Amelioration of municipal sludge by *Pistia stratiotes* L. : Role of antioxidant enzymes in detoxification of metals. *Bioresource Technol.*, 2008, **99** : 8715-21.
17. दत्ता एस के, गुप्ता वी एन एवं बनर्जी बी के – हिपीएस्ट्रम, राष्ट्रीय वनस्पति अनुसंधान संस्थान, लखनऊ का एक उक्लिस्ट कन्द्रीय पौधा। मा.वै.औ.अ. प., 2008, **16**(1) : 36–46.
18. गुप्ता वी एन एवं बनर्जी बी के – गुलदाउदी की विभिन्न प्रजातियों के कट पुष्पों के पोस्ट हार्वेस्ट व्यवहार पर विभिन्न होल्डिंग विलयनों का प्रभाव। मा. वै.औ.अ.प., 2008, **16**(1) : 68–73.
19. गुप्ता वी एन, बनर्जी बी के एवं दत्ता एस के – कुहाषा कक्ष में मल्टी ब्रैक्टेड बोगेनविलिया की कलमें में जड़ पुंजरन हेतु ऑक्सिजन के प्रभाव का अध्ययन। मा.वै.औ.अ.प., 2008, **16**(1) : 58–63.

#### CHAPTER IN BOOK

Tripathi RD, Srivastava S, Mishra S and Dwivedi S – Strategies for phytoremediation of environmental contamination. *In* : Development in Physiology, Biochemistry and Molecular Biology of Plants, **vol. 2**. (Eds. B Bose and A Hemantaranjan). *New India Publishing Agency*, New Delhi, 2008 : 175-220.

#### POPULAR ARTICLE

द्विवेदी ए के एवं बनर्जी बी के – पुष्प कला – एक नयी दिशा (स्पेशल आर्टिकल)। *विज्ञान प्रगति*, 2008, **57**(9) : 27–34.

### 3. PH.D THESES SUBMITTED/AWARDED

#### SUBMITTED

1. 'Chemical evaluation and standardization of some important hypoglycemic plants' – Lucknow University, Lucknow – Mr. DP Singh. *Supervisors* : Dr. AKS Rawat, Scientist, NBRI, Lucknow and Dr. (Mrs.) A Khare, Lucknow University, Lucknow.
2. 'Molecular characterization of cucumo-viruses causing severe mosaic and ring spot diseases in chrysanthemum and their strategies' – Lucknow University, Lucknow – Mr. Susheel Kumar. *Supervisors* : Dr. SK Raj, Scientist, NBRI, Lucknow and Prof. HN Verma, Lucknow University, Lucknow.

## AWARDED

“Sustainable mitigation of pollution from pond ecosystem through aquatic plants and microbial intervention” – Lucknow University, Lucknow – Mr. Jatin Kumar Srivastava.  
Supervisors : Dr. Nandita Singh, Scientist, NBRI and Prof. P.N. Sharma, Lucknow University, Lucknow.

## Summary

Experiments were undertaken with the aim to devise a method for remediation of urban ponds. The study was accomplished stepwise with the following objectives :

1. The reconnaissance of the water bodies of Lucknow City - to select some representative ones for further study.
2. Observe the seasonal variation in the water quality of selected ponds.
3. Study the pollution influx from catchment areas.
4. Devise methods for active removal of microorganisms from water through chemicals.
5. Evaluate the soluble reactive phosphate (SRP) removal capacity of aquatic macrophytes.
6. Study the phytoremediation efficiency of aquatic plants for removal of nutrients and pathogenic microbes.
7. Horizontal flow constructed wetland system based on the study for sustainable mitigation of pollution from contaminated urban water pond.

There are a number of pond water bodies both in rural and urban areas of Lucknow. A prelim study showed that the water quality of these water bodies was degrading because of improper use of water, especially for dumping of municipal waste and overexploitation by small scale industries. There is a lack of sufficient information of the water chemistry of these water bodies. This study was initiated on the request of Lucknow Nagar Nigam and sponsored by the Directorate of Environment, U.P.

Water bodies of Lucknow city were surveyed and found to be contaminated mainly by bio-stimulants such as  $\text{PO}_4^{3-}$ ,  $\text{NO}_3^{1-}$ ,  $\text{NH}_4^{1+}$ ,  $\text{Cl}^{1-}$  and

organic matter. Not only the macronutrients but the trace metals were also found to be present especially in the ponds of suburban areas. The results of these ponds represented evidences more leaning towards an ecological problem. Defecation has also been evidenced by the presence of microbes like *E. coli* and other enterobacters. Three water bodies were selected for study on the basis of pollutant level. These selected water bodies were monitored for the comprehensive study of natural imbalance of nutrient ions such as  $\text{PO}_4^{3-}$ ,  $\text{NO}_3^{1-}$ ,  $\text{NH}_4^{1+}$  and  $\text{Cl}^{1-}$ . The common seasonal changes were recorded and statistically analyzed, exhibiting a correlation of parameters and also the dependency of one upon another. In summers, where there is a loss of water due to evaporation, results showed more ionic concentration in the water however, the rainy and winter seasons showed a different chemistry after an average spell of rain. Overall study presents a seasonal variation in the ionic species in water and its impact on the water chemistry. The fluxing of ions inside the water body showed the natural periodic phenomenon of a water body to get eutrophied.

There are a number of coagulants used for the precipitation, coagulation and flocculation. The most common are alum [ $\text{Al}_2(\text{SO}_4)_3 \cdot 18\text{H}_2\text{O}$ ], ferric chloride [ $\text{FeCl}_3$ ], lime [ $\text{CaO}$  or  $\text{Ca}(\text{OH})_2$ ] and various polyelectrolytes. The study has been carried with a variety of such polyelectrolytes viz.  $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ ,  $\text{CuSO}_4$ ,  $\text{Al}_2(\text{SO}_4)_3 \cdot 18\text{H}_2\text{O}$ ,  $\text{CaCl}_3$  and  $\text{CaCl}_2$ . Copper sulphate showed the best results on both phosphate and chloride ions. The results have also shown the reduction in microbial cell count. The results indicate that the ions have different rate of precipitation on different treatments. The study reveals a better sustainable method to clean up the polluted water bodies. The chemical changes in water quality on the treatment of polyelectrolytes have also been examined and found to have no toxic impact on the water quality if carried in normal pH conditions.

The nutrient removal efficiency of seven plant species, viz., *Marselia* spp., *Pistia stratiotes*, *Ipomea aquatica*, *Hydrilla verticillata*, *Trapa natans*, *Chara* spp., and *Ludwigia repens*, including rooted floating and submerged aquatic macrophytes were studied. The overall performance of the submerged

macrophytes for the removal of SRP was more significant than floating aquatic macrophytes. Aquatic macrophytes in monoculture showed the removal of one or two nutrients simultaneously, however, polyculture of these macrophytes can be used in most of the treatment facilities.

Nutrient removal ability of two grasses viz. *Vetiveria zizanioides* (L) Nash and *Phragmites karka* (Retz) Trin ex. Steud in a mesocosm showed that the pH dependent phosphate removal efficiency was recorded to be more in *Phragmites* at alkaline pH and in *Vetiveria* at slightly acidic pH. Both the plants can remove the phosphate ions from the water at a higher rate, *Phragmites* being more efficient as it reduced the P concentration at alkaline medium and can be used in most efficient engineered wetlands. It was found that the root hairs grow more vigorously in these two plants in water. Higher the surface area of the roots exposed to the water higher is the uptake of nutrients.

*Vetiveria zizanioides* (L.)Nash was used for biological removal of bio-stimulants. The members of Enterobacteriaceae are responsible for phosphate solubilizing in media and in the case of scarcity of phosphate in media, these bacteria accumulate  $PO_4^{3-}$  in their outer layer of cell wall. Vetiver reportedly has mycorrhizal association; besides having potential for removal of  $PO_4^{3-}$  also showed allelopathic affect on the microorganisms present in the water. In fact, after

a period of 96 hrs, old roots of this plant have been found to have killing effects on the *E. coli*, *Enterobacter* spp., *Pseudomonas* spp., belonging to the family Enterobacteriaceae. The oil from both types of plant material, one that was not having mycorrhizal association with the roots and the other that was not having such an association, showed quite different response on the bacteria isolated from the experimental pond water systems.

Based on the studies, a **Horizontal flow constructed wetland system (HFCWS)** model has been designed to make available all the treatment protocols to be followed at the same place on a pilot scale. The system has been given two viz., primary and secondary settling tanks and one treatment horizontal bed. The Horizontal flow indicates the continuous flow of the water to avoid the growth of mosquitoes. The horizontal bed has been given a slope of 0.0830 for the higher hydraulic detention time. Higher the detention time higher will be the the time of exposure of water to the rooting system of plants like *V. zizanioides* and *P. karka*. The prototype model was designed so as to minimize the energy consumption, which has been designed in this model to be consumed only once, while pumping out the water from the pond or any other water body to the primary settling tank. After testing the workmanship of the system in the prototype model developed at NBRI, the HFCWS system is being constructed at RJP site in Lucknow City by the local municipal authority.

## 4. LECTURES, SYMPOSIA, CONFERENCES, ETC.

### LECTURES

1. 'Conservation of plant diversity in NBRI Botanic Garden – A national facility' – Dr. AK Goel, Scientist, at Nagaland University, Lumani, Nagaland .. August 4, 2008
2. 'Climate change and agriculture' – Dr. SN Singh, Scientist, at BHU, Varanasi, in the 'Teachers' Refresher Course' .. August 9, 2008
3. 'Defense response of plants to attack by insects & pests' – Dr. R Tuli, Director, at CIMAP, Lucknow, on the occasion of CIMAP Day .. August 11, 2008
4. 'Biofuel with particular focus on *Jatropha curcas* as biodiesel' – Dr. N Singh, Scientist, at BHU, Varanasi, in the 'First Refresher Course in Environmental Studies' .. August 11, 2008
5. Dr. SK Tiwari, Scientist, delivered the following lectures, in the training programme on "Financing of Medicinal & Aromatic Plants Projects", at BIRD, Lucknow, during September 22-24, 2008 :
  - i) 'Industrial and other uses of medicinal and aromatic plants (MAPs)'
  - ii) 'Important medicinal plants and their cultivation practices'
  - iii) 'Important aromatic plants'

- iv) 'Storage processing, value addition and other quality aspects of MAPs'
  - v) 'Detailed discussion on cultivation and economics of priority MAP crops'
6. 'Plant genomics : Challenges and opportunities' – Prof. KC Upadhyay, School of Life Sciences, JNU, New Delhi, at NBRI, Lucknow, on the occasion of CSIR Foundation Day .. September 26, 2008

## CONFERENCE, WORKSHOPS, MEETINGS, ETC. ATTENDED AND PAPERS PRESENTED

### Conference

Mr. SK Sharma, JTA and Dr. RK Upadhyay, Project Assistant, attended the National Conference on "Increasing Production and Productivity of Medicinal and Aromatic Plants through Traditional Practices", at GB Pant University of Agriculture & Technology, Pantnagar, during September 18-20, 2008 and presented the following papers :

- i) Sharma SK, Upadhyay RK and Tewari SK – Inter-cropping models for medicinal and aromatic plants.
- ii) Upadhyay RK, Sharma SK and Tewari SK – Increasing production and productivity of medicinal and aromatic plants through traditional practices.

### Workshops

- 1. Dr. AK Goel, Scientist, attended a two-day workshop on "Global Biodiversity Information Facility (GBIF)", at CSIR Headquarters, New Delhi, during July 24-25, 2008.
- 2. Dr. A Prakash, Scientist, attended a three-day programme on "Knowledge Management", at HRDC, Ghaziabad, during September 10-12, 2008.

### Meetings

- 1. Dr. BK Banerji, Scientist, attended the meeting of the Executive Committee of National Horticulture Mission (NHM), as DG CSIR nominee, at Krishi Bhawan, New Delhi, on July 16, 2008.

- 2. Dr. A Prakash, Scientist, attended the meetings at UP State Biodiversity Board (UPSBB), Lucknow for establishment of Biodiversity Park in the state of Uttar Pradesh, on July 4 and September 19, 2008.

## EVENTS ORGANIZED

### Training Programme

A training programme on "Biodiversity standards and digitization of natural history collections and data cleaning", was organized by Global Biodiversity Information Facility (GBIF), Copenhagen, Denmark, in association with CSIR, New Delhi and NBRI, Lucknow, on August 22, 2008. The programme was chaired by Dr. Rakesh Tuli, Director, NBRI; convened by Dr. Tariq Husain, Scientist and conducted by Dr. Vishwas Chavan, Senior Programme Officer, DIGIT, GBIF. The aim of the programme was to get acquainted with the tools and programmes used on international platform by GBIF to document primary data available in herbarium records and floral and faunal surveys. Forty-two participants from ten biological institutes, including NBRI, attended the training.



Training programme in progress

The training session was opened by Dr. Rakesh Tuli, Director, NBRI, with his introductory remarks on the scope of adopting international standards and tools for developing harmonized database on biodiversity in India and sharing it globally. At the outset, Dr. Tuli appreciated the efforts of GBIF in accelerating the digitization of primary data and its distribution through a global network of data providers. He encouraged the participants to examine the utility of GBIF standards and tools in developing user-friendly and application oriented databases on Indian biodiversity.

## 5. TECHNICAL AID, ADVICE AND TRAINING

### TECHNICAL AID AND ADVICE

Gamma irradiation facilities were provided to the following :

- i) Dr. BG Suresh, Head, Genetics and Plant Breeding, Allahabad.
- ii) Dr. V Mathew, Assistant Manager Plantation, Tata Chemical Ltd., Aurangabad.

### Training Imparted

1. Sixty-four students of different universities/institutes were imparted training on various topics of their interest, during July–September, 2008.
2. Thirty farmers were imparted training under Rural Development Project and Seed Quality Mission, at Banthra Research Station, NBRI,

on July 10, 2008. They were informed about the importance of quality seeds for high yield and profitability. The seed packets of Monsanto hybrid were also distributed to farmers.

3. Dr. RK Roy, Scientist, acted as a resource person in the training programme on “Landscape gardening and maintenance”, organized by the Bougainvillea Society of India, New Delhi, during July 22-23, 2008 for the gardeners.
4. The Institute organized a one-day training programme on “Production and Quality Control of Biofertilizers”, for 17 officials of different biofertilizer laboratories of UP, on September 20, 2008. They were provided with cultures of phosphate solubilizing bacteria and *Rhizobia*. *Rhizobia* cultures were of chickpea, pea, masoor and urad.

## 6. IMPORTANT EVENTS

### INDEPENDENCE DAY

The Institute and its research centres celebrated the Independence Day on August 15, 2008. Dr. R Tuli, Director, unfurled the National Flag and addressed the staff members. The Institute made arrangements for distribution of sweets on the occasion.

### SADBHAVNA DIWAS

The Institute observed *Sadbhavna Diwas* on August 20, 2008 with a view to promote harmony among people of all religions and states and goodwill towards everyone and a pledge to this effect was administered by Dr. SP Singh, Senior-most Scientist, to all the employees of the Institute.

### हिन्दी पखवाड़ा

संस्थान द्वारा हिन्दी पखवाड़ा 15–29 सितम्बर, 2008 के मध्य मनाया गया। इस अवधि में संस्थान के कर्मचारियों हेतु हिन्दी ज्ञान, टंकण, आशुलेखन, वर्ग पहली तथा टिप्पणी आलेखन प्रतियोगिताओं का आयोजन किया गया। इन प्रतियोगिताओं में 250 से अधिक कर्मचारियों ने भाग लिया।

हिन्दी पखवाड़े का शुभारम्भ 15 सितम्बर, 2008 को हिन्दी दिवस समारोह के आयोजन के साथ, डॉ. राकेश तुली, निदेशक, की अध्यक्षता में हुआ। इस समारोह के मुख्य अतिथि डॉ. कौशलेन्द्र पांडेय, प्रख्यात लेखक व साहित्यकार, थे। डॉ. कौशलेन्द्र पांडेय ने अपने संबोधन में संस्थान में हो रहे हिन्दी कार्यों में उत्तरोत्तर प्रगति की सराहना की। डॉ. तुली ने वैज्ञानिक लेखन को हिन्दी में अधिक से अधिक करने की सलाह दी, जिससे आम आदमी तक विज्ञान की पहुंच हो सके।

हिन्दी पखवाड़े के मध्य प्रो. जे.सी. बोस स्मारक व्याख्यान का भी आयोजन 24 सितम्बर, 2008 को किया



डॉ. कौशलेन्द्र पांडेय व्याख्यान देते हुए

गया, जिसमें डॉ अमित मिश्र, वैज्ञानिक, सी.डी.आर.आई., लखनऊ ने अपने व्याख्यान में विभिन्न शोध सम्बन्धित जानकारी दीं। सी.एस.आई.आर. स्थापना दिवस के अवसर पर 26 सितम्बर, 2008 को विभिन्न हिन्दी प्रतियोगिताओं के विजेताओं को पुरस्कृत भी किया गया। संस्थान के कर्मचारियों के बच्चों के लिए हिन्दी निबन्ध प्रतियोगिता का भी आयोजन किया गया, जिसमें लगभग 150 बच्चों ने भाग लिया। इस प्रतियोगिता के विजेताओं को 29 सितम्बर, 2008 को हिन्दी पखवाड़े के समापन समारोह के अवसर पर प्रो. इन्द्रमणि मिश्र, आई.आई.टी., रुड़की, ने पुरस्कार वितरण किया। प्रो. मिश्र ने संस्थान के अधिकारियों एवं कर्मचारियों की हिन्दी में कार्य करने हेतु भूरी-भूरी प्रशंसा की।

### CSIR FOUNDATION DAY

The Institute observed the 'Open Day' on September 26, 2008 to commemorate the Foundation Day of Council of Scientific and Industrial Research (CSIR). On this occasion various Laboratories, Botanic Garden, Exposition, Herbarium, Library and Banthra & Aurawan Research Stations remained open to public. A large number of students, researchers and general public visited various laboratories, Exposition and garden. A joint exhibition of Lucknow-based CSIR laboratories viz. CDRI, NBRI, CIMAP and IITR, highlighting the technologies, was also organized by the Institute.

On this occasion, a special award giving function was organized in the auditorium of the Institute. Prof. KC Upadhyay, Former VC, MS University, Vadodara and Professor, School of Life Sciences, JNU, New Delhi, was the Chief Guest. In his lecture entitled, "Plant genomics : Challenges and opportunities", Prof. Upadhyay narrated that global studies were carried out on various aspects and

genomics for enhancing the productivity of crop plants under adverse environment conditions. He further added that till date genomes of five species, namely *Arabidopsis*, rice, poplar, grapevine and papaya had been sequenced and with the advancement of high throughput sequencing technology, the sequencing of several other genomes was in progress.

Prof. PN Tandon, President, Brain Research Centre Society, Manesar, presided over the function. In his presidential address, Prof. Tandon appreciated the efforts of Lucknow-based CSIR laboratories towards scientific developments and advancement of knowledge. He also remarked that best talents of the country should be utilized so as to make the global presence.

Earlier Dr. Rakesh Tuli, Director, NBRI, while welcoming the august gathering said that we need to realize our potential and everyone should make efforts to take India to new heights. We must pledge that CSIR should have its share in nation building and making its presence felt globally.

Later in the function, Prof. Upadhyay presented wrist watches, shawls and 'Samman Patras' to those members of staff who retired from the service after attaining the age of superannuation during September 2007 to August 2008 and wrist watches to those who completed 25 years of continuous service in CSIR/NBRI. Besides these, prizes and certificates were also awarded to young winners of Science Essay Competition by Prof. Tandon.

On this occasion, the 'Herbal Gulal' and 'Herbal Sindoor' technologies were transferred to M/s Shri Ganesha Herbal Colours Pvt. Ltd., Raipur.

In the end, Dr. SKS Rathore, Scientist, proposed the vote of thanks.



Glimpses of CSIR Foundation Day celebrations

## 7. PERSONALIA

### HONOURS AND AWARDS

1. Dr. R Tuli, Director, has been conferred with **Sunder Lal Hora Medal 2008** by INSA, New Delhi.
2. Dr. AK Goel, Scientist, has been nominated as Expert Member in the Board of Studies in Botany at MS University, Vadodara, for a period of three years.
3. Dr. SK Tewari, Scientist, was designated as "Mentor" for the DST Project, "S & T application for innovative rural development in and around JNV, Unnao", at Jawahar Navodaya Vidyalaya, Unnao, for a period of two years.
4. The following research paper has been awarded **Dr. PD Sethi Research Paper Award 2007** on application of TLC/HPTLC in pharma analysis and standardization of herbal medicine :  
Srivastava S and Rawat AKS – Simultaneous determination of *Bergenia* and gallic acid in different *Bergenia* species. *J. Planner Chromat.*, 2007, **20**(4) : 275-77.

### MEMBERSHIPS

1. Dr. R Tuli, Director, has been nominated as follows :
  - i) Member, Panel of Experts for examining research proposals under "Biology & Environmental Sciences", to be conducted in Indian Antarctic and Arctic Programme.
  - ii) Member, Technical Committee on Status of Environment and Related Issues (North), Ministry of Environment and Forests, Govt. of India.
2. Dr. S Srivastava, Scientist, has been nominated Member of National Academy of Sciences, India.

### APPOINTMENTS

1. Dr. (Ms.) Mehar Hasan Asif, Gr. IV(2) .. Sep. 5, 2008
2. Dr. Ajit Pratap Singh, Gr. IV(2) .. Sep. 9, 2008
3. Dr. Lal Bahadur, Gr. IV(1) .. Sep. 10, 2008
4. Dr. Devendra Singh, Gr. IV(1) .. Sep. 11, 2008
5. Dr. Sumit Kumar Bag, Gr. IV(2) .. Sep.24, 2008

## 8. DISTINGUISHED VISITORS

1. Shri AS Chandel, Sr. Dy. Director, General (Electrical), BSNL Corporate Office, New Delhi .. August 25, 2008
2. A five member expert committee of JNU, New Delhi, visited the Institute on September 25, 2008, for recognizing the Institute for Ph.D. registrations under JNU Programme. The committee visited various labs like, Genomics, Plant Physiology, Environmental Sciences, Ethnopharmacology, Herbarium, Moss House and other plant houses to assess the facilities. The Director and other scientists made scientific presentations also.
3. Prof. KC Upadhyay, Former VC, MS University, Vadodra and Professor, School of Life Sciences, JNU, New Delhi .. September 26, 2008
4. Prof. PN Tandon, President, Brain Research Centre Society, Manesar .. September 26, 2008

### FORTHCOMING EVENTS

<i>Annual Rose and Gladiolus Show</i>	.. January 17-18, 2009
<i>Republic Day</i>	.. January 26, 2009
<i>National Science Day</i>	.. February 28, 2009
<i>National Safety Day</i>	.. March 4, 2009

To,

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