

1. RESEARCH ROUND-UP

IMPACT OF CLIMATE CHANGE ON THE VEGETATION OF NAINITAL AND ITS SURROUNDINGS

Climate change is a growing concern to the society and it refers to the variation in the earth's global climate or in regional climates over time. Current climate change predictions estimate further increase in temperatures of 1.4°C to 5.8°C by the year 2100. This will undoubtedly have severe consequences on biodiversity. Climate change is already forcing biodiversity and ecosystem to adopt shifting habitat, changing life cycle and the development of new physical traits.

Biodiversity plays a direct role in climate regulation. The links between biodiversity and climate change run both ways, biodiversity is threatened by human induced climate change and biodiversity resources can reduce the impacts of climate change on people and production. Biodiversity conservation can strengthen ecosystem resilience, improving the ability of the ecosystem to provide critical services in the face of increasing climatic pressures. A rapidly changing climate might favour species that can extend their ranges quickly or that can tolerate a wide range of climatic conditions, both these traits are shared by many invasive plant species.

The projected shift in vegetation type may lead to a large forest die back and loss of biodiversity

especially in the transition between forest types, as at higher altitude increase in temperature will result in shifts of lower altitude sub-temperate and temperate forest, to higher altitude sub-alpine and alpine forests resulting in the extinction of some temperate vegetation types. The outer ranges of Indian Himalaya support representative natural, unique and socio-economically important biodiversity, which is facing the problem of rapid depletion due to over exploitation and habitat degradation.

In Nainital valley, which is situated at N-29° 24', E-69° 28' in the valley of Gager range on the outer hills of Kumaon Himalaya at an altitude of ca. 1920 m., the rise in fossil fuel combustion and aerosol is a big threat to biodiversity because of heavy influx of tourism. Due to vehicular emissions, human interference and habitat destruction, there is a marked change in the climate of this beautiful health resort and its surroundings.

Habitat Fragmentation

It is a key factor that may impede the ability of species to track contemporary climate change in regions where the climate is becoming more favourable for certain species. Habitat fragmentation reduces dispersal ability and contributes to lags in distributional change. The rate and direction of species dispersal is based on habitat availability,





Androsace lanuginosa Wall. ex Roxb.
(Primulaceae)

Aquilegia pubiflora Wall. ex Royle
(Ranunculaceae)

Berberis asiatica Roxb. ex DC.
(Berberidaceae)

population density, growth dispersal distance and location of “refuges”. Distributional expansions are closely linked to habitat availability and contraction exacerbated by fragmentation, as a consequence of this biological communities will become increasingly dominated by generalist species, where as specialists are likely to continue to decline under the combined onslaught of habitat loss and climate change.

The loss and fragmentation of natural habitat affect distribution of biodiversity. There is an urgent need to restore a substantial fraction of the wilderness that has been depleted in the past. Various plant species such as *Sophora mollis*, *Schefflera venulosa*, *Pavetta tomentosa*, *Spermadictyon suaveolens*, *Aerva sanguinolenta*, etc. are on the verge of decline due to habitat fragmentation and over exploitation in Nainital area. Many species that are today widespread will experience large range reductions. Initial data on shifting of distributional range clearly indicate vegetation zones shifting towards higher elevations to save themselves from extinction. Efficient dispersal may be able to shift their ranges to take advantage of newly suitable habitats, but most species will at best experience a time lag before extensive colonization is possible, and hence, in the short term will show range diminishment.

Shift in Vegetation Towards Higher Altitudes

The prospects for native species to adapt to changing conditions may be improved by preventing the spread of invasive species that would otherwise start to compete with them. The capability of ecosystem and species to adapt will ultimately

depend on the extent of climate change. During the study, it has been observed that species of higher elevations are projected to shift higher. Those species such as *Berberis asiatica*, *Marsdenia roylei*, *Taraxacum officinale*, *Pyrus pashia*, *Jasminum officinale*, etc., found at altitudes of above 1000-1500m. i.e. in tropical and subtropical zones, have shifted their distribution to higher altitudes (about 2000 m.) i.e. sub-temperate zone. Species whose range may have already been affected by climate change are listed in Table-1. The limits of these species distribution have shifted 200-500 m. towards higher elevations as their earlier distributional range.

When climatic conditions change, unexpected results may follow, each species will respond in an individual fashion according to its climate tolerance and its ability to disperse into a new location, altering its phenological behaviour and breeding dates and those species that are unable to adapt will face extinction.

Pressure of Livestock

In Nainital area, habitat destruction has been identified as the main threat to biodiversity. Influence of humans and animals in the forest is of great importance. Human's need for food, fodder, fuel, shelter and fibre, combined with compelling need for economic development, exert enormous pressure on natural resources. There is high biotic pressure because of over grazing in Nainital and nearby areas, about 5000 sheep and goats and 3000 horses subsist on the grass for 3 months in the valley each year. The growth rate of grass is not proportional to the rate of grazing and the available grass is less than actual requirements. All *Quercus* species are good



Daphne papyracea Wall. ex Stued.
(Thymelaceae)

Geranium wallichianum D.Don ex Sweet
(Geraniaceae)

Hypericum oblongifolium Choisy
(Hypericaceae)

fodder for cattle and provide opportunities for continuous unregulated lopping. As a result, the most accessible forests are converting into bushy secondary growth consisting of *Berberis* sp., *Spiraea* sp., *Rubus* sp., *Daphne* sp., etc. Goats and sheep used for carrying bajri and horses used for giving joy rides to the tourists, cause most severe damage to the ground flora. Quarrying of stones for construction and digging of the hill sides for spreading earth on roads are responsible for increased erosion and habitat loss of several valuable species.

The richness or diversity of economically important species in these communities indicate high anthropogenic pressure, which may lead to habitat degradation and extirpation of the species in near future. There is significant positive relationship between the number of economically important species and number of rare and endangered species and it indicates that use pattern of the species is directly proportional to the rarity of species. If the rate of exploitation of economically important species from these areas continues, there is much probability of extinction of these species from their natural habitat in near future and may lead to ecosystem imbalance. Therefore, there is urgent need to initiate steps for conservation of high value communities.

Spread of Invasive Species

It has been observed that a rapidly changing climate might favour species that can extend their ranges quickly or that can tolerate a wide range of climatic conditions, both these traits are shared by many invasive species. In Nainital area, the biotic interaction and habitat fragmentation is a major threat to biodiversity. Invasive species are generalists and

are less influenced by biotic interactions while abundance of other species are indirectly influenced by climate and more by resource availability. Some invasive species such as, *Lantana camara* (Verbenaceae), *Parthenium hysterophorus*, *Ageratum conyzoides* (Asteraceae), etc. which were not reported earlier, are now flourishing luxuriantly and spreading their ranges towards higher elevation up to 2000 m. and destroying the native flora.

Migration of Plant Species

Some plant species, not reported earlier, had been collected from Nainital by R.K. Gupta (Flora of Nainitalensis) in the year 1968. These species such as *Erigeron acer* L., *Thalictrum virgatum* Hook.f. & Thoms., *Anemone tetrasepala* Royle, *Berberis glaucocarpa* Stapf., *Arisaema erubescens* (Wall.) Schott, *Cirsium verutum* (D.Don) Sprengel, *Erigeron karvinskianus* DC., *Eranthemum pulchellum* Andrews, *Blumea laciniata* (Roxb.) DC., *Sida cordata* (Burm.f.) Boiss, *Malvastrum coromandelianum* (L.) Garcke, *Woodfordia fruticosa* (L.) Kurz, *Quercus floribunda* Lindley ex A. Camus, *Lepidogathis hyalina* Nees, *Hemigraphis latebrosa* Nees, *Murraya koenigii* (L.) Spreng, *Justicia japonica* Thunb., *Blumea membranacea* DC., *Rheum austral* D.Don, *Holmskioldia sanguinea* Retz., *Mimosa rubricaulis* Lamk., *Bauhinia variegata* L. might have migrated from the surrounding areas and they form new reports for the area.

Climatic Data

Nainital is geographically located in "free tropospheric" zone and is reasonably sparse from the point of view of major pollution, making the site

quite suitable to study loading and climate variability. In lower atmosphere, aerosols and trace gases are considered to be the most important entities in the radiation budget and climate variability and being a tourist spot sulphur aerosols from fossil fuel

combustion are major threat. The records of actual temperature and precipitation pattern are indicating the fluctuation over the past decades (Figure 1, 2 & 3). These fluctuations may accelerate the growth of some plants at the expense of others and it can be

inferred how biota might respond to climate change by observing present and past distribution of plants, which are heavily determined by temperature and moisture pattern. However, scattered monthly temperature encompasses a vast range and a significant drift in local temperature over the decades is difficult to define. In Nainital area, weather conditions have been monitored during different seasons for the last one year. Data indicate that the mean temperature is increasing. Since 1968 the annual mean temperatures have been recorded by ARIES, Nainital, and it has been seen that mean annual temperature fluctuated but with a rising trend. The lowest mean temperature 5.5°C was recorded in 1977 and the highest mean temperature 26.5°C in 1985. The pattern of the seasonal weather conditions is more extreme. At present, not only hot summers and frosty winter periods occur more frequently but also intense storms and heavy snowfall were observed during mid February, 2009. Changes in global temperature patterns would trigger widespread alterations in rainfall patterns and for many species, precipitation is a more important determinant of survival than temperature. Indeed, except at tree line, rainfall is the primary determinant of vegetation structure. Apart from this, changes in the distribution of hot and cold periods and changes in a number of other chemical and physical

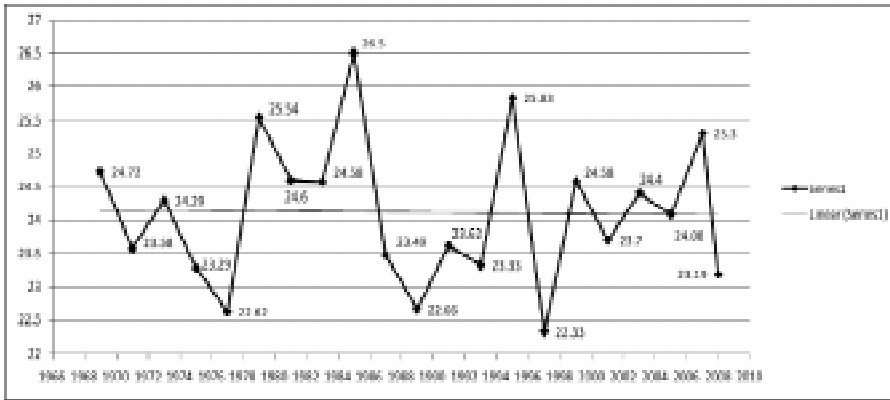


Figure-1 : Average maximum temperature for the last 40 years (1969 – 2008) (Source : ARIES, Nainital)

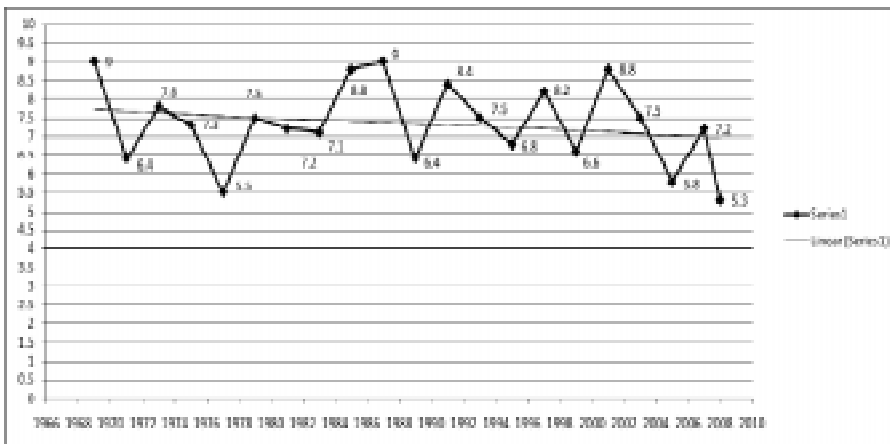


Figure-2 : Average minimum temperature for the last 40 years (1969 – 2008) (Source : ARIES, Nainital)

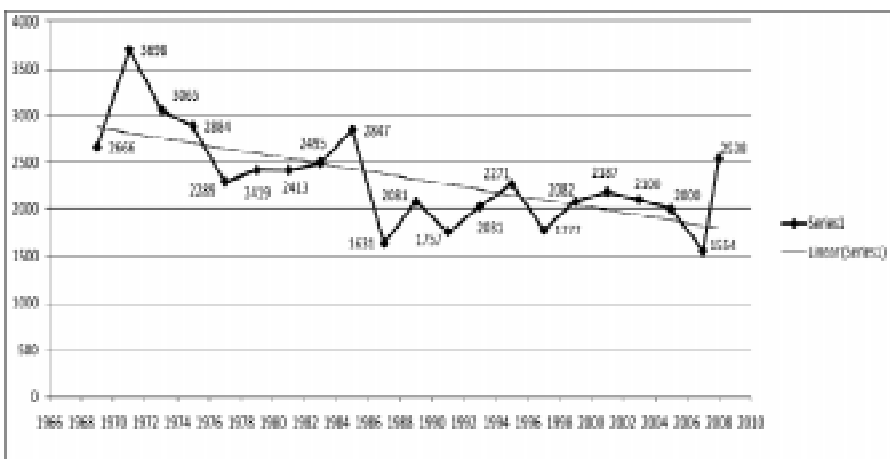


Figure-3 : Average precipitation for the last 40 years (1969 – 2008) (Source : ARIES, Nainital)

variables including precipitation, evaporation rates, soil and water chemistry will also determine the vegetation structure.

Changes in Phenological Behaviour

It is the climatic condition which determines the reproduction behaviour of any individual species. Phenology is the study of cycling of biological events

and seasonal appearances and it helps us to observe changes in the life cycle of plants, as well as the behaviour of foragers. Plants are adapted to annual seasonal cycle and all its stages are regulated by changes in seasonal climate. It is important to observe the appearance of buds, leaves, bloom, pollination, fertilization and seed dispersal and correlate it with the weather pattern. These changes

Table-1 : Comparative distributional range of taxa in Nainital

S.No	Plants	Family	Distribution Range	Altitude	Altitude given by R.K. Gupta
1.	<i>Bupleurum tenue</i> D.Don	Umbelliferae	On way to Tiffin Top	2125 m.	Above 1500 m.
2.	<i>Gerardinia leschenaultiana</i> Decaisne.	Urticaceae	Snow Peak	2265 m.	Up to 2000 m.
3.	<i>Catharanthus pusillus</i> G.Don	Apocynaceae	Snow Peak	2265 m.	Above 1500 m.
4.	<i>Oenothera biennis</i> L.	Onagraceae	Snow Peak	2265 m.	Above 1500 m.
5.	<i>Pyrus pashia</i> Buch.- Ham. ex D.Don	Rosaceae	On way to Ram Nagar	2029 m.	Above 1000 m.
6.	<i>Potentilla nepalensis</i> Hook. f.	Rosaceae	Tiffin Top	2286 m.	Above 1500 m.
7.	<i>Fragaria nubicola</i> Lindl. ex Lacaita	Rosaceae	On way to Govn. House, On way to China Peak	2064 m., 2319 m.	Above 1500 m.
8.	<i>Persea odoratissima</i> (Nees) Kosterm.	Lauraceae	Kilbery	2354 m.	Above 1500 m.
9.	<i>Clematis montana</i> Buch.-Ham. ex DC.	Ranunculaceae	On way to DSB College, On way to Kumaon Univ.	2034 m., 2064 m.	1300 m.-2000 m.
10.	<i>Mentha longifolia</i> (L.) Huds.	Labiataeae	Kumaon Univ. Campus	2064 m.	Above 1400 m.
11.	<i>Taraxacum officinale</i> Weber	Asteraceae	On way to Ram Nagar	2029 m.	1000 m.-2000 m.
12.	<i>Rosa macrophylla</i> Lindl.	Rosaceae	Kilbery	2354 m.	Above 1300 m.
13.	<i>Marsdenia roylei</i> Wight.	Asclepiadaceae	On way to DSB College	2034 m.	1000 m.- 2300 m.
14.	<i>Viola serpens</i> Wall. ex Roxb.	Violaceae	On way to Govn. House	2065 m.	Above 1500 m.
15.	<i>Rubus foliosus</i> D.Don	Rosaceae	On way to Govn. House	2065 m.	Above 1500 m.
16.	<i>Nasturtium officinale</i> R.Br.	Cruciferae	On way to Snow Peak	2355 m.	Up to 2300 m.
17.	<i>Coriaria nepalensis</i> Wall.	Coriariaceae	On way to Kilbery	2354 m.	Above 1300 m.
18.	<i>Rumex nepalensis</i> Spreng.	Polygonaceae	On way to Govn. House	2065 m.	Above 1500 m.
19.	<i>Mazus surculosus</i> D.Don	Scrophulariaceae	Snow Peak	2265 m.	Above 1500 m.
20.	<i>Ilex dipyrena</i> Wall.	Aquifoliaceae	On way to Govn. House	2065 m.	1500 m.-3000 m.
21.	<i>Cissampelos pariera</i> L.	Menispermaceae	On way to Tiffin Top	2065 m.	Up to 1500 m.
22.	<i>Berberis asiatica</i> Roxb. ex DC.	Berberidaceae	Kilbery	2354 m.	Above 1000 m.
23.	<i>Cotoneaster microphyllus</i> Wall. ex Lindl.	Rosaceae	Snow Peak, China Peak	2265 m., 2605 m.	About 2000 m.
24.	<i>Lotus corniculatus</i> L. var. <i>Japonicus</i> Regel	Papilionaceae	On way to Snow Peak	2355 m.	Above 1500 m.
25.	<i>Jasminum officinale</i> L.	Oleaceae	Tiffin Top	2286 m.	1000 m.-3000 m.
26.	<i>Fagopyrum dibotrys</i> (D. Don) Hara	Polygonaceae	Kumaon Univ. Campus	2064 m.	Above 1500 m.
27.	<i>Hypericum oblongifolium</i> Choisy	Guttiferae	Tallital	1935 m.	Above 1500 m.
28.	<i>Aesculus indica</i> Colebr. ex Camb.	Hippocastanaceae	Mallital	2028 m.	Above 1300 m.
29.	<i>Rubus rosaefolius</i> Smith	Rosaceae	On way to China Peak	2091 m.	Above 1500 m.
30.	<i>Epilobium hirsutum</i> L.	Onagraceae	On way to China Peak	2091 m.	Above 1500 m.
31.	<i>Viola canescens</i> Wall.	Violaceae	Bara Pattar	2035 m.	Above 1500 m.
32.	<i>Lantana indica</i> Roxb.	Verbenaceae	Mallital, On way to China Peak	2028 m. 2091 m.	Up to 1300 m.



in plant phenology act as important early warnings of impending ecological change, and may be direct causes of community change by altering the timing of activities that allow species to coexist. Life cycle of many wild plants and their foragers are closely linked to the passing of the season and climate change can lead to loss synchronization of interdependent species.

Phenological observations were made on ca. 180 plant species. It was noticed that in ca. 58

plant species, representing 36 families and 55 genera, flowering was either advanced or delayed by one to three months, than as reported by Gupta approximately 40 years back and the specimens records from LWG (National Botanical Research Institute, Lucknow) and the herbarium of Kumaon University (DSB College, Nainital). There is marked change in the phenology of some species (Table-2) and the changes in phenological behaviour of species may be a strong indicator of climate change since many species are highly

Table-2 : List of taxa showing phenological records

S.No	Plants	Family	Place	Fl. & Fr.	By R.K. Gupta
1.	<i>Clematis montana</i> Buch.-Ham. ex DC.	Ranunculaceae	On way to DSB College, On way to Kumaon Univ.	June	April-May
2.	<i>Thalictrum foliolosum</i> DC.	Ranunculaceae	On way to China Peak	June	July
3.	<i>Aquilegia pubiflora</i> Wall. ex Royle	Ranunculaceae	On way to China Peak	June	July
4.	<i>Berberis asiatica</i> Roxb. ex DC.	Berberidaceae	On way to China Peak	February	March-April
5.	<i>Geranium wallichianum</i> D.Don ex Sweet	Geraniaceae	Kilbery, Snow Peak	June	July
6.	<i>Oxalis corniculata</i> L.	Oxalidaceae	Mallital	February	April–Nov.
7.	<i>Jasminum dispernum</i> Wall.	Oleaceae	Jeolikote	February	April
8.	<i>Duchesnia indica</i> Focke	Rosaceae	On way to Snow Peak	February	April
9.	<i>Rubus rosaefolius</i> Smith	Rosaceae	On way to China Peak	February	April-May
10.	<i>Pyracantha crenulata</i> (Don) Roem.	Rosaceae	On way To DSB College	February	April-May
11.	<i>Galium cryptanthum</i> Hemsl.	Rubiaceae	On way to Govn. House	June	Jul-Aug.
12.	<i>Rubia manjith</i> Roxb. ex Fleming	Rubiaceae	On way to Govn. House	June	July-Sept.
13.	<i>Deutzia staminea</i> R.Br. ex Wall.	Hydrangiaceae	On way to China Peak	February	April-June
14.	<i>Carpinus viminea</i> Lindl.	Betulaceae	On way to Govn. House	June	March-April
15.	<i>Coriaria nepalensis</i> Wall.	Coriariaceae	On way to Snow Peak	Fr. February	Fr. April-June
16.	<i>Dicliptra bupleuroides</i> Nees	Acanthaceae	On way to China Peak	February	May–Dec.
17.	<i>Pteracanthus alatus</i> (Wall. ex Nees) Bremk.	Acanthaceae	Jeolikote	February	August
18.	<i>Bupleurum tenue</i> D.Don	Umbelliferae	Sherwood college	June	September
19.	<i>Persea odoratissima</i> (Nees) Kosterm.	Lauraceae	Kilbery	June	March-April
20.	<i>Artemisia vestita</i> Wall ex DC.	Asteraceae	Snow Peak	June	August
21.	<i>Sonchus asper</i> Garsaults	Asteraceae	Jeolikote	April	August
22.	<i>Inula cappa</i> DC.	Asteraceae	Jeolikote	April	Sept.-Nov.
23.	<i>Saussurea taraxacifolia</i> Wall. ex Hook. f.	Asteraceae	Jeolikote	February	Aug.–Oct.
24.	<i>Viola canescens</i> Wall.	Violaceae	Bara Pattar	February	April
25.	<i>Gerardinia leschenaultiana</i> Decaisne.	Urticaceae	Snow Peak	June	August
26.	<i>Melothria heterophylla</i> (lour.) Cogniaux	Cucurbitaceae	On way to DSB College	June	May
27.	<i>Debregeasia salicifolia</i> (D.Don) Rendle	Urticaceae	On way to Kumaon Univ.	April	Sept-Oct.
28.	<i>Ficus neriifolia</i> J. E. Sm. var. <i>nemoralis</i> (Wall.ex Miq.) Corner	Moraceae	On way To DSB College	Fr. February	Fr. April
29.	<i>Hypericum oblongifolium</i> Choisy	Hypericaceae	Tallital	February	March-May



S.No	Plants	Family	Place	Fl. & Fr.	By R.K. Gupta
30.	<i>Litsaea umbrosa</i> Nees	Lauraceae	On way to China Peak	February	March-May
31.	<i>Boenninghausenia albiflora</i> Reichenbach	Rutaceae	On way to China Peak	February	July-Oct.
32.	<i>Quercus floribunda</i> Lindley ex A. Camus	Fagaceae	Above Tanki	February	April-May
33.	<i>Albizia mollis</i> Boiv.	Mimosaceae	Jeolikote	February	Fr. Nov.-Dec.
34.	<i>Cymbalaria muralis</i> Gaertn.	Scrophulariaceae	On way to Snow Peak	February	July
35.	<i>Mazus surculosus</i> D.Don	Scrophulariaceae	Snow Peak	June	March
36.	<i>Wulfenia amherstiana</i> (Wall.) Benth.	Scrophulariaceae	On way to China Peak	June	June-Aug.
37.	<i>Plantago erosa</i> Wall.	Plantaginaceae	On way to Govn. House	June	July
38.	<i>Rubus foliosus</i> D.Don	Rosaceae	On way to Govn. House	June	March-April
39.	<i>Potentilla nepalensis</i> Hook.	Rosaceae	Tiffin Top	June	April
40.	<i>Fragaria nubicola</i> Lindl. ex Lacaita	Rosaceae	On way to Govn. House, On way to China Peak	June	May
41.	<i>Fagopyrum cymosum</i> Meissn.	Polygonaceae	Kumaon Univ. Campus	June	August
42.	<i>Rumex hastatus</i> D.Don	Polygonaceae	Jeolikote	April	May-Oct.
43.	<i>Mentha longifolia</i> (L.) Huds.	Labiataeae	Kumaon Univ. Campus	June	July-Oct.
44.	<i>Prunella vulgaris</i> L.	Labiataeae	On way to Govn. House, Kumaon Univ. Campus	June	August
45.	<i>Scutellaria prostrata</i> Jacq. ex Benth.	Labiataeae	Kilbery	June	Aug.-Oct.
46.	<i>Malva neglecta</i> Wall.	Malvaceae	Tiffin Top	June	February
47.	<i>Androsace lanuginosa</i> Wall. ex Roxb.	Primulaceae	Kilbery	June	May
48.	<i>Epilobium hirsutum</i> L.	Onagraceae	On way to China Peak	February	Aug. –Sept.
49.	<i>Reinwardtia trigyna</i> Planch.	Linaceae	Jeolikote	February	April-June
50.	<i>Desmodium heterocarpum</i> (L.) DC.	Papilionaceae	Jeolikote	February	July-Aug.
51.	<i>Viola biflora</i> L.	Violaceae	On way to China Peak, Snow peak	June	May
52.	<i>Viola serpens</i> Wall. ex Roxb.	Violaceae	On way to Govn. House	June	May
53.	<i>Pilea scripta</i> Wedd.	Urticaeae	On way to Govn. House	June	June-Sept.
54.	<i>Viburnum cotinifolium</i> D.Don	Caprifoliaceae	Kilbery, On way to China Peak	June	April-June
55.	<i>Bergenia ligulata</i> (Wall.) Engler.	Saxifragaceae	On way to DSB College	June	Feb.-March
56.	<i>Malaxis cylindrostachya</i> Kuntze	Orchidaceae	Kilbery	June	August
57.	<i>Eulophia herbacea</i> Lindl.	Orchidaceae	Snow Peak	June	July

sensitive even to the smallest change in the long prevailing climate of any ecosystem. It was possible to confirm that changes in phenology may provide strong evidence of global warming. The

results of the study can be summed up as; in the last 40 years the average beginning of growing seasons in Nainital has advanced by 30-45 days.



PATENTS AWARDED/FILED

Awarded

1. Chemically synthesized artificial promoter for high level expression of transgenes (0328 NF/1998/EP).
2. Development of an anti-cough, anti-tussive and throat soothing herbal formulation (0573 NF/2002/US).
3. Fermented herbal health drink from plant *Andrographis* (0330 NF/2001/IN).
4. Herbal oro-dental care composition and process for preparing the same (0474 NF/2003/IN).
5. Herbal oro-dental care composition for treatment of halitosis & mouth ulcer (0474 NF/2003/JP).
6. Nontoxic dental care herbal formulation for preventing dental plaque and gingivitis (0569 NF/2002/IN).
7. A process for preparation of herbal colours useful for cosmeceutical applications (0077 NF/2001/IN).
8. A process for the preparation of herbal dry colours using natural dyes and natural ingredients for direct skin application and other purposes (0142 NF/2000/IN).
9. A synergistic fermented plant growth promoting, bio-control composition (0070 NF/2003/IN).

Filed

A two component plant expression module for tightly regulated and high level anther specific expression in plants (006 NF/2009/IN).

NEW PROJECTS

1. A project entitled, "Assessment of bryodiversity in Meghalaya and Manipur (North Eastern Hills)", has been sponsored by the Ministry of Environment and Forests, Govt. of India, New Delhi, for a period of three years with Dr. V Nath, Scientist as PI .
2. A project entitled, "Modernization of NBRI Botanic Garden as a model centre of excellence for *ex-situ* conservation of rare, endangered, threatened and endemic plant species", has been sponsored by Ministry of Environment, Forest and Wildlife, Govt. of India, New Delhi, for a period of three years with Drs. AK Goel, Scientist as PI and RK Roy, Scientist as, Co-PI.
3. A project entitled, "Re-orientation training programme (RoTP) in quality assurance of herbal drugs for teachers/paramedics", has been sponsored by Department of AYUSH, New Delhi, for a period of three years with Drs. (Mrs.) S Khatoon, Scientist as PI and AKS Rawat, Scientist as Co-PI.

2. PUBLICATIONS

RESEARCH PAPERS

1. Abhilash PC and Singh N – Pesticide use and application : An Indian scenario. *J. Haz. Mat.*, 2009, **165** : 1-12.
2. Agnihotri P, Husain T and Singh H – Nakuleshwar : A new discovered sacred grove from Pithoragarh district. *Sci. Cult.*, 2009, **75** (1-2) : 42.
3. Arora K, Sharma M and Sharma AK – Control pattern of regenerant differentiation and plantlet production from leaflet segments of *Azadirachta indica* A. Juss. (Neem). *Acta physiol. Plant.*, 2009, **31**(2) : 371-78.
4. Bajpai R, Dwivedi SK and Upreti DK – Observation on lichens growing over some monuments of Dhar and Mandav area of Madhya Pradesh, India. *Flora and Fauna*, 2008, **14**(2) : 253-58.
5. Banerji R – Omega – 3 fatty acids : Sources, nutrition, health benefits, metabolism and



- stability – an overview. *J. Lipid Sci. Technol.*, 2008, **40**(2) : 75-82.
6. Banerji R, Bajpai A and Verma SC – Oil and fatty acid diversity in genetically variable clones of *Moringa oleifera* from India. *J. Oleo Sci.*, 2009, **58**(1) : 9-16.
 7. Bhargava A, Shukla S and Ohri D – Metroglyph analysis of morphological variation in *Chenopodium* spp. *World J. agric. Sci.*, 2009, **5**(1) : 117-20.
 8. Dubey U, Upreti DK and Rout J – Lichen flora of Along Town, West Siang district, Arunachal Pradesh. *Phytotaxonomy*, 2007, **7** : 21-26.
 9. Govindarajan R, Vijayakumar M, Rao ChV, Pushpangadan P, Asare-Anane H, Persaud S, Jones P and Houghton PJ – Antidiabetic activity of *Croton klotzschianus* in rats and direct stimulation of insulin secretion *in vitro*. *J. Pharmacy Pharmacol.*, 2008, **60** : 371-76.
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2. *In*: Ethnopharmacology – Recent Advances (Eds. P Pushpangadan, V George and KK Janardhanan). *Daya Publishing House*, New Delhi, 2008 :
 - i) Pushpangadan P, Govindarajan R, Srivastava SK, Rao ChV, Nair KN, Rawat AKS, Mehrotra S, Sharma AK, Rajashekharan S, George V and Latha PG – Scientific evaluation of traditional medicine : Ethnopharmacology, reverse pharmacology, system biology to metabolomics : 158-74.
 - ii) Rao ChV and Pushpangadan P – Ethnomedicinal potential of herbal drugs on gastric dysfunction in experimental animals : 62-71.
3. Nayaka S, Upreti DK and Bajpai R – Diversity and adaptive response of lichen in Antarctica. *In*: Frontiers in Fungal Ecology, Diversity and Metabolites (Ed. KR Sridhar). *IK International Publishing House*, New Delhi, 2009 : 107-23.
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POPULAR ARTICLE

Goel AK and Roy RK – Establishment of an orchid house in the Botanic Garden, National Botanical Research Institute, Lucknow. *Phytotaxonomy*, 2007, **7** : 125-27.

3. Ph.D. THESES SUBMITTED/AWARDED**SUBMITTED**

1. **Mr. Dharendra Pratap Singh**
Chemical evaluation and standardization of some important hypoglycemic plants.
Guides : Drs. AKS Rawat, Scientist, NBRI, Lucknow and Mrs. A Khare, Lucknow University, Lucknow.
University : Lucknow University, Lucknow.
2. **Mr. Naveen Kumar Singh**
Microbial assisted phytoremediation of toxic metals by aquatic plants.
Guides : Drs. UN Rai, Scientist, NBRI, Lucknow and M. Singh, Lucknow University, Lucknow.
University : Lucknow University, Lucknow.
3. **Mr. PC Abhilash**
Monitoring of organochlorine pesticide (Lindane) in soil-plant system of a contaminated environment and its phytoremediation/bioremediation.

Guides : Dr. N Singh, Scientist, NBRI, Lucknow and Prof. SC Srivastava, Lucknow University, Lucknow.
University : Lucknow University, Lucknow.

4. **Mr. Santosh Kumar**
Standardization of an ayurvedic group of dasmoola.
Guides : Drs. S Khatoon, Scientist, NBRI, Lucknow and CL Verma, Lucknow University, Lucknow.
University : Lucknow University, Lucknow.

AWARDED

1. **Mr. Amresh Gupta**
Phytopharmacological evaluation of selected medicinal plants in gastritis.
Guides : Dr. ChV Rao, Scientist, NBRI, Lucknow and Prof. PN Singh, UP Technical University, Lucknow.
University : UP Technical University, Lucknow.



2. **Ms. Anshu Rathi**
Standardization and quality evaluation of “Pitapapra” plant used in Indian System of Medicine for liver disorder.
Guides : Drs. S Mehrotra, Emeritus Scientist, NBRI, Lucknow and A Shirwaikar, Manipal College of Pharmaceutical Sciences, Manipal.
University : Manipal College of Pharmaceutical Sciences, Manipal.
3. **Mr. Dinesh Kumar Yadav**
Functional Characterization of surface glycoprotein of rabies virus expressed in transgenic tobacco.
Guides : Dr. R Tuli, Director, NBRI, Lucknow and Prof. SC Srivastava, Lucknow University, Lucknow.
University : Lucknow University, Lucknow.
4. **Mr. M Vijayakumar**
Development and standardization of hypoglycemic herbal formulations.
Guides : Drs. P Pushpangadan, Ex-Director, NBRI, Lucknow; S Mehrotra, Emeritus Scientist, NBRI, Lucknow and A Shirwaikar, Manipal College of Pharmaceutical Sciences, Manipal.
5. **Mr. Mridul Kumar Shukla**
Response of cyanobacteria and crop plant grown under stress of fly ash and heavy metals.
Guides : Drs. R D Tripathi, Scientist, NBRI, Lucknow and N Sharma, Lucknow University, Lucknow.
University : Lucknow University, Lucknow.
6. **Mr. Puneet Singh Chauhan**
Physiological and molecular characterization of rhizosphere competent plant growth promoting *Pantoea agglomerans* NBRISRM.
Guides : Drs. CS Nautiyal, Scientist, NBRI, Lucknow and YK Jaiswal, Jiwaji University, Gwalior.
University : Jiwaji University, Gwalior.
7. **Mr. Rajesh Bajpai**
Studies on lichens of some monuments of Madhya Pradesh with reference to biodeterioration and biomonitoring.
Guide : Dr. DK Upreti, Scientist, NBRI, Lucknow.
University : BB Ambedkar University, Lucknow.

4. LECTURES, SYMPOSIA, CONFERENCES, ETC.

LECTURES

1. Dr. R Tuli, Director, delivered the following invited lectures :
 - i) ‘Lab to land : Nature’s bounty to improve economy’, in 96th Indian Science Congress, at NEHU, Shillong .. January 4, 2009
 - ii) ‘Improving rice for arsenic tolerance and non-accumulation in grains’, in Indo-Chinese Workshop on “Plant Genomics and Quantitative Genetics”, at Meerut University, Meerut .. February 14, 2009
2. Dr. V Nath, Scientist, delivered the following lectures :
 - i) ‘History and floristic studies in Indian Bryophytes’ and ‘Current trends in bryological researches’, at BHU, Varanasi, during refresher course in Botany .. January 12, 2009
 - ii) ‘Bryophyte diversity in India and its conservation strategies’, during National Conference on “Recent Trends in Biodiversity Researches”, at Assam University, Silchar .. March 16, 2009
3. Dr. BK Banerji, Scientist, delivered the following lectures, at Gujarat Agriculture University, Ahmedabad, on January 24, 2009 :
 - i) ‘Effects of physical and chemical mutagens on plant’.
 - ii) ‘Induction of somatic mutations in bougainvillea’.
 - iii) ‘Improvement of ornamental plants by hybridization and mutation breeding’.
 - iv) ‘Genetic improvement of bougainvillea’.

4. Dr. DV Amla, Scientist, delivered the following lectures :

- i) 'Plants for future : Biotechnological approaches', during Science Expo-2009, at Regional Science City, Lucknow .. January 29, 2009
- ii) 'Designing of plants for future through biotechnological approaches', during the Conference on "Current Advances in Biological Research", at IITR, Lucknow .. February 2, 2009
- iii) 'Transgenic development in legumes : New approaches', during International Conference on "Grain Legumes : Quality Improvement, Value Addition and Trade", at IIPR, Kanpur .. February 15, 2009
- iv) 'Transgenic plants and their applications', at BHU, Varanasi .. March 7, 2009

5. Dr. SN Singh, Scientist, delivered the following lectures :

- i) 'Environment concern and sustainability' and 'Climate change and crops', at Directorate of Environment, UP, Lucknow .. February 12 and 17, 2009, respectively.
- ii) 'Agriculture and climate change', on the occasion of Science Day, at NBRI, Lucknow .. February 28, 2009

6. 'Genetic base broadening in grain legumes at CLIMA' – Prof. W Erskine, Director, CLIMA, Australia .. February 17, 2009

7. 'Conservation, value addition and commercialization of traditional knowledge in India' – Dr. AK Goel, Scientist, during National Conference on "Recent Trends in Biodiversity Researches", at Assam University, Silchar .. March 17, 2009

8. 'Calculation of measurement uncertainty' – Dr. KP Slingh, Scientist, IITR, Lucknow, at NBRI, Lucknow .. March 25, 2009

9. 'Molecular ecology of microbes associated with plant and soil health' – Dr. CS Nautiyal,

Scientist, during Brain Storming session on "Plant-Microbe Interaction", at Agharkar Research Institute, Pune .. March 6, 2009

CONFERENCES, SEMINARS, WORKSHOP, ETC. ATTENDED AND PAPERS PRESENTED

Conferences

1. Drs. AKS Rawat and S Srivastava, Scientists, attended the International Herbal Conference-2009, at Indian Institute of Science, Bangalore, during February 26-28, 2009 and Dr. Rawat presented a paper entitled, 'Importance of quality control in development of scientific validated novel herbal product based on traditional knowledge for global positioning'.
2. Drs. BK Banerji and RK Roy, Scientists, attended the National Conference on "Floriculture for Livelihood and Profitability", at IARI, New Delhi, during March 16-19, 2009, and presented the following papers :

Oral Presentation

Roy RK – Landscape gardening-basics and applications.

Poster Presentations

- i) Banerji BK – Improvement of bougainvillea cultivar 'Los Banos Beauty' and 'Pixi' by ethyl methyl sulphonate with particular reference to induction of chlorophyll mutation.
- ii) Banerji BK – Role of mutation breeding methods in improvement of vegetatively propagated ornamental crops.
- iii) Banerji BK and Dwivedi AK – New chrysanthemum cultivars released by National Botanical Research Institute, Lucknow.
- iv) Dwivedi AK, Saxena M, Verma AK and Banerji BK – Effect of gamma irradiation on chrysanthemum cultivar 'Mini-Queen' with particular reference to induction of somatic mutation.



- v) Roy RK – Floriculture – a vibrant commercial sector of India – an overview.
 - vi) Singh CP, Banerji BK, Verma TS and Roy RK – Colourful cannas for landscaping.
 - vii) Singh VN, Saxena M, Banerji BK and Dwivedi AK – Characterization of eight single whorl genotypes of *Hibiscus*.
 - viii) Verma AK, Mishra P, Dwivedi AK and Banerji BK – Characterization of chrysanthemum large flower cultivars.
3. Dr. L Tyagi, Young Scientist, attended the International Conference on “Energy and Environment (EnviroEnergy 2009)”, at Taj, Chandigarh, during March 19-21, 2009 and presented a paper entitled, ‘Attenuation of nitrous oxide from agricultural fields’.
 4. Dr. MR Suseela, Scientist, attended the National Conference on “Antimicrobial Resistance : From Emerging Threat to Reality”, at AAI-Deemed University, Allahabad, during March 23-25, 2009 and delivered a Keynote Address entitled, ‘Cyanobacterial resistance to agrochemicals’. Dr. Suseela also chaired one of the sessions.
 5. Mr. D Wahal, Scientist, attended a one-day Conference on “Open Access to Publications : Policy Perspective, Opportunities and Challenges”, at India Habitat Centre, New Delhi, on March 24, 2009.

Seminars

1. Messers D Wahal, Scientist and Y Misra, Technical Officer, attended a one-day seminar on “The World Bank and its Knowledge Resources”, at Giri Institute of Development Studies, Lucknow, on March 5, 2009.
2. Dr. D Singh, Scientist, attended the National Seminar on “Emerging Trends in Plant Sciences and Herbal Medicines”, at ND University of Agriculture and Technology, Kumarganj, Faizabad, during March 17-18, 2009 and presented a paper entitled, ‘Yield and economics of different methods of sowing,

wheat varieties and time of nitrogen application in late sown condition of wheat (*Triticum aestivum*)’.

Workshop

Drs. T Husain and KN Nair, Scientists, attended the National Workshop to discuss the draft of India’s Fourth National Report (FNR) to the Convention on Biological Diversity (CBD), at UNDP Conference Hall, Lodhi Estate, New Delhi, on February 24, 2009.

Meetings

1. Dr. RK Roy, Scientist, attended the 9th meeting of the Core Group on “Technology Demonstration Project for Lal Quilla-Fatehpuri Masjid Road Stretch, Delhi”, at CSIR, New Delhi, on January 12, 2009.
2. Dr. AK Goel, Scientist, attended the meeting of Technical Review Committee on “Quality Standards of Indian Medicinal Plants”, at ICMR, New Delhi, during February 3-6, 2009.

EVENTS ORGANIZED BY NBRI

Commercialization of Floriculture Activities in Uttar Pradesh

The Institute organized a Group Meeting on February 6, 2009 under the Rural Development Project of CSIR, to take initiative for commercialization of floriculture activities in UP. Dr. R Tuli, Director, NBRI, Lucknow, chaired the meeting, which was attended by experts, scientists & technical staff, farmers and entrepreneurs. Dr. Tuli, while welcoming the participants, gave brief outline about the meeting. He stressed upon the need for promoting advanced floricultural technologies in UP so that the farmers of the state get benefitted. Dr. Tuli invited the industries and farmers to discuss their needs and limitations for high quality floriculture in the state. Dr. BK Banerji, Scientist, presented NBRI’s achievements in the area of floriculture.

Several doubts on success of poly houses, in UP, were raised in the meeting, owing to high temperature and sunshine in the state. Dr. Fulzele



Commercialization of floriculture activities in U.P. meeting in progress

of Agrobiotech, Nawi Mumbai, told that poly house technology was successful for growing Gerbera and Roses in Nagpur. He further told that the climatic conditions in Nagpur were similar to that of Lucknow and with slight modifications in the design, it can also be made successful in Lucknow. The members suggested that NBRI should take lead in developing models to demonstrate this technology at the Institute.

Based on the outcome of this meeting, another Group Meeting, under the chairmanship of Dr. R Tuli, was organized at NBRI on March 6, 2009. Dr. Tuli, while welcoming the participants, explained the significance of floriculture with particular reference to poly house technology in UP. Experts from NABARD, SIDBI, State Bank of India, UPDASP, Agribusiness and poly house technology sectors, presented the status, technological details, infra-structural requirements, marketing and financial outlay of the high-tech floriculture activity to the potential floriculturists and entrepreneurs present in the meeting. It was decided to develop one model of naturally ventilated poly-green house for demonstration of protected cultivation of Gerbera and Dutch roses in NBRI and after the success of this

model, the high-tech poly houses of one acre size may be taken up.

Teachers' Training Programme

Under the Rural Development Project of CSIR, principals and science teachers of 16 selected schools, from Lucknow and Sultanpur districts, were invited to NBRI, Lucknow, for a two-day orientation programme, during February 6-7, 2009. Thirty-one participants attended the programme. Dr. R Tuli, Director, NBRI, inaugurated the programme. Dr. Tuli, while welcoming the participants, expressed his hope of succeeding in taking the NBRI Green Technologies to villages through schools as knowledge dissemination centres.



Teachers' Training Programme in progress

Dr. SK Tewari, Scientist and Nodal Officer of the project, briefed the gathering about the work plan and methodologies of the activities proposed in the Rural Development Project of CSIR. Later, the participants visited the farm sites of NBRI at Banthra Research Station, Aurawan Research Centre and Biomass Research Centre at Lucknow-Kanpur Highway for practical training and demonstrations.

5. TECHNICAL AID, ADVICE AND TRAINING

TECHNICAL AID AND ADVICE

Gamma irradiation facilities were provided to the following :

- i) Dr. V Mathew, Assistant Manager – Plantations, Aurangabad.
- ii) Dr. AH Khan and Mr. MI Kozgar, AMU, Aligarh.

- iii) Mr. AK Singh, BHU, Varanasi.
- iv) Dr. AK Sharma, GB Pant University of Agriculture and Technology, Pantnagar.
- v) Prof. Mohd. Kaleem, A A I–Deemed University, Allahabad.
- vi) Mr. J Kumar, CS Azad University of Agriculture and Technology, Kanpur.



TRAINING

Training Imparted

1. Nine students of different universities/institutes were imparted training on various topics of their interest, during January-March, 2009.
2. Ms. Priyanshi and Mr. S Srivastava, were imparted three-day training on “Dehydration of Flowers and Floral Craft”, during January 19-21, 2009.
3. Messers A Palasar and J Rao, were imparted training on “Commercial Floriculture”, during March 2-3, 2009.
4. The Institute organized two group training programmes on “Commercial Floriculture”, during March 15-16 and 27-28, 2009. In all, 51 participants attended the training

programmes. The programmes were sponsored by the Department of Horticulture and Food Processing, Lucknow.

5. A training programme for cultivation of floriculture crops viz. tuberose and marigold was organized for the selected beneficiaries of Banthra, Aurawn, Kurauni and Khandedev villages of Lucknow, on March 25, 2009.

Training Received

1. Drs. Lal Bahadur and D Singh, Scientists, attended the Induction Training Programme, at HRDC, Ghaziabad, during February 23-28, 2009.
2. Dr. Anand Prakash, Scientist, attended the programme on “Leadership Development”, at HRDC, Ghaziabad, from March 22 to April 3, 2009.

6. ANNUAL ROSE AND GLADIOLUS SHOW

The most enchanting and well-known event of NBRI, the **Annual Rose and Gladiolus Show**, was organized by the Institute, during January 17-18, 2009 at its lush green Central Lawn. This year, the show attracted a total of 538 entries belonging to a large number of competitors from Lucknow and outstation. Mr. Sudhir Kumar, Principal Secretary, Department of Additional Energy Resources, Lucknow, was the Chief Guest and Dr. TK Chakraborty, Director, CDRI, Lucknow, was the Guest of Honour. In all, 223 prizes, besides 24 running challenge cups/shields/trophies, were awarded at the prize distribution function by Dr. Chakraborty on January 18, 2009.

This year, Director, CIMAP, Lucknow, stole the show by lifting as many as 8 running challenge cups/shields/trophies; followed by M/s Hindustan Aeronautics Ltd. (HAL), Lucknow and Mr MM Beg, Thakurganj, Lucknow, who secured the second position by winning 4 challenge cups/shields/trophies each. The prize for the best rose of the show was won by Director, CIMAP, Lucknow, while for the best gladiolus spike of the show was lifted by Mr MM Beg, Thakurganj, Lucknow.

On the occasion, a theme pavilion was also organized by NBRI. The main purpose was to showcase elite germplasm collections of rose and gladioli, maintained by the Institute in a categorized way. In gladioli, 80 cultivars were displayed under the theme germplasm collections, commercial cultivars and new NBRI hybrids. Simultaneously, 65 cultivars of roses were also displayed in different categories namely – hybrid tea, floribunda, polyantha, miniature and climbers. Special exhibits were ‘Green Rose’ (*Rosa viridiflora*), *Rosa clinophylla*, ‘Thornless Rose’ (‘City of Lucknow’) and ‘Cocktail’ (climbing rose). On the other hand, in order to popularize potted house plants selected specimens were displayed under the theme ‘**Rare & Novel Indoor Plants**’ wherein 50 house plants were displayed to show genetic diversity and the wide range available for selection.

Dr. R Tuli, Director, NBRI, Lucknow, while welcoming the guests, told that the Institute had been organizing the flower shows every year. He further added that flowers convey a special message through its diversity. Dr. Tuli informed the gathering that NBRI scientists are undertaking research to





Annual Rose and Gladiolus Show

Judging in progress (Left) and winners of the flower show along with the chief guest (right)

introduce novelty in these flowers by modifying their colour, number of spikelets, their arrangement and also introduce scent in non-scented flowers. He was of the view that India's contribution towards global floriculture trade was less than satisfactory and every effort should be made to take forward the local varieties to international market.

Mr. Sudhir Kumar, while appreciating the efforts of NBRI, said that it has an important role to

play in moving forward its R&D activities in floriculture for the benefit of farmers. Dr. TK Chakraborty felt happy to note that floricultural activities at NBRI had a great societal value and was providing livelihood to farmers in villages. He wished that NBRI plays an active role in motivating the farmers to take up floriculture trade so that flowers were available round the year for the benefit of the public. In the end, Dr. BK Banerji, Scientist, proposed the vote of thanks.

7. IMPORTANT EVENTS

REPUBLIC DAY

The Republic Day was celebrated on January 26, 2009 when Dr. R Tuli, Director, unfurled the National Flag and addressed the members of staff. Sweets were also distributed on the occasion.

NATIONAL SCIENCE DAY

The Institute celebrated the National Science Day on February 28, 2009. As in previous years, the day was observed as 'Open Day' when its Laboratories, Exposition, Library, Bioinformatics Centre, Banthra and Aurawan Research Stations and Botanic Garden were visited by a large community of students, drawn from local schools and colleges; farmers and general public. On this occasion, Dr. SN Singh, Scientist, NBRI, delivered a lecture entitled, 'Agriculture and climate change'.

A debate competition, for school children, was also organized on this occasion. The topic of the debate was 'Science is a boon to environment'. Dr. JK Johri, Scientist and Programme Coordinator,



School Children along with Dr. R Tuli

narrated the genesis of the programme and Dr. P Nath, senior-most Scientist, welcomed the participants. Dr. R Tuli, Director, distributed prizes to the successful competitors. In the end, Dr. JK Johri proposed the vote of thanks.

NATIONAL SAFETY DAY

The National Safety Day was observed by the Institute on March 4, 2009. The National Safety Pledge was administered to the members of staff by Dr. R Tuli, Director, NBRI, Lucknow.

8. PERSONALIA

HONOURS AND AWARDS

1. Dr. AK Goel, Scientist, was conferred upon the **Dr. J. W. Harshberger Medal-2008** by the Society of Ethnobotany, at Department of Life Sciences, Assam University, Silchar, during the National Conference on "Recent Trends in Biodiversity Researches", on March 16, 2009.
2. Dr. BK Banerji, Scientist, was elected as a Visiting Fellow by the Department of Botany, Gujarat Agriculture University, Ahmedabad, for the year 2008-2009.
3. Dr. S Dwivedi, DST Young Scientist, was conferred upon the **Young Scientist Award** by the Council of Science and Technology, UP, for the year 2007-08. The award carried a cash amount of Rs. 25,000/-, citation, shawl and a memento.



Dr. S Dwivedi receiving the award from Hon'ble Minister, S&T, U.P. Govt.

4. Dr. BK Banerji, Scientist, acted as Judge in the Lucknow Cantt Garden Competition-cum-Flower Show, organized by Head Quarters, Central Command, during February 19-21, 2009.

MEMBERSHIPS

1. Dr. R Tuli, Director, has been nominated as member of the following :
 - i) Indian Society of Cell Biology, Varanasi, for the years 2009-2011.
 - ii) Review Committee on Genetic Manipulation, DBT, New Delhi.
 - iii) Academic Committee, National Institute of Plant Genome Research, New Delhi.
 - iv) Fellowship Scrutiny Committee (Biological Sciences), The National Academy of Sciences, Allahabad, India.
 - v) Sub-Committee for Plant Sciences, Agriculture and Environment for NASI-Young Scientist Platinum Jubilee Awards 2009.
2. Dr. CS Nautiyal, Scientist, has been nominated as Member, Research Advisory Committee, School of Life Sciences, Jaipur National University, Jaipur.

PROMOTIONS

Following members of staff were promoted under CSIR SRAP Rules 2001 w.e.f. the dates noted against each :

1. *From Scientist 'F' Gr. IV(5) to Scientist 'G' Gr. IV(6)*
 1. Dr. AK Sharma .. July 23, 2007
 2. Dr. SK Raj .. September 3, 2007
 3. Dr. R Banerji .. February 1, 2008
 4. Dr. V Nath .. February 1, 2008

RETIREMENTS

1. Dr. SP Singh, Scientist 'G' .. January 31, 2009
2. Dr. RK Gupta, Scientist 'G' .. January 31, 2009
3. Mr. VK Lal, TO .. January 31, 2009
4. Ms. A Samuel, Assistant .. February 28, 2009

9. TV PROGRAMME

डॉ. बी के बनर्जी, वैज्ञानिक, ने ग्रामोदय कार्यक्रम के अन्तर्गत लखनऊ दूरदर्शन में पुष्पकृषि एवं ग्रामीण रोज़गार पर परिचर्चा की .. 16 फरवरी, 2009

10. DISTINGUISHED VISITORS

1. Prof. W Erskine, Director, CLIMA, Australia .. February 17, 2009
2. Dr. SK Mathur, Former Director - Horticulture, Rashtrapati Bhawan, New Delhi .. February 28, 2009
3. Dr. Mahadevappan, Vice Chancellor, Dharwad
4. Prof. T Ramasarma, INSA Honorary Professor, Indian Institute of Science, Bangalore .. March 20, 2009
5. Dr. C Fraser-Jenkins, Kathmandu .. March 25, 2009

11. NEW EQUIPMENT INSTALLED

A UV–Spectrophotometer, Model – Perkin Elmer Lamda 35 UV/VIS, has been installed. It is used for primary identification and quantification of compounds having absorption in UV-Visible region (200-1010 nm). Its range of detection is 0.1-2.0 D.



Model- Perkin Elmer Lamda 35 UV/VIS Spectrophotometer

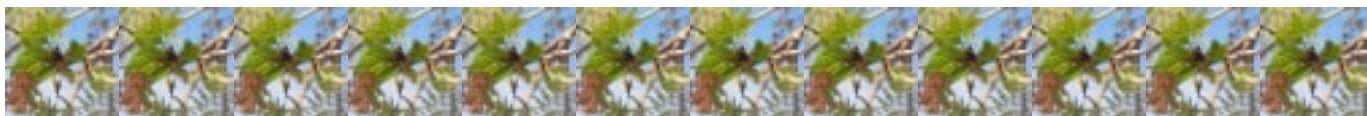
12. SPORTS



NBRI Men's TT team along with Prof. (Mrs.) Vani Brahmachari

The Institute participated in the 40th Shanti Swarup Bhatnagar Memorial Tournament (Indoor), at NGRI, Hyderabad, during February 20-22, 2009.

The NBRI men's team, comprising Messers DK Purshottam, HC Bhatt, and S Venkatesh, bagged the Table Tennis Champions Trophy. Mr. Purshottam also won the CSIR Table Tennis Championship in the individual event.



ANNOUNCEMENT

**XIX Annual Conference of Indian Association for
Angiosperm Taxonomy (IAAT) & International Symposium on**

at

NATIONAL BOTANICAL RESEARCH INSTITUTE, LUCKNOW, INDIA



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Please also visit NBRI website for latest information, registration form, etc.
<http://www.nbri-lko.org>

FORTHCOMING EVENTS

- | | | |
|------------------------|----|--------------------|
| 1. INDEPENDENCE DAY | .. | August 15, 2009 |
| 2. SADBHAVNA DIWAS | .. | August 20, 2009 |
| 3. HINDI DIWAS | .. | September 14, 2009 |
| 4. CSIR FOUNDATION DAY | .. | September 26, 2009 |

To,

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