



**annual
report**

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TROPICAL BOTANIC GARDEN AND RESEARCH INSTITUTE
PALODE, THIRUVANANTHAPURAM, KERALA, INDIA.



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From the Director's Desk.....

I feel immensely honoured to present the Annual Report of Tropical Botanic Garden and Research Institute, for 2002-2003. This period witnessed remarkable achievements in the Garden Development and R&D sections through action oriented programmes planned and executed systematically. The programmes initiated/ revived were mainly aimed at conservation and sustainable utilization of the rich and varied genetic resources of the state for the economic advantage and well being of the people. A good many extension activities including imparting training, conducting workshops and seminars were undertaken during this period.

About 15 new research projects are initiated, in addition to the 30 ongoing Research programmes ushering in an era of new plant-based research activities. Extensive plant collection trips to every nook and corner of the Western Ghats and Peninsular India, conducted during the period helped enrich the living collection in the Garden. A number of rare and endangered plants were introduced. A new variety of balsam, developed by the scientists has been registered at ICAR, New Delhi. Development of a Hortus Malabaricus Garden, depicting the plants of this esteemed publication, has been initiated.

The National Gene Bank programme of the Department of Biotechnology has been extended up to 2007. Under this programme, a number of valuable specimens from Andaman and Nicobar islands were introduced. Novel research programmes involving advanced DNA fingerprinting techniques of a number of valuable medicinal species and their accessions have been started.

About 4 books and 70 research papers have been published in national and international journals. As many as 40 papers were presented during national and international conferences.

The Bio-informatics Sub Centre of the Department of Biotechnology, functioning at the Institute is all set to create more novel data bases, related to the floristic wealth of Kerala.

This period also witnessed new collaborations on aspects of mutual interest, pertaining to conservation and sustainable utilization through assistance from international agencies like the World Bank and National agencies like DST, DBT, CSIR, ICAR and MoEF.

I gratefully acknowledge the generous support of Shri A K Antony, the Hon' ble Chief Minister of Kerala, who sanctioned a one-time grant of Rs. 3 crores, to the Institute.

The period also witnessed the launch of the new set up in Science and Technology Governance of the State. The erstwhile Science, Technology and Environment Committee had been reorganized to form the new Scientific Council, The Kerala State Council for Science, Technology and Environment.

Our Silver Jubilee Celebrations await launch shortly. A good many constructive programmes like Open House, Public Awareness Programmes, National and International Conferences etc have been planned for the occasion.

I am confident that the Institute will surge forward with renewed vigour, with the giant quantum of support and guidance from the Hon'ble President, the Vice Presidents, the Executive Vice President and Members of KSCSTE, the learned Research Council, the Management Committee and the dedicated scientists and supporting staff of TBGRI.



G M Nair

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HORTICULTURE AND GARDEN DEVELOPMENT

THE developmental programmes of this major division are accomplished through the following units. Arboretum, Palmetum and Central Nursery Unit.

Bambusetum Unit.

Medicinal, Aromatic and Spice Plants Unit.

Orchid Biology, Education and Extension Unit.

Ornamental Plants and Plant Distribution Unit.

ARBORETUM, PALMETUM AND CENTRAL NURSERY UNIT

The unit added 30 species of trees to the arboretum this year, increasing the total collection to 830 species. Propagation studies of extremely rare, endemic plants such as *Buchanania barberi* and *Humboldtia decurrens* were initiated during the period. About 100 seedlings of *B. barberi* and 50 seedlings of *H. decurrens* are ready for planting as well as for distribution. Besides, about 500 seedlings of various trees were supplied to the public during the period.



Garden entrance



'Queen of balsams'

A new variety of balsam 'Queen of balsams' (INGR No. 03040) developed by Dr P.A. Jose and Dr Jacob Thomas has been registered by the Plant Germplasm Registration Committee of Indian Council of Agricultural Research, New Delhi.

Jasminum Germplasm

A germplasm of *Jasminum* (Oleaceae) with 48 species/varieties is maintained. The collection includes wild species, cultivated varieties and a few exotics introduced through exchange programmes. Propagation, multiplication and distribution of these plants are done as a part of the conservation programme.

R & D Activities

The Unit has published two books during the period.

Flora of Agasthyamala, which brings out a detailed inventory of the flowering plant diversity of Agasthyamala



The arboretum-a picturesque view

Central Nursery

This unit serves as an active propagation centre for various ornamental plants required for the sales unit. About 60,000 saplings were raised to cater to the needs of the Ornamental plants unit. The unit has standardised protocols for the vegetative propagation of the endangered 'Pitcher Plant' (*Nepenthes khasiana*), through axillary shoot multiplication.

New to Science (Flowering Plants)

Bulbophyllum rosmarianum
Chrysopogon copei
Dimeria agasthyamalayana
Dimeria josephii
Fuirena simpsonii
Memecylon sivadasanii
Strobilanthes pushpangadanii

biosphere reserve, the unique hot spot of endemism of the Western Ghats.

Common tropical and sub-tropical sedges and grasses – an illustrated account, which gives an illustrated account of 44 sedges and 55 grass species common to the tropics and sub-tropics of the globe.

Besides the regular garden developmental activities, the unit operates 2 externally funded projects and two in-house programmes



NATP Project on Wild Crop Relatives

This project sponsored by NBPGR aims at establishing a germplasm collection of arborescent crop relatives of the Western Ghats. Wild relatives of *Cinnamomum* (4 species), *Garcinia* (4 species), *Myristica* (2 species) and *Syzygium* (3 species) were collected during the report period. Collections of an extremely rare species, *Garcinia imberti* and a new species, *Memecylon sivasadanii* were the major achievements of the project during the year.

Eco-taxonomic studies of the grassland vegetation of Kerala

Documentation of the flora of selected grasslands of the state was done through the CSIR-funded project. Three new species of grasses were described viz. *Chrysopogon copei*, *Dimeria agasthyamalayana* and *D. josephii*, during the report period.

Presently, the Unit is planning to undertake a new developmental project on the establishment of a Hortus Malabaricus Garden (a garden representing the plants depicted in the Hortus Malabaricus of van Rheedee). A complete list of plants was prepared and preliminary collections of 50 species were also done during the report period.

Study of the genus *Ischaemum* (Poaceae) of Peninsular India is another in-house programme of the period. About 150 accessions of the genus belonging to 20 species were collected from different parts of Kerala. *Ischaemum impressum* Hack. has been reported as new to the flora of Kerala from the Wayanad district.

BAMBUSETUM UNIT

The bamboo live collection is well maintained. About 67 saplings were added to the bambusetum during the report period, of which 52 have survived. A peculiar type of precocious flowering observed in *Dendrocalamus strictus* has been reported. Macro-proliferation trials were conducted in 9 species and 12,000 saplings were produced.

The extension activity, popularising bamboo cultivation, gained wide attention among farmers, paper industries, plantation organizations like Kerala Forest Department, Kerala Forest Development Corporation and various NGOs. This year about 11,000 saplings were distributed.

In collaboration with the State Forest Department, the Unit established one plot at Kulathupuzha, in Thiruvananthapuram district and another at Mananthavady, in Wayanad district. At the 5 hectare area in Kulathupuzha 7 species were successfully raised and maintained.

Fruit crops

Propagation studies of *Persea americana* with *P. macrantha* as root stock and *Achras sapota* with *Chrysophyllum cainito* were conducted. 80% successful grafts were obtained in the trials of *Achras sapota* with *Chrysophyllum cainito*. Apart from the experimental trials, clonal propagation of *Psidium guajava*, *Garcinia gummi-gutta*, 2 varieties of *Mangifera indica*, *Elaeocarpus serratus*, *Artocarpus heterophyllus*, *Psidium cattleianum*, *Flacourtia montana*, *F.*

inermis etc. was established.

The unit has an orchard with 84 species of both wild and cultivars of fruit plants. An accession of 240 plants has been successfully reared in the orchard. A progeny orchard of *Mangifera indica* (improved varieties), *Garcinia gummi-gutta*, *Phyllanthus emblica*, *Elaeocarpus serratus*, *Mangifera indica* (local varieties), *M. indica* (wild) and *Artocarpus heterophyllus* was also maintained

MEDICINAL, AROMATIC AND SPICE PLANTS UNIT

Plant explorations were carried out to different parts of the Western Ghats and as a result, the existing germplasm collection was enriched by introducing several new accessions of Medicinal, Aromatic and Spice plants. The Unit undertook developmental and maintenance activities of the Herbal garden, harbouring about 750 species representing the primary and secondary gene pool of medicinal plant species. The conservation-education programmes of the Unit were boosted by undertaking the new project 'Establishment of a Millieu based Sanctuary and Conservation - Education Centre of Medicinal Plants of the Western Ghats' funded by the Western Ghats Development Programme. In order to establish a Field Gene Bank of Medicinal and Aromatic plants, a series of programmes have been initiated and significant progress has been achieved with regard to conservation and assessment of intra-specific variability of selected species - a thrust area demanding urgent attention - as a part of the project 'National Gene Bank for Medicinal and Aromatic Plants' funded by DBT. New findings have been made in the fields of Biosystematics,



Diospyros discolor 'Velvette apple'



Elaeocarpus serratus - a wild edible fruit



Baccaurea courtallensis - a variegated variety



Alpinia zerumbet - Shell ginger



Mud wall encircling Itty Achuden Vaidyan's garden showing educational scripts using natural dye.

intra-specific variability and distribution of the species of *Piper* and *Curcuma* of the Western Ghats, as a part of the project sponsored by DBT entitled 'Taxonomic data organization and DNA finger printing studies of selected endemic species of *Piper* and *Curcuma* in India'. Taxonomic and intra-specific variability studies were also carried out on *Cinnamomum*, *Acrotrema* and *Pellionia* species.

ORCHID BIOLOGY, EDUCATION AND EXTENSION UNIT

Regular activities of this Unit like enrichment of the live collection, taxonomic studies, breeding and phenology studies, the maintenance and upkeep of the orchidaria, fertigation and pest management etc. were continued. 25 species of orchids were added to the collection from Munnar and Wayanad. Of this, two prove to be new to science: one in the genus *Gastrochilus* and the other in the genus *Oberonia*. Detailed studies are currently underway.



Vanda wightii-a rediscovery

Other important additions to the orchid collection are 12 species brought by Dr. P.V. Sreekumar, collaborator in All India Co-ordinated Research Project-viz. *Bulbophyllum backhusenii*, *B. apodum*, *Aerides emericii*, *Rhynchostylis retusa*, *Acriopsis indica*, *Schoenorchis minutiflora*, *Plocoglottis javanica*, *Pteroceras muriculatus*, *Papilionanthe teres*, *Pomatocalpa andamanica*, *Pholidota*

Rediscovery

Begonia aliciae
Buchanania barberi

imbricata and *Aerides multiflora*. *Phalaenopsis* hybrid and *Paphiopedilum sukhakulii* brought from Thailand have now become well acclimatized in the Orchidarium.

Enrichment of the existing *Vanilla* collection continued with the introduction of *Vanilla grandiflora* from America. All the flowers of *V. planifolia* were pollinated and fruits were produced. A small processing unit was also established.

Education and Extension Activities

The Unit participated in seven exhibitions both national and local, in various places highlighting achievements of the Institute. Students, researchers and others from about 105 institutions visited the Institute for study purposes. As a part of education and extension activities of the unit, several demonstration programmes and extension lectures were given/ undertaken for the benefit of the visitors.

ORNAMENTAL PLANTS AND PLANT DISTRIBUTION UNIT

General Ornamental Section

The shrubbery complex area of the garden has been reconstructed during the report period. Beautification of the garden with the planting of different varieties of *Ixora*, *Hibiscus* and mixed groups of foliage and flowering shrubs was done. Plants with attractive coloured foliage and pretty flowers were planted along the sides of the footpaths to give it more appeal. Ample provision has been made for further additions in respective places. A 'carpet bed' depicting 'Kathakali' the traditional art form of Kerala in the middle of the shrubbery and a triangular



A view from the garden



'box garden' near the fish bone style Rose Garden were the newly developed attractions.

Structural designs and rearrangements of landscape with additions and deletions of the features were made at the Emblem carpet bed, Guest house premises, rear and lateral sides of the office building and the front landscape of the Biotechnology laboratory.

Herbarium specimens of all available ornamental plants were prepared, identified and documented giving emphasis to their nativity, landscape potential and adaptability. Nearly 60% of the work has been completed and the rest is in progress.

Cacti and Succulents

This collection comprises about 100 species of cacti and above 160 species of other succulents. Three species of cacti and succulents viz. *Ceropegia candelabrum*,



Cephalocereus senilis, 'Old man's cactus'

Ceropegia sp. and *Cereus* sp. were newly added to the collection. Besides the maintenance of the collection in the glasshouse, rock garden and other open areas, propagation studies like grafting were tried in *Euphorbia* and other succulents. Production of seedlings, saplings and graft plants was also carried out during the period.

Ferns and Gymnosperms

This section has a fern collection of 155 species in 72 genera and 30 families. The collection includes 22 species coming under the rare, endangered and threatened category. Five species viz. *Histiopteris incisa*, *Lygodium japonicum*, *Sphaerostephanos unitus*, *Thelypteris confluens* and *Pronophrium triphyllum* were newly added to the existing collection. Taxonomic studies on the genus

New to Science (Pteridophytes)

Selaginella camusii



Glass house and the rock garden

New distributional records

Cadaba trifoliata
Drypetes sepiaria
Ipomoea parasitica
Justicia betonica var. *ramosissima*
Phyllanthus rotundifolius



Butea monosperma

Selaginella of the Western Ghats resulted in the discovery of two species, new to science.

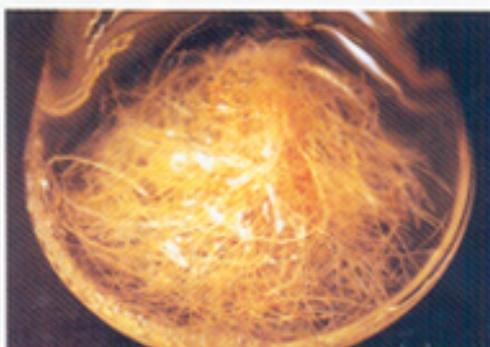
Gymnosperms at TBGRI represent 36 species in 15 genera belonging to 7 families. Living fossils (Cycads) are the main attraction. *Zamia fischeri*, a vulnerable cycad is newly added to the existing collection. Six species of cycads viz. *Cycas beddomei*, *C. circinalis*, *C. revoluta*, *C. rumphii*, *Zamia furfuracea* and *Z. pumila* were supplied to the Botanic Garden of the Indian Republic (BGIR), Noida.



PLANT BIOTECHNOLOGY

National Gene Bank for Medicinal and Aromatic Plants

National Gene Bank for Medicinal and Aromatic Plants, project sponsored by Department of Biotechnology, Government of India has been extended up to 2007 (10th Plan period) commencing from November 2002 with a total outlay of Rs. 89.39 lakhs.



Hairy root culture of *Withania somnifera*

As an ongoing programme, the division is taking care of the *in vitro* repository and cryo-preservation. As part of *in vitro* repository, shoot cultures of *Decalepis arayalpathra*, *Geophila reniformis*, *Kaempferia rotunda*, *K. galanga*, *Trichopus zeylanicus* ssp. *travancoricus*, *Nervilia prainiana*, *N. aragoana*, *Rauvolfia micrantha*, *R. serpentina*, *R. beddomei*, *Piper trichostachyon*, *P. galeatum*, *Acorus calamus*, *Heracleum candolleianum*, *Mahonia leschenaultii*, *Coleus forskohlii*, *Curcuma longa*, *Rubia cordifolia*, *Adhatoda beddomei*, *Vanilla andamanica*, *Rotula aquatica*, *Uleria salicifolia* and *Holostemma annulare* were subcultured and maintained.

As part of the cryo-bank, two accessions were added and thus it now holds 20 accessions, belonging to 16 species as seeds and one accession (*Holostemma annulare*) as shoot tips. Experiments were initiated to cryo preserve the shoot tips of *Rauvolfia beddomei* and *Kaempferia galanga*.

Genetic uniformity of the micro propagated plants and their donor plants of *Acorus calamus*, *Mahonia leschenaultii* and *Heracleum candolleianum* was carried out using DNA fingerprinting techniques.

Seed Bank

Seed Bank of the Institute holds about 620 active accessioned collections, of which 240 are collected from the TBGRI flora. The accessioning pattern was restructured according to the Bentham and Hooker's classification with Hutchinson's modification. About 648 accessions were revised on the basis of the specific numbers to their respective family, genus, species, sample number and year of collection (eg. The accession number of *Ocimum sanctum* L. was changed from M.00061.84 to TSB 121.1.4.1.02.). A new Index Seminum 2003, with 897 seed types was published. Data were collected on phenology of fruiting, seed maturation and seed ecology

of *Aegle marmelos* and *Coscinium fenestratum*, from their natural habitats.

The low moisture content effect on seed viability and storage was conducted at different temperature and humidity for *Aegle marmelos*, *Coscinium fenestratum*, *Helicia travancorica*, *Ochlandra travancorica*, *Asparagus racemosus*,

Rauvolfia tetraphylla, *Ficus benghalensis*, *F. benjamina*, *Oroxylum indicum* and *Musa acuminata*.

Ex-situ conservation through micropropagation of rare and endangered species

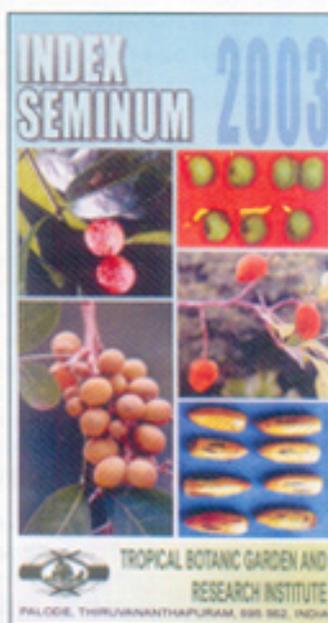
Agro forestry species

Rattan palm, bamboos, banana and several woody agro/ medicinal species represent a fast depleting natural resource of Western Ghats region that are multiplied on priority basis, for reintroduction to natural habitats and large scale planting on plantation scale. Protocols have already been standardised for the mass multiplication of Rattan species such as *Calamus thwaitesii*, *C. andamanicus*, *C. brandisii*, *C. nagabettai*, *C. rotang*, *C. hookerianus*, *C. travancoricus* and Bamboos such as *Bambusa arundinacea*, *Bambusa vulgaris*, *Dendrocalamus strictus* and *Ochlandra travancorica*.

Tree species

The project, funded by the Department of Biotechnology, Government of India, was started against the backdrop of destructive harvest of several precious medicinal trees, for their plant parts like roots, bark or wood in the preparation of popular ayurvedic formulations such as Dasamoola, Chyvanaprasa, Ashtavarga etc. The species, *Stereospermum suaveolens*, *Premna corymbosa* and *Oroxylum indicum* are among those, facing rarity/extinction. The clonally micro-propagated plants so produced are established in the community pots and ready for reintroduction into their natural habitat.

Apart from this, clonal micro-propagation protocols were developed for highly sought after woody medicinal species viz. *Calophyllum apetalum*, *Aegle marmelos*, *Crataeva magna*, *Blepharistemma membranifolia*, *Morinda umbellata* etc. The





latter two species were successfully reintroduced into natural forest habitats in the Western Ghats

Musa species

Most of the local traditional *Musa* varieties are not known / commercialised due to the lack of knowledge or scarcity of the propagules. Southern districts like Kanyakumari and Thiruvananthapuram are rich in the above mentioned traditional varieties. This project is aimed to conserve, multiply, evaluate and popularise them.

In vitro shoot multiplication techniques have been standardized for 'Matti' and 'Chenkathali' from rhizome meristem.

In vitro shoot multiplication technique has been standardized for 'Poonkalli' from inflorescence meristem.

Multiplication trials are taken up for the varieties 'Chaampakannan' and 'Vaali-ethan', from rhizome meristem and Rasakathali from inflorescence meristem.



Piper barberi
in vitro conserved shoots



Aristolochia tagala-multiple
shoots in node culture

Hardening trials are being carried out for 'Chenkathali' and 'Poonkalli.'

Bioproduction of phytochemicals/bioactive compounds

Nearly 60% of the medicinal plants have roots as the source of drugs used in traditional medicine. These plants are invariably subjected to destructive harvesting leading to some of them becoming rare and endangered. As part of our ongoing effort to develop root cultures as a renewable source of medicine and also for sustainable supply of bioactive compounds, half a dozen plants were identified and cultures established. Laboratory scale production of normal and *Agrobacterium rhizogenes* mediated root cultures of five medicinal plants such as *Plumbago rosea* (Plumbagin), *Withania somnifera* (Withanolides), *Hemidesmus indicus* (2 hydroxy 4-methoxy benzaldehyde), *Decalepis arayalpathra* (2 hydroxy 4-methoxy benzaldehyde) and *Rauvolfia micrantha* (Ajmalicine) have already been established for their respective high value, low volume compounds. Experiments are in progress in two other plant species namely *Ophiorrhiza* sp. (Camptothecin) and *Nothopodites nimmoniana* (Camptothecin).

In *Withania somnifera*, experiments were conducted to determine the effect of different concentrations of gibberellic acid (GA₃) and auxins (IBA and IAA) and putrescine in MS basal medium for root biomass increase and production of secondary metabolites (withanolides and alkaloids). Total withanolides and

alkaloids were separated as per the standardized procedure. Qualitative determination for Withanolide D was done by TLC using Liebermann's Burchard reagent and alkaloids by Dragendorff's reagent. In addition, a preliminary experiment was carried out to find out the effect of B5 medium on the growth of the root compared to the optimal medium (full - strength MS). Phytochemical assay has been

undertaken in *Rauvolfia micrantha*. The study of the effect of different concentrations of polyamine supplementation of half-strength MS medium, for the fast growth and production of alkaloids was continued. Untransformed root cultures of *Hemidesmus indicus* were initiated and established. Experiments have been carried out to enhance the root biomass production in shake flask cultures which showed 20 fold increase in growth. Similarly, untransformed root cultures of *Ophiorrhiza mungos* was initiated and experiments are in progress.

Chemical profiling and DNA fingerprinting of Medicinal and Aromatic Plants

The programme on bio-prospecting of MAPs is envisaged to evolve strategies for effective conservation and characterization of our rich biogenetic resources using chemical and molecular marker techniques, for sustainable utilization. The work is currently focused on DNA fingerprinting of the following species.

Andrographis paniculata

Chemical profiling with respect to andrographolide content and DNA fingerprinting using RAPD was carried out for 22 accessions of *Andrographis paniculata*, representing the northern states of India, collected during this period. With these additions, the number of accessions of *A. paniculata* currently being screened has now been increased to 47. A total of twenty-five 10-mer primers were used for the estimation of intra-specific variation in this species. Estimation of chemical and genetic variation in the species shows that the accessions from Tamil Nadu merit consideration for further genetic improvement programmes.

Rhododendron arboreum

RAPD analysis of *Rhododendron arboreum* accessions collected from the North-Eastern and South-Western parts of India resulted in population specific DNA



products with selected primers. The experiments were repeated by bulk DNA analysis using maxi-prep RAPD reaction. The products were eluted out and are being characterized for the development of DNA markers capable of discriminating these two populations.

Piper nigrum

Total of 25 accessions of *P. nigrum* representing both wild and cultivars were selected for RAPD analysis using thirty 10-mer primers. Out of 184 amplified products generated, 114 were found to be polymorphic among the accessions (62%). Estimation of genetic variation following Nei's genetic identity method revealed moderate intra-specific variation in this species. Genetic data indicates that wild accessions are genetically more diverse than cultivars as evidenced by mean value of GS as 0.94 and 0.96 respectively. Segregation of accessions in the cluster was broadly in agreement with their geographical distribution with few exceptions.

Bioinformatics Sub-DIC

Bioinformatics Sub-DIC (DBT) of the institute is focusing on the development of tools and techniques for biodiversity data management to enable conservation and sustainable utilization. The Centre has realised the urgent need for digitalisation of the information on genetic diversity into a centralized database and has progressed significantly in this venture. Digitalised database generation of genetic resources of the country will help in formulating suitable strategies for practical conservation and sustainable utilization of genetic diversity in a scientific and meaningful way. In the light of these, the Centre has developed database software, "Plant Info" which offers computational tools for easy documentation, management and analysis of plant diversity data. The achievements made during the last one year are:

Development of a software "Garden Info" for the documentation and analysis of germplasm collection and maintenance data of botanic gardens.

Development of a software "Seed pack", which offers computational tools for the management of seed bank data.

Development of a software "Bio lit", for the documentation and cataloguing of the publications of TBGRI.

Development of software for the management of

library books, periodicals and other data related with library.

Organised the database "Plant Info series I - Endemic Medicinal Plants of Kerala" comprising the data of 35 medicinal plants.

Formulation of the passport data documentation model and distribution among the scientists of TBGRI for the establishment of the database on germplasm collection and R & D achievements of TBGRI.

Launched the Web Site <http://www.btisnet/nic/in/tbgri>.

In view of initiating a public domain facility for biodiversity databases and analytical tools, the Centre has started an Extension Centre near Techno Park, Thiruvananthapuram.

Educational/training courses/M.Sc./M.C.A/B.Tech project works, Ph. D programmes and R & D activities are conducted at the Extension Centre.

LAN facility was established at Biotechnology Division for perusing Internet facilities.

At present, the Main Centre at TBGRI campus is concentrating on data acquisition and the Extension Centre at Puthenthoppe in Thiruvananthapuram City has taken up the development of software and promoting bioinformatics educational activities.

The Centre has also re-designed the Web site of Department of Biotechnology, Government of India.

COMMERCIAL TISSUE CULTURE UNIT

Mass propagation of high value ornamentals

Laboratory level rapid propagation protocols of selected hybrids of Orchids and Anthuriums were established. Overwhelming response from the public enabled the division to start mass propagation of ornamental plants of great interest and demand. Around 1,00,000 plants produced during the period were sold after hardening or in culture bottles to the growers, entrepreneurs or private nursery establishments.

A project has been initiated during the period on *Anthurium* protoplast studies. Isolation and purification of protoplasts from aseptic cultures of *Anthurium* (hybrid var. Agnihothri) was carried out.



MICROBIOLOGY

Survey and inventory of the Mushrooms of the Western Ghats

Collection trips were conducted to Kulathupuzha forest areas. 243 collections were made and all are maintained in the herbarium. Out of this, four are new records to India and one of the species, *Termitomyces umkowaani* is an edible one.



Termitomyces umkowaani

Survey and inventory of the Micro fungi of the Western Ghats

Conducted field trips to Shendhurney wild life sanctuary. Identified 200 foliicolous fungi. All specimens are kept in the herbarium. 34 new species and 5 new varieties were reported. 13 species and 2 genera were reported for the first time from India.

Mycorrhizal Association of Endemic Trees in the Western Ghats

A survey on mycorrhizal association of endemic palms and medicinal plants of the Western Ghats and TBGRI campus was conducted. Root colonization and AM spore load in the rhizosphere were estimated. The palms were found to be highly mycorrhizal. Among the medicinal plants studied, *Decalepis arayalpathra*, an endangered plant, was found as highly mycorrhizal and dependant on mycorrhiza for its establishment.

Screening and Isolation of Actinomycetes from Western Ghats for Bioactive compounds

Extraction and purification of the antibiotic compound TBGA-1 from the strain of *Streptomyces setonii* was standardised. The chemical properties of the purified compound such as solubility, melting point, etc and different spectra including UV-Vis, IR, MASS, NMR (^{13}C and ^1H) were studied. The MIC values and antimicrobial spectrum of the compounds were also studied. A screening study was conducted to select L-Asparaginase enzyme producing actinomycetes. *Streptosporangium nondiastaticum* (TBG-75A20) and *Streptomyces setonii* (TBG-19NRA1), isolated from Neyyar wild life sanctuary showed good L-Asparaginase activity. The effect of temperature, incubation period, concentration of various

nutrients on L-Asparaginase activity of these two strains was studied in detail.

DNA Fingerprinting in Mushrooms

DNA fingerprinting and genetic diversity evaluation of 6 species of the genus *Agaricus* was done and the fingerprint profile using different primers was studied. The distance between each species was established. Isozyme analysis



Value added mushroom products

of these 6 species using Esterase, Peroxidase, Malate dehydrogenase and Superoxide dis- mutase was also studied.

Development of value added products

A novel product 'Mushroom Wine' was developed and an application for Indian patent was filed for this process.

New Generic Records to India (FUNGI)

Dysrhynchis uncinata
Teratosperma anacardii

**NEW SPECIES
(FUNGI)**

Asteridiella kombeensis
Asteridiella myristicacearum
Asterina atalantiae
Asterina averrhoae
Asterina cynanchi
Asterina gomphandrae
Asterina hopeae
Asterina lanneae
Asterina mallotica
Asterina microtropidicola
Asterina naraveliae
Asterina samaderae
Asterina viscid
Balladyna rubiacearum
Clasterosporium cyperacearum
Echidnodella veteriae
Lembosia araliacearum
Lembosia linocierae
Meliola cadambae
Meliola dysoxyl-malabarici
Meliola gamsii
Meliola gliricidiicola
Meliola lanneae
Meliola oleacearum
Meliola shivarajui
Meliola syzygiigena

Questieriella grewi
Questieriella tephrosiae
Questieriella terminaliae
Sarcinella cassiae-fistulae
Sarcinella dalbergiae
Sarcinella hugoniae
Spiropes armatelicola
Tretospora ochreinaucleae

**NEW RECORDS TO INDIA
(FUNGI)**

Acrodyctys balladynae
Asterina aporusae
Asterina deightonii
Asterina triumfeticola
Lembosia ormosiae
Meliola aethiops
Meliola hyptidis
Meliola ichnocarpi-volubili
Meliola rauvolfae
Meliola smilacis
Meliola strychni-multiflorae
Pluteus amphicystis
Pluteus martinicensis
Pluteus subcervinus
Priellieuxina anamirtae
Spiropes dialii
Termitomyces umkowaani

**ETHNO MEDICINE AND
PHARMACOLOGY**

THE main objectives of the R&D and extension activities of the Division are to conserve, preserve and sustainably utilize the rich traditional herbal wealth and indigenous knowledge of our country.

TBGR model for benefit sharing with Kani tribes based on the technology transfer of 'Jeevani' received the **Equator Initiative Award** in recognition of the outstanding achievements in the conservation of biodiversity and reduction of poverty in the equatorial belt. The award was received by former Director of TBGR, Dr. P. Pushpangadan at the **World Summit on Sustainable Development**, held at



Spilanthes ciliata-a potent hepatoprotective plant

Johannesburg, South Africa, from 26th August to 4th September, 2002. A World Bank Consultancy Project on "**Pilot Participatory Programme For Conservation and Sustainable Use of Medicinal and Aromatic Plants**" under the Kerala Forestry Programme is now successfully being implemented at 8 Kani tribal settlements at Kottur, Thiruvananthapuram district and 1 Malappandaram tribal settlement at Achenkovil, Kollam district. In this programme 9 activities are implemented. Under the activity number 3, a mechanism has been worked out and implemented in the field for the



Sri Lankan team visiting the tribal settlement

cultivation of medicinal plants through buyback arrangement, linking with the industrial establishment, to generate income/self employment to the tribes.

As per the recommendation of IUCN Sri Lanka Country Office, 3 groups of community members (20 members in each group) from Sri Lanka visited TBGRI and also the tribal area to study the ongoing programme. A team of experts from South Africa also visited the Institute as well as tribal areas to study and observe the activities of the Consultancy programme.

Ethnopharmacological assays were carried out on selected medicinal plants to evaluate anticancer, antidiabetic, antioxidant and hepatoprotective properties. The ethanolic extract of *Spilanthes ciliata* showed remarkable antihepatotoxicity against paracetamol induced liver damage in Wistar rats. Significant free radical scavenging and hepatoprotective effects were observed in methanolic extracts of aerial parts of

Rhinacanthus nasuta. Methanolic extract of rhizome of *Helminthostachys zeylanica* showed significant hepatoprotective activity against CCl₄ induced liver damage in Wistar rats. Antidiabetic property of *Withania coagulans* fruits was confirmed.

The ongoing ethnopharmacological assays on selected medicinal plants include (i) Search for pharmacologically active extracts/ active fractions in Bryophytes and Pteridophytes (Cryptogams) vis-à-vis development of standardized phytomedicines for liver protection, cancer and fungal infections. (ii) Studies on selected folk/tribal medicinal plants (Angiosperms) for antiviral properties (against Cocksackie virus, Hepatitis B virus and HIV virus. (iii) Antifungal properties (Collaborative project involving Microbiology Division of SCTIMST). Potent antidiabetic property was detected in *Cassia kleinii* leaf.

TBGRI model of benefit sharing with Kani tribes based on the technology transfer of 'Jeevani' received the Equator Initiative Award in recognition of the outstanding achievements in the conservation of biodiversity and reduction of poverty in the equatorial belt.

PHYTOCHEMISTRY



Chemical investigation of the endemic plants, *Garcinia imberti*, *Ammomum cannicarpum*, *Acrotrema amottianum* and *Lagenadra ovata*, resulted in the isolation of pure compounds belonging to the class of steroids,

FROM *Trichopus zeylanicus*, vitexin, vicenin-2, a chromone and sitosterol were isolated and their structures elucidated by UV, IR, ¹H-NMR, ¹³C NMR and MS studies and by chemical means.

The structure of Columbianadin, a furanocoumarin isolated from *Heracleum candolleianum* was confirmed by Raman and IR spectral studies.

Chemical prospecting of 13 accessions of different *Curcuma* species involving curcumin estimation and essential oil analysis and 10 accessions of *Piper nigrum* involving piperin estimation were carried out.

terpenoids, flavonoids etc. Structure elucidation of the isolated compounds by various spectroscopical techniques is in progress.

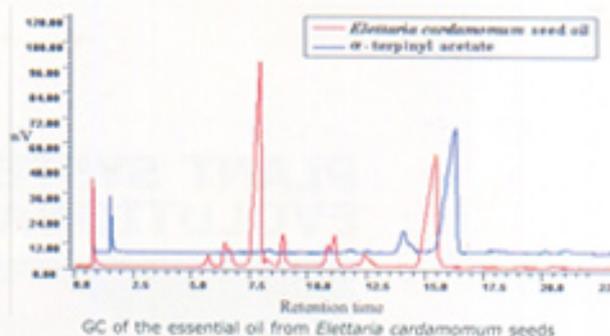
The essential oil isolated from *Ammomum cannicarpum* showed promising antimicrobial activity and the oil has been analyzed by GC-MS and the major constituents were identified.



Monographs on 4 plants (*Elettaria cardamomum*, *Cinnamomum zeylanicum*, *Myristica fragrans* and *Murraya koenigii*) that included various parameters such as ash value, soluble extractives, TLC, HPLC, HPTLC and GC profiles, estimation of major active compounds and pharmacognostic details, were prepared for publication by Indian Council of Medical Research (ICMR), Govt. of India.

Pharmacopoeial standards of 5 medicinal plants containing pharmacognostic, chemical and ayurvedic parameters were revised and submitted to the Department of Indian Systems of Medicine, Ministry of Health and Family Welfare, Govt. of India for publication in 'The Ayurvedic Pharmacopoeia of India'.

Anti-microbial activity was observed in the hexane and methanol extracts of *Acrotrema arnotianum* and



GC of the essential oil from *Elettaria cardamomum* seeds

the phytochemical study resulted in the isolation of pure compounds belonging to the class of steroids, terpenoids, flavonoids etc.

CONSERVATION BIOLOGY

Data base on Kerala flora

Database on Kerala flora was completed. The database depicts the 4500 flowering plant species of Kerala, in 1278 genera and 207 families. The details covered for each species are legitimate name, synonyms, habits, reference to best available description and illustrations, distribution (World, India, Western Ghats, Kerala), nativity, conservation status, phenology, uses and local names.

Flora of Eravikulam National Park (ENP)

This work enumerated 990 species of flowering plants and 77 species of Pteridophytes. An analysis has shown that 21 species of angiosperms are exclusively endemic to ENP and 180 species come under different threat categories of IUCN.

Study on mutualism between *Cullenia exarillata* and vertebrate community in Silent Valley

As part of the study, flowers, nectar, fruits and seeds were quantified and correlated with the consumption rate of interacting vertebrates. Floral traits, attractants and rewards were analysed to



Nasikabatrachus sahyadrensis - New family, new genus and species

understand pollination mutualism. Fruit traits, seed dispersal, seed germination and seedling demography were studied to understand the effective dispersal of seeds. Analysis of data is in progress.

Amphibian Ecology in relation to plant communities in the Western Ghats

Thirty ecologically and strategically different habitats in the forests of the Western Ghats were selected and the frog fauna of these habitats was surveyed round the year. Of the species collected and identified, about 100 species are believed to be new to science.

Aerobiology of Kerala

Slides exposed by Rotorod and Burkard samplers at 41 strategic sites in rural, urban and coastal areas covering northern, central and southern part of Kerala have been scanned. Data gathered on airborne pollen and spores show that dominant pollen among them are those of Poaceae, Amaranthaceae/Chenopodiaceae and Areaceae and spores were those of *Aspergillus/Penicillium*, *Cladosporium*, basidiospores and aerospores.



Philautus glandulosus
Rare and endemic frog species of southern Western Ghats



PLANT SYSTEMATICS AND EVOLUTIONARY SCIENCES

R & D Activities

Floristic studies

During the period under report, a total of 56 field trips were conducted to different forest types, resulting in the collection of 7700 specimens for herbarium and documentation. Further, data gathered during these studies were utilized to compile the flora of the respective areas and also to contribute to the Red Data book. A total of 900 specimens were critically studied, their identity determined and incorporated with the existing collection in the herbarium.

Systematic study on Balsam

The systematic study on balsam resources of the state under the project "Survey, inventory and collection of horticulturally promising wild balsams of Western Ghats of Kerala state" has been successfully completed. During the reporting period, 4 exploration trips each of one week duration were conducted to various evergreen and Shola forests of Western Ghats such as Agasthyamala, Anaimudi, Sholayar and Nilgiri-Wayanad plateau. Four promising wild species and 10 hybrids were selected for multiplication and more than 1500 saplings were raised for restoration and popularization programmes.



Thottea idukkiensis - an endemic species



Morinda reticulata - critically endangered taxon of the Western Ghats

Systematic studies of special groups of plants

Under this programme, *Cinnamomum* and *Sonerila* are selected for in depth taxonomic studies. *Cinnamomum* is economically important, while *Sonerila* is a wild ornamental. Species of both the genus have morphologically interesting characters and at the same time pose serious problems in taxonomic delimitations. The

study revealed data on species composition, distribution and taxonomic entity.

Climbers are another group of plants selected for the study. They are the integral part of the forest flora that developed specialized mechanisms for their establishment. The study focussed on their diversity, distribution and ecosystem specificity.

Reproductive biology

The reproductive biological studies of two rare endemic species viz. *Ixora agasthyamalayana* and *Morinda reticulata* were carried out to find out the causal factors responsible for the depletion of their population in the wild. The study covers flower development, anthesis, stigma receptivity and pollen-ovule (PO) ratio. In *I. agasthyamalayana*, anthesis occurs between 6 AM-1 PM and PO ratio is found as 2400:1. Pollen fertility was 88% and viability 72% in Brewbaker's medium with 1% sucrose. It is protogynous in nature and receptivity lasts for 48 hrs. The highest percentage of pollen germination was after 6 hrs of anthesis and declined after 24 hrs resulting in less than 10%. Floral dimorphism and incompatibility of *M. reticulata* was also studied. It is a heterostylous plant with pin and thrum flowers. Anthesis occurs at 6 PM. 88-92% of pollen grains are fertile and 70-76% is viable in Brewbaker's medium. Thrum flowers fail to produce seeds, whereas pin flowers produce 80% fruits by cross pollination.

Ecological studies of RET species

The study is being carried out with the objective of establishing the causes of rarity of 3 rare and endemic species viz. *Goniothalamus rhynchantherus*, *G. wightii* and *Popowia beddomeana* in their respective ecosystems. The study envisages 5 major tasks such as vegetative and reproductive dynamics, insect-pest infestation, predation and conservation

strategies. Occurrence of millipedes in the mature flowers of *G. wightii* is an interesting observation. The stem of *G. wightii* is affected by witch broom disease. Preliminary investigations revealed virus/ Mycoplasma Like Organism (MLO) to be the causal agent. However, further studies including TEM are required for confirmation. Simultaneously, standardization of vegetative propagation to raise clonal population is also pursued.

Ethnobotanical studies of North Kerala

As a part of the ongoing programmes, two survey trips were conducted among the tribal communities viz. the Malasars inhabiting the Nelliampathy forest areas, Palakkad district and Kattunaikans, Kurumars and Paniyas of Sultan Battery and Muthanga forests of Wayanad district. Some of the plant species used as single drugs include *Abutilon persicum*, *Anaphalis subdeccurens*, *Bulbophyllum sterile*, *Costus speciosus*, *Drynaria quercifolia*, *Glycosmis pentaphylla*, *Huntaria zeylanica*, *Mecardonia procumbens*, *Naringi crenulata*, *Richardia scabra* and *Scoparia dulcis*. Lesser known edible species such as *Amaranthus caudatus*, *A. polygamus*, *Oxalis latifolia*, *Phytolacca octrandra*, *Schleichera oleosa* and *Syzygium hemisphericum* were also recorded. Seedlings of *Schleichera oleosa* and *Syzygium hemisphericum* were introduced to TBGRI as a part of *ex situ* conservation. 224 specimens belonging to 56 species were added to the Herbarium which has raised the herbarium collection of this study to 1195, belonging to 751 species.

Rescue and Restoration of RET medicinal plants.

The project on rescue and restoration of medicinal plants, launched with financial assistance from FRLHT, aimed at restoring the populations of RET medicinal plants which are under the risk of over exploitation was continued during the period. The candidate species are *Coscinium fenestratum*, *Canarium strictum*, *Dysoxylum malabaricum*, *Embellia ribes*, *Garcinia morella*, *Knema attenuata*, *Myristica dactyloides*, *Myristica malabarica*, *Ochreinauclea missionis*, *Persea macrantha*, *Piper barberi*, *Piper mullesua*, *Piper longum*, *Trichopus zeylanicus* sub. sp. *travancoricus* and *Vateria indica*. Permanent plots were established in all the 3 Medicinal Plants Conservation Areas (MPCAs). Air layering, grafting, stem cuttings with hormone treatment and seed storage studies were taken up as part of conservation strategies. Multilocation trials of these species were tried at six MPCAs for assessing their growth performance. A 5 hectare field gene bank has been set up in the MPCA at Bonaccord in association with State Forest Department.

Biosphere Reserve Programmes

As lead/coordinating centre for Nilgiri and Gulf of Mannar Biosphere Reserves, the division is engaged in the development of a comprehensive database on both these Biosphere Reserves. A compendium on Nilgiri Biosphere has been published. Also, the division is in close interaction with different R & D institutions that also undertake research in these Biosphere Reserves, as well as with State Forest Departments aimed at efficient management.

Environmental Impact Assessment (EIA) studies

The Division has been engaged in conducting environmental impact assessment for hydel projects of KSEB from time to time. During the reporting period, the division carried out the EIA for Pooyamkuttu Hydroelectric Project. The EIA of the revised Pooyamkuttu scheme with respect to different submergible level options is under preparation.

Quantitative Assessment and Mapping of Non Wood Forest Products (NWFPs) in Southern Kerala

To assess the quantum availability of NWFPs in Southern Kerala, the study has been initiated with the financial assistance from the Kerala State Forest Department. 6 field trips of one week duration each were made, covering all habitats and vegetation types. During these survey and exploration trips, 179 species were collected from Thenmala, 241 species from Naduvathamuzhy, 213 from Vadasseikkavu, 239 species from Kuttampuzha, 203 species from Munnar and 97 species from Chinnan Wild Life Sanctuary. The programme resulted in the development and standardization of a unique methodology for quantification of NWFPs.

Herbarium management

Apart from the day to day activities of updating nomenclature based on recent publications and principles of International Code on Botanical Nomenclature (ICBN), 7700 specimens were processed in addition to establishing the identity and incorporation of 900 specimens in the herbarium stock. Also prophylactic activities aimed at warding off pests are also being regularly carried out as part of herbarium management. An account of herbarium activity during the period is summarised below.

Number of specimens deposited as on 31 / 03 / 2003	17600
Number of specimens processed	7700
Mounted for filling	2300
Unmounted for reference	5400
Number of specimens incorporated	900
Number of nomenclature corrections carried out	2559
Indexing of General Herbarium specimens	3234
Number of sheets renovated	1817
Maintenance and fumigation	17600
Maintenance of reference specimens	34400
Number of enquiries attended	866
Number of tour programmes conducted	56
Number of classes/training courses conducted	48



LIBRARY AND INFORMATION SERVICES

THE Library and Information Service Division caters to the information needs of the scientific staff of the Institute. The total holding consists of 7225 books. In addition to the normal routine services, the Library provides specialized services such as Current Awareness Services, Selective Dissemination of Information, Bibliographic Services, Newspaper



Clipping Services and Photocopying Services. Cataloguing of books and periodicals using the Soft-ware 'Libsoft' is in progress.

Internet facility is provided in the Library for the Scientists to collect upto date information in their respective research areas. Many students and researchers have used the library during the period for reference and photocopying facilities.

PEOPLE AND TBGRI

VISITORS

His Excellency Sri Ved Marwah, The Governor of Manipur.
Sri Sompal, Member, Planning Commission, Govt. of India.
Sri A M Gokhale, IAS, Additional Secretary, Ministry of Environment and Forests, Govt. of India.
Dr N J Kurian, Advisor, Planning Commission, Govt. of India.
Dr M Sanjappa, Director, Botanical Survey of India.
Dr W Selvamurthy, Advisor, DRDO, New Delhi.
Dr K R Shivanna, University of Delhi.
Dr R K Arora, IPGRI, New Delhi.
Dr G M Reddy, G M Reddy Foundation, Hyderabad.
Three team of experts from Sri Lanka and one from South Africa under the World Bank Consultancy programme.
Members of Overseas Residents Club, Kowdiar.
Students of Elamanoor Vocational Higher Secondary School, Elamanoor.
Students of Jesus Training College, Mala.
Students of K.R. College of Arts & Science, Tamil Nadu.
Students of St. Mary's College, Trichur.
Students of Darsana Higher Secondary School, Nedumangadu.
Students of T.E.M.V.H.S.S., Mylode, Kottarakkara.
Students of Kerala Forest School, Arippa.
Students of Govt. VHSS, Mavelikkara.
Students of Govt. L.P.S., Thycaud.
Students of Presidency College, Chennai.
Students of Govt. G.H.S., Airooppa.
Students of Govt. Boys Vocational H.S.S., Malayinkil.
Students of St. Thomas C.S.I. Church, Kollam.
Students of Pioneer Kumaraswamy College, Nagercoil.

Students of Chinmaya Vidyalaya, Kunnumpuram.
Students of Thirumala Govt. U.P.S., Thirumala.
Students of Govt. L.P.S., Kulappada.
Students of Govt. U.P.S., Kudavoorkonam.
Students of Marthoma College of Science and Technology, Kollam.
Students of Govt. L.P.S., Bharathannoor.
Students of St. Victor's L.P.S., Perantode.
Students of Govt. H.S., Chirakkara.
Students of D.V. Vocational Higher Secondary School, Thalavoor.
Students of Govt. L.P.S., Kunnappuzha.
Students of Alva's Ayurvedic Medical College, Moodidri.
Students of Qaid-E-Millath Govt. College, Chennai.
Students of St. George Central School, Kollam.
Students of Govt. Higher Secondary School, Karapuzha.
Students of Sri. Parasakthi College for Women, Courtallam.
Students of Govt. L.P.S., Muthuvila.
Students of L.M.S.H.S.S., Vattappara.
Students of Govt. Higher Secondary and Vocational Higher Secondary School, Pathanamthitta.

EXTENSION ACTIVITIES

The Bioinformatics Centre of the Division of Biotechnology has tied up with the University of Kerala and proposed to start M. Phil course in Bioinformatics during the current academic year (2003 - 2004) in which BTIS, TBGRI will be the Centre, conducting the course.

The Centre has started a 6-month training course for M. Sc. Botany/ Biotechnology first class holders on



His Excellency Sri. Ved Marwah and wife during his visit

"Bioinformatics and Biodiversity Data Management". The trainees were selected through a National level eligibility test and interview.

The Centre, jointly with C-DIT organized a National Workshop on "Bioinformatics Tools, Techniques and Algorithms" from July 10 to 12, 2002 at Thiruvananthapuram

The Centre provided one month summer training on "Biological database designing" to M.Sc. Bioinformatics students.

The Centre provided project work implementation facility for two M.C.A students for a period of six months. With respect to the Human Resource Development programme, the Commercial Tissue Culture Unit imparted training to 17 entrepreneurs in two batches, on "Tissue Culture Techniques" as dissertation work and "Floriculture with *Anthurium*" as extension and employment generation programme.

A workshop on "**Indigenous Knowledge Strategies For Kerala**", supported by IK Programme, World Bank, Washington DC, was organised jointly by the Divisions of Phytochemistry and Ethnomedicine and Ethnopharmacology, with a view to develop concrete indigenous knowledge based proposals for the Kerala State Planning Board for the inclusion of the same in the 10th Five Year plan.

The Plant Systematics and Evolutionary Sciences Division organized a 5-day training programme on "Nursery Techniques and Mngement", for the Eco-



Hon'ble Chief Minister, Sri. A. K. Antony inaugurating the IK Workshop

development Committee members of Peppara Wildlife Sanctuary during 16-20 December 2002.

Exhibitions

'World Ayurveda Conference', organized by Swadeshi Science Movement (a unit of Vijnanabharati) from 30-10-2002 to 5-11-2002 at Kochi.

'All India Exhibition' - Golden Jubilee Celebration at St. Thomas College, Kozhencherry from 1-11-2002 to 8-11-2002.

'Thiruvalla Pushpamela' - organized by Horticulture Development Society from 23-1-2003 to 28-1-2003.

'Mavelikara Pushpamela' - organized by the Society of Agri-Horticultural Development from 29-1-2003 to 2-2-2003.

'Palode Cattle Fair' from 7-2-2003 to 13-2-2003.

Over 3,000 students, 1,500 general public and 150 foreigners visited the garden during 2002-'03



Memecylon sivadasanii Mohanan et. al - new species from Agasthyamala

**EXTERNALLY FUNDED PROJECTS**

No.	Project	Funding Agency	Principal Investigator
1	Development of standards of selected therapeutically important Indian medicinal plants and preparation of monographs thereof.	Indian Council for Medical Research	Dr V George
2	Genotyping of bio-diversity for conservation and prospecting of biological wealth in South-Western and North-Eastern parts of India.	Department of Biotechnology(DBT), Govt. of India	Director
3	Rescue and restoration of RET medicinal plants of Agasthyamala, Kulamavu and Wayanadu MPCAs.	FRLHT	Dr A G Pandurangan
4	Establishment of database for Nilgiri and Gulf of Mannar biosphere reserves.	Ministry of Environment & Forests (MOEF), Govt: of India	Dr A G Pandurangan
5	National Agricultural Technology project on sustainable management of plant biodiversity.	NBPGR	Dr N Mohanan
6	Taxonomic data organization of wild species of <i>Piper</i> and <i>Curcuma</i> in India and DNA finger printing studies of selected endemic species.	DBT, Govt: of India	Director
7	Tissue culture assisted floriculture for self employment and income generation of economically weaker women in selected village panchayaths of Kerala.	DBT, Govt: of India	Dr S Seeni
8	Non Wood forest Produce including medicinal plants.	Forest Department, Govt. of Kerala	Dr A G Pandurangan
9	Black mildew disease on Wattles (<i>Acacia</i> spp.) in Kerala State.	Forest Department, Govt. of Kerala	Dr T K Abraham
10	Ornamental resources at Shola forests of Kerala.	Forest Department, Govt. of Kerala	Dr A G Pandurangan
11	Collection, evaluation and documentation of mushroom germplasm of the Western Ghats.	Forest Department, Govt. of Kerala	Dr T K Abraham
12	All India Coordinated Research Project on Orchids.	MOEF, Govt. of India	Dr C Sathish kumar
13	National Gene Bank for Medicinal and Aromatic Plants, II Phase.	DBT, Govt. of India	Director
14	Regeneration of plants from <i>Agrobacterium rhizogenes</i> induced hairy roots and comparative field performance of conventional, tissue culture and hairy root derived plants of <i>Plumbago rosea</i> L.	Kerala State Council for Science, Technology and Environment (KSCSTE)	Dr K Satheesh Kumar
15	Value Added Cottage Industry.	WGDP, Govt. of Kerala	Dr K C Koshy Dr C Sathish kumar
16	Strengthening of Ayurvedic pharmacopiel standards of ISM drugs.	Ministry of Health & Family Welfare, Govt. of India	Dr V George
17	Protoplast studies in <i>Anthurium andraeanum</i> .	KSCSTE	Dr Bejoy Mathew
18	Establishment of Sub-Distributed	DBT, Govt. of India	Dr P N Krishnan



Information centre at TBGRI under Bio-informatics Programme.

19	Consultancy Service on implementation of pilot participatory programme of conservation and sustainable utilization of medicinal and aromatic plants (World Bank Consultancy Programme)	Forest Department, Govt. of Kerala	Dr S Rajasekharan
20	Study on mutualism between <i>Cullenia exarillata</i> and vertebrate community in the tropical forests of Silent Valley, Kerala.	MOEF, Govt. of India	Dr T S Nayar
21	Pharmacopoeal screening of selected traditional medicinal Pteridophytes of Western Ghat region of Kerala and molecular characterization of promising species.	Forest Department, Govt. of Kerala	Dr A Subramoniam
22	Conservation of selected rare and economic rattan palms of the Western Ghats through <i>in vitro</i> multiplication and re-introduction.	MOEF, Govt. of India	Dr S Seeni
23	Pooyamkutty Hydro Electric Project.	KSEB	Dr A G Pandurangan
24	An integrated approach for the sustainable development of mushroom industry with active participation of the tribals and weaker section in selected localities of Kerala.	DBT, Govt. of India	Dr T K Abraham
25	Hepatoprotective studies on selected medicinal Plants of the Western Ghats, Kerala.	KSCSTE, Govt. of Kerala	Dr P G Latha
26	Investigation on the Macro fungal Diversity in the Thenmala forest Division of Western Ghats of Kerala.	WGDP, Govt. of Kerala	Dr T K Abraham
27	National Gene Bank for Medicinal and Aromatic plants,(III rd phase).	DBT, Govt. of India	Dr G M Nair
28	Collection ,micro-propagation and reintroduction of some endemic zingibers of Western Ghats, Kerala.	WGDP, Govt. of Kerala	Dr Bejoy Mathew
29	Bamboo and Reed Resource Enhancement in Kerala.	WGDP, Govt. of Kerala	Dr K C Koshy
30	Establishment of a Milieu-Based Sanctuary & Conservation - Education Centre of Medicinal Plants of the Western Ghats.	WGDP, Govt. of Kerala	Dr P J Mathew
31	Industrial Development and Economic Upliftment of Weaker Sections through Bio fertilizer Manufacturing.	WGDP, Govt. of Kerala	Dr T K Abraham
32	Ex-situ Conservation and Sustainable Utilisation of Rare, Endemic and High-Value Medicinal Plants of southern Western Ghats through <i>in vitro</i> Multiplication and Evaluation of Quality retention-A Lab to Land Programme.	WGDP, Govt: of Kerala	Dr G M Nair
33	Anti-cancer studies on selected medicinal plants used in traditional medicines of Kerala to treat cancer/cancer like symptoms.	Forest Department, Govt. of Kerala	Dr P G Latha
34	Chemical Prospecting and DNA Finger	DBT, Govt. of India	Director



Printing of *Andrographis paniculata*.

35	Conservation through Micro propagation & reintroduction of rare and endemic plants in Ayurveda.	DBT, Govt. of India	Mr D Ajithkumar
36	Establishment of Germplasm collection of Palms of Peninsular India and Development of Palmetum.	DBT, Govt. of India	Mr P C Benoy
37	Eco-taxonomic studies of the grassland vegetation of Kerala.	CSIR	Dr N Mohanan
38	Induction and phytochemical investigations of normal and hairy root cultures of <i>Decalepis arayalpathra</i> , a critically endangered medicinal plant.	KSCSTE	Dr C G Sudha
39	Microbial Biomass and litter decomposition.	Forest Dept, Govt. of Kerala	Dr T K Abraham
40	Economic, Financial and Managerial evaluation and upgradation of existing scenario in rural and urban small scale mushroom cultivation and processing units in Kerala.	DST, Govt. of India	Dr N S Pradeep
41	Establishment of seed bank, propagation and <i>ex situ</i> conservation of endemic and threatened species of Western Ghats.	MOEF, Govt. of India	Dr P N Krishanan
42	Studies on anti-viral properties of some known medicinal plants vis-à-vis phytomedicine development.	DBT, Govt. of India	Dr A Subramoniam
43	Micro propagation and cultivation of most sought after medicinal herbals used in Ayurveda and allied systems with people's participation.	DBT, Govt. of India	Dr A Gangaprasad
44	Establishment of seed and Pollen Cryo- bank for ex-situ conservation and sustainable utilization of orchids of Western Ghats.	DBT, Govt. of India	Dr G M Nair
45	Networking of mushroom tribals weaker sections, production and processing units for effective employment generation and uplifting the socio-economic status of women.	DBT, Govt. of India	Dr T K Abraham
46	Sustainable utilisation of the lesser known medicinal plants of Western Ghats, with particular reference to liver diseases.	Kerala State Planning Board	Dr P G Latha

RECOGNITIONS AND AWARDS

Dr G M Nair was nominated in the following committees

- i. Member, B P Pal Environment Award Committee, Ministry of Environment and Forests, Govt. of India.
- ii. Executive Committee Member, Noida Botanical Gardens, Noida.
- iii. Executive Committee Member, Kerala State Medicinal Plants Board.
- iv. Member, Patent Registry Cell, Govt. of Kerala
- v. Member, State Biodiversity Board, Govt. of Kerala.



- Dr P Pushpangadan, former Director received The Equator Initiative Award in recognition of the outstanding achievements in conservation of biodiversity and reduction of poverty in the equatorial belt, at the World Summit on Sustainable Development held at Johannesburg, South Africa, from 26th August to 4th September, 2002.
- Dr S Rajasekharan nominated as Member of the Board for Holistic Development of Herbs, Health and Human Resources (BODH, New Delhi) by the Government of Kerala.
- Dr S Rajasekharan nominated as a Member, Subject Committee on Health, Thiruvananthapuram Corporation.
- Dr S Rajasekharan nominated as a Member, Subject Committee, Health, Sanitation and Drinking Water, Nedumangadu Municipality.
- Dr S Rajasekharan was nominated as a Secretary, World Ayurveda Congress 2002 held at Kochi from November 1-4, organised by Swadeshi Science Movement of India.
- Dr P G Latha was nominated as one of the editorial committee members of Journal of Natural Remedies published from Bangalore.
- Dr P G Latha was nominated as referee of Journal of Herbs, Spices and Medicinal Plants, USA.
- Dr P G Latha was nominated as referee of Indian Journal of Biotechnology, NISCAIR, New Delhi.
- Dr P G Latha was nominated as M.Phil degree (Botany) examiner, Kerala University, Trivandrum.
- Dr P K Sureshkumar, nominated as member OISCA International (Japan), Trivandrum Chapter.
- Dr A K Sreekala, nominated as Women's Forum Convenor, OISCA International (Japan), Trivandrum Chapter.
- Dr K Radhakrishnan, nominated as Convener, Children's Forestry Programme of OISCA, Trivandrum Chapter.
- Dr A Gangaprasad, elected as Managing Committee Member (2003-2004) of the Kerala Cut Flower Producers.
- Dr N Mohanan, elected to the Executive Council of Indian Association for Angiosperm Taxonomy (IAAT) for 2003-2005.
- Dr T S Nayar, nominated as the Executive Editor of Rheedeia, the official journal of IAAT.
- Dr C Sathish Kumar, nominated as Assistant Editor of Rheedeia, the official journal of IAAT.
- Dr K C Koshy, nominated as Assistant Editor of Rheedeia, the official journal of IAAT.
- Dr K C Koshy, affiliate member, INBAR since December 2002.

AWARDS

- Dr S D Biju received INSA (Indian National Science Academy) Fellowship under International Collaboration 2003.
- Dr P A Jose received R S Rao award for the best paper in Biodiversity Conservation in the National Seminar on Plant Taxonomy and XII Annual Conference of IAAT at Goa University, Goa. Sept. 26-27, 2002.
- Dr Mathew Dan received Prof T R Sahu award for the best paper in Medicinal Plants Systematics in the National Seminar on Plant Taxonomy and XII Annual Conference of IAAT at Goa University, Goa. Sept. 26-27, 2002.
- Dr N S Pradeep received best poster award for the presentation "*Bio prospecting and DNA finger printing of Oyster Mushrooms*" (Co authored by P Padmesh, Dr D A Evans and Dr T K Abraham) at the International Seminar on Biodiversity Conservation and Evaluation, held at Bose Institute, Calcutta, India in December 2002.



Ph. D. AWARDED

- C K Biju 'Meliolales in the Shola forests of Munnar, Kerala'. Ph.D., University of Kerala.
- P A Jose, 'A Study on the Population Structure, Dynamics and Conservation of Two Rare and Endemic Trees of Western Ghats of Kerala' University of Kerala.
- N S Pradeep, 'Bioprospecting of some species of *Pleurotus*'. Gandhigram Rural Institute, Deemed University, Madurai.
- P K Sureshkumar 'Ethno botanical investigation and search for aphrodisiac, anti-cancer activities in wild orchids of Western Ghats region of Kerala.' University of Kerala.

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- Thripthi K M, P S Jyothish and T S Nayar 2003. *Acromycespora* of Palode market in Thiruvananthapuram district, Kerala. In: Rao G P et al. (Eds.) *Frontiers of Fungal Diversity in India*. International Book Distributing Co. Lucknow, pp. 781-789

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- Abraham J P, I H Joe, V George, O F Nielsen and V S Jayakumar 2003. Vibrational spectroscopic studies on the natural product, Columbianadin. *Spectrochimica Acta Part A*, 59, 193-199.
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**GOVERNING BODY**

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Secretary, Planning and Economic Affairs Department/ his nominee not below the rank of Joint Secretary	Member
Vice-Chancellor, Kerala Agricultural University	Member
Head, Dept. of Botany, University of Kerala	Member
Principal Chief Conservator of Forests nominated by the Government	Member
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Dr Y R Sharma, Director, Indian Institute of Spices. Research, Calicut	Member
Dr M A Haque, Director, Ministry of Environment & Forests, Govt. of India	Member
Director, Tropical Botanic Garden and Research Institute	Ex-officio Member Secretary

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Head, Dept. of Botany, University of Kerala	Member
Director, Kerala Forest Research Institute, Thrissur	Member
Principal Chief Conservator of Forests, Government of Kerala	Member
Director, Tropical Botanic Garden and Research Institute	Member secretary

KERALA STATE COUNCIL FOR SCIENCE, TECHNOLOGY AND ENVIRONMENT

Hon. Chief Minister, Government of Kerala	President
Minister for Industries, Government of Kerala	Vice-President
Minister for Finance Government of Kerala	Vice-President
Minister for Agriculture Government of Kerala	Vice-President
Minister for Health Government of Kerala	Vice-President
Minister for Education Government of Kerala	Vice-President
Minister for Forests Government of Kerala	Vice-President
Minister for Water Resources Government of Kerala	Vice-President
Vice-Chairman, Kerala State Planning Board	Vice-President
Chief Secretary, to Government of Kerala	Vice-President
Dr M S Valiathan	Executive Vice-President
Secretary, Department of Science and Technology, Government of India	Member
Vice-Chancellors of Cochin University of Science & Technology and Kerala Agricultural University	Members
Secretary, Finance Department, Government of Kerala	Member
Secretary, Planning and Economic Affairs Department, Government of Kerala	Member
Five eminent persons nationally known for their expertise in S&T, Industry and Environment (nominated by the Government)	Members
Director, VSSC, Thiruvananthapuram	Member
Director, RRL, Thiruvananthapuram	Member
Director, SCTIMST, Thiruvananthapuram	Member
Director, CWRDM, Kozhikode (nominated from among the Directors of R&D Centers on rotation)	Member
Director, RGCB, Thiruvananthapuram (nominated from among the Directors of R&D Centers on rotation)	Member
Prof P A Wahid	Member Secretary

**KSCSTE EXECUTIVE COMMITTEE**

Executive Vice-President	Chairman
Secretary, Department of Science and Technology, Government of India or his nominee	Member
Secretary, Planning, Government of Kerala	Member
Secretary, Finance, Government of Kerala	Member
Director, CWRDM, Kozhikode (nominated from among the Directors of R&D Centers on rotation)	Member
Director, RGCB, Thiruvananthapuram (nominated from among the Directors of R&D Centers on rotation)	Member
One representative each of Industry, Environment and Education, nominated by the Government from among the Members of the Council	Member
Member Secretary	Secretary

TBGRI RESEARCH COUNCIL

Prof H Y Mohan Ram, F.N.A., New Delhi	Chairman
Dr K R Shivanna, Bangalore	Member
Dr A R K Sastri, Kakinada	Member
Dr M A Haque, New Delhi	Member
Dr V Rajagopal, Kasaragod	Member
Prof K S Manilal, Kozhikode	Member

TBGRI MANAGEMENT COMMITTEE

Dr G M Nair, Director	Chairman
Prof P A Wahid, Member Secretary, KSCSTE	Member
Dr M Baba, Director, CESS	Member
Smt K S Annamma, Additional Secretary, Planning and Economic Affairs Department, Govt. of Kerala	Member
Dr T S Nayar, Scientist, TBGRI Registrar, TBGRI	Member (Convenor)

TBGRI STAFF**DIRECTOR**

Prof (Dr) G M Nair

HORTICULTURE AND GARDEN DEVELOPMENT

Dr G B Nair	Deputy Director, Head (Retired on 31-5-2002)
Dr Jacob Thomas	Scientist-C (on leave)
Mr A E Shanavas Khan	Scientist-B (on leave)

Mr M Abdul Jabbar	Tech. Officer
Mr P Mony	Garden Maistry
Mr K C Thomas	Gardener
Mr C Murali	Gardener
Mr K Asok Kumar	Gardener
Mr G Sudarsana Kurup	Gardener
Mr S Ajayakumar	Gardener

ARBORETUM, PALMETUM AND CENTRAL NURSERY UNIT

Dr N Mohanan	Scientist-C, Head
Mr P C Binoy	SSA
Mrs Seema G Gopal	JSA
Mr T Sabu	Tech. Officer
Mr Joemon Jacob	Tech. Officer
Mrs A Sabeena	Tech. Officer
Mr K Narendran Nair	Gardener
Mr V Satheesan	Gardener (on leave)
Mr K Vijayakumar	Gardener
Mr G Vijayakumaran	Gardener
Mr L Thulaseedharan	Gardener
Mr A K Azeem	Gardener

ORCHIDS, EDUCATION AND EXTENSION UNIT

Dr C Sathish Kumar	Scientist B, Head
Dr P K Suresh Kumar	Scientist B
Dr S Binu	JSA
Mr S S Dayal	Guide
Mr V Prem Kumar	Guide
Mr M Saleem	Tech. Officer
Mr S Mohammed Sherief	Tech. Officer
Mr T Jamaludeen	Garden Maistry
Mr V Venugopalan Nair	Gardener
Mr M Shajahan	Gardener

MEDICINAL, AROMATIC AND SPICE PLANTS UNIT

Dr P J Mathew	Scientist - C, Head
Dr Mathew Dan	SSA
Dr A Mohan Das	SSA
Dr Sam P Mathew	JSA
Mr C Muraleedharan Unnithan	Tec. Officer
Mr E S Santhosh Kumar	Tech. Officer

BAMBUSETUM UNIT

Dr K C Koshy	Scientist B, Head
Mr B Gopakumar	Tech. Officer
Mr K S Kalesh	Tech. Officer
Mr N Salahudeen	Gardener
Mr S Baburaj	Gardener
Mr M Varkey	Gardener



Mr K Asokachandran Nair Gardener

ORNAMENTAL PLANTS AND PLANT DISTRIBUTION UNIT

Mr Cheriyon P Koshy	Scientist A, Head
Mr R Rajvikraman	SSA
Mr Raju Antony	Tech. Officer
Mr K J Lathan Kumar	Tech. Officer
Mr G Thulasidas	Tech. Officer
Mr K Selvaraj	Labour Supervisor
Mr J Michael	Garden Maistry
Mr B Jayakumar	Gardener
Mr P Manikandan Nair	Gardener
Mr B Harilal Kumar	Gardener
Mr C Sudarsanan	Gardener
Mr J Rajan	Gardener
Mr P Babu	Gardener
Mr P Prabhakaran	Gardener
Mr D Udayakumar	Gardener
Mr R Suresh Kumar	Gardener
Mr V Ranjan	Gardener
Mr N Pradeep	Gardener

PLANT BIOTECHNOLOGY

Dr S Seeni	Deputy Director, Head (on leave)
Dr P N Krishnan	Scientist E1, Head in charge
Dr K Satheesh Kumar	Scientist B
Dr S Mukuntha Kumar	Scientist B
Mr P Padmesh	Scientist B
Dr C G Sudha	Scientist B
Dr William Decruse	Scientist B
Dr C Anil Kumar	SSA
Mr D Ajith Kumar	SSA
Dr A Ganga Prasad	JSA
Mrs R K Radha	JSA
Dr K K Sabu	JSA (on leave)
Dr C K Biju	JSA (on deputation from Microbiology Division)
Mrs S Shailajakumari	Tech. Officer
Mrs C R Chithra	Tech. Officer
Mrs S Bindu	Tech. Officer
Mr K Gopakumar	Tech. Officer
Mr V Girish Kumar	Lab. Asst.
Mrs V S Sindhu	Lab. Attendant
Mrs S Syamala Kumari	Lab. Attendant
Mr P Shaji	Gardener

COMMERCIAL TISSUE CULTURE UNIT

Dr Bejoy Mathew	Scientist B, Head
Mrs B J Radhika	Tech. Officer
Mrs D Beena	Tech. Officer
Mr M K Sreekumaran	Tech. Officer
Mrs Kanakasundaram	Lab. Attendant
Mr G Manoharan	Gardener

MICROBIOLOGY

Dr T K Abraham	Scientist E2, Head
Dr V B Hosa Goudar	Scientist C
Dr K B Vrinda	Scientist B
Dr K Vijayakumar	SSA
Mr S Shiburaj	JSA
Dr N S Pradeep	JSA
Mr H Biju	Tech. Officer
Mr K Anil Kumar	Gardener
Mr S R Kamalesh Kumar	Gardener
Mr R Valsaladevi	Helper

ETHNOMEDICINE AND ETHNOPHARMACOLOGY

Dr S Rajasekharan	Scientist E2, Head
Dr P G Latha	Scientist E1
Dr A Subramoniam	Scientist E1
Dr D A Evans	Scientist B (Resigned)
Mr A Subash Baby	Pharmacist
Dr T G Vinod Kumar	JSA (on leave)
Mr E S Anil Kumar	JSA
Mrs B S Geetha	JSA
Mr M Navas	Tech. Officer
Mrs J Ushakumari	Tech. Officer
Mrs S Ambili	Tech. Officer
Mr S Ajikumaran Nair	Tech. Officer
Mr S Radhakrishna Pillai	Animal House Technician
Mr G Santhosh Kumar	Animal House Technician
Mr G Anilkumar	Animal House Assistant
Mrs A Leela	Helper

PHYTOCHEMISTRY

Dr V George	Scientist E2, Head
Dr V Sabulal	Scientist B (on leave)
Mr K B Ramesh Kumar	JSA
Mr Dhruvan Tandeykkal	JSA
Mr Gopanraj	Tech. Officer
Mr Anil John	Tech. Officer
Mrs Rajani Kurup	Tech. Officer
Mrs B Sumitha	Tech. Officer
Mrs P Sasikala	Lab Attendant

CONSERVATION BIOLOGY

Dr T S Nayar	Scientist E1, Head
Dr S D Biju	SSA
Mr P S Jothish	JSA
Mr S Suresh	Tech. Officer
Mr M Sibi	Tech. Officer
Mr G Madhu	Gardener

PLANT SYSTEMATICS AND EVOLUTIONARY SCIENCES

Dr A G Pandurangan	Scientist E1, Head
Dr P A Jose	Research Scientist (SSA on deputation from Horticulture and Garden Development Division)
Dr M Rajendra Prasad	Research Scientist (JSA, on deputation from Biotechnology Division)
Mr K Radhakrishnan	SSA
Mr G Rajkumar	JSA
Dr A K Sreekala	JSA
Mrs V S Usha	Herbarium Assistant
Mrs M P Geethakumari	Tech. Officer
Mrs K P Deepthi Kumari	Tech. Officer
Mr R Thulaseedharan	Gardener

LIBRARY AND INFORMATION SERVICES

Mrs A Syamala Kumari	Librarian
Mr K Sabarish	System Analyst (on deputation)
Mrs V Sujatha	Junior Library Assistant
Mrs V Leena Kumari	Helper
Mr C R Vinukrishnan	Helper

ART AND PHOTOGRAPHY

Mr K P Pradeep Kumar	Artist/Photographer
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Mr S Suresh Kumar	(on leave)	Mrs Baby Girija	Sweeper
Mr C Suseendran	Asst. Artist	Mr V Gangadhara Pillai	Sweeper/Cleaner
ADMINISTRATIVE STAFF			
Mr K M A Rahman	Registrar	ENGINEERING SECTION	
	(under suspension)	Mr P P Markose	Tech. Officer
Mr K Ramadas	Registrar, April-June 2002	Mr Ajith S	Asst. Works Supervisor
Mr S Nithyanandan	Registrar,	Mr B R Boby	Overseer
	July-August 2002	Mr V S Suresh Kumar	Electrician
Mr N Mohana Kurup	Registrar (September	Mr P Ajith Kumar	Plumber
	2002 onwards)	Mr R Prabhakaran Nair	Pump Operator
Mr Ravi Abraham	Accounts Officer	Mr M Madhusoodhanan Nair	Painter
	(under suspension)	Mr A Thankappan	Label writer
Mr K M Jalaludeen	Finance Officer	Mr P S Hanikumar	
Mr C M George	Purchase Officer	SECURITY	
	(Retired on 30-4-2002)	Mr V Jayadhar	Security Officer
Mr K G Ajithkumar.	Asst. Adm. Officer	Mr P R Chandrasekharan Nair	Security Guard
Mrs S Radhalekshmy Ammal	P.A. to Director		(Sergeant in-charge)
Mr Suresh Chandran	Section Officer	Mr S Chandran	Security Guard
	(Purchase Officer in charge)	Mr P Jain	Security Guard
Mrs R Sarala Devi	Section Officer	Mr A Johnson	Security Guard
Mrs C Syamala	Senior Accountant	Mr K Mohanan	Security Guard
Mrs S Meenakumary	Office Asst. Grade-III	Mr P Ramachandran Nair	Security Guard
Mr K Vijayan	Office Asst. Grade-III	Mr G Somasekharan Nair	Security Guard
Mr M Anilkumar	Office Asst. Grade-IV	Mr C Stanley	Security Guard
Mr B Sreekumar	Office Asst. Grade-IV	Mr K Krishnankutty Nair	Security Guard
Mr M Sulfikar	Office Asst. Grade-IV	Mr R Rajan	Security Guard
Mrs B S Ajanthakumary	Office Asst. Grade-IV	Mr K Ramachandran Nair	Security Guard
Mrs S R Bindu	Office Asst. Grade-IV	Mr R Ramachandran Nair	Security Guard
Mrs G Subhadra	Typist Grade. I	Mr V Sreedharan Nair	Security Guard
Mrs A Santha	Typist Grade. I	Mr A Subairkunju	Security Guard
Mrs N Rajalekshmi Ammal	Typist Grade. I	Mr C Sukumaran Nair	Security Guard
Mrs R Subha Sankar	Computer Operator	Mr T Sukumaran Nair	Security Guard
Mr K Mohammed Habeebulla	Typist/Data Entry Operator	Mr B Surendran Nair	Security Guard
Mrs P S Shyladevi	Typist	Mr K Surendran Nair	Security Guard
Mrs C Gracy	Stenographer Gr. I	Mr S Venugopalan Nair	Security Guard
Mrs R Prasannakumary	Stenographer Gr. II	Mr B Venukrishnan Nair	Security Guard
Mr K P Elias	Store Assistant	Mr P Vijayakumar	Security Guard
Mr M Ramaswamy	Driver Gr. I	Mr G Viswambharan	Security Guard
Mr V Rajendran Nair	Driver Gr. I	Mr K Balakrishnan Nair	Security Guard
Mr R Gopinathan Nair	Driver Gr. I	Mr M Bhuvanachandran	Watchman
Mr A Salim	Driver Gr. I	Mr K Raveendran Nair	Watchman
Mr D Mohanachandrakumar	Driver Gr. I	PUTHENTHOPE EXTENSION CENTRE	
Mr T Mohanakumar	Driver	Mr C Sunil Chandran	Estate Supervisor
Mr P Rajendran	Driver	Mr B Chandran	Gardener
Mr C P Somasekharan Nair	Driver	Mr M Vijayan	Gardener
Mr V Sudheeshkumar	Driver	Mr R Anilkumar	Gardener
Mr S Chandran Chettiar	Helper Gr. I	BIOINFORMATICS EXTENSION CENTRE	
Mr C Sathyan	Helper Gr. I	Prof (Dr) G M Nair	Chairman
Mr B Vijaya Kumar	Helper Gr. I	Dr P N Krishnan	Co-ordinator
Mr G S Madhusoodhanan Asary	Helper	Dr S Sreekumar	Information Officer
Mr B Jayalalkumar	Gardener (on other duty)	Dr C K Biju	Technical Assistant
Mr M Shajahan	Gardener (on other duty)	Mr Gireesh M Pillai	Data Entry Operator
Mr S Thulaseedharan	Gardener (on other duty)		
Mrs Kumari Girija	Sweeper		
Mrs K Lali Kutty	Sweeper		

**TROPICAL BOTANIC GARDEN AND RESEARCH INSTITUTE,
PALODE, THIRUVANANTHAPURAM****INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31 MARCH 2003**

	SCH No.		YEAR ENDED 31/03 /2003	YEAR ENDED 31/03/2002
INCOME				
Grant in aid 2002-2003 from Ministry of Science, Technology & Environment (A) Department, Government of Kerala		43,470,000.00		
Less: Amount utilised for Repayment of loan PCC		5,278,793.00		
Less: Amount earmarked for PCC		7,178,459.00		
Less: amount utilised for payment of PF		3,332,392.00		
Less: Amount earmarked for PF		3,793,521.00		
Less: Amount utilised for purchase of Capital Assets		272,721.00	23,614,114.00	23,635,979.00
Interest from Banks	13		-----	10,711.00
Miscellaneous Income			766,013.50	376,331.00
Income from Technology Transfer Royalty				41,400.00
TOTAL			24,380,127.50	24,064,421.00
EXPENDITURE				
Research, Development and other Expenses	14		1,344,414.00	285,353.00
Employee Benefits	15		19,845,806.00	25,418,441.00
Travelling Expenses	16		253,823.00	65,059.00
Administrative Expenses	17		2,460,434.80	1,790,741.20
Vehicle Expenses	18		1,030,867.00	950,434.00
Repairs and Maintenance	19		105,305.00	168,384.00
Prior Period Expenses			-----	926,539.00
Depreciation			1,890,751.63	2,227,395.00
Miscellaneous income transferred to Corpus Funds a/c	20		-----	14,935.00
Other Expenses			8,120.00	164,520.00
TOTAL			26,939,521.43	32,011,801.20
Net Excess of Expenditure over Income			2,559,393.93	7,947,380.20

TBGRI

**annual
report**