ANNUAL REPORT 1989-'90

TROPICAL BOTANIC GARDEN AND RESEARCH INSTITUTE
THIRUVANANTHAPURAM

ANNUAL REPORT
1989-'90

TROPICAL BOTANIC GARDEN AND RESEARCH INSTITUTE
(T B G R I)
PALODE, THIRUVANANTHAPURAM - 695 562
KERALA, INDIA
PHONES : 226, 236 (Palode), 72538 (Res. Thiruvananthapuram)
Grams : TROPGARDEN

Members of the Governing Body

1.	The Chief Minister, Kerala State	...	Chairman
2.	Prof. (Dr.) N. Balakrishnan Nair, Chairman, State Committee on Science, Technology and Environment	...	Vice-Chairman
3.	Secretary to the Govt. of Kerala, Planning & Economic Affairs Department	...	Member
4.	Secretary to the Govt. of India, Dept. of Environment, Bikkaner House, New Delhi-110 001	...	Member
5.	Secretary to the Govt. of Kerala, Finance Department	...	Member
6.	Vice-Chancellor, Kerala Agricultural University, Mannuthy, Trichur	...	Member
7.	The Principal Chief Conservator of Forests, Kerala State	...	Member
8.	Head, Department of Botany, University of Kerala, Kariavattom	...	Member
9.	Professor H. Y. Mohan Ram, Dept. of Botany University of Delhi, Delhi-110 007	...	Member
10.	Professor A. Abraham, Avittom Road Kannammoola, Trivandrum-11	...	Member
11.	Prof. V. S. Rama Das, School of Life Sciences University of Hyderabad, Central University P.O., Hyderabad-500 134	...	Member
12.	Dr. M. H. Mari Gowda, Retd. Director of Horticulture, Karnataka Govt., 288, 38th Cross, 8th Block, Jayanagar, Bangalore-41	...	Member
13.	Prof. M. K. Prasad, Pro Vice-Chancellor, University of Calicut-673 635	...	Member

14.	Sri. R. Haresh, Executive Director, TVS Ltd. West Veli Street, Madurai-1	...	Member
15.	Prof. T. R. Govindachari, Retd. Director of Research, CIBA–Geigy Ltd., 22, Crescent Park Street, T. Nagar, Madras-17	...	Member
16.	The Director, Tropical Botanic Garden and Research Institute, Palode, Trivandrum	...	Member Secretary

Members of the Executive Committee

1.	Prof. (Dr.) N. Balakrishnan Nair, Chairman State Committee on Science, Technology & Environment	...	Chairman
2.	Secretary to Government, Planning and Economic Affairs Department	...	Member
3.	Head, University Department of Botany, Kariavattom, Trivandrum	...	Member
4.	Director, Kerala Forest Research Institute, Peechi	...	Member
5.	Sri. S. Chand Basha, Chief Conservator of Forests (Social Forestry)	...	Member
6.	Director, Tropical Botanic Garden and Research Institute, Palode, Trivandrum	...	Member Secretary

CONTENTS

FOREWORD

Resource is the life-blood of any nation. Success of a society depends on its capability to utilize the available resources optimally through the application of Science and Technology. Kerala's renowned natural plant wealth has never been the subject of deep research with the end in view of making the best use in the service of the people. There is considerable scope for exploring better productive use of the rich floristic wealth of the region such as canes, bamboos, plants useful for sericulture, fast growing trees useful in social forestry programmes and development and promotion of other plant-based industries that can generate gainful employment to the rural people. This will open up a new concept of socio-economic transformation through the application of Science and Technology developed by our R & D centres.

Keeping in view the above said points, as well as the objectives of the Institute as given in its memorandum, new challenges in botanical research are being pursued. The period under review witnessed unique accomplishments in exploration, collection, introduction and conservation of a large number of rare and endangered tropical plants. The additions made in the garden include 11 bamboo species, 20 palm species, 32 tree species and 45 medicinal plant species. About 220 species / varieties of seeds were also introduced by the seed bank. Quite a few of our young scientific talents had their turn of enrichment in the Kew Gardens, with the liberal assistance of the British Council. Their expertise is of immense value in our future pursuit of our garden management. The setting of the garden is thus now on a solid foundation. Now in the turn of events, with the new building complex being completed and the necessary infrastructure for research is being built, the year is poised for opening up the vistas of scientific wonders. With the setting of an enchanting garden and an inspiring laboratory system we have all the reason to look up for epoch making events in the service of humankind.

As you are aware that I have assumed the charge of Director on 12–11–1990, the credit of the achievements accomplished during the period, 1989–90, definitely goes to my predecessor and his team. Of course, I will continue to uphold the best traditions and work established by my predecessors and reinforce the R & D activities of the Institute with renewed vigour in the light of valuable guidance, sustained support and active co-operation from the Research Advisory Committee, the Executive Committee, the Governing Body and the entire staff of TBGRI.

Dr. P. Pushpangadan

PLANT TAXONOMY

Collection and Conservation of Bamboos

Considerable progress has been achieved in the development of the bambusetum during this period. The planting area is further expanded with foot paths and foot steps to facilitate easy access. The foot steps on the slopes has been protected from erosion by planting *Cynadon* grass. The existing collection has been enriched with the addition of 11 more species raising the total number of species to 39.

Planting of 15 offsets of 8 species and 60 seedlings of 7 species were done during this year. This include a seedling of *Ochlandra* sp. raised from the offset collected from Wynad, one specimen of *Bambusa burmanica* raised from the survived offset brought from Dehra Dun, one offset of the climbing bamboo, *Melanocalamus compactiflorus* and two offsets of *Bambusa nana*, three seedling each of *Cephalostachyum pergracile, Dendrocalamus brandisii, D. membranaceus* and *Thyrsostachyus siamensis*, one seedling of *Phyllostachys pubescens*, received from the Royal Botanic Gardens, Kew, four seedlings of *Dendrocalamus longispathus*, an offset of *Melocanna baccifera;* 4–5 seedlings each of *Cephalostachyum pergracile, Dendrocalamus brandisii, D. longispathus, D. membranaceus, Thyrsostachys siamensis*, and one offset of *Bambusa vulgaris*. About 20 seedlings of *Dendrocalamus strictus* and 8 seedlings of *Thyrsostachyus siamensis* were planted near the entrance of Bambusetum.

A collection tour to Munnar, Mannavanchola, Madupatty areas was conducted in May 1989, during which 10 offsets of two species of *Arundinaria* (?) were collected of which 8 were planted in the site and two in pots. Flowering and fruiting specimens of *Ochlandra travancorica* were also collected from Adimali.

A rare incidence of flowering of two clumps of a tall species of bamboo, possibly *Dendrocalamus calostachyus* was observed near Tiruvalla during the month of May 1989. Thirty specimens of

these were collected and photographs taken. Unfortunately seeds could not be collected as all the culms were cut down before the maturity of the flowers.

Another interesting flowering of a species established in the bambusetum (unidentified) was also observed. Profused branching in this species is noted in August upto September and flowering started in November and continued upto April. Since the seeds were being eaten away by birds one entire clump of the species was covered with mesh as a protective measure and thereby we could collect few seeds. A few culms of a giant bamboo in the Museum gardens at Trivandrum produced flowers during January–February. Ample specimens of these plants were collected for the Herbarium.

Seventy three herbarium sheets belonging to 17 species collected from FRI, Dehra Dun were identified, labelled and handed over to the Herbarium. The bamboo herbarium is further enriched with approximately 100 flowering specimens.

Eco-Restoration of Rare and Endangered Orchids

As a part of the project on the eco-restoration of rare and endangered orchids at the Garden, steps were taken to bring plants of this category from various parts of Western Ghats. Sampling for eco-restoration was carefully done so as to ensure maximum genetic diversity from different populations sighted, with the understanding that a meaningful conservation can be achieved. So, the second trip of the project to Munnar-Kodaikanal conducted during 19–27, May was aimed at this goal. During this trip *Hetaeria ovalifolia* (Wight) Benth. ex. Hook.f. was collected from Munnar, near to Top Station. This is a very rare and much endagered species now restricted to limited localities of Kerala and Tamil Nadu. Though originally reported from Courtallum in 1851 by Wight, this species has disappeared from the type locality. Since then it was subjected to much damage floristically. Now it has been found in certain destruction prone areas where it is being represented by a handfull of individuals. So, the urgent need to conserve this species from extinction is imperative. Representative samples were collected for introduction and eco-restoration.

For the first time the Indo-Sri Lankan subendemic genus *Diplocentrum* was brought for introduction. Sizable populations were located at Bodimettu.

Schoenorchis filiformis (Wight) Scltr. nom. illeg. was collected from Munnar-Kodaikanal border. Since this taxon has a questionable affinity with the genus *Schoenorchis*, a critical study was made to clarify the doubts and to reassess its correct status and identity. Preliminary studies proved that actually two species were involved in this and they are generically distinct from all other known taxa. So it was decided to erect a new genus to accommodate these two species. The generic name *Seidenfadeniella* was tentatively chosen.

The following orchids were also collected during this trip: *Bulbophyllum fuscopurpureum, B.* cf. *fischeri, Brachycorythis splemdida, Dendrobium anamalayanum, D. nutantiflorum, Eria pauciflora, E. pseudoclavicaulis, Gastrochilus acaulis* and *Schoenorchis nivea.*

Labelling of about 220 species of orchids housed at the Species House was done. Multiples of many orchids like *Dendrobium moschatum,* D. *fimbriatum* etc. were given separate labels.

Wild Flowers of Kerala

An exploratory tour was conducted to Munnar from 19th to 25th May, 1989 to study and survey the wild plants. About 70 species belonging to 10 genera and 15 species of the families, Lauraceae, Papilionaceae, Sapindaceae, Asteraceae, Solanaceae, Balsaminaceae, Gesneriaceae, Scrophulariaceae, Liliaceae and Hypericaceae were collected for herbarium purpose. Identification of herbarium specimens collected during this trip and earlier trips are in progress. Fifteen species were photographed in flowering condition in natural habitat belonging to *Pterocarpus, Schleichera, Erigeron, Crotalaria, Datura, Impatiens, Rhyncoglossum* and *Hypericum.* Live plants from the following families/genera were brought to the Garden for the purpose of introduction into the natural habitat. (no. of the specimens in brackets). *Osbeckia* (2) *Datura* (9) *Melastoma* (4) *Celastrus* (2), *Hypericum* (4), *Begonia* (4) *Erigeron* (8) *Leucas* (3) *Strobilanthus* (4) and *Crotalaria* (3) *Passiflora* (3), *Aeschynanthus* (8) members of Asteraceae (2), Zingiberaceae (4),

Lamiaceae (8), Liliaceae (9) Gentianaceae (2). They were potted and allowed to grow in pots for 3–4 months.

Until August-September '89, all the potted plants were thriving well in the pots. But many of them like *Leucas*, *Erigeron*, *Passiflora*, *Aeschynanthus*, when transferred from the pots into the natural habitat got perished. Others like *Datura*, *Crotalaria*, *Hypericum*, and *Strobilanthus* showed stunted growth. When they were again repotted, only *Datura* picked up well in the pots. Disturbance in the micro-habitat of the high altitude and failure to restore the same in the Garden may be the main reason for the perishness of the plants brought from Munnar. At the same time plants like *Melastoma*, *Begonia* and members of Zingiberaceae show steady growth at the site.

At present more than 80 species of angiosperms thrive well. Presently the main activity at the site is to propagate the ones which are brought from different forests of Kerala. This include plants like *Thunbergia*, *Leea*, *Begonia*, *Teccoa*, and 2 species of *Zingiberaceae*. Several species of *Ipomoea* locally collected are also propagated by stem cuttings and others like *Clitoria*, *Crotalaria* and *Hibiscus* by seeds. Annuals like *Lindernia* and *Torrenia*, when perish after seed settings, are propagated by seeds to occupy their respective places at the site. Adding more species to the site by local collections and routine work of maintaining the plants at the site are being continued.

Way Side Flowering Plants

Editing based on the rough write-up of 150 way side plants are in progress. The editing of about 30 species are done but more relevant data have to be added based on literature survey. This part is being conducted based on library work. Twenty unidentified plants belonging to Poaceae and Cyperaceae are identified. Identification of other sheets are being continued and a few have to be confirmed at MH. Of the 200 species collected so far, 25 are illustrated.

Palynology

Attempt has been made to build up a palynological herbarium based on about 1000 pollen slides belonging to nearly 350 species. Pollen slides of a few mangrove plants occurring in India are

collected to make pollen slides to serve as type slides of these species in connection with the study of Quaternary vegetation of Kerala. These grains are preserved in vials for processing. Attempt has also been initiated to collect pollen grains of Kerala plants, especially forest trees as it will serve complementary to the systematic study of the flora and in course of time Quaternary vegetation of the State.

Herbarium

The main work done during the year was to streamline the procedures for processing and accessioning (incorporation) of specimens.

The existed system of pickling loose specimens in large buckets produced a lot of problems like damage of specimens, missing of tags, etc. and this practice has resulted in quite a sizable number of specimens without numbers. Therefore, steps were taken to pickle all fresh specimens in polythene bags.

The present suggestion is that the collector will handover the specimens properly pickled to the herbarium making entries viz. date, name of collector, field nos. (-to-) date of collection and localities in the register kept for receiving the specimens. This will facilitate easy processing of the collection and handing over the mounted sheets to the collector. This method proved to be successful in saving time and unnecessary wastage of manpower in sorting the dried specimens of respective collectors.

Collector → Herbarium (for drying) → Collector (for Selection)

Herbarium ← Collector ← Herbarium ←
(for incorporation) (for identification) (for mounting and stitching)

A new register is kept for the inward entry of specimens. All new receipts of fresh specimens are being recorded.

There were 3 large buckets with full of specimens which were taken out, dried, pressed and poisoned.

Accession of specimens involves the following steps:

1. Labelling the identified sheets
2. Providing accession number for each sheet

3. Entry of each sheet in the accession register
4. Entry of specimens in the index cards and preparation of new index cards for every addition of species
5. Keeping the specimens in folders

5.1. Species folders (White) The name of the species is written on righthand side bottom of the folders. The genus number concerned is that given in FBI. At the centre of the genus folder name of the family number are written in capital letters. The family number is that followed in FBI.

The families are being arranged according to Bentham & Hooker's system followed in FBI with modification by Hutchinson in the case of splitting of families. Since family numbers are provided according to their sequance the filing of specimens will be easier, so also their accessibility. A register for the taxa represented is also being kept.

In short within this period definite arrangement for processing the specimens and their incorporation are made. 751 specimens were processed and 109 specimens were mounted and stitched. Incorporation and checking of specimens belonging to 25 families were completed. Additional details regarding the specimens were entered for already accessioned specimens. The work of 487 specimens belonging to 85 genera and 152 species were completed so far and the rest is in progress.

MICROBIOLOGY

A programme of work on the Rhizosphere and mycorrhizal microorganisms of the trees growing in the natural forests of Western Ghats and in the Arboretum of TBGRI was taken up in the month of April 1989. For this purpose, study trips were conducted to Agastyamala, Bonaccord, Kannikketti, Ponmudi etc. During these trips endemic and economically important trees like *Humboldtia unijuge* Bedd: *Myristica malabarica* Lank. *Gluta travancorica* Bedd : *Bentinckia coddappanna* Berry : *Dalbergia Latifolia* Roxb, etc. were located for detailed study.

Soil samples surrounding the roots of *Dalbergia latifolia*, *Humboldtia unijuge*, *Myristica malabarica*, *Gluta travancorica* and *Bentinckia coddappanna*, were collected. Soil samples 1 M away from

the roots, of which samples were collected earlier, were also collected to compare the fungal population present in the soil with that of the fungi present on the surface of the roots.

The fungal organisms present in the rhizosphere of the trees were found to be more in number compared to those in the surrounding soil. This was found to be the same in case of all the samples collected from the natural forest areas of the western ghats (Agasthyamalai, Ponmudi, Bonaccord, Kannikketti etc). This phenomenon is not specific, but common to all the trees from which we have collected samples. But in the case of the samples collected from the Arboretum area of TBGRI the fungi present in the soil was found to be more compared to the rhizosphere fungi. This may be due to the rich soil available in the Arboretum area due to the addition of manure for the growth of the trees. But further detailed work is needed for establishing the view.

Most of the fungi isolated from the soil and from the rhizosphere were identified. A good number of these organisms like *Aspergillus*, *Pencillium*, *Drechslera* etc. were found to be common to the soil and the rhizosphere. But most of the fungi present in the rhizosphere was found to be different from those present in the surrounding soil. Some common genera like *Rhizopus*, *Neurospora* etc. were found only in soil and not in the rhizosphere. The difference in fungal strains present in the surrounding soil from those present in rhizosphere suggest that some fungal strains prefer to grow in the vicinity of the roots, ie, in the rhizosphere only. But these fungal strains were found to be non-specific to the trees of which the samples were collected. Genera like *Alternaria*, *Curvularia*, *Aspergillus* and *Pencillium* are found in the rhizosphere of all the trees. Most of the organisms isolated from the soil and also from the rhizosphere are found to be non-pathogenic, even though a few are reported to be pathogenic.

Whether these microorganisms present in the rhizosphere are beneficial to the trees or simply an associate is not clear at this stage. Further studies are necessary to clarify this point.

GARDEN DEVELOPMENT

Arboretum

As in the previous years we were able to keep up the progress in plant introduction and planting at the Arboretum during this report period also.

Eighty species of trees were introduced to the Arboretum raising the total introduction to 660 species. Most of these plants were collected through regular plant collection trips to different parts of Western Ghats like Agastyamalai, Bonaccord, Mundanthurai, Kannikketti etc. During a visit to Shriharikotta islands of Andhra Pradesh some trees found there were also collected. We were also able to raise some exotic plants through seed exchange programme with other Botanic Gardens abroad.

With the addition of 5 species of *Ficus*, the *Ficus* collection of the section has gone upto 80 species which is now one of the main attraction to the students and other visitors.

During this report period 110 sapplings were planted at the Arboretum. This include 15 species of woody climbers and 12 species of wetland plants. With this addition, the total number of species planted in the Arboretum was raised to 550.

Using the computer facility available at the garden, data of 600 accessions were prepared and stored based on the International Transfer Format.

Palmetum

Twenty species of palms were introduced during this period. Of these 16 species were received through exchange programme from the Royal Botanic Gardens, Kew. The Palmetum has now 62 species planted in the field.

Medicinal Plants

Thirty two tree species of medicinal importance were planted in the newly developed area near the Iron Bridge Road. Ten tree species of evergreen nature were planted in the gaps of already existing natural vegetation along the river side. The shrubbery near *Centella*

lawn was extended by planting 15 shrubs. Ten shrubby species were planted along the road side near the orchidarium. A 'Bog Garden' with 20 species was developed during this year. Two more new displays of medicinal plants were assembled this year-viz. plants of "chyavanaprasam" and plants used by tribals against cancer. A gene pool consisting of 8 species of *Asparagus* was planted near the Orchidarium and another with 10 species of *Cassia* was planted near the Iron Bridge Road.

Details of six hundred and fifty accessions of medicinal plants are stored in the computer according to the International Transfer Format.

Plant collection trips were conducted to Dellenoys Fort, Kulathupuzha, Cannoor and Cheenikala to collect plants for introduction and replacement. As a result about 45 species were introduced and 40 field numbers of Herbarium specimens were collected.

Propagation techniques of 40 species of medicinal plants were standardised and the details presented at the National Workshop on 'Nursery Techniques of Medicinal Plants' held at TBGRI from 2nd to 7th Jan. 1990.

(i) *Eco-Rehabilitation and Gene Pool Development of Endangered Medicinal Plants of Western Ghats*

Three endangered medicinal plants such as *Holostemma annulare*, *Rauvolfia serpentina* and *Coscinium fenestratum* were selected for this study. A site of approximately one and a half acre near Kalampara was identified for establishing the 'gene pool'.

Data sheets consisting of all relevant aspects were prepared for collecting the field data of each accession of the above plants.

Bio-topes for growing the above mentioned plants were prepared in three different parts of the selected area, which is protected by a fence made all along the periphery using *Erythrina* and *Gliricidia* poles. An irrigation system for watering the plants and a nursery for maintenance of collected plants were established at the site.

Plant collection trips were conducted to Kallar, Braemore, Bonaccord, Ponmudi, Dellenoy Fort, Cheenikala, Kannikketty and

Agasthyamalai to collect these plants. Three hundred plants of *Holostemma annulare*, 90 plants of *Rauvolfia serpentina* and 10 plants of *Coscinium fenestratum* were collected during these trips. Necessary field data for all these collections were also gathered. Those plants which established in the nursery were transferred to the field and taken care of.

(ii) *Survey and ex-situ conservation of Plants used against Cancer by Tribals of Kerala*

During this report period 35 tribal settlements of Thiruvananthapuram, Wyanadu, Kollam, Pathanamthitta, Kottayam, Ernakulam and Thrissur were visited and necessary information on anti-cancer plants used by them were recorded. The approach in collecting the data was systematic and an information format was prepared for this purpose. In addition to the information on anti-cancer plants, notes on plants used by tribes for their ailments were also recorded. Selected information from 'medicine-men' were recorded. Herbarium specimens and planting materials of the plants used by them were collected for identification and introduction to the garden. 426 field numbers were collected for the herbarium and most of them were identified.

Thirty six species of plants reported to have anti-cancer properties were collected from the forest around the tribal settlements. These plants were identified and planted in the medicinal garden for ex-situ conservation.

Germplasm Centre and Seed Bank

About 220 species/varieties were introduced as seeds/spores from the following Botanic Gardens and other institutions abroad.

Fruit Spirit Botanical Garden, Dorroughby, N.S.W. Australia 2480.

Royal Botanic Gardens, Kew, U. K.

Faculte des Sciences Agronomiques
5800 Gembloux, Belgium

Botanica Zahrada University Komenskeho
Bratislava, CSSR

Jardin botanique national de Belgique
Domaine de Bouchout
B–1860 MEISE, Belgium

Ogrod Botaniczny Polskiej Atademii Nauk
02–973 Warszawa
Polska
Poland

Jardin Botanique Cantonal
CH 1007 Lausanne, Switzerland

INRA
Station de Botanique et
de Patholegie Str. 63
D–8000 Munchen 19
West Germany

Botanischer Garten ünd Botanisches Museum
1000 Berlin 33, Germany

Peter RA Dolphin
3 Buck more Avenue
Peters Field
Hants Gu32 2EF
England

Bereich Botanik and Arboretum
des Museums fur Naturkunde
der Humboldt – Universitat Zu Berlin
DDR – 1195 Berlin

Botanical Gardens
Gen. Foulkesweg–37
6703 BL Wageningen
The Netherlands

These seeds/spores were handed over to the nursery section for suitable germination trials and seeds of about 90 species were germinated and seedlings supplied to the different sections during the year.

About 80 species/varieties were introduced as seeds/spores from different places in India through exchange, purchase or through collection trips.

We have supplied seed samples of our plants to the following Botanic Gardens/Universities/Institutions around the world.

Hortus Botanicus, Instituti Plantarum Medicinalium
H–2011 Budakalz, pf: 11, Hungaria

Mr. K. M. Sangter, Research Dept. T&M Ltd., Mill House
Melton, Woodbridge, Suffolk IP13 6DH, England

Hortus Botanicus Universitatis Varsoviensis
00–478 Warszawa, Polska – Poland

Conservatoire et Jardins, Botaniques de Nancy
100, Rue du Jardin Botanique, E-54600 Villers-Les Nancy
France

Hortus Botanicus, Acad. Sci. Bulgaricae
1000 – Sofia, Bulgaria

Botanical Gardens, Agricultural University
6703 BL Wageningen, The Netherlands

Botanischer Garten, der Universitat Zurich
CH–8008 Zurich, Switzerland

National Botanical Research Institute, Rana Pratap Marg
Lucknow- 226 001

Botanic Gardens, Glassgow G12 OUE, Scotland, U. K.

Botanischer Garten, Hesten 10, D–2000 Hamburg 52, F.R.G.

Faculte Des Agronomic Collections Vegetales
B–5800 Gembloux, Belgium

INRA, 06606 Antibes, France

Botanical Survey of India, Calcutta, India

Nanjing Botanical Garden, Mem. Sun Yat-Sen
Nanjing, Jiangsu, China

Fovarosi, Allat Es Novenykert, 1371 Budapest, Hungary

Romello Malvia, C-3/5, Riven Bank Colony
Lucknow- 226 018

Royal Botanic Gardens, Kew, U. K.

Fruit Spirit Botanical Garden, Dorroughby, N.S.W.
Australia 2480

Agrartudomanyi Egyetem, Botanikus Kert
H–2103 Godollo Hungary

Jardin Botanique National De Belgique, Service des collections
Vivantes B– 1860 – MEISE, Belgium

A few seedlings of *Hevea braziliensis* were supplied to the Hortus Botanicus Plantage, Amsterdam on special request.

We have received 73 Index Seminum from other countries. But due to difficulties in getting import permit and strict quarantine regulations we could not fully utilize these indices this year.

Seeds of over 100 species of our plants were collected, processed and stored for exchange programme during the report year.

Ornamental Plants Section

(*i*) *Landscape Plantings:* The steep slopes at the rear of the main building has been terraced into two manageable slopes, dressed with top soil and then turfed with the wild grass *Cynadon dactylon.* The detailed plan prepared for landscaping this area was approved and appreciated by the experts at the Royal Botanic Gardens, Kew. About 200 selected plants were planted as per the plan so as to give a representative display of different colour, texture and forms of the plant world. Patches of *Heterocentron elegans* (Spanish shawl), *Stenotaphrum secundatum* (St. Augustine grass), *Hemigraphis alternata* (H. *colorata*) etc were planted as ground covers. The lower edge of the area has been protected with grass to prevent erosion. The mixed planting, the ground covers and grass turfing give this area an unique appearance.

The path leading to the canteen and the medicinal plants garden has been reconstructed to solve the soil erosion problem.

The width of the path has been reduced to 4 ft. Two ridges were made on both sides of this path and they were interconnected with shallow bumps across the path at regular intervals. The ridges were protected with grass. Rooted cuttings of *Allamanda neriifolia* were planted at regular intervals on the right side of this path to make conical topiaries.

The grass strips on the terraces of the rose garden were removed and the sides of these terraces protected with river stones collected from Idinjar and Chittar rivers. This made the feedings effective and the rose garden, beautiful. The old plants were replaced with new ones.

The area adjacent to the circular hut near the nursery has been landscaped and attractive flowering shrubs were planted with bricks paving around each plant. The left side of the main nursery road has been landscaped and saplings are planted 10 mtrs apart as avenue trees. Flower beds were also prepared between the trees with perennial flowering plants.

(ii) Display planting:-

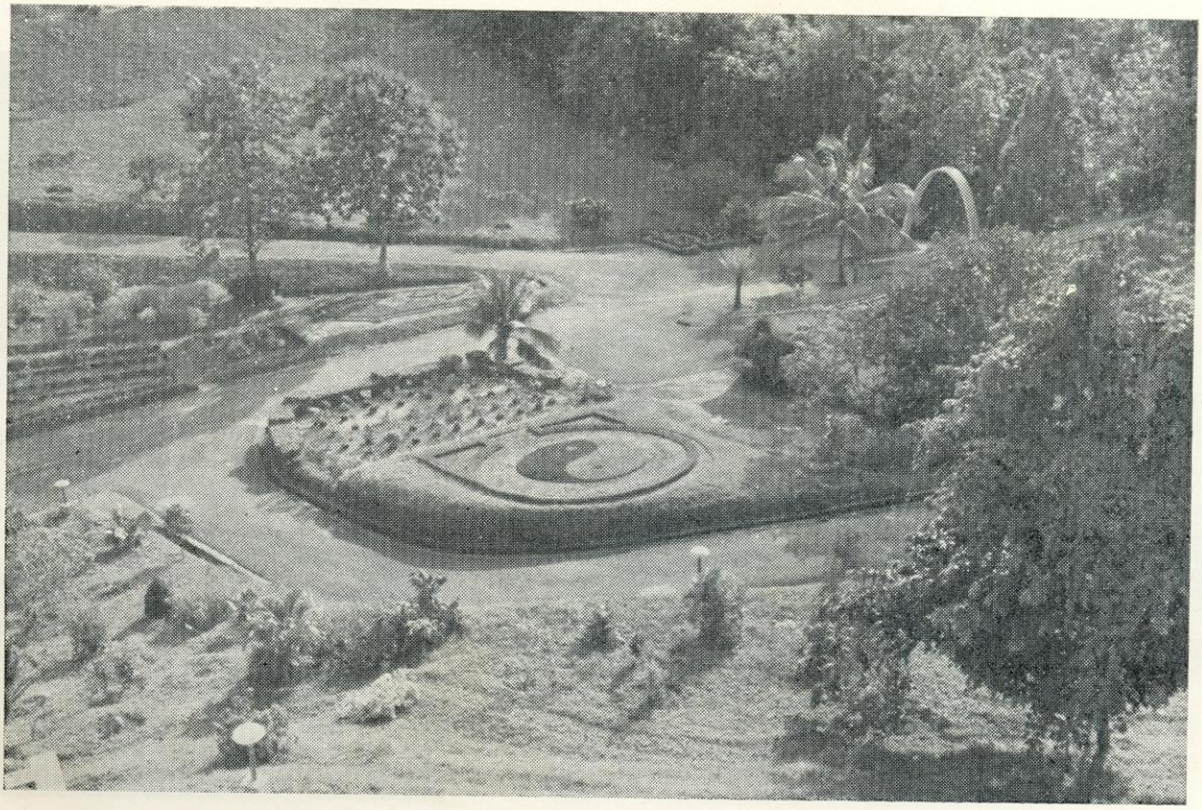
The woodland garden, displaying the shade loving plants achieved better shape during this year by the establishment of the first set of planting. A narrow foot path using railway sleepers as steps was also constructed for accessibility. Over 100 plants were planted during this year which include rare plants like *Nicolaia elatior* (Torch ginger) *Strongylodon* etc. A good collection of Bromeliads was also planted there.

Over 35 species/varieties of variegated plants were planted near the eastern side of the Guest House as a special display.

In order to cover the cut surface on the side of the Guest House road, 15 flowering climbers were planted. Plastic coated mesh pieces were also fitted to the surface to support these plants. The display area near the flag post with *Poganatherum* hedge is extended towards the main gate.

One large annual bed with a permanent standard and boarder plants was made near the main entrance. A few other annual beds near the shrubbery and some display beds with *Alternanthera*,

A portion of the new research block



A view of the ornamental landscape

Visit of Prof. Vernon Heywood, Director, IUCN Botanical Gardens Secretariat, UK

Seeds for exchange in the seed bank

Pothos crassipedunculatus Sivadasan et Mohanan —

Daisy and *Coriopsis* were also made as a part of the beautification programme.

The shrubbery was further enriched with the addition of 32 more species. A large number of potted plants were transferred to soil as permanent plantings.

Central Nursery

The Central nursery was modernised by adding the nursery facilities like:

(1) Propagation frames for seed germination and rooting of cuttings.

(2) Pandels with shade cloths for establishing seedlings under reduced sunlight.

(3) Shed with fibre glass roof to protect plants from heavy rains during the establishing period.

(4) Polytunnel for germination of seeds and rooting of cuttings with controlled light, temperature and humidity.

Over 200 new plants were introduced to the garden through the central nursery from different sources. About 150 introductions were made as seeds from different botanic gardens and other sources. There was about 40% success with seeds received from other countries and the seedlings were handed over to concerned sections for planting.

Propagation of Begonias, African Violets, Coleus etc. was done to produce healthy plants for displays. The Central nursery could satisfy the needs of the different sections by propagating those plants on request. New stocks of annuals are also prepared for the annual beds. Budding of roses was continued to produce sufficient new and healthy plants to replace the old ones in the rose garden.

Surplus planting materials were made available for sale to the public. By this year almost all the old stocks of plants were repropagated to produce healthy plants for display. Old stocks were disposed off to save manpower, manure, and water. As a result we

could display plants of good standard comparable to other botanic gardens. This is a major achievement of the central nursery.

This year the community pot centre where the young orchid seedlings are establishing themselves got a new fibre glass roofing with shade cloth. Shade cloth covering was also provided in the orchidarium where hybrid orchids are kept. Planting in the open orchidarium continued during this period. Excess orchid materials were sold to orchid growers at a nominal price.

BIOTECHNOLOGY

Micropropagation of Rare and Endangered Plant Species

In accordance with the recommendation of the Research Advisory Committee, the application of plant tissue culture as a tool to conserve and multiply endangered plant taxa was a high priority area during this year also. The selection of a species for micropropagation depended on its inclusion in CITES appendix, in the list of Rare and Threatened Plants of India published by IUCN, its local importance and our difficulty in collecting the same from the wild.

I. Orchids

Apart from working out a rapid propagation method for the north-eastern Red Vanda (listed on Appendix I of the CITES regulations), the micropropagation programme was extended to some rare terrestrials of the Western Ghats.

(a) *Renanthera imschootiana* Rolfe (Red Vanda)

Only a limited number of plants were available for explantation. A method was developed to regenerate large number of plantlets from the leaves of pot-grown mature plants. Differentiation of upto 40 shoots per explant occurred on suitable nutrient media supplemented with complex additives and plant growth regulators. Severe phenolic exudation was a major setback during the initial weeks of culture. However, it seemed not to hinder regeneration. The explants derived from regenerated shoots could be used for reculture. Shoots with 2–3 well developed roots could be raised by 12 weeks. Phenotypic uniformity of the clonal regenerate was confirmed by chromosome counts of root tip squashes.

(b) *Habenaria Crinifera* Lindl.

Experiments revealed that regeneration potential of this plant is confined to meristematic tip portions of the tuber. Prolonged maintenance and continued growth of the shoots are yet to be standardized with changes in the nutrient media and frequent transfers.

(c) *Anoectochilus regalis* Bl.

Rhizome sections with and without nodes were used. Due to the limited number of explants that could be prepared, each treatment had only 4 explants. Approximately 20% of the contamination-free explants produced solitary shoots especially from the node when suitable nutrient medium was used. The shoots have now unfolded the first leaves and the roots have not yet formed.

(d) *Nervilia* sp.

Several attempts were made to regenerate plants from the stem explants. The tissues remained fresh for prolonged periods but never differentiated into shoots in modified Knudson C medium. Leaf base explants usually got contaminated. Various nutrient formulations are tried to induce regeneration in the stem explants.

II. Medicinal Plants

Shoot tip and nodal explant cultures were established to regenerate shoots from apical and axillary meristems. The emphasis was on rapid initiation and multiplication of shoots without being proceeded by callus formation.

(a) *Adhatoda beddomei* C. B. Clarke (Acanthaceae)

Among the various explants of the field-grown mature plants, shoot buds could not be induced in petioles and internodes. Nodal explants cultured in Schenk and Hilde-brandt nutrient formulation responded very favourably when supplemented individually, cytokinins and auxins were ineffective in inducing axillary shoot growth. A combination of cytokinins and auxin promote the development of 5 to 8 callus-free shoots from the axils within 6 weeks. The number of regenerated shoots increased 4–fold in 8 to 10 weeks during

subculture. The shoots were separated and transferred to hormone-free rooting medium which induced profuse rooting within 3 weeks. Some of the rooted plantlets initially transferred to pots did not survive. Hence, hardening of approximately 25 other plantlets is tried in a mist chamber before transferring to the nursery.

(b) *Commiphora mukul* Engl. (Burseraceae)

Nodal segments of newly developing shoots of field grown plants as well as pot-grown cuttings were cultured in SH medium containing various growth regulators. A synergistic combination of cytokinin and auxin yielded 2 to 3 shoots in most of the explants within 4 weeks of culture. However, the shoots were all condensed with a rosette of leaves. Attempts to induce rooting in the regenerated shoots in presence of such agents as IBA, Charcoal and IAA are not yet successful. At present, shoots regenerated in low inorganics (half strength MS and woody plant nutrient media) are tested with a whole range of auxins.

(c) *Holostemma ada-kodien* Schultes (Asclepiadaceae)

This laticiferous twining shrub much sought after for a number of Ayurvedic preparations, was taken up for regeneration studies very recently. All the explants viz. shoot tip, node, internode, petiole etc. cultured in SH medium containing various combinations of cytokinin and auxin produced calli easily. Since direct shoot regeneration could not be observed in any of the medium tried so far, possible induction of embryogenesis in the callus cells is attempted.

(d) *Strychnos colubrina* L. (Loganiaceae)

Shoot apices and nodes of young shoots derived from mature plants of this woody climber were cultured in various nutrient formations. While most of the explants got browned within 20 days, highly proliferating white calli were obtained in approximately 40% of the shoot tips cultured in SH medium containing 2,4–D. The calli were subcultured in the same medium and then transferred to shooting media containing varied levels of cytokinin.

Whole embryos, cotyledon-free embryos and isolated cotyledons of first germinating seeds were also cultured. Irrespective of the growth regulators used, intact plants were always formed from

the whole embryos. However, cotyledonary explants and embryos devoid of the cotyledons produced calli to varying degrees in presence of 2,4–D the former tissue in a wide range (0.1–5.0 mgl^{-1}) and the latter in low concentrations (0.1–1.0 mgl^{-1}) when used alone. BA did not induce callus formation. The 2, 4–D induced calli are subcultured for differentiation of shoots/embryos.

III. Insectivorous plant(s)

Three month-old axenic seedlings of *Nepenthes khasiana* Hook. f. were used for tissue regeneration experiments. Shoot cuttings with 2 – 3 nodes and apices cultured on nutrient medium supplemented with the appropriate concentrations of phyto-hormones produced 3–8 shoots only in the axils of the leaves in 2 months time. These later produced roots when transferred to rooting media.

IV. Ferns

Spores of the horticulturally desirable *Achrostychium* species from Brazil and some others received from Berlin were cultured and sporophytes raised in a few of them. The standardization of method to sterilize fern spores using Benlate and aseptic culture of the sporophytes is in progress. Once perfected, this should pave the way for raising a large number of rare and attractive ferns of the Kerala forests.

V. Experimental control of Protocorm-like body multiplication and shoot regeneration

Previous observations indicated that protocorm like bodies (plbs) proliferated upon the basal stem parts of *Cattleya* seedling culture could be easily subcultured and used as a ready source of inoculum for shoot regeneration. The possibility of preferential induction of two different responses viz. plb multiplication and shoot regeneration without cross contamination effects was investigated using these plbs. The results suggest that plbs could be routinely multiplied without shoot differentiation. Difficulties were, however, encountered in the exclusive induction of shooting without plb multiplication.

VI. Studies on in vitro cultures of Anthurium and Philodendron

As part of the STEC-sponsored scheme on Micropropagation of *Anthuriums* and *Philodendron*, a collection of these plants was made towards the end of 1989. The plants being expensive, altogether about 90 plants including the desired varieties such as *Anthurium andreanum Agnihothri*, *Anthurium schizerianum* (red, orange), *Philodendron* Pink Prince, *Philodendron* Cardinal Black and *Philodendron* Tropic Sunrise were collected from various sources.

A series of experiments were conducted to optimise the culture conditions, source of inoculum etc. Among the various media tested, maximum callus proliferation was observed in more than 70% of the foliar explants of both *Anthurium* and *Philodendron* in suitable nutrient media. Nodular callus formation was noticed in the laminar sections of *Anthurium andreanum* and leaf and stipular segments of *Philodendron* Blue Mist.

VII. Isolation and culture of achlorophyllous protoplasts of orchids

Earlier studies revealed that only 2–5% of the achlorophyllous and less chlorophyllous protoplasts derived from the leaf bases of *Vanda coerulea* and *Phalaenopsis* hybrids divided but perished within 6 weeks due to browning and contamination with cytoplasmic debris from the degenerated chlorophyllous protoplasts. Methods to isolate achlorophyllous protoplasts from the leaf bases were attempted. It was interesting to observe population of a specific bacteria which did not overgrow but was sufficient to spoil the cultures. The identity of the endophytic bacterium, nature of its association with the host cells and its multiplication in the culture are not yet known.

Experiments were also conducted to culture the protoplasts released from the roots of *in vitro* grown Hybrid–36 (*Vanda coerulea* ♂ x *Renantanda* Henry Truman ♀) seedlings. Protoplasts were released mostly from the critical zone of the roots while the velamen tissue remained more or less intact. Though clean, achlorophyllous protoplasts were obtained, seldom these protoplasts divided in culture. Such symptoms as bulging of the protoplasts and development of buds on the sides of the protoplasts were observed. Viability test with FDA staining revealed that approximately 50%

of the protoplasts were alive after 3 weeks of culture. These experiments are in progress.

PAPERS PUBLISHED

1. Sivadasan M., N. Mohanan and C. Sathish Kumar, 1989. *Pothos crassipedunculatus*, a new species of Pothos Sect. Allopothos (Araceae) from India, *Plant Systematics and Evolution* **168**: 221–235.

2. Sathish Kumar, C. 1989. Two novelties in the genus *Trias* Lindl. (Orchidaceae) *Blumea* **34**: 103–109.

3. Sathish Kumar, C. 1989. The Economic potential of our native orchids and the urgent need to their conservation: *Proc. First Kerala Science Congress* pp. 13–17.

4. Koshy K. C. 1989. A note on *Triumfetta tungarensis* Billore *J. Econ. Tax. Bot.* **12** (2): 499–500.

SEMINARS, SYMPOSIA, WORKSHOPS AND TRAINING

Mr. P. J. Mathew attended the National Symposium on 'Recent Advances in Plant Cell Research' organised by the Department of Botany, University of Kerala at Thiruvananthapuram from 7–9th June, 1989 and presented a paper on 'Cytological studies on the South Indian Piperaceae'.

Mr. Mathew Dan attended the 'Ayurveda Seminar on Cancer' from 10–11 March, 1990 held at Amala Cancer Research Institute, Thrissur, Kerala.

Mr. Bejoy Mathew attended the training course on 'Recent Trends in Plant Tissue Culture and Plant Transformations' held at the National Chemical Laboratory, Pune from 19th Feb. to 4th March 1990.

Dr. S. Seeni and Smt. P. G. Latha presented a paper in the National Symposium on "Recent Advances in Plant Cell Research" held at Thiruvananthapuram in the first week of June, 1989.

Dr. P. N. Krishnan attended meetings at Ernakulam on 26–3–1990 and 27–3–1990 for preparing a blue print and time bound

action plan for developing Ernakulam into a Biotechnology District'.

Smt. Latha, P. G. attended the seminar on 'Plant Genetics and Biotechnology' held at Kottayam between 8–10 February 1989 and presented a paper entitled 'Conservation of some rare and endangered orchids of India through tissue culture methods'.

Workshops conducted at TBGRI

(a) A one week National Workshop on 'Nursery Techniques of Medicinal Plants' was conducted from 2nd to 7th January 1990 in the joint auspices of TBGRI and LSPSS. Thirty participants representing Ayurvedic and Agricultural Universities, Research Institutes and Social organisations working in the field of medicinal plants attended in the workshop. Propagation techniques of 300 medicinal plants were discussed in detail. As a follow up action it is decided to publish a technical manual in series dealing with propagation of medicinal plants discussed in the workshop. The manuscript of the first number of the series giving details of the propagation of 50 plants is getting ready.

(b) The Fourth Group Monitoring Workshop on DST Funded Projects in Plant Sciences was held at Thiruvananthapuram from 16th to 18th January, 1990 in the joint auspices of Tropica Botanic Garden, and Research Institute, and Sree Chitra Tirunal Institute for Medical Sciences and Technology. This workshop was attended by more than thirty distinguished professors, botanists and scientists from various universities and institutions in India. On 18th January 1990 all the participants including ten associates visited the garden and they expressed their happiness in the fast development of our garden in a country like India.

Training at TBGRI

Miss Anne Damon from U. K. visited our garden and stayed with us for a month. During her stay she worked in all the sections along with our scientists. She had given training to our field staff in rose budding, pruning, orchid cultivation etc.

Four garden staff from SHAR Centre, Sreeharikotta were given training in basic horticulture and related fields at different sections of the garden and advanced nursery techniques for a month.

Extension activities

We have participated in the Thiruvananthapuram Flowershow in January, 1990 with our Ficus collection, Medicinal Plants and orchids.

We have also participated in the Agricultural Festival at Palode in February 1990.

Eleven species of Ficus were supplied to the National Museum of Natural History, New Delhi for a permanent display.

About 50 species of trees were supplied to the Assistant Conservator of Forests, Kollam for planting at the Asramam Gardens Kollam.

Visits to Other Institutions

Dr. T. K. Abraham, Mr. N. Mohanan and Mr. A. E. Shanavaskhan visited SHAR Centre, Shriharikotta on their invitation to study the natural vegetation of the area and to suuggest suitable methods for its preservation.

Mr. C. Sathish Kumar visited the Botanical Survey of India Southern Circle, Coimbatore from 27th April to 3rd May, 1989 for consulting the herbarium in connection with the study of rare and endangered orchids.

Mr. Mathew Dan visited the Medicinal Plantation of Forest Department at Kulathupuzha on 2nd June, for helping them in identifying their collections.

Visit/Training in U. K.

(a) **Director's visit to U. K.**

At the invitation of the British Council, the Director visited the Royal Botanic Gardens, Kew, IUCN and other centres of excellence in U. K. during November-December 1989.

The primary objectives of the visit were to familiarise with the current developments in the field of horticulture and conservation and to draw up a training programme, supported by the British

Council, for two of our scientists in conservation, staff management, documentation and related fields.

The programme included visiting Kew, Wakehurst Place, IUCN, BGCS and the Universities of London, Birmingham, Reading, Manchester and Oxford as well as meetings with twenty six experts in various fields in which TBGRI have active involvement.

During his visit to the Royal Botanic Gardens, Kew, he met eminent persons like Prof. G. T. Prance, Director, Kew Gardens, Mr. I. Beyer, Deputy Curator and Mr. Hans Fliegner and arrangements were made for the proposed training programme of the scientists of TBGRI at Kew. Discussions with Dr. Paul Tompsett and Dr. John Dickie of Wakehurst Place resulted in suggesting the setting up of a modern Seed Bank at TBGRI. Discussions with many other experts on conservation programmes, training in documentation, public education, micropropagation of *Calamus*, eco-rehabilitation programme etc. have been made fruitful.

An immediate result of the visit was the finalisation and later implementation of the training programmes of our scientists and the visit of Mr. Fliegner and Dr. Mantell to the Garden in early 1990. But more significantly, the visit provided the much needed assurance that our work is being recognised in Universities, conservation circles and by other concerned groups and that we are moving along the right lines.

(b) **Staff training/visit to U. K.**

Mr. P. J. Mathew and Mr. N. Mohanan had undergone a training programme on modern conservation methods at R.B.G., Kew from 1st August to 30th August 1989. During their stay at U. K. they have also visited several other Botanic Gardens and Nature Reserves in U. K.

Dr. T. K. Abraham visited Royal Botanic Garden, Kew from 10th February to 24 March, 1990 to study modern conservation aspects, Garden Management, Planning and Development and Public Education in Botanic Gardens. He had visited Royal Botanic Garden, Edinburgh and several other Botanic Gardens in U. K. He had also visited several established commercial nurseries to study modern propagation methods and nursery management.

During his stay at RBG, Kew he had discussions with the Director Prof. G. T. Prance, the Curator, Mr. J. B.E. Simmons, the Deputy Curator Mr. I. Beyer on aspects of mutual interest. He also had discussions on conservation aspects with Prof. Vernon H. Heywood of IUCN and Dr. Peter Wyse Jackson of BGCS. He had also visited the C.A.B. International Mycological Institute and gone through the culture collection, herbarium and culture collection database. He had discussions with mycologists on fungal identification methods and preservation techniques.

Mr. A. E. Shanavaskhan visited the Royal Botanic Garden, Kew from 5th March to 17th April 1990 to study conservation aspects, especially the techniques of in-situ and ex-situ conservation. He had also visited several other Botanic Gardens in U. K.

LIBRARY

In 1989–90 three hundred and twenty nine books were added to the collection raising the total number of volumes to 3881. At present the library is subscribing for 65 national and international journals.

Services

The library has been utilized as a reference centre by research students from other institutions. Photocopying machine was made available to the research workers, from within and from other institutions for copying research papers and other articles related to science.

Special collections

The special collection of books, journals, articles, guide books and other transparencies of botanic gardens, which started in 1987 was enriched further with new additions during this period. The photographs and slides depicting the development of the garden was also added to the existing collection.

Other activities

Sale and distribution of publications of the Institutes were done through the library.

Meteorological Data 1989-90

Month	*Precipitation (mm)*	*Evaporation (mm)*	*Maximum temperature (°C)*	*Minimum temperature (°C)*	*Relative humidity*
1	2	3	4	5	6
April '89	240.4	110.4	33.7	23.3	77.8
May	230.8	99.4	32.1	24.0	82.6
June	503.6	76.6	28.0	22.6	86.6
July	368.2	50.2	29.0	22.6	84.4
August	186.9	60.2	29.6	22.8	88.0
September	302.6	51.2	30.3	22.5	83.3
October	531.0	53.3	30.1	22.8	84.7
November	198.4	88.8	32.1	—	82.7
December	37.0	156.3	33.6	—	75.7
January '90	36.4	179.2	33.3	—	74.8
February	Nil	211.4	34.9	—	70.6
March	69.2	230.8	35.2	—	70.9
Total	2784.3	1376.8			

2 & 3 Monthly total

4, 5 & 6 Monthly average

CIVIL WORKS

The construction work of the main building was completed.

General Works in the Garden

Construction of the main gate, guard house, river side fencing work and overhead water tank near the laboratory and library complex were completed. Construction of a pandal and side drain at the nursery and construction of a propagation shed with fibre glass roof near the potting shed are going on. Supplying and fixing fibre glass roof sheets for the community pot shed was completed.

Construction of a propagation shed at the medicinal garden and two water tanks near the main building was also completed. Construction of an approach road to the electrical substation building is completed. Estimates for the propagation and potting shed at the Arboretum is prepared.

Staff Changes

Shri. R. Muraleedharan Nair, Section Officer returned to his parent department (Accountant General's Office) in April 1989 and Sri. Appukuttan Asari, Under Secretary, Government Secretariat took charge as Administrative Officer in June 1989.

Shri. M. P. Sadasivan Nair, Accounts Officer returned to his parent department (AG's Office) in October 1989 and Shri C. Sukumara Pillai, Under Secretary, Government Secretariat took charge as Accounts Officer in January 1990.

Staff of the Institute

Director

Professor A. N. Namboodiri

Deputy Director

Dr. G. Bhadran Nair

Scientist-in-Charge

Dr. T. K. Abraham

Research and Development

Plant Taxonomy Division

Dr. T. S. Nayar	Scientist
Dr. K. C. Koshy	Sr. Scientific Assistant
Sri. C. Sathish Kumar	Sr. Scientific Assistant
Sri. N. Mohanan	Sr. Scientific Assistant

Herbarium Section

Sri. S. Mukunthakumar	Asst. Herbarium Keeper (on leave)

Plant Biotechnology Division

Dr. S. Seeni	Scientist
Dr. P. N. Krishnan	Scientist
Smt. P. G. Latha	Scientist
Sri. P. K. Suresh Kumar	Tech. Assistant
Smt. C. G. Sudha	Tech. Assistant

Medicinal Plant Division

Sri. P. J. Mathew	Sr. Scientific Assistant
Sri. A. E. Shanavaskhan	Tech. Assistant

Germplasm Centre and Seed Bank

Sri. Jacob Thomas	Scientist

Horticulture and Garden Development

Sri. Bejoy Mathew	Tech. Assistant
Sri. C. Anil Kumar	Garden Assistant
Sri. P. C. Benoy	Garden Assistant
Sri. P. A. Jose	Garden Assistant
Sri. Mathew Dan	Garden Assistant
Sri. R. Raj Vikraman	Garden Assistant

Library

Smt. V. Sujatha	Jr. Library Assistant

Artist

Sri. K. P. Pradeep Kumar

Administrative Division

Sri. Appukuttan Asari R.	Administrative Officer
Sri. C. Sukumara Pillai	Accounts Officer
Sri. K. G. Ajithkumar	P. A. to Director
Smt. S. Radbalekshmy Ammal	P. A. to Accounts Officer
Sri. Suresh Chandran	Assistant Gr. I
Smt. C. Syamala	Accountant
Smt. V. Jayasree	Assistant Gr. II
Smt. A. Santha	Typist Gr. II
Smt. G. Subhadra	Typist Gr. II
Smt. C. Gracy	Stenographer Gr. II

Purchase Section

Sri. C. M. George	Purchase Officer
Smt. R. Sarala Devi	Assistant Gr. I
Smt. N. Rajalekshmi Ammal	Typist Gr. II

Engineers

Sri. K. C. Eapen	Consulting Engineer
Sri. P. P. Markose	Engineering Supervisor

Drivers

Sri. M. Ramaswamy	Driver Gr. I
Sri. V. Rajendran Nair	Driver Gr. I
Sri. D. Mohanachandra Kumar	Driver Gr. II
Sri. A. Salim	Driver Gr. II
Sri. R. Gopinathan Nair	Driver Gr. II
Sri. N. Raveendran	Driver Gr. II

Helpers

Sri. R. Bhargavan	Helper Gr. I
Sri. S. Chandran Chettiar	Helper Gr. II
Sri. C. Sathyan	Helper Gr. II
Sri. B. Vijayakumar	Helper Gr. II
Sri. T. Mohanakumar	Helper Gr. II

Field Section

Sri. Cheriyan P. Koshy	Garden Works Manager
Sri. G. K. Udayadas	Garden Maistry
Sri. P. Mony	Garden Maistry
Sri. K. Selvaraj	Garden Maistry
Sri. J. Micheyal	Head Gardener

Security Wing

Sri. T. M. Abdul Salam	Security Officer
Sri. V. Raveendran Pillai	Assistant Security Officer
Sri. P. R. Chandrasekharan Nair	Security Guard
Sri. P. Jain	Security Guard
Sri. K. Ramachandran Nair	Security Guard
Sri. A. Johnson	Security Guard
Sri. K. Mohanan	Security Guard
Sri. S. Chandran	Security Guard
Sri. G. Somasekharan Nair	Security Guard

Sri. C. Stanly	Security Guard
Sri. N. Radhakrishnan Nair	Security Guard
Sri. C. P. S. Nair	Security Guard
Sri. Viswambharan Nair	Security Guard

Other Staff

Sri. Lazar Joseph	Night Watchman
Sri. M. Bhuvanachandran	Night Watchman
Smt. R. Valsala Devi	Part-time Sweeper

Projects

Sri. K. Satheesh Kumar	Research Associate	ICAR Project
Sri. C. Muraleedharan Unnithan	Research Assistant	STEC Project
Sri. K. Vijayakumar	Research Assistant	STEC Project

Important visitors to the Garden

Mr. Darshan Shankar, Advisor to Prime Minister on Technology Mission, New Delhi.

Mr. Roger Budd, British Council Division, Madras.

Justice P. C. Balakrishnan, High Court, Ernakulam.

Justice K. K. Narendran, High Court, Ernakulam.

Justice Varghese, Kalliath, High Court, Ernakulam.

Mr. David Pothen, High Court, Ernakulam.

Mr. M. S. K Ramaswamy, Agricultural Production Commissioner, Kerala.

Mr. N. S. Krishnan Kutty, Station Director, All India Radio, Trivandrum.

Mr. Kartar Singh, Senior Project Officer, British Council Division, Madras.

Jusitce V. S. Malimat, Chief Justice of Kerala.

Mr. R. Haresh, Executive Director, TVS Ltd.

Prof. H. Y. Mohan Ram, Dept. of Botany, University of Delhi.

Air Mshl. G. Sen, Southern Air Command, IAF, Trivandrum.

Mr. Alok Sheel, District Collector, Pathanamthitta.

Mr. G. Mukundan, Chief Conservator of Forests, Trivandrum.

Mrs. Parveen Farooqui, Department of Science & Technology, New Delhi

Prof. H. N. Singh, School of Life Sciences, University of Hyderabad.

Dr. M. M. Johri, Molecular Biology Unit, Tata Institute of Fundamental Research, Bombay.

Dr. S. Mahadevan, Dept. of Biochemistry, IIT, Bangalore.

Dr. V. S. Venkatachala, Director, Birbal Sahni Institute of Palaeobotany, Lucknow.

Mr. Desmond Chaffe, British High Commission, New Delhi.

Mr. K. John Mathai, Chairman, KSRTC, Trivandrum.

Prof. V. H. Heywood, Director, Botanic Gardens Conservation Secretariat, Richmond, U. K.

Mr. N. Gangadharan, Chief Judicial Magistrate, Trivandrum.

Mr. M. Chakrapani, Judl. First Class Magistrate, Nedumangad.

Mr. J. Chitharanjan, MLA

Mr. M. Haridasan, District Educational Officer, Thiruvalla.

Educational Tours from Institutions to the Garden

Colleges

1. St. Thomas College, Kozhencheri.
2. College of Agriculture, Vellayani, Trivandrum.
3. Department of Botany, Assumption College, Changanacherry.
4. Department of Applied Chemistry, Cochin University of Science and Technology.
5. Department of Botany, Mar Ivaniose College, Trivandrum.
6. N. S. S. College, Pandalam.
7. N. S. S. College, Nilamel.
8. H. H. M. S. B. N. S. S. College for Women, Trivandrum.
9. All Saints College, Trivandrum.
10. S. V. U. College, Tirupathy.
11. Vaidyaratnam Ayurveda College, Ollur, Thaikkathussery.
12. Government Ayurveda College, Thrippunithura, Ernakulam.
13. Kerala Agricultural University, College of Horticulture.
14. Department of Botany, The American College, Madurai.
15. Department of Agronomy, College of Agriculture, Vellayani.

16. Government Law College, Trivandrum.
17. Kongunadu Arts and Science College, Coimbatore.
18. St. Peters College, Kolencherry.
19. College of Forestry, Vellanikkara, Trichur.
20. Little Flower College, Guruvayoor.
21. S. N. College, Chempazhanthi.
22. Catholicate College, Pathanamthitta.
23. Department of Biosciences, Saurastra University, Rajkot, Gujarat.
24. D. B. College, Sasthamcotta.
25. Government Victoria College, Palghat.
26. Hindu College, Delhi University.
27. Sacred Heart College, Thevara, Cochin.
28. St. Theresa's College, Ernakulam.
29. St. Thomas College, Kozhencherry.
30. Government Arts College Thycaud, Trivandrum.
31. Government College, Pattambi.
32. Ayurveda College, Trivandrum.
33. Dept. of Entomology, College, of Agriculture, Vellayani.
34. Madras Christian College, Tambaram.
35. St. Xavier's College, Palayamkottai.
36. Holy Cross College, Rochnagar, Nagarcoil.
37. Government Homoeopathic Medical College, Trivandrum.
38. S. N. College, Varkala.

Schools

1. Muslim High School for Boys, Kaniyapuram.
2. Government U. P. School, Kaniyapuram.
3. St. Mary's High School, Vettucaud, Trivandrum–7.
4. S. N. M. Teacher Training Institute, Moothakunnam, Alwaye.
5. Government H. S., Naranganam, Pathanamthitta.
6. Government Central High School, Eastfort, Trivandrum.

7. Government L. P. S. Manvila, Kulathur, Trivandrum.
8. St. Joseph's High School, Trivandrum.
9. Bethany Academy Residential School, Vennikulam.
10. M. J. S. High School for Girls, Edathua.
11. Bharatiya Vidya Bhavan, Elamakkara, Cochin.
12. Kendriya Vidyalaya, Pattom, Trivandrum.
13. Jyoti Nilayam English Medium High School, St. Andrews, Trivandrum.
14. Marthoma High School, Mukkola, Trivandrum.
15. Government High School, Kadakkal.
16. Shree Vidyadiraja English School, Valiyavila.
17. Government High School for Girls, Vanchiyoor, Trivandrum.
18. St. Antoney Convent School, Karakkamandapam, Trivandrum.
19. Fort High School, Trivandrum.
20. Government High School, Karakulam.
21. B. H. S. Kanniyakulangara, Vembayam.
22. Ex-Service Men's U. P. School, Attupuram, Kadackal.
23. Government U. P. S., Nedumcaud, Karamana.
24. St. Antony's High School, Valiathura, Trivandrum.
25. Irakkuzhi U. P. S., Chadayamangalam, Quilon.
26. Sachidananda Yoga Sanskrit Upper Primary School, Polachira, Nedungolam, Quilon Dist.
27. G. M. U. P. School, Mavoor.
28. Government B. S. S., Nedumangad.
29. P. P. M. High School, Karakonam.
30. Government T. S. S. Chalai, Trivandrum.
31. N. S. V. H. S. Varacodu, Punalur.
32. Government High School, Aruvikara.

33. N. S. V. H. S. Varacodu, Punalur.

34. Kerala Forest School, Arippa.

35. Government U. P. S. Chanthavila, Trivandrum.

36. Boys U. P. S., Nedumangad.

37. Government Model H. S., Trivandrum.

38. Government High School, Kaduvazhannoor, Pulimath.

39. S. P. T. P. M. Government U. P. School, Kuravankonam, Trivandrum.

40. Arippa U. P. S. Chozhicodu, Kulathupuzha.

41. S. A. U. High School, Anad, Nedumangad.

42. Government High School, Karippoore, Nedumangad.

43. Sivagiri High School, Sreenivasapuram, Varkala.

Others

1. The Employees of the Instrumentation Department, The Travancore-Cochin Chemicals Limited, Udyogamandal, Cochin.

2. The Kerala State Bharath Scouts and Guides State Training Centre.

3. Young Men's Christian Association, Anchal.

4. Kerala Sastra Sahithya Parishad, Quilon District Committee.

5. Employees of Southern Air Command, (Administrative Wing), Trivandrum.

6. Mitranikethan, Trivandrum.

7. Kerala Farm Journalists Forum, Chackai, Trivandrum.

8. Institute of Homoeopaths Kerala, Thiruvalla Unit.

9. International Centre for Study and Development, Quilon.

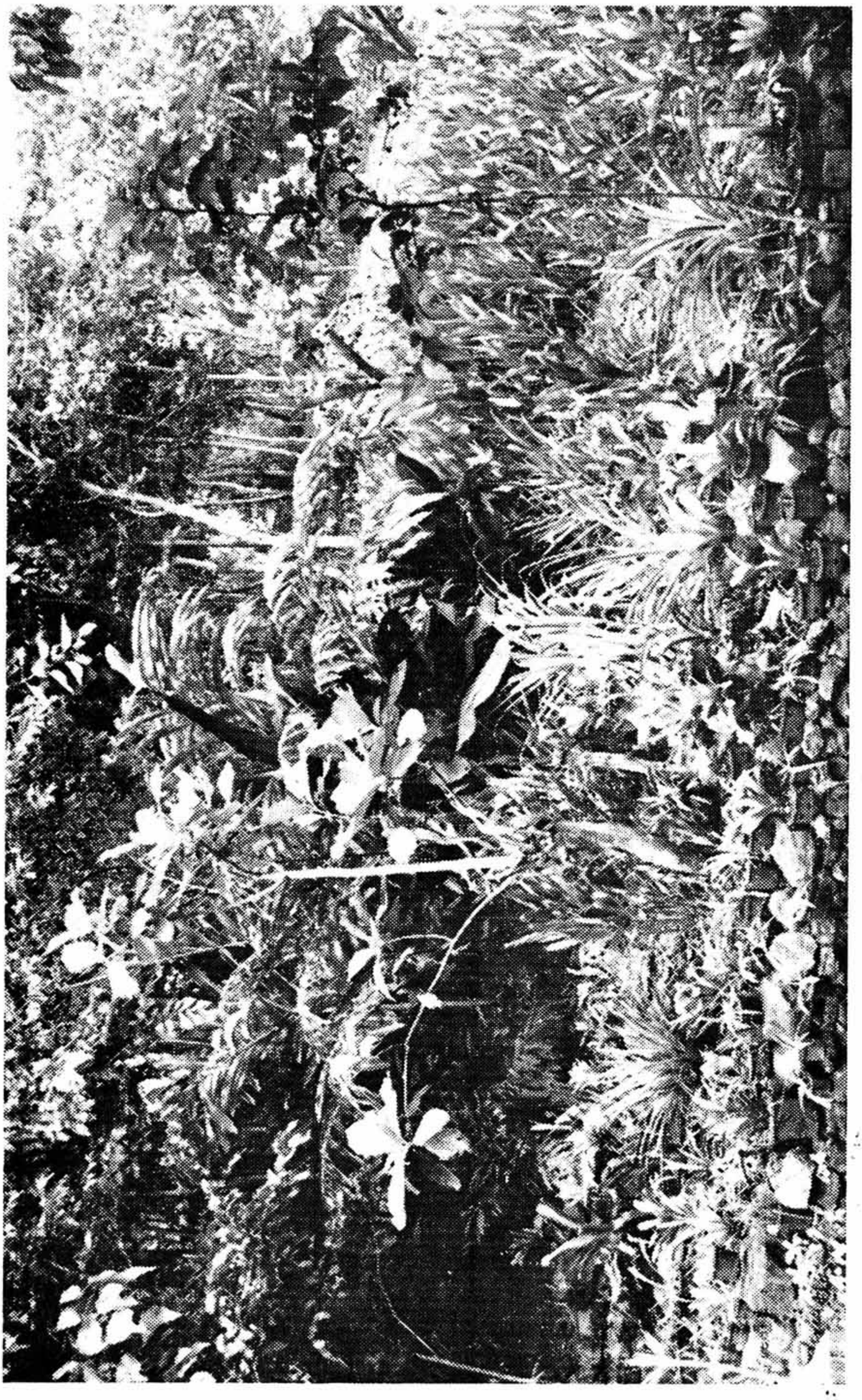
10. Mar Thoma Church, Salem.

11. Central Plantation Crops Research Institute, Palode.

12. Sree Das Ayurveda Research Centre, Pakalkuri.

13. Central Institute of Medicinal and Aromatic Plants, Lucknow.

14. Christian Agency for Rural Development, Palode, Trivandrum.
15. Kerala Samachar, Malayalam Daily.
16. Young Men's Christian Association, Trivandrum.
17. Meera Industrial Training Centre & Nedumangad Chain Survey School.
18. "Samanwayam", Stage Screen and Sports Society.
19. The Institute of Rural Development, Kottarakkara.
20. Y's Mens Club of Pathanamthitta.
21. Institute of Management in Government, Trivandrum.
22. Agestyar Siddhavaidya Asramam, Vanchiyoor, Trivandrum.
23. Loard's Women's Association, Trivandrum.



Printed at St. Joseph's Press, Thiruvananthapuram-695 014.