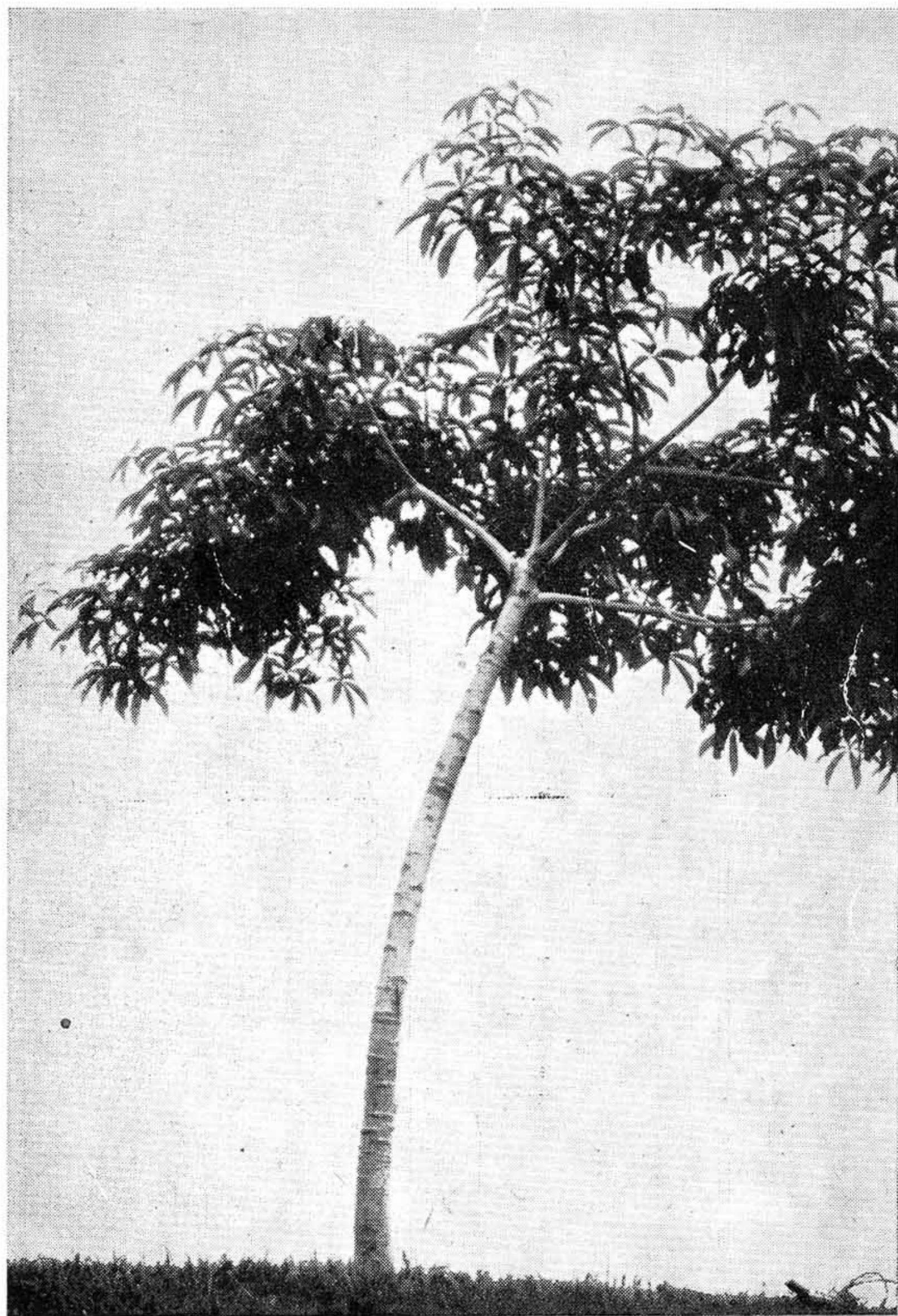
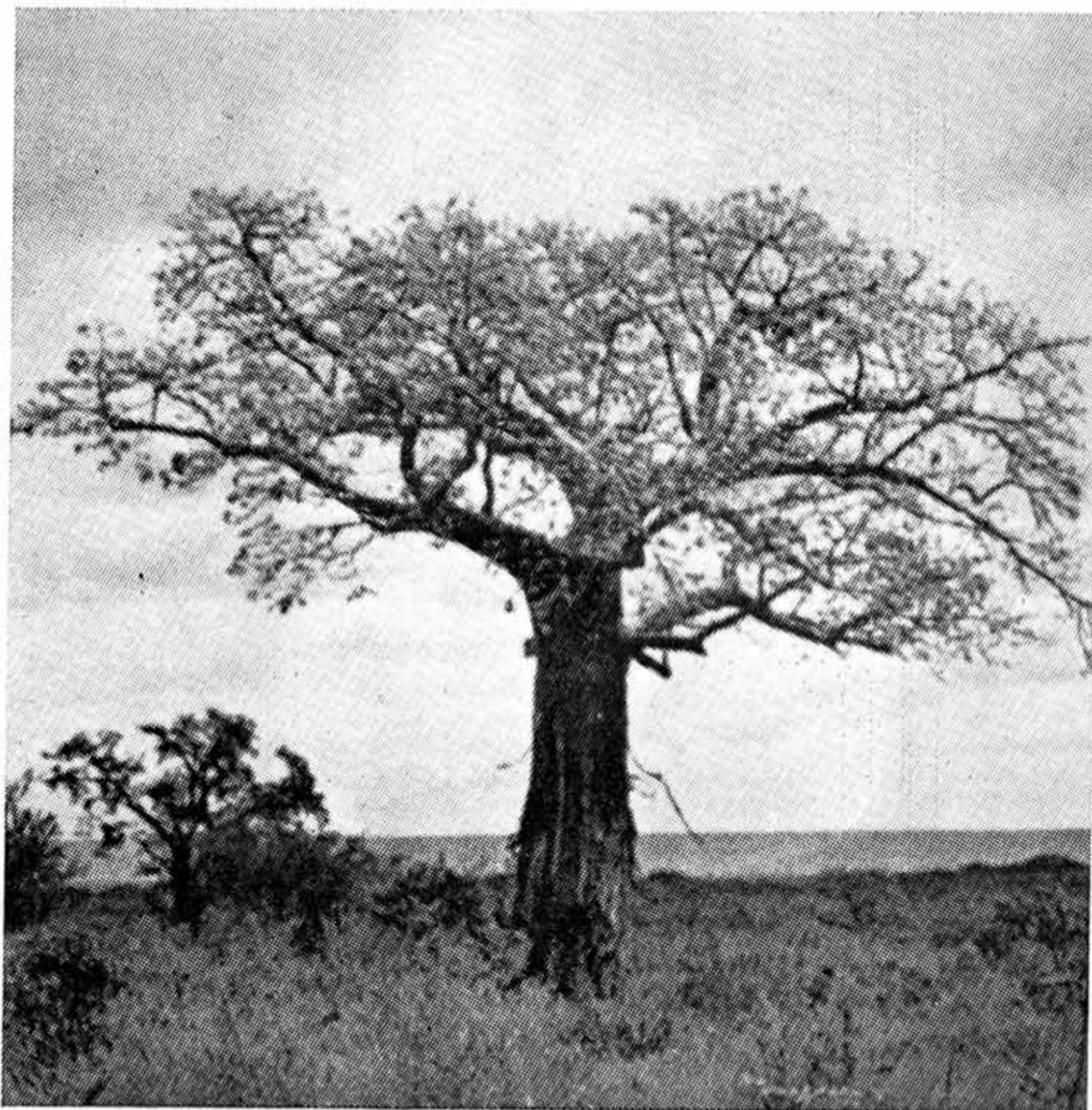


Tropical Botanic  
Garden and Research Institute  
TRIVANDRUM



ANNUAL REPORT  
1987



*Adansonia digitata*. (Baobab Tree), a native of Central Africa, thrives even in near desert conditions. One of the longest lived trees, Baobab is also remarkable for its enormous trunk which sometimes reaches a girth of 8 metres or more. In large trees, the trunk hollows out and forms a natural reservoir for water. In other cases, the trunk is excavated to form a human dwelling. African superstition endows the tree with a soul and the spirits of ancestors are supposed to hover around it. Stamps of several African countries depicting baobab tree are represented in the TBGRI collection.

Front Cover

*A two year old baobab tree in the Garden.*

# **ANNUAL REPORT**

## **1987**



**TROPICAL BOTANIC GARDEN AND RESEARCH INSTITUTE  
( T B G R I )**

**PALODE, TRIVANDRUM, KERALA, INDIA**

**PHONES : 70686 (Trivandrum) 26, 36, 46 (Palode)**

**Grams : TROPGARDEN**

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4. Director, Kerala Forest Research Institute, Peechi
5. Sri. S. Chand Basha, Chief Conservator of Forests (Social Forestry)
6. Director, Tropical Botanic Garden and Research Institute, Palode, Trivandrum ... Member Secretary

## FOREWORD

It has been a busy and eventful year. The beginning of the year marked the completion of the shifting of the administrative offices and laboratories from the city to the garden site. The year ended with the resounding success of the two-day medicinal plant exhibition which attracted more than 15000 visitors to the Garden.

The much planned three-month horticultural course for the young scientists was conducted with the co-operation of the British Council and the Royal Botanic Gardens Kew.

The TBGRI continued to work in close association with the International Union of Conservation of Nature and Natural Resources (IUCN) and two articles on our garden appeared in the first issue of the IUCN Magazine, Conservation News, in December 1987.

Many facilities such as a second Orchidarium, Community-pot Centre, Nursery shed etc were commissioned this year. Construction of the main laboratory building and staff quarters made satisfactory progress. The first planting in the steadily developing Bamboosetum was made in May. Also, our scientists have successfully micropropagated the endangered orchid, Blue Vanda. Important additions to the herbarium, medicinal plant collection, arboretum and orchidarium were made. Extension services such as supply of saplings to organisations and institutions continued. Exchange of seeds and research materials with national and international institutions touched a new peak. And this year, the Garden attracted almost three thousand students, who were given conducted tours by our staff.

The Executive Committee was reconstituted and we welcome the new members. The relinquishment of Professor Abraham from the Chairmanship of the Executive Committee marks the end of an era and leaves a void difficult to fulfil. As the Founder Director and later as Chairman of the Executive Committee, Professor Abraham has guided the Institution with great vision and dynamism. We also lost the services of Shri. S. Varadachari, whose vivacity, energetic leadership and intense involvement was a source of inspiration to all of us. Dr. P. N. Nair, who retired as Chief Conservator, was one of our strongest supports and during his stewardship, steered the institution through many stormy waters.

Steady progress has been made because of the unstinted support of the Government, Governing Body, Executive Committee and staff of the Institute. The British Council and the Royal Botanic Gardens, Kew, and other international institutions were always ready and anxious to assist us. The severe cuts in our grants pose a big challenge but because of the universal support and goodwill we look forward to the future with confidence.

**Professor A. N. Namboodiri, Director, TBGRI**

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## PLANT BIOTECHNOLOGY

### Mericlone and Breeding in Orchids

As per the recommendations of the Research Advisory Committee (RAC), due emphasis was given to meristem culture in Orchids. Leaf bases, axillary and perennial shoot apices were the sources of meristem selected for the purpose.

The leaf base culture of the endangered blue vanda (*Vanda coerulea* Griff. ex Lindl.) described earlier was repeated to ensure the reproducibility of the findings in various nutrient formulations. Excised leaf bases in the nutrient medium responded favourably producing clumps of protocorm like bodies (Plb) in two months after culture. The plbs later developed into plantlets with inact root and shoot systems in 4-5 months. Among the various media tried, the one developed by Mitra *et al* (1976), with minor modifications and supplementation with BA and NAA at 1 mg/l each, promoted rapid proliferation of plbs (25-32 plbs per leaf base) in more than 85% of the explants. A modified Gaviota 63 medium with the same additive induced multiplication of plbs (45-55 plbs per leaf base) in nearly 50-60% of the explants.

An experiment was conducted with 5-leaved seedlings to study the effects of leaf age on leaf base regeneration. Though the number of protocorms and frequency of explants producing protocorms were more or less the same for the first four leaves, a tendency towards increased rhizogenesis was observed in the fifth leaf. The number of shoots regenerated from the base of the fifth leaf was considerably less.

Leaf bases of *Aranda* hybrids grown in the field and those of *Dendrobium* hybrid seedlings grown in flasks were used for regeneration studies. Approximately 30% of the explants of *Aranda* and 40% of the explants of *Dendrobium* responded favourably in modified Mitra *et al* (1976) and Gaviota 67 nutrient media respectively. The number of plbs proliferated upon *Aranda* leaf explants were fewer (5-9) than those of *Dendrobium* (10-20). Subsequent differentiation of shoots from the protocorms leading

to complete plantlet formation occurred on modified Mitra *et al* (1976) medium supplemented with banana pulp (70 gms/litre) and BA and NAA at 1 mg/l each.

Development of a reliable method for the culture of flower stalks and regeneration of multiple shoots from every node of *Phalaenopsis* hybrids were attempted during the year. Two to three shoots could be easily obtained from the node of the flower stalk cultured on modified Mitra *et al* or Gaviota 67 nutrient media supplemented with other organic addenda. However, prolific growth of the shoots producing stout roots and broad leaves required a subculture on Gaviota 63 containing 70 g/l banana pulp. A minor irritant in the work on flower stalk culture was surface decontamination. Even under stringent conditions of surface sterilization nearly 60% of the flower stalk explants got infected in culture. Further, attempts are now being made to virtually eliminate the problem in routine manipulations.

Apical shoot meristem culture was successfully developed in two of the hybrids of *Dendrobium* (*Dendrobium* Ng Eng Cheow ♂ × *Dendrobium* Tay Swee Kang ♀). Meristems surgically removed from 2-year old seedlings were cultured in 20 different media. The explants responded with swelling within a week after culture and produced plbs in a month. Liquid media were found to be far better than solid ones. From the data so far collected best plb proliferation occurred on modified Vacin and Went medium where more than 80% of the explants produced 6-8 protocorms each. The protocorms were quite healthy and big in size and readily produced more than a few shoots on being transferred to solid nutrient media supplemented with banana pulp and hormones. It is possible that this technique of mericloneing could be extended to other hybrids of commercial value.

Some of the hybrid seedlings produced in this Institute (given below) are now transferred to the community pot centre

Cross		No. of seedlings transferred
1. <i>Dendrobium</i> Ng Eng Cheow ♂	× <i>Dendrobium</i> Tay Swee Kang ♀	1000

- |    |                                     |   |                                 |    |
|----|-------------------------------------|---|---------------------------------|----|
| 2. | <i>Renantanda</i> Henry<br>Truman ♀ | × | <i>Vanda coerulea</i> ♂         | 5  |
| 3. | <i>Vandopsis</i> Twinkle ♂          | × | <i>Vanda tessellata</i> ♀       | 10 |
| 4. | <i>Dendrobium</i> Toshiko ♀         | × | <i>Dendrobium chrysanthum</i> ♂ | 5  |

Special care is being given to ensure subsequent growth of these seedlings as we would like to release our hybrids as early as possible.

#### **Production of haploids through anther culture in Cassava**

Early stages of androgenesis in anther and pollen cultures were investigated. Anthers cultured in MB liquid medium containing 2, 4-D, NAA and kinetin at 2 mg/l each, coconut water and casein acid hydrosylate increased in size from 1.5 mm to 3.0 mm in 20 days of culture. Corresponding increase in the size of the viable pollen (from 0.12  $\mu\text{m}$  to 0.23  $\mu\text{m}$ ) was however accompanied by marked decrease in pollen viability (from 98% to 35.5%) during this period.

Visible callus initiation was first noticed in the connective tissue of the anthers after 15 days. Due to high mitotic activity and consequent callusing in this tissue, the anther lobes got pushed apart from each other. If, however, traces of filament tissue were present, callusing occurred first in such traces and continued until the callus engulfed either partly or completely the anther lobes within 15 days of culture. Anthers showing calli proliferated upon the filament tissue were discarded.

Cytological observations of the calli produced within the anther lobes after 25 days of culture were made. Calli with cells containing diploid chromosome complements predominated (95%) while the rest of the calli consisted of mixoploid cells with diploid ( $2n = 36$ ), haploid ( $n = 18$ ) and near haploid ( $n = 20$ ) chromosome numbers. The haploid cells were found in groups, after enclosed within a common outer wall and embedded in an otherwise diploid somatic callus.

*Ab initio* pollen culture technique used successfully in some other systems by releasing the pollen at high speed rotation in liquid nutrient media did not work in cassava. Therefore, pollen mass

was released from precultured anthers and subsequently cultured in MB and Nitsch liquid nutrient medium supplemented with glutamine, asparagine and m-inositol. Approximately 10% of the pollen showed 2-fold increase in size after 25 days of culture. In some of them the exine got broken releasing the cellular contents as a massive structure which at times got swelled up in size in the nutrient medium. The multicellular nature or otherwise this body growing out-side the limits of the pollen is being investigated.

A rapid multiplication scheme using axillary buds in liquid cultures was standardised with the objective of developing an effective *Agrobacterium* mediated *in vitro* transformation system for cassava. Multiple shoots with 15 fold increase in growth compared to that of solid nutrient media were obtained. Besides, shoot differentiation and subsequent growth of the shoots leading to complete plantlet formation occurred in the same flask without the need for any subculture.

#### **Tissue culture of medicinal plants**

The investigations on *Withania somnifera* cultures briefly reported last year continued with 30 different hormonal concentrations and combinations in MS nutrient medium. The focus was on the development of a simple but effective regeneration system which might become useful in studying various aspects of biochemistry and molecular biology. It was shown during the first half of the year that it is possible to regenerate shoots from leaf tip and leaf base cultures at 30-60% efficiency which was not attained earlier. The culture of axenic shoot explants in basal MS medium supplemented with 0.5 mg/l BA or zeatin produced as many as 15 shoots from every node within a period of 30 days. A conservative estimate suggested that adoption of the technology now developed would make it possible to produce at least 5000 – 7000 shoots from a single node. Rooting of the shoots normally required the presence of 0.2 mg/l IAA in the medium. However, if the shoots were already raised in media containing trace amounts of the auxin, rooting occurred even in basal medium. The post transplantation survival frequency of the shoots varied from 50 to 60%. However, when stringent conditions of initially transferring the plantlets to pots kept under high humidity and low temperature

(25°C) and then transferring them to the field after 4 weeks were followed, the frequency could be raised to 75–80%.

The tremendous potential of medicinal plants as raw materials for varied allo-ayurvedic preparations coupled with the scarce availability of these resources in the wild has now forced many laboratories and biotechnology corporations around the globe to develop rapid multiplication schemes for such plants and also to devise appropriate cell culture technologies so that the bioproducts could be harvested from the cells grown in bioreactors and fermentors right in the laboratory. Keeping this global awareness in mind and also considering the primary role a botanical garden ought to play in conserving the fast dwindling medicinal plants resources, considerable attention was paid during the year to establish regeneration schemes as well as callus and suspension cultures of plants with longstanding medicinal use. Invariably plants which formed the source of a major active principle were selected for this study. Some such plants were *Commiphora mukul* (guggulipid), *Coscinium fenestratum* (berberine), *Sida rhombifolia* (ephedrine) and *Gloriosa superba* (colchicine).

Among the various sources of tissue tried in MS medium supplemented with 25 combinations of hormones, shoot apices and nodal explants of *Commiphora mukul* responded favourably for callus initiation. Callus formation occurred in 30% of the explants cultured in presence of BAP (1.0 mg/l). In subsequent subcultures after 6–8 weeks, however, browning and eventual necrosis of these calli occurred. Attempts to prevent browning of the calli viz. use of ascorbate or citrate in the nutrient medium, frequent transfer of the calli to fresh media and use of liquid media did not yield desired results. This problem was even more severe in shoot explant cultures of *Coscinium* which got browned soon after a wash with detergent and surface sterilization. This necessitated the development of a surface sterilization procedure which could save atleast 50% of the explants free from browning and infection. As readily available source of tender tissues in this rare plant is in short supply, other methods of vegetative multiplication viz. cuttings and layering are also now resorted to.

The work on callus and cell suspension cultures of *Sida*, on the other hand, was encouraging. Highly prolific and friable

calli were raised from internodal and leaf explants in MS medium supplemented with 2, 4-D (2.0 mg/l) and BA (0.5 mg/l). The calli proliferated on the root explants were of solid type and slow growing initially but they became somewhat friable in subsequent subcultures particularly in media containing elevated levels of 2, 4-D (3.0 mg/l). Whereas the calli proliferated on the leaf explants were chlorophyllous, those derived from internode and root explants were less pigmented and pigment-free respectively. Cell cultures with fine suspensions of cell aggregates were successfully raised from the leaf and internode-derived calli. The rates of growth of the calli, cell cultures and relative synthesis of ephedrine in different media are yet to be determined. The interesting feature of these cultures however, was the significant levels of chlorophyll accumulation even in media containing high concentration of 2, 4-D (5 mg/l). This property may make these cultures ideal for studying the relationship between pigment synthesis and growth and also the photosynthetic physiology. Thus far, regeneration of plants both from the primary explants and callus cultures has not been obtained. In fact, necrosis of the explants occurred in media containing cytokinins which usually induce shoot regeneration in tissue culture.

In accordance with the recommendations of the RAC, attempts were made to establish callus cultures of *Gloriosa superba* which might serve as a valuable source of Colchicine. The availability of colchicine-rich corms was season-bound as the plants were visible in field conditions only after the monsoon. Callus induction and root initiation were obtained with relative ease but shoot regeneration has not yet been possible. The following responses were observed in MS medium supplemented with the respective additives, reduced callus and pronounced root formation in NAA (2.0 mg/l) and BA (0.5 mg/l) moderately growing semi-friable callus without organogenesis in 2, 4-D (2.0 mg/l), NAA (1.0 mg/l) and BA (.05 mg/l), marginal callus formation in NAA (5 mg/l), 2, 4-D (1.0 mg/l) and BA (0.5 mg/l) as well as in NAA (0.5 mg/l) and BA (0.2 mg/l). As the callus formation was confined to specific zones of meristem seen in the growing ends of the corms, the frequency of the response did not exceed 50% in any particular treatment. It is suggested therefore that it would be quite sufficient if the explants of the growing tips of the corms are used for future

experiments. A tendency to form embryo-like structure was noticed in some explants cultured in presence of NAA (0.5 mg/l) and BA (0.2 mg/l). However, it is too early to decide whether they represent embryogenesis.

### **Protocorm differentiation in orchids**

The carbohydrate metabolism of the protocorms developing from the tender leaf bases of the *Cymbidium* hybrid was investigated in greater depth. The biphasic nature of free sugar accumulation in the cultured leaf tissue suggested that the initial increase in the endogenous pool of free sugars was due to the uptake of sugars from the nutrient milieu which was different from the later event contributed mostly by the breakdown of synthesized starch during the culture period. This was substantiated by the near lack of dry weight increase but substantial increase in fresh weight in 10 days of growth, inverse relationship between endogenous levels of sugars and starch, and rapid decline in the levels of starch after 20 days of culture. The exponential rates of development of protocorms was evidently possible with the rapid catabolism of starch, spurt in the activities of amylase enzymes associated with it and an overall increase in processes correlated with primary metabolism. Activity staining of amylase fractionated on a native gel proved the intense activity of the anodic isozyme which already existed but as a feeble band in the inoculum. However, the interesting aspect of the study was that a new, slow migrating anodic isozyme appeared in the crude extracts of rapidly growing tissues after 10 days of culture and disappeared after 25 days. The foliar development of protocorm was thus found to be a dynamic system quite comparable to the tobacco callus and leaf disc regeneration systems where marked synthesis as well as rapid depletion of starch is reported during shoot initiation.

### **PLANT TAXONOMY**

Various Research Projects were undertaken during this year to explore the plant wealth of Kerala, to conserve the endangered species and to introduce them to the garden. Work on these research projects approved by the Research Advisory Committee is in progress.

1. *Plant exploration of Pathanamthitta District with special reference to the collection and introduction of arborescent species.*

Plant exploration trips were conducted to Pathanamthitta District. 230 saplings belonging to 80 species were collected. These include saplings of trees like *Anacolosa densiflora*, *Baccaurea courtallensis*, *Canthium dicoccum*, *Diospyros microphylla*, *Dipterocarpus bourdillonii*, *Dysoxylum beddomei*, *Xylia xylocarpa* etc. Seeds belonging to 15 arborescent species were also collected.

2. *Study and introduction of Wild flowers of Kerala*

Eighty plantlings of herbs belonging to 15 species, 30 plantlings of shrubs belonging to 10 species, 20 plantlings/cuttings of twiners belonging to 5 species and orchids belonging to 6 species were collected for introduction. Numerous seeds were also collected for rearing.

A small area of about 10 cents near the Library and Laboratory Complex was cleared, keeping as such all the canopied native small trees in order to introduce wild plants, mainly shrubs and perennials.

A project on the study of common plants of Trivandrum was undertaken. 830 specimens from 225 species were collected so far for this purpose.

3. *Taxonomic studies on Indian Orchids*

The genus *Trias* was critically studied. One collection (CSK 3668) from Bonaccord proved to be very different from all other known species. Further studies on the related genus *Bulbophyllum* revealed that the Sri Lankan *B. crassifolium* is a true *Trias* and should be transferred. These findings are being used in the preparation of a paper titled "Two novelties in the genus *Trias* Lindl. (Orchidaceae)". A distribution map of the genus *Trias* was also prepared.

Micromorphological characters of the seeds of 7 species of orchids viz. *Bulbophyllum fimbriatum*, *Coelogyne nervosa*, *Dendrobium jerdonianum*, *Pholidota* sp., *Smithsonia maculata* S. *straminea* and *Trias bonaccordensis* were studied.

A survey-cum-collection trip extending from 3rd July to August 31 was made to Sikkim. Plants were collected from up to a height of 19,000 ft. Exploration studies were made in North Sikkim as well as in a few parts of East Sikkim (Jalep La and Kupep). About 2000 specimens were collected. Seventy two species of orchids were brought for introduction. Two species of *Drosera* and one species of *Utricularia* from Sikkim represented the insectivorous plants of the collection. Other important collections from this area include *Cypripedium tibeticum* and *Cycas pectinata*, a rare and endemic cycad of Eastern Himalayas. Three Sikkim orchids, flowered during this period, were identified as *Bulbophyllum elatum*, *B. yoksunense* and *Herminium congestum*.

Plant exploration and collection trips were conducted to Munar. About 50 species of orchids were collected. 3 species of *Arisaema* were also collected. Of these *A. sarracenioides*, a rare aroid, forms the second collection after the type in 1937.

#### 4. *Collection and Conservation of Bamboos*

The sloppy hill area in the north west part of forest bit No. 1 of the garden was selected for growing bamboos and reeds. The slopes were found suitable for bamboo growing as two species: *Bambusa arundinacea* and *Ochlandra travancorica* are growing naturally in this area. There is also a perennial water source. An area of 5120 m<sup>2</sup> was cleared for the first stage of bamboosetum and points were marked at intervals of eight meters for planting. The first planting, a seedling of *Bambusa arundinacea*, was on Thursday, 21 May 1987.

A survey of bamboos growing in the garden site was conducted. The common species in the region are *Ochlandra travancorica* and *Bambusa arundinacea*. The former is growing gregariously along the sides of river Chittar and also in moist regions while the latter is found on the hill slopes. In the garden area *B. arundinacea* occurs mainly in three localities—Thippettippara, Kalanpara and Kunnalakkarikam, and they also form the natural vegetation of the bamboosetum site. It is interesting to note that almost all clumps of *B. arundinacea* in the garden site are of the same age (approximately 3–4 years). This suggests a possible gregarious flowering in the early eighties ie. before we moved into the garden site.

Collection trips were conducted to Pathanamthitta, Vayalathala, Kozhencherry, Thiruvalla and Munnar area to collect offsets of Bamboos. During this year 50 offsets/ cuttings belonging to 20 species were collected and introduced into the Bamboosetum. Of these, 34 cuttings belonging to 17 species are getting established. In addition 25 seedlings/cuttings are grown in the nursery. A thatched hut of 8 x 4 metres was constructed at the site to keep the garden implements, manure etc and also the newly planted ones till they get established.

### Herbarium

The herbarium is enriched with the addition of 925 mounted sheets and 1850 duplicates during this year. 1200 specimens (including duplicates) were processed and kept for mounting. The updated position of the collection is as follows:

Total mounted herbarium sheets	8,125
Duplicates	18,147
Processed (but not mounted) specimens	1,200
Spirit collection	145
Total families	159
Total genera	863
Total species	1,758
Accessioned specimens	4,340
Card index prepared	2,444

## GARDEN DEVELOPMENT

### Plant Introduction

Plants of various groups were introduced into the garden by the combined efforts of scientists attached to plant taxonomy and garden development. The palm collection was enriched by the introduction of 15 rare species of tropical palms from the Royal Botanic Gardens at Kew.

With the addition of 11 more species of *Ficus* received from the Utrecht University Botanic Garden, Netherlands, the *Ficus* collection has gone up to 67 species this year. Number of woody species increased to 440 from 360 with the introduction of 80 species this year.

Eighteen species of Bamboos were added to the Bamboo collection this year.

Forty more species of medicinal plants were added to the herbal garden. The strength of germplasm of medicinal plants is now raised to 690 species.

One hundred and twenty five species of orchids were introduced this year. This include 72 species brought from Sikkim.

Insectivorous plants introduced this year include saplings of *Nepenthes khasiana* and two species of *Utricularia* and one species of *Drosera*.

Some of the important plants introduced this year include *Cypripedium tibeticum* from North Sikkim and *Cycas pectinata*, a rare and endemic cycad of Eastern Himalayas. *Ginkgo biloba* the 'living fossil', *Tupidantus calyptratus* were also introduced during this year.

### **Arboretum**

This year eighty more species of woody plants were added to the tree collection raising it upto 440 from 360. These introductions were made through plant exploration trips to various forest areas. Exotic species were added mainly through seed exchange programme with botanic gardens abroad. One hundred and twenty species of woody saplings were planted at the Arboretum this year raising the total number of planted species to 360. Saplings for further planting are maintained at the nursery. In addition to the proper maintenance and protection of the planted trees, growth performance of all these plants are recorded. The saplings planted at the Arboretum in the first year (1985) have attained a height of 4.5 to 6.0 mtrs and a girth of 20 to 30 cm.

With the completion of the Arboretum road and foot paths this year the arboretum is now well accessible to visitors. The approximately 2 km long road running through the periphery of the planting area of the arboretum gives the vistoris a rare opportunity to see natural forest part of the Arboretum on one side with the actively growing introduced species on the other side. The two-foot wide foot path running along the planted area will lead the visitor to each and every plant.

We have succeeded in raising of St. Helena rebony through air layering.

### Medicinal plants

The germplasm collection of medicinal plants was raised to nearly 700 species by the addition of 40 species this year mainly through collection trips conducted to forest areas.

The medicinal garden was extended further by planting 50 shrubs and 20 tree saplings. Thirty beds of herbs and under-shrubs were also raised. A hut surrounded by aromatic plants was constructed at the centre of the extended area as a resting place for the visitors.

Twenty special groups of plants based on their therapeutic properties were arranged for display for the benefit of students and the general public.

Steps were taken to conserve the endangered species *Coscinium fenestratum* by planting 100 plants in a separate plot. Planting materials of this plant and several other species were supplied to individuals and organisations including the Social Forestry Department, FACT and Nagarjuna Herbal Concentrates, Thodupuzha. Students from Agriculture and Ayurveda Colleges regularly visit the Garden for collecting research material.

By the addition of 75 herbarium specimens of medicinal plants, the strength of the medicinal herbarium has gone up to 925 mounted sheets. More than 100 raw-drugs were also collected and identified during the year raising the raw-drug collection to 300 specimens.

Seeds of medicinal plants were collected periodically from plants in the garden and stored in seed cabinets for seed exchange programme.

Germination studies on the seeds of *Aristolochia indica* using different germination media are in progress.

Experiments on the vegetative propagation of *Coscinium fenestratum* using root hormones are showing promising results.

### Ornamental plants

The staff members of this section were greatly benefited by the training programme on basic horticulture conducted by Mr Roy Bee, former Director of Park Systems, Manchester, England.

One of the interesting collections during this year is the addition of 40 varieties of *Begonia*. These plants were kindly supplied by Professor Lekshmi, Ayurveda Research Institute, Poojapura, Trivandrum. Now the section harbours 539 taxa of foliage and flowering plants.

Several species/varieties/c.v. of *Anthurium*, *Achimenas*, African violets, *Azalea*, *Begonia*, *Clerodendrum*, *Muehlenbeckia*, *Thunbergia*, *Malpighia*, *Calathe* etc are added to this section during this year.

The front area of the guest house was designed and planted accordingly. Extensive areas of lawns are now maintained by the ornamental division and efforts to select the best varieties of grass suitable to our conditions are on.

### Germplasm Centre and Seed Bank

This unit received seeds/spores/seedlings of 459 species from the following Botanic Gardens/Universities around the world.

1. Hortus Botanicus Austro-Sinensis, Guangzhou, China
2. Royal Botanic Gardens, Kew, England
3. University Botanic Garden, Utrecht, Netherlands
4. Bereich Botanik und Arboretum Humboldt – Universitat Zu Berlin, DDR.
5. Department of Botany, University of Toronto, Canada
6. Jardin Botanique Cantonal, Switzerland
7. Jardin Botanique de Bordeaux, France
8. Botanic Garden, Vacratot, Hungary
9. Central Institute for Genetics, Gatersleben, GDR
10. Botanic Gardens, Toowong, Australia
11. Sri Venkateswara University, School of Biological and Earth Sciences, Tirupati, South India

We are receiving regular requests from Botanic Gardens and Universities around the world for supply of seeds of our plants.

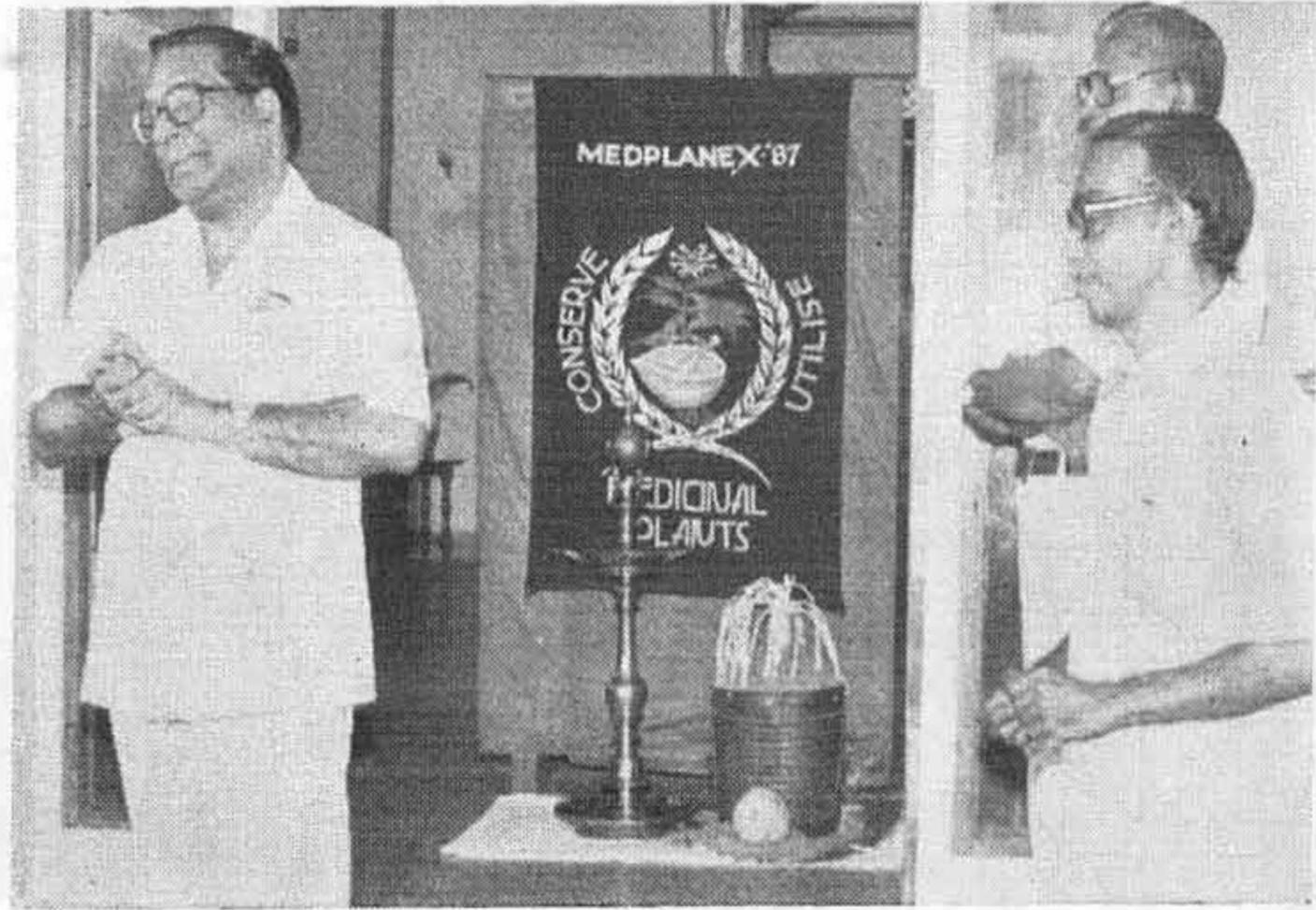
Of these, twenty requests were processed and about 140 seed samples were mailed to the concerned Botanic Gardens/Universities. Requests from the following centres have already been served while the remaining are being processed.

1. Bereich Botanik und Arboretum der Humboldt-Universität Zu Berlin, GDR
2. Botanic Gardens, Singapore
3. National Herbarium and Botanic Garden Harare, Zimbabwe
4. Jardin Botanique de la Bratislava, Czekoslovachia
5. Hortus Botanicus Universitatis, Polska, Polonia
6. Botanischer Garten der Universität Wien, Rennweg, Austria
7. Hortus Botanicus, Sofia, Bulgaria
8. Botanischer Garten und Botanisches Museum, Berlin
9. Jardin Botanique, Lausanne (Suisse) Switzerland
10. Royal Botanic Gardens, Sydney, Australia
11. Carlos Eralio R. Ruiz, Buenos Aires, Republica Argentina
12. Jardin Botanique National de Belgique, Meise (Belgique)
13. Botanischer Garten der Universität, Zurich
14. Faculte des Sciences Agronomiques de l' Etat Gembloux Belgium
15. Botanischer Garten, Heston, Hamburg
16. University Botanic Gardens, Utrecht, The Netherlands
17. Conservatoire et Jardins Botaniques de Nancy, Villers-les-Nancy, France
18. Station de Botanique et de Pathologie Vegetale, Antibes, France
19. Laboratorio di Citologia Ed Embriologia Vegetate, Firenze, Italy
20. Department of Botany, Kakatiya University, Warangal, India.

At present we have dried and processed seeds of 177 species collected from our garden which are ready for distribution.

### **Extension Services**

Though not within our mandate, various organisations call upon us for help in landscaping, garden lay outs designing as well as for training of gardeners. In spite of the severe constraints in funds and personnel we are trying to meet these demands to the best of our ability.



Prof. N. Balakrishnan Nair, Chairman, Science, Technology and Environment Committee opens the Medicinal Plant Exhibition on December 4, 1987.



Hon'ble Speaker Sri Varkala Radhakrishnan, addressing the Concluding Session of the Exhibition.



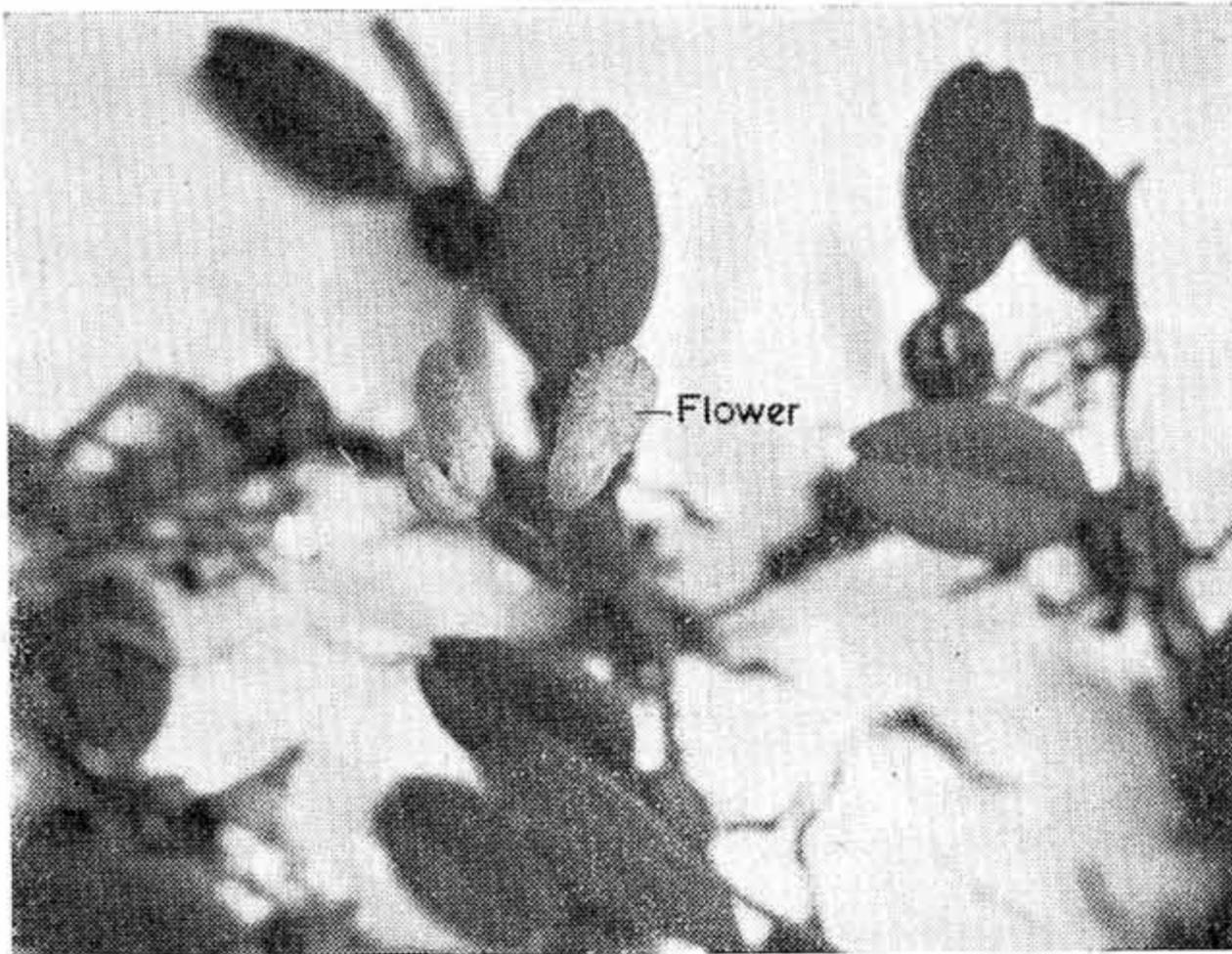
Large crowds lined up at the entrance of the Garden even before the Medicinal Plant Exhibition was opened.



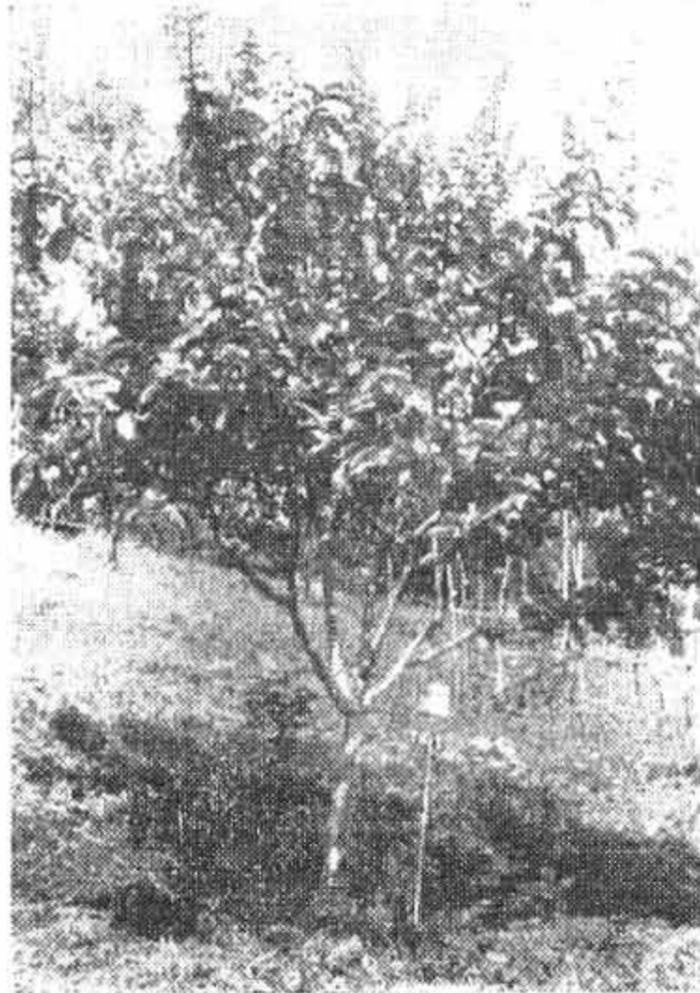
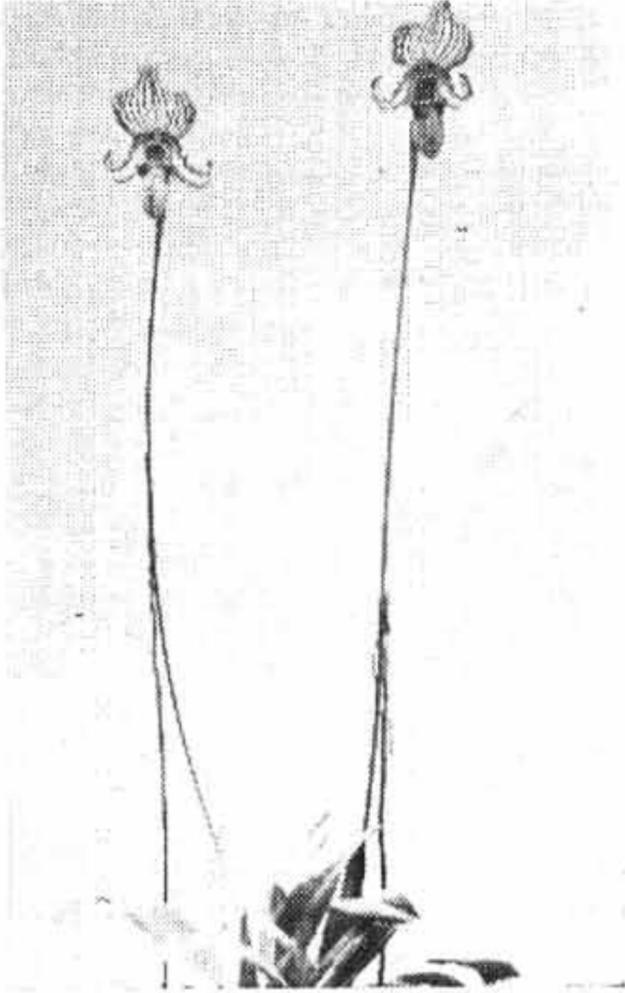
Prof. Nambiar and Sri K. V. Surendranath having a lively discussion on an exhibit. The Hon'ble Speaker looks on.



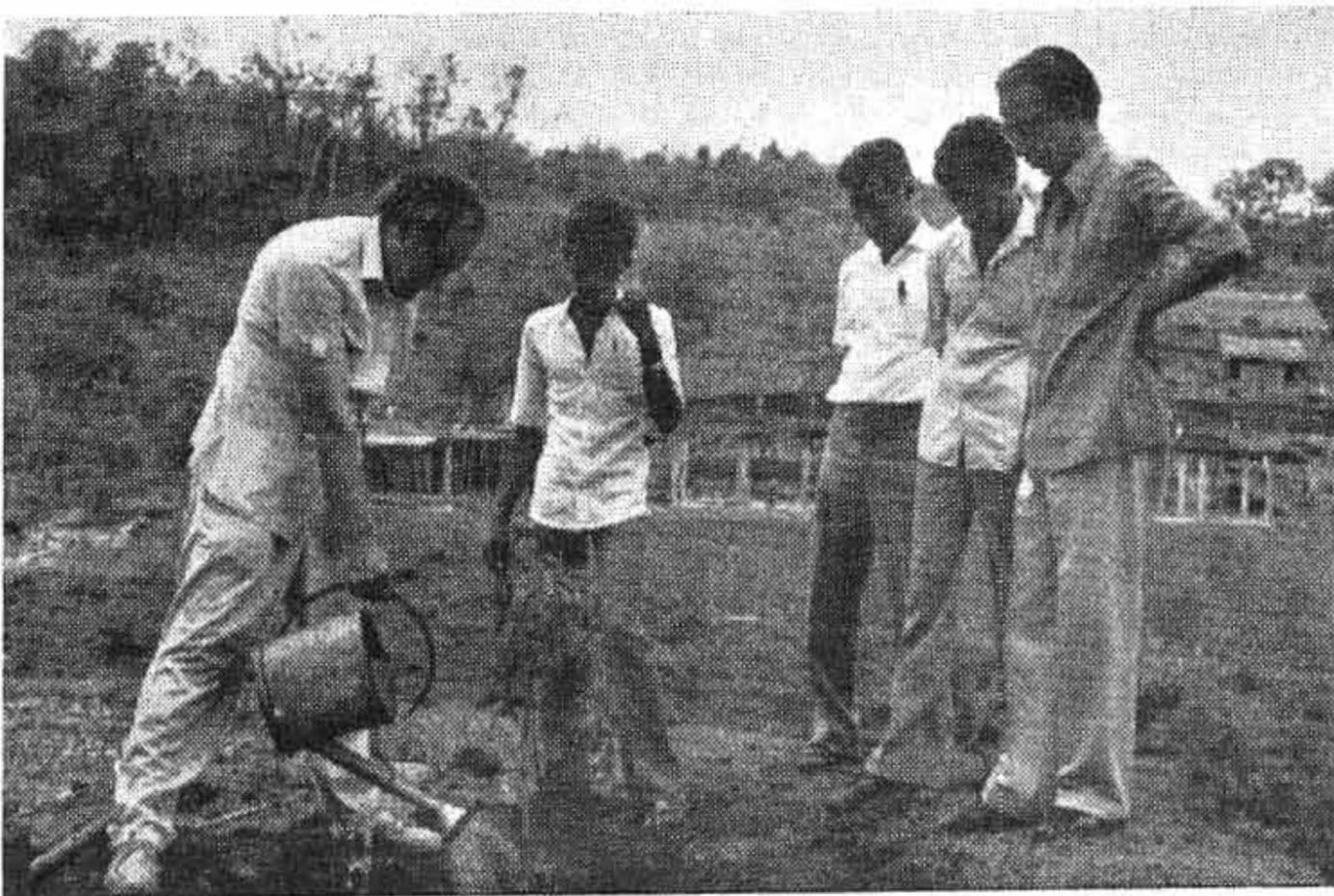
Nobel Laureate Richard Syngé and Mrs Syngé visited the Garden in December 1987.



Van Rheedé's mysterious orchid (*Bulbophyllum* sp) bloomed this year.



(Left) Fairrie's Thousand Pound Lost orchid (see note on the inner cover).  
(Right) Pride of India, a sapling of which was planted in 1985 was the first introduced tree in the arboretum to flower.



Mr. Roy Bee, renowned horticulturist, writer and broadcaster, planted a sapling at the end of the three-month horticulture course he gave to the scientists of the Garden.

One of the most satisfying projects we had undertaken was the design of the music fountain park in front of the High Court which was commissioned by the Chief Justice in June, 1987. On this occasion Hon'ble Justice K. Sukumaran, who was the moving spirit behind this venture, in his welcome speech, specially thanked TBGRI for its contribution.

A lay out for a garden at the Centre for Development Studies, Trivandrum was prepared by our scientists. In consultation with the Director and the garden staff, planting was completed in the area in front of the main building under the supervision of our staff.

The Scientist-in-charge of the Arboretum was deputed to study the possibility of developing an arboretum on the Hill Palace Grounds at Trippunithura. A preliminary project report was drawn up and the extent to which TBGRI can be of assistance was well defined. Saplings required for the first stage of planting were also raised in our garden. Further steps taken by the Government in implementing the proposal are awaited.

At the request of the Idukki Development Authority a plan for a garden was prepared and sent.

Besides supplying material to individuals and research students planting materials on a large scale were supplied to the following institutions:

- i Fertilizers and Chemicals Travancore (FACT) Udyogamandal, Kerala.
- ii Nagarjuna Herbal Concentrates, Thodupuzha, Kerala
- iii College of Agriculture, Vellayani, Trivandrum
- iv Social Forestry wing of Kerala Forest Department
- v Centre for Development Studies, Trivandrum

## PUBLISHED PAPERS

1. Sathish Kumar C., and Finn. N. Rasmussen, 1987. *Cheirostylis seidenfadeniana* sp. nov. (Orchidaceae) from India, Nord. J. Bot. 7 (4): 409-411

2. Sathish Kumar C. and K. S. Manilal 1987. A synopsis of *Ipsea* (Orchidaceae). Kew Bull. 42(4): 937-943
3. Chanda S. V., Joshi, A. K., Krishnan, P. N. and Y. D. Singh. 1987. *In vivo* nitrate reductase activity in leaves of Pearl Millet, *Pennisetum americanum*, L. Leeke. Aust. J. Plant Physiol. 14: 125-134
4. Latha, P. G. and S. Seeni 1987. Nutrient requirements of some selected orchids grown *in vitro*. In Proc. Hiroshima Symposium on orchids (in press)

### Award

Dr P. N. Krishnan was one of the authors of the Hari Ohm Ashram Prerit Bhaikaka Inter University Smarak Trust Award winning paper in Botany entitled "Distribution of glycosidase and acid invertase activities in relation to elongation growth in Pearl Millet internode" which appeared in J. Exp. Botany vol. 37: 1406-1415, 1986.

### EXHIBITION OF MEDICINAL PLANTS AND PLANT PRODUCTS (MEDPLANEX '87)

One of the mandates to the TBGRI was to organise a germ-plasm collection of economic plants and since 1984 we had been building up a herbal gene pool which now comprises around 700 species of medicinal plants. Our frequent interaction with the visitors made it clear that there is an innate propensity in human beings to make use of medicinal plants in the event of common ailments and to understand their healing properties. It was interesting to note that even the present generation has good faith in herbal remedies and many people are interested to cultivate these plants in their surroundings. The constant enquiries that we were receiving about the cultivation methods of certain medicinal plants was a sure indication that some people and organisations are interested in taking up the cultivation on a large scale.

It is a matter of common knowledge that certain medicinal plants that were very commonly used are no more available and substitutes which may not have the desired effect or potentiality are widely used. Therefore, with a view to familiarize the layman

with at least the common medicinal plants and to stress the need for propagating herbals, the Institute decided to hold an Open House Programme and an exhibition of medicinal plants, plant parts and plant products in December 1987. The decision to hold the exhibition on 4 & 5 December was taken in November and within one month the massive preparations for holding it had to be made. An organising committee was constituted with the Director as President, Sri P. J. Mathew as Secretary and Professor V.P.K. Nambiar as adviser. Thanks to the enthusiasm of the scientists and others, the elaborate arrangements could be finalized a day before the fete.

Yet there were anxious moments. During the night before the opening day unseasonal rains lashed the Garden with all its fury and the downpour continued even on the morning threatening to drown the exhibits. Fortunately, the sky cleared a little before the opening ceremony and pleasant weather prevailed throughout the time of exhibition although as if on cue, rain picked up again after the final ceremonies were over.

Everything went on as scheduled. The exhibition was thrown open to the public by Dr N. Balakrishnan Nair, Chairman, State Committee on Science, Technology and Environment and Chairman, Executive Committee of Tropical Botanic Garden and Research Institute, at 9.00 a.m on 4 December 1987. The exhibits were arranged in such a way as to be informative and at the same time aesthetically appealing. In addition to the descriptions, the exhibits were interspersed with quotations, statistical data (tabular and diagrammatic representations), photographs etc. In order to explain the significance of the exhibits and the live plants in the garden to the public, 75 volunteers including teachers and students of botany from the nearby colleges were given special training for a week and as guides and interpreters they played a very admirable role.

The important exhibits, to list a few, were:

- *Marauri*, the bark of Upas tree (*Antiaris toxicaria*)
- *Bhooj patra*, the processed bark of Indian berth (*Betula alnoides*) used as paper in olden days.
- *Ginseng*, the wonder drug of China

- *Diabetic-cup* made of the heartwood of *Pterocarpus maruspium*.
- A century old pot carved out of a single piece of wood used by Azhvancherry Thamprakal to keep 'asavas' and 'arishtas'
- Seeds of pine-tree (*Vateria macrocarpa*) which appear like beak of birds
- Rudraksha with six faces
- Rare manuscripts and books, paintings, illustrations and photographs of medicinal plants
- Collection of stamps of medicinal plants, flowers and fruits issued by countries all over the world

The entire herbal garden was thrown open to the public. In addition to the 700 species of herbals, there were also 25 special groupings which included:

- Plants used in the treatment of tumours, jaundice, diabetes, diarrhoea etc.
- Single plant remedies for different ailments
- Plants used by tribals
- Endangered and threatened plants
- The ten plants of 'Dasamoola' roots of which are used for the preparation of 'Dasamoolarishta'
- The ten plants of the legendary 'Dasapushpa' etc.

The organizers of the exhibition expected at the most 2000 visitors only during the two days because of the distance from the city and the difficulty to reach the garden. However, all our calculations went wrong. There was a heavy turn out even at the outset and the number exceeded 2000 within two hours. The fact that most of the visitors were youngsters bear ample testimony to the growing awareness of the use of herbal remedies in the treatment of common complaints.

A stall that attracted people in large numbers was the 'Oushadhapura' where the preparations of single drug remedies and herbal products for complaints like cough, asthma, headache, gas trouble, allergy, ulcer and diabetes were demonstrated. The stall of Prakrithi Chikitsa Sahakarana Sanatorium, Trichur, set up right in the middle of the medicinal plant garden also attracted large crowds. The rush to purchase the selected medicinal plants at the sales counter set up in connection with the exhibition was indica-

tive of the interest of the people in the cultivation of medicinal plants. Taking into consideration the difficulty in getting food items around the area, light refreshment stalls were also opened inside the garden.

About 7000 persons visited the garden on the first day. People from distant places even from remote locations of Northern Kerala came to the exhibition and from their reactions we were gratified to know that the visitors were having an educative and enjoyable experience. The second day of the exhibition was even more exciting. The rush at the entrance became uncontrollable at times. However, everything went off smoothly. It is estimated that more than 15000 persons came to the garden in these two days.

A public function was arranged at 3.30 p.m. on 5th December. Sri Varkala Radhakrishnan, Hon'ble Speaker, Kerala Legislative Assembly presided over the function. The Hon'ble Speaker in his presidential address said that in an era where destructive tendencies rule the roost, the establishment of Tropical Botanic Garden and Research Institute with the purpose of the conservation and propagation of endangered plants should be hailed. Sri K. V. Surendranath, M.L.A. and Dr A. V. Issaac M.L.A. also spoke on the occasion. The Speaker inaugurated the free distribution of seedling of medicinal plants to those who had registered their names in advance. He also distributed the certificates to the participants of the training programme in Horticulture conducted by the Institute. The exhibition came to a close by 5.00 p.m. on 5 December 1987.

The publicity aspect of the exhibition was given due importance from the very beginning. One circular announcing the exhibition and an illustrated brochure were sent to the professionals in the field of Botany and Ayurveda, Colleges in Kerala and schools in Trivandrum and Quilon Districts. All leading dailies in Malayalam and 'The Hindu' gave adequate coverage to the exhibition. The Malayala Manorama wrote a 'curtain raiser' to the exhibition and Kerala Kaumudi and Mathrubhoomi carried news items about the exhibition on 4th, 5th and 6th December. The Trivandrum Doordharshan and All India Radio also gave reports of 15 minutes duration about the exhibition, its significance, and its impact on the public.

The exhibition was an eye-opener in many ways. Only the medicinal plants, which by themselves are not very attractive, were open to the visitors and consequently we expected that students and research workers in botany and native systems of medicine alone would respond. As it turned out, people from all walks of life, braving constraints in transportation and refreshments, reached the rather inaccessible village of Palode to spend hours with plants. Even long after the exhibition was over enquiries about medicinal plants poured in and we are doing our best to satisfy the curiosity of the public. Every member of the small staff of the Institute strained to the limit to get the exhibition organised but judging from the reactions of the visitors and the news media, our efforts were not in vain.

## **LIBRARY**

### **Books and Periodicals**

In 1987, 230 books were procured and added to the collection raising the total number of volumes to 3395. There has been a steady increase in the number of journals subscribed and at present the library is supplied with 85 national and international journals.

### **Services**

The photocopying machine was extensively used during the Horticultural Training Programme conducted by the Institute in February – May 1987 to supply the course materials to all the participants. Copies of some of the rare works of interest like Bourdillon's *Reports on the Forests of Travancore*, *Vrikshayurveda*, *Sahasrardha Vrikshadikalude Varnana* by B. J. Ponon, collected from different sources were taken for the Library. The number of persons from other institutions using the Library is increasing.

### **Special Collections**

A separate collection of books, journals, articles, guide-books and colour transparencies of botanic gardens was started in 1987. Efforts to build up a library of photographs and colour slides have also been started.

### **Other activities**

Sale and distribution of publications of the Institute are done through the Library. The publicity aspect of the Medicinal Plants

Exhibition conducted on 4th & 5th December was mainly looked after by the Assistant Librarian. A subject and country index of the stamp collection which attracted almost all the visitors to the Library is under preparation.

### **ODA Book Presentation Programme**

The British Council has very graciously agreed to present books of our choice worth £ 3600 (Rs. 83,000 approx.) to the Library. This is the second time that the Library is selected for the presentation of books within 4 years.

### **STAFF TRAINING COURSE IN HORTICULTURE**

Last year's report gave a brief review of the search to find a suitable person to train our scientists in horticulture. As a result of Royal Botanic Gardens' efforts and the British Council's support an expert was identified and the course was scheduled to start by early 1986. At the last moment the arrangement had to be cancelled and a second attempt to bring the expert to India was also not successful.

As a result of the continued and combined effort of the Curator the Supervisor of Studies, and Mr. Hans Fliegner of the Kew Gardens and the British Council, the proposal was revived and the services of Mr. Roy Bee, the former Director of Park Systems, Manchester, Britain were made available to us.

Mr. Roy Bee, a well known horticulturist, writer and broadcaster, came to Trivandrum after a great deal of preparation and with a lot of teaching material. Months before he came here, Mr. Bee began researching the extensive collection of Indian Plants in the Herbarium of the Manchester University. In consultation with Mr Fliegner, who was in Trivandrum in October 1986 and who studied the requirements of our students in depth, Mr Bee had drawn up a practically oriented course in horticulture. One of Mr. Bee's books along with ancillary papers were used for the course. In addition, illustrated articles showing practical aspects of horticulture from Roy Bee's gardening column in Manchester Evening News were also used as course material. Besides, Mr Roy Bee brought an extensive collection of 35 mm colour slides of gardens and plants, materials on pests and diseases, soil test kits and various samples.

There were ten participants in the Course, five of whom were senior Scientific Assistants and the other five were fresh candidates who were selected from a list of two hundred applicants from which twenty were short listed. They had undergone a written test and were interviewed by a Committee chaired by Mr Roy Bee.

The three month intensive course began on 12th February 1987. The work and application of the trainees were such that rapid progress was made through the course and a very high standard achieved as evaluated by Mr Roy Bee.

As part of the course some of the projects previously identified by Mr Hans Fliegner were also undertaken as training exercises which incidentally contributed to the landscaping of the garden. These included the planting of the *Plumeria* avenue, a boundary planting of ornamental trees and replanting of trees and shrubs in front of the Guest House.

Weekly plant identification tests were held throughout the course which gave the participants an opportunity to evaluate their knowledge of the flora in and around the garden.

Lectures were arranged not only to show gardens, landscapes, horticultural designs, scientific advances in horticulture etc from other parts of the world but also to question and think for themselves.

Practical training was given in nursery practice, arboriculture, turf culture, habitat conservation, conservation of material collected in the wild and establishment techniques. Advances techniques such as fluid seed sowing were also taught.

At the completion of the course, Mr Roy Bee evaluated the performance and gave a report of the performance of each individual of the group. Course certificates were handed over to the participants at a meeting held in the Garden by Sri Varkala Radhakrishnan, Hon'ble Speaker of the Legislative Assembly on December 5, 1987.

The five graduates recruited to this course were absorbed as Garden Assistants and one each was allocated to the major sections of the Garden. After three months in a section they

would rotate so that over a period of fifteen months the Assistants will gain experience of the whole range of living collections and garden activities.

As a part of further training, Mr Jacob Thomas, one of the Senior Scientific Assistants, was deputed to Kew for an year's training.

It is also proposed to hold a refresher course for the participants during 1988.

### SEMINARS AND SYMPOSIA

Dr Sinclair Mantell, Wye College Department of Horticulture, London University, UK, visited our Institute during January 1987. He spent a week at the Biotechnology Division giving practical demonstrations to some of the scientists of the latest orchid protoplast isolation and culture procedures. He also discussed in depth the principles, techniques and applications of plant protoplast culture.

Dr T. K. Abraham attended the 27th Annual conference of the Association of Microbiologists of India held at Nagpur from 20-23 December 1986 and presented a paper entitled "Biodegradation and utilization of cellulosic wastes by a thermophilic fungus *Mucor rufescens* C16"

Mrs P. G. Latha attended the 12th World Orchid Conference at Tokyo, Japan, and the World Orchid Hiroshima Symposium at Hiroshima, Japan, during 18-25 March 1987. She presented a poster session entitled 'Isolation, Purification and Culture of Orchid Protoplasts' at Tokyo, and a paper entitled 'Nutrient requirements of some selected orchids grown *in vitro*' at the Hiroshima Symposium.

Dr K. C. Koshy attended a symposium on "The Biology and utility of wild plants" jointly sponsored by University Grants Commission and Prof. G. L. Shah Commemoration Committee held at Surat in March 14 - 16, 1987 and presented a paper entitled "An addition to the flora of Gujarat State—*Mackenzia integrifolia* (Dalz.) Bremek."

Dr P. N. Krishnan attended a three week training programme on 'Anther Culture' at the Department of Botany, Delhi University, during May 1987.

Dr T. S. Nayar underwent a training programme in Quaternary palynology at Birbal Sahni Institute of Palaeo-Botany, Lucknow from 23-9-1987 to 16-10-1987.

Dr S. Seeni participated in the three week training programme on the 'Genetic manipulation of *Streptomyces*' at the Unit of Genetic Engineering, School of Biological Sciences, Madurai Kamaraj University during November 1987.

Sri P. J. Mathew attended the 'Sastra-87' conducted at the Ayurveda College, Trivandrum on December 18, 1987 and presented a paper entitled "Medicinal plants—Our vanishing wealth".

#### TROPGARDEN FORUM: Seminars

During the Year

<i>Speaker</i>	<i>Date</i>	<i>Title of seminar</i>
Dr Sinclair Mantell (Wye College, London University, UK)	14-1-1987	Morphogenetic studies on selected crops
Dr Andrew Greller (Department of Biology City University of New York, USA)	16-1-1987	A comparison of the forest composition of Sri Lanka and Central America
Dr S. Seeni	18-2-1987	A close look at Orchid protoplasts
Dr A. N. Namboodiri	6-7-1987	Some recent trends in the study of plant sterility
Dr G. Gopalan	20-7-1987	Biochemistry of Protocorm Development
Mr P. C. Binoy	3-8-1987	Introduction to the Medicinal Plant Germplasm of TBGRI

Mrs P. G. Latha	17-8-1987	Some unusual nutrient additives for protocorm growth and differentiation in orchids
Mr P. J. Mathew	31-8-1987	Problems and prospects of screening plants for anticancer active principles
Dr T. K. Abraham	5-10-1987	Biodegradation and utilization of cellulosic waste materials by thermophilic microorganisms
Mr N. Mohanan	19-10-1987	Role of trees in landscape designing
Mr C. Sathishkumar	24-10-1987	Images of Sikkim
Miss C. G. Sudha	2-11-1987	Berberine synthesizing plants and their relevance to tissue culture
Dr K. C. Koshy	23-12-1987	A country report on Bamboos in India

#### METEOROLOGICAL OBSERVATION AT THE GARDEN SITE

Meteorological data for the year 1987 viz. monthly total rainfall, total evaporation, average R. H. and average maximum temperature are presented in the figure given below. Salient features included lack of rainfall in the months of January and February, higher average temperatures and higher rainfall compared to 1986. While the rest of the state and the country at large experienced one of the worst drought of this century, both the monsoons were favourably disposed towards the garden site.

**METEOROLOGY DATA**

<i>Month</i>	<i>Precipitation*</i> <i>mm</i>	<i>Evaporation*</i> <i>mm</i>	<i>Maximum temperature</i> <i>°C**</i>	<i>Relative humidity</i> <i>%**</i>
January	—	170.3	33.7	65.7
February	—	165.7	34.6	64.9
March	68.5	166.6	35.9	62.2
April	209.0	142.4	34.6	77.4
May	295.0	149.3	34.0	78.6
June	402.0	72.3	30.6	83.9
July	97.0	97.5	31.3	80.7
August	352.0	88.1	30.3	85.5
September	501.0	94.4	31.7	82.6
October	400.4	81.9	30.9	88.1
November	155.0	94.0	31.5	82.7
December	277.4	104.2	32.1	82.4
<b>Total</b>	<b>2757.6</b>			

\* Total of the month

\*\* Monthly Average

**CIVIL WORKS****a) Laboratory and Library Complex**

Construction work of the Laboratory and Library Complex which began in December 1986 made steady progress during the

later half of 1987. The building has three separate blocks accommodating laboratories, offices and library with circular stair cases connecting the blocks. The pace of construction was slow in the beginning and in addition to the structural work already contracted for, separate tenders were called for electrical, plumbing, aluminium frames etc and contracts were signed. A committee with the Director, Consulting Engineer, Accounts Officer and Site Engineer was formed and the Committee, in consultation with the contractors, set targets for construction for every two weeks, reviewed the progress biweekly and tried to solve the problems that cropped up. Remarkable progress was made and about 50% of the structural work was completed by the end of the year. Work on electrification, water supply and sanitation were also started by the end of December.

#### **b) Staff Quarters**

The construction of the first stage of staff quarters which began in September 1986 continued throughout the year. By December, Quarters A, B and D as well as community hall and Bachelor's Quarters reached the final stages of construction. As for type C Quarters, structural work was completed by December 1987. Electrical and plumbing works were almost over. Construction of the water tank, flooring and painting were the only items that were pending for completion in staff quarters by the end of the year.

#### **c) Ancillary Facilities**

The second orchidarium which now houses native species was completed by February. A community pot centre for orchids was also commissioned in March 1987.

Construction of a modern Nursery and Potting Shed designed by Mr Roy Bee was started in March 1987 and the facility became operational in August.

#### **d) Roads and Miscellaneous work**

The earth work and metalling of the nearly 2 km long Arboretum Road was completed. With the opening of the road all main parts of the garden became accessible.

Black topping of the main arterial road and the road to the Guest House was taken up in February and was duly completed.

Several minor works including the retaining wall and side steps of the medicinal plant garden were completed.

## ADMINISTRATION

### Staff changes

Sri K. K. Kuttappa Kurup, Accounts Officer returned to his parent department in May and Sri P. Govindan Nair took charge as Accounts Officer in his place in September 1987. As per orders of the Director the new Accounts Officer has been holding administrative charges also.

Sri Jacob Thomas was deputed to the Royal Botanic Gardens, Kew, for a one-year, training programme and he left for U.K. in September 1987. Dr G. Gopalan went to West Germany on a Humboldt Fellowship for post doctoral studies in August 1987.

Sarvasri C. Anilkumar, Mathew Dan, R. Rajvikraman, P. C. Binoy, and P. A. Jose, the five trainees who have successfully completed the training course in horticulture took charge as Garden Assistants in May 1987.

### Staff of the Institute

#### Director

Professor A. N. Namboodiri

#### Deputy Director

Dr G. Bhadrans Nair

#### Scientist-in-Charge

Dr. T. K. Abraham

### Research and Development

#### *Plant Taxonomy Division*

Dr T. S. Nayar

Sr. Scientific Assistant

Sri N. Mohanan

Jr. Scientific Assistant

Sri C. Sathish Kumar

Jr. Scientific Assistant

Dr K. C. Koshy

Jr. Scientific Assistant

#### *Herbarium Section*

Sri S. Mukuntha Kumar

Assistant Herbarium Keeper

*Plant Biotechnology Division*

Dr S. Seeni	Scientist
Dr G. Gopalan	Scientist (on leave from Aug. 1987)
Dr P. N. Krishnan	Scientist
Sri P. K. Suresh Kumar	Technical Assistant
Smt P. G. Latha	Scientist
Smt C. G. Sudha	Technical Assistant

*Medicinal Plant Division*

Sri P. J. Mathew	Sr. Scientific Assistant
Sri A. E. Shanavaskhan	Field Assistant (on leave)

*Germplasm Centre and Seed Bank*

Sri Jacob Thomas	Sr. Scientific Assistant
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*Horticulture and Garden Development*

Sri Bejoy Mathew	Field Assistant
Sri C. Anil Kumar	Garden Assistant
Sri P. C. Binoy	Garden Assistant
Sri P. A. Jose	Garden Assistant
Sri Mathew Dan	Garden Assistant
Sri R. Rajvikraman	Garden Assistant

*Library*

Sri K. P. Vijayakumar	Assistant Librarian
Smt V. Sujatha	Jr. Library Assistant

*Artist*

Sri K. P. Pradeep Kumar
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**Administrative Division**

Sri K. K. Kuttappa Kurup	Accounts Officer (up to May 1987)
Sri P. Govindan Nair	Accounts Officer (from September 1987)
Sri K. G. Ajithkumar	P. A. to the Director
Smt. S. Radhalekshmi Ammal	P. A. to the Accounts Officer
Sri R. Muraleedharan Nair	Section 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. Rajalekshmy 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. Mohanachandrakumar	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 T. Bhaskaran	Garden Maistry
Sri K. Selvaraj	Garden Maistry
Sri J. Micheyal	Gardener

*Security Wing*

Sri T. M. Abdul Salam	Security Officer
Sri V. Raveendran Pillai	Asst. 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 S. Viswamparan Nair	Security Guard

*Other Staff*

Sri Lazer Joseph	Night Watchman
Sri M. Bhuvanachandran	Night Watchman
Sri R. Valsala Devi	Part time Sweeper

## IMPORTANT VISITORS TO THE GARDEN IN 1987

Sri K. C. Pradhan, Secretary, Finance & Tourism, Sikkim

Dr Sinclair Mantell, Department of Horticulture, London University, England

Professor S. K. Krishna Swamy, Vice-Chancellor, Madurai Kamaraj University, Madurai.

Sri T. V. Madhusudanan, Inspector General of Police, Kerala State

Mr N. Kaleeswaran, Agricultural Production Commissioner, Government of Kerala.

Mr. Roy Bee, 88 Darley Avenue, Manchester, M121 2GG, England.

Dr Samia Al Azharia Jan, Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), Eschborn, West Germany

Dr Y. P. Nanda, Head, Division of Biological Products Indian, Vety. Res. Inst., Izatnagar, U.P.

Prof. M. K. Prasad, Pro-Vice Chancellor, Calicut University

Sri Uppili Appan, Secretary, Government of Kerala

Sri V. V. Raghavan, Minister for Agriculture, Government of Kerala

Dr T. N. Krishnan, Director, Centre for Development Studies, Trivandrum-11

Smt Sudha Pillai, District Collector, Trivandrum

Sri K. V. Vidyadharan, Member, Board of Revenue, Trivandrum

Dr N. C. Nair, Retd Joint Director (BSI), Shanmugha Vilas, Perunnai, Changanacherry-2

Sri C. J. Mathew, Post Master General, Kerala

Dr P. K. K. Nair, Deputy Director, National Botanic Research Institute, Lucknow.

Sri P. Ramachandran, Chief Engineer, Public Works Department, Roads & Bridges, Trivandrum

Sri S. N. Santha Kumar, Director of Horticulture, Government of Karnataka, Bangalore

Sri W. R. King, Deputy Secretary, Council for the Indian School Certificate Examinations, New Delhi

Sri M. R. V. Thampan, Chief Engineer, K. S. E. Board, Trivandrum  
 Professor R. L. M. Synge, 19 Meddow Rise Road, Norwich, England  
 Mrs Ann Synge, 19 Meddow Rise Rd, Norwich, England  
 Prof. T. A. Davies, Haldane Research Centre, Nagercoil, Tamil Nadu  
 Sri C. V. Padmarajan, Ex-Minister and Ex. President, KPCC  
 Sri Varkala Radhakrishnan, Speaker, Kerala Legislative Assembly  
 Sri K. V. Surendra Nath, M. L. A., Nedumangad  
 Dr A. V. Issaac, M. L.A., Muvattupuzha  
 Sri K. K. Sarin, Director General, Ministry of Surface Transport, New Delh  
 Sri K. R. Chandra Mohanan, M.L.A., Chadayamangalam  
 Sri A. S. Monie, Retd Conservator of Forests, Trivandrum  
 Dr M. Thangavelu, Dean, PSG Institute of Medical Sciences, Coimbatore  
 D Balaraman Nair, Professor of Pathology, PSGIMS, Coimbatore

#### EDUCATIONAL TOURS FROM INSTITUTIONS TO THE GARDEN

1. Lourd Mount School, Trivandrum
2. H. J. A. College, Paravoor
3. Agricultural College, Vellayani
4. N. S. S. College, Nilamel
5. S. D. College, Alleppey
6. S. N. College, Quilon
7. Homoeo College, Trivandrum
8. St. Alphonsa College, Palai
9. Forest Training School, Arippa
10. S. N. M. College, Maliankara
11. Science Forum Students, Nilamel College
12. Bishop Moore College, Mavelikkara

13. Iqbal College, Peringamala
14. Bishop Abraham Memorial College, Kalliooppara
15. Students from Department of Science and Technology
16. Science Club, Attingal Dist.
17. Concordia U. P. S. Peroorkada
18. Botany Department, Calicut University
19. T. T. C. Students from Nanniyode
20. Ayurveda College, Trivandrum
21. Mary Giri High School
22. State Institute of Education, Trivandrum
23. Extension Training Centre, Kottarakkara
24. Central School, Trivandrum
25. Health Department, Kerala State
26. St. Gregorios College, Kottarakkara
27. Village Extension Officers as part of the Training Programme in Social Forestry at the Agricultural College, Trivandrum
28. Engineering College, Trivandrum
29. CPCRI, Palode
30. St. Peter's College, Kolencherry
31. College of Horticulture, Kerala Agricultural University, Mannutti
32. Upasana Academy, Challimukku
33. Department of Horticulture, Agricultural College, Calicut
34. Government Arts and Science College, Calicut
35. St. Alberts College, Ernakulam
36. Y's mens Club of Pathanamthitta
37. Participants of the International Training Programme at C. D.S.
38. Sasthra Sahitya Parishad, Quilon Unit
39. St. Mary's English School, Mullassery
40. D. B. College, Munnar

41. Extension Training Institute, Kottarakkara
42. St. George's High School, Idukki
43. Employees from Kerala Electrical and Allied Engineering Company, Kundara
44. Government H. S. Chithara

### BOOK REVIEW

(From The Bulletin of the Torrey Botanical Club. Vol 174. p. 341-342, 1988)

#### FLORA OF THE TROPICAL BOTANIC GARDEN, PALODE

By T. S. Nayar, K. C. Koshy, C. Satish Kumar, N. Mohanan and S. Mukuntha Kumar. 144 pages. Tropical Botanic Garden and Research Institute  
Rs. 50/-

Palode is a quiet, small town 39 km west of Trivandrum, in the Trivandrum District of Kerala State, India. It sites on the coastal plain 100 m above the level of the Arabian Sea, at the foot of the Western Ghats near the tip of India. The climate is torrid, sub-humid, and subtemperate. The vegetation is primarily epiphyte-laden, liane-festooned forest of two types; a deciduous forest on well-drained uplands, and an evergreen forest in the river valley, with a transition between them. There is also some herbaceous marsh and stream vegetation. The majority of people who inhabit the region grow rice and a great variety of vegetables (including Colocasia, tapioca, okra, breadfruit, and jack), fruits (banana, mangosteen, durian, and rambutan), and spices (black pepper, chillis, cloves, cinnamon, and cardamom). They speak Malayalam, employ a sanskrit-derived script, and worship Hindu deities. In most aspects of appearance, food, custom, manner of speech, village architecture, and the arts, they resemble the people of Kandy in the central mountains of Sri Lanka.

Palode was formerly subject to the King of Travancore, the southern of the three kingdoms on the "Malabar Coast" of peninsular India, the other two being Cochin and Malabar. The whole region had long been a centre of world trade and was famous even in Roman times for ivory, tropical hardwood lumber, gold, elephants, peacocks, monkeys, spices, and textiles. Indeed, it was for a route to the Malabar coast of India that Columbus set sail.

Previous treatments of the flora of this area by Rama Rao (Flowering Plants of Travancore, 1914) and Bourdillon (The Forest Trees of Travancore, 1908), following the initial treatment by Drackestein in 1686-1744. Now a splendid team of young scientists, under the direction of Professor A. N. Namboodiri, (Ph.D., Uni. of Michigan) has produced a modern flora for their new home, the Tropical Botanic Garden and Research Institute, on 121 hectares just west of the town of Palode. The Institute specializes in the areas of plant taxonomy and biotechnology (mainly orchid hybridization and propagation). In developing this flora the authors drew upon the earlier treatments, as well as on the first five volumes of "The Revised Flora of Ceylon" that have been published by the Smithsonian Insitution.

This is a paleotropical flora and is represented by many genera and families that will be unfamiliar to American botanists who have not done field work in south Florida or in Latin America: Sapotaceae, Lecythidaceae, Arecaceae, Pandanaceae, Dipterocarpaceae, woody Euphorbiaceae, arborescent Celastraceae, Gnetaceae, etc. Some families such as Dipterocarpaceae, Pandanaceae, and Gnetaceae are not native to the neotropics. Nevertheless, there is much to marvel over in reviewing this list of plants, for there are a wealth of native orchids represented, including *Bulbophyllum*, *Cymbidium*, *Vanda*, *Vanilla*, and *Dendrobium*; some commercially important native taxa, such as *Cinnamomum verum* (true cinnamon), *Piper* (black pepper), *Myristica* (a nutmeg), *Mangifera indica* (mango), *Begonia*, *Azadirachta indica* (neem), *Equisetum*, *Selaginella*, as well as *Psilotum nudum*, and a wealth of ferns. Other plants of interest in the flora of Palode are: *Bombax ceiba*, which produces magnificent red flowers that cover the leafless tree in January; *Callicarpa tomentosa*, a tree; also *Calamus* (rattan), *Desmodium* spp., *Dioscorea* spp., *Diospyros ebenum* (ebony), *Garcinia gummi-gutta* (mangosteen), *Jasminum* (jasmine), *Lagerstoremia* spp., *Olea dioica* (an olive), *Pandanus* (screw-pine), *Rauvolfia serpentina*, and *Zingiber* (a ginger).

All of the authors have received their education in India and this work attests to the competence of their training...

(By Andrew Greller, Queen's College, City University of New York).

*PAPHIOPEDILUM FAIRRIEANUM*

**Fairrie's Thousand Pound Lost Orchid**

*Paphiopedilum fairrieanum* has many a story to tell. It is a new comer to Kerala but that is not all. Native of an entirely different climate and habitat of Arunachal Pradesh, Sikkim and Western Bhutan and occurring at elevations between 1300-3000 m., we had very little hope of bringing this species into bloom in TBGRI where the elevation is only about 50 m. Private collectors in Trivandrum rarely had the chance to grow lady's slipper orchids, as the genus *Paphiopedilum* and related ones are popularly called, in their nurseries and the persons who could get them in flower are rarer still. Our *Paphiopedilum* spp. which came from Shillong and Kalimpong were not willing to produce flowers for many years in the new home but after repeated trials it bloomed this year.

Originally described by John Lindley in 1857 and named in honour of Mr. M. Fairrie of Liverpool, in whose collection it first flowered in Europe, *Paphiopedilum fairrieanum* then became lost to cultivation for many years. In 1905 when only one plant existed in England, it was rediscovered after a reward of £ 1,000 had been offered by Mr. Frederick Sander, a leading orchid nursery man of his day. In a matter of years this species became one of the most popular orchids.

