

CHAPTER-III
SUMMARY OF MAJOR ACHIEVEMENTS
DURING 1999-2000

Highlights of the activities undertaken and research findings made by the Council and its Institutes during the year are as follows :

Forest Research Institute, Dehra Dun

- O A substitute of pectin from *Cassia tora* seed gum used in food industry was identified. A process of making this substitute was standardized and patent of the same was filed.
- O Adhesives to be used in plywood industry were prepared from tannins of *Uncaria gambier* and *Acacia catechu*.
- O Methods were standardized to isolate dyes from *Shorea robusta* (bark), Lantana (leaves) and other species. Three pure compounds namely ginkgetin, sequoiaflavone and apigenin neohesperidoside (a new compound) were isolated and characterized from the medicinally important *Cephalotaxus harringtonii* var. *harringtonia* leaves.
- O Physical and mechanical properties of timber species, viz., *Ailanthus excelsa*, *Salix alba* and *Paulownia fortunei* have been evaluated and classified for different end uses on the basis of their strength properties.
- O More than 150 nitrogen fixing species distributed at various altitudes in Himalaya were identified on the basis of the presence of nodules and nitrogenase activity. These species can be used for afforestation/ reforestation of degraded sites.
- O A method for obtaining high yield pulp from *E. tereticornis* using OPP and OHP was developed. This method is more environmental friendly than the conventional ones.
- O A method was standardised to isolate the bioactive compound 10-deacetyl baccatin-III (.01-.02%) from *Taxus baccata* needles.
- O A cheaper adhesive for use in plywood industry was developed from naturally occurring material like CNSL oil.
- O An efficient and versatile stalk puller was developed to eradicate lantana weed.
- O Two implements viz. Knife and aggressive tooth pattern type weed-clearing tool have been developed with improved steel and design.
- O About 2100 wood samples were examined and identified as received from various Govt. Deptts., Public undertakings, CBI/Police Deptts.
- O Short Term Training Courses on more than 10 subjects relating to forestry were organised during the year in which officials of the Govt. of India, the state forest departments, public sector undertakings as well as representatives from various industries participated.
- O Transfer of Technology on wood bending through NRDC, New Delhi was effected.

O Training courses on 'Trap Tree Operation' for control of Sal borer for SFD officials, (short term course) were organised attended by 300 officers.

O The technology for the production of katha from *Uncaria gambier* was sold to the following industries:

M/s Mantu Khair Industries, Rangia, Assam – 10.00 lakh.

M/s Shiv Shakti Industries, Hanuman Garh (Rajasthan) – 10.00 lakh.

M/s TVL Hi-Tech Polymers Pvt. Ltd., Dehra Dun – 10.00 lakh.

M/s T.K. Products Ltd., Tilak Bazar, New Delhi – 05.00 lakh.

A technology to prepare alpha-cellulose (purity 99.5%, brightness>80%) of different degree of polymerisation (800-3000) was developed for Gujrat Alkali & Chemicals Ltd., Vadodara.

Institute of Forest Genetics and Tree Breeding, Coimbatore

- The protocol for micro-propagation of *Oxytenanthera stocksii* and benchscale production using macro-proliferation methods has been developed and sent to NRDC for patent assistance. The putative hybrids of *E. citriodora* and *E. torelliana* has been successfully micropropagated using axillary buds.
- Regeneration protocol was developed for *E. tereticornis* through somatic embryo-genesis and organo-genesis from seedling explants. In *Casuarina equisetifolia*, caulogenosis was obtained from mature needles and various seedling explant sources like hypocotyl tissue, cotyledonary leaves and epicotyl tissue. Micropropagation techniques were adopted for production of quality planting stock in teak using seeds from CSO.
- Seed collection, processing, storage, pretreatment requirement, and germination methods were standardised for *Aegle marmelos*, *Syzygium cumini*, *Feronia elephanta* and *Strychnos nux-vomica*.
- Various Agroforestry models like agri-silviculture, silvi-horticulture, and silvi-pasture were demonstrated in farmers' field. The most productive combination of species were Teak, Casuarina and Casuarina-Moringa.
- Information on 17 endangered and endemic plant taxa of Western ghats has been collected as a part of creating a database on bio-diversity.

O A technology to prepare alpha-cellulose (purity 99.5%, brightness>80%) of different degree has been developed.

O The Institute has organised under UNDP project, 13 training programmes. About 590 participants (students, farmers, lectures, village womens, tribals, range officers, forest guards and foresters) attended the training programs. The subjects covered during the training are importance of tree planting, tree hybrids, vegetative multiplication, nursery techniques, seed collection and storage method, collection of medicinal plants, bio-fertilizer and pest disease management”.

Institute of Wood Science and Technology, Bangalore

Operation of solar drying kilns for longer hours was improved by use of blackened concrete brick, when used as heat sink within the kiln.

- Timber pre-treated by simple brush coat of inorganic salt solution on wood was used to improve performance of synthetic enamel paint and polyurethane paint under outdoor exposure.
- Reaction parameters were standardized for imparting thermoplasticity to wood.
- Wood fibres grafted with maleic anhydride modified poly propylene was used to increase compatibility within polypropylene matrix.
- Modification of aroma by simple chemical reactions was taken up for value addition and better utilization of *Eucalyptus* hybrid oil, which has very limited industrial use. Preliminary screening of four modified products prepared from *E.* hybrid oil in perfumery industry indicated that the products of epoxidation and oxidation are of perfumery value.
- Scientific debarking was devised on Jigat leaving one or two strips of bark intact along the trunk of the tree and spraying the tree with insecticide/fungicide. Regeneration of bark (Jigat) was also found to be satisfactory (90%) with least damage to standing trees.
- Eight identified provenances of *Santalum album* are being maintained for *in situ* conservation in collaboration with respective State Forest Departments.
- A method to prevent leaching of colouring matter from *Pterocarpus marsupium* wood by chemical treatment with either i) $\text{CuSO}_4 + \text{K}_2\text{Cr}_2\text{O}_7$ or ii) $\text{ZnCl}_2 + \text{CuCl}_2 + \text{K}_2\text{Cr}_2\text{O}_7$ or iii) CrO_3 was devised
- The host range of the cerambycid beetle, *Batocera rufomaculata* was documented. *Ceiba pentandra* has been found as a favorable host of this pest.
- Standardized physico-chemical conditions for high frequency multiple shoot induction and further multiplication of *in vitro* differentiated shoots from mature and selected clones.
- Ideal size and type of stem cutting, media, auxin (IBA, NAA, NOA), age of cutting for high frequency root induction for vegetative propagation of Teak was established.
- In *Eucalyptus tereticornis*, macropropagation technique was perfected by using soft leafy stem cuttings, obtained from the stump sprouts of VMG of *Eucalyptus*.

Tropical Forest Research Institute, Jabalpur

- Cost effective tissue culture protocol has been developed for *Dendrocalamus strictus* which is very difficult to root by conventional method of vegetative propagation.
- Tissue culture protocols have been developed for *Bambusa vulgaris* and medicinal plant - *Kaempferia galanga*.
- While analysing quantitative genetic characters in teak, it was established that 3 parents viz., ORPUB-1, ORPUB-4 and ORPUB-5 elite clones were the best general combiners for use in controlled breeding programme.
- The first ever progeny trial was established in *Albizia procera* at Amgagon, Maharashtra comprising 30 families with five replications and ten individuals within families for future breeding population with selected segregants.

- By utilizing the idle space in paddy crop and teak plantations, cultivation techniques of paddy-bach and Teak-safed musli have been standardised and extended. These models generate sustainable additional income to the growers without affecting the yields of main crops.
- Technological packages for the rehabilitation of coal and iron mine overburdens have been developed and extended.
- The time required for the natural eco-restoration of coal, iron, manganese and lime stone mined areas has been worked out on the basis of physical, chemical, nutritional and biological characteristics.
- For developing effective sink area and green belt in industrially polluted areas, species have been identified, graded and indexed.
- Lime kiln pollution tolerant tree species have been screened on the basis of bio-chemical indicators of species.
- Phyto-chemical formulations prepared using different additives and toxic constituents of *Jatropha curcas*, Parthenium were proved to be effective antifeedant and insecticides against bamboo leaf roller and teak defoliator.
- Chemical and bio-chemical characters imparting resistance to teak, bamboo and *Albizia procera* against their key defoliators have been identified and thereby resistant clones of these species have been selected.
- Nursery techniques of *Albizia procera*, *D. sissoo* and *A. nilotica* have been standardised with respect to root trainers, potting mixture, biofertilizers, optimum time of sowing etc.
- Integrated management packages for diseases of seeds and nursery have been developed with respect to *Tectona grandis*, *G. arborea* and *Azadirachta indica*.
- *Vitex nigundo* and *Cuscuta reflexa* extracts have been found to control damping off and wilt of *Albizia lebbek* and *Moringa pterygosperma*. Leaf extracts of Marigold has been used to check the growth of decay fungi in wood.
- Defoliator and leaf skeletonizer resistant clones of teak, foliage feeder and leaf roller resistant provenances of *Albizia* and bamboo respectively have been screened and their chemical control methods have also been developed.
- Methodology for identifying indicators for selection of potential JFM sites has been developed.

Institute of Rain and Moist Deciduous Forests Research, Jorhat

- Documentation of pests associated with forest trees in nurseries, plantations and natural forests of Northeast has been completed. It contains various informations on the distinguishing characters, distribution, host plants, nature of damage, damage potential, life cycle, and control measures of the insect pest.
- Works on the control of *Calopepla leayana* using pathogens, parasites, and predators has been completed.

- Studies on the micro-faunal component of litter eco-system and their changes in relation to shifting cultivation has been completed.
- A total of 60 (sixty) phyto-pathogenic fungi have been recorded in different forest nurseries, plantation and natural forests of Northeast India. Nine comprise new fungi-host combinations from North-East India and the *Scaphidium* sp. is a new host in *Bambusa balcooa*. This record is also a new addition to fungal flora of India.
- Various fungicides were tried for the control of leaf blight of *D. retusus* and of *A. mangium*. Bavistin and extract of *Sterostiphnos unitus* were found to be effective against leaf blight of *D. retusus*. Indofil M-45 and extract of *Ocimum sanctum* was found to be the most effective against leaf blight of *A. mangium*.
- Vegetative propagation of *Gmelina arborea* through grafting has been standardised through rooting of single nodal cuttings.

Tropical Forest Research Institute, Jodhpur

- In the agroforestry experiments, 277 stand density per hectare was found optimum for *P. cineraria* and *Tecomella undulata*. In another experiment on fodder and fruits species viz. *E. officinalis*, *C. mopane*, *H. binata* and *C. mopane* was found to be the best species for fodder and fuel production.
- On semi stabilized dune, *A. tortilis* and *Calligonum polygonoides* were found to perform best. Performance of *Prosopis juliflora* was best only on bare dune.
- Quantity of water per irrigation was found to be more important than frequency of irrigation. Spot method of irrigation with 45 mm of water resulted in 6-9-fold increase in biomass production in *E. camaldulensis*, *A. nilotica* and *D. sissoo*.
- VAM inoculation with the combination of *Rhizobium* in the nursery was found to be very effective on *Acacia nilotica*, *Albizia lebbek* and *P. cineraria* growth.
- *Capparis decidua* has been investigated for its various biocidal activities and its antifeedant and aphicidal efficacies have been established.
- It was found that a farmer can earn Rs. 55000 or more from the fifth year onwards by planting 100 trees per ha of *Punica granatum*, *Zizyphus mauritiana*, *Carissa carrandus*, *Cordia myxa* and *Embilica officinalis* (20 each) on his farm land in arid regions.
- 175 ha of Seed Production Areas (SPA). 55 ha of SSO, 5ha of VMG and 29 ha of CSO of different tree species have been established in Rajasthan and Gujarat.
- In vitro protocol for *Ailanthus excelsa* and *Acacia nilotica* completed.
- Detailed studies on the bionomics and management of Rohida defoliator, *Patialis tecomella* have been completed. It was ascertained that the pest belongs to a new species *tecomella* under a new genus *Patialis* and sub-family Cioninae of the family Curculionidae. A checklist containing 64 insect pest species on rohida, *Tecomella undulata* including 24 new pest records has been prepared.

- Detailed studies on the bio-ecology of insect pests of *Prosopis* spp. with special emphasis on the management of gall forming insect have been completed. It was ascertained that in lopped trees higher production of pods and lesser formation of galls take place.
- *Oxyrochis tarandus*- a sapsucker was recorded damaging green pods of *Prosopis cineraria* and *P. juliflora* in the field conditions for the first time from India.

Himalayan Forest Research Institute, Shimla

- Identification of insect-pests responsible for large scale mortality in Chir Pine (*Pinus roxburghii*) was done and assessment of causes leading to its proliferation was completed.
- A planting stock of about 8,000 ETPs of Poplars was raised in Paonta Valley under UNDP Programme and distributed amongst the farmers. Under Environmental Awareness Programme, 200 students of 11 different schools of Distt. Shimla were taken to the field and apprised of the forestry conservation and related practices.

Centre for Forestry Research and Human Resource Development, Chhindwara

- Essential oils were extracted from the medicinal plants e.g. *Ocimum*, *Cympopogon*, *Mentha*, and fractionated by using different solvent systems.
- Locally fabricated low cost mist unit has been developed.
- Prophylactic application of phorate 10G @ 50 gm followed by Dimethoate 30 E.C. 0.03% was prepared and found to be highly effective in reducing pest/weevil infestation and enhancing the quality and quantity of *Terminalia bellirica* seeds.

Centre for Social Forestry and Eco-Rehabilitation, Allahabad

- For afforestation of waterlogged sodic site, suitable planting technique has been developed.
- Efficiency of biofertilizers has been studied on important forestry species (*Dalbergia sissoo*, *Acacia nilotica* and *Casuarina equisetifolia*) at nursery level.