

CHAPTER-VI

INSTITUTE OF RAIN AND MOIST DECIDUOUS FORESTS RESEARCH JORHAT

Institute of Rain and Moist Deciduous Forests Research, Jorhat, established in April 1988, covers the forestry research needs of the North-Eastern States of Assam, Meghalaya, Arunachal Pradesh, Nagaland, Manipur, Tripura, Mizoram and Sikkim. The research priority areas are ecology and conservation methods of rain forests, control of shifting cultivation, silvicultural characters of rain forest species, seed characters, germination and group characters of important species, soil characteristics of humid forest, role of mycorrhizae and micro-organisms, chemical characterization of forest produce, watershed management etc.

Major research highlights of the Institute during the year are summarised as follows :

FOREST ENTOMOLOGY

Severe stem borer infestation and incidence of defoliations were observed in *Paulownia fortunei* and *Anthocephalus cadamba* respectively in experimental plots at New Sonowal, Hollongapara, Assam. Entrance holes of the borers in all the trees were near the base of the stem surrounded by mass of fine particles of chewed wood and excreta along with resin like material from the bark. Similar holes with said wood refuse mixture were also observed in the upper regions of the growing stem, particularly where the branches arise.

A. cadamba trees in the same plot were also infested with defoliator *Epiplena quadricaudata* (Lepidoptera: Epiplenidae). The larvae indiscriminately feed on the leaves leading to defoliation.

Systemic insecticide Nuvan at 0.1% was tried against the cerambycid borer in *P. fortunei*. The solution (0.1%) was injected into the holes and the mouth of the holes were sealed with mud. The entire stem was also sprayed with Nuvan. *A. cadamba* trees were treated with 0.05% Cypermethrin. Immediate knockdown effect was observed on insects on all treated trees.

Studies were carried out to understand the changes in the litter microfauna in fallow areas as well as in areas where shifting cultivation is practiced. The collembolans and acarine populations were always characteristically dominant ranging from 50-60% of the total microfaunal population. Shifting cultivation has completely disrupted the microfaunal population. For example, collembolans which were at 45% while land was fallow had declined to 0.5% after burning and cropping. On the whole, the results show qualitative and quantitative increase in the soil and litter fauna with the increase in the fallow period.

During a survey in 1995 in Hologapara Reserve Forest, Meleng, Jorhat, two different types of plant galls were found on *Styrax serrulatum* (in Assamese : Kolioid). The galls as their shape indicate, known as "Banana gall" & "Coral gall", are caused due to infestation of two different species of aphids on the leaf-buds of the plant. So far this was a new record from Assam.

Natural enemy complex and associated insects

1. **Lepidopteran predator:** Several lepidopteran caterpillars of *Conobathra aphidivora* (Lepidoptera: Pyralidae) were found inside both the galls. The larvae make silken tunnels and

hide inside even during feeding on aphids. These larvae are the most effective predator of gall-aphids. Pupation occurs inside the silken network. Adult moth emerges inside and comes out through the gall opening.

2. **Coleopteran Predator:** Few larvae and adult beetles were found feeding on aphids inside the coral gall. Pupation occurs among the aphid colony and even adults mate in the gall and lay eggs. The unidentified beetle is minute and belongs to family Coccinellidae.

This study is significant in terms of exploration of North-East Indian Forest fauna. The main achievements of the investigation were knowledge of detailed structure of galls; new, undescribed aphid species and morphs; and natural enemy complex. The aphids may exhibit alternation of generations between *Styrax* and some other woody plants or weeds. Extensive survey may unveil the complete life-cycle of the aphids.

SHIFTING CULTIVATION

Shifting cultivation or Jhuming is an old type of cultivation and still favoured by the tribal people of North-East India. It is damaging to the natural ecosystems of the tropical rain forests. Repeated burning of vegetation at short intervals leads to inhibition of biological activities, loss of diverse vegetation, and degradation of soil. Studies were undertaken to find out the changes occurring during shifting cultivation and compare the results with the nearby natural forests in different localities of North-East India. Four localities, namely, Chilonijan (Karbi-Anglong) in Assam, Burnihat in Meghalaya, Khonsa in Arunachal Pradesh and Simsangiri (Garo Hills) in Meghalaya were selected. In all the localities which had remained fallow for 1,5,10,15 and 20 years were marked and detailed studies on vegetation analysis and physico-chemical properties of soil were carried out.

The dominant species in different fallow plots in Chilonijan were *Lantana camara* with Important Value Index (IVI) in 5 yrs, 15 yrs and 20 yrs old communities as 120, 49 and 120 respectively. This was followed by *Eupatorium odoratum* with IVI 30 in 5 yrs, *Thysanolaena maxima* with IVI 36 in 10 yrs, and *Croton caudatus* with IVI 56 in 20 yrs fallow. The salient features of fallow land in Chilonijan was appearance of *Dendrocalamus hamiltonii* in 10 yrs fallow land and *Melocanna beccifera* in 15 yrs and 20 yrs fallow. However, in the natural forest, the dominant species were *Ficus* sp. followed by *Dillenia indica* and *Lagerstroemia speciosa* with high IVI value.

In Burnihat, the dominant species was *Lantana camara* followed by *Thysanolaena maxima* and *Musa* sp. However, natural forest at Burnihat shows *Dillenia pantagyana* with IVI 24 followed by *Sterculia villosa* and *Ficus* sp.

At higher altitudes, in places like Khonsa, post harvest jhuming fallow of about 5 years was dominated by dense grassy vegetation and few species of small tree like *Mallotus philippensis*. The dominant grass were *Oplismenus compositus* followed by *Borreria articularis* and *Ageratum conyzoides*. In 10 yrs fallow, *Macaranga*, *Thysanolaena maxima* and *Eupatorium odoratum* were found to be dominant.

Occurrence of *Lantana camara* and *Thysanolaena maxima* in all the fallows of selected sites was found to be significant.

Available phosphorus build up increases in 10 & 15 years fallows. Total nitrogen decreased after burning (2.8% to 2.27%) in the jhum plots. Exchangeable potassium, calcium and magnesium significantly increased after burning and gradually decreased during cropping



Cerambycid larva inside the tunnel



Leaf folder infestation on
A. cadamba leaf



Pupa of *Conobathra aphidivora*
(P) in the coral gall



Coral gall (A) and Banana gall (B)
on *Styrax serrulatum*

period. From 5 year fallow onwards, build up of potassium was noticed while calcium and magnesium remained unchanged.

Comparison of microfungi data among these sites indicated a relatively higher number of fungi in natural forests than fallow lands. Species of *Aspergillus*, *Fusarium*, *Penicillium*, *Pythium*, *Rhizopus* and *Torula* were dominant fungi groups in all the sites of shifting cultivation as well as natural forest.

FOREST PATHOLOGY

11 (eleven) forest nurseries, 4 (four) plantations, and 2 (two) reserve forests were surveyed for the study of VAM fungi. A record number of VAM spores were found in the rhizosphere soil of *Gmelina arborea* (10,862 VAM spores/50g soil), *Dalbergia sissoo* (6,786 VAM spores/50g soil) and *Ceiba pentandra* (9,305 VAM spores/50g soil) raised in SCCP Nursery, Social Forestry, REC Campus, Silchar, Assam.

VAM association in *Bambusa tulda* and *Bambusa pallida* of Social Forestry, MFP Plantation, Chibra, Ri-Bhoi, Meghalaya and *Melocanna baccifera* of Jeypore Réserve Forest, Block No.236, Dibrugarh Forest Division, Assam shows maximum percentage of VAM infection in *Melocanna baccifera* (40.3%) followed by *Bambusa tulda* (23%). *Bambusa pallida* showed only 9% of VAM infection.

Studies on the disease of forest tree species show that in the nursery (UNDP nursery, SFS College campus, Burnihat Assam) leaf spot of *Anthocephalus chinensis* and rust of *Dalbergia sissoo* were common. Leaf spot of *Populus gamblei* caused by *Cercospora* sp. and Tar spot of *Chinamomum zeylenicum* were prevalent at Silvicultural Range Nursery, Basistha, Guwahati. Leaf spot of *Tetrameles nudiflora* caused by *Cercospora* sp. was recorded from MFP Plantation, Chibra, Meghalaya. Besides, bamboo blight, a serious problem of *Bambusa balcooa* plantation, was found to be caused by *Fusarium equiseti*.

TREE BREEDING AND PROPAGATION

Calamus tenuis (Local name : Jati Bet) is an economical plant in Assam, mass propagation of which is one of the research priority. Conventional vegetative propagation methods such as cutting, grafting and layering are not possible because solitary stemmed rattan *Calamus tenuis* has single growing apex. Tissue culture of palms in general is extremely difficult and often very slow as compared to other species.

Seeds of *Calamus tenuis* were collected from Holongpara Reserved Rain Forest in Jorhat District, cleaned in distilled water and then sterilised in 0.01% Mercuric Chloride. Embryos were rescued in sterile environment and were subjected to fiftytwo treatments with single or different combinations of growth regulators. The cultures were incubated and allowed to grow in aseptic environment and observations were made.

Great variation in different type of developing tissues was observed in the screened experimental set. Amongst all, multiple shoot formation was the most suitable and prominent feature for furtherance of the propagation.

SILVICULTURE AND MANAGEMENT

Surveys were undertaken to identify seed production areas in natural forests as well as plantation. At New Sonowal and Sibsagar (Assam), plantations of *Tectona grandis* and *Dalbergia sissoo* were identified. Natural forest area near Dergaon (Assam) was identified for

seed production of *Lagerstroemia speciosa*. Seed characteristics were studied and preliminary observations on seed weight were noted.

Germination tests were conducted under laboratory conditions with cold water and boiling water treatments. *Dalbergia assamica* showed maximum germination of 66.8% in 24 hours cold water treatment and a minimum of 55.2% in 48 hour cold water treatment.

Topographical Tetrazolium test was carried out to see the viability of seeds. *D. sissoo* showed a maximum viability of 97% followed by *D. assamica* (85%).

EXTENSION

Initiatives towards alleviation of poverty and socio-economic upliftment of villages under UNDP project in North-East Indian States were taken through Social Forestry and Agro-Forestry. Ten villages were selected near Jorhat and Burnihat. Information regarding socio-economics of the villages was collected to carry out some beneficiary activities. Seedlings were supplied free of costs for planting on homestead land, agriculture lands, farmlands as well as in the abandoned fields. The selected species are *Artocarpus chaplasha*, *Embllica officinalis*, *Dalbergia sissoo*, *Gmelina arborea*, *Anthocephalus chinensis* and *Moringa oleifera* etc. So far 1076 seedlings/stumps have been supplied to the farmers. Training on VAM and Biofertilizers was imparted to Forest Guards/Foresters and farmers. Under Forestry Extension Programme, technology transfer campaign was organised in some villages and farmers were made aware of the latest technology for sustainable forestry. Establishment of seed production areas of important tree species like *Dipterocarpus macrocarpus* and *Tectona grandis* etc. in association with SFD's is another significant achievement. Efforts are being made to multiply various bamboos and cane species of this region through macro and micro propagation.

Planting stock improvement programme

100 ha. of Seed Production Areas (SPAs), besides Vegetative Multiplication Garden, Clonal Seed Orchards (CSD) and Seedling Seed Orchards will be developed in the North-East by the end of the Project period, i.e., 1998-99. Establishment of SPAs of 20 Ha. of *Terminalia myriocarpa* and *Dipterocarpus macrocarpus* in Arunachal Pradesh and 20 Ha. of *Tectona grandis* in Mizoram is in progress. A temporary Nursery has been started at Jorhat recently to cater to the nursery requirements of the Research Divisions of this Institute.

IDRC project on eco-rehabilitation of Himalayas

Under this project, this Institute has been assigned research work on development of ecofriendly land use alternatives to shifting cultivation in harmony with social and cultural ethos of different tribes. Three typical villages each in the states of Assam and Meghalaya were selected and ground truth information on socioeconomic status of the villagers, extent of shifting cultivation etc. was collected. In these villages, some beneficiaries were also selected and to augment their income, distribution of improved breeds of pigs and chickens has been taken up.

EDUCATION/TRAINING

Training programmes sponsored by UNDP on Seed Orchards and Importance of VAM and Rhizobia Culture in Forestry were organised.

1. July 1996; Assam and Meghalaya. Training and demonstration of Forestry Practices to rural women and tribals.

2. December 1996; Assam, Forest Rangers College, Jalukbari. Training on VAM as bio-fertilizer in forestry, Seed production Areas and Seed Orchards.
3. January 1997; Kolasib, Mizoram. Training on VAM as bio-fertilizer in forestry, Seed production areas and Seed Orchards.
4. March 1997; Jorhat, Assam. Training on VAM as bio-fertilizer in forestry, Seed Production areas and Seed Orchards.