CHAPTER IV
TROPICAL FOREST RESEARCH INSTITUTE JABALPUR

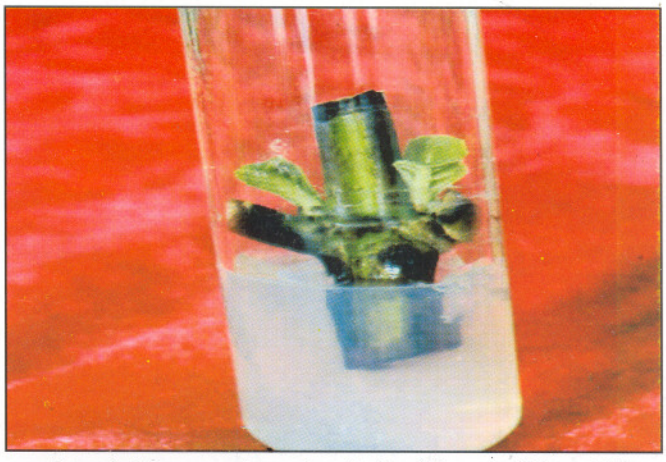
Working as a regional Institute of ICFRE since 1988, TFRI caters to the forestry research needs of four central states of India, viz. Madhya Pradesh, Chhattisgarh, Maharashtra and Orissa. Thrust areas of research in the institute relate to non-wood forest products, rehabilitation of mined areas and other stress sites, development of and demonstration in agroforestry models, planting stock improvement, developing tissue culture protocols for difficult species of central Indian forests and control of forest diseases and pests. During the recent years, TFRI has established constant liaison with state forest departments, NGOs working in the field of forestry and allied areas, universities imparting education in forestry, and forest based industries.

PROJECTS COMPLETED DURING THE YEAR 2003-2004

Project 1: Developing tissue culture protocols for important forest tree species: (a) Teak and (b) *Gmelina arborea* [020/TFRI-2000/Gen-22/ 2000-2004]

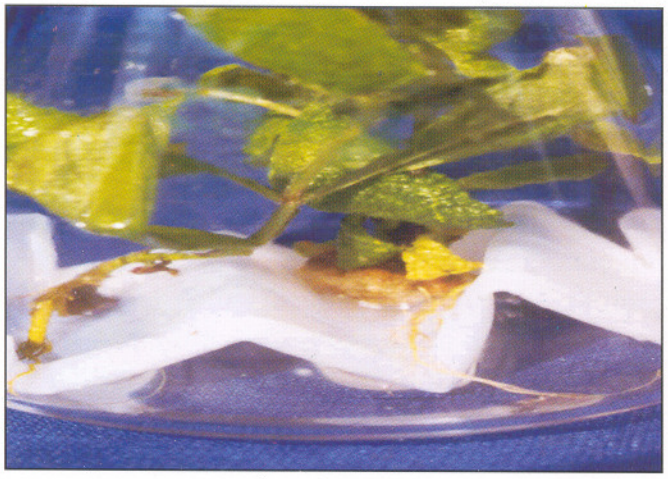
Principal Investigators - (a) Dr Fatima Shirin and (b) Shri Yogeshwar Mishra

Findings: (a) Teak: Nodal segment with axillary buds from mature trees was found to be the most responsive explant for culture establishment. Phenolic exudation, which is a major problem in teak culture establishment, was controlled by pretreatment with 0.1 percent (w/v) solution of boric acid or ascorbic acid. Murashige and Skoogs medium containing 10 μM BA and 1 μM NAA was found to be the best for shoot multiplication. NAA proved to be the most effective auxin resulting in 60 percent *in vitro* rooting. Rooted plantlets (5 and 6 weeks old) were hardened under *in vitro* conditions. Around 60 percent green healthy plantlets were obtained in thermocol cups containing sand soaked with half strength MS medium.



A nodal segment pretreated with ascorbic acid solution with sprouted shoots

4 -5 fold shoot multiplication in mature teak cultures on 10 μM BA and 1 μM NAA

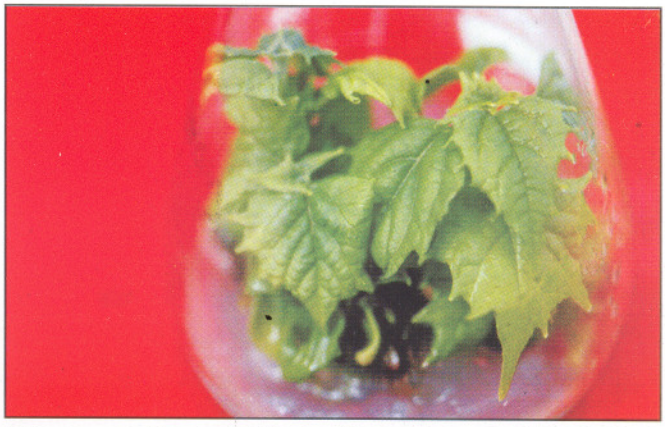


In vitro rooting on liquid MS medium with 10 μM NAA

Hardening of teak plantlets in soilrite

(b) *Gmelina arborea*: The maximum culture establishment of 60 percent was obtained using nodal segments as explants. Standardized 4mg/l silver nitrate as suitable dose for inhibition of callus formation. The maximum shoot multiplication rate of 7 fold was obtained by applying interactions of 1μM BA and 0.1μM Kn. IBA was found suitable source of auxin and its dose of 10 μM resulted in 83 percent rooting. WPM medium was found as suitable basal and its ½ strength further enhanced the rooting percentage up to 86 percent. Developed stepwise hardening procedure for the *in vitro* raised plantlets.

Profuse callus formation without $AgNO_3$



Maximum shoot multiplication rate in combination of different cytokinins

In vitro rhizogenesis with 10 m IBA on ½ WPM medium

Transfer of plantlets after washing with dithane

Project 2: Standardization of improved nursery techniques for different multipurpose forest tree species of central India [024/TFRI-2000/ Silvi-17/2000-2004]

Principal Investigator – Shri R.K. Shrivastava

Findings: The project had two components, viz., (a) Standardization of root trainer seedling production system and (b) Studies on compost production and its evaluation. Potting mixtures (varying ratios of soil, sand and compost) for raising seedlings of nine MPTs (*Albizia lebbek, Dalbergia latifolia, Pterocarpus marsupium, Gmelina arborea, Bombax ceiba, Acacia catechu, Azadirachta indica, Emblica officinalis* and *Pongamia pinnata*) have been standardized. Most suitable sieve sizes for potting mixtures for eight species (except for *D. latifolia)* have also been standardized as 16 to 72 holes mesh. Root trainer cells of 300 ml. have been uniformly found suitable for all the target spp.

Root biomass produced in different sizes of root trainers

Project 3: Biodiversity studies in protected areas: (a) Nauradehi Wildlife Sanctuary, M.P. and (b) Debrigarh Wildlife Sanctuary, Orissa [016/TFRI-2000/BD-16/2000-04]

Principal Investigator - Dr D.K. Shadangi

Findings: Phyto-sociological studies have been conducted in eight compartments of Debrigarh Wildlife Sanctuary with identification of 43 tree species. The common species are *Shorea robusta, Dendrocalamus strictus, Bambusa arundinacea, Aegle marmelos, Buchanania lanzan* and *Emblica officinalis*, etc. Compartments nos. L-11 and L-12 were found to be good habitats of *Chlorophytum tuberosum* (Safed musli) and *Curculigo orcheoides* (Kali musli). Some other compartments were also found to be good habitats of important medicinal plants like *Dioscorea daemona* (Baichandi), *Costos speciosus* (Kevkand) and *Swertia chirata* (Chirayta) etc. In the interior part of the sanctuary (along the bank of Hirakund reservoir), *Vetiveria zizanioides* (Khus) was found to grow in abundance. Study was completed in five ranges of Nauradehi Wildlife Sanctuary. pH of surface soil varies from 5.5 to 6.6; EC ranges from 0.01-0.02 mm hos/cm, organic matter ranges from 0.24 to 3.16 percent; available nitrogen from 250-350 kg/ha.; phosphorus 17-25 kg/ha. and potassium 15-250 kg/ha.

A panoramic view of Debrigarh Wildlife Sanctuary, Orissa

An extensive patch of *Chlorophytum tuberosum* (Safed Musli) in Debrigarh Wildlife Sanctuary, Orissa

Project 4: Establishment of advance centre of NWFPs (in five sub-projects) [022/TFRI-2000/NWFP-19/2000-2005]

Principal Investigator – Shri Hori Lal

Sub-project 19(3): Resource assessment of NWFPs, documentation and development of NWFP information system

Findings: Database has been modified and designed forms. Programmes have been written to interpolate information and performing queries. Data entered for 75 species. Tested the module as complete package.

Project 5: Effect of ageing on gum and resin characteristics in relation to their identification (Species: Gums - *Acacia nilotica, Anogeissus latifolia* and *Sterculia urens*; Resins - *Boswellia serrata* and *Shorea robusta*) [048/TFRI-2002/NWFP-2(8)/2002-2004]

Principal Investigator - Dr Abha Rani

Findings: Tapped and collected samples of gums viz. *Acacia nilotica, Anogeissus latifolia* and *Sterculia urens*. Estimated physico-chemical parameters viz. refractive index, acid value in extracted volatile oil of *Boswellia serrata* and *Shorea robusta*. Estimated moisture and impurities in freshly collected samples of gums. The study could not establish any perceptible / significant change in chemical properties of the gums over a period of time.

PROJECTS CONTINUED DURING THE YEAR 2003-2004

Project 1: Social and livelihood analysis of dependence of tribal people on forests [015/TFRI-2000/Econ-23/2000-2005]

Principal Investigator - Dr Nanita Berry

Status: Data on socio-cultural aspects of Korku tribe and their dependence on forests, from four villages, viz. Kuppa and Handipani of Betul district and Chanagarh and Jollykheda of Hoshangabad district M.P. were collected. Vegetation survey for the availability of NTFPs in the selected villages, revealed that fruit and bark, seed oil as medicine and fuelwood etc. of 38 species are being used by korkus.

Fuel wood and Bamboo used by the Korkus

Fuel wood storage for rainy season by tribal

Involvment of Tribal in NTFPs Selling

A view of primary haat at BETUL

Project 2: Development and standardization of management practices for most promising existing agroforestry systems in central Narmada valley and Satpura plateau agro-climatic regions [043/TFRI-2002/Agro-1(8)/2002-2007]

Principal Investigator – Shri A.K. Sah

Status: OSR trials were established by planting *Gmelina arborea, Tectona grandis* and *Emblica officinalis* and intercropped with Soybean (Kharif crop) and wheat (Rabi crop) in RBD having seven treatments (tree-crop combination and control) in three replications. Observations on growth and yield parameters were recorded. Soil samples were collected and analysed. Studies are based on earlier survey made for most suitable agroforestry system in central Narmada valley region.

Project 3: Economic evaluation of NTFPs in tribal belt of Madhya Pradesh [044/TFRI-2002/Agro-2(9)/2002-2005]

Principal Investigator – Shri A. Argal

Status: Mandla, Betul and Chhindwara, Damoh, Neemuch, Shivpuri, Sheopur, Umaria and Shahdol districts have been identified as potential weekly market for NWFP. Range-wise five important NTFPs have also been identified in the above nine districts. Data are being collected with the help of state forest departments.

Project 4: Collection of ethnobotanical data from various tribes of central India [006/TFRI-97/Bot-7/2000-2005]

Principal Investigator - Dr Rajiv Rai

Status: Ethnobotanical studies were conducted from Gond, Bhariya and Korku tribes in Madhya Pradesh and Gond and Halbi tribes in Chhattisgarh state. Eighty different

ethnobotanical uses of various plants of forest origin have been documented. Twenty two tree species and forty two herbal plants, which are conserved by tribals in sacred groves called Deogudis, have been documented. Traditional herbal healers were interviewed for documentation of ethnobotanical information.

Author collecting ethnobotanical data from Bhariya people village Geldubba Distt. - Chhindwara, Madhya Pradesh

Project 5: Impact of eco-restoration of degraded forests [017/TFRI-2000/Ecol-20/2000-2005]
Principal Investigator - Dr S.K. Banerjee

Status: Studies were conducted in degraded forests where local people through VFC/FPC, have been protecting the area. Three sites have been selected for vegetation survey, study of physico-chemical characteristics of soil, socio-economic survey, etc. Soil samples (surface / sub-surface) collected from protected (target) sites, unprotected degraded sites and also from adjoining natural forests to assess causative factors for forest degradation. The selected sites are – Niwas, Mandla (M.P.), Pali, Korba (Chhattisgarh) and Sambalpur (Orissa). Soil sample are being analysed.

Project 6: Ecological and economic evaluation of teak monoculture and mixed plantations [032/TFRI-(2000)2001/Ecol-2(5)/2000-2005]
Principal Investigator - Dr S.K. Banerjee

Status: Growth and biomass studies were carried out in age series plantations of *Tectona grandis* at Bhariya in Seoni district of M.P. Contribution of different components to total biomass varied considerably. Biomass of teak plants of different age series has been estimated and component-wise biomass (leaf, stem, branch, twig and roots, etc.) was tabulated for interpretation. Phyto-sociological studies were carried out for mixed plantations of different years, viz., 1986, 1993, 1997, 1998 and 1999, respectively.

Project 7: Mass multiplication of *Trichogramma* sp. and their efficacy against key pests of teak forests [018/TFRI-2000/Ento-24/2000-2005]
Principal Investigator - Dr Mohd. Yousuf

Status: Out of 29 Trichogrammatid egg parasitoids, *Trichogramma raoi* were collected, identified, multiplied in the laboratory and were studied against *Eutectona machaeralis*, *Hyblaea peura* and *Corcyra cephalonica*. Viability of *T. japonicum*, *T. raoi* and *T. pretiosum* for storage studied. Studied longevity of parasite and effect on parasitization by using various concentrations of sucrose, glucose, honey and fructose. Field experiments were carried out with 5 *Trichogramma* sp. viz. *T. brasiliensis*, *T. chilonis*, *T. japonicum*, *T. pretiosum* and *T. raoi*, for testing their field efficacy and establishment. Observations have also been taken on the dispersal of all the above *Trichogramma* sp. About 61 lakhs parasitoids (*Trichogramma* sp.) were multiplied for experimental field release.

An experiment has been carried out on the effect of cold storage (4°C) for testing the effect on emergence and viability of *T. japonicum*, *T. raoi* and *T. pretiosum* at intervals of 15 to 60 days at the interval of 5 days with various foods (maize, pearl millet, groundnut, wheat, rice, gram, sorghum and barley) and their

combinations on the development and egg laying of *C. cephalonica* at 24 ± 1° C, 30 ± 1° C and at room temperature. One field experiments *T. chilonis* of 5 *Trichogramma* spp. by releasing at the rate of 1.5 lakh wasps per hectare at selected sites during monsoon season in teak by forest of Mandla Division. *T. chilonis* proved best among 5 sp., showing about 49 percent control of skeletonisation in teak forest.

Project 8: Management of insect pests of forest nurseries in central India [045/TFRI-2002/ Ento-1(5)/2002-2005]

Principal Investigator - Dr N. Kulkarni

Status: Experimental nursery stock of six thousand seedlings of teak, siris, sissoo and aonla was maintained in polybags. In the experimental nursery the most common insect identified is *Holotrichia* sp.

Project 9: Investigation into the nature of inheritance and breeding of teak (*Tectona grandis*) [019/TFRI-2000/Gen-21/2000-2005]

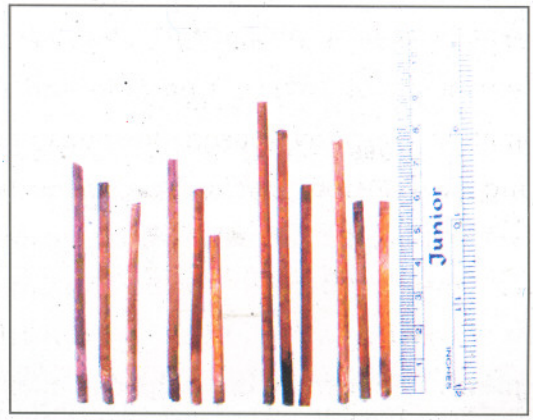
Principal Investigator - Dr P.H. Chauhan

Status: Two advanced generation production populations were established with elite trees identified on the result of earlier genetic testing. One of these populations was established at Nagpur with ten tested clones of Maharshatra origin and the other at Bhubaneswar with 14 tested clones, 13 of these clones are of Orissa origin.

Wood core samples were collected from a 20 years old progeny trial of teak at Dhondatopa, Orissa. Data was generated on important wood traits including specific gravity for estimation of genetic parameters. Analysis of variance revealed highly significant variation for heart and sap wood percent and specific gravity at family level.

As many as 12 parents showed positive gca (general combining ability) effect for specific gravity, which is the most important wood property. Parents ORPUB 2 and ORPUB 22 have been found to be the best general combiners for this trait. Five parents exhibited positive values of gca for at least five traits studied, indicating constellation of additive genes. It is, therefore, suggested that these parents may be used in specific breeding programmes.

General view of a progeny of teak



Variation among families for heart and sap wood percentage

Project 10: Studies on differential adventitious rooting response vis-à-vis clonal propagation of economically important forestry species [038/ TFRI-2001/Gen-2(4)/2001-2005]

Principal Investigator - Dr S.A. Ansari

Status: Rooting response of semi-hardwood cuttings (in relation to PEG induced water stress) and sprout cuttings (in relation to water stress regimes) was studied employing various phytohormones (IAA, IBA, NAA and Thiamine HCl) or doses (0, 2.5, 5.0, 7.5 and 10.0 mM) of selected single phytohormone (Thiamine HCl / IAA) and their all possible interactions as quick dip treatment. The results of these studies indicated that a moderate water stress is beneficial for adventitious rhizogenesis. Successful adventitious rooting (75 percent) of sprout in *Gmelina arborea* emerged as an efficient procedure for cloning of mature ortets. Air layering experiments were conducted in about 7-10 years old plantations of *Anogeissus latifolia, Boswellia serrata, Dalbergia latifolia, Dalbergia sissoo* and *Gmelina arborea* with different doses of auxins, thiamine and their combinations in rainy season. Response of air layering in five tree species was found to be highly variable, out of which only *Boswellia serrata* and *Dalbergia sissoo* responded positively with very high adventitious rhizognesis. Treatment of IBA helped in attaining up to 95 percent plantlet production in *Boswellia serrata* and 70 percent in *Dalbergia sissoo.*

Semi-hardwood cuttings of *Dalbergia latifolia*

Air-layered plantlets of *Boswellia serrata*

Rooting in sprouts of *Gmelina arborea*

Project 11: Germplasm conservation and investigation on inheritance pattern of *Gmelina arborea* [040/TFRI-2002/Gen-1(5)/2002-2005]
Principal Investigator - Dr P.H. Chauhan

Status: Open pollinated seeds from 54 phenotypically selected trees were collected and preserved. Systematic surveys were undertaken in forest areas of Chhattisgarh and Maharashtra states to identify and mark candidate plus trees. A total of 46 CPTs were selected and marked from eight locations. Along with each CPT, observations on growth, form and health were also recorded for five equally good trees in their vicinity employing check tree method. Six locations of Jashpur (CG) have given 29 CPTs, while one location of Katghora has provided 12 and another single location of Sawantwadi (MS) has contributed 5 CPTs.

Project 12: Evaluation of various NWFP species for saponin potential and their value addition [021/TFRI-2000/Chem-18/2000-2005]
Principal Investigator - Ms Neelu Singh

Status: Isolated and estimated saponin glycosides from *Jatropha curcus* seeds and *Chlorophytum borivillianum* tubers in different quarters and physico-chemical properties were determined. Assessed biological activities of saponin glycosides against insect pests viz. *Triboleum castaneum, Callosobruchs chinensis, Rhipicephalus sanguineus*; fungi, viz. *Aspergillus flavus, Fusarium oxysporum* and weed *Echinochloa colonum*.

Project 13: Establishment of advance centre of NWFPs (in five sub-projects) [022/TFRI-2000/NWFP-19/2000-2005]
Principal Investigator – Shri Hori Lal

Sub-project 19(1): Germplasm collection, conservation biology, domestication and commercial cultivation of threatened species of medicinal plants of India

Status: Maintained 250 plants of Harra, Malkangni and Guggal in TFRI campus. Estimated bio-chemical parameters in Harra and Malkangani seeds. Collected Harra fruits from Gureghar nursery, Satara (Maharashtra) and Pendra Road, Bilaspur (Chhattisgarh), Malkangni seeds from Damoh and Jagatpur, Amarkantak (M.P.), Mahua seedlings from silviculture nursery, Pune (Maharashtra) and Guggal from State Forest Research Institute, Jabalpur (MP).

Sub-project 19(4): Qualitative and quantitative variations in tree borne oilseeds in central India

Status: Estimated biochemicals viz. toxic fraction of Kusum seed oil, phenolic acids, total phenols, carbohydrates, proteins and tannins in *Garcinia indica, Schleichera oleosa* and *Mesua ferrea*. Surveyed the natural areas of *Actinodaphnae hookeri* at Gureghar nursery, Panchagani in Maharashtra. Collected 25 seedlings each of *Meusa ferrea* and *Garcinia indica* from Dodamarg Range, Samantwadi Division (Maharashtra) and received 1 kg. *M. ferrea* seeds from RFRI, Johrat (Assam). Maintained 525 plants of Kusum and Kokum in TFRI campus.

Sub-Project 19(5): Standardization of methodologies for extraction and value addition of NWFPs providing sustenance to tribals

Status: Estimated acid and water insoluble ash in the mucilage of *Hyptis suaveolens* and *Eulophia nuda* and assessed solubility and swelling power of starch of *Curcuma angustifolia*. Separated and estimated volatile oil and resin contents and impurities in the samples of *Gardenia gummifera*. Starch was

extracted, purified and estimated from the bulbous rootstock of *Curculigo orchioides* (Kali musli).

Project 14: Integrated management of diseases of seeds, nurseries and plantations [035/TFRI-2001/Patho-4(5)/2001-2006]

Principal Investigator - Dr Jamaluddin

Status: Seeds of 13 provenances of *Acacia nilotica* were evaluated for seed associated Mycoflora and *Trichurus spiralis* was found in 6 provenances. Six fungi and one bacterium from *Albizia procera* seeds and ten fungi from neem seeds were isolated and identified. Biocontrol experiments were conducted by using *Trichoderma* spp., PSB and VAM fungi against Fusarium wilt of *Gmelina arborea*. Combinations of rhizobium, Trichoderma, AM fungi were tried against Fusarium wilt of *Dalbergia sissoo* in nursery. The combination of AM fungi, rhizobium and *T. polysporum* was found the best in controlling the disease. *Streptomyces* sp. was successfully used to control wilt of *A. procera, D. sissoo* and *A. lebbek* in nursery. Soil solarization completely eliminated population of pathogens. Nematode and weed populations were also drastically reduced. Germination and survival of *D. sissoo* and *A. nilotica* seedlings in solarized plots increased as compared to non-solarized plots. Extracts of *Eucalyptus tereticornis* and *Azadirachta indica* were found very effective in inhibiting growth of *Fusarium solani* and *F. oxysporum* causing wilt of *D. sissoo* and *G. arborea*. Neem leaves had more pronounced effect in reducing sporulation of both the pathogens.

Project 15: Development of germplasm bank of biofertilizers and field application of effective strains on important tree species [046/TFRI-2002/Patho-1(6)/2002-2005]

Principal Investigator - Dr R.K. Verma

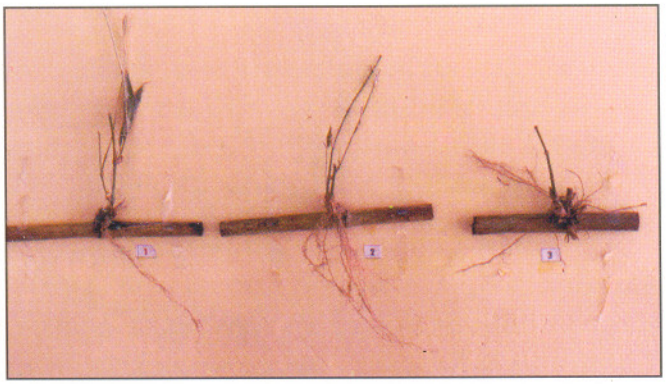
Status: Samples were collected from Nagpur, Nashik, and Ratlam for isolation of different biofertilizer organisms and examined. VAM fungi were isolated and identified from collected samples. Root colonization by VAM fungi were studied in 25 different spp. of bamboos planted at Amarvati in Maharashtra. Economics of application of biofertilizer was calculated for teak experiment conducted at Belkund, MPFDC nursery. Experiments were conducted in root trainers to study the effect of VAM fungi, Azospirillum, PSB, and companion fungi on the growth of Aonla, Neem, Sissoo and Khamer.

Project 16: Standardization of macro-propagation protocol for mass multiplication of bamboo species [042/TFRI-2002/Silvi-3(5)/2002-2005]

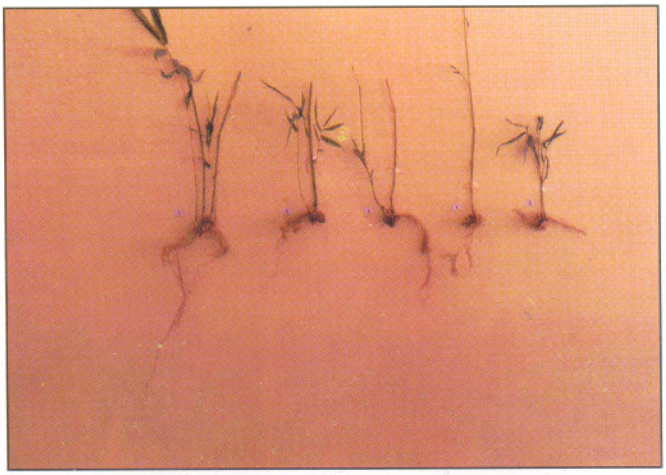
Principal Investigator – Shri N.P.S. Nain

Status: With the aim to identify the best period of adventitious rooting in culm and side branch cuttings of *Bambusa tulda, B. vulgaris* var. green, *B. nana* and *Dendrocalamus membranaceous*, culm cuttings and side branch cuttings were planted in January (winter), April (summer), July (rains) and October. In *B. nana* rooting was found to occur equally in all seasons, adventitious rooting was found to be season-specific in the remaining three bamboos under study. April to July was the best period for their rooting. In case of *Bambusa tulda* adventitious rooting occurred only in April. The efficacy of various auxins and non-auxins in relation to adventitious rhizogenesis was also evaluated. After sterilization in 2 percent mercuric chloride solution for 10 minutes, equimolar (1mM) doses of IAA, IBA, NAA and boric acid were administered to cuttings for 24 h as immersion treatment. The species exhibited differential response to growth regulators for

rooting. Treatment of IAA gave significantly better rooting in *Bambusa tulda* (13 percent) and *B. vulgaris* var. green (58 percent), while IBA and boric acid showed better result for *Dendrocalamus membranaceous* (47 percent) and *B. nana* (54 percent).



Adventitious rooting in B. *vulgaris* (green)



Seasonal rooting - effect of growth regulators

Project 17: Standardization of seed handling and storage techniques for important tree species of central India [041/TFRI-2002/Silvi-2(4)/2002-2005]

Principal Investigator - Shri K.S. Negi

Status: Good seeds of bijasal and khair were collected, stored at two moisture levels and three temperatures. Pretreatment and germination studies of seeds was undertaken with cold and hot water, acid scarification and hormone treatment. Various parameters like purity percentage, weight, initial moisture content, germination percentage etc. have been studied. Seed storage studies on plastic containers, polybags and jute bags were also undertaken for their effect in germination.

Project 18: Investigation on methodologies for determination of elapsed period after felling of teak and bamboo [047/TFRI-2002/NWFP-1(7)/2002-2005]

Principal Investigator – Shri Hori Lal

Status: Estimated crude fibre, ash and moisture contents in bamboo samples collected from Lamta and Lanji, Balaghat district, M.P. The project is proposed for extension by one year.

Project 19: Evaluation of carbon sequestration potential of different silvicultural systems for the management of teak forests in central India [023/TFRI-2000/Silvi-15/2000-2004]

Principal Investigator – Shri S.P. Tripathi

Status: Some data of past harvests have also been collected and extensive survey of literature has been done to assess carbon as it gets accumulated in the soil in different situations. Field observations are in progress.

NEW PROJECTS INITIATED DURING THE YEAR 2003-2004

Project 1: Development of a decision support system for predicting suitability of tree species in various climatic conditions in central India [059/TFRI-2003/Misc-IT-1(1)/2003-2006]

Principal Investigator – Shri Sharad Tiwari

Status: Fifteen species have been identified and information of these species in relation to climatic conditions is being collected. Three

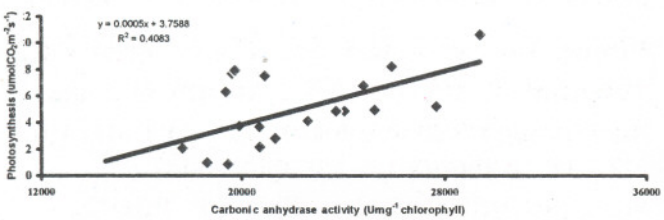
object tables viz. climate, soil and species have been designed for the software.

Project 2: Study of the impact of ban on tree felling in central Indian states vis-à-vis the import of timber [060/TFRI-2003/Misc-Policy-2(2)/2003-2005]

Principal Investigator – Shri Yogesh Dwivedi

Status: Information from state forest departments on the status of ban/ restrictions, if any, on felling of green trees in forests was collected. Detailed information was obtained from the state of M.P. only, while brief information was received from Maharashtra.

Relationship between carbonic anhydrase activity and photosynthetic rate



PROJECTS COMPLETED DURING THE YEAR 2003-2004

(Externally Aided)

Project 1: Studies on carbonic anhydrase and its relationship with photosynthesis and productivity in Teak (*Tectona grandis*) [033/TFRI-2001/Gen-1(CSIR)(3)/2001-2004]

Principal Investigator - Dr S.A. Ansari

Findings: CA activity and photosynthetic rate were studied in twenty-one teak plants of about 10 years ages maintained at vegetative multiplication garden of TFRI, Jabalpur. There was a very strong positive correlation, i.e. r=0.639 ($p<0.01$) between CA activity and photosynthesis rate (Figure). Findings would be of importance to establish correlation between CA and photosynthetic rate in teak trees of different age.

PROJECTS CONTINUED DURING THE YEAR 2003-2004

(Externally Aided)

Project 1: Improving infrastructure facilities for *ex-situ* conservation of rare / threatened plants in the botanical garden, TFRI, Jabalpur [037/TFRI-2001/BD-1(3)/Nov. 2001-Oct. 2004]

Principal Investigator - Dr V. Nath

Status: Germplasm of rare / threatened species, like *Schleichera oleosa, Abroma angusta, Calotropis gigantea, Commiphora wightii, Aristolochia indica, Aloe barbandensis, Chlorophytum tuberosum, Gloriosa superba, Rauvolfia serpentina* and *Thalictrum foliolosum* were collected and maintained in the Botanical Garden (BG). 26 other such plant species of central India have also been grown and maintained. The BG additionally has 78 native plants of different families of central India and 13 species of bamboo that are being maintained in the garden. Modernisations of BG has also been done.

Mappia foetida Endemic plant of Maharashtra

Project 2: Screening and identification of teak of Madhya Pradesh for resistance against major insect pests [034/TFRI-2001/Ento-1(4)/May 2001-Apr. 2005]

Principal Investigator - Dr N. Roychoudhury

Status: The project has been extended by the funding agency by one year. Teak Seed Orchards (TSOs) at Jabalpur, Behrai and Nanditola (Seoni), Madhya Pradesh were assess for damage impact of major insect pests on 150 teak plants of MP origin. Carried out insect survey in teak nurseries, plantations and natural forests. Conducted feeding bioassay experiments against teak leaf skeletonizer on 5 MP teak clones (3 trials) and plus tree progeny of 25 MP teaks. Compiled data on feeding bioassay experiments against teak leaf skeletonizer. Recorded observations on flowering and fruit setting in 4 MP teak and collected their seeds for further observations. Measured defoliation impact of major insect pests on 135 clones of MP teak in TSO, Behrai (Seoni). 18 clones were observed to be less prone to teak leaf skeletonizer.

Project 3: Productivity enhancement – management for people's participation [054/TFRI-2003/Ext-1(FF)(1)/Jan.2003-Sept.2004]

Principal Investigator – Shri R.K. Srivastava

Status: Microplan in respect of one village (Village Forest Committee, Moiyanala) has been prepared; the plan for another village, Barbatti, is being prepared. Entry Point Activities in the form of small works have been taken up in the two villages and necessary planning for establishment of pasture land in Barbatti has been accomplished.

NEW PROJECTS INITIATED DURING THE YEAR 2003-2004

(Externally Aided)

Project 1: Taxonomy and documentation of fungi occurring in the forests of Madhya Pradesh and Chhattisgarh [061/TFRI-2003/Patho-1(CSIR)(7)/Nov.2003-Dec.2006]

Principal Investigator - Dr R.K. Verma

Status: Initial surveys were conducted in the forests of Pipariya, Pachmarhi of west Chhindwara division and in Bori WLS to collect fungi. Collected 85 samples.

Project 2: Studies on cataloguing the genetic variation in teak species (*Tectona grandis* and *T. hamiltonii*) using molecular markers [052/TFRI-2003/Gen-1(DBT)(6)/Apr.2003-Mar.2006]

Principal Investigator - Dr S.A. Ansari

Status: Inter and intra-population genetic variation in *Tectona grandis* and *T. hamiltonii* was observed to catalogue teak genetic resources using DNA markers Random Amplified Polymorphic DNA and Amplified Fragment Length Polymorphism. Laboratories have been established and the required equipments are procured. DNA extraction protocols have been standardized for the purpose.

Project 3: Standardization of production technology of some important medicinal plants under tropical climate of Madhya Pradesh [055/CFRHRD-2003/1(5)/May, 2003-Apr., 2006]

Principal Investigator - Dr A.K. Pandey

Status: 3500 seedlings of amla (*Emblica officinalis*) were raised from seeds collected from Panna, M.P. 3000 seedlings of sarpagandha (*Rauwolfia serpentina*) and 5000 seedlings of

kalmegh (*Andrographis paniculata*) were also raised through seeds collected from Chhindwara. Sarpagandha germplasm was collected from Chhindwara and Seoni and planted in the NWFP garden of the institute. 100 seedlings each of gurbel (*Millettia auriculata)* and gurmar (*Gymnema sylvestre*) were raised through cuttings and transplanted in the field (NWFP garden). Ascorbic acid and phenolic acids in amla fruits collected from different localities have been estimated.

Project 4: Entomological survey of Kanha National Park, MP [058/TFRI-2003/Ento-(6)/ Jul.2003-June 2004]
Principal Investigator - Dr K.C. Joshi

Status: Insect specimens were collected by using butterfly collection net in five ranges of Kanha national park periodically, as well as by using light trap during night. 160 specimens morphologically different were identified and preserved. These include 48 species of butterflies, 77 species of moths, 12 species of beetles, 10 species of bugs, 3 species of wasps and ants, 4 species of grasshoppers, 2 species of crickets and 4 species of mantids.

Project 5: Developing coalition approach to non-timber forest produce for better livelihood of tribal communities of M.P. [053/TFRI-2003/ Agro-1(DFID)(10)/Jan. 2003-Dec. 2004]
Principal Investigator – Shri A. Argal

Status: Women dominated four self-help groups (SHGs) have been identified in Kundam block in Jabalpur district. Two major NTFPs – Mahua and Lac – have been selected through PRA exercise. Capacity building of SHGs has been attempted through imparting training. However, some constrains were identified for mahua, like distress sale, low volume, problem with establishing market linkages, etc. Similarly for Lac, factors like lack of technical know-how, frequent failure of crop, lack of value addition techniques and market linkages were found to be the major inhibiting factors.

Project 6: Introduction of egg parasitoid *Trichogramma* species in Natural Teak Forests of Mandla, MP to prevent growth loss due to teak defoliators *Hyblaea puera* and skeletonizer *Eutectona machaerali* [062/TFRI-2003/Ento-2(MPFD)(7)/Dec. 2003-Nov. 2004]
Principal Investigator - Dr K.C. Joshi

Status: Experiments are being initiated and field work will be initiated on the onset of the monsoon.

Project 7: Introduction of egg parasitoid *Trichogramma* species in Teak Plantations of FDCM, Nagpur to prevent growth loss due to teak defoliators *Hyblaea puera* and skeletonizer *Eutectona machaeralis* [064/TFRI-2003/Ento-3(FDCM)(8); Dec. 2003-Nov. 2004]
Principal Investigator - Dr K.C. Joshi

Status: Experiments are being finalised in collaboration with state forest department and will be initiated on the onset of monsoon.

TECHNOLOGY ASSESSED AND TRANSFERRED

Transfer of Technology

- Organized three weeks' summer training on industrial microbiology for under graduate students of St. Aloysius College, Jabalpur from 2nd to 3rd May, 2003.
- A three weeks long training programme on Techniques of plant tissue culture for undergraduate students of Biotechnology, Govt. Science College, Jabalpur was held on 28th July, 2003.

- Organized two days' training workshop of subordinate forestry personnel of Madhya Pradesh on Agroforestry practices, planting techniques, cultivation of medicinal plants and biofertilizer under extension of technology programme on 22nd and 23rd December, 2003.
- Training programme on cultivation of medicinal plants was organized at the campus on 12th and 13th February, 2004 under National Medicinal Plants Board sponsored project.
- Organized four days' training programme for the officials of state forest department of Madhya Pradesh at Motinala (Dist. Mandla) and Baihar (dist. Balaghat) on Management of Sal borer epidemic. The topics covered were – recognizing beetles of sal heart wood borer; its difference from other morphologically related insect species like *Aeasthus helosericen;* categorization of borer attacked sal trees and natural enemies of sal borer.

EDUCATION AND TRAINING

Training Attended

National

1. Shri P.K. Choudhary, IFS and Shri R.K. Srivastava, IFS attended training on Govt. budgeting including performance budgeting and Zero based budgeting at Kothari Agriculture Management Centre, Sona Bagh, Singara Estate Road, Coonoor, Nilgiris from 22nd to 26th September, 2003.
2. Shri. A. Argal, IFS attended training on People's participation in wasteland management at Centre of ecological and rural development, Auronville, Villupuram, Tamil Nadu from 13th to 17th October, 2003.
3. Shri Yogesh Dwivedi, IFS attended training on Role of information Technology in Forest Management at TERI, New Delhi from 3rd to 7th November, 2003.
4. Dr Jamaluddin attended training on National Symposium at Hamdard University, New Delhi from 29th to 31st December, 2003.
5. Dr A.K. Pandey attended training on National Conference on medicinal plant in agroforestry at Chandigarh at Chandigarh on 3rd and 4th November, 2003.
6. Shri S.P. Tripathi, IFS, Dr Abha Rani, Dr Yogendra Singh and Dr S.K. Banerjee attended training on Forestry Research Management at Chandra Shekhar Azad University of Agriculture and Technology, Kanpur from 15th to 17th November, 2003.
7. Shri Avinash Jain attended training on Eco-restoration of wasteland at FRI, Dehradun from 13th to 17th October, 2003.
8. Shri Har Prasad attended training on Ecological management of forest at FRI, Dehradun from 22nd to 29th October, 2003.
9. Dr (Ms) Nanita Berry attended training on Devolution and community based Forest Management at National Institute of Rural Development, Hyderabad from 1st to 3rd March, 2004.
10. Dr N. Kulkarni attended training on Microbial control of insect pest constraints current development and perspectives in integrated pest management at IARI, New Delhi from 19th January to 9th February, 2004

PUBLICATIONS

Research Papers

1. Impact of different managements systems on biodiversity conservation in Abhoya, West

Bengal from Ecology division were submitted to National Seminar on Forest Resources Management held in 15th to17th November, 2003 in Dept. of Forestry C.S. Azad University of Agri and Technology, Kanpur.

2. Ground flora diversity under man made forests from Ecology Division was presented in the National Workshop on Regional strategies for plant conservation held at TFRI, Jabalpur on 26th and 27th Feb., 2004.
3. Yousuf M. and Joshi, K.C. (2003). Description of new species of *Oligosita haliday* (*Hymenoptera: Trichogrammatidae*) from India. Shaspha, 10(1):7-8.
4. Roychoudhary, N.; Joshi, K.C. and Shukla P.K. (2003). Screening Insect Resistant Trees. ICFRE brochure No. 106, Tropical Forest Research Institute, Jabalpur, India, 22 pp.
5. Dadwal, V.S.; Soni, K.K. and Jamaluddin (2002). Diseases and their control measures of some important medicinal plants of central *India. Indian J. Trop. Biod.,* 10 : 60-62.
6. Dadwal, V.S. and Jamaluddin (2002). Nutritional studies of *Tricholoma giganteum* and *Tricholoma crassum. J.Basic Appli. Mycol.,* 1(2):178-182.
7. Dadwal, V.S., Bisen, S.S., Chaurasia, M. and Jamaluddin (2003). Role of storage fungi in germination of *Strychnos potatorum* Linn. F. Suppl. *Indian Forester,* 129 (10) : 1297-1299.
8. Dadwal, V.S. and Jamaluddin (2003). Bio-control of important pathogens of forestry species bu Streptomyces formulation. *Indian Forester*, 129 (10):1270-1280.
9. Dadwal, V.S., Verma, R.K. and Jamaluddin (2003). A new species of Phomopsis causing phyllode spot and top dying in *Acacia mangium. J. Mycol. Pl. Pathol.*, 33(1):42-44.
10. Soni,K.K. and Jamaluddin (2004). Mortality of *Causuarina equisetifolia* in clonal seed orchard in Tamil Nadu, *India. Jour. Trop.For.Sci.*,16(1):132-135.
11. Verma,R.K. and Jamaluddin (2004). Response of arbuscular mycorrhizal fungi in combination on growth and nutrient uptake in *Bambusa nutans. Ind. For.,* 9(2) : 181-186.
12. Role of Microorganism in Conservation of Plant Biodiversity by Dr Jamaluddin presented in the workshop on Regional strategy for plant conservation, 26th and 27th Feb., 2004, TFRI, Jabalpur.
13. Training and demonstration on application of biofertilizer was organized at Nagpur, Social forestry division during 8th January, 2004. Training and practical demonstration were given by Dr Jamaluddin, Dr R.K. Verma, Dr K.K. Soni and Dr V.S. Dadwal.
14. Dr Jamaluddin attended International Conference on Quality timber products of teak from sustainable forest management, Peechi, Kerala, KFRI from December, 2nd to 5th 2003 and presented paper entitled – Tree health of teak in central India on 3rd Deceber 2003 in session No. 5.
15. Soni, K.K. and Jamaluddin (2003). Role of cultural and sanitation practices in the management of diseases in degraded forest. Paper presented in seminar on management of degraded forest for productivity enhancement and carbon sink expansion, 15th and 16th Januarv, 2003.

16. Verma, R.K. and Jamaluddin (2003). Diversity of arbuscular mycorrhizal fungi in forests of central India. Prospecting of fungal diversity and emerging technologies at Agharkar Research Institute, Pune, 6th and 7th Feb., 2003.

Brochure / Pamphlets

Following brochures/pamphlets were published during 2003-04:

(i) General information brochure/leaflets on TFRI (for distribution among govt. depts. / semi-govt. organizations, universities/ colleges, NGOs, etc.

(ii) वैज्ञानिक विधि द्वारा रंगीनी लाख का उत्पादन (on production of lac) : by Akhilesh Argal and Nanita Berry

CONFERENCES / MEETINGS / WORKSHOPS / SEMINARS / SYMPOSIA/ EXHIBITIONS

- 13th RAG meeting was held at the campus on 27th and 28th August, 2003. 21 members and other special invitees participated from all the four states under TFRI jurisdiction.
- Organised national workshop on 'Regional strategy for plant conservation' on 26th and 27th February, 2003 at Tropical Forest Research Institute campus.

13th RAG meeting in progress, 27th and 28th August, 2003

Exhibition / Mela

- Participated in National Herbal Fair from 14th to 16th December, 2003, at Bhopal, Madhya Pradesh. Books / publications of ICFRE worth Rs. 6,500/- were sold at the fair.
- Participated in *Aranyotsav* 2004, state level fair, on medicinal plants and other forest products at Jabalpur from 6th to 9th February, 2004.

LINKAGES AND COLLABORATION

- A collaborative project entitled "Development coalition approach to non timber forest produces for better livelihoods of tribal communities of Madhya Pradesh" started under DFID.

DISTINGUISHED VISITOR

- Dr D.P. Singh, Vice Chancellor, JNKVV, Jabalpur.