

## PROJECTS ONGOING DURING THE YEAR 2008-2009

### PLAN PROJECTS

#### **Project 1: Evaluation of medicinal plant based agroforestry (Silvi-Medicinal) system under existing teak plantations. [105/TFRI/2006/Agro-1(14)]**

**Status:** OSR and OFR field trials were conducted to standardize the silvi-medicinal system using *Curcuma longa*, *Costus speciosus* and *Gloriosa superba*. Observation on yield, growth and biomass of intercrops recorded. The data indicated that *C. longa* and *C. speciosa* performed well under the full canopy of teak. The maximum plant height of *Gloriosa superba* was observed in 50% pruned teak, whereas significant yield reduction with respect to sole crop was registered under closed tree canopy. Analysis of OSR and OFR trials indicates that macro nutrients (NPK) are decreased in the intercrop as compared to sole crop (medicinal plants).



*Gloriosa superba* under silvi-medicinal system

#### **Project 2: Study on plant diversity in sal-teak ecotone zone as influenced by ecological and climatic changes. [085/TFRI/2005/Biod. 2 (5) / 2005 – 2009.**

**Status:** Periodical survey of two sal teak ecotone zones at 1. Umariya (M.P.) and 2. Jagadapur (C.G.) were conducted for the study. Compartment history and maps of the area were collected. The climatic data from 1947 to 2008 were collected from local observatory. Ten quadrats of 20 x 20m size at both the sites were laid down for observation on number, occurrence and girth of tree species. Seven quadrats of 3 x 3m size for shrubs and herbs/grasses were laid out for phytosociological study. Quadrats were also laid out in sal dominated and teak dominated natural forests at the study sites for observation. The climatic data including temperature, humidity and solar radiation inside and outside of the forests were recorded from both the sites. The result showed that the diversity of tree, shrub and herb species were high in ecotone sites as compared to sal and teak dominated compartments.

Fifty soil samples each were collected from both the sites to analyse pH and nutrient status of the area. The data showed that the soil of teak forest had 7.12 to 7.30 pH and sal forest had an acidic range of soil varying from 5.32 to 6.02 pH. The pH in ecotone zone, however, varied from 5.56 to 6.93.

#### **Project 3: Screening of tropical forest tree species for their potential as carbon sink in M.P. and Chhattisgarh. [124/TFRI/2007/Ecol-2(9)].**

**Status:** Established agroforestry systems with *Tectona grandis* and *Dalbergia sissoo* as tree species and *Triticum aestivum*, *Cicer arietinum* and *Withania somnifera* as agricultural crops. Carbon sequestered by tree species and agricultural crops was measured by Biomass Method. Carbon accumulated in coarse and fine litter and organic carbon in the soil was also taken into consideration. *Tectona grandis* – *Triticum aestivum* agroforestry system sequestered 23.84 tonne carbon/ha per year.

Carbon sequestration potential of different aged *Eucalyptus eurograndis* – *Triticum aestivum* agroforestry systems was measured by Biomass Method at village Majitha (Jabalpur). This system sequestered 36.65 tonne carbon/ha per year.

Carbon sequestered by *Tectona grandis* plantations raised at Bodla forest range under Kawardha division (Chhattisgarh) was measured by non-destructive Biomass Method by measuring GBH and putting their values in allometric equations. Similarly, carbon sequestered by *Shorea robusta* plantations at Motinala, Mandla forest division (M.P.) was measured.

Soil samples from all the selected sites were collected and analysed in laboratory for organic carbon and other physio-chemical characteristics.

#### **Project 4: Studies on the efficacy of toxins of soil actinomycetes against major forest insect pests. [103/TFRI/2006/Ento-2(13); 2006-2009]**

**Status:** Collected 90 soil samples from forests of Madhya Pradesh, Maharashtra and Chhattisgarh and isolated 3 actinomycetes/bacteria on potato-dextrose agar medium following serial dilution technique and pour plate method. Extracted toxins (antibiotics and its fractions) of actinomycetes, *Streptomyces* sp. and tested against key insect pests of teak (*Hyblaea puera*, *Eutectona machaeralis*), siris trees (*Spiroma retorta*) and maharukh trees (*Atteva fabriaciella*). Conducted toxicity tests of antibiotics and its fractions of isolated actinomycetes. Efficacy of a commercially available bioproduct (spinosad) of a soil actinomycete was tested against above target pests through leaf and larval treatment as well as field-cum-laboratory tests which proved to be significantly ( $p < 0.05$ ) effective.

#### **Project 5: Evaluation of biopesticidal products for the management of teak defoliator and skeletonizer in forest nursery. [104/TFRI /2006/Ento-3(14)]**

**Status:** Biopesticides like neem formulation at/above 0.5% offer 90% antifeedant effect against teak skeletonizer and can also be used as a prophylactic treatment to inhibit over 80% egg laying of teak defoliator as a component of IPM module. Foliar spraying of biopesticides 0.05% of Spinosad (Actinomycete), 45 % EC and 0.05% Agropest *bt*, is effective to manage teak defoliator and skeletonizer in forest nursery. EPNs *Heterorhadtites indica* and *Steinernema carpocapsae* were reared and their bioefficacies evaluated for the first time against teak skeletonizer. EPN, *H. indica* in laboratory bioassay (dose-range 3 to 30 ijs larva<sup>-1</sup>) in 72 hrs post-exposure caused mortality up to 76.47 % at 10ijs larva<sup>-1</sup> and 100% at 30ijs larva<sup>-1</sup>. Field spraying experiment indicated that 10000 infective juveniles/ litre kills 50% larvae of leaf skeletonizer. EPN if mixed with biopesticides like 0.05% of Agropest–b + derisome or conserve (spinosad) killed cent per cent larvae. First time, 3 native EPN populations (1 *Steinernema* spp. and 2 *Heterorhabditis* spp.) were isolated and being maintained successfully as no previous reports from the central Indian forest floor is available.

#### **Project 6: Chemical control of insect pests and diseases of *Buchanania lanzan*. [114/TFRI- 2007/ Ento.2(17)]**

**Status:** Survey was conducted at Laripara (Bilaspur), Batkakhapa / Karabhoh (Chhindwara), Padar (Betul) in Madhya Pradesh and Purkabodi (Bhandara) in Maharashtra state for monitoring the insect pests and diseases of *Buchanania lanzan*. Incidence of stem borer (60%), leaf gall forming insect (40%), defoliator (26%), inflorescence sap sucker thrips (50%) and wilt and leaf blight/curling/diseases (60%) were recorded in nurseries and natural stand. Three fungicides viz.

dithane, bavistin and redomil in different concentrations were tested against *Fusarium* wilt disease of *B. lanzan* in forest nursery at Salibara, Chhindwara. Bavistin 0.29% proved best to prevent the seed associated fungi. Eight commercial pesticides viz. monocrotophos, endosulfan, cypermethrin, fenvalerate, deltamethrin, alphamethrin, biopro super and neem oil were tested against defoliator, *Lamida carbonifera* in Entomology nursery, TFRI, Jabalpur. Endosulfan 0.05% followed by monocrotophos 0.05% proved better than the remaining pesticides. Six insecticides viz; dichlorvos, paradichlorobenzene, endosulfan, dimethoate, monocrotophos and neem oil were tested against stem borer *Batocera rufomaculata*. Dichlorvos 0.03% proved better than remaining pesticides used. Similarly five pesticides viz. endosulfan, monocrotophos, neem oil, bavistin and alpha naphthyl acetic acid in different concentrations were tested against insect pests and diseases to enhance the quality and quantity of seeds in natural stand of *B. lanzan*. The result showed that endosulfan 0.07 % + Bavistin 0.2% + alpha naphthyl acetic acid 40 ppm proved best to enhance the quality and quantity of the fruit produced.

### **Project 7: Application of growth promoting microbes and soil amendments to produce improved seedlings of forest trees. [118/TFRI-2007/Patho-1(12)]**

**Status:** Germplasm of growth promoting micro organisms were collected from Seoni, Balaghat, Chhindwara, Tamia, Umariya, Matkuli, Jhirpa and Pachmarhi (M.P.). A field experiment was laid out on sandal to test the effect of soil amendment and biofertilizers on its growth. After two months of planting, there was no mortality in biofertilizer applied seedlings along with soil amended with loam soil, *Leucaena* leaf and mixed organic matter as compared to 20% mortality in control and uninoculated seedlings. The growth of sandal was maximum in soil amended with *Leucaena* leaf and mixed organic matter along with biofertilizer application. Another experiment on *Dalbergia sissoo* was conducted in root trainer to study the effect of plant growth promoting organisms (two fungi, *Trichoderma* sp. and *Aspergillus* sp. and three bacteria, *Azotobactor*, *Azospirillum* and PSB) on its growth. After 3 months, maximum survival of seedlings was recorded in *Trichoderma* (local strain) amended soil with soil and sand (2:1) followed by application of *Azospirillum* along with soil amended *Leucaena* leaf. Maximum height (19cm) was recorded in *Trichoderma* + FYM, soil and sand in 1:2:1 ratio applied seedlings followed by *Azospirillum* + FYM as compared to control (5.7cm). Two other experiments on *Jatropha curcas* and *Gmelina arborea* are in progress. Culture of organisms are maintained in the laboratory.

### **Project 8: Genetic variation for *in-vitro* morphogenetic potential of *Dalbergia sissoo* Roxb. clones and evaluation of their field performance. [ID No. 117/TFRI-2007/Gen.-1 (13) (ICFRE)]**

**Status:** Five promising trees of *D.sissoo* were selected from Raigarh, Chhattisgarh in 2009. Vegetative propagules were collected for stock build up of clonal materials for *in-vitro* propagation. Shoot multiplication of five clones (GBW, JB 1, FZB, FZK, RB) was evaluated by conducting two experiments. In the first experiment, the effect of nature of culture medium (liquid and semi solid) and different basal media (MS, WPM, Nitsch and Nitsch) was evaluated in five clones. The data obtained from three way analysis revealed that the highest average number of shoots per explants after six week of inoculation was obtained for FZK clone (3.23) followed by FZB clone (3.07) on MS liquid medium. In the second experiment, explant types

(single and double nodal segment) inoculated in three basal media (MS, WPM, N&N) were tested in five clones (GBW, JB 1, FZB, FZK, RB). Significant effect of explant types, basal media and clones was observed on number of shoots after six weeks of inoculation. The double nodal explant was invariably found to be superior compared to single nodal explant. However, the interaction of explant types with clones and media had no significant effect on shoot multiplication. The highest average number of shoots per explant was obtained on a combination of FZB clone and WPM medium (2.42) followed by combination of FZK clone and WPM (2.36) and combination of FZB clone and Nitsch and Nitsch medium (2.17).

**Project 9 : Sustainable management of medicinal plants in JFM areas in different agro-climatic zones of Madhya Pradesh. [079/TFRI/2005/Silva-1(8)]**

**Status:** Data have been collected from sample plots laid out for generating data on sustainable harvesting of kalmegh, chironji and satawar as per following details:

- Kalmegh in Satnur Forests area, Sawari Range, Delakhadi Forest Range, West Chhindwara Forest Division, and at Naunichhapar Village, Chhindwara Range in East Chhindwara Forest Division
- Chironjee in Sitadongri, Delakhadi Forest Range, West Chhindwara Forest Division and Khumbhadeo Forests, East Harrai Range and Ojhaldhana Village East Batkakhapa Range, East Chhindwara Forest Division.
- Satawar in Bandhi Circle, Umariya Forest Range, Katni Forest Division.

**Project 10 : Standardization of nursery techniques of *Strychnos nux-vomica* and *Strychnos potatorum*. [080/TFRI/Silviculture 2-(9)]**

**Status:** Seed germination studies of *Strychnos nux-vomica* and *Strychnos potatorum* under different physical, chemical and hormonal treatment were conducted. Vegetative propagation study through branch and root cutting of *Strychnos nux-vomica* and *Strychnos potatorum* under different hormonal treatment was conducted. Seeds of *S. nux-vomica* and *S. potatorum* were sown in polythene bags to conduct fertilizer trial in order to accelerate the growth of seedlings. Data on germination, sprouting, rooting, survival and growth of both the species under different experiments were recorded.

**Project 11: Seed physiology of the tropical forest species with special reference to their maturity and storage. [076/TFRI-2004/Silvi-2(7)]**

**Status:** The viability of *Bassia latifolia* seed was assessed using different storage conditions. The seed of this species can best be stored at 25<sup>0</sup>C with shedding moisture content. Seed maturation studies for determination of seed collection time had been completed on *Ablomoscus moscatus*, *Moringa oleifera*, *Holoptelea integrifolia* and *Sapindus laurifolia*. Best collection time for *Ablomoscus moscatus* was noted at 30 days after anthesis, when the color of the pod turned reddish brown before it opened. Best harvest time for *Moringa oleifera*, *Holoptelea integrifolia*, and *Sapindus laurifolia* were 77, 60, 117 days after anthesis respectively with 65%, 4%, 10% moisture content respectively. Stored seeds of *Schleichera trijuga*, *Hardwickia binata*, *Sapindus laurifolia*, *Rauvolfia serpentine*, *Moringa oleifera*, *Terminalia chebula*, *Mimusops elengi*,

*Holoptelea integrifolia* and *Emblica officinalis* were sampled for viability assessment at regular intervals depending on the species. Best storability at 45<sup>0</sup>C was found for *Hardwickia binata* seeds with 100% germination after one year of storage

**Project 12: Development of nursery techniques for *Terminalia chebula* Retx. (Harad). [107/TFRI/2006/Silvi-1(12)]**

**Status :** Studies on seed germination of *Terminalia chebula* under different physical, chemical and hormonal treatment were conducted from the seeds and branch cuttings collected from Chandrapur (Maharashtra), Bhilairgarh (Chhattisgarh), Tamia (Madhya Pradesh) and Sambalpur (Orissa). Vegetative propagation study through different size of branch cuttings under different concentration of hormonal treatment was conducted. Seeds of *Terminalia chebula* were sown in polythene bags and germination beds. Germination, sprouting, rooting, survival and growth of the desired species under different experiments were recorded and statistically analysed.