

Project 1: Estimation of gene diversity and enhancing seed production in seedling seed orchards of Eucalyptus, Casuarina, Acacia and Teak [IFGTB/RP-31/2003-2008]

Findings: The fertility was registered for each tree at the age of eight and nine years in seedling seed orchards of Eucalyptus tereticornis and E. camaldulensis established at two sites (one moist and one dry) in southern India. The effect of different treatments on tree growth and fertility was studied in one unpedigreed Seedling Seed Orchard (SSO) each of E. camaldulensis and E. tereticornis in an arid location (Pudukkottai) in southern India. Compared to untreated control, only hormone application showed significant increase in proportion of fertile trees in both species for four successive years. The number of fruits produced per tree also increased significantly with hormone application, though the difference was comparatively less in the fourth year.

Two seedling seed orchards each of Casuarina equisetifolia and C. junghuhniana established by thinning provenance trials in coastal (Pondicherry) and inland locations (Karunya and Panampally) in South India were evaluated for sex expression and fertility variation. Orchards established in coastal environment had less fertility variation and hence maintained higher diversity in both species. Coastal site had more trees contributing effectively to seed production than inland locations.

Fertility differences between clones were estimated in a 25 years old Clonal Seed Orchard (CSO) of teak at Walayar in Kerala State. There were great differences in fertility between two seedling seed orchards of Acacia auriculiformis established in two locations. Thus fertility variation is directly correlated with the location and the climatic conditions each year.

Project 2: Isolation of Somaclonal Variants of Casuarina equisetifolia for Salinity Tolerance [IFGTB/ RP-8/2002-2007]

Findings: Successful induction of callus and regeneration of shoots was achieved using juvenile cotyledon explants. The species was found to be recalcitrant to regeneration through tissue culture evident by low shoot regeneration of the callus cultures. Biochemical studies indicated slight increase in the total proteins and proline and decrease in the total amino acids in callus tissues after 24 hours of salt stress. Screening of salt tolerant callus was done. The isolated tolerant callus could not regenerate into plantlets due to recalcitrant nature of callus for regeneration.

Project 3: Identification, isolation, evaluation and mass production of native fungi for the management of teak and Casuarina stem borers [IFGTB/ RP-21/2002-2007]

Findings: The seven potential isolates of entomopathogenic fungi selected out of fifteen were mass multiplied in media like vegetable waste, rice powder, coffee husk, and sorghum grain media to determine the suitable media for mass production. The fungus grew better on sorghum grain and on coffee husk.

Replicated field experiments at different locations were conducted at one year old teak plantation at Moondamuzhy, Kerala and at a private Casuarina plantation at Ulunthurpettai, Tamil Nadu to test the effectiveness of the seven potential isolates of

entomopathogenic fungi on the pests *Sahydrassus malabaricus* and *Indarbela quadrinotata*, respectively. Three different concentrations were used in the experiments and effective concentration was determined for controlling the pests. Two commercially available entomopathogenic fungi products (*Beauveria bassiana* and *Metarhizium anisopliae*) were tested against the targeted pests *Sahydrassus malabaricus* and *Indarbela quadrinotata* (*Casuarina* stem borer) under lab conditions and it was found that both the products were not effective in controlling the pest *S. malabaricus* and less effective in the case of *I. quadrinotata* as compared to the native isolates.

Project 4: Testing of promising plant derived chemicals against key pests (Component: Bioactive compounds from *Acacia nilotica* (Babul) against the major defoliators of forestry tree species) [IFGTB/RP-22/2002-2007]

Findings: *A. nilotica* leaves, flowers, fresh pods, seeds and twigs were extracted and their biopesticidal properties were tested and identified in terms of antifeedancy, ovicidal activity, pupal and larval mortality against teak defoliators. Results indicated the adverse effects of methanol and hexane extracts of *A. nilotica* flowers, pods and seeds on the tested insects, whereas these effects were not expressed by the extracts of twigs.

Individual secondary metabolites such as phenols, phenolics and polyphenols were also isolated and identified from different tissues of *A. nilotica*. The biological properties of these metabolites were evaluated on the teak defoliators, *H. puera* and *E. machaeralis*. Some of the bioactivities expressed by these metabolites include reduction in food consumption index, extended larval duration and high mortality.

Project 5: Testing and evaluation of selected existing control methods for key diseases of *Casuarina* spp. with reference to blister bark and root-rot [IFGTB/RP-24/2002-2007]

Findings: Application of fungicide solution (*Bavistin/ Indofil M-45*) to the trees of *Casuarina equisetifolia* and *C. junghuhniana* in the field trails was done at periodical intervals. Roots and rhizosphere soil samples collected from the trials were assessed for mycorrhizal colonization of both Ecto- (ECM) and Arbuscular (AM) mycorrhizal fungi. The samples exhibited higher percentage colonization of AM fungi as compared to ECM fungi. The AM fungal genera viz., *Acaulospora* and *Glomus* were found dominant in most of the soil samples analyzed.

Pure culture of the blister bark disease pathogen, *Trichosporium vesiculosum* was raised in the laboratory and subsequently artificially introduced in the soil at the root zone of the trees in the experimental trail site at Panampally, Kerala. After a period of inoculation, few trees of *C. equisetifolia* in various treatments expressed the symptom of blister bark disease. Maximum percent of infection of blister bark disease was recorded on T1 (control) plants and minimum percent infection was observed on T2 (Fungicide treatment). There was no infection/symptom of blister bark diseases in the trees treated with biofertilizers and biocontrol agents during the period of observation.