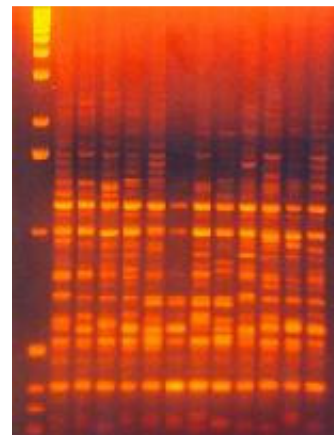


COMPLETED EXTERNALLY AIDED PROJECTS

Project 1: Genome evaluation and characterization in Casuarinas and Eucalyptus for improving productivity and conservation

Findings: The project aimed at assessing the genetic diversity in different population levels in *Casuarina* and *Eucalyptus*, specifically targeting those which are currently utilized under the breeding program developed by the Institute. The second major focus of the project was on developing end use markers for diagnosing species identity and specific traits. The genetic diversity existing between and within six eucalypts and five *Casuarina* species were assessed using ISSR marker system. Subsequently, nine species-diagnostic markers were identified for *Casuarina* and *Allocasuarina* species and twenty one diagnostic markers were identified for five species (*E. camaldulensis*, *E. citriodora*, *E. grandis*, *E. tereticornis* and *E. urophylla*).



ISSR-PCR profile of the species *Eucalyptus tereticornis* for genetic diversity estimation

These markers were converted into SCAR markers in *C. equisetifolia* and *C. junghuhniana*. At the sub specific taxa level, genetic diversity was estimated within and between fifteen provenances of *E. tereticornis*, six progenies of seed orchards of *E. camaldulensis* and *E. tereticornis*, forty superior performing clones of *E. tereticornis* and *E. camaldulensis*, four SSOs of *C. equisetifolia* and two SSOs of *C. junghuhniana* using ISSR marker system. Further, three putative markers were identified using RAPD and four markers using SSRs for non-rooting clones of *E. tereticornis* and the SSR markers were validated at the family level. The project also provided leads for developing early selection markers for pulping trait in *E. tereticornis*, where in allelic diversity in the *CCR* and *CesA* genes were correlated with the holocellulose, lignin and pentosan content of the wood.

Project 2: Identification of Broad Spectrum Antifungal Proteins from Elite Medicinal Plants for Control of Plant Pathogens

Findings: The project aimed at identification and characterization of broad spectrum antifungal proteins from medicinal plants including *Acorus calamus*, *Withania somnifera*, *Piper longum* and *Rauwolfia tetraphylla*. Initially the above mentioned species were screened for antifungal proteins and *A. calamus* and *W. somnifera* were short listed for protein purification. Further, optimized the source tissue, developmental stage and buffer composition for extraction of total proteins with antifungal activity from these two species. Subsequently, purified a 32 KDa antifungal protein from leaves of *A. calamus* with pI value of 7.93, pH optima at 5.6 and temperature optima at 36°C. The protein was localized in the epidermal layers and xylem lumen of the leaf tissues. The peptide sequence showed similarity to peroxidase from *Oryza sativa*. It inhibited the hyphal extension of major pathogens including *Trichosporium vesiculosum*, *Macrophomina phaseolina* and *Fusarium moniliforme*. In *W. somnifera*, an acidic lectin with 30 KDa size and pI value of 4.0 was purified. It showed a similarity with concanavalin A like lectin

from *Canavalia maritima* and inhibited the hyphal extension of *T. vesiculosum*, *M. phaseolina*, *F. moniliforme* and *Rhizoctonia solani*.

Project 3: Refinement of *in vitro* multiplication protocol for *Bambusa nutans* and *Dendrocalamus giganteus*

Findings: Developed *in vitro* axillary bud proliferation protocol for the multiplication of mature plants of *Bambusa nutans* and *Dendrocalamus giganteus*. Pruning of actively growing culms was effective in *D. giganteus* for the emergence of axillary shoots, where more explants with suitable size can be extracted for inoculation. Modification in supply of Nitrogen and Magnesium was found to be favorable for culture establishment and shoot multiplication in *D. giganteus*. Addition of low levels IBA was effective in controlling shoot necrosis of *D. giganteus* rooted plants. Glucose as a carbon source was identified as the major regulator for root induction in multishoots derived from mature plants like *B. nutans* and *D. giganteus*. Field demonstration trial was established with 500 plants of *B. nutans* in the ongoing field trial project for tissue culture plants.

Project 4: Selection and clonal propagation of commercially important medicinal plants [IFGTB/G.O./TN -11/2005 / Ext./2005-08]

Findings: 60% to 90% rooting of different genotypes was observed in the combination of 100 ppm IBA concentration and composted coirpith in *Tinospora cordifolia*. Cuttings from young trees of *Aegle marmelos* responded to the combination of 2000 ppm IBA concentration and vermiculite. 60% rooting was observed. In the case of *Terminalia bellerica*, woody branch cuttings were tried with different concentrations of IBA and potting media. Initially, 3% of rooting was observed in the combination of 2000 ppm IBA and vermiculite. Further, using serial propagation technique, rooting of cuttings from the rejuvenated plants was enhanced to 30% using the combination of IBA and NAA with a concentration of 1500 ppm each and soilrite. Eleven genotypes of *Tinospora cordifolia* were subjected to biochemical analysis for alkaloid content. High alkaloid content was observed in the roots of the genotype from Anaikatti with a value of 50. Eight genotypes of *Aegle marmelos* were studied for alkaloid content. High alkaloid content was observed in the leaves (64) and fruits (80) from the genotype in IFGTB campus. Four genotypes of *Saraca asoca* were studied to find the tannin content. High tannin content was observed in the leaves (3.22) of the genotype from Peechi, Kerala and in the bark (22.03) of the genotype from Courtrallam. Twenty four genotypes of *Terminalia chebula* were studied to find the tannin content. High tannin content was observed in the bark (8.69) of the genotype from Bargur and in the fruits (7.36) of the genotype from Thalaimalai.

Project 5: Development of yield assessment methods for *Eucalyptus* species and *Anacardium occidentale* using image analyzer. (Funding agency: Tamil Nadu Forest Plantation Corporation-TAFCORN) [IFGTB/EF-RP-22/2005-07]

Findings: Methods were developed for single tree height, diameter and volume estimation. Pictures taken from 10 to 30 meters ground distance with a reference scale at breast height can be measured using Image analyser. Correction factors were worked out for the above measurements to estimate actual height, diameter and volume. Height and diameter of single tree can be estimated in high precision and accuracy with an error of $\nabla 1.0\%$. A formula was developed and validated for estimation of single tree volume from trunk surface area and height. This method of volume estimation showed an error of $\nabla 3.02\%$.