Project Profile

Project Code:	IFGTB / RP4 / 2000-2005
Project Title:	Variability Studies with Special Emphasis on Physiology, Biometry and Biochemistry in Selected Tree Species For Tree Improvement
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Date of commencement of the project:	01-04-2000
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Objectives:

1. Grade the clones of casuarina and eucalypts assembled by IFGTB based on physiological andbiometrical characteristics. Study the genetic divergence.
2. Study the comparative performance of seed raised and clonally propagated materials.
3. Determine the tissue characteristics of juvee and adult materials.
4. Investigate the mechanism of change in sex expression in clones of casuarina.
5. Identification of salt tolerant (sodic) clones of casuarina.

Summary:

Variation is the basic resource to be explored for genetic improvement in any species and hence plays a key role in any tree improvement programme. Considering its importance, a project entitled Variability studies with special emphasis on physiology, biometry and biochemistry in selected tree species for tree improvement was undertaken at the Institute of Forest Genetics and Tree Breeding, Coimbatore for 5 years. The major objectives of the project were (1) Grade the clones of casuarina and eucalypts assembled by IFGTB based on physiological and biometrical characteristics, (2) Study the genetic divergence, (3) Study the comparative performance of seed raised and clonally propagated material , (4) Determine the tissue characteristics of juvee and adult materials, (5) Investigate the mechanism of change in sex expression in clones of casuarina and (6) Identification of salt tolerant (sodic) clones of casuarina. Various studies were undertaken in 76 clones of Casuarina equisetifolia (Chidambaram / Chengalpet group: 33 and Tiruchendur group: 43) and 59 clones of Eucalyptus (E. tereticornis: 16 and E. camaldulensis: 43). Crown length exhibited the highest degree of variation followed by diameter at breast height (DBH) or collar diameter (CDM) among all the primary characters (total height, DBH, CDM, crown length, cladode length, cladode diameter and number of primary branches) in casuarina. Diameter at breast height showed higher degree of variation than total height. Number of primary branches, cladode length, cladode diameter and total height showed narrow difference between the values of phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) indicating that these traits were less influenced by environment. Volume index and crown length recorded high values for broad-sense

heritability coupled with high values for GCV and genetic gain indicating that these traits had considerable genetic variability, thus offering good opportunity for improvement through selection. All the clones of casuarina and eucalypts were graded based on point grading, a method where both quantitative and qualitative traits were used for assessment. Based on the physiological studies, 12 casuarina clones and 5 eucalypts clones were identified for semi-arid locations. These clones exhibited superior growth coupled with favourable physiological characteristics including high photosynthesis, carboxylation efficiency and water use efficiency. Mahalanobis D2 statistics and Tocher s clustering method was used to study the genetic divergence in clones of casuarina and eucalypts. Based on these studies 20 casuarina clones and 10 eucalypts clones were identified for future tree improvement programmes. The results on genetic divergence have got an immediate application in the establishment of clonal seed orchards. Information on genetic distance between genotypes helps in developing planting design, such that it can facilitate equal opportunity for hybridization among the genotypes and obtaining quality seed with high vigour. Observations recorded on shoot length, root length, collar diameter, shoot fresh weight, shoot dry weight, root fresh weight, root dry weight, biomass index and total biomass from an experiment to elucidate the difference in growth performance between seedlings and rooted cuttings derived from randomly selected female clones of casuarina grown in the clone bank showed that seedlings performed better than rooted cuttings during the study period of 3 years. The within variability estimated using coefficient of variation was also less in seedlings in around 60 per cent of the cases. Biochemical / molecular / anatomical studies were conducted to understand the tissue characteristics between the juvee and adult tissues of casuarina. Total phenol content and peroxidase activity exhibited an increasing trend with maturity whereas, chlorophylls, total crude proteins and DNA content recorded a decreasing trend. However, the protein profiles (obtained from 4 different positions from lower to upper positions within a tree) when studied using SDS-PAGE technique, did not show any variation. Among the various anatomical parameters, pith diameter and thickness of phloem tissue varied among the stem cuttings obtained from the four positions. Seventy-three clones of C. equisetifolia were screened for salt tolerance in a field experiment at Tiruchirapalli, Tamil Nadu. Based on growth and physiological parameters nine clones were identified for planting in sodic soils.