

PROJECT PROFILE

- Title** : Characterization of Eucalyptus clones for physiological and nutritional parameters
- Principle Investigator** : Shri. S. Saravanan, Scientist-D
- Project Associates** : Dr. C. Buvaneshwaran, Scientist-E

Start and Completion dates : July 2008 and March 2013

Objectives:

A. Long term objectives of the project

1. Characterization of Eucalyptus clones for site specific, water and nutrient use efficiency for higher productivity using less input.

B. Short term objectives of the project

1. To characterize the Eucalyptus clones of Institute of Forest Genetics and Tree Breeding for
 - a. Photosynthetic efficiency and other related physiological characters
 - b. Dry matter allocation to different biomass components
2. To rank and categorize the clones on the basis of the photosynthetic efficiency, dry matter partitioning for use in breeding and clonal forestry.

Funding Agency : ICFRE

SUMMARY

Established Eucalyptus clonal trials at four locations (Coimbatore, Pudukottai, Sivagangai and Tirunelveli) with 29 short listed clones from IFGTB ITC, TNPL and TAF CORN and one seedling for comparison purpose for assessing the water use and nutrient use efficiency of various clones. Morphological parameters like leaf area, leaf length and width, specific leaf area and leaf area index have been worked out for the short listed clones. Physiological

parameters like CO₂ assimilation, net photosynthetic rate, stomatal conductance, transpiration rate, etc. were recorded from the four trial plots. The ratio of net photosynthetic rate to transpiration is termed as Instantaneous water use efficiency ($\mu\text{ mol mmol}^{-1}$). Higher the value, better the efficiency of plant to divert water for photosynthesis than transpiration.

In the clonal trial established at Coimbatore, clone **C-14** recorded maximum height (8.6 m) and girth (18.0 cm) followed by C-186 (7.65 m and 16.0 cm) and C-196 (6.90 m and 17.0 cm). With reference to the stem fresh weight, C-14 registered maximum of 15.70 kg followed by C-186 (14.30 kg) and C-196 (12.40 kg). The same trend was observed in the net photosynthetic rate and found higher in the C-14 ($17.6 \mu\text{ mol m}^{-2}\text{ s}^{-1}$) followed by **C-196** and C-186. The water use efficiency also worked out and C-14 registered higher value (5.466) than the other two clones of C-196 and C-186 (5.122 and 4.924 respectively).

At Pudukottai, clone **C-188** registered maximum height and GBH of 8.5m and 20.0 cm followed by C-10 and C-7 (8.3 m; 19.0 cm and 8.3 m; 19.0 cm respectively). The fresh weight of stem also recorded maximum in C-188 (15.0 kg) followed by C-10 (14.0 kg) and C-7 (11.0 kg). The net photosynthetic rate also higher in C-188 (14.61) followed by C-10 (14.54) and C-7 (13.19). C-188 registered higher value of 4.775 than the C-10 (4.460) and C-7 (3.967). The WUE values ranges from 4.775 in C-188 followed by 4.716 in C-10 and 3.967 in C-7.

C-19 registered maximum in terms growth parameters (9.0 m; 21.0 cm) followed by C-111 (8.0 m; 19.0 cm) and C-186 (7.65m; 19.0 cm) at Karikudi clonal trial. The fresh weight recorded maximum in C-19 (22.0 kg) followed by C-111 (19.0 kg) and C-186 (15.0 kg). The net photosynthetic rate was observed higher in C-19 (14.07). C-19 registered higher value in WUE of 5.020 followed by C-111 and C-186.

At Tirunelveli, **C-188** registered maximum height and girth of 7.2 m and 12.5 cm followed by C-123 and C-63 with 6.60 m; 12.0 cm and 6.0 m; 11.0 cm respectively. The stem biomass also recorded the same trend (7.25 kg; 6.3 kg and 4.0 kg). The net photosynthetic rate was

higher in C-188 (16.29) followed by C-123 (14.53) and C-63 (12.98). The WUE recorded higher in C-188 (5.026) followed by C-123 and C-63.

Based on the above study, **C-14, C-19, C-188, C-10, C-123 and C-186** showed higher productivity and better water use efficiency and these clones can be multiplied in a large scale for distribution.