

SCREENING OF SELECTED FOREST TREE SPECIES OF SRI LANKA FOR THEIR RESPONSE TO INCREASING ATMOSPHERIC CARBON DIOXIDE

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Investigating the effects of increasing atmospheric CO₂ on forest tree species is important as forests play a major role in maintaining the ecological balance of an ecosystem. The objective of this study was to determine the response of photosynthesis, and its related physiological parameters, Growth and morphological parameters of selected forest tree species such as Teak (*Tectona grandis*), Jak (*Artocarpus heterophyllus*), Satinwood (*Chloroxylon swietenia*), and two varieties of Mahogany (*Swietenia macrophylla* and *Swietenia mahogany*) to elevated CO₂.

The experiment was carried out at the Rice Research and Development Institute (RRDI), Batalagoda, Ibbagamuwa, from October 2002 to February 2003. Three experimental treatments were defined as elevated CO₂ (i.e., 570 ppm) in open top chambers, ambient CO₂ (i.e., 370 ppm) in open top chambers and ambient CO₂ (i.e., 370 ppm) under open field conditions. The experiment was conducted over a period of 161 days.

The total dry weight was higher under elevated CO₂ as compared to ambient CO₂ in all species except *Chloroxylon swietenia*. The response was highest in *Swietenia macrophylla* and the highest mean total dry weight was in the elevated CO₂ treatment. The mean root dry weight, mean leaf dry weight and mean stem dry weight were significantly higher under elevated CO₂ as compared to the ambient. The height increment during the experimental period was highest in *Chloroxylon swietenia* under elevated CO₂. The girth increment during this period was highest in *Swietenia macrophylla* and it was observed in the elevated CO₂ treatment. When averaged across all species, the mean relative growth rates and absolute growth rates were higher under elevated CO₂ than under ambient. When individual species were considered, only *Chloroxylon swietenia* showed a slight decrease in absolute and relative growth rates under elevated CO₂ while the others show an increase. Net photosynthetic rate (P_n) was higher in the elevated CO₂ treatment in *Artocarpus heterophyllus*, *Swietenia mahogany* and *Tectona grandis*. But a slight decrease of P_n was observed in *Swietenia macrophylla* under elevated CO₂ in comparison to ambient CO₂. Leaf water potential was higher in all five species under elevated CO₂ and the highest response to elevated CO₂ was observed in *Chloroxylon swietenia*. The stomatal diffusive resistance was highest in *Tectona grandis* and the value was 16.86 s cm⁻¹. The lowest was observed in *Chloroxylon swietenia* and the value was 2.87 s cm⁻¹. The lowest diffusive resistance was observed in the elevated CO₂ treatment. The transpiration rate was highest in *Chloroxylon swietenia* and the value was 12.71 μg cm⁻² s⁻¹. The lowest was observed in *Artocarpus heterophyllus* and there was no significant difference among the three treatments. The mean leaf temperature was highest in *Artocarpus heterophyllus* and the lowest leaf temperature was found in *Chloroxylon swietenia*.

Based on the above results, it can be concluded that elevated CO₂ increases growth of a majority of tree species tested. This could have favourable implications for both natural and plantation forestry in Sri Lanka. Results of the present study showed that the capacity of forests for carbon sequestration would be higher in a future climate with higher atmospheric CO₂ levels.