

Quantification of Photosynthetic Light Response Parameters of Four Coconut Seedling Varieties Ready for Field Planting

**Kumarathunga W.Y.C., Weerasinghe L.K.^{*}, Nainanayake A.D.¹ and
Chandrathilake T.H.¹**

Department of Crop Science,
Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka

Sri Lanka has a wide range of coconut varieties that perform differently. The performance of these varieties under different environmental conditions is usually evaluated based on visual scoring or yield data, which takes longer to generate information and also to make selection decisions. Alternatively, physiological traits like carbon assimilation can be used to understand how plants respond to different environmental conditions. Photosynthesis is a key physiological trait that determines carbon assimilation and can thus be used to better understand plant functioning by quantifying photosynthesis light response parameters. Potted four varieties of coconut seedlings (TT (Tall x Tall), DGT (Dwarf Green x Tall), DBT (Dwarf Brown x Tall), and TDB (Tall x Dwarf Brown)) were arranged in a Randomized Complete Block Design (RCBD) to investigate varietal variation in photosynthetic light response characteristics under field capacity. The means of Light-saturated photosynthesis rate (P_{max}) for TT, DGT, DBT and TDB varieties were 17.50, 17.03, 13.37 and 14.93 $\mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$ while the mean Light Compensation Point (LCP) were 17.92, 15.8, 15.6 and 15.81 $\mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$ respectively. Further, the mean Light Saturation Point (LSP) for TT, DGT, DBT and TDB varieties were 630.2, 570.2, 454.8, and 417.3 $\mu\text{mol photons m}^{-2} \text{ s}^{-1}$ while the mean leaf Dark Respiration rate (R_D) of TT, DGT, DBT and TDB varieties were 0.78, 0.68, 0.66 and 0.81 $\mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$ respectively. However, none of the light response curve parameters and concentrations of leaf sugar, starch, nitrogen, and phosphorous, growth measurements, and soil nitrogen and phosphorous varied significantly ($P=0.05$) among the four varieties tested. Hence, it can be concluded that the four varieties perform similarly in relation to the above parameters at the field planting stage. Further research under soil moisture stress conditions is recommended to identify varietal variation among the same coconut varieties.

Keywords: Coconut seedling, Growth parameters, Leaf functional trait, Light response curves, Photosynthesis

¹Plant Physiology Division, Coconut Research Institute, Lunuwila, Sri Lanka

^{*}lasanthaw@agri.pdn.ac.lk