

## DIURNAL VARIATION OF PHOTOSYNTHESIS AND GAS EXCHANGE CHARACTERISTICS IN SELECTED COCONUT VARIETIES

D. S. Muthugala<sup>1</sup>, M.D.P. Kumarathunge<sup>2</sup> and Nalaka Geekiyanage<sup>1</sup>

<sup>1</sup>Department of Plant Sciences, Faculty of Agriculture, Rajarata University of Sri Lanka, Puliyankulama, Anuradhapura, Sri Lanka

<sup>2</sup>Plant Physiology Division, Coconut Research Institute, Lunuwila, Sri Lanka

Coconut (*Cocos nucifera* L.) is an economically important perennial crop, which is widely distributed in tropical and sub tropical climates. This study was conducted to examine the diurnal variation in photosynthesis and gas exchange characteristics of selected coconut varieties to facilitate the screening of coconut varieties for drought tolerance. Four varieties; CRIC60, CRIC65, CRISL98 and Kapruwana were arranged in the Complete Randomized Design. Leaf net photosynthesis (P), inter cellular CO<sub>2</sub> concentration (C<sub>i</sub>), stomatal conductance (g<sub>s</sub>), stomatal resistance (r<sub>s</sub>), leaf temperature (T<sub>l</sub>), instantaneous transpiration rate (E) and Vapour Pressure Deficit (VPD) were measured at hourly intervals during 07:00 – 17:00 hours. Stomatal Density (SD), concentration of sugar, starch and chlorophyll a, chlorophyll b and carotenoid were also measured. Data were analyzed using General Linear Models. P in all varieties was greatest during 08:00 – 09:00 hours and decreased after 16:00 hours. There was a midday depression in all varieties during 11:00 – 13:00 hours. In contrast to other varieties, only CRIC65 showed a minor decline and a quick recovery in P during 12:00 – 13:00 hours. The same variety had the lowest r<sub>s</sub> ( $p=0.03$ ) and a high E ( $p<0.001$ ). P was significantly lower ( $p=0.004$ ) during the evening than morning and midday. Kapruwana and CRIC65 had significantly higher g<sub>s</sub> and E than other varieties [ $p<0.001$ ] in both cases]. There was no significant difference in P, C<sub>i</sub>, T<sub>l</sub> and VPD among varieties during daytime. The starch, sugar and SD were not different among varieties. However, varieties differed in concentration of chlorophyll a, chlorophyll b and carotenoid [ $p<0.001$ ] in all cases]. Results suggested that, the optimum time periods for photosynthesis measurements, irrespective of the coconut variety, are morning (07:00 – 10:00) and midday (11:00 – 13:00). However the morning is more appropriate than the midday due to the presence of midday depression. The variety CRIC65 would potentially tolerate drought conditions.

**Keywords:** Coconut, Diurnal variation, Midday depression, Photosynthesis