

**Varietal variation in stomatal conductance, transpiration and photosynthesis of commercial sugarcane varieties under two contrasting water regimes**

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**Abstract**

The objective of this study was to evaluate some selected physiological characters of commercial sugarcane varieties under different growing conditions in Sri Lanka. A field experiment was conducted at the Sugarcane Research Institute, Uda Walawe (6°21'N latitude, 80°48'E longitude and 76 m altitude) where the annual average rainfall is about 1450 mm with a distinctly bimodal distribution. Eight sugarcane (*Saccharum* hybrid L.) varieties were grown under irrigated and rainfed conditions in split plot design. Stomatal conductance ( $g_s$ ), instantaneous transpiration rate ( $E_l$ ) and photosynthetic rate per unit leaf area ( $P_n$ ) were measured. Canopy stomatal conductance ( $g_c$ ), instantaneous canopy transpiration rate ( $E_c$ ) and transpiration efficiency ( $P_n/E_l$ ) was calculated. The behaviour of  $g_s$  in many respects to the moisture availability and growing stage was similar to the responses seen in  $P_n$ . Water deficit significantly reduced  $g_s$ ,  $E_l$  and  $P_n$ . Recovery of  $g_s$  and  $P_n$  from water stress with rainfall was quite rapid under rainfed conditions. The varieties Co775, SL8306, SL7103 and SL88116 which had higher  $P_n$  and  $P_n/E_l$ , and lower  $g_s$ ,  $E_l$ ,  $g_c$  and  $E_c$  showed comparatively superior physiological performances under rainfed conditions. Water conservation through lowering stomatal conductance, both at the individual leaf and canopy level, and higher photosynthetic rate were identified as physiological mechanism responsible for drought resistance of sugarcane.

**Keywords:** photosynthesis, sugarcane, stomatal conductance, transpiration, water regimes