

# Photosynthetic light-response curves in sugarcane plants under field conditions

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The aim of this work was to evaluate the photosynthetic light-response at two canopy positions of sugarcane varieties growing under field conditions. Sugarcane IACSP93-2060 has curved leaves at the upper canopy layer while IACSP95-3028 has erect leaves. Photosynthetic evaluation were taken in canopy layers with differential exposure to sunlight: upper (high light availability); and bottom (low light availability). Light-response curves were fitted using a nonrectangular hyperbola and several cardinal variables were evaluated. Sugarcane IACSP95-3028 showed higher values of photosynthetic capacity ( $P_{max}$ ) than IACSP93-2060 in both upper (44.2 vs. 28.0  $\mu\text{mol m}^{-2} \text{s}^{-1}$ ) and bottom layers (29.6 vs. 25.6  $\mu\text{mol m}^{-2} \text{s}^{-1}$ ). The light compensation point did not differ between varieties or canopy layers, ranging from 31 to 34  $\mu\text{mol m}^{-2} \text{s}^{-1}$ , as well as the dark respiration that varied between 1.2 and 1.7  $\mu\text{mol m}^{-2} \text{s}^{-1}$ . However, the apparent quantum efficiency of IACSP93-2060 was higher in bottom canopy layer than in upper layer (0.051 vs. 0.040  $\mu\text{mol} \mu\text{mol}^{-1}$ ). This result indicates that leaves of the bottom layer have improved light use as a consequence of shading promoted by the upper canopy leaves. Changes in light curve convexity gave additional information on differences regarding light use. At the upper layer, curve convexity of the two varieties was around 0.60, indicating no light saturation. Light saturation was not observed at the bottom position; however, convexity was around 0.81 and suggests lesser responsiveness of photosynthesis to light increasing. In conclusion, small differences in leaf angle insertion ( $5^\circ$ ) cause large differences in photosynthesis and the attenuation of light availability through plant canopy increases quantum efficiency of photosynthesis of older leaves regardless leaf architecture.

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