

Seasonal and diurnal variation of photosynthesis, biomass production and canopy development in sugarcane varieties

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The sazonal and diurnal patterns of photosynthesis are directly related to biomass production. The objective of this work was to evaluate the variation of photosynthesis in four sugarcane varieties SP79-1011, IACSP94-2094, IACPS94-2101 and IACSP95-5000 growing under field conditions. Measurements of photosynthesis (P_N), biomass accumulation and leaf area index (LAI) were taken every month from September 2010 to February 2011, sampling these important physiological traits during the spring and summer seasons. P_N was measured on the first fully expanded leaf with visible ligule (+1), every two hours between 7:00 and 17:00 h, considering the natural variation of light availability. The highest values of P_N occurred between 9:00 and 13:00 h. Maximum values of P_N were around $35 \mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$, regardless sugarcane varieties. Estimates of CO_2 uptake throughout spring and summer seasons revealed similarity among SP79-1011, IACSP-95-5000 and IACSP94-2101, with IACSP94-2094 showing lower (~28%) photosynthesis. However, the highest biomass accumulations were observed in IACSP95-5000, IACSP94-2101 and IACSP94-2094 ($>250 \text{ ton ha}^{-1}$), with the lowest biomass production occurring in SP79-1011 ($\sim 174 \text{ ton ha}^{-1}$). There was not a direct correlation between CO_2 uptake per leaf unit area and biomass accumulation. However, we found significant correlation between LAI and biomass production, with LAI ranging between 10.5 and 14.5 in IACSP95-5000, IACSP94-2101 and IACSP94-2094. The lowest LAI value was found in SP79-1011 (7.0). We conclude that biomass production in those sugarcane varieties is explained by canopy development and soil covering rather than to photosynthesis per unit area.

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