Interceptation of Photosynthetically Active Radiation, CO_2 assimilation and accumulation of total fresh matter by sugarcane varieties in subtropical condition

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The knowledge about the variation of photosynthetically active radiation (PAR) enables the quantification of photosynthesis in agricultural systems directly related, in sugarcane cultivation, with the productivity of sugar and energy. The experiment aimed to study the PAR in two sugarcane varieties irrigated by subsurface drip system at Campinas, Brazil planted in 03/05/2010 with spacing of 1.5 m. The varieties IAC-SP95-5000 (IAC95) have curved leaves and leaf insertion angles around 16.9° and IAC-SP79-1011(IAC79) have erect leaves and leaf insertion angles near 11°. Measurements of maximum daily PAR in the area were made by LICOR-LI190SB at 7 m height (PAR_I), 0.1m below the upper canopy (PAR_{DI}) and 0.5m above the ground (PAR_{DT}). The global solar irradiance (Qg) measurements were made at 7 m height and the maximum CO_2 daily assimilation (A_{CO2}), with NR-LITE and LI6400XT, respectively. The results indicate the cloudiness and rainfall have strong influence on availability of PAR for plants. On clear days (Qg>= 910Wm^{-2} and no rain), assuming an average albedo of 5%, the assimilated PAR by the canopy (PAR_{AS} = (PAR_I-0.05.PAR_I-PAR_{DT})) in relation to PAR_I was 0.74 and 0.64 for IAC95 and IAC79 respectively. On cloudy days (Qg<910 Wm^{-2} or rainfall) PAR_{AS} related to PAR_I was 0.81 and 0.75 for IAC95 and IAC79 respectively. Both meteorological conditions have PAR_I (μmol $CO_2m^{-2}s^{-1}$) approximately 1.69xQg (Wm^{-2}). The A_{CO2} in November was 947078.5 and 793233.0 $mmolCO^2h^{-2}day^{-1}$ and in December was 595721.7 and 2783824.5 $mmolCO_2m^{-2}day^{-1}$ for cultivars IAC95 and IAC79, respectively. The total fresh matter (culm and leaves) (TFM) produced in December was 87.6 and 76.6 kg ha^{-1} for IAC95 and IAC79, respectively. These data suggests that IAC95, with insertion angles 5% greater, presented more CO_2 assimilation, interception of PAR and accumulation of TFM than IAC79.

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