Exogenous sucrose modulates differently photochemistry activity and CO_2 fixation in two contrasting sugarcane cultivars

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Sucrose may modulate photosynthesis in sugarcane but the biochemical mechanisms are not understood yet. This work was performed in order to evaluate the influence of exogenous sucrose on the photosynthesis and sugar metabolism in sugarcane. Two contrasting cultivars in terms of drought resistance (IAC-SP-94-2094 - resistant and IAC-SP-95-5000 - sensitive) were compared. Exogenous sucrose (50 mM) was sprayed in +3 leaves of seven month old plants. Both cultivars showed similar leaf sucrose content but the sensitive genotype presented higher reducing sugar levels and lower starch content. Exogenous sucrose induced contrasting response in terms of sugar metabolism, that is, the resistant cultivar presented stronger decrease in leaf sucrose content, increase in reducing sugars and no alterations in starch content. Sucrose also affected differently the CO_2 fixation, photochemistry activity and Rubisco large subunit content. Net photosynthesis decreased more prominently in the IAC-SP-94-2094 in parallel to Rubisco content resulting higher intercellular concentration of CO_2. The dark photochemical parameters (Fo and Fv/Fm) indicated no sucrose-induced changes associated to photo-inhibition and photodamage in the two cultivars. Contrastingly, the light photochemical parameters (ΔF/Fm', ETR, qP and NPQ) were only changed in the resistant cultivar, indicating lower yielding in photosystem II and higher heat-energy dissipation. The data indicate that exogenous sucrose induces a strong cultivar-dependent modulation on the chlorophyll fluorescence, photosynthesis and sugar metabolism in sugarcane plants. However, the elucidation of biochemical and physiological mechanisms underlying these contrasting responses need further studies involving enzymatic and molecular approaches.

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