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Photosynthetic damage induced by combined effects of salinity and heat stresses in cashew plants

Adilton Vasconcelos de Fontenele¹, Sérgio Luiz Ferreira-Silva¹, Evandro Nascimento Silva¹, André Luis Coelho da Silva¹, Joaquim Albenísio Gomes Silveira¹

¹*Laboratório de Metabolismo de Plantas, Departamento de Bioquímica e Biologia Molecular/UFC, Campus do Pici, Tel: 85-3366-9821, e-mail: adilton_vf@yahoo.com.br*

Although the effects of the salinity and heat stresses on plant metabolism have been extensively studied, little knows how their combination affects the photosynthesis. In this study were assessed the combined effects of salinity and heat stresses on the photosynthetic efficiency of cashew plants. Thirty days-old plants were watered with nutrient solution without or with 100 mM NaCl until the stressed plants reached a stomatal restriction of 80%. Then, control and salt-stressed plants were exposed to 25°C or 45°C for 12 h in a growth chamber under controlled conditions performing the following treatments: control (25°C), salinity, heat (45°C) and salinity + heat. The stomatal conductance of plants exposed to salinity, heat and salinity + heat stresses was reduced by 70%, 20% and 70%, respectively, while the CO₂ assimilation in plants subjected to those three stresses was decreased by 50%, 50% and 80%, respectively, in relation to control. The effective quantum yield of photosystem II was not affected by salt-stress, but it was reduced equally by 50% in response to heat stress or the salinity + heat. The electron transport rate was not affected by salinity alone, but it was dropped by 50% in response to both heat and salinity + heat stresses. The non-photochemical quenching was not affected by saline treatment isolated, but it was 4-fold and 20-fold high in the heat stress and in the combination of the two stresses, respectively. The photochemical quenching was equally reduced by 30% in the heat and salinity + heat treatments, but it was not affected by salinity alone. The results display that the photosynthesis in cashew plants is more affected by heat stress than by salinity. Moreover, show that in plants under saline conditions the damage of heat stress on the photosynthesis are intensify, indicated that the combination theses two stresses possess an antagonistic effect on the photosynthetic efficiency.

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