

Mechanisms of energy dissipation in peanut under water stress

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Abstract

Effect of drought on the mechanisms of energy dissipation was evaluated in two-month-old *Arachis hypogaea* cvs. 57-422, 73-30, and GC 8-35. Plants were submitted to three treatments: control (C), mild water stress (S1), and severe water stress (S2). Photosynthetic performance was evaluated as the Hill and Mehler reactions. These activities were correlated with the contents of the low and high potential forms of cytochrome (cyt) b_{559} , plastoquinone, cyt b_{563} , and cyt f . Additionally, the patterns of carotenoids and chlorophylls (Chls), as well as the alterations of Chl a fluorescence parameters were studied. Under mild water stress the regulatory mechanism at the antennae level was effective for 57-422 and GC 8-35, while in the cv. 73-30 an overcharge of photosynthetic apparatus occurred. Relative to this cv., under S1 the stability of carotene and the dissipative cycle around photosystem (PS) 2 became an important factor for the effective protection of the PS2 reaction centres. The cyclic electron flow around PS1 was important for energy dissipation under S1 only for the cvs. 57-422 and 73-30.

Additional key words: *Arachis*; chlorophyll fluorescence; cultivar differences; cytochromes; energy dissipation; Hill reaction; Mehler reaction; photosynthetic electron carriers; photosystems 1 and 2; plastoquinone; xanthophyll cycle.

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Abbreviations: C = control; Chl = chlorophyll; cyt = cytochrome; DCPIP = 2,6-dichlorophenolindophenol; DCPIP₂ = reduced 2,6-dichlorophenolindophenol; DPC = 1,5-diphenyl-carbazide; F_m = maximum fluorescence; F_v = variable fluorescence; F_0 = initial, minimal, or basal fluorescence; MV = methyl viologen; N = neoxanthin; PQ = plastoquinone; PS = photosystem; q_p = photochemical quenching; RuBPCO = ribulose-1,5-bisphosphate carboxylase/oxygenase; RWC = relative water content; S1 = mild water stress; S2 = severe water stress; V = violaxanthin; Z = zeaxanthin; Φ_e = quantum yield of PS2 electron transport.