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“Bridging the gap between increasing knowledge and decreasing resources”

Chlorophyll Fluorescence as a Tool for Evaluation of Drought Stress Tolerance in Iranian Pistachio Cultivars

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Abstract

Pistachio (*Pistacia vera* L., Anacardiaceae) is one of the major horticulture crops in Iran with high plantation surface areas, production and export rates. However, water deficiency has been becoming a main limiting factor for growth and development, and especially for maintaining yield quality and volume of this crop. In this study, the responses of chlorophyll fluorescence, carbohydrate content and a number of growth parameters of three Iranian pistachio cultivars (*P. vera* cv. Akbari, Kaleghochi and Ohadi) to different osmotic drought stress levels (-0.1, -0.75 and -1.5 MPa) and subsequent recovery were investigated in a greenhouse experiment held in Ghent, Belgium. With increasing drought stress intensity, desired parameters were monitored during both drought stress build-up and subsequent recovery. Maximum quantum efficiency of PSII photochemistry (Fv/Fm), effective quantum yield (Φ PSII) and photochemical quenching (qP) decreased in drought-stressed plants in both drought and recovery stages. Non-photochemical quenching (NPQ) was not significantly influenced after two weeks of drought stress. When comparing the different cultivars of pistachio, our results show that decreasing the solution's osmotic potential lowered Fv/Fm and NPQ in Akbari while no effect was observed for the other cultivars. There were no significant differences between Φ PSII and qP during drought stress build-up among the three cultivars. For the drought treatments, we evidenced a significant accumulation of fructose, sucrose and starch in all cultivars during drought stress stage, whereas there was no significant accumulation of glucose compared to control. Total fresh and dry plant weights and leaf dry weight decreased significantly at all drought stress levels compared to control. The ratio of root/shoot and leaf dry weight increased in drought-stressed treatments. Stem elongation had a significantly higher value in control compared to drought stress treatments. Seedling main stem diameter did not vary significantly between drought stress treatments and control. As overall conclusion, most of chlorophyll fluorescence parameters decreased in drought stress condition. Therefore, these parameters could be used as a tool to recognise the resistant or susceptible pistachio cultivars.

Keywords: Carbohydrate content, growth parameters, water deficiency