Accumulation of proline concentration, carbohydrates and lipid peroxidation in helianthus shoots-leaves as affected by Mn toxicity and hormones

A. Giannakoula *, I.F. Ilias

Department of Crop Production, Technological Educational Institute of Thessaloniki, PO Box 141, Sindos 54100, Greece

Abstract: The objective of this research was to investigate the effects of metal toxicity and growth retardants Prohexadione-Calcium on the growth and physiological parameters of helianthus (*Helianthus annus* L.) grown under a growth chamber environment. Main stem length of helianthus plants decreased in a quadratic pattern as the concentration of Mn and Prohexadione-Ca increased. High concentrations (200 mgl^{-1}) resulted in shorter plants than control plants. The application of 200 mgl^{-1} of Mn resulted in diminution of the leaf chlorophyll concentration, in both cultivars and also, significantly affected variable fluorescence Fv, maximum quantum yield of photosystem II (PSII) photochemistry (Fv/Fm), and the others chlorophyll fluorescence parameters (Fo, Fm, Fv/Fo). Since chlorophyll content and and variable fluorescence decreased significantly but Fo did not change significantly the decrease of $t_{1/2}$ indicates negative changes on the acceptor side of PSII, which also may related to the diminution of the Calvin cycle. Furthermore, high accumulation of proline concentration, carbohydrates and lipid peroxidation was induced after exposure of plants to Mn treatment.