

Effect of zinc and ascorbic acid on the agronomic characteristics of medicinal plant of purple coneflower under drought stress conditions in Khuzestan

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ABSTRACT:

An experiment was conducted at Sardasht in Khuzestan to evaluate the effect of zinc sulfate and ascorbic acid on *Echinacea purpurea* in response to water deficit stress. The experimental treatments included the water deficit stress as the main factor at three levels (a1: irrigation after 70 mm evaporation, a2: irrigation after 120 mm evaporation, and a3: irrigation after 170 mm evaporation from class A pan), and the treatment combination included the zinc sulfate at two levels (b1: no application and b2: foliar application of zinc sulfate with the concentration of five (5) per thousand) and the foliar application of ascorbic acid at four levels (c₁: no application, c₂: 50 mg/l, c₃: 100 mg/l and c₄: 150 mg/l) as the secondary factor. The results showed that the application of water deficit stress on purple coneflower caused significant differences in the stem diameter, number of flowering branches, stomata density, zinc concentration of aerial parts, fresh weight yield, RWC, LAI, proline concentration, CGR, RGR and NAR. Highest LAI was related to the complete irrigation treatment with 2.85. Highest proline concentration belonged to foliar application of zinc sulfate in the condition of irrigation after 170 mm evaporation from class A pan with 10.16 mg/g fresh weight and the lowest proline concentration was related to the treatment of no foliar application of zinc sulfate in complete irrigation condition with 0.08 mg/g fresh weight. The highest CGR with 6.77 g/m²/day was obtained in control and the lowest CGR with 4.16 g/m²/day was obtained in the treatment of 170 mm stress. The highest growth rate with 0.19 g/m²/day was obtained in control and the lowest growth rate with 0.14 g/m²/day was obtained in the treatment of 170 mm stress. The highest NAR with 2.64 g/m²/day belonged to control and the lowest NAR with 1.91 g/m²/day belonged to the treatment of 170 mm stress. Considering the results of this study, the application of ascorbic acid as an antioxidant may decrease the harmful effects of drought stress on some characteristics of purple coneflower including NAR, CGR, RGR, and RWC.

Keywords:

Ascorbic acid, water deficit stress, agronomic characteristics