

Effects of water stress and soil nitrogen levels on some biochemical properties in grain sorghum cultivars under greenhouse conditions

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Abstract

In order to study the effects of different amounts of irrigation and nitrogen levels on physiological reactions of two sorghum (*Sorghum bicolor*) cultivars, an experiment was performed under greenhouse conditions at Ferdowsi University of Mashhad, in 2011. Treatments were two irrigation regimes (I₁, I₂, consisting 100 and 40 % of field capacity, respectively), four nitrogen levels (N₁, N₂, N₃ and N₄ consisting 0, 30, 60 and 90 mg N/kg soil, respectively) and two cultivars (Sepideh and M5) arranged in randomized complete block design with three replications. The results showed that water stress significantly decreased chlorophyll a and b and increased carotene contents in sorghum cultivars. Nitrogen application had significant effect on chlorophyll a. Water treatments led to an increase ascorbat and soluble sugars contents. Water stress and nitrogen application increased prolin content of sorghum cultivars. Grain yield was affected by water stress and nitrogen treatments. The highest value of grain yield was obtained by full irrigation and 60 mgN/kg soil. Our result show that in water stress conditions, biochemical changes in sorghum were accrued such as increase activity of antioxidants, reduces the content of free radicals in cells and increase in the amount of carotenes prevents damage to the plant cells. Also in these conditions, with increasing content of osmotic adjustment and water balance of the cells, could prevent severe reduction in leaf relative water content of the cells and causes the stabilization of the cell structure. According to correlation coefficients obtained from the experiments we can conclude that in drought conditions, biochemical factors in maintaining grain yield consist of concentration of soluble carbohydrates and proline, respectively.

Keywords: Water stress, Greenhouse, Nitrogen, Grain sorghum.

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