

## Effects of foliar application of humic acid and drought stress on growth and physiological characteristics of marigold (*Taget erecta*)

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### Abstract

Plants are faced with various environmental stresses during their growing period. Each of these stresses have different effects on growth, metabolism and yield according to the sensitivity level and stage of the plant growth. One way of reducing the negative effects of the stresses is to use humic substances. The present study was carried out to evaluate the effects of humic acid and drought stress on morphological and physiological indices of marigold. The experiment was carried out according to the factorial arrangement, based on completely randomized design with three replications, in Department of Horticultural Science, Arak University, in fall and winter of 2016. The effects of four humic acid levels (0, 50, 100 and 250 mg/L) and three irrigation intervals (5, 10 and 15 days) was investigated on physiological and morphological traits of the marigold (root length, number of leaves and flowers, chlorophyll a, chlorophyll b, total chlorophyll, carotenoids, phosphorus, calcium and proline contents). Results showed that root length and proline content was increased by increasing intensity of drought stress. The highest proline content was obtained by 15-day irrigation interval without humic acid and the lowest content was obtained by 5-day irrigation interval with 250 mg/L humic acid. However, drought stress reduced number of leaves and flowers, chlorophyll (a, b and total), carotenoid, and phosphorus and calcium contents. Higher levels of humic acid, particularly 250 mg/L, increased the amount of chlorophyll a, chlorophyll b, total chlorophyll, carotenoids, phosphorus content, root length, number of leaves in the sixth week and number of flowers; but reduced the calcium and proline contents. The 250 mg/L humic acid treatment not only reduced the negative effect of drought stress, but also was able to improve the physiological and morphological characteristics. In conclusion, using humic acid, especially at higher concentrations, is recommended for increasing the irrigation interval of marigold flower.

**Keywords:** Humic acid, Drought stress, Phosphorus, Chlorophyll.

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