

Abstract

Drought is the most harmful factor of crop production in the arid and semi-arid eras which has a negative impact on all aspects of plant growth and production. Also, in the plants exposed to severe soil dry the photosynthetic apparatus activities were damaged or impaired, leading to a decrease of photosynthetic capacity and lipid oxidation is increased in these conditions. Therefore, many studies have been done to minimize the stress effects caused by Water deficit in plants. Therefore, the use of mechanisms that lead to losses of this tension can be useful. Growth regulators has a crucial role in the pharmaceutical industries have many applications. Developmental processes of plants plays and their use the yield of crops can be improved. Jasmonic acid and methyl jasmonate (MeJA) are plant growth regulators that can affect many physiological and biochemical processes in plants. On the other hand, tendency to use fertilizers with advances nano science, nano, special attention increased. Nano-titanium dioxide has beneficial effects on the growth, physiological processes and activities of the plant metabolism. Therefore, in order to evaluate effect of various concentrations of two elicitors Jasmonic acid (JA) and Nano-titanium dioxide (TiO₂) on the activity of antioxidant defense system, Morphophysiological traits ,growth parameters and gene expression 1-8 Cineol santhase of Sage under drought stress, a factorial experiment in a completely randomized design with three replications was conducted in University of Zabol. The experimental treatments was included drought stress (irrigated in Field capacity, depletion of soil water content up to 50% and 75% of FC condition), foliar Nano Titanium dioxide spray (Control, 50 and 100 mg.l⁻¹) and jasmonic acid (control, 75 and 150 mg.l⁻¹). In this study some morphological traits (Fresh and dry weight, Height, Number of leaves, Stem diameter, Length and width of the leaves) Physiological traits (Relative water content, Chlorophyll a, b and T. chlorophyll, Total phenol, Proline) and activities of antioxidant enzymes (Peroxidase, Ascorbate peroxidase, Guaiacol peroxidase, Superoxide dismutase and Catalase) were estimated .experiment. The next step involved extracting RNA and cDNA synthesis in order to examine the gene expression pattern 1-8 Cineol santhase ,were performed and using the Real-time PCR method, the gene expression pattern was studied. The data obtained from the morphological, physiological, and molecular measurements were analyzed using SAS v. 9/1. The results showed that increased levels of drought stress, cause decreased growth parameters, Photosynthetic pigments, relative water content and the amount of proline, the activity of antioxidant defense system (Enzymatic and non-enzymatic) and the gene expression pattern 1-8 Cineol santhase increased. However tha application of Jasmunic acid and Titanium dioxide at each level of drought stress, changed the amount of Physiological, morphological traits, activity of antioxidant system and the gene expression pattern 1-8 Cineol santhase in Sage, So that with increasing Foliar Concentration, the amount of Photosynthetic pigments, relative water content, proline and the activity of antioxidant defense system (Enzymatic and non-enzymatic), expression pattern Cineol and morphological traits increased, While their their combined use (Interaction between jasmonic acid and titanium dioxide) was non-significant. According to the results, using jasmonic acid and titanium dioxide Separate under drought stress can have a positive effect on the traits of the studied sage

Key words: Growth regulators plant, Antioxidant enzymes, Medicinal plant, Nanoparticles, Photosynthetic pigments



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