PHYSIOLOGICAL AND BIOCHEMICAL RESPONSES OF MARIGOLD MEDICINAL PLANT (*CALENDULA OFFICINALIS L.*) TO DROUGHT STRESS

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Drought stress is one of the most important factors that limit crop productivity worldwide [2]. For assigning drought stress on biochemical indicators of Calendula (*Calendula officinalis* L.), an experiment was carry out on research farm of Collage of Agriculture at Shahed University in 30 Km of South Tehran region. This study was based on randomized complete block (RCBD) with three replications in 2010-2011. The factors of soil water potentials as drought stress were including: D_1 (Control or applying 0.5 atm as field capacity (FC)), D_2 (potential of 3.5 atm), D_3 (potential of 6.5 atm), and D_4 (potential of 10 atm). The results showed that drought stress had significant effect on all characters ($P<0.01$), and drought stress changed anthocyanins content, carotenoids content, and soluble sugars, proline content and photosynthetic pigments content. Also, maximum of photosynthesis pigments contents (17.59) were obtained on soil medium stress and proline content in optimum irrigation (0.5 atm) 47 % were lower than hard relatively stress.

In order to cope with water shortage, plants developed several adaptive features at morphological, physiological, biochemical and molecular levels, which permit their continuous growth and survival. In most cases, when osmotic stress is detected, plant's first response is to avoid low water potential by decreasing stomatal conductance and, in long term, by changes in root growth in order to maximize water uptake [3]. As additional tolerance mechanisms, plants must avoid cell dehydration by preventing water loss, via cell wall hardening, or promoting water influx, as a result of active solute accumulation that decreases the osmotic potential, through a process named osmotic adjustment. Plants submitted to water deficit are seriously affected by secondary damages caused by oxidative stress. As previously mentioned, one of the earliest responses aiming water loss avoidance involves stomatal closure, which subsequently down-regulates the photosynthetic machinery due to a decrease in CO_2 uptake [1]. As a consequence, the photosynthetic electron transport chain becomes over-reduced, resulting in the generation of reactive oxygen species (ROS). In plant cells, the excessive production of ROS is potentially harmful to lipids, proteins and nucleic acids, whose oxidation may in turn lead to detrimental effects such as enzyme inhibition, chlorophyll degradation, disruption of membranes integrity, loss of organelle functions and reduction in metabolic efficiency and carbon fixation,amongothers [1].

References

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