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Title

Effects of drought stress on morphophysiologic and biochemical triats of safflower (Carthamus tinctorious L.) under different planting methods and spraying of Zinc nanochellat

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Abstract:

In order to to studythe effect of drought stress on morphophysiological and biochemical *triats* of safflower in under different methods of planting and spraying zinc Nano chelate, a study in the form of twice-split plots in a randomized complete block design with three replications in two The crop year 2016-2017 and 2017-2018 were conducted at Agricultural and Natural Resources Research and Training Station of Zahak . Experimental factors include planting at two levels (flat and furrow) as the main factor, irrigation regime at three levels (irrigation after 45 percent(control), 65and 85 percent depletion of soil water) as a secondary factor. spraying Zinc Nano chelate in three levels (non-spraying, spraying 0.5 and 1 g. Li^{-1}Zinc Nano chelate) as sub-sub-factor. Results of variance analysis showed that morphological and physiological characteristics except chlorophyll fluorescence measured in 2016 crop year increased significantly compared to 2017. The results showed that drought stress and spraying Zinc Nano chelate had a significant effect on yield, yield components and water use efficiency and oil percentage and other morphological characteristics. Number of heads per plant, 1000-seed weight, grain yield and water use efficiency were affected by planting method. Drought stress significantly reduced and spraying Zinc Nano chelate also increased the studied traits. Seed yield in flat planting method increased by 16% compared to barley and furrow planting methods. . irrigation after 45 percent(control) compared to irrigation 85 percent depletion of soil water increased grain yield by 28%. spraying Zinc Nano chelate at a 1 g. Li^{-1}Zinc Nano chelate increased grain yield by 28%, water consumption by 29% and oil by 11% compared to non-spraying. The results of growth index analysis showed a decrease in dry weight, harvest index and crop growth rate under the influence of drought stress. In the early stages of growth in both planting methods did not show significant differences in terms of growth indices under the influence of different irrigation treatments. The difference between implantation methods became apparent upon entering the reproductive stage. Increasing spraying Zinc Nano chelate at the level of 1 g. Li^{-1}Zinc Nano chelate improved the changes in growth indices in most irrigation regimes. The results of physiological examination showed that under drought stress the physiological traits of chlorophyll fluorescence, RWC, chlorophyll index decreased. Physiological parameters showed better improvement with increasing overlap under stress and non-stress conditions in most stages of development. The results of biochemical analysis of leaves showed an increase in proline and soluble carbohydrates and catalase and peroxidase in leaves under drought stress. Application of zinc increased proline and soluble carbon hydrate, catalase and peroxidase in leaves. Levels of chlorophyll a and b and leaf chlorophyll decreased due to dehydration stress. Application on the amount of these three pigments also increased. With increasing stress, the amount of potassium, sodium and zinc, calcium and magnesium increased. Application of zinc fertilizer increased zinc, magnesium, potassium, calcium and decreased sodium in the leaves. Based on the results of flat planting method with spraying 1 g. Li^{-1}Zinc Nano chelate in the event of drought stress can be able to compensate and eliminate the damage caused by stress for economic production in Sistan climate.

Key words: Zinc, Drought stress, Proline, Grain yield, Growth index