

Effects of field capacity based-irrigation levels on physiological and agronomic characteristics of medicinal pumpkin (*Cucurbita pepo* L.)

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Extended Abstract

Zeynali, M., Maleki Zanjani, B., Moradi, P., Shekari, F., Effects of field capacity based-irrigation levels on physiological and agronomic characteristics of medicinal pumpkin (*Cucurbita pepo* L.) *Applied Research in Field Crops* Vol 31, No. 4, 2019 1-3: 1-20(in Persian)

Introduction: Pumpkin (*Cucurbita pepo* L.) is a diploid plant, which belongs to the Cucurbitaceae family. Drought is one of the main abiotic stresses that restricts plant production in the most farmlands in Iran. To develop crops with enhanced resistance to drought stress, it is necessary to obtain sufficient knowledge of physiological mechanisms and also the genes that are responsible for the control of drought resistance traits at different plant developmental stages. Since pumpkin is not indigenous to Iran and was introduced into the country just a few decades ago, there is a lack of information available on how its morphological and physiological traits would be affected by drought stress in regions with mild drought such as Zanjan. Thus, the present study can be a preliminary step for further study in pumpkin which can lead to increasing production of this economically and medicinally important plant in the region.

Materials and Methods: To investigate the effect of duration of drought stress on several physiological parameters in four cultivars of medicinal pumpkin (*Cucurbita pepo* L.), an experiment was conducted as split – split plot based on a complete randomized block design (RCBD) with three replications. The main plots were allocated to five levels of water stress (S1 or control, S2 or irrigation at 75% of field capacity (FC), S3 or irrigation at 50% FC, S4 or irrigation at 25%

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FC and S5 or without irrigation (rainfed)), the sun-plots were allocated to four pumpkin cultivars that are grown in multiple regions of Iran (V1 or anonymous cultivar from Khoy, V2 or anonymous cultivar from Isfahan, V3 or anonymous cultivar from Zanzan and V4 or var. *Stytiaca*) and the sub-subplots were assigned to 12-week duration of water stress. The data were subjected to variance analysis using SAS 9.1 software.

Results and Discussion: The results showed that there were not statistically significant differences among the four cultivars for the most of the measured traits. Since pumpkin is not native to Iran, it seems that these cultivars have a similar genetic origin. Our results showed that with increasing intensity of water stress, seed and fruit yields and their component traits were reduced. Leaf relative water content (RWC) in the all pumpkin cultivars decreased with increasing drought stress where the lowest RWC was related to *Stytiaca* cultivar at the twelfth week of drought stress imposition under rainfed conditions. In our study, total exchange gas in all four cultivars when they were imposed to drought stress was changed. One of the first responses of plants to drought is stomatal closure, restricting gas exchange between the atmosphere and the inside of leaf. The drought stress resulted in reduction of chlorophyll a, b and carotenoids. A reason for chlorophyll content reduction is that drought stress enhances the production of reactive oxygen species (ROS) such as O₂ – and H₂O₂, which can lead to lipid peroxidation and, consequently, chlorophyll degradation (Tatrai *et al.*, 2016). Proline contents were increased under drought stress. The proline accumulation during the stress helps plants reduce oxidative destruction and it is necessary for survival under drought stress (Verbruggen and Hermans, 2008). Our study revealed that with increasing drought stress, seed protein (%) was increased. Moreover, increasing drought stress resulted in enhanced levels of soluble sugar. The observed rise in the content of soluble sugars during stress can be attributed to the cessation of growth or the synthesis of these compounds via non-photosynthetic routes (Ghorbanali, 2003).

Conclusion: The results of this study showed that under normal irrigation conditions, anonymous cultivar from Isfahan (V2) outperformed the other cultivars in the most of the measured traits e.g. fruit yield, RWC, photosynthesis and transpiration rate, stomatal conductance and carotenoids. It might be stated that with increasing the duration and the intensity of drought stress, V2 cultivar was less affected by drought stress compared to other ones because its photosynthetic indices were less impacted by water deficit, leading to the smaller decrease of its yield attributes. Hence, V2 cultivar was found to be superior compared to the other cultivars and has the potential to be cultivated under Zanzan region growing conditions.

Keywords: Drought stress, proline, pumpkin, soluble sugar, seed protein

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