

## **University of Zabol**

**Graduate School** 

Faculty of Water and Soil Department of Water Engineering The thesis Submited for PhD Degree (In the Field of Irrigation and Drainage)

## Effect of seaweed extract on water salinity stresses and in bell peppers and simulation of yield with AquaCrop

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## Abstract

Salinity and drought stress are of the most important factors limiting the yield of plants in arid and semi-arid regions. Seaweed extract fertilizer, as one of the biofertilizers, increases the strength and resistance of plants against abiotic stresses through the acceleration of germination, further expansion of roots and absorption of nutrients. This study aimed to evaluate the effect of seaweed extract on the effects of salinity and water deficit on the yield and yield components of bell pepper in Zahak County. Brackish water was obtained from wells in the region. The study was conducted in two cropping seasons of Bahman 1401 and 1402 in a randomized complete block design with three replications. The treatments included three levels of irrigation water (I1, I2, I3, respectively equivalent to 60, 80 and 100% of the plant's water requirement) and three levels of irrigation water salinity (S1, S2 and S3, respectively equivalent to 1, 3 and 5 dS/m) and four levels of seaweed (SE1, SE2, SE3 and SE4, respectively equivalent to 0, 0.5, 1.5 and 3 g/l). Treatment zero was considered as the control treatment (without seaweed). The highest yield (34.6 ton/ha) was obtained from the I3S1SE4 treatment and the lowest (5.3 ton/ha) was obtained from the I1S3SE1 treatment. In all treatments, water productivity increased with increasing seaweed extract content. water productivity values ranged from 1.07 kg/ha in I1S3SE1 treatment to 4.57 kg/ha in I2S1SE4 treatment. The results showed that although under-irrigation up to 80% reduced the yield of bell pepper plants, considering that this reduction was not significant and increased the efficiency of irrigation water use, the amount of water used could be reduced by 20% in order to save water consumption and its application cost. Also, considering that the application of seaweed extract at a level of 3 g/l caused the greatest increase in yield and yield components of bell pepper and reduced salt and water stresses, the use of this level of seaweed is recommended for bell pepper plants under research conditions. The results showed that the accuracy and efficiency of the EcoCrop model for simulating yield and water use efficiency under different water quantitative and qualitative treatments is acceptable in both calibration and validation stages. Also, considering that different water quantitative and qualitative treatments have not been simulated with this plant model so far, and on the other hand, considering the simplicity and high accuracy of the model, it can be used to evaluate different irrigation scenarios with different qualities in terms of salinity in order to optimize water use and irrigation management for similar plants in the Sistan region.

Keywords: Water use efficiency, leaf area index, soil salinity, chlorophyll, vitamin C