Purslane as a super-high K accumulator Halophyte

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INTRODUCTION

Purslane (*Portulaca oleracea* L.) is a valuable, nutritive vegetable crop for human consumption and for livestock forage. It is widely distributed around the globe and is popular as a potherb in many areas of Europe, Asia, and the Mediterranean region. This plant possesses mucilaginous substances which are of medicinal importance. It is also a rich source of nutrients such as potassium and magnesium as well as antioxidant (Kamaluddin et al., 2020). It is widely used in folk medicine most probably because of the efficacy of some of its constituents.
Purslane has been classified as a moderately salt tolerant plant with a threshold of 6.3 dS m-1 and a slope of 9.6 percent (Maas & Grattan, 1977; Kumamoto et al., 1990). In addition, it is reported that purslane tolerance to salinity increases after first cutting (Grieve & Suarez, 1997). Grieve and Suarez (1997) introduced Purslane as an excellent candidate for cropping with highly saline waters.
Iran's agricultural section is negatively affected by water scarcity and salinity and it is estimated that around 55 percent of its agricultural lands are suffered (Qureshi et al. 2007). In addition, Iran imports huge amount of livestock foods while tries to decrease its dependence. At the same time, it is estimated that around 75 m3sec-1 of saline drainage waters are available in Khuzestan province (Howeizeh et al., 2017), in the future. So, using saline drainage waters for halophyte plant production such as Purslane towards decreasing dependence to livestock food import seems to be a good strategy for Iran. In this line, the present study was carried out to quantify the effect of salinity stress on Purslane performance.

METHODOLOGY

To evaluate the response of Purslane to salinity stress the effect of different irrigation water salinities including 0.44 (control), 3, 6, 9, 12, 15 and 18 dSm-1 on Purslane properties was studied under outdoor conditions. The salinity treatments arrange in a completely randomized design with 3 replications. Sodium (Na) and potasium (K) content were measured using a flame photometer.

RESULTS

Effect of salinity on Purslane K content

The results showed that Purslane top K content at lowest salinity level of 0.3dSm-1 of irrigation water was the highest and it was equal to 11.4 percent. The results also showed that salinity stress had negative effect on Purslane top K content. It decreased successively as salinity of irrigation water increased and significantly followed the non-linear quadratic regression model (Y=11.82 – 0.63X+0.021X2, R2=0.83**). The minimum Purslane K content (7.17 percent) was observed at highest irrigation water salinity of 18 dSm-1 (Fig. 1)

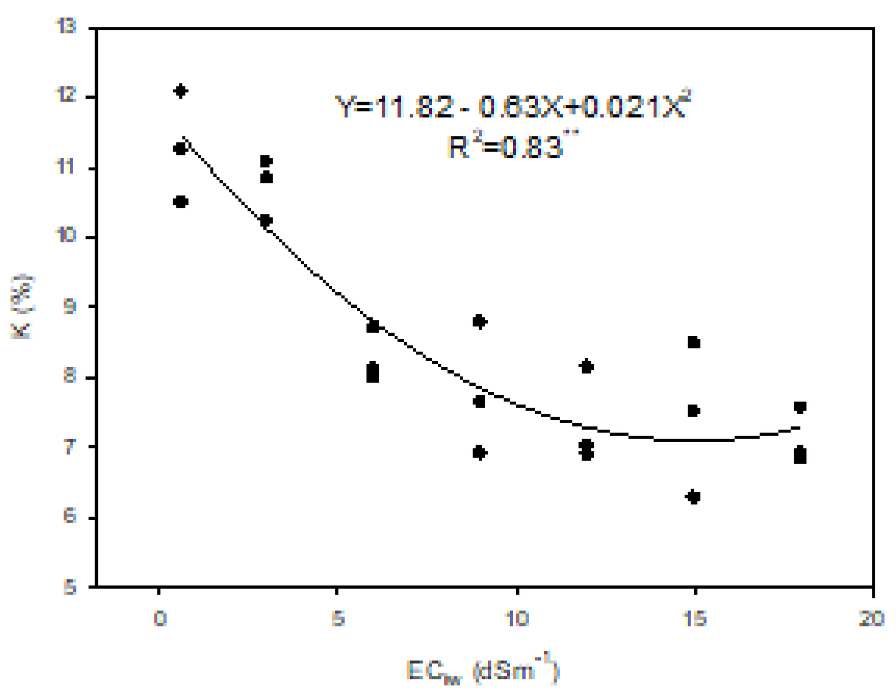

Fig 1- The effects of different irrigation water salinity levels on purslane shoot potassium content.

Effect of salinity on Purslane Na content

In contrast with Purslane K content, the top Purslane Na content was increased as salinity stress increased and it followed a non - linear quadratic regression model (Y=1.45+ 0.76X-0.026X2, R2=0.84**). The Na content at the lowest salinity level of 0.3dS-1 was equal to 1.9 percent and successively increased to 6.7 percent at highest salinity level of 18 dSm-1 (Fig. 2).

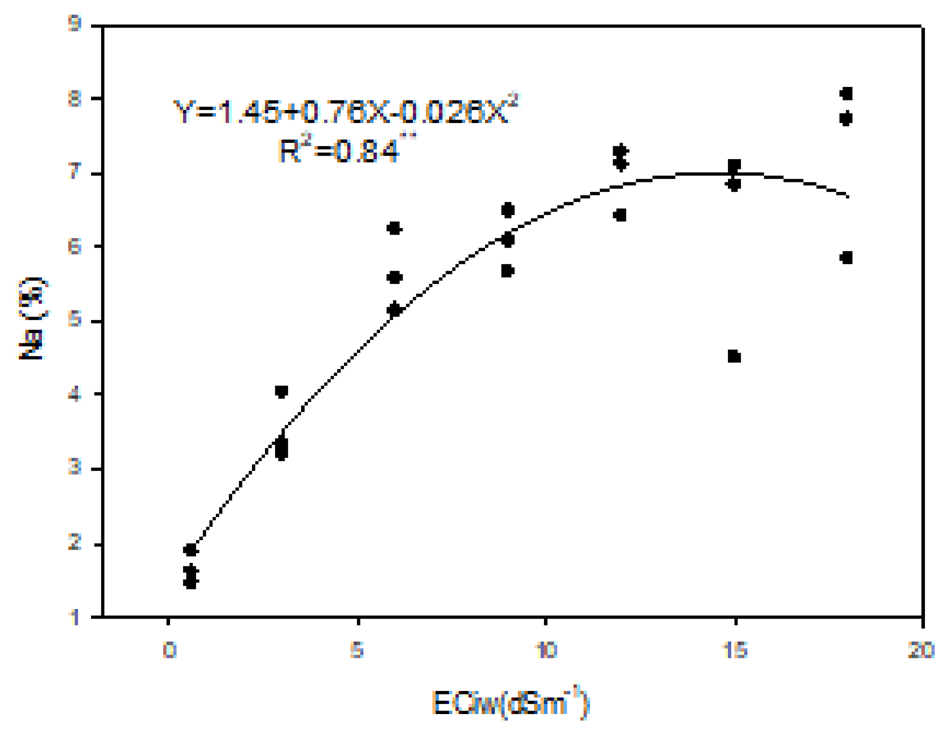

Fig 2- The effects of different irrigation water salinity levels on purslane shoot sodium content.

Purslane Na and K content correlation

As Purslane top K and Na content in response to salinity stress was in reverse, the hypothesis of negative effect of Na on K absorptions is form. To document this, the Na and K content of Purslane was correlated. The results confirmed the high and significant correlation between Na and K content of Purslane under different salinity stresses. So, it can be concluded that low K content of Purslane is due to higher sodium absorption as a result of increasing salinity stress.

DISCUSSION

The potassium content of Purslane shoot dry weight under conditions of our experiment was around 11 percent at non – saline conditions and it is around 10 times of average potassium content in plant shoot dry matter sufficient for adequate growth (Marschner, 2012). Our results is in line with Kafi and Rahimi (2011). They reported the Purslane K content of 7.3 percent at lowest salinity level of zero Na content. They also showed the significant decrease in Purslane leaf K content with increasing salinity stress. With increasing Na content of irrigation water from 0 to 240 mM, the Purslane leaf K content decreased by 64 percent.

CONCLUSIONS

It was concluded that Purslane is a super high K accumulator plant that can be produced with saline water.

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