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ORIGINAL ARTICLE

Study Nutritional status of *Melissa officinalis* under Salt stress and Brasinolyd

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ABSTRACT
To study the effect of salinity stress and Brasinolyd on growth of Melissa officinalis an experiment was carry out as factorial using completely randomized block with three replications in the research greenhouse, Islamic Azad University, branch of Marand. The plants were irrigated with four salinity levels 2, 4, 6, 8 dSm-1 and three levels of Brasinolyd as 0.0, 0.5, 1 ppm. At flowering, plants were harvested and growth characteristic such as shoot and root dry weight, chlorophyll and proline contents were determined. The results showed that the growth characteristics significantly decreased by increasing salinity of water.
Keywords: *lemon balm, growth, Salinity stress, Brasinolyd*

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INTRODUCTION

A member of the Lamiaceae (mint) family, lemon balm (*Melissa officinalis*) belongs to a genus which includes five species of perennial herbs native to Europe,central Asia and Iran. Although *Melissa officinalis* originated primarily in Southern Europe, it is now naturalized around the world, from North America to NewZealand [1]. Lemonbalm occurs naturally in sandy and scrub by areas [2] but has also been reported to grow on damp waste land, at elevations ranging from sea level to the mountains [3]. Sari and Ceylan [4] reported that it has medicinal effects and aromatic properties. Salts concentrated in the soil with the irrigation water and after water evaporation and then taken up by crops. The response and growth of plants to saline conditions vary at different stages of growth. All plants tolerate salinity to a certain threshold level without yield reduction. After that, an increase in salinity level significantly reduces yield. Management practices must be selected to ensure that the levels of salinity in the soil are not harmful to crop growth. The objective of this study was to investigate the effect of brasinolyd and salinity stress on growth characteristics of lemon balm.

MATERIALS AND METHODS

The experiment was conducted as factorial complete randomized block design with three replications, in the research greenhouse, Islamic Azad University, branch of Marand.
The factors were: 1-Salinity with four levels 2, 4, 6, 8 $dSm^{-1}$and 2-Brasinolyd with three levels, 0.0, 0.5, 1 ppm on the lemon balm. The seeds were prepared from Caspian Marand agencies, Marand. Per pot, 2 kg of 4 mm washed sand was added, then the seed disinfection with sodium hypochlorite 5.0% for 5 minutes, were planted in pots. About a week after planting and seedling growth, thinning operation was done. After the seedlings had reached to the 4-leaf stage both days, 150 ml of the Hoagland solution with the electrical conductivity 2, 4, 6, 8 dS m^{-1} were irrigated. Immediately after each treatment, Brasinolyd was sprayed on plants. At flowering, plants were harvested. About 3 days before harvesting, plant chlorophyll content and proline were measured [5, 6]. At harvest, plants were taken to determine Shoot and root dry weight. The leaf area was measured. All the data were subjected to statistical analysis using

SAS software (SAS Institute, version 9.2). Where the F-test showed significant differences among means, differences between the treatments were performed by Tukey Test.

RESULTS

The results showed that water salinity had insignificant effects on plant growth. But brasinolyd only had significant effects on proline, leaf area and root dry weight (Table 1).

Table 1. ANOVA of effects of Salinity and Brasinolyd on plant growth characteristic

S.O.V	DF	MS					
		Proline	Chlorophyll b	Chlorophyll a	Leaf area	Shoot D.W	Root D.W
S	3	0.44^{**}	341.84^{**}	452.2^{**}	1625.3^{*}	0.024^{*}	0.0002^{**}
B	2	0.39^{**}	$^{n.s}11.49$	$^{n.s}26.5$	$^{*}1005.4$	$^{n.s}0.012$	0.0001^{*}
S*B	6	1.31^{**}	$44.28^{n.s}$	$25.8^{n.s}$	$168.2^{n.s}$	$0.016^{*.}$	$0.00004^{n.s}$
Error	22	0.029	11.12	16.14	212.5	0.004	0.00003

: significant at α=0.01** :significant at α=0.05* n.sNon-significant:

Root dry weight

The results showed that the use of S & B has the significant effects (5%) on root dry weight (Table 1). The mean comparison showed that the highest and lowest root dry weight was observed in S2 and S4, respectively (Table 2). But with the increasing amount of B, root dry weight as well as the significant increase in the B2 group had the highest root dry weight (Table2).

Shoot dry weight

The results showed that the effect of S and S * B, respectively, at 1% and 5% had a significant effect on shoot dry weight (Table 1). Mean comparisons showed that the highest shoot dry weight observed in S2, which had a significant difference with S4 (Table 2). The interaction effects were significant and the mean comparison showed at Fig.1.

Leaf area

Analysis of variance showed that the effects of S and B respectively at 1% and 5% were significant in leaf area (Table 1). Means comparison showed the highest leaf area was in (Table 2). But the increase in the amount of B leads to significantly increased leaf area (Table 2).

Table 2.Mean comparison of effects of Salinity stress and brasinolyd on plant characteristics

Treatment	Dry Weight		Leaf area	Chlorophyll		Proline
	Root	Shoot		a	b	
S1	0.017ab	0.54ab	40.43a	52.68a	38.25a	0.71c
S2	0.022a	0.62a	42.41a	51.75a	33.34b	1.2a
S3	0.014ab	0.62a	24.57ab	45.62b	19.99c	1.15ab
S4	0.011b	0.52b	14.19b	37.3c	11.59d	0.97b
B0	0.013b		22.63b			0.99b
B1	0.015ab		28.1ab			0.84b
B2	0.02a		40.5a			1.19a

Chlorophyll a

Analysis of variance showed that the effect of S on the chlorophyll was significant at 1% (Table 1). Means comparison showed that the highest amount of chlorophyll observed in the S1 treatment (Table 2).

Chlorophyll b

Analysis of variance showed that the effects of S and S*B on chlorophyll b was significant at 1% (Table 1). Means comparison showed that the highest and the lowest amount of chlorophyll was in the treatments S1 and S2, respectively, which is significantly different to other treatments (Table 2). The comparison showed that the amount of chlorophyll b significantly decreased with the increasing use of S treatments (Table 2).

Proline

Analysis of variance showed that the effect of treatments on the amount of proline was significantly at 1% (Table 1). Means comparison showed that the highest proline, exist in S2 (Table 2). Mean Comparison showed that increased consumption of the B, significantly increased amounts of proline(Table 2). Also mean comparison showed that with increasing use of S & B, proline is also increasing, but in other treatments it has a significant decreasing trend (Fig.3).

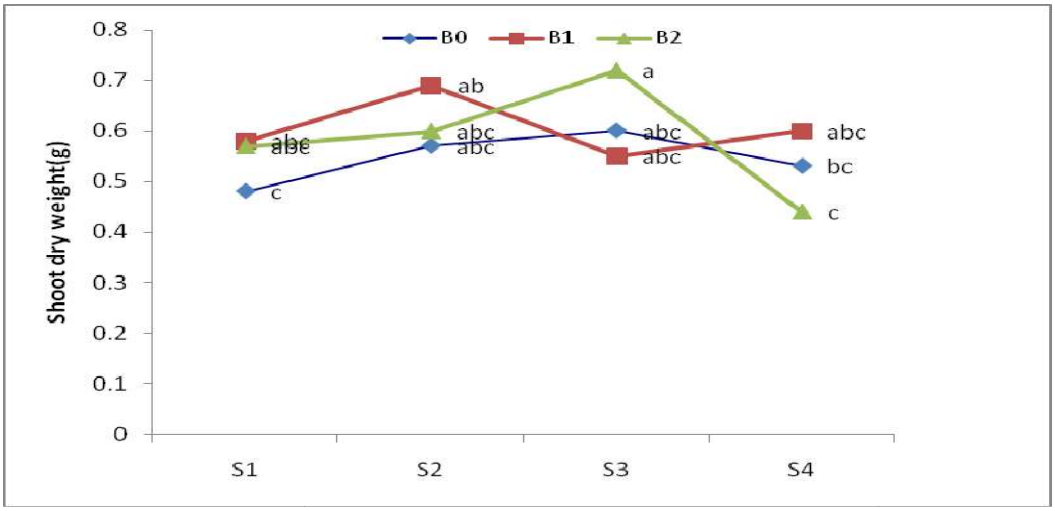

Fig.1.Effects of Salinity and brasinolyd on Shoot dry weight of Lemon balm

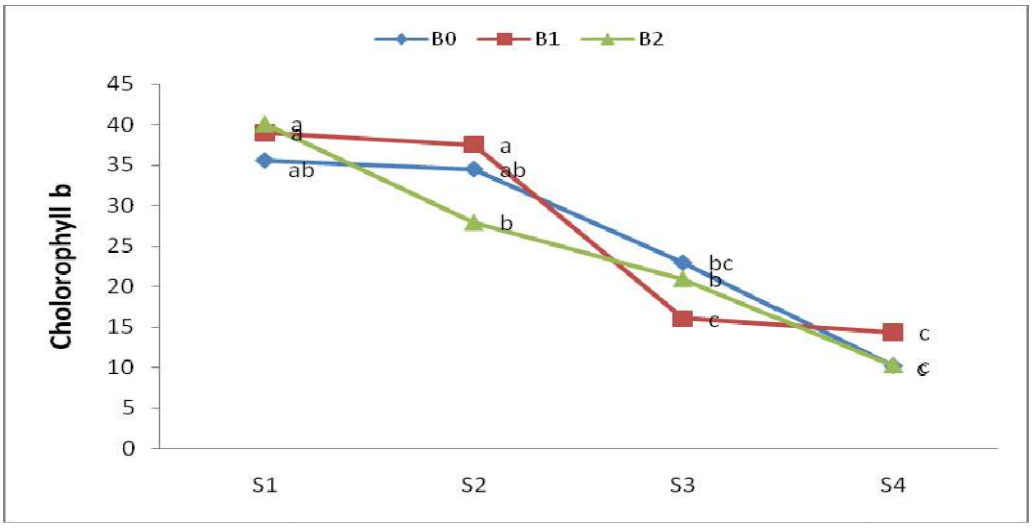

Fig.2.Effects of Salinity and brasinolyd on cholorophy b contents of Lemon balm

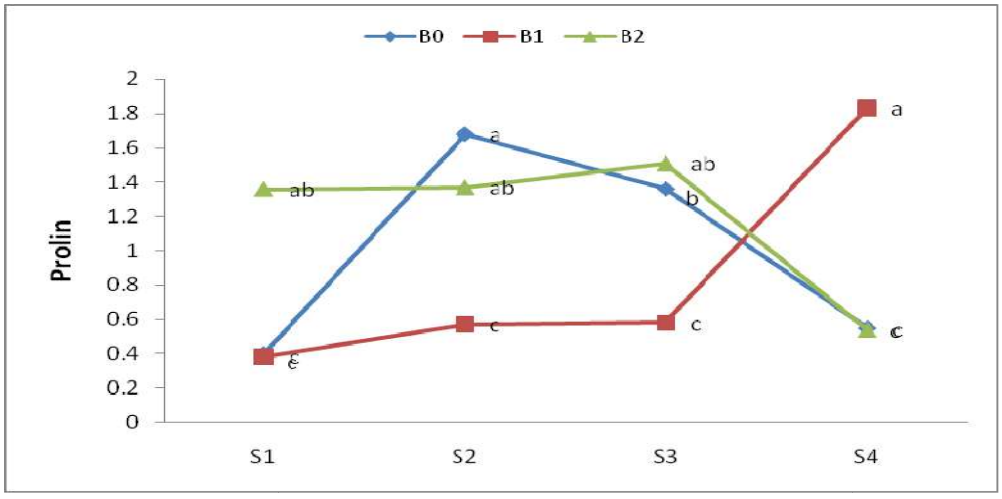

Fig.3.Effects of Salinity and brasinolyd on proline contents of Lemon balm

DISCUSSION AND CONCLUSIONS

The results showed that salinity stress significantly affected growth parameter of lemon balm. The results of this study confirmed that salinity stress had a negative effect on most of the growth characteristics of lemon balm. The Highest plant characteristics were observed under S2treatment and all of growth

parameter were reduced as increasing in salinity. Salinity also caused reduction in the shoot and root dry weight. Torrecillas *et al*., [7] reported that Shoot and root dry weights reduced by salinity in *Cistus albidus* and *Cistus monspeliensis*. The same result observed by Genhua and Denise [8]. According to Rengel [9] the osmotic effect is responsible for the decreasing growth of aerial organ under saline stress.

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