



Seed treatment of *Coriandrum sativum* L. with salicylic acid under salinity

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ABSTRACT: In order to investigate the effect of salicylic acid on *Coriandrum sativum* L. germination, this experiment was conducted in Nahavand University, on base of factorial experiment as completely randomized design with three replications. The treatments included a combination of 4 levels of salinity (0, 2, 4 and 6 dS/m) and four levels of priming (0, 0.1, 0.3 and 0.6% salicylic acid). The results showed that salinity and priming decreased germination percentage, radicle length, plumule length and seedling fresh weight significantly. As using salicylic acid even in the lowest concentration (0.1%) decreased all measured traits to lowest amount (0). In this study salicylic acid did not have significant effect on reducing harmful effect of salinity. This can be dated to the high concentration of salicylic acid which is used in current study. It can be concluded although salicylic acid is a growth stimulator in plant germination, the concentration which is used for priming must be limited.

Keywords: *Coriandrum sativum* L., salicylic acid, salinity, priming.

INTRODUCTION

Salicylic acid is an endogenous growth regulator with phenolic nature (Sakhabutdinova *et al.*, 2003). It acts as a potential, non-enzymatic antioxidant as well as a plant growth regulator and plays an important role in regulating some plant physiological processes (Noreen *et al.*, 2009) such as stimulating adventitious organ, development, herbicidal effect and providing resistant biotic and abiotic stress (Canakci and Munzuro lu, 2007, Hussein *et al.*, 2007).

The germination stage, due to the effect on plant density is critical, because plant survival and establishment is related to early stages of growth (Boydak, 2003). It is reported that ions in water or soil at this stage can be stimulating or inhibitory effect on germination (Tanji, 1990).

Snaranta *et al.*, (2002) stated salicylic acid is an important intermediate molecule in plants against environmental stresses.

Since *Coriandrum sativum* L. is a valuable medicinal plant, the aim of this study is to investigate the effect of priming with high concentration of salicylic acid on germination of *Coriandrum sativum* L. in saline condition.

MATERIAL AND METHODS

The current study was carried out in Nahavand University lab, Iran in 2015 as a factorial experiment based on a randomized complete block design with three replications. The experimental treatments included salinity at four levels (0, 2, 4 and 6 dS/m) and

salicylic acid at four levels (0, 0.1, 0.3 and 0.6%). The *Coriandrum sativum* L. seeds were sterilized by 10% hypochlorite solution and then, were rinsed with distilled water. The seeds were soaked in salicylic concentrations (0, 0.1, 0.3 and 0.6%) at 25°C for 24 hours. Distilled water was used as control treatment. Afterwards, the primed seeds were rinsed with distilled water and dried between two layers of paper (23±2°C with relative humidity of 60%).

After 24 hours, the seeds were located in petri dishes. After 7 days, the number of germinated seeds was recorded. A seed was considered germinated upon emergence of radical about 2 mm in length. Seed germination percentage was determined at the end of the test. The radicle length, plumule length and seedling fresh weight was measured.

Analysis of Variance was based on ANOVA procedure by software SAS. Differences among the means of the treatments were estimated using the Duncan's multiple range tests at the 5%.

RESULTS AND DISCUSSION

The results showed that salinity affected germination percentage, radicle length, plumule length and seedling fresh weight significantly (Table 1). Also, the results showed that salicylic acid significantly affected seed germination percentage, radicle length, plumule length and seedling fresh weight (Table 1). There was a significant interaction between salinity and SA concentration too.

Table 1: Analysis of variance for different growth parameters of *Coriandrum sativum* L. in response of salinity and priming.

Source of variation	Degree of freedom	Sum of square			
		Seedling Fresh weight	Plumule length	Germination percentage	Radical length
Salinity levels	3	0.00008**	7.44**	343.45**	4.34**
Priming levels	3	0.0012**	61.44**	7951.53**	52.33**
Salinity*priming	9	0.00008**	7.17**	370.69**	4.27**
Error	32	0.000008	0.7	64.51	0.22

** : significant at 0.01 probability levels

Table 2 showed that radical length was significantly decreased with the increasing salinity stress (Table 2). The seedling fresh weight and plumule length were not reduced significantly up to 6 dS/m salinity level.

Using priming treatments decreased germination percentage, radicle length, plumule length and seedling fresh weight significantly (Table 3). As using salicylic acid even in the lowest concentration (0.1%) decreased all measured traits to lowest amount (0).

Table 2: Effect of salinity levels on the studied parameters of *Coriandrum sativum* L.

Salinity levels	Mean				
	Seedling weight	Fresh	Plumule length	Germination percentage	Radical length
0	0.007a	1.75 a	18.33 a	1.66 a	
2 (dS/m)	0.006 a	1.45 a	16.66 ab	1.20 b	
4 (dS/m)	0.005 a	1.45 a	10.90 bc	1.18 b	
6 (dS/m)	0.001 b	0 b	6.66 c	0.23 c	

Within column means followed by the same letter (a ...) are not significantly different at the 0.05 level, according to Duncan test.

Table 3: Effect of priming levels on the studied parameters of *Coriandrum sativum* L.

Priming levels with salicylic acid)	Mean			
	Seedling Fresh weight	Plumule length	Germination percentage	Radical length
0%	0.02 a	4.54 a	51.66 a	4.19 a
0.1%	0 b	0 b	0 b	0 b
0.3%	0 b	0 b	0 b	0 b
0.6%	0 b	0 b	0 b	0 b

Within column means followed by the same letter (a ...) are not significantly different at the 0.05 level, according to Duncan test.

The interaction of salinity and priming had significant effect on germination percentage (chart 1). The highest germination percentage was produced in the first level of salinity (control or 0 dS/m) and first level of priming (control or 0% salicylic acid).

In other words the highest germination percentage was produced without using salinity and priming treatment (77%). Also there was no significant difference between first and the second level of salinity (2dS/m) without priming treatment (chart 1).

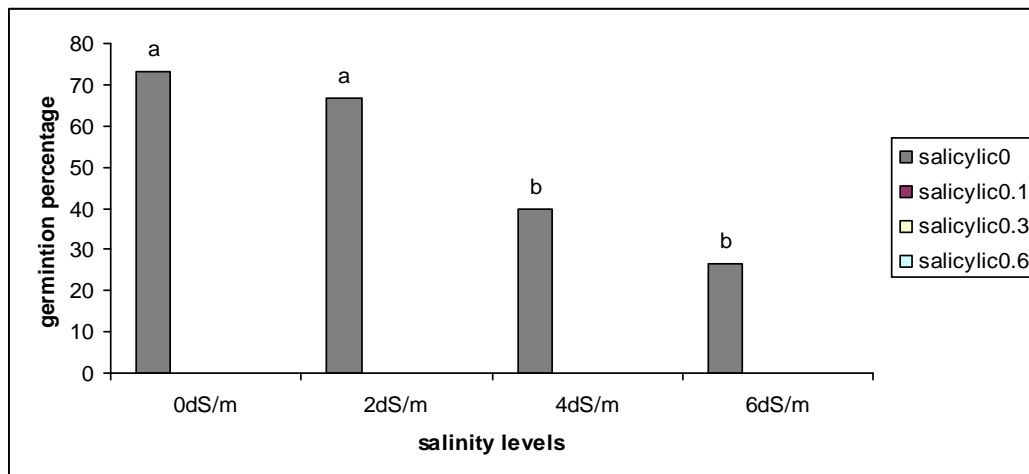


Chart 1. The interaction effect of salinity and salicylic acid on germination percentage of *Coriandrum sativum* L.

The interaction of salinity and priming had significant effect on radical length (chart 2). The highest radical length was obtained without using salinity and without priming treatment (6.66). Using salinity and salicylic acid treatment decreased radical length significantly even in lowest levels (chart 2). The interaction of

salinity and priming had significant effect on plumule length (chart 3). The highest plumule length was obtained when no salinity and priming treatment were used (7). Also there was no significant difference in plumule length between first and the second level of salinity (2dS/m) in lack of priming treatment (chart 3).

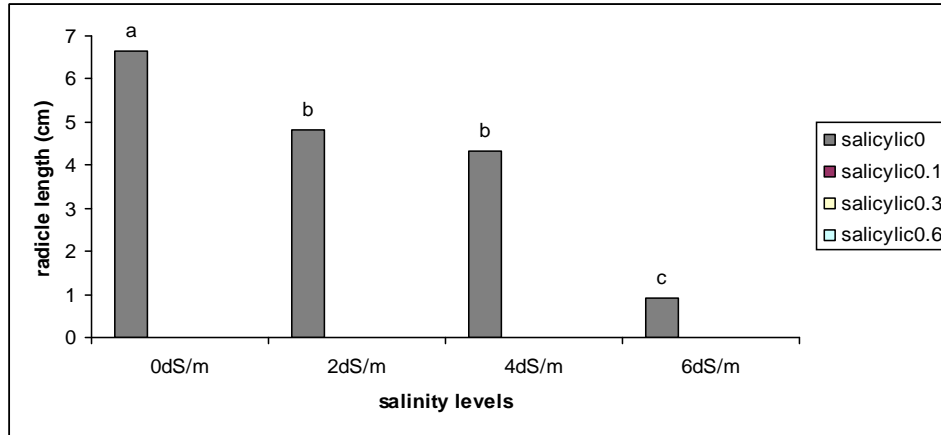


Chart 2. The interaction effect of salinity and salicylic acid on radicle length of *Coriandrum sativum* L.

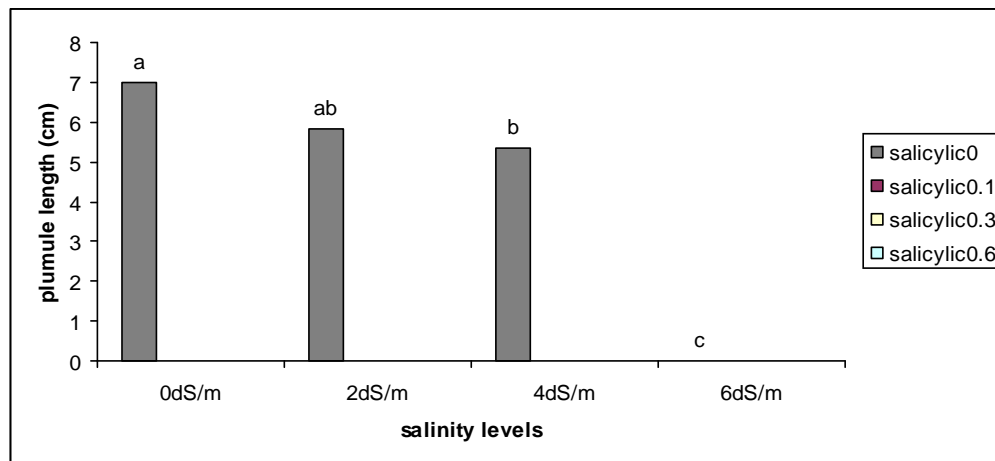


Chart 3. The interaction effect of salinity and salicylic acid on plumule length of *Coriandrum sativum* L.

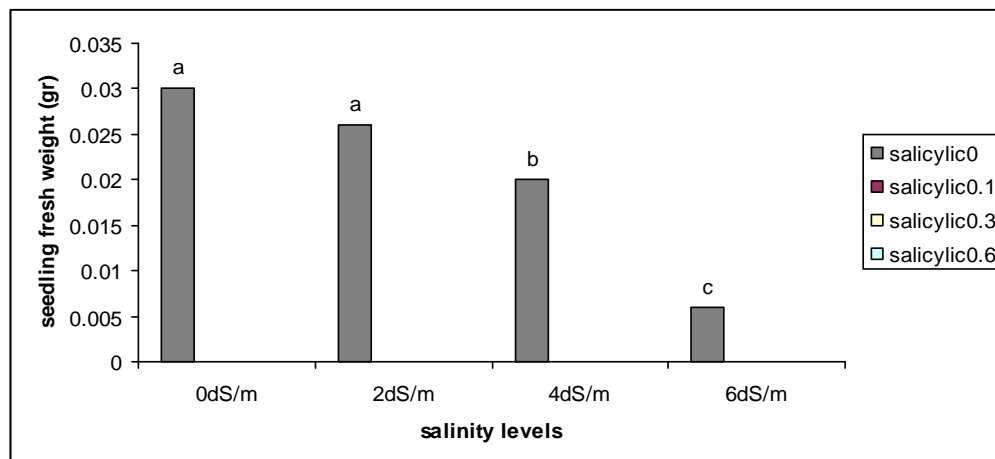


Chart 4. The interaction effect of salinity and salicylic acid on seedling fresh weight of *Coriandrum sativum* L.

The interaction of salinity and priming had significant effect on seedling fresh weight (chart 4). The highest seedling fresh weight was produced without using salinity and in the lack of priming treatment (0.03). Using salinity and salicylic acid treatment decreased radical length significantly even in lowest levels (chart 4).

The results showed that priming *Coriandrum sativum* L. seeds with salicylic acid did not have significant effect on reducing harmful effect of salinity. However the previous studies showed the useful effects of priming with salicylic acid in biotic and abiotic stresses (Maria *et al.*, 2000, Dat *et al.*, 1998, He *et al.*, 2002, Kang and Saltveit, 2002). In this study this useful effect did not observe. The reason for this can be dated to the high concentration of salicylic acid which is used in this research. It can be concluded although salicylic acid is a growth stimulator in plant germination, the concentration which is used for priming must be limited and high levels of salicylic acid not only don't improve germination condition, but also had unfavorable effects on it.

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