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Effects of spermine on root length, root fresh weight and root dry weight in orange

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ABSTRACT: Salt tolerance in citrus has been linked to the exclusion of toxic ions from the shoot. the physiological role of stress-induced PA accumulation remains unknown. Polyamines titers, altered in different manners, are dependent on several factors, such as plant species, tolerance or sensitivity to stress and duration of stress. The experiment was conducted in 2011at the greenhouse and laboratory was located in Shiraz (Iran). Effect of different salinity levels alone showed that increasing salinity levels, root dry weight was reduced to salinity levels so that maximum root length and root dry weight of the lowest salinity level of 3200 mg per kg soil. Effects of polyamines showed that with increasing concentrations of foliar polyamines root dry weight was increased.

***Keywords*:** Salt stress, root dry weight, Root length.

INTRODUCTION

Salt tolerance in citrus has been linked to the exclusion of toxic ions from the shoot (Garcia-Sanchez, 2002). Thus, citrus rootstocks have a great influence on the amount of Cl^- and/or Na+ accumulated in the foliage of grafted trees (Storey and Walker, 1999). In citrus, it has been reported that 10 mM KNO3 is a much higher concentration which nitrate is reported to act as a chloride antagonist (Cerezo, 1999). At this concentration, potassium also can equalize the imbalances resulting from the excess of Na+ without affecting the physiological responses (Ban˜uls, 1997; Moya, 1999). In Navelina orange, KNO3 supplementation via root partially counteracted saltstress reduced plant growth by increasing dry matter and new leaf area (Iglesias, 2004). Polyamines (PAs) are organic polycations found in all living organisms. In higher plants putrescine (Put), spermidine (Spd) and spermine (Spm) are the most abundant PAs and are involved in the various developmental processes (Tonon, 2004). For the fact that the levels of PAs increase during adaptation to stresses in a variety of plants, it is thought that they are also involved in these processes. Salt stress causes an initial water-deficit and ion-specific stresses resulting from changes in K^+/Na^+ ratios. Thus, it leads to an increased Na^+ and Cl^- concentrations that decrease plant growth and productivity by disrupting physiological processes, especially photosynthesis (Shu, 2010). Salt stress affects photosynthetic efficiency of plant through stomatal limitation and non-stomatal limitations, such as stomatal closure (Meloni, 2003), chlorophyll content loss (Sudhir and Murthy, 2004), inhibition of Rubisco activity (Brugnoli and Björkman, 1992; Ziska, 1990), and degradation of membrane proteins in photosynthetic apparatus (Khan and Ungar, 1997). However, the physiological role of stress-induced PA accumulation remains unknown. Polyamines titers, altered in different manners, are dependent on several factors, such as plant species, tolerance or sensitivity to stress and duration of stress. The exogenous addition of polyamines to stress treated cells or tissues could lead to injury alleviation and growth promotion in most cases, although the effects varied between polyamines and among plant species (Shen, 2000; Bouchereau, 1999; Capell, 2004; Kauskabe, 2004). Plants under salinity stress are observed to be associated with a reduction in salt tolerance. So far, the physiological role of PAs in tolerance to environmental stress remains uncertain (Bais and Ravishankar, 2002; Capell et al., 2004; Amri and Shahsavar, 2010). It has been suggested that exogenous application of polyamines can to some extent alleviate salinity-

induced decline in photosynthetic efficiency, but this effect strongly depended both on PAs concentrations or types and stress levels (Duan et al., 2008).

MATERIALS AND METHODS

The experiment was conducted in 2011at the greenhouse and laboratory was located in Shiraz (Iran). Orange seedlings were used in this study. To achieve this prestigious producer of greenhouse seedlings 6 months from Valencia varieties of citrus trees around the city of Shiraz was purchased and the plants were planted in the pots containing 8 kg of soil. As substrate, a layer of soil surface horizons (30-0 cm) from ghalat district of Shiraz, procurement and testing of the soil, depending on the mix of soil, nutrients were added. To prepare the salt solutions of NaCl purity 99.5%, MERCK, Germany was used to build factories and solutions with concentrations of 800, 1600 and 3200 ppm was made. To prepare a solution containing spermine, spermine powder was manufactured by SIGMA American country represented using different concentrations (0.1 and 0.2 mili molar) were prepared from this material. The field experiment was laid out in randomized complete block design with factorial design with four replications.

RESULTS AND DISCUSSION

Root length

Interaction of different levels of salinity and dissolved sprayed with various concentrations of polyamines on root length, root length showed the highest level of treatment without soil sprayed with a solution 0.2 mM polyamines were (29.1 cm). The lowest root length was also related to salinity levels of 3,200 milligrams per kilogram of soil treatments with spray solution with 0 and 0.1 mM polyamines was (no growth). Effect of different salinity levels alone showed that with rootstocks, root length was reduced so that the maximum root length of the shortest root level without salt The salinity level of 3200 mg per kg soil. Effects of polyamines showed that with increasing concentrations of polyamines were sprayed over the roots grew.

Table 1. Interaction of different levels of salinity and concentrations of polyamines on root length (cm)

Polyamine	Salinity levels (mg/ kg)				mean
	0	800	1600	3200	
0	27.71c	25.86d	15.44f	0i	17.2B
0.1	28.73b	21.98e	16.25f	0i	16.7B
0.2	30.38a	28.83b	14.41g	11.04h	21.2A
mean	29.1A	25.5b	15.3c	3.62D	-

Any two means not sharing a common letter differ significantly from each other at 5% probability

Root fresh weight

The results showed that the root fresh weight generally decreased with increasing salinity levels from the root fresh weight no significant between 0 and 800 mg per kg of soil salinity was observed. The results showed that foliar polyamines on root fresh weight with increasing concentration of the added weight. Interaction of different levels of salinity and concentrations of polyamines on root fresh weight showed the highest fresh weight of treated soil with no sprayed with a solution of 0.2 mM polyamines, respectively. The lowest root fresh weight of 3,200 milligrams per kilogram of soil salinity level treatments sprayed with a solution of 0 and 0.1 mM polyamines, respectively.

Table 2. Interaction of different levels of salinity and concentrations of polyamines on Root fresh weight (gr)

Polyamine	Salinity levels (mg/ kg)				mean
	0	800	1600	3200	
0	11.55d	11.35d	10.73d	0f	8.40B
0.1	11.55d	12.27c	11.24d	0f	8.79B
0.2	15.44a	13.39b	11.35d	8.69e	12.2A
mean	12.8A	12.3A	11.1B	2.89C	-

Any two means not sharing a common letter differ significantly from each other at 5% probability

Root dry weight

Results of the interaction of different levels of salinity and dissolved sprayed with various concentrations of polyamines on root dry weight showed the greatest root dry weight of treated without solution sprayed with 0.2 mM polyamines, respectively (26.7gr). The lowest root dry weight of 3,200 milligrams per kilogram of soil salinity level treatments sprayed with a solution of 0 and 0.1 mM polyamines was (no growth). Effect of different salinity levels

alone showed that increasing salinity levels, root dry weight was reduced to salinity levels so that maximum root length and root dry weight of the lowest salinity level of 3200 mg per kg soil. Effects of polyamines showed that with increasing concentrations of foliar polyamines root dry weight was increased.

Table 3. Interaction of different levels of salinity and concentrations of polyamines on Root dry weight (gr)

Polyamine	Salinity levels (mg/ kg)				mean
	0	800	1600	3200	
0	4.19e	4.29e	5.21d	0g	3.42C
0.1	6.44c	6.54c	6.13cd	0g	4.77B
0.2	7.26a	6.64c	6.95b	3.47f	6.o8A
mean	5.96A	5.82A	6.09A	1.56C	-

Any two means not sharing a common letter differ significantly from each other at 5% probability

REFERENCES

Amri E and Shahsavar A. 2010. Response of lime seedlings (Citrus aurantifolia L.) to exogenous spermidine treatments under drought stress. AJBAS, 4(9): 4483-4489.

Bais HP and Ravishankar GA. 2002. Role of polyamines in the ontogeny of plants and their biotechnological applications, Plant Cell Tiss. Organ Cult., 69: 1-34.

Ban uls J, Serna MD, Legaz F, Talon M and Primo-Millo E. 1997. Growth and gas exchange parameters of Citrus plants stressed with different salts. J. Plant Physiol. 150, 194–199.

Brugnoli E and Björkman O. 1992. Growth of cotton under continuous salinity stress: influence on allocation pattern, stomatal and non-stomatal components of photosynthesis and dissipation of excess light energy. Planta, 187: 335–347.

Capell T, Bassie L and Christou T. 2004. Modulation of the polyamine biosynthetic pathway in transgenic rice confers tolerance to drought stress. USA. Proc. Natl. Acad. Sci., 101: 9909-9914.

Cerezo M, Garcia-Agustin P and Primo-Millo E. 1999. Influence of chloride and transpiration on net 15NO3 uptake rate by citrus roots. Ann. Bot. 84, 117–120.

Duan JJ, Li J. Guo SR and Kang YY. 2008. Exogenous spermidine affects polyamine metabolism in salinity-stressed Cucumis sativus roots and enhances short-term salinity tolerance. Journal of Plant Physiology, 165: 1620–1635.

Garcia-Sanchez F, Jifon JL, Carvajal M and Syvertsen JP. 2002. Gas exchange, chlorophyll and nutrient contents in relation to Na+ and Claccumulation in 'Sunburst' mandarin grafted on different rootstocks. Plant Sci. 162, 705–712.

Iglesias DJ, Levy Y, Gomez-Cadenas A, Tadeo FR, Primo-Millo E and Talon M. 2004. Nitrate improves growth in salt-stressed citrus seedlings through effects on photosynthetic activity and chloride accumulation. Tree Physiol. 24, 1027–1034.

Kauskabe YL, Nada S and Hara S. 2004. Overexpression of Spermidine Synthase Enhances Tolerance to Multiple Environmental Stresses and Up-Regulates the Expression of Various Stress-Regulated Genes in Transgenic Arabidopsis thaliana, Plant Cell Physiol., 45: 712-722.

Khan MA and Ungar IA. 1997. Effect of thermoperiod on recovery of seed germination of halophytes from saline conditions. America. Jourbal of Botany, 84: 279–283.

Meloni DA, Oliva MA, Martinez CA and Cambraia J. 2003. Photosynthesis and activity of superoxide dismutase, peroxidase and glutathione reductase in cotton under salt stress. Environmental and Experimental Botany, 49: 69–76.

Moya JL, Primo-Millo E and Talon M. 1999. Morphological factors determining salt tolerance in citrus seedlings: the shoot to root ratio modulates passive root uptake of chloride ions and their accumulation in leaves. Plant Cell Environ. 22, 1425–1433.

Shu S, Sun J, Guo SR, Li J, Liu CJ, Wang CY and Du CX. 2010. Effects of exogenous putrescine on PSII photochemistry and ion distribution of cucumber seedlings under salt stress. Acta Horticulturae Sinica, 37: 1065–1072.

Storey R and Walker RR. 1999. Citrus and salinity. Sci. Hortic. 78, 39–81.

Sudhir P and Murthy SDS. 2004. Effects of salt stress on basic processes of photosynthesis. Photosynthetica, 42: 481–486.

Tonon G, Kevers C, Faivre-Rampant O, Grazianil M and Gaspar T. 2004. Effect of NaCl and mannitol iso-osmotic stresses on prolin and freepolyamine levels in embryogenic Fraxinus angustifolia callus. J. Plant Physiol., 161: 701-708.

Ziska LH, Seemann JR and DeJong TM. 1990. Salinity induced limitations on photosynthesis in Prunus salicina, a deciduous tree species. Plant Physiology, 93: 864–870.