Available online at http://www.ijabbr.com

International journal of Advanced Biological and Biomedical Research

Volume 2, Issue 4(2), 2014: 256-259

Efficiency of Foliar Application of Humic Acid on Improve Absorb of K than Na and Salt Tolerance in *Petunia Hybrida* L.

A. Rahimian Boogar[1], A. Gholamalizadeh Ahangar[2], E. Shirmohamadi[2]

[1]*Department of Horticulture Science and Green space, Faculty of Agriculture, University of Zabol, Zabol, Iran*
[2]*Department of Soil engineering Science, Faculty of Water and Soil engineering, University of Zabol, Zabol, Iran*

Abstract

Salinity is a major limitation ecological factor for plant development in arid and semi-arid regions. The ionic imbalance, deficiency of nutrients and degradation of plant metabolites are caused by saline conditions, are affected by the reduction ratio of potassium (K) then sodium (Na). In this research foliar applications of humic acid (HA) for improve the absorption of K under salt stress was applied at 100, 300,600 and 900 ppm with control treatment. Experiment was conducted in a randomized complete block design with three replications. Data's analyzed with spss-19 and means were compared by LSD test. Evaluated characteristics are K and Na concentration, and ratio of K then Na in root, stem and leaf. Analyses of variance results are showed the foliar application of HA have a significant effect on K and Na concentration, and ratio of K then Na in different organs of *petunia hybrida* L., ($P < 0.01$). Results of means compare are showed the significant effect of HA on K and Na absorption, and the highest absorb of K and lowest absorb of Na were obtain at 600 and 900ppm of HA. So, highest ratio of K than Na is obtained at 900ppm.

Keywords: Salinity, Sbsorption, Damage, Balance.

Introduction

Great part of media culture in green space is salt or lead to salt condition. The climate, soil texture and water qualities are affective on seed bed salinity. Salinity as a limiting factor affected on plant sow and growth, use tact is necessary for reduce the damages of salinity on plant development. The negative effects of salinity on plant growth are due to lower osmotic potential, osmotic stress in the soil solution, ion-specific effects of salinity and the loss of nutrient balance (khan *et al.*, 2009). Ion imbalance under salinity causes increase sodium concentration in tissues and appears to be signs of nutrient deficiencies and degradation of metabolites (Tester and Davenport, 2003). So, high sodium concentration in media culture is competing with potash absorption in the plasma membrane of plant cells (Jiang *et al*., 2012). Salinity causes to impair in absorption system of selective transfer of mineral elements and indicated the negative impact on plant physiological processes with creating an inappropriate ratio of potassium to

sodium, so-called poisoning (Niu *et al*., 1995). In stress of salt or sodium condition, high levels of sodium is impair the action of potassium in roots and destroyed the membrane of root cells and change its ability of selective absorption, so high level of sodium in soil decreased potassium absorption by plants (Turan *et al*., 2009). Low cytosolic sodium concentration and high ratio of potassium ions than sodium is one of the most important aspects at known for salt tolerance (Lockhart, 2013; Summart et al., 2010). We aim in this research, investigate the effects of foliar application of HA on improve the potassium absorption and reduce the negative effects of sodium ions in petunia plants in salt stress.

Material and method

Experiment was carried out in a randomized complete block design with three replicate. Treatments of HA are used in 100, 300, 600 and 900ppm and control. Petunia plants are sowed in media culture of soil and leaf-soil mixture (1:1). Media culture and irrigation water electrical conductivity is 7.95 and 3, respectively. Foliar application of HA is used on petunia plants, one and five week after transplanting. Evaluated characteristics: K and Na concentration, ratio of K then Na in root, stem and leaf. Analysis of data was implemented with using SPSS V.16, and means were compared by LSD test of One-Way ANOVA at a significant level of $P<0.05$.

Results

Analysis of variance is show that amount of K and Na in leaf, stem, root and ratio of K then Na are significant at $P<0.01$, but amount of Na in root is significant at $P<0.05$ (Table 1).

Table 1: analysis of one-way ANOVA

Source	df	Mean Squares								
		K root	K stem	K leaf	Na root	Na stem	Na leaf	K/Na root	K/Na stem	K/Na leaf
Between group	4	0.033**	0.056**	0.098**	0.013*	0.031**	0.038**	0.016**	0.034**	0.097**
Within group	10	0.001	0.001	0.001	0.003	0.003	0.002	0.001	0.001	0.001
C.V.		13.78	10.53	10.57	4.19	6.25	7.25	16.90	13.77	15.81

** and * significantly at %01 and %05.

Result of compare means are showed significant effect of foliar application of HA on K and Na absorption and concentration in root, stem and leaf. So, humic acid have a significant effect on ratio of K then Na in root, stem and leaf of petunia (Table 2). Foliar application of HA is significantly increases concentration of K in root, stem and leaf of petunia than control treatment, So that 600 and 900ppm of HA were highest effect on increases amount of K in root, leaf and stem, respectively (Table 2). And lowest concentration of Na in leaf, stem and root is obtained in treatment of 900ppm of HA (Table 2). Results are showed foliar application of HA under salt stress increase the accumulation of Na in root then leaf and stem, but in 900ppm concentration of Na are lower than control treatment (Table 2). Investigate the effects of HA on ratio of K than Na are showed the different treatments of HA have significant effects on increase the ratio of K than Na in root, stem and leaf of petunia than control treatment. So, treatments of 900ppm and 600ppm were highest effect on increase the K accumulation in root and stem respectively (Table 2).

Table 2: compare means of K, Na and K/Na in leaf, stem and root of *petunia hybrida* L.

Variable	HA (ppm)				
	100	300	600	900	control
K root (%)	0.68bc†	0.73b	0.83a	0.87a	0.61c
K stem (%)	1.06d	1.18c	1.28b	1.42a	1.16c
K leaf (%)	1.45c	1.62b	1.84a	1.60b	1.37c
Na root (%)	1.79a	1.76a	1.77a	1.63b	1.74ab
Na stem (%)	1.64b	1.64b	1.66b	1.60b	1.86a
Na leaf (%)	1.54b	1.44bc	1.45bc	1.39c	1.68a
K/Na root (%)	0.37c	0.41bc	0.46ab	0.53a	0.34c
K/Na stem (%)	0.64cd	0.71bc	0.76b	0.88a	0.62d
K/Na leaf (%)	0.81d	0.93c	1.12b	1.26a	1.14b

† Similar letters for each row are not significant.

Discussion

Foliar applications of HA have a positive effect on increase the accumulation of potassium in petunia organs than sodium. This result is agreement with effects of HA on nutrient uptake by wheat (Tahir *et al*., 2011). The positive effects of HA on absorption of K maybe depended to humic ability on distance of K movement and improve the selective absorption of nutrient, Du et al (2013) Consistent with these results showed that HA increased the P movement and the amount of water-extractable P, acid-extractable P and Olsen P in soil. Benefit the use of HA in plants under stress decrease H2O2 and lipid peroxidation and improve the chemical and physical interactions between HA and the plant root system inducement the plant resistance (García *et al*., 2014).

Acknowledgments

The authors wish to thank Vice Chancellor for Research and Technology of Zabol University for provided the financial cost of this research.

References

Du, Z., Wang, Q., Liu, F., Ma, H., Ma, B. and Malhi, S.S. (2013). Movement of Phosphorus in a Calcareous Soil as Affected by HA. Pedos. 23(2): 229–235.

García, A. C., Santos, L. A., Izquierdo, F. G., Rumjanek, V. M., Castro, R. N., Santos, F. S., Souza, L. G. A. and Berbara, R. L. L. (2014). Potentialities of vermicompost HAs to alleviate water stress in rice plants (Oryza sativa L.). J. of Geo. Exp. 136: 48-54.

Jiang, C., Belfield, E.J., Mithani, A., Visscher, A., Ragoussis, J., Mott, R., Smith, J. A. C., & Harberd, N.P. (2012). ROS- mediated vascular homeostatic control of root-to-shoot soil Na delivery in Arabidopsis. EMBO J. 31: 4359–4370.

Khan M. A., Shirazi, M. U., Alikhan, M., Mujtaba, S. M., Islam, E., Mumtaz, S., A. Shereen, A., Ansari, R. U., & Ashraf, M. Y. (2009). Role of proline, K/Na ratio and chlorophyll content in salt tolerance of wheat. Pak. J. Bot. 41(2): 633- 638.

Lockhart, J. (2013). Salt of the Earth: Ethylene Promotes Salt Tolerance by Enhancing Na/K Homeostasis. The Plant Cell. 25: 3150. IN BRIEF

Marschner, H. (1995). Mineral nutrition of higher plants. Academic Press, London. Second edition. P: 647.

Niu, X., Bressan, R. A., Hasegawa, P. M., Pardo, J. M. (1995). Ion homeostasis in NaCl stress environments. Plant Physiol. 109: 735-742.

Summart, J., Thanonkeo, P., Panichajakul, S., Prathepha, P., & Mc Manse, M. T. (2010). Effect of salt sress on growth, inorganic ion and proline accumulation in Thai aromatic rice, Kaho Dawk Mail 105, Callus Cul. 9(2): 145- 152.

Tahir, M. M., Khurshid, M., Khan, M. Z., Abbasi, M. K., & Kazmi, M. H. (2011). Lignite-Derived HA Effect on Growth of Wheat Plants in Different Soils. Pedos. 21(1): 124–131.

Tester, M., Davenport, R. J. (2003). Na transport and Na tolerance in higher plants. Ann Bot. 91: 503–527.

Turan, M. A., Elkiram, A. H. A., Taban, N., & Tban, S. (2009). Effect of salt stress on growth, stomatal resistance, proline and chlorophyll concentrations in maize plant. Afr. J. Agric. Res. 4(9): 893- 897.