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EFFECT OF ZINC ON THE GROWTH , CHEMICAL COMPOSITION AND ANATOMICAL STRUCTURE OF BARLEY (*HORDEUM VULGARE* L.C.M VAR.) GROWN IN SALINE MEDIUM .

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SUMMARY

A factorial experiment was conducted in hydrponic culture to study the role of zinc to restrict salinity effects of morphological , anatomical and chemical features for barley plants . There was an increase in dry weight in presence of zinc with an increase in shoot content of Zn a compared with decrease in Na . On the other hand , there were an increase in the number of vascular bundles and vessel diameters in presence of zinc in saline growth medium .

key word :- Salinity , Zinc , barley

Introduction

Soil salinity is a major agricultural problem in the arid and semi - arid regions . Salinity stress causes an imbalance in uptake of mineral nutrients and their distribution in the plants (4) . Salt stress effects on morphology , anatomy as well as metabolism of plant species (7) . Zn is necessary for root cell membrane integrity (6) , to mitigate the adverse effect of NaCl by inhibition of Na^+ and Cl^- uptake or / and translocation (1) . It is important to understand changes in anatomical structure under salinity condition that may mitigate by the amount of Zn nutrients in plants . The present investigation was to recognize the possible protective role of Zn against salinity .

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Materials and Methods

Hydroponic culture was used in this experiment by preparing Hoagland solution in suitable black plastic pots prepared to that purpose (8) . Dissolve 100 mM NaCl in it and put the pots in green house , after seven days of barley seeds germination in petri dishes , the seedling were pricked in each of the pots . Zn was used at rate of 0 and 10 ppm of $ZnSO_4 . 7H_2O$. The plant were harvested 5 weeks after pricking and stem segments were taken of 3 cm above pot surface (3) . The stem diameter and thickness of vessels were measured microscopy by using ocular micrometer .The shoot and root dry matters were determined . Elements were determined spectrophotomatricaly .

Result and Discussion

The growth of shoot and root of barley plant c.v C.M were restricted by increased salinity (table 1.) and there were reduction in dry matters more severe in the roots than shoots . However the dry matter increase with Zn application were 11.27 % and 30.76 % for the shoot , 8.5 % and 12.5 % for the root in non saline and saline medium , respectively . The root / shoot ratio increased as the salinity and Zn level increased . The lower shoot and root dry matter due to salinity is attributed to the water stress , Na^+ , Cl^- toxicity and ionc imbalance in the plants (2) . High concentration of Na^+ causes a range of osmotic and metabolic problems for plant . Metabolic toxicity of Na^+ is largely effect it's ability to compete with K^+ for binding sites essential for cellular function (9) . The Zn concentration and its uptake in shoot was increased by adding 10 ppm of Zn in non saline and saline medium , but salinity resulted in a significant decreased level of Zn concentrations . The Na concentrations increased in the shoots by salinity . However , they decreased with increasing Zn applications . The K / Na and Ca / Na ratios in the shoot decreased with 100 mM NaCl and 0 ppm Zn (table 3.) . The positive effect of Zn treatment on shoot and dry matter of plant due to salinity could be explained by the decreased levels in the uptake of Na^+ and Cl^- concentrations , and their translocations from root to shoot as a result of increasing membrane integrity with Zn treatment . Salinity and Zn treatment induced structural changes in stem of barley . The vessels diameter as well as number of vascular bundles decreased upon salinity treatment (table 2.) . The Zn application improved

vascular tissue formation and increased relative thickness .

Responses to salinity are often expressed as anatomical and cytological changes (5) . This investigation showed that the salinity caused an inhibition of growth of vascular elements . Zn addition could have protected vascular tissues against salinity effects by the inhibition of Na^+ and Cl^- uptake or / and translocation in the barley plant .

Table 1: Effect of salinity and Zn on Dry Weight of shoot , root and root /shoot ratio in barley .

Zn (ppm)	Salinity (mM)	Shoot (g/pot)	Root (g/pot)	Root/ Shoot
0	0	5.5 b	0.811 *a	0.147 b
	100	2.6 d	0.112 b	0.043 a
10	0	6.12 a	0.880 a	0.143 b
	100	3.40 c	0.126 b	0.037 a

* values were compared using a Duncan multiple range test at the 5% level .

Table 2: Effect of salinity and Zn on number of vascular bundles and diameter of vessel in stem of barley .

Zn (ppm)	Salinity (mM)	Number of vas. Bundles	Diameter of v.b (mm)
0	0	45 a	62.10^{+-4}
	100	23 c	30.9^{+-2}
10	0	40 a	65.5^{+-4}
	100	31 b	40.1^{+-3}

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Table 3: Effect of salinity and Zn on some elements and its ratio to Na in shoot of barley .

Zn (ppm)	Salinity (mM)	Zn (ppm)	Na (m g /g)	K (mg /g)	Ca (mg /g)	K/ Na	Ca/ Na
0	0	23.3 * b	2.40 c	25.0 a	12.0 b	10.4	5.00
	100	10.1 d	19.10 a	5.5 d	9.0 c	0.09	0.15
10	0	28.7 a	3.0 c	27.0 a	13.5 b	9.00	4.50
	100	18.6 c	44.1 b	15.0 b	1 .1 a	0.34	0.25

*values were compared using Duncan multiple range test at the 5% level .

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تأثير الزنك في النمو و التركيب الكيميائي و التشريحي لنبات الشعير النامي في الوسط الملحي

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الخلاصة

أنجزت تجربة عامليه لدراسة دور الخارصين للحد من تأثير الملوحة مظهرياً وتشريحياً وكيميائياً لنباتات الشعير . وجد حصول زيادة في الوزن الجاف للنباتات عند وجود الخارصين مع زيادة في محتوى المجموع الخضري من عنصر الخارصين مقابل انخفاض محتواه من عنصر الصوديوم ، من ناحية أخرى ، وجدت زيادة في عدد الحزم الوعائية مع زيادة أقطار الأوعية لسيقان النباتات عند وجود الخارصين في وسط النمو الملحي

الكلمات المفتاحية :- الملوحة ، الخارصين ، الشعير .