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EFFECT OF PRESOAKING GUAR SEEDS IN SOME PLANT VITAMINS OR PHYTOHORMONES ON GERMINATION AND SEEDLING GROWTH IN THE PRESENCE OF NACL.

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ABSTRACT

The present experiment is planned as an attempt to minimize the harmful effects of NaCl salinity(2500, 5000 and 7500 ppm) on germination percentage (GP %) and seedlings growth (fresh and dry weight as well as seedling length)of guar, through presoaking seeds in selected phytohormones (ABA or SA) and vitamins (AsA or Thi) at 50 and 100ppm for each. The low level of NaCl increased significantly guar seed germination percentage and seedling growth ,whereas that increasing salinity levels up to 5000ppm decreased seed germination percentage as well as seedling growth and this effect increased consistently and rapidly with increasing NaCl salinity as compared to non-salinized (control). The great reduction occurred under high salinity levels (7500 ppm NaCl). In most cases, presoaking seeds with selected material had a significant effect on seed germination as well as seedling growth under both normal and NaCl saline conditions compared to control except ABA at 100ppm with high salinity levels. On the other hand, under normal conditions, maximum germination was achieved in seeds presoaked with AsA at both level and Thi or SA at 100 ppm .Generally, phytohormone (SA) and plant vitamin (AsAorThi) counteracted the harmful effect of salinity on guar seedling growth against different salinity levels. These results suggested that AsA presoaking alleviate the adverse effects of NaCl presoaking guar seeds salinity on the seed germination and seedling growth of the guar followed by SA over the non- presoaking treatment.

Keywords: Guar, salinity, abscisic acid (ABA), ascorbic acid(AsA), salicylic acid(SA) and thiamine (Thi) , seed germination, seedling growth.

INTODUCTION

Salinity is one of the major and increasing problems in irrigated agriculture in Egypt. Salt effects on different morphological, physiological, and biochemical processes (Singh and Chatrath 2001) .These include delays the seed germination as well as final germination percentage (Rahman *et al.*, 2000 and Hu & Schmidhalter, 2001), ion homeostasis (Zhu,2001) and damaged photosynthetic components and decrease in photosynthetic activity(Wang and Nii, 2000). The sensitivity of plants to salinity may depend on their developmental stage (Adams, 1990). Most plants are more sensitive to salinity during germination and seedling growth ((Fowler, 1991and Reinhard *et al.*, 1995). Seed germination is an important and critical development phase in the life cycle of plants (Gutterman, 1993 and Kigel, 1995), where the most sensitive period of growth occurs during germination or early seedling growth and development (Catalan *et al.*, 1994). Presoaking seed treatments have been shown to enhance stand establishment in non-saline areas (Khan,1992) and have potential in saline areas as well (Ashraf

&Ruaf, 2001; Basra *et al.*, 2005). Presoaking seeds is a promising technique, being cost, and low risk. Imposition of abiotic stress during germination and early cycle of plant life results in altered level of plant hormones. The decreased salicylic acid and increased abscisic acid contents observed in salt stressed plants has led to the suggestion that salt stress induced change in endogenous hormonal levels . Exogenously seed treatment with phytohormons and plant vitamins generally stimulate (directly or indirectly). Guar or cluster bean, *Cyamopsis tetragonoloba (L.)* Taub, is a member of the Fabaceae (Leguminosae) family was used as a protein rich cattle feed. The endosperm of guar seed is a rich source of mucilage or gum, which forms a viscous gel in cold water, and is used as an emulsifier, thickener and stabilizer in a wide range of foods and industrial applications .Guar is a moderate sensitive plant to salt stress and salinity stress is one of the major abiotic stresses affecting. The present study is conceived with to investigate the effects of presoaking guar seeds in varying concentrations of phytohormone (ABA or SA) or plant vitamins(AsA or Thi)on guar seed germination and seedling growth under normal and NaCl saline conditions.

MATERIALS AND METHODS

A homogenous lot, healthy and almost uniform size, of guar seeds surface sterilized by soaking in 0.01% mercuric chloride for 3 minutes, then repeatedly washed with distilled water and divided into 9 groups. The first group of seeds was soaked (12hours) in distilled water to serve as control (S0) and the remaining 8 groups were separately soaked for 12 hours in aqueous solutions of abscisic acid (ABA), ascorbic acid(AsA), salicylic acid(SA) and thiamine (Thi) at 50 or 100 ppm of each. Every group was divided into four sub-groups .The sub-group transferred to sterile Petri dishes (11 cm diameter) containing two layers of the filter papers (Whitman No. 1).The first sub-group was moisture with 10 ml of distilled water (control). The remainder sub-groups were salinized with 10 ml distilled water added with NaCl at 2500, 5000 and 7500 ppm for treatments (S1, S2 and S3, respectively). In order to avoid water losses, 5 ml of these solutions added Petri dishes, every 3days. Thirty of each guar seeds were allowed to germinate at about 25±2C in the dark. Petri dishes were tightly sealed with the impermeable colorless film in order to avoid water losses during the incubation. Thiram was added to the solutions at a concentration of 0.2% (w/v) to control the fungi infection. The number of seeds that sprouted and germinated was counter after 7 days. Seeds were considered to have germinated when shoot extended to more than 2mm from the seeds. After 14 days final germination, seedlings were harvested and washed with water after harvest. The experiment was repeated tow times and a complete randomized block design with three replicates was followed .The following data were recorded: germination percentage (ISTA, 1999), shoot and root length (cm), was measured on ten seedlings randomly taken from each replicate, weighed, and the fresh weight per10 seedling was calculated. In addition, shoot and root dry weight were (mg) measuremed using the same seedlings taken for the determination of fresh weight. They were oven-dried at 70ºC until constant weight was reached. The obtained data were subjected to statistical analysis of variance according to Gomez and Gomez (1984) LSD value for comparison.

RESULTS AND DISSCUSSION

a-Germination Percentage (GP %):

Data in Table (2) and Fig (2) indicated that the low level of NaCl increased significantly guar seed germination percentage whereas, decreased gradually with increasing NaCl levels. The great reduction occurred under high salinity levels (7500 ppm NaCl). In most cases, presoaking seeds with either selected phytohormones or plant vitamins had a significant effect on seed germination under both normal and NaCl saline conditions compared to control except ABA at 100ppm had no effect under high salinity levels. On the other hand, under normal conditions, maximum germination was achieved in seeds presoaked with AsA at 100 ppm. Furthermore, phytohormons (SA) or plant vitamins (Thi or AsA) used combined with low salinity level (2500 ppm) increased germination percentage as compared to control (untreated seeds). Under moderate NaCl saline (5000ppm), maximum germination was obtained in seeds presoaked with AsA, however lowest was achieved in seeds presoaked with ABA**.** On the other hand, under high saline level (7500 ppm), presoaking guar seeds with AsA at both levels and SA at 50 ppm enhanced seed germination as compared to control (untreated seeds). However, maximum reduction in percentage was recorded in seeds presoaked with ABA as compared to remaining treatments including control. Generally, both phytohormones and plant vitamin used enhanced germination percentage under moderate and high salinity levels (5000 and 7500 ppm) as compared to the untreated plants under such salinity level .Furthermore, AsA were more effective than SA in increasing germination percentage of guar. In view of these results obtained, it is obvious that salt stress caused a reduction in guar germination. These findings are agreement with Hamada & Al-Hakimi, 2001; Shalata and Neumann, 2001; El -Bassiouny *and Bakheta.,* 2005; Khan et al, 2006 and Bassuony *et al.,* 2008)in different plant species.. The effect of salinity on germination seeds in many species is not only on lowering the percentage of germination, but also lengthening the time needed to complete germination (Ayers, 1952). In addition, some plants are sensitive to salinity at the seedling stage, because the mechanism of the tolerance to salinity is not yet fully developed, (Almodares *et al.,* 2007).

Table (1): Effect of presoaking guar seeds in ABA , SA, AsA or Thi on germination percentage, seedling shoot and root length (cm) grown under normal and NaCl conditions.

Salinity levels (ppm) / treatment (ppm)	S0	S1	S2	S3	Mean	S0	S1	S2	S3	Mean
	1st Exp.					2nd Exp				
Seed germination%										
water	70	87	61	56	68.5	70	83	60	54	66.7
ABA (50)	73	80	67	63	70.7	70	73	62	60	66.2
ABA (100)	70	73	69	61	68.2	72	78	72	60	70.5
SA (50)	85	90	78	73	81.5	85	90	80	76	82.7
SA (100)	90	90	73	64	79.2	90	92	77	66	81.2
AsA (50)	90	93	80	73	84.0	83	83	80	70	79.0
AsA (100)	92	96	86	80	88.5	89	90	83	78	85.0
Thi (50)	93	80	77	62	78.0	89	83	80	57	77.2
Thi (100)	90	83	78	70	80.2	90	80	80	73	80.7
Mean	83.6	85.7	74.3	66.8		82.0	83.5	74.8	66.0	
LSD at 5%	Salinity:1.3 Treatment:2.3 Interaction:4.1					Salinity:1.5 Treatment:1.8 Interaction:4.4				
Shoot length (cm)										
water	4.13	5.64	3.43	2.12	3.83	4.53	5.34	3.13	2.32	3.83
ABA (50)	4.81	4.52	3.72	2.64	3.92	4.91	4.62	3.43	2.55	3.87
ABA (100)	4.43	4.73	3.43	2.14	3.68	4.83	4.53	3.19	2.34	3.72
SA (50)	5.89	6.54	5.76	3.56	5.44	5.76	6.14	5.32	4.16	5.34
SA (100)	5.54	6.65	4.45	3.55	5.05	5.64	6.15	4.33	3.63	4.94
AsA (50)	6.16	6.43	4.34	3.32	5.07	5.96	6.51	4.23	3.41	5.03
AsA (100)	6.66	7.18	4.65	4.13	5.66	6.32	6.94	4.49	3.93	5.42
Thi (50)	6.14	5.32	4.22	3.15	4.71	6.21	5.46	4.32	3.43	4.86
Thi (100)	6.67	5.42	4.62	3.32	5.01	6.35	5.36	4.35	3.24	5.01
Mean	5.60	6.03	4.40	3.21		5.65	5.67	4.12	3.23	
LSD at 5%	Salinity:0.08 Treatment:0.12 Interaction:0.23					Salinity:0.11 Treatment0.15 Interaction:0.21				
Root length (cm)										
water	2.16	1.68	1.26	1.12	1.56	1.96	1.43	1.16	0.92	1.37
ABA (50)	2.36	2.49	1.93	1.11	1.97	2.16	2.29	1.73	1.01	1.80
ABA (100)	1.56	1.38	1.24	1.02	1.30	1.43	1.28	1.14	1.12	1.24
SA (50)	2.69	2.43	2.12	1.69	2.23	2.52	2.23	1.92	1.39	2.02
SA (100)	2.54	2.37	1.88	1.56	2.09	2.32	2.18	1.63	1.33	1.87
AsA (50)	3.32	3.72	1.89	1.63	2.64	2.28	2.72	1.39	1.23	1.91
AsA (100)	2.82	2.95	1.87	1.29	2.23	2.46	2.36	1.55	1.12	1.87
Thi (50)	3.14	2.76	1.85	1.35	2.28	2.84	2.66	1.71	1.15	2.09
Thi (100)	3.45	2.94	1.66	1.48	2.38	2.85	2.63	1.45	1.21	2.04
Mean	2.67	2.52	1.74	1.36		2.31	2.20	1.52	1.16	
LSD at 5%	Salinity:0.23 Treatment:.37 Interaction:00.74					Salinity: 0.15 Treatment:0.25 Interaction:0.53				

NaCl salinity inhibits seed germination through increased osmotic potential; hence the seeds were unable to imbibe the water required for germination(Maas & Nieman ,1 978) or decrease of the water movement into the seeds during imbibitions(Hadas, 1977) and/or reduced water uptake which arrested radicle emergence (Hampson and Simpson, 1990; Begum *et al.,* 1992) and/or accumulation of Na+ and Cl- ions changes in the activate a number of metabolic processes necessary for germination (Kayani *et al.,* 1990) and/or accumulation of toxic ions ,facilitate the intake of ions in sufficient amounts to be toxic for the embryonic activities due to the influence of the cations more than anions of acid radical used, ,the entry of the ions to the seeds that might have been toxic to the embryo or the developing seedlings (Huang and Redmann ,1995 and Almodares *et al.,* 2007) and/or inhibition of the uptake of several essential nutrients causing nutritional or ionic imbalance (Al-Ansari,2003 and Taamalli *et al.*,2004). Furthermore, excess of Na+ might cause problems with membranes and enzyme inhibition (Dodd and Donvn, 1999) , disturbance in metabolism leading to increase in phenolic compounds (Ayaz *et al.,* 2000) which lead to decreasing both cell division and cell elongation (Ghoulam and Fares, 2001).In addation, the germination processes might have been stopped as a result of contact of the seeds with high concentration of Na+ and Cl- ions(Almodares *et al.,* 2007) and/or by accumulation of these factors On the other hand,data revealed that AsA or SA or Thiamine alleviated partially the adverse effect of salt stress on guar germination. The results proved that phytohormone (SA) and vitamin (AsA) partially counteracted the harmful effect of NaCl salinity on guar seed germination.

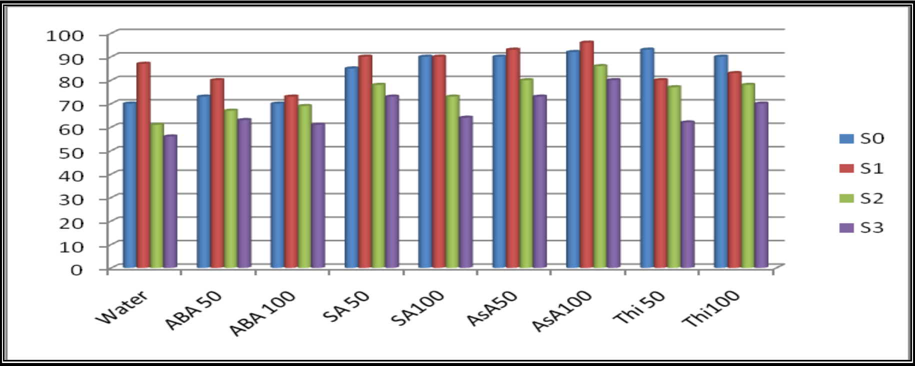

Fig. (1): Effect of presoaking in ABA , SA, AsA or thi on germination percentage of guar seeds grown under normal and NaCl conditions at 7 days from sowing.

Concerning the inhibitor effect of ABA on seed germination in this study. The results are in agreement with Schopfer and Plachy (1984), they stated that ABA may interfere with seed germination by changing the water status of the seed so that water uptake is inhibited. In addition, Baskin and Baskin,(1998) stated that ABA seed treatments failed to improve germination percentage and seedling growth .Moreover, Kabar (1997) found that exogenous ABA is a potent inhibitor of seed germination and seedling growth in many plant species. Concerning the promotive effect of AsA, many researchers revealed the positive effect of AsA on germination and seedling growth i.e. Huan, (1988) and Ishibashi & Iwaya (2006), they concluded that presoaking seeds with AsA increased the germination rate and improved germination process. In addition, Shaddad *et al.,* (1999) found that AsA counteracted the adverse effects of salinity on seedling growth as well as metabolic mechanisms and metabolic activities in the plants. Regarding the effect of Thi may be due to the significance of vitamin B1 in cellular respiration as co-enzyme in the decarboxylation of pyruvate and α-ketoglutarate to acetyl and succinyl CO-A is well established and affects the respiratory process (Rajagopal *et al.,* 2001). And increase dhydration of seeds would help hydrolysis of food reserves in the germinating seeds and would consequently enhance the availability of respiratory substrates for energy production and nutrition. It could thus account for the observed increase in germination count . A similar promotive effects on seed germination by Ansari *et al.*,(1990)and Samiullah *et al.*,(1991). Most published data indicate that the salinity delayed seed germination as well as final germination percentage (Gutierrez-Boem *et al.*1994; Huang and Redman, 1995; Munoz *et al.* 1996; Mohamed, 2002 and Zeinali et al,. 2002). Concerning the interactions, presoaking seeds with AsA or SA is much effective in alleviating stress effects of salinity on the plants reported earlier by Ashraf and Foolad,(2005)and Ashraf *et al.,* (2008). Moreover, Tari *et al.*,(2002) showing that salt tolerance is induced in seedlings raised from seeds primed with salicylic acid. Also with Afzal *et al.*,(2005) and Farooq *et al.*,(2005). These results are also supported by Senaratna *et al.,* (2000), they observed that the enhanced tolerance of tomato and bean seedlings sprayed with SA and ASA to drought stress. In this concern, under the influence of salt stress the osmotic potential greatly decreased and both AsA and SA presoaking moderated it (Szepesi *et al.,* 2005)and might be the result of augmented activities of proteinase in endosperm and the contents of soluble sugar, protein and free amino acids (Zhang *et al.,* 1999) and may be due to enhanced oxygen uptake and the efficiency of mobilizing nutrients from the cotyledons to the embryonic axis under saline conditions (Kathiresan *et al.,* 1984) and may be due to increased rate of cell division in the root tips of seedlings from primed seeds (Rivas *et al.* , 1984).

b-Seedlings Growth :

Data in Tables (2&3) revealed that increasing salinity levels up to 5000ppm decreased seedling growth (seedling root and shoot lengths as well as fresh and dry weights)and this effect increased consistently and rapidly with increasing NaCl salinity as compared to non-salinized (control) . Presoaking in phytohormones (ABA or SA) or plant vitamins (AsA or Thi) treatments showed a significant effect on guar seedling growth under normal and these treatments ,in most cases, decreased seedling length under high NaCl saline conditions when compared with untreated plants(control). During normal conditions, minimum root length was recorded in seeds treated with 100 ppm ABA. While, maximum shoot length was attained in seeds presoaked with salicylic acid at 50 ppm and AsA or at 100ppm, while ABA at both level drastically effected under high level of NaCl (7500ppm).Generally, ABA at 100 ppm used levels decreased significantly seedling shoot length while, AsA application proved optimum values for seedling shoot and root length as well as seedling length. Moreover, SA or AsA reduce the harmful effects of salinity on the root length. In the present investigation, the stimulation effect of low NaCl salinity level (2500 ppm) on seedling length (shoot and root length) may be resulted from the beneficial effect of low concentration of chloride on many physiological processes as photosynthesis and osmoregulators. The inhibitory effects of salt stress on guar seedling growth are in agreement with the observations of Abraham and Kiran,(2003) ;Neveen and Shawky ,(2003); Silva *et al.*,(2003) and Azooz *et al.* ,(2004) . Moreover, Cicek and Cakirlar (2002) reported that salinity reduced shoot length, fresh and dry weight of maize seedlings. In addition, Shannon and Grieve (1999) indicated that salinity reduced fresh weight of some vegetables. Also, Jeannette *et al.* (2002) that total fresh weight of root and shoot was significantly reduced with increased salt stress

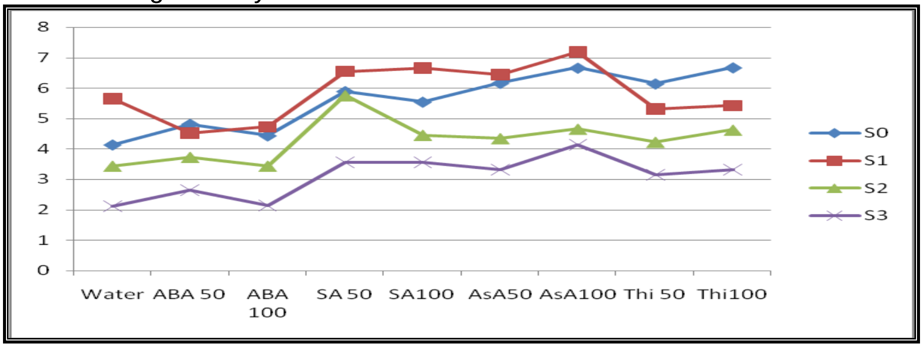

Fig. (2): Effect of presoaking in ABA , SA, AsA or thi on guar seedling shoot length (cm) grown under normal and NaCl conditions .

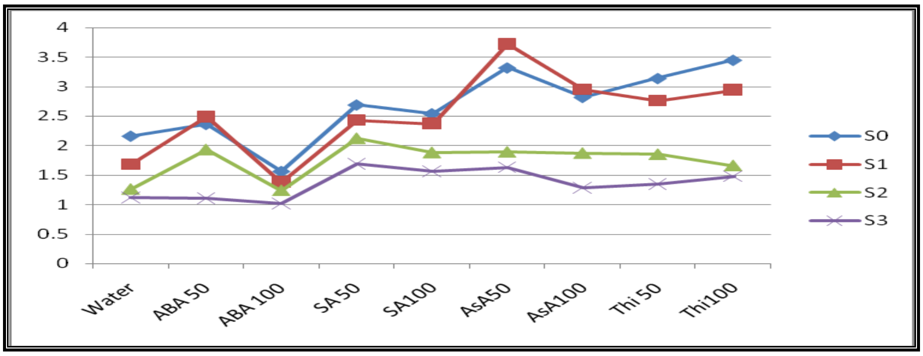

Fig. (3): Effect of presoaking in ABA , SA,AsA or thi on guar seedling root length(cm) under normal and NaCl conditions after7days from sowing.

Moreover, Hatung (2004) suggested that the bad effects of salinity on seedling shoot and root length may be due to the bad effects of salinity on meristematic cell division and elongation as well as root penetration. Also, Hawker and Walker (1978) revealed that this reduction in growth is due to reduced cell division or cell enlargement caused by salinity stress. Moreover, Greenway (1963) recorded that salinity reduced seedling length either by making osmotic cell enlargement dependent on soluble accumulation, and effect of salinity on cell size and number of cells per unit area .Yet, Tesu et al,. (1980) revealed that three stages of cell growth were adverse affected particularly elongation and differentiation with increasing salinity level. Moreover, the reduced seedling growth weight under salt stress conditions could be attributed to the physiological drought induced by the low water potential and osmotic adjustments as a result of increased ionic concentration in their cells, which result in deformation of macromolecules by disrupting their shell or bound water (Schwarz, 1985) and/or may be due to the expenditure of energy on the synthesis of organic or inorganic solutes for osmotic adjustment rather than for growth (El- Banna, 1985).

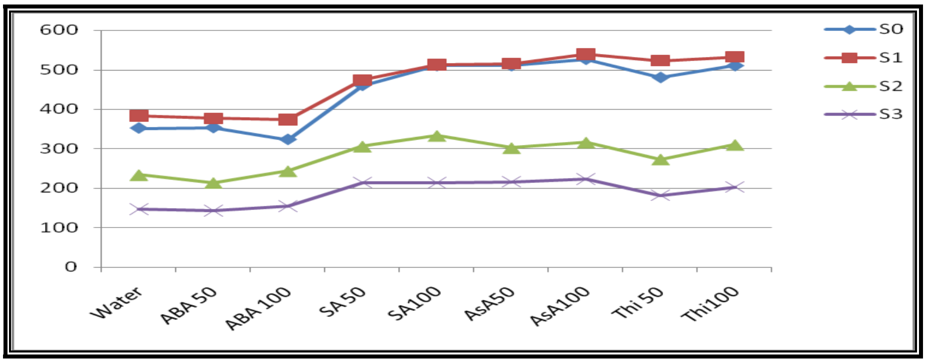

Fig. (4): Effect of presoaking in ABA , SA,AsA or thi on guar seedling shoot fresh weight (mg/10 seedling) grown under normal and NaCl conditions

In addition, seedling grown in saline media accumulate high levels of salt and an osmotic adjustment is needed to keep root water potential lower than that of the external medium, energy must be expended to create such osmotic adjustment and this may lead to seedling growth reduction (Yeo, 1983) and /or might be attributed to the osmotic effect resulting from salt stress which cause disturbances in water balance and inhibited apical growth and internal hormonal imbalance (El-Desouky and Atawia, 1998; Younis *et al.* ,2003) and/or may be due to toxic effects of the NaCl used as well as unbalanced nutrient uptake by the seedlings (Hajibagheri *etal*.,1989) and /or suppressing effects of salinity on both meristematic cell division and elongation as well as root penetration (Bernstein, 1971) and/or may be another reason for this decrease.

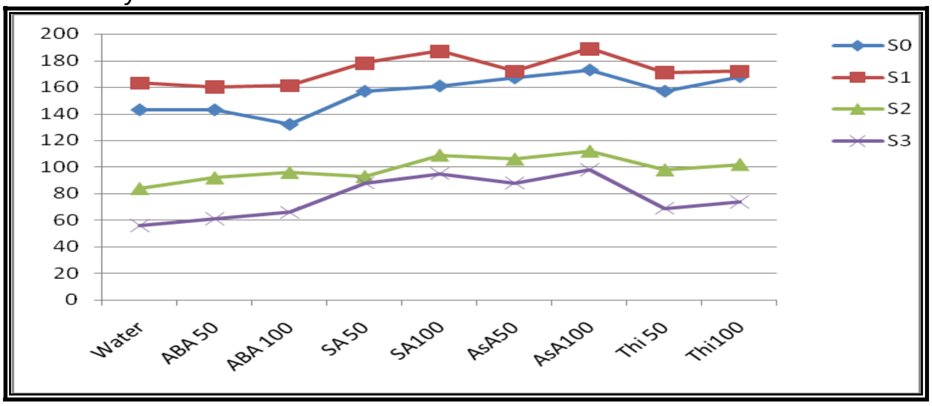

Fig (5) Effect of presoaking in ABA , SA,AsA or thi on guar seedling root fresh weight(mg/10 seedling)grown under normal and NaCl conditions

Concerning the improve of AsA or SA presoaking are in accordance with the Senaratna *et al.,* 2000 ,Afzal *et al.,* (2005) and Farooq *et al.,* (2005) .. These results are also in confirmation with Tari *et al.,* (2002) showing that salt tolerance is induced in seedlings raised from seeds primed with salicylic acid. Stress tolerance due to presoaking of seeds suggests that these molecules trigger the expression of the potential to tolerate stress rather than having any direct effect as a protecting (Senaratna *et al.,* 2000). Also, Khodary (2004) found that SA increases the fresh and dry weights of shoot and roots of stressed maize plants. Results are also in accordance with the findings of Afzal *et al.,* (2005) for wheat seedlings primed with SA under saline conditions. Salinity tolerance in seeds presoaked with SA might be the result of augmentedactivities of proteinase in endosperm and the contents of soluble sugar, protein and free amino acids under stress conditions (Zhang *et al.,* 1999).The improving effect of AsA on seedling growth may be due to the fact that AsA is a major primary antioxidant (Nijs and Kelley, 1991), plays an important role in preserving the activity of enzymes (Padh, 1990). Furthermore, Noctor and Foyer (1998) stated that AsA is a small, water soluble antioxidant molecule which acts as a primary substrate in the cyclic pathway for enzymatic detoxification of hydrogen peroxide, it acts directly to neutralize superoxide radicals and/or regulates implicated in regulation of cell division (Smirnoff, 1996) and cell wall expansion and cell elongation (Gonzalez-Reyes *et al.,* 1994; El-Yazal, 2007). Moreover, Smirnoff (1996) obtained that cell wall ascorbate and cell-localized ascorbate oxidase have been implicated in control of growth; high ascorbate oxidase activity is associated with expanding cells. Who pointed out that the beneficial effect of AsA on root length may be attributed to the fact that AsA is involved in the regulation of root elongation, cell vacuolation and cell expansion.

Table(2): Effect of presoaking guar seeds in ABA , SA, AsA or Thi on seedling fresh and dry weight(mg/10 seedling) grown under normal and NaCl conditions after 14 days from sowing.

Salinity levels (ppm) / treatment (ppm)	Seedling shoot fresh weight(mg/10seedling)									
	S0	S1	S2	S3	Mean	S0	S1	S2	S3	Mean
	1st Exp.					2nd Exp				
water	352	383	233	147	278.8	332	373	213	156	268.5
ABA (50)	353	376	213	143	271.3	326	362	214	153	263.8
ABA (100)	323	373	243	154	273.3	335	362	223	165	271.3
SA (50)	460	474	306	214	363.5	397	409	262	187	313.8
SA (100)	510	513	333	213	392.3	412	438	283	193	331.5
AsA (50)	510	516	302	216	386.0	410	466	272	192	335.0
AsA (100)	526	540	316	223	401.3	423	473	296	213	351.3
Thi (50)	480	523	273	182	364.5	387	403	233	176	299.8
Thi (100)	510	533	310	203	278.8	413	433	241	194	320.3
Mean	458.2	515. 7	281	188.3		381. 7	413. 2	248.8	181.0	
LSD at 5%	Salinity: 12 Treatment: 18 Interaction:30					Salinity:23 Treatment:17 interaction:37				

	Seedling shoot dry weight(mg/10seedling)									
water	74	85	50	38	61.8	64	78	48	41	57.8
ABA (50)	74	87	56	38	63.8	64	82	46	41	58.3
ABA (100)	76	85	59	41	65.3	78	87	50	43	64.5
SA (50)	107	98	98	54	81.8	84	93	52	46	68.8
SA (100)	112	114	98	58	95.5	96	114	56	46	78.0
AsA (50)	119	112	88	59	94.5	82	٩9	56	48	71.3
AsA (100)	92	128	94	68	95.5	92	108	98	50	79.5
Thi (50)	103	109	94	56	83.0	78	83	57	42	65.0
Thi (100)	113	124	68	59	91.0	83	87	61	46	69.3
Mean	96. 7	104. 7	71. 7	52.3		80.1	92.3	54. 9	44. 8	
LSD at 5%	Salinity:1.5 Treatment: 1.4 Interaction:2.8					Salinity:2.1 Treatment:1.8 interaction:2.7				
	Seedling root fresh weight(mg/10seedling)									
water	143	163	84	56	111.5	١١٣	١٣٣	76	62	96.0
ABA (50)	143	160	92	61	114	128	134	78	63	100.8
ABA (100)	132	161	96	66	113.8	141	131	72	67	102.8
SA (50)	157	178	93	88	129	154	165	88	71	119.5
SA (100)	161	187	109	95	138	158	164	94	75	122.8
AsA (50)	167	172	106	88	133.3	177	172	96	78	130.8
AsA (100)	173	189	112	98	143	183	189	102	٨8	140.5
Thi (50)	157	171	98	69	123.8	167	171	78	74	122.5
Thi (100)	168	172	102	74	129	168	172	92	78	127.5
Mean	155. 7	172. 6	99.1	77.2		154.3	159.0	86.2	72. 9	
LSD at 5%	Salinity: 3.1 Treatment:2.5 Interaction:3.9					Salinity:2.4 Treatment: 1.9 interaction:2.7				
	Seedling root dry weight(mg/10seedling)									
water	32	43	23	17	28.75	33	37	21	19	26.5.0
ABA (50)	35	47	23	14	29.75	36	32	24	15	26.25
ABA (100)	33	48	24	13	29.50	35	32	21	12	25.00
SA (50)	44	53	32	22	37.75	48	49	36	21	38.50
SA (100)	41	53	38	24	39.00	47	49	33	23	38.00
AsA (50)	45	59	35	22	40.25	53	54	29	19	38.75
AsA (100)	45	56	39	25	41.25	53	57	36	23	42.25
Thi (50)	43	45	32	21	35.25	38	42	28	23	32.75
Thi (100)	48	53	31	23	38.75	43	55	29	25	38.00
Mean	40.7	50.8	30. 8	20.1		42. 89	45. 22	28.5 6	20.00	
LSD at 5%	Salinity:1.2 Treatment: 1.5 Interaction:2.4					Salinity:.1.7 Treatment:2.1 Interaction:3.1				

Generally, phytohormones (SA) and plant vitamins (AsA or Thi) counteracted the harmful effect of salinity on guar seedling (growth against different salinity levels.In addition, AsA or SA was more effective than other treatment to reduce the effect of salinity on seedling fresh and dry weights. Our results suggested that ASA presoaking alleviate the adverse effects of salinity on the seed germination and seedling growth of the guar followed by SA presoaking over the non- presoaking treatment. Moreover, Cicek and Cakirlar (2002) reported that salinity reduced shoot length, fresh and dry weight of maize seedlings. In addition, Shannon and Grieve (200) indicated that Salinity reduced fresh weight of some vegetables. Similar result was observed by Jeannette *et al.* (2002) that total fresh weight of root and shoot was significantly reduced with increased salt stress.

REFERENCES

Abraham, L. and Kiran, G.S.(2003): Effect of NaCl stress on growth of Sorghum bicolor (L.) Monech. J. of Eco. Physiol. 6: (3/4), 137-140.

Adams, P. (1990): Effect of salinity on the distribution of calcium in tomato (*Lycopersicon esculentum*.L.) fruit and 006 Ceaves. Plant nutrition-physiology and applications. Proceedings of the Eleventh International Plant Nutrition Colloquium, Wageningen, Netherlands, 30 July - 4 August 1989. Kluwer Academic Publishers, Dordrecht, Netherlands: 1990. 473-476.

Afzal, I., S.M.A. Basra, N. Ahmad and M. Farooq. (2005): Optimization of hormonal priming techniques for alleviation of salinity stress in wheat (*Triticum aestivum* L.). Caderno de Pesquisa Série Biologia 17(1): 95-109.

Al-Ansari, F.M. (2003): Salinity tolerance during germination in two arid-land varieties of wheat (*Triticum aestivum* L.). Seed Sci. and Tech. 31: (3), 597-603.

Almodares A., Hadi M. R. and Dosti B. (2007): Effects of salt stress on germination percentage and seedling growth in sweet sorghum cultivars. Journal of Biological Sciences. 7(8): 1492-1495.

Ansari, S. A.; Samiullah, M. M.; Afridi, R. K. and Khan, N.A. (1990): Response of field grown lentil to pre-sowing seed enrichment with pyridoxine. Field Crops Research, 23:45-53.

Ashraf, M. and Foolad. M.R. (2005): Pre-sowing seed treatment – A shotgun approach to improve germination, growth and crop yield under saline and non-saline conditions. Advances in Agronomy 88: 223-271.

Ashraf, M. and Rauf, H. (2001): Inducing salt tolerance in maize (*Zea mays* L.) thorugh seed priming with chloride salts: Growth and iontransport at early growth stages. Acta Physiol. Pl., 23: 407–17

Ashraf, M., H.R. Athar, P.J.C. Harris and T.R. Kwon. (2008): Some prospective strategies for improving crop salt tolerance. Advances in Agronomy 97: 45-110.

Ayaz F.A., Kadioglu A., Turgut R., (2000): Water stress effects on the content of low molecular weight carbohydrates and phenolic acids in Ctenanthe setosa (Rose.) Eichler,Can. J. plant Sci. 80: 373-378.

Ayers, A.D. (1952). Seed germination is affected by soil moisture and salinity. Agro. J. 44: 82-84.

Azooz, M.M., Shaddad, M.A. and Abdel-Latef, A.A. (2004): Leaf growth and K+/Na+ ratio as an indication of the salt tolerance of three sorghum cultivars grown under salinity stress and IAA treatment. Acta Agronomica Hungarica. 52: (3), 287-296.

Baskin, C.C. and J.M. Baskin, (1998): Seeds: Ecology, Biogeography and Evolution of dormancy and germination. Pp: 41–3. Academic Press New York.

Bassuony, R.A. Hassanein, D.M. Baraka and Khalil, R.R.(2008):Physiological Effects of Nicotinamide and Ascorbic Acid onZea mays Plant Grown Under Salinity StressII-Changes in Nitrogen Constituents, Protein Profiles, Protease Enzyme and Certain Inorganic Cations Aust. J. Basic & Appl. Sci., 2(3): 350-359.

Basra, S.M.A., I. Afzal, R.A . Rashid and Hameed, A. (2005): Inducing salt tolerance in wheat by seed vigor enhancement techniques. Int. J. Biot. Biol., 2: 173–9

Begum F., J.L. Karmoker, Q.A. Fattah and A.F.M. Moniruzzaman,(1992):The effect of salinity on germination and its correlation with K+, Na+, Cl–

accumulation in germinating seeds of Triticum aestivum L. cv. Akbar. Plant Cell Physiol., 33: 1009–14

Bewley, J. D. (1997): Seed germination and dormancy. Plant Cell 9:1055-1066.

Bernstein, L.(1971) :Osmotic adjustment of plants to saline media. I. Steady state. Amer. J. Botany 48: 909-918.

Catalán L, Balzarini M, Taleisnik E, Sereno R, and Karlin U. (1994): Effects of salinity on germination and seedling growth of Prosopis flexuosa (D.C). Forest Ecology and Management 63: 347–357.

Cicek, N. and H. Cakirlar. (2002): The effect of salinity on some physiological parameters in two maize cultivars. Bulgarian Journal of Plant Physiology 28: 66-74.

Dodd, G. L. and Donovan, L. A. (1999) Water potential and ionic effects on germination and seeding growth of two cold desert shrubs. Amer. J. Bot. 86: (8), 1146-1153.

El-Banna, Y. (1985): The effect of salinity on the morphological, anatomy and ultrastructure of field bean and wheat plants and their modification by selected growth-regulating chemicals. Ph. D. Thesis, Univ. of London.

El-Bassiouny, H.M. and M.A. Bakheta, (2005): Effect of salt stress on relative water content, lipid peroxidation, polyamines, amino acids and ethylene of two wheat cultivars. Inter. J. Agric. And Boil., 7: 363-365.

El-Desouky, S.A. and Atawia, A.A.R. (1998): Growth performance of some citrus rootstocks under saline conditions. Alex. J. of Agric. Research 43: (3), 231-254.

El-Yazal, M.A.S. (2007): Effect of some antioxidants on growth, yield and some chemical constituents of onion (Alluim cepa L.) plants. Fayoum J. Agric. Res. & Dev., 21(1):162-176.

Farooq, M., S.M.A. Basra, K. Hafeez and N. Ahmad. (2005): Thermal hardening: a new seed vigor enhancement tool in rice. Journal of Integretive Plant Biology 47: 187-193.

Fowler, N. L.(1984): The role of germination date, spatial arrangement, and neighborhood effects in competitive interactions in Linum. J. Ecol 72:307–318.

Fowler J.L. (1991) : Interaction of salinity and temperature on the germination of Crambe, Agron. J. 83: 169-172.

Gomez, K.A. and Gomez, A.A. (1984):Statistical Procedures for Agriculture Research. John Wiley and Sons, Inc. New York.

Gonzalez-Reyes, J.A. Hidalgo, A., Caler, J.A., Palos, R. and Navas, P. (1994): Nutrient uptake changes in ascorbate free radical-stimulated onion roots Plant Physiol. 104: 271-276.

Greenway, H. (1963): Plant responses to saline substrates. III. Effect of nutrient concentration on the growth and ion uptake of Hordeum vulgare during NaCl stress. Aust. J. Biol. Sci. 16: 616-619.

Ghoulam, C. and K. Fares.(2001): Effect of salinity on seed germinationand early seedling growth of sugar beet (Beta vulgaris L.). Seed Sci.& Technol, 29: 357-364.

Gutterman Y. (1993): Seed germination in desert plants. New York: Springer.

Gutierrez-Boem, F.H., Scheiner, J.D. and Lavado, R.S.(1994): Some effects of soil salinity on growth, development and yield of rape seed (Brassica napus L.). J. Agron. Crop. Sci. 172: 182-187.

Hadas A., (1977): Water uptake and germination of leguminous seeds in soils of changing matrix and osmotic water potential, J. Exp. Bot. 28: 977-985.

Hajibagheri M.A., Yeo A.R., Flowers T.J., CollinsJ.C., (1989) Salinity resistance in Zea mays fluxes of potassium, sodium and chloride, cytoplasmic concentrations and microsomal membrane lipids, Plant, Cell and Envir. 12: 753-757.

Hamada A.M., Al-Hakimi A.M.A. (2001): Salicylic acid versus salinity-drought-induced stress on wheat seedling. Rostl. Výr., 47: 444–450.

Hatung,W. (2004): Plant response to stress: Abscisic acid fluxes. Marcel Dekker. Inc., New York.

Hawker, J.S. and Walker, R.R. (1978): Effect of sodium chloride on expansion rates and invertase activity of leaves. Aust. J. Plant Physiol. 5: 73-80.

Huang, J. and Redmann, R.E. (1995): Salt tolerance of Hordeum and Brassica species during germination and early seedling growth. Can. J. plant Sci. 75: 815-819.

Hu, Y., U. Schmidhalter, (2001): Effects of salinity and macronutrient levels on micronutrients in wheat. J. Plant Nutr., 24, 273-281.

Ishibashi, Y. and Iwaya-Inoue, M. (2006): Ascorbic acid suppresses germination and dynamic status of water in wheat seeds. Plant Production Science. 9 (2): 172 – 175.

ISTA (1999): International Rules for Seed Testing. Seed Science and Technology. 27: 1 – 333

Jeannette, S.; Craig R. and Lynch, J.P. (2002): Salinity tolerance of phaseolus species during germination and early seedling growth, Crop Sci. 42: 1584-1594.

Kabar K (1997): Comparison of reversal of abscisic acid-induced inhibition of seed germination and seedling growth of some Gramineae and Liliaceae members by kinetin and gibberellic acid.Turkish Journal of Botany 21, 203-210.

Kathiresan, K., V. Kalyani and J.L. Gnanarethium. (1984): Effect of seed treatments on field emergence, early growth and some physiological processes of sunflower (Helianthus annus L.). Field Crops Research 9: 255-259.

Kayani, S.A., Naqvi, H.H. and Ting, I.P. (1990): Salinity effects of germination and mobilization of reserves in jojoba seed. Crop Sci. 30: 704-708.

Khan, A.A., (1992):Preplant physiological seed conditioning. In: Ganick, J. (ed.), Horticultural reviews, Vol. 13. Pp: 131–81. John Willey, New York.

Khan M. A., Ahmed M. Z.and Hameed ,A. (2006) : Effect of sea salt and L-ascorbic acid on the seed germination of halophytes Journal of Arid Environments .67: 535–540.

Khodary, S.E.A., (2004) Effect of salicylic acid on the growth photosynthesis and carbohydrate metabolism in salt-stressed maize plants. Int. J. Agri. Biol., 6: 5–8.

Kigel, J. 1995. Seed germination in arid and semiarid regions. p. 645–699. In J. Kigel *et al.* (ed.) Seed development and germination. Marcel Dekker, New York.

Maas E.V., Nieman R.H., (1978): Physiology of plant tolerance to salinity. In: Crop Tolerance and suboptimal land conditions, Chap.13, pp. 277-299.

Mohamed, M.H. (2002): Response of the greenhouse pepper hybrids to salinity during different growth stages. Egyptian J. of Hort. 29: (2), 249-270.

Munoz, C.E., Barlow, P.W. and Palma, B. (1996): Effect of sea water on roots of Prosopis alba (Leguminosae) seedlings. Phyton. 59: (1/2), 55-63.

Neveen, Shawky, N.B.E.T.(2003):Physiological studies on the effect of salinity, ascorbic acid and putrescine on sweet pepper plant. Ph.D. Thesis, Dept. of Agri. Bot., Faculty of Agri. Univ. of Cairo.

Nijs, D. and Kelley, P.M. (1991): Vitamin C and E. donate single hydrogen atoms in vivo. FEBS Lett. 284: 147-151.

Noctor, G. and Foyer C.H. (1998): Ascorbate and glutathione: keeping active oxygen under control. Annual Review of Plant Physiol. and Plant Mol. Biol. 49: 249-279.

Nuran Cice and Hűsnű Cakirlar, (2002): The effect of salinity on some physiological parameters in two maize cultivars. Bulg. J. Plant Physiol., 2002, 28 (1-2), 66-74.

Padh, H. (1990): Cellular function of ascorbic acid. Biochem. Cell Biol. 68: 1270-1275.

Rajagopal, R.; Afaq, S.H. Afridi, R.M. and Mohammed, F. (2001). Germination and growth of Datura innoxia Mill. II. Effect of pre-sowing seed treatment with four vitamins on germination and seedling growth in pot culture. Hamdard-Medicus. 44 (1): 99 – 108.

Rahman, M.S., Matsumuro, T., Miyake, H. and Takeoka, Y. (2000):Salinity-induced ultrastructural alternations in leaf cells of rice (Oryza sativa L.). Plant Prod. Sci. 3: 422-429.

Reinhardt D.H and Rost T.L. 1995. Primary and lateral root development of dark- and light-grown cotton seedlings under salinity stress. Bot. Acta. 108: 403-365.

Rivas, M., F.J. Sundstorm and R.L. Edwards. 1984. Germination and crop development of hot pepper after seed priming. HortScience 19: 279-281.

Samiullah, M. M.; Khan, N.A.; Ansari, S. A.and Afridi, R. K. (1991): Pyridoxine augments growth, yield and quality of mustard through efficient utilization of soil applied NP-fertilizers. Acta Agron. Hung., 40:111-116.

Schopfer, P.and Plachy, C.(1984):Control of Seed Germination by Abscisic Acid : II. Effect on Embryo Water Uptake in Brassica napus L. Plant Physiol. Sep;76(1):155–160

Schwarz M (1985): The use of saline water in hydroponics. Soilless Cult. 1: 25-34.

Shannon, M. C.and Grieve, C. M. (1999), Tolerance of vegetable crops to salinity. Sci. Hortic., 78, 5-38.

Senaratna, T.; Touchell, D.; Bunn, E.; Dixon, K. (2000) : Acetyl salicylic acid (Aspirin) and salicylic acid induce multiple stress tolerance in bean and tomato plants. Plant Growth Regulation, v.30, p.157-161.

Shaddad, M.A., Radi, A.F., Abdel-Rahman, A.M. and Azooz, M.M. (1999): Response of seeds of lupinus termis and Vicia faba to the interactive effect of salinity and ascorbic acid or pyridoxine. Plant and Soil 122: 177-183.

Shalata, A and P. M. Neumann. (2001): Exogenous ascorbic acid (Vitamin C) increases resistance to salt tolerance and reduced lipid peroxidation. J. Exp. Bot., 364: 2207-2211.

Silva, A.V.C. da, Seixas, E.S., Vanzolini, S., Vitoria, D.P. and Rodriguez, T.J.D. (2003a): Lettuce seed germination under salinity stress. Acta Horti. 607: 27-31.

Singh, K.N., and R. Chatrath. (2001): Salinity tolerance. In: M.P. Reynolds, J.I. Ortiz-Monasterio, and A. McNab, eds, Application of Physiology in Wheat Breeding.CIMMYT, D. F. Mexico, pp.101-110.

Smirnoff, N. (1996): The function and metabolism of ascorbic acid in plants. Annals of Bot. 78: 661-669.

Szepesi, Á., J. Csiszár, S. Bajkán, K. Gémes, F. Horváth, L. Erdei1, A.K. Deér, M.L. Simon and I. Tari. (2005): Role of salicylic acid pre-treatment on the acclimation of tomato plants to salt- and osmotic stress. Acta Biologica Szegediensis 49(1-2): 123-125.

Taamalli, W., Abz, L., Youssef, N.B., Miled, D.D.B. and Zarrouk, M.(2004): Lipid breakdown in sunflower (Helianthus annuus L.) seeds during post germinative growth under salt-stress. Rivista Italian delle Sostanze Grasse 81: 90-97

Tari, I., J. Csiszar, G. Szalai, F. Horvath, A. Pcsvaradi, G. Kiss, A. Szepesi, M. Szabo and L. Erdei. 2002. Acclimation of tomato plants to salinity stress after a salicylic acid pre-treatmemt. Acta Biologica Szegediensis 46: 55-56.

Tesu, V., Toma, L.D. Tesu, C. and Ifteni, L. 1980. the reaction of some cultivated and wild plants to different levels of soil salinity. Bulletin de L' Academic des Sciences Agricoles det Forestieres. 10: 5-24.

Yeo, A.R. (1983): salinity resistance: physiologies and prices. Physiol. Plant. 58: 214-222.

Younis, M.E., El-Shahaby, O.A., Nemat Ally, M.M., and El-Bastawisy Zeinab, M. 2003. Kinetin alleviates the influence of waterlogging and salinity in Vigna sinensis and Zea mays. Agronome 23: 277-285.

Zeinali, E., Soltani, A. and Galeshi, S.(2002): Response of germination components to salinity stress in oil seed rape (Brassica napusL.). Iranian J. of Agric. Sci. 33: (1), 137-145.

Zhu, J.K.(2001.) Plant salt tolerance. Trends Plant Sci. 6: 66–71.

Zhang, S.-G., Gao J.-Y. and Song J.-Z.(1999): Effects of salicylic acid and aspirin on ATP contents in wheat seedlings under NaCl stress. Acta Bot. Sin. 41: 675–676

Wang, Y. and Nii, N. (2000): Changes in chlorophyll, ribulose biophosphate carboxylase-oxygenase, glycinebetaine content, photosynthesis and transpiration in Amaranthus tricolor leaves during salt stress. J. Hortic. Sci. Biotechnol. 75 : 623-627.

تأثير نقع بذور الجوار فى بعض الفيتامينات و الهرمونات الطبيعية على الانبات ونمو البادرات فى وجود كلوريد الصوديوم

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اجريت هذةالتجربة بغرض دراسة تقليل الاثر الضار لملوحة كلوريد الصوديوم بتركيزات (٧٥٠٠،٥٠٠٠،٢٥٠٠جزء فى المليون) على نسبةالانبات ونمو بادرات نبات الجوار وذلك بنقع البذور فى بعض الفيتامينات (حمض الاسكوربيك اوالثيامين) أوبعض الهرمونات الطبيعية(حمض الابسيسك أوحمض السلسيلك) بتركيز ١٠٠،٥٠جزء فى المليون لكل منهم. ولقد اوضحت الدراسة ان التركيز المنخفض من الملح يزيد معنويا من نسبة الانبات ووكذلك يحسن من نمو البادرات(طول البادرة و الوزن الطازج و الجاف)، بينما زيادة تركيز الملح حتى ٥٠٠٠ جزء فى المليون تؤدى الى نقص فى نسبة الانبات وكذلك نمو البادرات ،وكان التركيز المرتفع للملح اكثر تأثيرا.كما أثبتت الدراسة أن معظم معاملات النقع فى االمواد المختارة كانت فعالة فى زيادة نسبةالانبات وصفات النموللبادرات المتمثلة فى طول البادرة و الوزن الطازج و الجاف للبادرة تحت الظروف الطبيعية وملوحة كلوريد الصوديوم مقارنة بالبذور غير المعاملة فيما عداحمض الابسبيسك.كما أوضحت نتائج التجربة ،تحت الظروف الطبيعية ،أن اكبر نسبة انبات فى البذور التى نقعت فى حمض الأسكوربيك (بكلا تركيزية) وحمض السلسليك(١٠٠جزء فى المليون). عامة، كما أن حمض الاسكوربيك اوالثيامين أوحمض السلسيلك لة تأثير فى تقليل الاثر الضار لملوحة كلوريد الصوديوم على نسبة إنبات ونمو البادرات لنبات الجوار . كما أوضحت نتائج التجربة أن حمض الأسكوربيك ثم حمض السلسيلك يقلل الاثر الضار لملوحة كلوريد الصوديوم على نسبةالانبات ونمو البادرات لنبات الجوار .

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