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THE RESPONSE OF *Albizzia lebbek, L.* PLANTS GROWN IN SANDY SOIL UNDER SALT STRESS TO BIOGEN, GENISTEIN AND VAPOR CARD TREATMENTS.

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ABSTRACT

Pot experiments were conducted during the two growing seasons of 2001 and 2002, at the Fac. Agric., Minia Univ. to overcome the inhibitory effect of saline irrigation water on growth, nodule formation and chemical components *of Albizzia lebbek, L.* seedlings grown in sandy soil . Biogen , genistein and vapor gard treatments were used for this purpose . Three saline irrigation water treatments contained 3000, 6000 and 9000 ppm of NaCl and $CaCl_2$ mixture (1:1 ratio by weight) as well as tap water (as control) were used . The treatments for saline resistance were, biogen at 3g /pot, genistein at 20 M, vapor gard at 3% , biogen at 3g /pot + genistein at 20 M , biogen at 3g /pot + vapor gard at 3% , genistein at 20 M + vapor gard 3%,as well as, untreated control . The, obtained results showed that salinity reduced all plant growth characters, plant chemical composition and nodule formation. The depression effect was increased as salinity level increased from 3000 to 9000 ppm. All chemical treatments had an advantage effect over untreated plants under normal or saline conditions. Biogen, mixed to the soil, improved the growth performance and chemical composition of both salt-affected and unaffected plants, particularly in soils treated with genistein. The antitranspirant, vapor gard, showed a positive effect under normal or saline conditions in comparison with untreated plant. As plants growth , chlorophyll contents and chemical composition were increased with application of vapor gard . Therefore, incorporating the genistein with the Rhizobium containing biofertilizer (biogen) or vapor gard as an antitranspirant may be considered as a promising treatment that can be used to alleviate the adverse effect of salinity.

INTRODUCTION

Albizzia lebbek ,L. belongs to Family Fabaceae (Leguminosae.) It is handsome,deciduous tree with a spreading umbrella of feathery foliage. It is used as fire wood, furniture and as construction timber for house ,it carves and polishes well and resembles rose-wood .It is often planted for shade,fodder(the young foliage contains about 20% protein and is fed to livestock) and useful fuel .fixes nitrogen through nodules on its roots (Ayensu ,1981). Therefore, studying the effect of different factors , such as salinity ,and biofertilization on growth parameters of *Albizzia lebbek,L.* is of a particular interest.

Salinity in soil and / or water is of increasing importance factors to agriculture as it causes a stress condition to most plant species . Secondary, salinization is increasing year after year due to extensive irrigation with poor quality water and increasing land water table . However, plants differ in their tolerance to salinity, most plants, are not capable to tolerate high levels of salinity (Greenway and Munns,1980).

Recently, the Egyptian agricultural strategy aims to a continuous expansion of trees and shrubs cultivation in the newly reclaimed sandy soils. However.success in such areas depends on good choice of plant species, which could tolerate salinity. It is well known that salinity of soil or irrigation water and drought stresses had an adverse effects on plant growth (EL-

Fakhrani, 2001). The reduction in growth of ornamental trees by salinity may result from its effects on dry matter allocation, ions relation, water status, physiological processes, biochemical reactions and/or a combination of such factors(Zidan and Malibaria,1993; EL-Fakhrani, 2001).

Osmotic stress and ionic interactions associated with salinity stress may affect leaf mineral balance (Walker and Dougles, 1983), water relations (Wutscher, 1979; Syverstsen *et al* .,1988)and net CO_2 assimilations (Garcia-Legaz *et al.,* 1993).

Application of bio-fertilizers proved to be favorable in enhancing growth and nutritional status of many trees (Mehta,et *al.,* 1995 ;olesniewiez and Thomas, 1999;Ali *et al.,* 2002; and Huat *et al* .,2002). Unfortunately, most of the new reclaimed areas are poor in nodule - forming microorganisms because they are mostly having sandy structure and / or salt affected land . Therefore, inoculation with microbial biofertilizer , is needed.

Subba. Rao (1999) mentioned that biofertilizers are carrier based preparations containing beneficial microorganisms in available state intended for seed or soil application and designed to improve soil fertility and help plant growth by increasing the number and biological activity of desired microorganisms in the root zone

In general, biofertilizers are environment friends, low cost agricultural input with maximum out put . These biofertilizers are found to play an important role in enhancing plant growth and productivity through nitrogen fixation, phosphate solubilization, plant hormone production, ammonia excretion and to control various plant diseases (Dadarwal *et al ,* 1997 and Hegde *et al* .,1999).

Plant growth, nodulation, N2 fixation, N and soluble sugar concentration, yield and seed amino acid and protein contents of soybean plant were all reduced under moderately salt stress, and severely affected at relatively high salinity (Moftah, 2000). Biogen, mixed to the soil, improved the growth, performance and chemical constituents of both, salt - stressed and unstressed plants. Genistein, applied directly into the soil, substantially improved seedling emergence, plant growth, plant chemicals and yield (Moftah, 2000). Also, with soybean he showed that incorporating the isoflavone (genistein) with the Rhizobium containing biofertilizer (biogen) may be considered a promising treatment that can be used under newly reclaimed soil conditions to alleviate the unfavorable effects of salinity, often exist in such soil, on the growth and productivity of soybean.

Delgado *et al.* (1994) and Lynch and Smith (1994) attributed the inhibition of nodulation under salinity stress to the inhibition of flavonoid secretion by plant roots. Moftah (2000) found that salinity reduced the number of flavonoid compounds secreted by roots and under high salinity level secretion of the isoflavone (genistein) was completely suppressed .

Vapor gard was used successively as an antitrantspirant agent. It was found to increase vegetative growth parameters, chlorophyll contents, N, P and K% and leaf water contents (Attia *et al,* 1991; Mahfouz.1997; Mehana, 2001 and Abdou, 2003).

The aim of the present study was to find ways to overcome the adverse effect of saline irrigation water on nitrogen fixation and nodule formation of *Albizzia lebbek,L.* under the newly reclaimed sandy soils which are usually salt -affected land.

MATEMALS AND METHODS

Pot experiments were carried out at the nursery of Faculty of Agriculture, Minia University during the two successive seasons of 2001 and 2002 to investigate the response *of Albizzia lebbek ,L.* seedling grown under different salt conditions to the biofertilizer (biogen) Isoflavone (genistein)and vapor gard treatments.

Uniform and healthy seedlings of one year old , were taken from the nursery and transplanted in 40 cm diameter plastic pots on Feb 15th of each year (one seedling / pot) .The chosen seedlings were 63-65 cm height and were free of root nodules.

Each pot was filled with 12 kg of air - dried sandy soil . The soil was brought from the experimental Farm of Minia Univ., at Shosha, West Samalot City . The physical and chemical analysis of the experimental soil are shown in Table (1).

Table (I): Physical and chemical analysis of the soil used.

Sand %	Silt %	Clay %	EC (1:2.5)	pH (1:2.5)	Org. Matter %	CaCOa %	Total N%	Avail. P	Exch. K
90.8	5.9	3.3	1.09 mmohs /cm	8.16	0.09	12.7	0.02	10.6 ppm	0.2 mg/ l00g

Just before transplanting the soil was thoroughly mixed with the Rhizobium -containing biofertilizer (biogen) at the rate of 3g/pot (12kgsoil).

Just after transplanting genistein (4, 5, 7, tri -hydroxy isoflavone , synthetic G 6649 of 98% purity - Sigma Chemical Company) was applied as an aqueous solution at the rate of 20 uM in the irrigation water (as recommended by Zhang and Smith ,1994). Control plants were irrigated with a tap water only .

A spilt plot design with three replications and 10 plants per experimental unit was followed. Four levels of saline irrigation water occupied the main plots (A) and seven treatments of the biogen, genistein and vapor gard were assigned to the sub -plots.The main factor included the salt type used in irrigation water was mainly the chloride mixture of NaCl and $CaCl_2$ (1NaCl : 1$CaCl_2$ by weight) to give final concentrations of 3000 , 6000 and 9000 ppm as well as tap water was used as control treatment.

The other seven treatments were as follows , untreated , biogen at 3 g /pot, genistein at 20 uM , vapor gard at3%, biogen at 3 g/pot + genistein at 20 uM, biogen at 3 g /pot +vapor gard at 3% and genistein at 20uM + vapor gard at 3%.

In both seasons , seedlings of *Albizzia lebbek* were sprayed 3 times during the growing season at 3weeks intervals starting 4weeks from transplanting with vapor gard 3% containing 0.1 % of tween 20 as a surfactant, was applied until run off onto the foliage of the seedlings using manual atomizer. Control plant received a tap water and tween 20 only.

All transplanted seedlings were irrigated with tap water for one month before salinity treatment had begun.

Salinized or non- salinized water (control) was used as required to keep moisture around field capacity. Tap water was given one time monthly to all pots to remove the accumulation of salts in the root zone area .

All pots were fertilized with calcium super phosphate (15.5% P_2O_5) at the rate of 2g /pot before transplanting, ammonium sulphate(20.6%N) in the rate of4g / pot and potassium sulphate (48%K_2O))at the rate of 1g/ pot one month after transplanting .

On June 15th, 3 plants were randomly collected from each sub- plot, their roots were carefully separated, washed, plotted dry, and then nodules were cautiously removed and counted.

At the middle of November, the following growth parameters were recorded) : stem length and thickness (cm) , stems and leaves fresh and dry weights (gms), The total ammo nitrogen in leaves was determined according to (Nassar *et al* , 1977), total reducing sugars was also.estimated using Nelson method described by Moore , (1974) and Zayed (1976) . Moreover , pigments (chlorophylls a and b) were, also estimated according to Fadi and Sen El-Deen (1978). Regarding leaf free, bound and total water contents, they were measured as described by Gosef (1960) and auxin - like substances according to Tartoura (1984). Sodium and calcium % in the leaves were determined using flame photometer (Jakson,1967).The Obtained data were statistically analyzed following the L.S.D. method described by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

A-Vegetative growth :

1) Stem length and thickness .

Data in Table (2) showed the negative effects of salinity on plant length and thickness. The unjurious effects of salinity increased as salinity level increased and the differences between treatments were significant in case of stem length while were not significant in case of stem thickness. Suppression of stem length and thickness caused by salinity could be due to inhibition of cell division and / or cell elongation (Greenway and Munns , 1980). All chemical treatments increased significantly stem length over control treatment .Biofertilizer (biogen) + genistein treatment had the highest values (122.4 and 129.8cms) for both seasons, respectively, followed by biofertilizer (biogen) + vapor gard , since it were 120.4 and 127.2 cms for both season , respectively . Chemical treatments increased stem thickness but the differences between the treatments were not significant.The interaction between the two factors was significant, for stem length while was not for stem thickness.

2)Stem fresh and dry weights.

Results of Table (3) show that *Albizzia lebbek* stem fresh and dry weights / plants were decreased as salinity level increased. Similar results were reported by Shehata (1995) on poinciana. All chemical treatments increased significantly plant weight over control treatment. The interaction was significant for plant weights.

Table (2): Effects of saline irrigation water , biogen, genistein and vapor gard (VG) on Stem length and thickness of *Albizzia lebbek* , L. during two seasons (2001 and 2002)

Biofertilizer And Chemical treatments (B)	Saline irrigation (A)									
	First season					Second season				
	0.0 (ppm)	3000 (ppm)	6000 (ppm)	9000 (ppm)	Mean B	0.0 (ppm)	3000 (ppm)	6000 (ppm)	9000 (ppm)	Mean B
	Stem length (cm)									
Control	120.3	108.2	97.3	85.6	102.9	127.4	114.7	102.0	89.7	108.5
Biogen	132.3	125.8	113.3	101.3	118.2	146.7	135.5	118.8	106.2	126.8
Genistein	128.7	123.3	111.9	99.2	115.8	141.5	129.7	117.4	104.2	123.2
Vapor gard (VG)	126.7	122.3	109.9	96.7	113.9	140.2	128.4	115.4	101.8	121.5
Biogen+genistein	141.6	128.5	115.9	103.6	122.4	151.3	139.1	120.3	108.6	129.8
Biogen+(VG)	138.9	127.2	114.1	101.4	120.4	127.2	135.6	199.9	106.3	127.3
Genistein+(VG)	131.4	124.8	112.1	99.5	117.0	144.3	132.9	117.6	104.5	124.8
Mean A	131.4	122.9	110.6	98.2		142.7	130.8	115.9	103.0	
L.S.D. (5%)	A: 1.0 B:0.8 AB:1.6					A:1.5 B:0.9 AB: 1.8				
	Stem thickness(cm)									
Control	1.3	1.21	1.15	1.10	1.19	1.30	1.22	1.16	1.1	1.20
Biogen	1.42	1.33	1.27	1.21	1.31	1.42	1.33	1.28	1.21	1.31
Genistein	1.39	1.29	1.24	1.18	1.28	1.38	1.31	1.24	1.19	1.28
Vapor gard (VG)	1.96	1.26	1.21	1.15	1.40	1.37	1.28	1.22	1.16	1.26
Biogen+genistein	1.49	1.37	1.33	1.26	1.36	1.50	1.38	1.32	1.27	1.37
Biogen+(VG)	1.46	1.34	1.29	1.23	1.33	1.47	1.35	1.29	1.25	1.34
Genistein+(VG)	1.41	1.31	1.27	1.21	1.30	1.40	1.31	1.26	1.21	1.30
Mean A	1.49	1.30	1.25	1.19		1.41	1.31	1.25	1.20	
L.S.D. (5%)	A:N.S. B: N.S. AB: N.S.					A: N.S. B: N.S. AB: N.S.				

Table (3): Effects of saline irrigation water, biogen, genistein and vapor gard (VG) on stem fresh and dray weights of *Albizzia lebbek, L.* during two seasons (2001 and 2002).

Biofertilizer and chemical treatments (B)	Saline irrigation (A)									
	First season					Second season				
	0.0 (ppm)	3000 (ppm)	6000 (ppm)	9000 (ppm)	Mean B	0.0 (ppm)	3000 (ppm)	6000 (ppm)	9000 (ppm)	Mean B
	Stem fresh weight(gms / plant)									
Control	94.6	85.3	76.6	69.3	81.5	100.3	90.0	80.2	70.6	85.3
Biogen	104.5	101.4	92.2	82.9	95.3	11.6	106.9	95.6	84.9	100.9
Genistein	101.6	99.2	89.8	81.1	92.9	112.5	102.3	93.6	83.0	97.9
Vapor gard (VG)	100.5	97.2	87.6	78.9	91.1	112.1	101.3	92.2	81.7	96.8
Biogen+genistein	113.5	102.7	95.1	85.3	99.2	119.8	109.7	98.5	88.7	104.2
Biogen+(VG)	108.8	102.4	93.6	83.8	97.2	116.7	106.9	97.5	86.9	102.0
Genistein+(VG)	104.4	99.3	90.1	81.3	93.8	114.4	104.8	94.6	84.5	99.6
Mean A	104.0	98.2	89.3	80.4		113.1	103.1	93.2	82.9	
L.S.D. (5%)	A: 1.30 B:0.95 AB: 1.90					A:1.91 B:2.03 AB:4.06				
	Stem dry weight(gms/ plant)									
Control		42.6	34.5	31.4	36.7	42.3	40.6	36.3	31.9	38.5
Biogen	46.5	45.2	41.4	37.3	42.6	52.1	47.1	43.0	38.4	45.3
Genistein	45.0	44.4	40.4	36.5	41.6	50.7	46.0	42.2	37.5	44.1
Vapor gard (VG)	44.6	43.6	39.3	35.5	40.8	50.6	45.5	41.5	36.9	43.6
Biogen+genistein	50.3	46.3	42.6	38.3	44.4	53.8	49.2	44.2	40.1	46.8
Biogen+(VG)	48.3	46.0	41.8	37.5	43.4	52.5	48.0	43.7	39.1	45.8
Genistein+(VG)	46.2	44.6	40.4	36.6	42.0	51.4	47.1	42.5	38.1	44.8
Mean A	46.2	44.1	46.1	36.2		50.91	46.3	41.91	37.43	
L.S.D. (5%)	A:0.49 B: 0.40 AB: 0.80					A:0.61 B:0.59 AB:1.17				

3)Leaves fresh and dry weights.

A similar trend was observed for leaves fresh and dry weights / plant (Table 4) like the previous stem characters (Tables 2and 3). As salinity level increased plant weight (leaves/ plant) decreased and all chemical treatments had an advantage effect over untreated plants (control). The interaction between the two factors was significant and biofertilizer + genistein with 3000 ppm salinity had the heaviest weight.

Table (4): Effects of saline irrigation water , biogen, genistein and vapor gard (VG) on leaves fresh and dray weights of *Albizzia lebbek*, L. during two seasons (2001 and 2002).

Biofertilizer and chemical treatments (B)	Saline Irrigation (A)									
	First season					Second season				
	0.0 (ppm)	3000 (ppm)	6000 (ppm)	9000 (ppm)	Mean B	0.0 (ppm)	3000 (ppm)	6000 (ppm)	9000 (ppm)	Mean B
	Leaves fresh weight .(gms/ plant)									
Control	252.4	226.8	203.6	181.5	216.1	266.9	241.4	213.3	188.3	227.5
Biogen	277.7	264.8	241.3	214.0	249.5	307.8	285.4	250.8	225.8	267.5
Genistein	271.8	260.7	234.7	210.2	244.4	296.7	272.6	246.7	218.7	258.7
Vapor gard (VG)	264.2	256.2	230.6	203.6	238.7	293.7	270.5	243.5	213.4	255.3
Biogen+ Genistein	293.8	274.4	245.8	218.8	258.2	317.5	292.3	255.6	232.0	274.4
Biogen+(VG)	291.5	270.5	242.7	214.9	254.9	308.4	285.4	252.5	226.5	268.2
Genistein+ (VG)	275.9	261.5	236.2	211.0	246.2	302.7	278.4	250.0	220.5	262.9
Mean A	275.3	259.3	233.6	207.7		299.1	275.1	244.6	217.9	
L.S.D. (5%)	A:4.33	B:2.59	AB:5.18			A:5.52	B:4.27	AB: 8.54		
	Leaves dry weight.(gms/ plant)									
Control	63.4	59.6	55.0	51.8	57.5	66.6	63.8	58.8	53.3	60.6
Biogen	69.5	68.3	62.6	58.6	64.8	75.5	73.7	68.2	62.8	70.1
Genistein	67.4	67.0	61.3	58.1	63.5	73.9	71.7	67.6	61.4	68.7
Vapor gard (VG)	66.1	65.9	60.4	56.4	62.2	73.0	70.7	66.4	59.8	67.5
Biogen+ Genistein	72.7	71.0	73.8	60.0	66.9	68.3	65.7	69.3	64.6	72.0
Biogen+(VG)	72.3	70.2	62.7	59.0	66.1	67.5	64.5	69.2	63.1	70.8
Genistem+ (VG)	68.1	68.0	61.7	58.5	64.1	64.8	72.5	68.0	61.5	69.2
Mean A	68.5	67.1	61.1	57.5		74.1	71.8	66.8	60.9	
L.S.D. (5%)	A:2.00	B:0.88	AB: 1.76			A: 3.44	B: 2.71	AB: 5.41		

4) Root dry weight.

Results of Table (5) show that salinity significantly decreased plant root weight for both seasons . All chemical treatments significantly increased root weight over control treatment. The interaction effects between salinity levels and chemical treatments were significant and the interaction between low levels of salinity and biofertilizer + genistein had the highest values (Table 5). According to Munns and Termatt (1986), the retardation in growth as a result of salinity may be attributed to osmotic inhibition of water absorption, the excessive accumulation of ions such as Na^+ or Cl^- in plant cells and / or inadequate uptake of an essential nutrient. With respect to the effect of biofertilizers and vapor gard on growth and chemical constituents of plant, Ahmed and Ali (2002) reported that biofertilizer treatments enhanced plant growth and chemical constituents of anna apple trees Concerning vapor gard, as an antitranspirant agent, it was found that it increased vegetative growth parameters, chlorophyll, N, P and K % and leaf water contents (Attia *et al.,* 1991 and Mahfous, 1997. on *Eucalyptus citriodora* and roselle, respectively)

Table (5): Effects of saline irrigation water , biogen, genistein and vapor gard (VG) on roots dray weight of *Albizzia lebbek,L.* during two seasons (2001and2002).

Biofertilizer and chemical treatments (B)	Saline irrigation (A)									
	First season					Second season				
	0.0 (ppm)	3000 (ppm)	6000 (ppm)	9000 (ppm)	Mean B	0.0 (ppm)	3000 (ppm)	6000 (ppm)	9000 (ppm)	Mean B
	Root dry weight.(gms/ plant)									
Control	41.9	38.8	35.6	30.9	36.8	43.7	39.3	35.5	32.0	37.4
Biogen	55.9	51.7	46.9	41.5	49.0	56.8	51.3	46.7	32.1	49.2
Genistein	50.9	47.2	42.7	37.8	44.7	51.8	46.7	46.1	38.3	45.7
Vapor gard (VG)	46.2	42.9	39.1	34.2	40.6	47.0	42.2	38.3	35.2	40.7
Biogen+genistein	71.9	74.1	60.3	53.5	62.5	88.6	66.8	60.6	54.6	67.7
Biogen+(VG)	65.4	58.2	54.2	48.7	56.6	63.2	61.2	55.5	49.4	57.3
Genistein+(VG)	54.5	47.9	45.4	40.7	47.1	52.8	51.1	46.4	41.2	47.9
Mean A	55.2	50.1	46.3	41.0		54.7	51.2	47.0	41.8	
L.S.D. (5%)	A:2.73 B:124 AB: 2.48					A:1.86 B:1.96 AB:3.92				

B-Nodulation :

Total number of nodules/ plant was decreased as salinity level increased and the highest level of salinity (9000 ppm) had the lowest number of nodules (Table 6). The effect of salinity on nodulation may be attributed to osmotic effect (Monroe *et al.,* 1989) or to N_2 fixing nodules require continuous supply of carbohydrates and other photo - assimilates from shoot which are more affected by salinity (Dashti *et al.,* 1998). Chemical treatment increased number of nodules per plant over untreated plants. The interaction between the two factors was significant and the low level of salinity (3000 ppm) with biofertilizer + genistein had the highest values (224.7 and 224.6 nodule / plant) for the two season respectively. Similar results were reported by Moftah (2000) with soybean plant.

Table (6): Effects of saline irrigation water ,biogen, genistein and vapor gard (VG) on Total number of nodules of *Albizzia lebbek,L.* during two seasons (2001 and 2002).

Biofertilizer and chemical treatments (B)	Saline irrigation (A)									
	First season					Second season				
	0.0 (ppm)	3000 (ppm)	6000 (ppm)	9000 (ppm)	Mean B	0.0 (ppm)	3000 (ppm)	6000 (ppm)	9000 (ppm)	Mean B
	Total number of nodules/ plant									
Control	185.5	129.4	117.9	45.4	119.6	118.7	132.2	112.6	45.4	119.7
Biogen	201.5	185.7	135.6	88.0	152.7	199.9	186.0	135.0	87.2	152.01
Genistein	188.2	132.3	123.8	47.2	122.9	193.5	136.8	114.8	47.0	123.0
Vapor gard (VG)	186.3	130.9	121.0	46.5	121.2	191.4	134.9	113.5	46.4	121.6
Biogen+genistein	244.0	224.7	164.9	123.7	189.3	208.5	224.6	163.7	122.7	179.9
Biogen+(VG)	221.6	204.2	149.1	105.7	170.2	204.0	204.1	148.8	106.7	165.9
Genistein+(VG)	191.5	134.4	127.2	48.2	125.3	195.7	138.0	115.9	48.0	124.4
Mean A	202.7	163.1	134.2	72.1		197.4	165.2	129.2	71.9	
L.S.D. (5%)	A: 3.55 B:4.85 AB: 9.70					A:4.78 B:2.51 AB: 5.03				

C- Chemical composition:

1)Reducing sugars and amino nitrogen contents:

Salinity had an adverse effect on reducing sugars and amino nitrogen contents (Table 7). As salinity level increased the adverse effect increased. Chemical treatments had an advantage effect on reducing sugars and amino nitrogen contents over untreated plants for both seasons. The interaction between salinity levels and chemical treatments were significant and the low level of salinity with biofertilizer + geinstein had the highest values for both two seasons (Table 7). In this respect Delane *et al,* (1982) reported that the primary cause of reduced plant growth at high salinity level was attributed to the decrease in photosynthesis activity and to the adverse effect of Na^+ and Cl^- on plant metabolism.

Table (7): Effects of saline irrigation water, biogen, genistein and vapor gard (VG) on reducing sugars and amino nitrogein contents in leaves of *Albizzia lebbek,L* during two seasons (2001 and 2002).

Biofertilizer and chemical treatments (B)	Saline irrigation (A)									
	First season					Second season				
	0.0 (ppm)	3000 (ppm)	6000 (ppm)	9000 (ppm)	Mean B	0.0 (ppm)	3000 (ppm)	6000 (ppm)	9000 (ppm)	Mean B
	Reducing sugar content (mg/ g D.W.)									
Control	8.88	8.00	7.68	7.49	8.01	8.94	8.03	7.62	7.47	8.02
Biogen	9.23	8.50	8.46	8.33	8.63	9.28	8.53	8.49	8.34	8.66
Genistein	9.08	8.30	8.22	8.09	8.42	9.19	8.30	8.21	8.07	8.44
Vapor gard (VG)	9.03	8.24	8.15	8.01	8.36	9.07	8.26	8.25	7.97	8.39
Biogen+ genistein	9.33	8.66	8.56	8.58	8.78	9.44	8.70	8.67	8.57	8.85
Biogen+(VG)	9.27	8.61	8.47	8.41	8.96	9.31	8.55	8.52	8.40	8.70
Genistein+(VG)	9.17	8.44	8.37	8.25	8.56	9.20	8.47	8.42	8.24	8.58
Mean A	9.14	8.39	8.27	8.17		9.20	8.41	8.31	7.15	
L.S.D. (5%)	A:0.10	B:0.06	AB:0.11			A:0.08	B:0.03		AB:0.06	
	Amino nitrogen content (mg/ g D.W.)									
Control	3.41	3.23	2.95	2.73	3.08	3.58	"3.37	3.03	2.82	3.2
Biogen	3.77	3.73	3.48	3.33	3.58	4.15	3.82	3.63	3.34	3.74
Genistein	3.71	3.62	3.34	3.12	3.45	3.99	3.75	3.46	3.19	3.60
Vapor gard (VG)	3.62	3.49	3.22	2.98	3.32	3.80	3.60	3.33	3.11	3.46
Biogen+ genistein	4.01	4.00	3.77	3.66	3.86	4.42	4.30	3.77	3.58	4.02
Biogen+(VG)	3.92	3.91	3.64	3.43	3.73	4.29	4.07	3.66	3.45	3.87
Genistein+(VG)	3.76	3,66	3.39	3.22	3.51	4.02	3.81	3.53	3.26	3.66
Mean A	3.74	3.66	3.40	3.21		4.04	3.82	3.49	3.25	
L.S.D. (5%)	A:0.05		B:0.02	AB:0.05		A: 0.02		B:0.01	AB:N.S.	

2) Chlorophyll contents:

Results of Table (8) show the effects of salinity and chemical treatments on chlorophyll a and b and also the interaction between the two factors. Salinity significantly decreased leaf chlorophyll content (mg /g. fresh weight) for both seasons. The results are in agreements with those of EL-Noemani (1996) and Khafagi *et al.* (1996) on sugar beet .All chemical treatments increased significantly leaf chlorophyll contents over control plants. A similar conclusion was given by Mehana (2001) on mango. The interaction between the two factors was non significant (Table 8). Biofertilizer and/or vapor gard treatments improved the growth, performance and chemical constituents of both , salt - stressed and unstressed plants . Biogen application have a tendency to minimize the harmful effect of salinity (Moftah, 2000). This enhancement of plant growth may be attributed to the active photosynthetic process and N_2 fixation as shown by the present study and as reported by Kerr *et al.* (1985) and Moftah (2000) on soybean.

Table (8): Effects of saline irrigation water , biogen, genistein and vapor gard (VG) on chlorophyll contents in leaves *of Albizzia lebbek, L.* during two seasons (2001 and 2002).

Biofertilizer and chemical treatments (B)	Saline irrigation (A)									
	First season					Second season				
	0.0 (ppm)	3000 (ppm)	6000 (ppm)	9000 (ppm)	Mean B	0.0 (ppm)	3000 (ppm)	6000 (ppm)	9000 (ppm)	Mean B
	Chlorophyll a content (mg/ g F.W.)									
Control	2.869	2.725	2.648	2.570	2.703	2.847	2.761	2.651	2.518	2.694
Biogen	2.928	2.779	2.777	2.674	2.790	2.960	2.873	2.761	2.601	2.799
Genistein	2.916	2.752	2.720	2.647	2.759	2.932	2.847	2.735	2.561	2.769
Vapor gard (VG)	2.902	2.742	2.703	2.622	2.742	2.903	2.819	2.707	2.548	2.744
Biogen+genistein	2.939	2.835	2.808	2.727	2.827	2.997	2.939	2.818	2.676	2.858
Biogen+(VG)	2.934	2.807	2.780	2.700	2.805	2.990	2.903	2.790	2.651	2.834
Genistein+(VG)	2.921	2.752	2.707	2.648	2.762	2.932	2.847	2.736	2.593	2.777
Mean A	2.916\	2.770	2.738	2.655		2.937	2.856	2.743	2.593	
L.S.D. (5%)	A:0.040 B:0.032 AB:N.S.					A:0.042 B:0.049 AB:N.S.				
	Chlorophyll b content (mg/ g F.W.)									
Control	0.950	0.920	0.881	0.839	0.898	0.956	0.909	0.882	0.855	0.901
Biogen	0.985	0.953	0.920	0.867	0.931	0.976	0.929	0.925	0.894	0.931
Genistein	0.975	0.947	0.910	0.853	0.921	0.969	0.918	0.910	0.881	0.920
Vapor gard (VG)	0.966	0.939	0.901	0.850	0.914	0.966	0.916	0.901	0.875	0.915
Biogen+genistein	0.998	0.978	0.938	0.891	0.951	0.980	0.949	0.939	0.910	0.945
Biogen+(VG)	0.996	0.965	0.929	0.883	0.943	0.979	0.937	0.929	0.900	0.936
Genistein+(VG)	0.976	0.948	0.910	0.862	0.924	0.975	0.919	0.920	0.885	0.925
Mean A	0.978	0.950	0.913	0.864		0.972	0.925	0.915	0.886	
L.S.D. (5%)	A:0.025 B:0.015 AB:N.S.					A: 0.035 B:0.013 AB:N.S.				

3) Auxin like substances content.

Results of Table (9) show that salinity decreased significantly auxin - like substances content (mg /gm. D.W). While chemical treatments increased the content of auxin -like substances for both two seasons. The interactions between the level of salinity and chemical treatments were not significant.

Table (9): Effects of saline irrigation water , biogen, genistein and vapor gard (VG) on axin - like substances in leaves *of Albizzia lebbek, L.* during two seasons (200l)and 2002).

Biofertilizer and chemical treatments (B)	Saline irrigation (A)									
	First season					Second season				
	0.0 (ppm)	3000 (ppm)	6000 (ppm)	9000 (ppm)	Mean B	0.0 (ppm)	3000 (ppm)	6000 (ppm)	9000 (ppm)	Mean B
	Axin - like subances content (mg/ g D.W.)									
Control	0.84	0.76	0.69	0.66	0.74	0.87	0.79	0.76	0.72	0.79
Biogen	1.07	0.97	0.88	0.85	0.94	1.09	1.01	0.98	0.85	0.98
Genistein	0.97	0.88	0.81	0.77	0.86	1.00	0.91	0.89	0.94	0.91
Vapor gard (VG)	0.91	0.82	0.75	0.72	0.80	0.93	0.85	0.83	0.77	0.85
Biogen+genistein	1.17	1.07	0.97	0.93	1.04	1.19	1.09	1.07	0.99	1.09
Biogen+(VG)	1.10	1.00	0.09	0.86	0.97	1.12	1.02	0.99	0.91	1.01
Genistein+(VG)	1.00	0.90	0.82	0.79	0.88	1.03	0.94	0.91	0.84	0.93
Mean A	1.01	0.91	0.83	0.80		1.03	0.96	0.92	0.85	
L.S.D. (5%)	A:0.08		B:0.05		AB:N.S.	A:0.06		B:0.05		AB:N.S.

4) Water content.

Total water % , bound water and free water of *Albizzia lebbek* leaves are shown in Table (10) . Salinity decreased water content *ofAlhizzia lebbek* leaves and the differences were significant .While chemical treatments increased significantly leaves water contents. The interaction between salinity levels and chemical treatments were significant for both seasons (Table 10) . These results are in a good agreement with those of Hummel (1990) and Mehana (2001) on some woody plants and mango , respectively .

5) Sodium and calcium percent.

Sodium percent in *Albizzia lebbek* leaves increased as salinity levels increased while calcium percent decreased with high levels of salinity (6000 and 9000 ppm) for both seasons (Table 11). Osmotic stress and ionic interaction associated with salinity stress may affect leaf mineral balance (Walker and Doughles, 1983), water relations (Syvertsen Dougles *et al*., 1988) and net CO_2 assimilation (Garcia - Legaz *et al.*, 1993). Chemical treatments had no advantage effect over untreated plants (control) for Na^+ and Ca^{2+} % .The interaction between salinity levels and chemical treatments were significant in most cases (Table 10)

Table (10): Effects of saline irrigation content water, biogen, genistein and vapor gard (VG) *on* total water content, bound water and free water % of *Albizzia lebbek,L.* during two seasons (2001 and 2002).

Biofertilizer and chemical treatments (B)	Saline irrigation (A)									
	First season					Second season				
	0.0 (ppm)	3000 (ppm)	6000 (ppm)	9000 (ppm)	Mean B	0.0 (ppm)	3000 (ppm)	6000 (ppm)	9000 (ppm)	Mean B
	Total water content %									
Control	74.88	73.73	72.99	71.48	73.27	75.06	73.55	72.43	71.70	73.19
Biogen	75.00	74.30	73.82	72.30	73.86	75.15	73.85	72.71	71.97	73.42
Genistein	74.99	73.89	73.72	72.16	73.69	75.10	73.70	72.59	71.86	73.31
Vapor gard (VG)	75.24	74.11	74.06	72.57	74.06	75.35	74.09	72.91	72.15	73.63
Biogen+ genistein	75.18	74.06	74.00	72.46	73.93	95.20	73.91	72.74	72.03	73.47
Biogen+(VG)	75.32	74.31	74.15	72.74	74.13	75.48	74.20	73.01	72.28	73.74
Genistein+(VG)	75.21	74.31	74.04	72.60	74.04	75.30	73.95	72.87	72.15	73.57
Mean A	75.12	74.10	73.83	72.33		75.23	73.89	72.75	72.02	
L.S.D. (5%)	A:0.45	B:0.15	AB:0.30			A:0.22	B:0.03	AB:0.06		
	Bound water%									
Control	16.55	16.30	16.13	15.80	16.20	16.54	16.21	15.96	15.80	16.13
Biogen	16.56	16.48	16.26	16.02	16.33	16.56	16.27	16.02	15.85	16.18
Genistein	16.57	16.36	16.26	15.98	16.29	16.55	16.24	16.00	15.84	16.16
Vapor gard (VG)	16.66	16.44	16.35	16.09	16.39	16.60	16.33	16.09	15.91	16.23
Biogen+ Genistein	16.64	16.42	16.33	16.09	16.37	16.57	16.28	16.04	15.88	16.19
Biogen+(VG)	16.65	16.48	16.32	16.12	16.39	16.65	16.34	16.10	15.94	16.26
Genistein+ (VG)	16.64	16.48	16.30	16.11	16.38	16.60	16.69	16.05	15.91	16.21
Mean A	16.61	16.42	16.28	16.03		16.58	16.28	16.04	15.88	
L.S.D. (5%)	A:0.02	B:0.09	AB:0.17			A:0.02	B:0.02	AB:0.05		
	Free water%									
Control	58.33	57.43	56.86	55.68	57.08	58.52	57.34	56.47	55.90	57.06
Biogen	58.44	57.82	57.56	56.28	57.53	58.59	57.58	56.69	56.12	57.25
Genistein	58.42	57.53	57.46	56.18	57.40	58.55	57.46	56.59	56.02	57.16
Vapor gard (VG)	58.58	57.67	57.71	56.48	57.61	58.75	57.76	56.82	56.24	57.39
Biogen+ genistein	58.54	57.64	57.67	56.40	57.56	58.63	57.63	56.70	56.15	57.28
Biogen+(VG)	58.67	57.83	57.83	57.62	57.74	58.83	57.86	56.91	56.34	57.49
Genistein+(VG)	58.57	57.83	57.74	56.49	57.66	58.60	57.66	56.82	56.24	57.36
Mean A	58.50	57.68	57.55	56.30		58.65	57.61	56.71	56.14	
L.S.D. (5%)	A:0.14	B:0.04	AB:0.08			A:0.35	B: 0.04	AB:0.09		

Table (11): Effects of saline irrigation content water , biogen, genistein and vapor gard (VG) *on* total water content, bound water and free water % of *Albizzia lebbek,L.* during two seasons (2001 and 2002).

Biofertilizer and chemical treatments (B)	Saline irrigation (A)									
	First season					Second season				
	0.0 (ppm)	3000 (ppm)	6000 (ppm)	9000 (ppm)	Mean B	0.0 (ppm)	3000 (ppm)	6000 (ppm)	9000 (ppm)	Mean B
	Sodium %									
Control	0.336	0.424	0.509	0.559	0.457	0.343	0.432	0.518	0.570	0.466
Biogen	0.322	0.403	0.468	0.454	0.412	0.322	0.393	0.458	0.488	0.415
Genistein	0.327	0.410	0.484	0.507	0.432	0.329	0.409	0.487	0.530	0.439
Vapor gard (VG)	0.331	0.413	0.489	0.519	0.438	0.332	0.414	0.492	0.535	0.443
Biogen+ geni stein	0.317	0.395	0.453	0.433	0.400	0.312	0.382	0.444	0.473	0.403
Biogen+(VG)	0.321	0.401	0.465	0.465	0.413	0.319	0.393	0.463	0.498	0.418
Genistein+(VG)	0.326	0.407	0.475	0.481	0.422	0.326	0.401	0.472	0.509	0.427
Mean A	0.326	0.408	0.478	0.488		0.326	0.403	0.476	0.515	
L.S.D. (5%)	A: 0.019	B:0.040	AB:0.08			A: 0.017	B:0.038	AB:0.076		
	Calcium%in									
Control	2.410	2.530	2.210	2.040	2.298	2.56	2.680	2.520	2.320	2.520
Biogen	2.268	2.309	1.955	1.813	2.086	2.434	2.522	2.300	2.053	2.327
Genistein	2.314	2.404	2.078	1.925	2.180	2.483	2.573	2.394	2.187	2.409
Vapor gard (VG)	2.338	2.429	2.100	1.937	2.201	2.509	2.600	2.419	2.204	2.433
Biogen+ Genistein	2.199	2.239	1.895	1.753	2.022	2.409	2.446	2.229	2.055	2.285
Biogen+(VG)	2.244	2.307	1.974	1.826	2.088	2.034	2.495	2.298	2.083	2.328
Genistein+(VG)	2.291	2.356	2.016	1.858	2.130	2.460	2.548	2.347	2.116	2.368
Mean A	2.295	2.368	2.033	1.879		2.470	2.552	2.358	2.145	
L.S.D. (5%)	A:0.018	B:0.061	AB: 0.122			A:0.019	B:0.067	AB:0.134		

REFERENCES

Abdou, M.A. (2003): Physiological studies on *Washingtonia filifera,'Wendl.* Plant: 1- Reliefing the harmful effects of water stress on sandy soil grown seedling by the use of vapor gard and ascorbic acid. J. Agric. Sci. Mansoura Univ.,28 (5): 3331-3844.

Ahmed, A.A.and Ali, A.F.(2002): Effect of some biofertilizers on growth and chemical composition of two woody tree seedlings growth in sandy calcareous soil. Proc.Minia 1st Conf.for Agric. and Environ.Sci.Minia Egypt..March 25-28, 2002, p.419-429.

Ali, A.H.; El-Sayed, M. A. and Abd-EL-Aziz,Y.Z.(2002): Effect of spraying some nutrients and ascorbic acid on yield and fruit quality of anna apple trees *(Malus domeslica,* L.) Proc.Minia 1st Conf. for Agric and Environ Sci.Minia, Egypt, 1773- 1784.

Attia, F.A.;Moftah, A.E. and Abdou, M.A.(1991): The response of *Eucalyptus citriodora* to antitranspirant (*Vapor gard*). Menofyia J.Agric .Res 16(2):1177-1195.

Ayensu, E.S. (1981): Firewood Crops,Shrub and Tree Species for Energy Production. National Academy of Sciences.National Academy Press., Whashington D.C., U.S.A.

Dadarwal, L.R.,Yadav, L.S. and Sindhu,S.S.(1997): Biofertilizer production technology, prospects. In .Biotechnology Approaches . In Soil Microorganisms for Sust. enable crop production .p.323-337 Scientific publishers, Jodphus, India.

Dashti, N .; Zhang, F.; Hynes, R. and Smith D.L. (1998): Plant growth promoting rhizobacteria accelerate nodulation and increase nitrogen fixation activity by field grown soybean *[Glycine max(L)Merr]* under short season condition Plant and Soil 200:205-213.

Delane, R.; Greenway, H.; Munns. R. and Gibbs, J. (1982): Ion concentration and carbohydrate status of the elongation leaf tissue of *Hordeum vulgare* growing at high external NaCl. J.Exp. Bot, 33:557-573.

Delgado ,M.J.; Ligero , F.and Lluch,C. (1994): Effects of salt stress on growth and nitrogen fixation by pea, faba bean .common bean and soybean plants .Soil Biol. Biochem., 26:371-376.

EL-Fakhrani, Y.M.(2001): Effect of K fertilization on the tolerance of potato plants irrigated with saline ground water. Proc fifth Arabian Hort. Conf. Ismalia, Marsh 24-28p.l41.151.

EL-Noemani, A.A. (1996): Influence of irrigation with saline water on growth, yield and chemical composition of five sugar beet (*Beta Valgaris* ,L.) varities -Egypt. J.Appl .Sci.,11 (2) 268-291.

Fadl, M.S. and Seri EL-Deen, S.A. (1978): Effect of N^6 - Benzyl adenine on photosynthedc pigments and total soluble sugars in olive seeding growth under saline condition .Research Bullerin No.843, Fac.Agric . Ain shams Univ. ,Egypt.

Garcia -Legaz, M.F.;Ortiz,J.M.;Garcia-Lidon , A. and Cerda, A. (1993): Effect of salinity on growth ,ion content and *CO^* assimilation rate in lemon varieties ondifferent rootstocks. Physiol. Plant .,(89) : 427-432.

Gomez, K.A.and Gomez ,A.A. (1984): Statistical Procedures ofAgric. Res. John Wiley and Sons. NewYork , USA.

Gosef, N.A.(1960): Some Method For Studying Plant Water Relation Akad Nauh.Ussk, .246.PP.

Greenway, H.and Munns, H. R.(1980): Mechanism of salt tolerance in nonhalophtes .Ann. Rev .Plant physiol., 31:149-190.

Hegde, D.M., Dwivedi, B.S.and Sudhakara Babu ,S.S.(1999): Biofertilizers for cereal production in India - A review . Indian J.Agric . Res.,69(2):73-83.

Huat, O.K.;Awang,K.;Hashin ,A.and Majid, N .M.(2002): Effects of fertilizers and vesicular-arbuscular mycorrhizae on the growth and photosynthetic of *Azadirachta excelsa* (Jack)Jacobs seedlings .Forest Ecology and Management.158, ISS 1-3, p. 51-58.

Hummel, R.L.(1990): Water relation of container -grown woody and herbaceous plants following antitranspirant sprays.Hort Sci.,25 (7):772-775 (C.F.Hort Abst.,61,4993).

Jackson, M. E.(1967): Soil Chemical Analysis .Prentice Hall of Indian Private, New Delhi.

Kerr, P.S.; Israel, D.W.; Huber, S.C.and Rufty ,T.W.(1985): Effect of supplemental NO_3 on plant growth and components of photosynthetic carbon metabolism in soybean *(Glycine max*).Can J.Bot .,64:2020-2027.

Khafagi, O.M.A.; .Abdel-Rahman, A. and EL-Lawendy, W.I.(1996). Salt tolerance of sugar beet *(Beta vulgaris* ,L.) .1-Growth, water relations and photosynthetic pigments. Annals ofAgric. Sci., Moshtohor ,34(4) :1631 -1646.

Lynch, D.H. and Smith ,D.L.(1994): The effects of low root zone temperature stress on two soybean *(Glycine max,L.* Merr) genotypes when combined with Bradyrhizobium strains of varying geographic origin . Physiol . Plant., 88:212-220.

Mahfouz, S.S.(1997): Effect of some antispirants on the growth and chemical components of roselle plant under limited irrigation condition Ph.D.Thesis , Fac.of Agric ., Menofyia Univ.

Mehana, S.A. (2001): Water balance in small mango trees as affected by spraying antitranspirant (pinolene) in newly reclaimed soil .Proc. fifth Arabian Hort. Conf. Ismailia, Egypt.

Mehta, A.C.; Malavia,D.;Kaneria .B.B.and Khamapra, V.D.(1995): Effect of phosphatic biofertilizer in conjunction with organic and inorganic fertilizers on growth and yield of ground nut *(Arachis hypogaea).* Indian Journal ofAgron., 40 (4) :709-710.

Moftah, A.E.(2000): Response of soybean plants grown under saline condition to the biofertilizer "Biogen" and iso -flavone 'Genistein' Annals of Agric .Sci. Moshtohor, 38(2):869-882.

Monroe, J.D.; Owens,T.G.and LaRue ,T.A.(1989): Measurement of the fractional oxygenuation of leghemoglobin in intact detached pea nodules by reflectance spectroscopy. Plant Physiol .,91:598- 602.

Moore, T.C.(1974): Research Experiences in Plant Physiology .A laboratory Manual. Springer .Verlag Berlin .Heidelbery , New York p.247-257.

Munns, R. and Termatt,A.(1986):Whole plant response to salinity .Aust . J. Plant Physiol., 13:143-160.

Nassar, A.R.; EL-Tahawi, B.S. and Seri EL-Deen, S.A.(1997) Chromatographic identifications of oil and amino acid constituents in kernels of some almond varieties J. Amer.Oil . Chem.Soc.,54(11)

Olesniewiez, K.S.and Themas ,R.B.(1999): Effect of mycorrhiza colonization on biomass production and nitrogen fixation of black locust *(Robinia pseudoacacid)* seedling grown under elevated atmospheric carbon dioxide.New Phytologist, 142.ISSI, p.133-140.

Shehata, N.N. (1995): Respense of *Poinciana regia* seedlings to fertilization in sandy soil. M. Sc. Thesis ,Fac.Agric.Minia Univ .

Subba-Rao, N.S. (1999): Soil Microbiology. (Fourth edition of Soil Microorganism and Plant Growth) -Science Publishers ,Inc: U.S.A.

Syvertsen, J.P.;Lloyed,J.and Kriedemann ,P.E.(1988): Salinity and drought stress effects on foliar ion concentration .water relation and photosynthetic. characteristics of Citrus orchad. Aust.J. Agric. Res., 39:619-627.

Tartoura, K.A.(1984): Study of some factors affecting dormancy in Egypt apricot seeds M. Sc. Thesis, Fac. Agric., AL-Azhar Univ.

Walker, R. R. and Doughles ,T.J.(1983): Effect of salinity level on uptake and distribution of chloride ,sodium and potassium ions in citrus plants. Aust. J.Agric. Res.,34:145-153.

Wutscher, H.K.(1979): Citrus rootstocks. Hort. Rev.,(l):237-269.

Zayed, M. M.(1976): Biochemical and physiological studies of the regulation effects of some growth substances on cucumber seedling growth. M. Sc. Dissert,Fac Agric., AE-Azhar Univ.

Zhang, F. and Smith, D.E.(1994): Effects of low root zone temperature on the early stages of symbiosis estabishment between soybean *(Glycine max,* E.Merr.) and *Bradyhizobiumjaponicum.* J. Exp. Bot.,279:1467-1474

Zidan, M. A. and Malibaria, A.A. (1993): The role of K in alleviating stress affecting growth and some organic and mineral components of wheat Arab Gulf. J. Scient. Res., 11:201 -208.

استجابة نباتات اللبخ الناميه فى ارض رمليه تحت ظروف الاجهاد الملحى للمعامله بالبيوجين و الجينستين والفابورجارد.

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أجرى هذا البحث خلال عامي ٢٠٠١،٢٠٠٢ بمشتل كلية الزراعة جامعة المنيا ويهدف البحث إلى إمكانية التغلب على التاثير الضار الناتج عن نمو شتلات اللبخ فى تربة رملية تحت مستويات مختلفة من الملوحة ، ولقد تم زراعة الشتلات فى أصص و تم ري الشتلات بثلاث تركيزات من الأملاح و هى:٣٠٠٠،٦٠٠٠،٩٠٠٠ جزء فى المليون من أملاح كلوريد الصوديوم و كلوريد الكالسيوم بنسبة(١:١ بالوزن) بالإضافة الى الماء العادي كمعاملة كنترول .و لقد استخدم كلا من السماد الحيوى (البيوجين) و الجينستين ومضاد النتح
(الفابورجارد) للتغلب على التاثير الضار للملوحة بالمعاملات التالية .١ - بيوجين ٣ جم/ أصيص ٢ - جينستين بمعدل ٢٠ ميكرو مول ٣ - فابورجارد بمعدل ٣% ٤- بيوجين ٣جم /أصيص + جينستين بمعدل ٢٠ ميكرو مول ٥- بيوجين ٣جم / أصيص +فابورجارد بمعدل ٣ % ٦- جينستين بمعدل ٢٠ ميكرو مول + فابورجارد بمعدل ٣% ٧ – بدون معاملة (عدم معاملة التربة او الشتلات) .
ولقد تمت إضافة البيوجين الى التربة بمعدل ٣ جم / ١٢ كجم تربة فى كل اصيص ، وتم إضافة الجينستين كمعاملة تربة عند زراعة الشتلات في ماء الري ،اما الفابور جارد فتم استخدامه كمعاملة رش على المجموع الخضري ثلاث مرات بعد الزراعة .
ولقد استخدم الماء العادي في الري خلال الشهر الأول من الزراعة لجميع المعاملات ثم بعد ذلك استخدم الماء المالح فى ري المعاملات الخاصة بها، و كل شهر يتم ري جميع المعاملات بالماء العادي لغسيل الأملاح المتراكمة وفيما يلي أهم النتائج :

تسببت ملوحة ماء الري و خاصة عند تركيزات ٣٠٠٠، ٦٠٠٠ ، ٩٠٠٠ جزء في المليون في نقص معنوي في ارتفاع الشتلة و وزن السيقان و الأوراق والجذور وأيضا نقص عدد العقد البكتيرية الكلية علي الجذور ومحتوي النبات من السكريات المختزلة والنيتروجين الأميني ومحتوي الأوراق من كلوروفيل أ، ب وكذلك المواد الشبيهه بالأوكسينات و محتوي النبات من الماء الكلي والمرتبط و الحر. أما بالنسبة لمحتوي أوراق الشتلات من الصوديوم والكالسيوم فقد أدت الملوحة الي زيادة نسبة الصوديوم و نقص نسبة الكالسيوم عند استخدام تركيزات (٦٠٠٠، ٩٠٠٠ جزء في المليون).
أدت جميع المعاملات البيوجين والجنيستين و الفابورجارد الي تحسن كبير في جميع الصفات الخضرية و التركيب الكيماوي تحت الدراسة و كذلك أدت الي نقص نسبة الصوديوم في الأوراق.
أما بالنسبة للنباتات التي رويت بمياه ملحية و عوملت بالبيوجين و الجنستين و الفابورجارد فقد ادت جميع المعاملات الي التغلب علي التأثير الضار الذي تحدثه الأملاح وكانت أحسن المعاملات هو أستخدام البيوجين +الجنستين يليه أستخدام البيوجين+ الفابورجارد .
التوصيه :يمكن أستخدام البيوجين بمعدل ٣ جرام/ لكل ١٢ كجم تربة في الأصيص + الجنستين بمعدل 20 ميكرومول كأضافة للتربة عند الزراعة في محلول الري أو البيوجين بنفس المعدل + الفابورجارد بمعدل ٣% كمعاملة رش علي المجموع الخضري في التغلب أو تخفيف التأثير الضار للملوحة علي شتلات اللبخ.