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EFFECET OF GIBBERLLINE SPRAY ON GROWTH AND SOME CHEMICAL CONSTITUENTS OF *Casurina glauca* SEEDLINGS GROWN UNDER DILUTED SEA WATER CONDITIONS.

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ABSTRACT

This study was carried out in National Research Centre, Dokki. Giza in the two successive seasons 2002 and 2003 to study the effect of different salinity levels of diluted sea water(3000,6000,9000 and 12000 ppm) and gibberelline spray on growth and chemical constituents of *Casurina glauca* whereas control plants were irrigated with tap water (250 ppm salts). The obtained results showed that, salinity levels in most cases led to lower values of plant height, stem diameter,root length, fresh and dry weight of plant organs, chlorophyll A&B, N,P and K percentages in the two seasons. While carotenoids, carbohydrates,proline,Na,Ca and Mg percentages in the aerial parts increased as salinity levels were raised.

GA3 at 200 ppm led to the greatest values of plant height, stem diameter, root length, fresh weight of stem in the first season, dry weight of stem in both seasos, fresh and dry weight of branchlets in the second season, fresh and dry weight of roots in the first season and chlorophyll A&B. On the other hand, dry weight of root, carbohydrate, N,P,K,Na and Mg contents in both seasons. Ca in the first season increased by increasing GA3 ppm.

Salinity at 3000ppm and GA3 at 100&200 ppm increased mostly plant height, stem diameter, dry weight of stem, fresh and dry weight of branchlets and fresh and dry weight of roots in both seasons.

INTRODUCTION

Casuarina represent a group of 96 species of trees and shrubs belonging to the family casuarinaceae. Casuarina species are extensively planted for wood production, shelterbelts and land rehabilitation .

All plants are subjected to a multitude of stresses throughout their life cycle. Depending on the species of plant and the source of the stress, the plant will respond in different ways. It is well known that, increasing salinity problems in the Egyptian soils is due to the upward movement of water dissoling salts from the shallow ground water table as well as the higher evaporation from the soil surface. Several researchers have investigated the effect of salinity on the growth of different species of woody plants such as Somashekhar (1998) on *Prosopis juliflora*, Salem *et al* , (1998)on *Dodonaea viscosa*, Mazher and EL-Mesiry(1999) on *Leucaena leucocephala*, Azza and EL-Mesiry(2000) on *Sesbania aegyptiaca* and Sherbeeni(2001) on *Leucaena leucocephala*, *Melia azedarach* and *Dalbergia sissoo* stated that salinity application reduced growth patterns. Azza(2001) on *Parkinsonia aculeata* found that chloropgyll a , b and total sugars contents were decreaseed by increasing salinity levels.On the other hand, salinity levels increased carotenoids content. Sherbeeni(2001)on *Leucaena leucocephala, Melia*

azedarach and Dalbergia sissoo reported that salinity treatments decreased as N,P and K compared to control . Mohamed(1993) on *Nerium oleander Adhatoda vasica and Lantana camara* and Azza(2001) on *Parkinsonia aculeata* found that Na, Ca and Mg tended to increase as a result of increasing salinity. Farahat (1990) on *Schinus terebinthifolius* and Azza (2001) on *Parkinsonia aculeata* satated that increasing salinity concentration increased proline content in plant.

Plant growth regulators are widely used to regulate vegetative growth and gibberellic acid seemed to be the most effective growth regulator because of increasing cell elongation subsequently increase the vegetative growth . Shehata and EL-Tantawy (1994) on *Melia azedarach*, Salem *et al* (1998) *on Dodonaea viscosa* and Azza(2001)on *Anethum graveolens* found that GA_3 increased most growth parameters.Shedeed *et al* (1990)on Croton and Salem *et al.* (1998)on *Dodonaea viscosa* L. found that GA_3 as a foliar spray increased carbohydrates, N, P and K percentages. Eliwa(1994) on *Solaum cappsicastrum* reported that GA_3 at all concentration reduced chlorophyll A,B but increased carotenoids content in the leaves . The present study aimed to investigate the effect of three different levels of GA3 and saline irritgation water dilluted from sea water on grwoth and chemical composition of *Casuarina glauca* seedlings.

MATERIALS AND METHODS

The present study was carried out in National Research Centre, Dokki, Cairo, Egypt during two successive seasons of 2002 and 2003 . The physical and chemical characteristics of the used soil are determined according to pipette method (Piper 1950) and presented in Table(1).

Table(1) : Physical an chemical analysis of the soil.

Character	Result
Mechanical analysis	
Sand	96.81
Silt	0.93
Clay	2.26
Texture class	sandy
Chemical analysis	
pH	8.53
Ca CO_3 %	1.35
Organic matter (O.M.)%	0.36
Macronutrient (mg/100g)	
N	38.83
P	1.47
K	8.93
Mg	27.10
Na	7.45
Micronutrient (ppm):	
Fe	2.63
Mn	5.10
Zn	1.47
Cu	1.03

Six months old seedlings (25-30 cm height) were planted on March each season, as one seedling/pot 30 cm diameter filled with ten Kg sandy soil. The determined total concentration of sea water was 34300 ppm salts which contained Ca 450 ppm, Mg1285 ppm Na 10150 ppm , K 394 ppm, CO_3 15 ppm, HCO_3 98 ppm, SO_4, 2493 ppm and Cl 19415 ppm .

After planting seedlings were irrigated with using tap water for 21 days, then they were irrigated with the diluted sea water at concentrations of 3000 , 6000, 9000 and 12000 ppm . The untreated plants (control) were irrigated with tap water(250 ppm). On 10th of April the plants were sprayed at monthly intervals by three cocentrations of gibberellic acid(GA_3)namely 100 , 200 , 300 ppm , while the control received only tap water for 6 months.The statistical layout of the experiment was a completely randomized design (CRD)of 2 factors factorial(4 GA3 concentrations x5 salinity concetrations) each treatmnet included 12 plants in 3 replicates. Starting from March until one month before ending expirament, the plants received NPK(4.0g ammoium nitrate 33.5% N, 4.0g calcium super phosphate 15.5 % P2O5 and 2.0 g potassium sulphate 48.5 % k_2O)/ pot in four doses. The plants were fertilized after 4,8,16,20 week from transplanting. The following data were recorded plant height(cm), stem diameter(cm), root length(cm), fresh and dry weights(g) of plant organs.Chlorophyll (A&B) and carotenoids contents were determined in branchlets according Saric *et al* . (1967).Carbohydrate percentage contents was determined in branchlets according to Dubois *et al* .(1956). Nitrogen percentage was determined in branchlets by the modified micro kieldahl method as described by Pregl (1945).Phosphorus percentage was estimated according to King (1951).Potassium, sodium,calcium and magnesium percentages in branchlets were determined by using a Pye Unicance Model SP. 1900 Atomic Absorption spectrophotometer. The proline concentration was detrmined by using fresh material(branchlets) accordig to Bates *et al* ., (1973).

The data were statistically analyzed using L.S.D. test according to Steel and Torrie(1980) .

RESULTS AND DISCUSSION

I- Effect of different salinity levels of diluted sea water and GA_3 on some growth characters of *Casuarina glauca* :

Irrigation with saline water especially with the high levels (9000 and 12000 ppm) significantly decreased plant height in both seasons (Table 2). The reduction in plant height might be due to that salinity decreased each of cell division , cell elongation and meristematic activity, Ruf *et al* .(1963) and Bolu *et al* ,(1972). Similar effects were found by Sherbeeni (2001) on *Leucaena leucocephala*, *Melia azedarach and Dalbergia sissoo.*

Regarding the effect of GA_3 spray on seedling height, it could be noticed that spraying the plants with GA_3 at levels 100 and 200 ppm gave the greatest values. On the other hand, the plants sprayed with GA_3 at 300

ppm, had the lowest values.This increment in height may be due to the role of GA3 stimulating cell elongation(Gulati . 1979)These results coincided with those obtained by Saker(1995) on *Chrysanthemum cultivars*.

Table (2): Effect of different salinity levels of diluted sea water and GA_3 spray on plant height (cm) of *Casuarina glauca* seedlings in 2002 and 2003 seasons.

GA3 / Salinity	1 st season					2 nd season				
	0	100	200	300	Mean	0	100	200	300	Mean
cnotrol	94.92	105.28	98.88	83.30	95.60	102.77	110.85	104.83	94.28	103.18
3000 ppm	76.33	79.99	90.44	74.18	80.24	94.94	101.58	97.92	90.19	96.16
6000 ppm	64.96	66.34	74.08	63.22	67.15	87.07	91.03	93.98	81.44	88.38
9000 ppm	59.93	63.71	65.00	59.01	61.91	75.29	79.21	84.22	71.22	77.49
12000 ppm	54.76	48.75	55.55	47.34	51.60	69.19	72.86	75.12	64.19	70.34
Mean	70.18	72.81	76.79	65.41		85.85	91.11	110.01	80.26	

L.S.D at 5%
Salinity (A) = 7.22 (A) = 7.42
GA3 (B) = 6.25 (B) = 6.43
(AXB) = 3.61 (AXB) = 3.71

Concerning the interaction between the influence of salinity and GA_3 spray on seedling height, the results evident that GA_3 spraying at levels 100 and 200 ppm may be counteracted the injurious effect of salinity but did not affect with the high level of GA_3 (300 ppm) in both seasons.The former results were in agreement with those obtained by Mohamed(1988) on *Casuarina species*.

Stem diameter decreased gradually in response to increasing level of salinity(Table 3), this effect was found by all concentrations in the two seasons. These results were in agreement with those obtained by Salem *et al.*(1998)on *Dodonaea viscosa*.

Table (3): Effect of different salinity levels of diluted sea water and GA3 spray on stem diameter (mm) of *Casuarina glauca* seedlings in 2002 and 2003 seasons.

GA3 / Salinity	1 st season					2 nd season				
	0	100	200	300	Mean	0	100	200	300	Mean
cnotrol	8.3	9.2	9.8	8.1	8.9	9.1	9.6	9.7	9.1	9.4
3000 ppm	8.0	9.0	8.6	8.2	8.5	8.8	9.1	9.2	8.1	8.8
6000 ppm	7.7	8.1	8.4	7.4	7.9	8.5	8.9	9.0	8.1	8.6
9000 ppm	7.3	7.7	8.1	7.1	7.6	8.4	8.8	8.5	7.5	8.3
12000 ppm	5.9	6.9	7.2	5.6	6.4	7.5	.9	7.8	6.7	7.5
Mean	7.4	8.2	8.4	7.3		8.5	8.9	8.8	7.9	

L.S.D at 5%
Salinity (A) = 1.9 (A) = 1.8
GA3 (B) = NS (B) = NS
(AXB) = 1.4 (AXB) = 0.9

As for the effect of GA_3 spray on stem diameter, it can be noticed that stem diameter slightly affected whether with its increase or with its

decrease as respond of GA_3 spray and these results were confirmed in both seasons. These results were in accordanc with those obtained by Saker(1995) *on Chrysanthemum cultivars.*

Considering the interaction between salinity level and GA_3, seedlings sprayed with GA_3 at 100 ppm and irrigated with tap water had the thickest stems, while those sprayed with GA_3 at 300 ppm and received 12000 ppm saline water were the thinnest in both seasons.The plants irrigated with saline ater at 3000 and 6000 ppm increased root length (Table 4) in the first season.While root length increased only with saline water at 3000 ppm in the second season compared with the control.On the other hand, the other concentrations decreased it in both seasons.

Table (4): Effect of different salinity levels of diluted sea water and GA3 spray on root length (cm) of *Casuarina glauca* seedlings in 2002 and 2003 seasons.

GA3 / Salinity	1 st season					2 nd season				
	0	100	200	300	Mean	0	100	200	300	Mean
cnotrol	30.82	40.40	47.63	29.14	36.99	37.04	34.60	50.47	36.01	39.53
3000 ppm	40.11	43.48	51.86	37.18	43.16	42.21	53.34	46.32	36.90	44.69
6000 ppm	40.90	45.23	48.72	38. 85	43.34	40.60	38.04	37.87	35.66	38.04
9000 ppm	33.50	36.68	41.01	29.85	35.26	34.34	37.88	33.56	31.67	34.36
12000 ppm	24.87	26.06	30.78	21.26	25.83	24.87	32.41	28.93	20.45	26.67
Mean	34.04	38.37	44.00	31.33		35.81	39.25	39.43	32.14	

L.S.D at 5%

Salinity (A) = 8.24 **(A) = 6.18**
GA3 (B) = 7.14 **(B) = 5.35**
(AXB) = 4.12 **(AXB) = 3.09**

Regarding the effect of GA_3 spray on root length data revealed that the best values resulted from the date treatment of 300 ppm GA_3 followed by the level of 100 ppm, on the other hand, the level of 300 ppm had the lowest value in this respect.

These results confirmed those obtained by Shehata and Tantawy (1994) on *Melia azederach* .

Concerening the effect of interaction between salinity and GA_3 spray on root length,it was noticed that the lowest values appeared in the rooting of plants which were irrigated with saline water at level of 12000 ppm and those plants were sprayed by GA_3 at concentration of 300 ppm in the two seasons. The same trend nearly coincided with those obtained by many investigators such as Mohamed (1988) on *Casuarina species* and Shehata and Tantawy (1994) on *Melia azederach* .

Furthermore, irrigation with saline water at all concentrations significantly reduced the average fresh weight of the different plant organs in two seasons (Tables 5,7,9). Generally, it was observed that, the higher level of salinity gave the greatest reduction in the weight . The reduction in leaves fresh weight might be due to that salinity increased osmotic pressure,

which caused a reduction in plant water content. (Sonchezconde and Azura 1979).

Table (5): Effect of different salinity levels of diluted sea water and GA3 spray on fresh weight of stem (g) *of Casuarina glauca* seedlings in 2002 and 2003 seasons.

GA3	1 st season					2 nd season				
Salinity	0	100	200	300	Mean	0	100	200	300	Mean
cnotrol	58.85	61.05	64.09	63.71	61.93	57.86	53.43	54.81	59.51	56.40
3000 ppm	54.03	58.83	59.78	59.98	58.16	57.49	58.12	55.21	56.29	56.78
6000 ppm	50.69	53.56	54.04	56.84	53.78	54.96	51.30	52.47	53.63	53.09
9000 ppm	44.06	44.86	46.72	46.84	45.62	51.46	50.16	49.02	47.79	49.61
12000 ppm	38.07	40.32	44.92	39.52	40.71	48.13	47.34	44.53	43.06	45.77
Mean	49.14	51.72	53.91	53.38		53.98	52.07	51.21	52.06	

L.S.D at 5%
Salinity (A) = 6.05
GA3 (B) = NS
(AXB) = 3.02

(A) = 5.72
(B) = NS
(AXB) = 2.86

Table (6): Effect of different salinity levels of diluted sea water and GA3 spray on dry weight of stem (g) of *Casuarina glauca* seedlings in 2002 and 2003 seasons.

GA3	1 st season					2 nd season				
Salinity	0	100	200	300	Mean	0	100	200	300	Mean
cnotrol	17.89	18.75	21.25	20.06	19.49	20.04	22.27	23.79	20.31	21.60
3000 ppm	15.05	16.09	18.45	16.61	16.55	17.10	24.31	25.35	19.24	21.50
6000 ppm	14.68	15.48	16.47	16.08	15.77	17.11	17.85	18.86	17.88	17.93
9000 ppm	14.10	13.42	16.36	14.91	14.70	15.30	16.60	18.82	16.64	16.84
12000 ppm	11.47	12.35	12.95	11.79	12.14	12. 90	13.26	14.37	13. 84	13.59
Mean	14.64	15.29	17.10	15.89		16.49	18.86	20.24	17.58	

L.S.D at 5%
Salinity (A) = 2.77
GA3 (B) = 2.40
(AXB) = 1.38

(A) = 3.03
(B) = 2.62
(AXB) = 1.51

Table (7): Effect of different salinity levels of diluted sea water and GA3 spray on fresh weight of branchlets (g) of *Casuarina glauca* seedlings in 2002 and 2003 seasons.

GA3	1 st season					2 nd season				
Salinity	0	100	200	300	Mean	0	100	200	300	Mean
cnotrol	76.19	73.92	76.12	79.00	76.31	72.14	76.48	79.94	76.70	76.32
3000 ppm	72.53	77.23	81.05	74. 84	76.37	70.90	72.25	73.12	71.91	72.05
6000 ppm	67.47	61.11	64.38	69. 52	65.55	65.55	65.68	66.43	65.47	65.78
9000 ppm	63.18	55.13	56.26	66. 25	60.21	60.14	61.44	61.55	63.91	61.76
12000 ppm	61.62	48.90	44.06	51.99	51.64	59.31	60.59	61.65	53.77	58.83
Mean	68.16	63.26	64.37	68.27		65.61	67.29	68.54	66.35	

L.S.D at 5%
Salinity (A) = 7.66
GA3 (B) = NS
(AXB) = 3.83

(A) = 6.35
(B) = NS
(AXB) = 3.17

Similar results were obtained by Salem *et al*,(1998) on *Dodonaea viscosa*, Mazher and EL-Mesiry (1999) on *Leuceana Leucocephala* and Azza and EL-Mesiry(2000) on *Sesbania aegyptiaca* .

GA_3 spray at all concentrations had a slight effect on the fresh weight of the different organs of seedlings in both seasons. Considering the interactions between salinity levels and GA_3 spray, the highest level of GA_3 spray (300 ppm) under unsalined conditions resulted in the heaviest weight of vegetative organs in the two seasons.

The results of dry weight of all plant organs had a similar trend as that in the fresh weight (Tables 6,8,10).Salinity at all concentrations decreased the average dry weight of all plant organs in both seasons. Cl or Na accumulation in leaves might cause injury by interfering with normal stomatal closure causing excessive water loss and leaf injury symptoms like those of drought , as suggested by (Bernstein *et al* 1972) and CO2 fixation might be reduced under high levels of salinity which led to lower anabolism. Moreover, such decrease in fresh and dry weights of stem might be due to the inhibition of water absorption and/or distribution of mineral balance and/or absorption and utilization under salinity conditions. In the same time, the decrease in root fresh and dry weights might be due to the reduction in water and minerals absorption and / or the reduction in upper ground growth under salinity conditions.General reduction in the plant growth under salt stress might be attributed to the decrease in the total chlorophyll and reduced rate of photosynthesis (Seshadri Kannan and Saradha Ramani 1988).These results were obtained by Mazher and EL-Mesiry (1999) on *Leuceana leucocephala* . Concerning the effect of GA_3 spray on dry weight of stems, it is evident that spraying the plants with GA_3 at different levels espcialy at 200 ppm gave the best results in both seasons. These results may be due to the effective role of GA3 in enhancing the metabolism of protein as well as the enzyme systems, consequently the vegetative growth of plants was improved. These results were coincided with the findings of Eraki(1994) on rose. On the other hand , GA_3 spray at different levels increased dry weight of branchlets in both seasons. GA_3 spray at 300 ppm gave the highest average of dry weight of branchlets in the first season. But,GA_3 spray at 200 ppm gave the highest average of dry weight of branchlets in the second season. The results also declared that spraying the seedlings with GA_3 at level 200 ppm gave the best value on dry weight of roots in the first season. But in the second season, GA_3 spray at 100 ppm gave the best value on dry weight of roots .

The interaction between the treatments of salinity and GA_3 spray on all plant organs gave different results. The salinity at high level (12000 ppm) and unsprayed seedlings with GA_3 gave the lowest values of dry weight of stems and branchlets in both seasons. But, the salinity at high level(12000 ppm) and sprayed with GA_3 at 100 ppm gave the lowest value of dry weight of roots in the first season. While, the same result was obtained in the second

season by salinity at high level (12000 ppm) and unsprayed seedlings with GA_3.

Table (8): Effect of different salinity levels of diluted sea water and GA3 spray on dry weight of branchlets (g) *of Casuarina glauca* seedlings in 2002 and 2003 seasons.

GA3	1 st season					2 nd season				
Salinity	0	100	200	300	Mean	0	100	200	300	Mean
cnotrol	18.24	18.21	20.61	20.54	19.40	19.78	23.36	24.47	21.34	22.24
3000 ppm	16.15	17.26	19.25	18.11	17.69	17.02	18.72	19.94	18.58	18.57
6000 ppm	15.65	14.71	17.56	16.67	16.15	16.91	16.97	18.88	18.58	17.84
9000 ppm	15.25	14.25	14.66	16.87	15.26	15.67	15.66	17.87	17.28	16.62
12000 ppm	13.87	14.97	15.11	15.32	14.82	14.61	16.62	17.32	18.85	16.85
Mean	15.83	15.88	17.44	20.84		16.80	18.27	19.70	18.93	

L.S.D at 5%
Salinity (A) = 3.78 (A) = 3.84
GA3 (B) = 3.27 (B) = 2.40
(AXB) = 1.89 (AXB) = 1.38

Table (9): Effect of different salinity levels of diluted sea water and GA3 spray on fresh weight of roots (g) of *Casuarina glauca* seedlings in 2002 and 2003 seasons.

GA3	1 st season					2 nd season				
Salinity	0	100	200	300	Mean	0	100	200	300	Mean
Cnotrol	36.45	39.29	42.29	38.21	39.08	39.33	44.66	42.25	41.43	41.92
3000 ppm	32. 95	32.95	35.96	32.92	33.70	38.45	39.29	39.71	39.23	39.17
6000 ppm	30.80	31.82	28.06	31.96	30.66	36.37	35.14	34.35	37.90	35.94
9000 ppm	26.70	28.37	32.16	29.67	29.23	31.24	32.78	31.12	32.96	32.03
12000 ppm	22.52	21.45	23.41	24.51	22.97	25.10	25.44	25.87	25.28	25.42
Mean	29.90	30.78	32.38	31.45		34.10	35.46	34.66	35.36	

L.S.D 0.05
Salinity (B) = 6.03 (A) = 4.33
GA3 = NS (B) = NS
(AXB) = 3.01 (AXB) = 2.16

Table (10): Effect of different salinity levels of diluted sea water and GA3 spray on dry weight of roots(g) of *Casuarina glauca* seedlings in 2002 and 2003 seasons.

GA3	1 st season					2 nd season				
Salinity	0	100	200	300	Mean	0	100	200	300	Mean
Cnotrol	17.80	18.41	21.25	18.31	18.94	16.13	20.46	19.91	18.48	18.75
3000 ppm	13.91	14.44	16.48	15.36	15.05	13.96	17.16	16.15	14.40	15.42
6000 ppm	13.30	13.87	16.57	15.56	14.83	14.38	15.65	15.78	15.34	15.29
9000 ppm	12.00	12.62	14.01	13.01	12.91	12.62	14.52	14.08	13.37	13.65
12000 ppm	11.57	10.74	10.85	11.21	11.09	12.29	13.69	13.13	13.34	13.11
Mean	13.72	14.02	15.83	14.69		13.88	16.30	15.81	14.99	

L.S.D 0.05
Salinity (A) = 2.82 (A) = 2.84
GA3 (B) = NS (B) = NS
(AXB) = 1.41 (AXB) = 1.42

II-Effect of salinity and GA_3 spray on some chemical composition :-

As shown in Tables (11,12) chlorophyll(A), (B) content were reduced in respond of increasing the salinity levels in irrigation water and the most depression exhibited with the level of 12000 ppm salinity in the first and second seasons. The obtained decrease in leaf pigments under saline conditions might apparently due to absorption of ions such as iron as involved in the chloroplast formation protein synthesis (Jacobson and Ortli,1956), accumulation of ammonia in plant leaves was one of the main factors causing depression in chlorophyll content through, plastide breakdown, as a result of salinity treatments(Puritch and Barker, 1967).Whereas,the excessive of concentrations of salinity increased the carotenoids in branchlets in both seasons. The former results were in harmony with the findings of Bondok *et al* , (1995) on the three peach rootsotcks.

Table (11): Effect of different salinity levels of diluted sea water and GA3 spray on chlorophyll (A) in branchlets (mg/g F.W.) of *Casuarina glauca* seedlings in 2002 and 2003 seasons.

GA3	1 st season					2 nd season				
Salinity	0	100	200	300	Mean	0	100	200	300	Mean
Cnotrol	1.35	1.23	1.43	1.03	1.26	1.43	1.32	1.56	1.25	1.39
3000 ppm	1.12	1.06	1.38	0.95	1.13	1.35	1.25	1.42	1.16	1.30
6000 ppm	0.99	0.93	1.24	0.83	1.00	1.20	1.01	1.32	0.97	1.13
9000 ppm	0.85	0.78	1.02	0.74	0.85	0.97	0.92	1.17	0.77	0.97
12000 ppm	0.69	0.62	0.96	0.53	0.70	1.19	0.84	1.01	0.61	0.86
Mean	1.00	0.92	1.21	0.82		1.23	1.07	1.30	0.95	

Table (12): Effect of different salinity levels of diluted sea water and GA3 spray on chlorophyll(B) in branchlets (m/g F.W.) of *Casuarina glauca* seedlings in 2002 and 2003 seasons.

GA3	GA3	1 st season					2 nd season				
Salinity	Salinity	0	100	200	300	Mean	0	1.13	1.13	1.13	Mean
Cnotrol	Cnotrol	0.49	0.46	0.63	0.45	0.51	0.53	0.49	0.68	0.50	0.55
3000 ppm	3000	0.47	0.45	0.60	0.43	0.49	0.51	0.47	0.65	0.48	0.53
6000 ppm	6000	0.42	0.40	0.57	0.40	0.45	0.48	0.45	0.60	0.45	0.50
9000 ppm	9000	0.40	0.39	0.55	0.38	0.43	0.45	0.42	0.56	0.40	0.46
12000 ppm	12000	0.38	0.37	0.52	0.35	0.41	0.42	0.38	0.50	0.36	0.42
Mean	Mean	0.43	0.41	0.57	0.40		0.48	0.44	0.60	0.44	

Regarding the effect of GA_3 spray on chlorophyll(A)&(B) content, the obtained results cleared that spraying the plants with GA_3 at level 200 ppm resulted in the highest values, the high level of GA_3 decreased the chlorophyll(A)&(B)content in both seasons. On the other hand, spraying the plants with GA_3 at level 300 ppm resulted in the highest values of carotenoids, whereas, the lowest values of carotenoids were obtained by GA_3 spray at 200 ppm in both seasons . These results were in agreement with finding of Shehata and EL-Tantawy(1994) on *Milia azederach* and Abel Wahid(1995) on Sterelizia plants.

The plants irrigated with saline water at level of 12000 ppm and sprayed with 300 ppm GA_3 produced the lowest values of chloraphyll (A),(B)in the first and second seasons. But the highest chlorophyll (A),(B)content were obtained by unsalinized seedlings and sprayed with 200 ppm GA_3 . But percentage the opposite effect was obtained as for the carotenoid.

Salinization treatments tended to increase total carbohydrates compared to the control in both seasons. Similar results were obtained by Mohamed(1993) on *Adhatoda vasica and Nerium oleander* .

Table(14) obviously cleared that GA_3 spraying at levels 100,200 and 300 ppm icreased total carbohydrate in branchlets compared to control in both seasons. Increasing the level of GA_3 increased the total carbohydrates content. These results coud e explaine through the increase in leaf chlolophylls as results of GA_3 led to an increase in te synthesis of sugars and starch, concequently more carbohydrated prouction was obtained.

Concernigng the effect of the interaction showed that the plants sprayed with GA_3, at 300 ppm and irrigated with salinized water at 12000 ppm gave the highest value of total carbohydrates. Whereas, the untreated plants gave the lowest values of total carbohydrate in the first and second seasons.

Table (13): Effect of different salinity levels of diluted sea water and GA3 spray on carotenoids in branchlets (mg/g F.W.) of *Casuarina glauca* seedlings in 2002 and 2003 seasons.

GA3	1 st season					2 nd season				
Salinity	0	100	200	300	Mean	0	GA1	GA2	GA3	Mean
Cnotrol	0.37	0.43	0.34	0.47	0.40	0.39	0.45	0.37	0.49	0.43
3000 ppm	0.42	0.49	0.38	0.53	0.46	0.41	0.47	0.40	0.52	0.44
6000 ppm	0.47	0.53	0.42	0.56	0.50	0.46	0.55	0.42	0.56	0.50
9000 ppm	0.52	0.55	0.49	0.61	0.54	0.53	0.58	0.51	0.63	0.56
12000 ppm	0.56	0.61	0.52	0.64	0.58	0.57	0.63	0.55	0.57	0.60
Mean	0.47	0.52	0.43	0.56		0.47	0.45	0.45	0.55	

Table (14): Effect of different salinity levels of diluted sea water and GA3 spray on carbohydrats (% DW) in brachlets of *Casuarina glauca* seedlings in 2002 and 2003 seasons.

GA3	1 st season					2 nd season				
Salinity	0	100	200	300	Mean	0	100	200	300	Mean
Cnotrol	13.75	14.35	15.00	16.31	14.58	15.33	17.67	18.31	20.95	18.07
3000 ppm	16.35	17.35	18.95	20.71	18.34	17.59	18.73	21.69	21.12	19.87
6000 ppm	19.75	20.95	21.24	23.31	21.31	19.71	20.11	22.31	23.69	21.46
9000 ppm	22.61	23.11	24.51	26.11	24.09	22.64	24.71	26.71	28.84	25.73
12000 ppm	24.31	26.31	27.66	30.71	27.25	25.74	26.69	28.54	32.34	28.33
Mean	1935	20.41	21.44	23.43		20.27	21.58	23.51	23.35	

Table(15): Effect of different salinity levels of diluted sea water and GA3 spray in prolin concentration in branchlets of *Casuarina glauca* seedlings in 2002 and 2003 seasons.

GA3 / Salinity	1 st season					2 nd season				
	0	100	200	300	Mean	0	100	200	300	Mean
Cnotrol	7.3	6.0	5.1	3.6	5.5	6.5	5.0	4.1	2. 9	4.6
3000 ppm	9.2	7.5	6.2	4.9	6.9	7.9	6.5	5.2	4.7	6.0
6000 ppm	11.3	9.1	8.1	6.7	8.8	9.1	8.0	6.3	5.1	7.1
9000 ppm	13.5	11.3	10.7	8.2	10.9	12.1	10.3	8.6	6.7	9.4
12000 ppm	15.3	13.5	12.2	10.3	12.8	15.1	12.1	10.7	7.6	11.3
Mean	10.8	9.4	8.4	6.7		10.1	8.3	6.9	5.4	

Salinization treatments increased proline concentration in the branchlets in the first and second seasons. These results were obtained by Greenway and Munns(1980) they mentioned that proline increased under salinity stress to make plants more adapted to this unsuitable conditions, proline is considered as a cell stabilizer for osmotic perssure, and some enzymes synthesis.

On the other hand, proline concentration decreased by increasing GA_3 levels in both seasons.

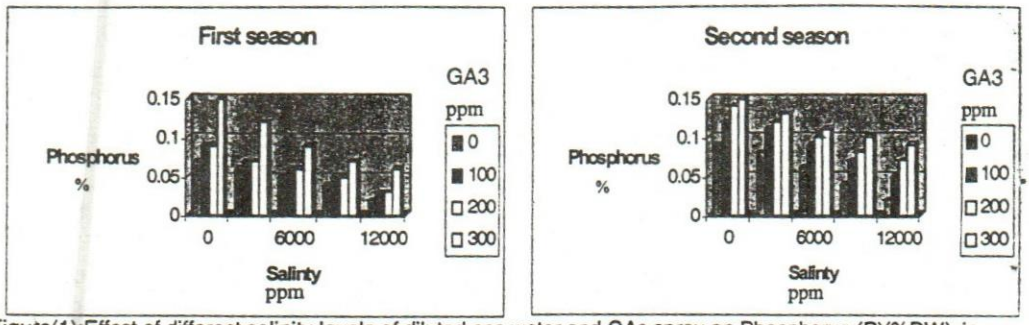
Seedlings irrigated with saline water at 12000 ppm and unsprayed with GA_3 gave the higest values of proline in the two seasons. Meanwhile, plants sprayed with GA_3 at 300 ppm and unsalinized water recorded the lowest proline int both seasons.

III- Effect of different salinity levels of diluted sea water and GA_3 spray on minerals percentage of *Casuarina glauca* :-

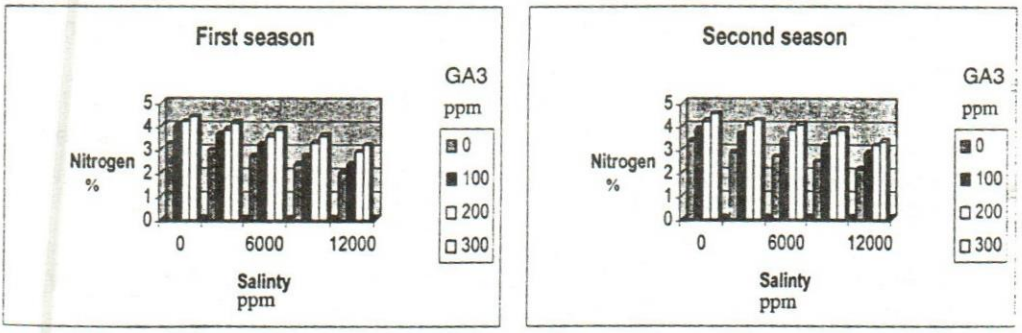
The recorded data in (Figers 1,2,3,4,5,6) showed that all salinity levels markedly reduced N,P and K percentages when compared with the control in both seasons, the decrease in N, P and K percentages with an increarse in proline content which might indicate disturbance in protein metabolism. Whereas Na, Ca and Mg percentages were increased progressively as salinity level increased in the two seasons. The obtained results were similar to those obtained by Salem *at al* ,(1998) on *Dodonaea viscosa* and Mazher and EL-Mesiry(1999) on *Leucaena leucocephala*.

However, spraying the plants with GA_3 increased minerals percentages (N,P,K,Na,Ca and Mg) in both seasons compared with the control. This increment in mineral composition may be attributed to the role of GA_3 in stimulating the synthesis of brotein(Broughton and McComb, 1967) which was reflected in increasing the plant growth, consequently the uptake of N,P,K,Na,Ca and Mg was increased.

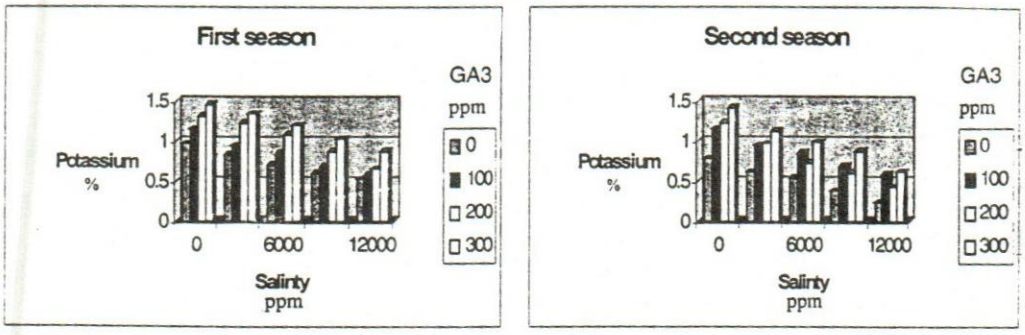
As a combination of salinity and GA_3 spray, salinity at 12000 ppm and GA_3 spray at all levels gave the greatest reduction in N, P and K % in the two seasons.On the other hand, salinity at 12000 ppm and GA_3 at all levels gave the highest values of Na, Ca and Mg in the first and second seasons .



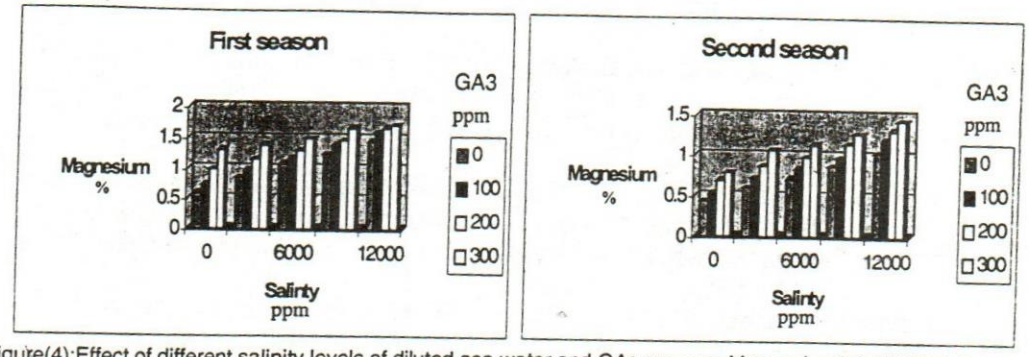
Figure(1):Effect of different salinity levels of diluted sea water and GA3 spray on Phosphorus (P)(%DW) in branch lets of *Casuarina glauca* seedlings in 2002 and 2003 seasons.



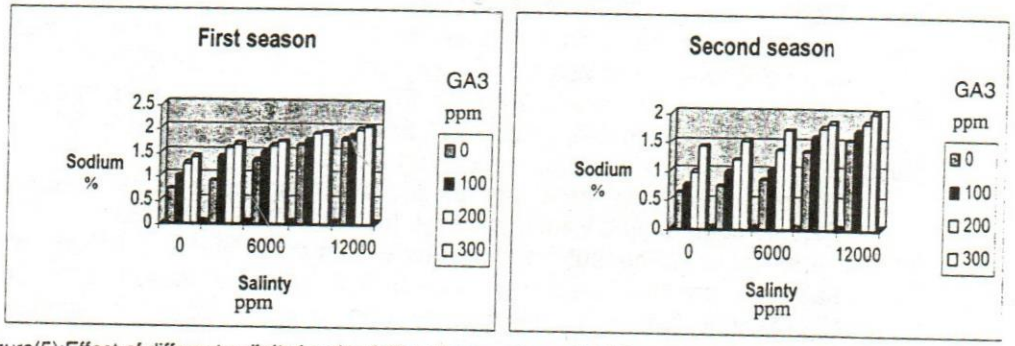
Figure(2):Effect of different salinity levels of diluted sea water and GA3 spray on Nitrogen (N_2)(%DW) in branch lets of *Casuarina glauca* seedlings in 2002 and 2003 seasons.



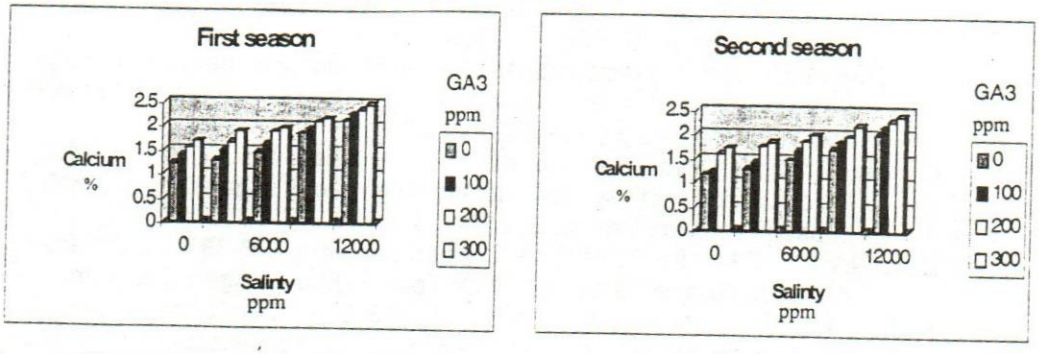
Figure(3):Effect of different salinity levels of diluted sea water and GA3 spray on Potassium(K%)(%DW) in branch lets of *Casuarina glauca* seedlings in 2002 and 2003 seasons.



Figure(4):Effect of different salinity levels of diluted sea water and GA3 spray on Magnesium(Mg)(%DW) in branch lets of *Casuarina glauca* seedlings in 2002 and 2003 seasons.



Figure(5):Effect of different salinity levels of diluted sea water and GA3 spray on Sodium(Na%)(%DW) in .branch lets of *Casuarina glauca* seedlings in 2002 and 2003 seasons



Figure(6):Effect of different salinity levels of diluted sea water and GA3 spray on Calcium(Ca%)(%DW) in branch lets of *Casuarina glauca* seedlings in 2002 and 2003 seasons.

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تأثير الرش بالجبرالين على النمو وبعض المكونات الكيماوية لشتلات الكازوارينا النامية تحت ظروف ماء البحر المخفف .

راوية عبدالهادى عيد – عزة عبدالحميد محمد مظهر

قسم نباتات الزينة والأشجار الخشبية -المركز القومى للبحوث – الدقى – القاهرة – مصر .

أجرى هذا البحث بالمركز القومى للبحوث خلال موسمى ٢٠٠٢ ، ٢٠٠٣ لدراسة تأثير مستويات الملوحة المختلفة لماء البحر المخفف بمعدل ٣٠٠٠ ، ٦٠٠٠ ، ٩٠٠٠ ، ١٢٠٠٠ جزء فى المليون والرش بالجبرالين على النمو والتركيب الكيماوى لشتلات الكازورينا ، بينما نباتات الكنترول تم ريها بماء الصنبور (٢٥٠ جزء فى المليون أملاح). وقد اوضحت النتائج المتحصل عليها الاتى :

أدت معاملات الملوحة الى نقص ارتفاع النبات ، سمك الساق ، طول الجذر ، الوزن الطازج والجاف لأعضاء النبات ، كلورفيل أ ، ب ، النسبة المئوية لكل من النيتروجين ، الفوسفور والبوتاسيوم فى الموسمين بالمقارنة بغير المعاملة، بينما الكاروتين والكربوهيدرات الكلية والبرولين والنسبة المئوية لكل من الصوديوم ، الكالسيوم والماغنسيوم زادت مع الملوحة .

رش الشتلات بالجبرالين بتركيز ٢٠٠ جزء فى المليون أدت للحصول على أعلى قيم لكل من ارتفاع النبات ، سمك الساق ، طول الجذر ، الوزن الطازج للساق فى الموسم الأول والوزن الجاف للساق فى الموسمين ، الوزن الطازج والجاف للأوراق والأفرع فى الموسم الثانى ، الوزن الطازج والجاف فى الموسم الأول وكلورفيل أ ، ب. من ناحية أخرى ، الوزن الجاف للجذور ، الكربوهيدرات الكلية ، النسبة المئوية لكل من النيتروجين ، الفوسفور ، البوتاسيوم ، الصوديوم ، الماغنسيوم فى الموسمين ، الكالسيوم فى الموسم الأول قد زادت جميعا بزيادة تركيز الجبرالين .

الملوحة عند تركيز ٣٠٠٠ جزء فى المليون مع الجبرالين بتركيز ١٠٠ ، ٢٠٠ جزء فى المليون أدت بصفة عامة لزيادة ارتفاع النبات وسمك الساق ، الوزن الجاف للساق ، والوزن الطازج والجاف للأوراق والوزن الطازج والجاف للجذور فى الموسمين .