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EFFECT OF HOUSE GREEN, GIBBERELLIC ACID (GA_3) AND ANTITRANSPIRANT ON GROWTH AND SOME CHEMICAL CONSTITUENTS IN POMEGRANATE AND BETULAEFOLIA PEAR PLANTS GROWN UNDER SALINE CONDITIONS

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ABSTRACT

This investigation was carried out during 2005 and 2006 seasons on pomegranate and Pyrus betulaefolia rootstock plants to study the effect of House Green, gibberellic acid and Paraffin oil as an antitranspirant in reducing salinity hazards on growth rate, total leaf area, trunk cross-sectional area and total dry weight. In addition, the effect of the different treatments on leaf and root mineral compositions (N, P, K, Na and Cl), total chlorophyll content, total leaf carbohydrate and leaf total free amino acids was determined.

The results could be summarized as follows:

1. Raising the salinity level of the irrigation solution from zero to either 1000 ppm or 2000 ppm NaCl caused a reduction in the plant growth rate, leaf area, total dry weight, trunk cross-sectional area, total leaf chlorophyll content and leaf total carbohydrates. While, increased total free amino acids in the leaf tissues of two fruits species. This influence was more pronounced in plants grown under the 2000 ppm NaCl salinity level
2. The growth rate,leaf area, trunk cross-sectional area,total dry weight, total leaf chlorophyll content and total leaf carbohydrates of the experimental plants were positively influenced by the application of House Green (soil applications) gibberellic acid or paraffin oil as an antitranspirant treatments yet, the inverse relationship was noticed with regards to the leaf total free amino acids content .
3. Significant positive interactions were generally noticed between either or both salinity levels and the other treatments except House Green (foliar sprays) on the growth rate, leaf area, trunk cross-sectional area, total dry weight, total leaf chlorophyll content and leaf total carbohydrates of the experimental plants.
4. Negative interaction reactions were noticed between either or both salinity levels and the different experimental treatments on the total amino acids content.
5. The influence of salinity on the concentration of the different nutrients was negative, in most cases, except for leaf and root sodium and chloride content, as they markedly increased with increasing the salinity level of the irrigation water.
6. Most of the significant influences of the different treatments on the leaf and root mineral composition were positive in most cases.
7. The statistical interactions between salinity levels and the other treatments on the leaf and root mineral composition were positive in most cases.
8. Some of the House Green, gibberellic acid or antitranspirant treatments retarded the appearance symptoms of harmful of Pyrus betulaefolia rootstock plants. i.e. when the plants were irrigated with the highest saline concentration (2000 ppm NaCl), the symptoms of chlorosis appeared after 95 days in 2005 and 113 days in 2006 .

INTRODUCTION

In Egypt, water availability is considered the prime constraint that determines the addition of new cultivated areas. Agricultural expansion needs a huge amount of available irrigation water which is already not sufficient to meet all the expected demands. The usage of water of poor quality had been widely tried, but with varying degrees of success. The presence of undesirable harmful salts; in quantity and quality, greatly determines the use of such water. The different effects of salts on plants were classified by Bernstein (1964) into primary injury ; which includes the toxic effect of ions, and secondary injury, which includes nutritional deficiency and osmotic effects, the primary salts stress takes two forms, a direct membrane strain causing permeability changes and hence ion efflux and indirect metabolic strain which causes metabolic disturbances. On the other hand, the secondary stress of salinity also has two forms; nutrient deficiency stress and osmotic stress with turgid loss (Levitt, 1980). The simultaneous presence of harmful salts in the root zone can influence ion uptake and translocation by plants .Synergistic and antagonistic effects can increase or decrease the intensity of these processes.

With the increasing use of saline water in agriculture, improving fertilization as a mean of alleviating growth inhibition had received great attention. The addition of House Green (20%N, 20%P_2O_5, 20%k_2O and chelated microelements) under high sodium and chloride levels was recommended by numerous investigators to improve yield, growth responses and water economy of many plants, (Ojala et.al .1983), Zidan and Malibari (1993) and El-Siddig and Ludders (1994)

Moreover, the application of growth promoters was found to play an important role in modifying the growth and development of plants grown under salinity stress condition by conjunction with their physiological and biochemical activities (Little and Loach, 1975). Besides, the drastic changes in the hormonal make up in salt-stressed plants including abscisic acid accumulation, ethylene evolution and auxins, gibberellic acid and cytokinins reduction was also found to occur. Exogenously introduced growth promoters partially reversed the negative effect of stress condition on the different physiological aspects especially photosynthesis and translocation processes (Stark and Czajkowska, 1981). In addition, antitranspirants also seem to participate in this respect. Antitranspirants provide a physical barrier to the loss of water at transpiring surfaces .Hence; it acts through minimizing the excess of transpiration over that of uptake. This improvement in water economy would probably help salt–stressed plants in maintaining their physiological and biochemical processes, at least, at an acceptable base line

Therefore, this study was conducted to evaluate the effect of House Green, Gibberllic acid and antitranspirant in alleviating salt stress in two species widely planted in newly cultivated areas.

MATERIALS AND METHODS

This work was carried out at the greenhouse of El-Sabahia experimental station in Alexandria during the seasons of 2005 and 2006. The

effect of House Green, Gibberllic acid (G A_3) and antitransprant in reducing salinity hazard was studied on one year old Wardi pomegranate (Punica granatum, L.) and Pyrus betulaefolia rootstock plants. During the first week of February, in 2004 season, the plants of each fruit species were singly planted in black polyethylene bags filled with about two kilograms of clay loam soil and held in the greenhouse of the Pomology department until the spring of the next season; when they received the different experimental treatments.

Sixty four plants (3 salinity levels × 5 fertilization or spray treatments × 4 replicates = 60 plants) from each of the two experimental fruit species were chosen in March of 2005 seasons. The selected plants of each fruit species, as uniform as possible in size and length, were kept in the greenhouse for about three months before the commencement of the experimental treatments.

In mid –June of both years of study, the selected plants were divided into three groups and each group received one of the following sodium chloride solutions : 0.0 ppm (tap water), 1000 ppm and 2000 ppm NaCl .Salinity treatments were achieved by irrigating each plant twice a week with 500 ml from one of the three saline solutions . The application of the different saline solutions continued till the termination of each experimental season.

After one week from the commencement of the salinity treatments, the plants of each group i.e. receiving one of the three saline levels, were again sub-divided to 5 sub –groups and each sub-group received one of the following treatments :

T_1 :Untreated ; control

T_2 :Soil application with House Green (20%N,20%P_2O_5, 20%k_2O, 0.5%Zn, 0.4% Fe, 0.5% Mn, 0.5% Cu, 0.0% B and 0.05% Mo) at the rate of 0.25% House Green.

T_3 :Foliar spray of the same House Green fertilizer, at the rate of 0.25%House Green. Triton B was added as a wetting agent at the rate of 0.1%.

T_4 :Gibberellic acid foliar sprays, at the rate 40 ppm gibberellic acid, as Berlex.

T_5: Antitranspirant foliar spray, at the rate 5% paraffin oil. Triton B was added as a wetting agent at the rate of 0.1 %.

All fertilization and foliar spray treatments were applied to the plants once every week till the termination of each experimental season. Fertilization treatments were achieved by adding 500ml/plant from any of the experimental nutrients, and the foliar spray treatments by applying 50ml/plant from any of the spray solutions.

The experiment was terminated when the plants irrigated with the highest saline concentration, 2000 ppm showed chlorosis on 50% of the leaf blades in pyrus betulaefolia rootstock plants. Symptoms of chlorosis appeared after 95 days in 2005 and 113 days in 2006

The following parameters were determined in the two successive seasons.

a. Vegetative characteristics :

1. Growth measurements were taken at beginning of the salt treatments and at the end of each experimental season by measuring the initial and final

length of the plants. the growth rate of each plant was calculated using the following equation :

$$\text{Growth rate} = \frac{\text{Final length} - \text{initial length}}{\text{Initial length}}$$

2. Total leaf area determination: 10 leaves from each of the pomegranate and betulaefolia plants were taken at the termination of the experiment. The leaves were carefully drawn on graph paper and the leaf area was measured by counting the squares to the nearest cm.
3. Trunk cross-sectional area of each plant was calculated.
4. Total dry weight of individual plants was determined by the end of the experiment (October,15)

b. Total leaf chlorophyll content :

The aforementioned leaf samples taken for estimating leaf area were used also for chlorophyll determination by using MINOLTA CHLOROPHYLL METER SPAD -502 (Minolta camera, LTD JAPAN)

c. Chemical analysis :

1. Total carbohydrates: were determined as percent on dry weight basis according to Dubios et.al. (1956).
2. Free amino acids: A sample of 0.1 gm from the dry ground materials of the leaf tissues of each replicate was plunged into 70% ethanol, boiled for 30 minutes and the extract was decanted. The residue was re-extracted twice in fresh 70% ethanol for another 15 minutes and the resultant extracts were combined and made up to volume by 70% ethanol .In this alcoholic extract, total free alpha amino acids were determined according to Lee and Takahashi (1966). The free amino acids were colorimetrically determined using a glycine standard. Total free amino acids content was expressed as mg /100 gm dry weight.
3. Leaf and root mineral content: leaf samples were collected from each plant of each of the two fruit species in October 15 of both 2005 and 2006 seasons. In addition, root sample was also taken from each plant at the end of experiment; October 15; 2006. The samples were washed with water, rinsed three times in distilled water and oven dried at 70-80°Cto a constant weight. The dried leaf and root materials of each replicate were ground and digested with sulphuric acid and hydrogen peroxide, according to Evenhuis and Dewaard (1980) .In this digested solution, N and P were colorimetrically determined, according to Evenhuis (1976) and Murphy and Riley (1962), respectively . K and Na were determined by flame photometer. Chloride was determined in the ground dried material of each sample by silver nitrate method (Jackson and Brown, 1955).

The obtained data throughout the course of this study were statistically analyzed according to the Randomized Complete Block Design (Snedecor and Cochran, 1990). A Combined analysis of variance for both experimental seasons was also carried out according to Little and Hills (1978).

RESULTS AND DISCUSSION

I- Effect of House Green, Gibberellic acid (GA_3) and Antitranspirant on the growth characteristics of Wardi pomegranate and Pyrus betulaefolia plants grown under different salinity levels :

Generally, the data in (Tables 1and 2) indicated that the growth rate, total leaf area, trunk cross-sectional area (2005 and 2006 seasons) and total plant dry weight (2006 seasons) of the experimental plants were noticeably influenced by salinity stress conditions . A significant reduction in the plants growth characteristics was quite evident with raising the salinity level of the irrigation solution from zero to either 1000 ppm or 2000 ppm NaCl (Tables 1 and 2). In both seasons, the growth rate of Wardi pomegranate and Pyrus betulaefolia plants irrigated by 1000 ppm NaCl was reduced by as much as 88 % and 78%, respectively, in 2005 and 79 % and 81%, respectively, in 2006 season in comparison with those irrigated by zero ppm NaCl level. The corresponding values for the 2000 ppm salinity level were 74 % and 55% respectively, in 2005 and 69 % and 57 %, respectively, in 2006 season .Also, the total leaf area of pomegranate and Pyrus betulaefolia plants irrigated by 1000 ppm NaCl was reduced by as much as 82% and 84%, respectively, in 2005 and 90% and 89 %, respectively, in 2006 season in comparison with those irrigated by zero ppm NaCl level. The corresponding values for the 2000 ppm salinity level were 68% and 66%, respectively, in 2005 and 85% and 81%, respectively, in 2006 season . While, in both seasons, a significant reduction in trunk cross-sectional area of the plants of the two fruit species were marked with increasing the saline concentration of the irrigation water up to 2000 ppm NaCl. However, the differences in trunk cross-sectional area of the pomegranate plants grown under moderate and low salinity levels were not big enough to be statistically significant. In both seasons, the percent reduction in trunk cross-sectional area of pomegranate plants grown under the highest salinity, 2000 ppm NaCl, reached as much as 95%. Pyrus betulaefolia plants, on the contrary, seemed to be affected by salinization. A significant decline in trunk cross-sectional area of pear plants was observed under both the 1000 and 2000 ppm NaCl levels. While, the total dry weight of pomegranate and Pyrus betulaefolia plants irrigated by 1000 ppm NaCl was reduced by as much as 80% and 92% respectively in 2006 seasons in comparison with those irrigated by zero ppm NaCl. The corresponding values for the 2000 ppm salinity level were 69% and 19%, respectively in 2006 seasons.

The fact that salinity affected the growth characteristics of the experimental plants was also reported by El-Kobbia (1983), Nawar and Ibrahim (1984), Israeli et al. (1986), Ezz and Nawar (1993), Abd Ella (1997), Amer and Youssif (2004) and Naiema (2004); working on different fruit species.

Table (1): Effect of House Green, Gibberellic acid (GA_3) and antitranspirant on growth rate, total leaf area and trunk cross–sectional area of Wardi pomegranate and Pyrus betulaefolia rootstock plants in 2005 season

Treatments	Pomegranates											
	Growth rate				Total leaf area (cm^2)				Trunk cross- sectional area			
	NaCl salinity levels				NaCl salinity levels				NaCl salinity levels			
	0 ppm	1000 ppm	2000 ppm	AV.	0 ppm	1000 ppm	2000 ppm	AV.	0 ppm	1000 ppm	2000 ppm	AV.
T1	0.141	0.114	0.072	0.109	4.43	3.71	2.75	3.63	0.891	0.879	0.747	0.839
T2	0.209	0.181	0.162	0.184	5.43	4.44	3.93	4.60	0.954	0.946	0.929	0.943
T3	0.162	0.139	0.125	0.142	4.80	4.09	3.23	4.04	0.888	0.869	0.850	0.869
T4	0.181	0.165	0.149	0.165	5.39	4.37	3.68	4.48	0.900	0.892	0.875	0.889
T5	0.197	0.179	0.152	0.176	5.04	4.10	3.55	4.23	0.923	0.915	0.904	0.914
Average	0.178	0.156	0.132		5.07	4.14	3.43		0.911	0.901	0.861	
L.S.D.0.05	Sal. 0.024	Treat. 0.045	Inter. 0.070		Sal. 0.26	Treat. 0.49	Inter. 0.76		Sal. 0.030	Treat. 0.048	Inter. 0.125	
Pyrus betulaefolia												
T1	0.131	0.093	0.061	0.095	4.73	3.72	2.62	3.69	0.662	0.442	0.296	0.467
T2	0.210	0.180	0.126	0.172	6.58	5.99	4.68	5.75	0.821	0.618	0.529	0.656
T3	0.189	0.126	0.084	0.133	4.92	4.31	3.55	4.26	0.667	0.551	0.372	0.530
T4	0.185	0.162	0.118	0.155	6.57	5.38	4.29	5.41	0.747	0.599	0.499	0.615
T5	0.204	0.159	0.120	0.161	5.83	4.74	3.65	4.74	0.687	0.618	0.414	0.573
Average	0.184	0.144	0.102		5.73	4.83	3.76		0.717	0.566	0.422	
L.S.D.0.05	Sal. 0.018	Treat. 0.035	Inter. 0.055		Sal. 0.32	Treat. 0.62	Inter. 0.96		Sal. 0.034	Treat. 0.064	Inter. 0.100	

T_1 :untreated ; control.

T_2 :Soil application with House Green (20%N,20%$P_2$05, 20%k_2O, 0.5%Zn, 0.4% Fe, 0.5% Mn, 0.5% Cu, 0.0% B and 0.05%Mo) at the rate of 0.25%House Green.

T_3 :Foliar spray of the same House Green fertilizer, at the rate of 0.25%House Green. Triton B was added as a wetting agent at the rate of 0.1%.

T_4 :Gibberellic acid foliar sprays, at the rate 40 ppm gibberellic acid, as Berlex.

T_5: Antitranspirant foliar spray, at the rate 5% paraffin oil. Triton B was added as a wetting agent at the rate of 0.1 %.

Table (2): Effect of House Green, Gibberellic acid (GA_3) and antitranspirant on growth rate, total leaf area, trunk cross-sectional area and total dry weight of Wardi pomegranate and Pyrus betulaefolia rootstock plants in 2006 season .

Treatments	Pomegranates															
	Growth rate				Total leaf area (cm^2)				Trunk cross- sectional area				Total dry weight gm/plant			
	NaCl salinity levels				NaCl salinity levels				NaCl salinity levels				NaCl salinity levels			
	0 ppm	1000 ppm	2000 ppm	AV.	0 ppm	1000 ppm	2000 ppm	AV.	0 ppm	1000 ppm	2000 ppm	AV.	0 ppm	1000 ppm	2000 ppm	AV.
T1	0.152	0.135	0.094	0.127	5.71	5.59	5.20	5.50	0.899	0.863	0.833	0.865	19.51	16.96	13.96	16,48
T2	0.244	0.189	0.188	0.207	7.92	6.35	6.19	6.82	1.015	0.992	0.969	0.992	26.96	21.37	19.03	22.45
T3	0.192	0.161	0.131	0.161	6.42	5.93	5.32	5.89	0.943	0.913	0.892	0.916	21.59	16.76	13.21	17.19
T4	0.228	0.179	0.151	0.186	7.41	6.32	6.07	6.60	0.950	0.932	0.927	0.936	23.09	18.73	17.26	19.69
T5	0.242	0.170	0.164	0.192	6.20	6.15	5.98	6.11	0.987	0.953	0.931	0.957	26.90	20.10	18.36	21.79
Average	0.212	0.167	0.146		6.73	6.07	5.75		0.959	0.931	0.910		23.61	18.78	16.36	
L.S.D.0.05	Sal.	Treat.	Inter.		Sal.	Treat.	Inter.		Sal.	Treat.	Inter.		Sal.	Treat.	Inter.	
	0.018	0.035	0.055		0.26	0.49	0.77		0.031	0.059	0.091		1.07	2.04	3.19	
					Pyrus betulaefolia											
T1	0.139	0.112	0.073	0.108	6.42	5.63	5.23	5.76	0.702	0.518	0.343	0.521	16.52	14.93	12.40	14.62
T2	0.228	0.192	0.135	0.185	7.61	6.99	6.67	7.09	0.853	0.661	0.553	0.689	23.59	20.86	18.01	20.82
T3	0.190	0.141	0.107	0.146	7.07	6.01	5.16	6.08	0.697	0.576	0.395	0.556	19.77	16.35	13.52	16.55
T4	0.202	0.163	0.118	0.161	7.55	6.98	6.14	6.89	0.788	0.651	0.520	0.653	19.95	19.90	17.45	19.10
T5	0.216	0.184	0.121	0.177	6.92	6.18	5.77	6.29	0.693	0.639	0.462	0.598	21.11	20.36	17.87	19.78
Average	0.195	0.158	0.111		7.11	6.36	5.79		0.747	0.609	0.455		20.19	18.48	15.85	
L.S.D.0.05	Sal.	Treat.	Inter.		Sal.	Treat.	Inter.		Sal.	Treat.	Inter.		Sal.	Treat.	Inter.	
	0.013	0.023	0.040		0.17	0.33	0.52		0.039	0.075	0.117		1.24	2.37	4.93	

T1 :untreated ; control.

T2 :Soil application with House Green (20%N,20%P205, 20%k2O, 0.5%Zn, 0.4% Fe, 0.5% Mn, 0.5% Cu, 0.0% B and 0.05%Mo) at the rate of 0.25%House Green.

T3 :Foliar spray of the same House Green fertilizer, at the rate of 0.25%House Green. Triton B was added as a wetting agent at the rate of 0.1%.

T4 :Gibberellic acid foliar sprays, at the rate 40 ppm gibberellic acid, as Berlex.

T5: Antitranspirant foliar spray, at the rate 5% paraffin oil. Triton B was added as a wetting agent at the rate of 0.1 %.

The apparent reduction in the growth rate, total leaf area, trunk cross sectional area and total dry weight of the plants under salinity stress conditions might be attributed to a marked decrease in the water absorbing potential of the plants under such conditions (Hartmond et al., 1987). In the meantime, Levitt (1980) reported that water shortage is the most critical factor in plant growth process. Besides, Bernstein et al. (1972) pointed out that the accumulation of specific ions such as sodium and chloride, in the different plant tissues, would probably exert an inhibitory effect on plant growth and development.

Moreover, in both seasons, the growth rate, total leaf area, trunk cross-sectional area and total dry weight of pomegranate and pear plants treated by House Green (soil application), gibberellic acid or paraffin oil antitranspirant was significantly higher than that of the control plants.

The data of the present study also revealed that there were significantly positive interactions between the different salinity levels and House Green (soil application), gibberellic acid and paraffin oil antitranspirant treatments. For example, the application of House Green (soil application), gibberellic acid paraffin oil antitranspirant significantly increased the growth rate, total leaf area, trunk cross-sectional area and total dry weight of pomegranate plants grown under 1000 and 2000 ppm NaCl salinity levels and to pear plants grown under 2000 ppm NaCl.

These findings seem to be in agreement with those obtained by other investigators such as: Shaheen (1984), Zhao et al. (1986) and Radi et al. (1989), on NaCl- gibberallic acid interaction, Cerda and Mortinez (1988) and El-Siddig and Ludders (1993) on nitrogen, Rao (1986) Amer and Youssif (2004) on potassium, Morales et al. (1992) on phosphorus, El-Abd (1996), on antitranspirant and Naiema (2004) on nitrogen, potassium, phosphorus and antitranspirant. They also concluded that this effect could be attributed to nutrient increase and salt uptake decrease.

II- Effect of House Green, Gibberallic acid (GA_3) and Antitranspirant on the leaf total chlorophyll content and leaf total carbohydrates of Wardi pomegranate and Pyrus betulaefolia plants grown under different salinity levels:

Generally, the results in (Tables 3 and 4) indicated that increasing the salinity level of the media caused a noticeable decrease in total chlorophyll content and total carbohydrates. This behavior was evident in the two experimental fruit species grown under both 1000 and 2000 ppm NaCl salinity levels. These results are in line with those reported by Patil and Patil (1982) and Doring and Ludders (1986); on pomegranates; Saloma et.al. (1992); on grapevines, Amer and Youssif (2004); on guavas and Naiema (2004); on Nemaguard peach. They all concluded that salinity stress condition reduced the concentration of leaf chlorophyll. Strogonov (1964) clarified the depressive influence of salinity on leaf chlorophyll content .He pointed out that salinity affects the strength of forces holding out the pigment-protein lipid complex in the chloroplasts. In the meantime, Garg et.al. (1993), Ezz and Nawar (1993), Zidan and Malibari (1993) and Abd-Ella (1997) concluded that salinity stress conditions reduced total carbohydrates.

Table (3): Effect of House Green, Gibberellic acid (GA3) and antitranspirant on leaf total chlorophyll content, leaf total carbohydrates and leaf total free amino acids of Wardi pomegranate and Pyrus betulaefolia rootstock plants in 2005 season.

Treatments	Pomegranates											
	Leaf chlorophyll (mg/100 g fresh weight)				Leaf total carbohydrates percentage (on dry weight basis)				Leaf total free amino acids (mg/100g on dry weight basis)			
	NaCl salinity levels				NaCl salinity levels				NaCl salinity levels			
	0 ppm	1000 ppm	2000 ppm	AV.	0 ppm	1000 ppm	2000 ppm	AV.	0 ppm	1000 ppm	2000 ppm	AV.
T1	54.43	48.58	45.95	49.65	10.99	9.51	9.05	9.85	19.05	19.86	22.34	20.42
T2	61.13	54.55	50.93	55.54	12.56	11.53	11.03	11.71	18.84	19.33	21.26	19.81
T3	55.85	51.93	47.39	51.72	11.06	9.75	9.26	10.02	16.82	17.13	18.01	17.32
T4	56.38	52.39	48.68	52.78	11.23	10.85	10.39	10.82	17.97	18.03	18.42	18.14
T5	57.45	52.93	49.55	53.31	12.38	11.50	11.13	11.67	18.68	18.41	19.82	18.97
Average	57.05	52.08	48.50		11.64	10.63	10.17		18.27	18.55	20.01	
L.S.D.0.05	Sal. 1.64	Treat. 3.12	Inter. 4.89		Sal. 0.19	Treat. 0.37	Inter. 0.58		Sal. 0.30	Treat. 0.57	Inter. 0.90	
	Pyrus betulaefolia											
T1	57.15	52.01	48.28	52.48	9.10	8.71	8.47	8.76	21.82	22.34	23.41	22.52
T2	63.78	57.02	52.43	57.74	10.98	9.45	8.90	9.78	20.58	21.89	22.75	21.72
T3	60.00	54.43	50.10	54.84	10.14	8.92	8.52	9.19	17.49	18.19	19.21	18.30
T4	60.43	55.83	51.45	55.90	10.61	9.26	8.71	9.53	18.07	18.51	20.35	18.98
T5	61.25	56.25	52.75	56.75	10.32	9.10	8.66	9.36	19.02	20.29	20.61	19.97
Average	60.52	55.11	51		10.23	9.09	8.65		19.40	20.24	21.27	
L.S.D.0.05	Sal. 1.44	Treat. 2.74	Inter. 6.61		Sal. 0.20	Treat. 0.38	Inter. 0.60		Sal. 0.30	Treat. 0.57	Inter. 0.89	

T1 :untreated ; control.

T2 :Soil application with House Green (20%N,20%P205, 20%k2O, 0.5%Zn, 0.4% Fe, 0.5% Mn, 0.5% Cu, 0.0% B and 0.05%Mo) at the rate of 0.25%House Green.

T3 :Foliar spray of the same House Green fertilizer, at the rate of 0.25%House Green. Triton B was added as a wetting agent at the rate of 0.1%.

T4 :Gibberellic acid foliar sprays, at the rate 40 ppm gibberellic acid, as Berlex.

T5: Antitranspirant foliar spray, at the rate 5% paraffin oil. Triton B was added as a wetting agent at the rate of 0.1 %.

Table (4): Effect of House Green, Gibberellic acid (GA_3) and antitranspirant on leaf total chlorophyll content, leaf total carbohydrates and leaf total free amino acids of Wardi pomegranate and Pyrus betulaefolia rootstock plants in 2006 season.

Treatments	Pomegranates											
	Leaf chlorophyll (mg/100 g fresh weight)				Leaf total carbohydrates percentage (on dry weight basis)				Leaf total free amino acids (mg/100g on dry weight basis)			
	NaCl salinity levels				NaCl salinity levels				NaCl salinity levels			
	0 ppm	1000 ppm	2000 ppm	AV.	0 ppm	1000 ppm	2000 ppm	AV.	0 ppm	1000 ppm	2000 ppm	AV.
T1	54.53	48.69	46.31	49.84	10.93	9.59	9.18	9.90	21.92	22.52	23.34	20.59
T2	62.70	54.39	51.30	56.13	13.77	11.38	10.83	11.99	20.89	20.10	21.26	20.72
T3	56.70	52.95	48.44	52.70	11.36	10.16	9.75	10.42	17.03	17.29	17.75	17.35
T4	57.40	54.13	49.12	53.55	11.80	10.90	10.39	11.03	17.63	18.04	19.68	18.45
T5	57.22	54.41	49.30	53.64	13.23	11.10	10.41	11.91	18.78	19.56	19.23	19.19
Average	57.7	52.95	48.85		12.22	10.63	11.11		19.25	19.48	20.25	
L.S.D.0.05	Sal. 1.92	Treat. 3.66	Inter. 5.79		Sal. 0.17	Treat. 0.33	Inter. 0.51		Sal. 0.31	Treat. 0.60	Inter. 0.94	
	Pyrus betulaefolia											
T1	57.25	52.20	48.58	52.68	9.36	8.92	8.64	8.79	21.93	22.56	23.69	22.73
T2	64.83	57.30	57.63	59.92	11.20	9.95	9.39	10.18	20.99	22.04	23.04	22.03
T3	60.89	56.49	50.25	55.88	10.33	9.35	9.06	9.58	17.85	18.39	19.49	18.58
T4	61.46	55.80	51.54	56.27	11.09	9.79	9.29	10.06	18.30	18.75	20.65	19.23
T5	62.14	56.15	52.59	56.96	10.99	9.61	9.20	9.93	19.22	20.52	20.79	20.18
Average	61.31	55.59	52.12		10.57	9.52	9.11		19.66	20.45	21.53	
L.S.D.0.05	Sal. 1.44	Treat. 2.75	Inter. 4.29		Sal. 0.18	Treat. 0.34	Inter. 0.53		Sal. 0.35	Treat. 0.66	Inter. 1.04	

T1 :untreated ; control.

T2 :Soil application with House Green (20%N,20%P205, 20%k2O, 0.5%Zn, 0.4% Fe, 0.5% Mn, 0.5% Cu, 0.0% B and 0.05%Mo) at the rate of 0.25%House Green.

T3 :Foliar spray of the same House Green fertilizer, at the rate of 0.25%House Green. Triton B was added as a wetting agent at the rate of 0.1%.

T4 :Gibberellic acid foliar sprays, at the rate 40 ppm gibberellic acid, as Berlex.

T5: Antitranspirant foliar spray, at the rate 5% paraffin oil. Triton B was added as a wetting agent at the rate of 0.1 %.

Moreover, the House Green (soil application), gilberellic acid and antitranspirant caused an apparent significant increment in the leaf chlorophyll content and carbohydrates of plants.

Regarding, the interaction influence between salinity and the other treatments on total leaf chlorophyll content and total leaf carbohydrates of the experimental plant, the results, generally, revealed that positive interaction reactions, in most cases, were observed between both salinity levels and the other treatments experimented herein . This behavior was evident in the two fruit species grown under salinity stress conditions. These results are in line with those reported by Abd El- Rahman and Hassanein (1988) and El- Abd (1996) on antitranspirants, Shaheen (1984) on gibberellic acid and Naiema (2004) on nitrogen, phosphorus, potassium and antitranspirants. They reported that these treatments increased the leaf chlorophyll content of plants grown under stress conditions. Besides, Garg et.al (1993) on nitrogen, phosphorus and/or potassium, and Urmiler and Stutte (1988) as well as Hayashi (1961) on gibberellic acid. They all reported that those treatments increased leaf starch concentration due to increasing photosynthetic activity and the efficiency of utilizing photosynthetic products.

III-Effect of House Green, Gibberellic acid (GA_3) and antitranspirant on the total free amine acids content of Wardi pomegranate and Pyrus betulaefolia plants grown under different salinity levels:

The results in (Tables 3 and 4), generally, indicated that salinity appreciably increased the free amino acids pool in the leaf tissues of the plants. The trend was, generally, noticed in the two fruit species experimented herein whether they were irrigated by the 1000 ppm or the 2000 ppm NaCl salinity levels. Yet, the leaf total free amino acids content in pomegranate plants irrigated by the 1000 ppm NaCl salinity did not differ significantly than the control plants; irrigated by tap water. These results are in agreement with those reported by Zidan and Malibari (1993), Garg et.al. (1993) and Abd-Ella (1997). They concluded that stress condition increased the free amino acids in plants. Shehata and Farrag (1983) reported that salinization impaired nitrogen incorporation into protein .This notion might help in explaining the high free amino acids level in plants subjected to the salinity stress conditions.

Moreover, in both seasons, the free amino acids content of the plants treated by House Green, gibberellic acid and paraffin oil antitranspirant was significantly higher than that of the control plants.

Regarding the interaction influences between salinity and the other treatments on the free amino acids pool of the experimental plants, the data,in both seasons, revealed that negative interaction reactions were noticed between either both salinity levels and the House Green, gilberellic acid and antitranspirant treatments. These results partially agreed with those reported by Hussein et.al. (1984); working on growth retardant and Zidan and Malibari (1993), on potassium. They concluded that these treatments reduced the amino acids content of plants grown under salinity stress condition.

IV- Effect of House Green, Gibberellic acid (GA_3) and antitranspirant on the leaf and root mineral composition of Wardi pomegranate and Pyrus betulaefolia plants grown under different salinity levels:

The data presented in Tables 5, 6 and7 show the influence of salinity stress conditions on leaf and root mineral composition (nitrogen, phosphorus, potassium, sodium and chloride) of pomegranate and Pyrus betulaefolia plants. In both seasons, the results of the present investigation, generally, indicated that increasing the salinity stress conditions significantly decreased the concentration of nitrogen, phosphorus and potassium in either leaf or root tissues of the plants grown under both 1000 ppm or 2000 ppm NaCl salinity levels, While, increasing the salinity stress conditions significantly increased the concentration of sodium and chloride in either leaf or root tissues of the plants grown under both 1000 ppm or 2000 ppm NaCl salinity levels. Such results were found by Salama et.al., (1992), El-Siddig and Ludders (1994), Amer and Youssif (2004) and Naiema (2004). Noteworthy, Feigin (1985) reported that the concentration of chloride increased linearly as the level of chloride in the salt solution increased. He pointed out that the ability of cell membranes to control salt uptake was reduced by the presence of high chloride levels in the media.

Moreover, in both seasons, the nitrogen, phosphorus, potassium, sodium and chloride content in either the leaf or the root tissues of the plants treated by the House Green (foliar or soil applications)and gibberellic acid were significantly higher than those of the control plants. In the meantime, the addition of paraffin oil antitranspirant significantly increased the concentration of nitrogen, phosphorus and potassium in the leaf and root tissues of plants. On the other hand, the application of antitranspirant did not statistically change the sodium and chloride in the leaf or root tissues of plants.

The data of the present study also revealed that there were significant positive interactions between the different salinity levels and the other treatments on the leaf and root nitrogen, phosphorus or potassium contents of the plants. Similarly, pear plants irrigated by 1000 ppm and 2000ppm NaCl and treated by House Green, gillerallic acid and antitranspirant also had significantly higher leaf and root sodium and chloride content. Also, in pomegranate plants grown under 2000ppm NaCl and receiving House Green, gibberellic acid and antitranpirant treatments showed significantly higher root sodium and chloride content than that in the corresponding control plants. Such results were found by Cerda and Martinez (1988), Schreiner and Ludders (1992) and Naiema (2004).

Table (5): Effect of House Green, Gibberellic acid (GA_3) and antitranspirant on leaf mineral content percentage (on dry weight basis) of Wardi pomegranate and Pyrus betulaefolia rootstock plants in 2006 season .

Treatments	Pomegranates															
	Nitrogen				Phosphorus				Potassium				Sodium				Chloride			
	NaCl salinity levels				NaCl salinity levels				NaCl salinity levels				NaCl salinity levels				NaCl salinity levels			
	0 ppm	1000 ppm	2000 ppm	AV.	0 ppm	1000 ppm	2000 ppm	AV.	0 ppm	1000 ppm	2000 ppm	AV.	0 ppm	1000 ppm	2000 ppm	AV.	0 ppm	1000 ppm	2000 ppm	AV
T1	2.85	2.51	2.32	2.56	0.388	0.334	0.292	0.338	1.41	1.34	1.03	1.21	0.73	0.80	0.85	0.79	0.64	0.74	0.79	0.72
T2	3.19	3.01	2.83	3.01	0.404	0.376	0.339	0.373	1.68	1.40	1.21	1.43	0.81	0.85	0.89	0.85	0.77	0.80	0.85	0.81
T3	2.84	2.71	2.52	2.69	0.388	0.361	0320	0.356	1.60	1.38	1.08	1.35	0.78	0.85	0.92	0.85	0.74	0.79	0.84	0.79
T4	2.97	2.79	2.61	2.79	0.388	0.363	0.344	0.365	1.61	1.40	1.13	1.38	0.81	0.87	0.92	0.87	0.75	0.80	0.84	0.80
T5	3.03	2.89	2.81	2.91	0.414	0.385	0.350	0.383	1.46	1.39	1.13	1.33	0.72	0.80	0.91	0.81	0.67	0.74	0.83	0.75
Average	2.98	2.78	2.62		0.396	0.364	0.329		1.55	1.38	1.12		0.77	0.83	0.90		0.71	0.77	0.83	
L.S.D.0.05	Sal.	Treat.	Inter.		Sal.	Treat.	Inter.		Sal.	Treat.	Inter.		Sal.	Treat.	Inter.		Sal.	Treat.	Inter.	
	0.07	0.12	0.19		0.09	0.017	0.027		0.01	0.03	0.04		0.03	0.05	0.08		0.02	0.04	0.07	
	Pyrus betulaefolia															
T1	2.73	2.34	2.28	2.45	0.368	0.331	0.306	0.335	1.29	1.13	0.91	1.11	0.65	0.68	0.82	0.72	0.64	0.68	0.74	0.69
T2	3.19	2.89	2.68	2.92	0.391	0.373	0.346	0.370	1.44	1.31	1.27	1.34	0.76	0.81	0.92	0.83	0.72	0.76	0.85	0.78
T3	2.84	2.50	2.40	2.58	0.371	0.358	0.331	0.353	1.35	1.23	1.08	1.22	0.71	0.81	0.91	0.81	0.65	0.77	0.87	0.75
T4	2.99	2.71	2.55	2.75	0.372	0.363	0.342	0.359	1.39	1.29	1.29	1.30	0.72	0.82	0.91	0.82	0.68	0.78	0.84	0.77
T5	2.94	2.71	2.48	2.71	0.410	0.373	0.351	0.378	1.32	1.22	1.15	1.23	0.63	0.76	0.90	0.76	0.64	0.77	0.81	0.74
Average	2.94	2.63	2.48		0.382	0.360	0.335		1.36	1.24	1.14		0.70	0.78	0.89		0.67	0.75	0.81	
L.S.D.0.05	Sal.	Treat.	Inter.		Sal.	Treat.	Inter.		Sal.	Treat.	Inter.		Sal.	Treat.	Inter.		Sal.	Treat.	Inter.	
	0.04	0.08	0.12		0.009	0.016	0.025		0.02	0.04	0.06		0.03	0.05	0.08		0.02	0.04	0.07	

T1 :untreated ; control.
T2 :Soil application with House Green (20%N,20%P205, 20%k2O, 0.5%Zn, 0.4% Fe, 0.5% Mn, 0.5% Cu, 0.0% B and 0.05%Mo) at the rate of 0.25%House Green.
T3 :Foliar spray of the same House Green fertilizer, at the rate of 0.25%House Green. Triton B was added as a wetting agent at the rate of 0.1%.
T4 :Gibberellic acid foliar sprays, at the rate 40 ppm gibberellic acid, as Berlex.
T5: Antitranspirant foliar spray, at the rate 5% paraffin oil. Triton B was added as a wetting agent at the rate of 0.1 %.

Table (6): Effect of House Green, Gibberellic acid (GA_3) and antitranspirant on leaf mineral content percentage (on dry weight basis) of Wardi pomegranate and Pyrus betulaefolia rootstock plants in 2005 season.

Treatments	Pomegranates																			
	Nitrogen				Phosphorus				Potassium				Sodium				Chloride			
	NaCl salinity levels				NaCl salinity levels				NaCl salinity levels				NaCl salinity levels				NaCl salinity levels			
	0 ppm	1000 ppm	2000 ppm	AV.	0 ppm	1000 ppm	2000 ppm	AV.	0 ppm	1000 ppm	2000 ppm	AV.	0 ppm	1000 ppm	2000 ppm	AV.	0 ppm	1000 ppm	2000 ppm	AV.
T1	2.56	2.29	2.14	2.43	0.372	0.323	0.289	0.348	1.29	1.17	0.98	1.15	0..63	0.77	0.85	0.75	0.63	0.70	0.78	0.70
T2	3.17	2.87	2.54	2.86	0.412	0.376	0.355	0.381	1.48	1.29	1.16	1.31	0.73	0.82	0.91	0.82	0.73	0.76	0.83	0.78
T3	2.90	260	2.39	2.63	0.399	0.370	0.344	0.371	1.44	1.16	1.06	1.22	0.71	0.79	0.90	0.80	0.72	0.75	0.81	0.76
T4	2.81	2.68	2.40	2.61	0.403	0.382	0.352	0.379	1.45	1.22	1.14	1.27	0.75	0.83	0.91	0.84	0.75	0.73	0.83	0.77
T5	2.98	2.71	2.59	2.76	0.416	0.393	0.367	0.392	1.34	1.21	1.08	1.21	0.69	0.79	0.89	0.79	0.66	0.73	0.79	0.73
Average	2.88	2.77	2.41		0.400	0.369	0.341		1.40	1.23	1.07		0.71	0.80	0.89	0.80	0.70	0.73	0.81	
L.S.D.0.05	Sal. 0.09	Treat. 0.17	Inter. 0.27		Sal. 0.012	Treat. 0.023	Inter. 0.036		Sal. 0.03	Treat. 0.05	Inter. 0.08		Sal. 0.02	Treat. 0.05	Inter. 0.07		Sal. 0.02	Treat. 0.05	Inter. 0.07	
	Pyrus betulaefolia																			
T1	2.51	2.30	2.18	2.33	0.370	0.344	0.311	0.342	1.17	0.89	0.86	0.97	0.60	0.65	0.76	0.67	0.63	0.66	0.71	0.67
T2	3.01	2.78	2.61	2.80	0.422	0.389	0.326	0.379	1.38	1.20	1.11	1.23	0.73	0.76	0.82	0.77	0.68	0.73	0.80	0.74
T3	2.72	2.46	2.20	2.46	0.393	0.379	0.323	0.365	1.26	1.05	0.99	1.10	0.67	0.74	0.79	0.73	0.65	0.72	0.77	0.71
T4	2.83	2.61	2.45	2.63	0.407	0.360	0.340	0.369	1.35	1.27	1.01	1.21	0.70	0.76	0.91	0.79	0.66	0.73	0.81	0.73
T5	2.68	2.51	2.37	2.52	0.416	0.385	0.347	0.383	1.21	1.02	0.95	1.06	0.63	0.71	0.79	0.70	0.62	0.72	0.77	0.70
Average	2.75	2.53	2.36		0.402	0.371	0.329		1.27	1.08	0.98		0.67	0.71	0.82		0.65	0.70	0.77	
L.S.D.0.05	Sal. 0.05	Treat. 0.09	Inter. 0.14		Sal. 0.011	Treat. 0.021	Inter. 0.033		Sal. 0.03	Treat. 0.06	Inter. 0.10		Sal. 0.02	Treat. 0.04	Inter. 0.06		Sal. 0.02	Treat. 0.04	Inter. 0.06	

T1 :untreated ; control.

T2 :Soil application with House Green (20%N,20%P205, 20%k2O, 0.5%Zn, 0.4% Fe, 0.5% Mn, 0.5% Cu, 0.0% B and 0.05%Mo) at the rate of 0.25%House Green.

T3 :Foliar spray of the same House Green fertilizer, at the rate of 0.25%House Green. Triton B was added as a wetting agent at the rate of 0.1%.

T4 :Gibberellic acid foliar sprays, at the rate 40 ppm gibberellic acid, as Berlex.

T5: Antitranspirant foliar spray, at the rate 5% paraffin oil. Triton B was added as a wetting agent at the rate of 0.1 %.

Table (7): Effect of House Green, Gibberellic acid (GA_3) and antitranspirant on root mineral content percentage (on dry weight basis) of Wardi pomegranate and Pyrus betulaefolia rootstock plants in 2006 season.

Treatments	Pomegranates																			
	Nitrogen				Phosphorus				Potassium				Sodium				Chloride			
	NaCl salinity levels				NaCl salinity levels				NaCl salinity levels				NaCl salinity levels				NaCl salinity levels			
	0 ppm	1000 ppm	2000 ppm	AV.	0 ppm	1000 ppm	2000 ppm	AV.	0 ppm	1000 ppm	2000 ppm	AV.	0 ppm	1000 ppm	2000 ppm	AV.	0 ppm	1000 ppm	2000 ppm	AV.
T1	1.89	1.69	1.60	1.73	0.286	0.250	0.220	0.252	0.69	0.52	0.38	0.53	0.48	0.58	0.68	0.57	0.39	0.45	0.48	0.44
T2	2.20	2.15	2.10	2.15	0307	0.286	0.272	0.288	0.75	0.59	0.45	0.60	0.51	0.60	0.82	0.64	0.50	0.53	0.65	0.56
T3	1.93	1.76	1.66	1.78	0.284	0.277	0.246	0.269	0.69	0.57	0.43	0.56	0.49	0.58	0.79	0.62	0.47	0.50	0.58	0.52
T4	1.91	1.80	1.72	1.81	0.292	0.280	0.247	0.273	0.68	0.60	0.48	0.59	0.50	0.59	0.80	0.63	0.49	0.52	0.65	0.55
T5	2.08	1.91	1.86	1.95	0.293	0.280	0.256	0.276	0.71	0.57	0.44	0.57	0.49	0.53	0.78	0.60	0.40	0.48	0.58	0.49
Average	2.00	1.56	1.79		0.292	0.275	0.248		0.71	0.57	0.42		0.49	0.58	0.77		0.45	0.50	0.59	
L.S.D.0.05	Sal.	Treat.	Inter.		Sal.	Treat.	Inter.		Sal.	Treat.	Inter.		Sal.	Treat.	Inter.		Sal.	Treat.	Inter.	
	0.02	0.04	0.06		0.009	0.017	0.026		0.02	0.03	0.05		0.02	0.05	0.07		0.03	0.06	0.1	
	Pyrus betulaefolia																			
T1	1.71	1.47	1.35	1.51	0.255	0.230	0.216	0.238	0.65	0.50	0.39	0.52	0.33	0.35	0.45	0.38	0.38	0.43	0.45	0.42
T2	1.87	1.69	1.58	1.71	0.302	0.263	0.248	0.271	0.75	0.61	0.53	0.63	0.34	0.43	0.52	0.43	0.43	0.45	0.54	0.48
T3	1.70	1.53	1.45	1.56	0.273	0.259	0.243	0.258	0.66	0.60	0.49	0.58	0.32	0.42	0.51	0.42	0.40	0.44	0.52	0.45
T4	1.80	1.59	1.41	1.60	0.277	0.260	0.246	0.261	0.73	061	0.50	0.61	0.37	0.43	0.52	0.44	0.40	0.46	0.55	0.47
T5	1.84	1.63	1.51	1.66	0.294	0.263	0.247	0.268	0.76	0.60	0.49	0.58	0.32	0.41	0.51	0.41	0.39	0.44	0.53	0.44
Average	1.78	1.58	1.46		0.280	0.255	0.240		0.71	0.58	0.48		0.34	0.40	0.50		0.40	0.45	0.51	
L.S.D. 0.05	Sal.	Treat.	Inter.		Sal.	Treat.	Inter.		Sal.	Treat.	Inter.		Sal.	Treat.	Inter.		Sal.	Treat.	Inter.	
	0.02	0.03	0.5		0.009	0.018	0.027		0.03	0.06	0.10		0.02	0.04	0.06		0.02	0.04	0.07	

T1 :untreated ; control.

T2 :Soil application with House Green (20%N,20%P205, 20%k2O, 0.5%Zn, 0.4% Fe, 0.5% Mn, 0.5% Cu, 0.0% B and 0.[illegible]%Mo) at the rate of 0.25%House Green.

T3 :Foliar spray of the same House Green fertilizer, at the rate of 0.25%House Green. Triton B was added as a wetting agent at the rate of 0.1%.

T4 :Gibberellic acid foliar sprays, at the rate of [illegible]0 ppm gibberellic acid, as Berlex.

T5: Antitranspirant foliar spray, at the rate [illegible]% paraffin oil. Triton B was added as a wetting agent at the rate of 0.1 %.

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تأثير الهاوس جرين وحمض الجبريليك ومضادات النتح عل كل من النمو و بعض المركبات الكيماوية فى شتلات الرمان و أصل كمثرى البتشيفوليا النامية تحت ظروف ملحية.

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أجرى هذا البحث خلال عامى ٢٠٠٥/٢٠٠٦ على شتلات كل من الرمان واصل كمثرى البتشيفوليا وذلك لدراسة تأثير الهاوس جرين وحمض الجبريليك و أحد مضادات النتح وهو زيت البرافين على مدى تحمل هذه الشتلات لملوحة ماء الرى وأيضا لدراسة تأثير هذة المعاملات على معدل النمو الخضرى للشتلات ومساحة اوراقها ومساحة مقطع ساقها ووزنها الجاف الكلى بالاضافة الى محتوى اوراقها وجذورها من العناصر المعدنية (النيتروجين و الفوسفور و البوتاسيوم و الصوديوم و الكلوريد) ومحتوى اوراقها من الكلوروفيل والمواد الكربوهيدراتية والاحماض الامينية الحرة الكلية.

ويمكن تلخيص النتائج المتحصل عليها كالاتى :

١- انخفض معدل نمو الشتلات ومساحة اوراقها ووزنها الجاف الكلى ومساحة مقطع ساقها و محتوى الاوراق من الكلوروفيل الكلى ومحتوى الاوراق من الكربوهيدرات و ذلك بزيادة مستوى ملوحة ماء الرى. بينما زاد محتوى الاوراق من الاحماض الامينية الحرة الكلية وكان هذا التأثير أكثر وضوحا فى الشتلات التى رويت بالمستوى المرتفع من الملوحة (٢٠٠٠ جزء فى المليون كلوريد صوديوم).

٢- أدت المعاملة بالهاوس جرين (اضافة ارضية) وحمض الجبريليك ومضاد النتح الى زيادة معنوية فى معدل نمو الشتلات ومساحة اوراقها و مساحة مقطع ساقها ووزنها الجاف الكلى ومحتوى الاوراق من الكلوروفيل الكلى ومحتوى الاوراق من الكربوهيدرات بينما انخفض محتوى الاوراق من الاحماض الامينية الحرة الكلية.

٣- لوحظ تداخل معنوى موجب بين كل من تركيزى الملوحة او احدهما و المعاملات المختلفة فيما عدا الرش بالهاوس جرين على معدل نمو الشتلات ومساحة اوراقها ووزنها الجاف الكلى ومحتوى الاوراق من الكلوروفيل الكلى ومحتوى الاوراق من الكربوهيدرات.

٤- أدى التداخل بين ملوحة ماء الرى و معاملات التسميد والرش المختلفة الى انخفاض تركيز الاحماض الامينية الحرة الكلية باوراق شتلات الرمان و اصل كمثرى بتشيفوليا .

٥- أدت زيادة ملوحة ماء الرى الى انخفاض تركيز العناصر المعدنية المختلفة فى معظم الحالات فيما عدا محتوى الاوراق و الجذور من عنصر الصوديوم و الكلوريد حيث زادت نسبتها بزيادة ملوحة ماء الرى.

٦- كانت معظم التأثيرات المعنوية موجبة للمعاملات المختلفة على محتوى اوراق وجذور الشتلات من العناصر المعدنية .

٧- ادى التداخل بين معاملات الملوحة ومعاملات الرش و التسميد الى زيادة معنوية فى محتوى الاوراق والجذور من معظم العناصر المعدنية .

٨- بعض معاملات الهاوس جرين وحمض الجبريليك اواحد مضادات النتح ادى الى تأخير ظهور أعراض أضرار الملوحة لبشتلات أصل كمثرى البتشيفوليا ومثالا على ذلك عندما رويت هذه الشتلات بالتركيز العالى من الملوحة (٢٠٠٠ جزء فى المليون كلوريد صوديوم) أظهرت أعراض الاصفرار بعد٩٥ يوم فى عام٢٠٠٥ وبعد ١١٣ يوم فى عام ٢٠٠٦ .