4. Calcium and magnesium content being determined through titration against Na EDTA (Versenate) solution according to Barrows and Simpson (1962).
5. Zinc, iron and manganese spectrophotometrically by Mnican Sp. 1900 Atomic absorption Spectrophotometer.

III.4. Statistical analysis:

All data obtained during both seasons of study were subjected to analysis of variance according to the method described by Snedecor and Cochran (1972). However, "Factorial design": as well as the significant differences among means were determined by Duncan's multiple range test (Duncan, 1955).

VI. RESULTS AND DISCUSSION

It is well known that salinity is considered one of the factors that affect plant growth through its despressive effect on both metabolic activities and water relations within the different plant tissues. Thus, the following presentation of results and discussion will concern with the effect of saline conditions, SAR and chloride on growth and leaf chemical compoistion of apricot and mango seedlings.

1. Effect of salts concentration, sodium adsorption ratio and $Cl:SO_4$ ratio in irrigation water on growth of apricot and mango seedlings:

1.1. Effect on stem length:

Data obtained during 1994 and 1995 seasons regarding the specific and interaction effects of the three investigated factors (salinity concentration, SAR and $Cl:SO_4$ ratio) on the exhibited increase in stem length of both apricot and mango seedlings are presented in Table (2).

1.1.a. Specific effect:

Regarding the specific effect of salinity concentration, data obtained revealed that all three investigated (2000, 4000 and 6000 ppm) saline solutions resulted in an obvious decrease in stem length of seedlings for both fruit species during two seasons. Such decrease was significant as compared to those of tap water irrigated seedlings. On the other hand, the most depressive effect was always concomitant to the highest concentration i.e. 6000 ppm during both seasons of salinity, irrespective of fruit species, however, the 2000 ppm saline solution exhibited the lowest decrease. Meanwhile, the 4000 ppm concentration was intermediate in this concern, whereas differences between the three salinity concentrations were significant as each was compared to two other ones with both apricot and mango seedlings during two seasons of study. In addition, it could be noticed that apricot seedlings were more sensetive to increasing salinity concentration than mango especially under

the highest concentration as rate of decrease was more acute with former fruit species than latter. These results are in coincide with the finding of Wilcox *et al.* (1951) reported that salinity of soil solution may affect growth of plant in two ways : 1st the osmotic pressure of the solution may be high enough to limit the availability of water to the plant or 2nd hight concentration of salts in the solution may facilitate the uptake of one or more of the presentions so that an accumulation may result and cause a derangement of the normal metabolism of the plant. In addition, Pokroveskey (1957) found that in glycophgtes both cell divison and cell elongation were inhibited with increased salinity.

Moreover, Makhija *et al.* (1980) found that rising salinity levels (above 7.5 mmhos/cm conductivity of saturation extract) causing growth reduction on guava seedlings. They found that accumulation of Cl^- and Na in toxic concentration in plant tissues and nutrient imbalance were the main effects of salinity. Behairy *et al.* (1984) on Thompson seedless and american grape plants and Khamis *et al.* (1984) on guava and olive seedlings, they found that stem length was depressed by salinity concentrations.

Concerning the specific effect of sodium adsorption ratio (SAR), it is quite clear that the increasing SAR from 3 to 6 in irrigation water resulted significantly depressing the stem length of seedlings in both apricot and mango seedlings during two seasons of study. Moreover, both two fruit species under study were equally the same regarding the response of their seedlings to SAR. Similar observation was also found by El-Deen *et al.* (1979) on olive seedlings, Behairy *et al.* (1984) on Thompson seedless and American grape, Khamis *et al.* (1984) on guava and olive seedlings and Abd El-Aziz *et al.* (1985) on some citrus rootstocks seedlings. They found that sodium adsorption ratio (SAR) resulted in significant reduction of plant height.

Table (2): Stem length (cm) of apricot and mango seedlings as influenced by salt concentration, sodium adsorption ratio, Cl : SO_4 ratio and their combinations in saline irrigation water during 1994 and 1995 seasons.

Treatments SAR / Conc.xCl ratio	Apricot						Mango					
	1994			1995			1994			1995		
	3	6	Mean*	3	6	Mean*	3	6	Mean*	3	6	Mean*
Tab water , control	89.5a	89.5a	89.5A	71.1a	71.1a	71.1A	56.4a	56.4a	56.4A	70.0a	70.0a	70.0A
Low Cl 2000 ppm	88.6a	76.6b	79.3B	68.7a	58.0b	61.3B	51.6b	45.0c	47.8B	63.1b	58.0cd	59.6B
High Cl 2000 ppm	79.3b	73.0c		60.5b	58.0b		50.0b	44.0c		62.6bc	54 5de	
Low Cl 4000 ppm	68.6d	59.3ef	61.6C	52.1bc	49.6c	49.3C	40.1d	35.1ef	37.C	51.6ef	46 8fg	48.0C
High Cl 4000 ppm	62.0e	56.6fg		49.0c	46.3cd		38.1de	34.5f		49.9ef	43.8gh	
Low Cl 6000 ppm	66.5d	54.6g	58.4D	42.2d	41.5d	42.0D	33.4fg	29.1hi	30.0D	42.1gh	36.5ij	38.2D
High Cl 6000 ppm	57.0fg	55.3g		42.1f	42.3f		31.1gh	26.0i		40.5hi	34.1ij	
Mean**	73.1A	66.4B		55.1A	52.4B		43.0A	38.6B		54.2A	49.1B	
Means for***	Low	High		Low	High		Low	High		Low	High	
Cl : SO_4 ratio	72.8A	70.3B		56.8A	55.0A		43.4A	42.1B		54.2A	53.0B	

*, **, ***: Means refere to specific effect of salinity concentration, SAR and CL : SO_4 ratio, respectively.
values within the same column or row for any of the 3 investigated factors were individually differentiated by capital letters, while for interaction small letters were used, as means followed by same letter/s were not significantly difference.

As for the specific effect of the $Cl:SO_4$ ratio of saline solution used for irrigation on stem length, it could be noticed from data in Table (2) that the higher ratio (increasing the level of chloride in irrigation water) resulted in a significantly decreased in both apricot and mango seedlings during two seasons of study. In this respect, Abd El-Aziz *et al.* (1985) on some citrus seedlings and Kabeel (1985) on some deciduous fruit species, they found that increasing $Cl:SO_4$ ratio was not affected in stem length.

1.1.b. Interaction effect:

Reffering the interaction effect of the investigated three factors i.e., salinity concentration, SAR and $CL:SO_4$ ratio on stem length, data obtained in Table (2) showed that obviously the variable response of both apricot and mango seedlings to the different combinations of irrigation water used during two seasons. The most depressive irrigation solutions on stem length of both apricot and mango was that combination between the highest salinity concentration (6000 ppm) X SAR 3 or 6 X higher $Cl:SO_4$ ratio, whereas the lowest stem length was resulted. Moreover, two other combinations of 6000 ppm saline solution ranked second in an increasing order. On the other hand the lowest decrease in stem length was detected by those seedlings irrigated with 2000 ppm saline solution of SAR 3 and lower $Cl:SO_4$ ratio as compared to those continuously irrigated with tap water during 1994 and 1995 seasons for seedlings of two studied fruit species.

These results could be confirmed with those of Pandy and Divate (1976) who stated that shoot length in grape vines reduced considerably as the salts concentration increase. This results are in confirmity with the findings of Kabeel (1985) on some deciduous fruit species.

1.2. Effect on net increase in stem length:

1.2.a. Specific effect:

Concerning the specific effect of different factors involved in this study i.e. (salinity concentration, SAR and $Cl:SO_4$ ratio) on the net increase in stem length (cm), data obtained in Table (3) clearly show that

a significant effect for salts concentration in irrigation water, irrespective of both apricot and mango plants. It was also noticed from the obtained results that net increase in stem length (cm) decreased significantly with increasing the salts concentration in the irrigation water from tap water to 6000 ppm. On the other hand, the most depressive effect was always concomitant to the lowest concentration i.e., 6000 ppm during both seasons of study, irrespective of fruit species, however the 2000 ppm saline solution exhibited the lightest decrease. Meanwhile, the 4000 ppm concentration was intermediate in this concern, whereas differences between the three salinity concentrations were significant as each was compared to two other ones with both apricot and mango seedlings during 1994 and 1995 seasons. In addition, it could be noticed that apricot seedlings were more senstive to increasing salinity concentration than mango as rate of decrease was more acute with former fruit species than later.

Reffering the specific effect of SAR, it was quite clear that the highest ratio i.e. 6 resulted significantly in depressin the stem elongation of seedlings in both apricot and mango seedlings than the later one i.e. SAR3 during two seasons of study. Moreover, both two fruit species were equally the same regarding the response of their seedlings to SAR.

As for the specific of the $Cl:SO_4$ ratio of saline solution used for irrigation on net increase in stem length, it could be noticed from data in Table (3) that the higher ratio caused a significant decrease net increase in stem length than lower ratio in both fruit species during the study.

1.2.b. Interaction effect:

Regarding the interaction effect of the investigated there factors i.e. salinity concentration X SAR X $Cl:SO_4$ ratio, on net increase in stem length, data obtained in Table (3) showed obviously the variable response of both apricot and mango seedlings to the different combinations of irrigation water used during two seasons. The most depressive irrigation solution on net increase in stem length of both apricot and mango was

Table (3): Net increase in stem length (cm) of apricot and mango seedlings as influenced by salt concentration, sodium adsorption ratio, Cl : SO_4 ratio and their combinations in saline irrigation water during 1994 and 1995 seasons.

Treatments SAR / Conc.xCl ratio	Apricot						Mango					
	1994			1995			1994			1995		
	3	6	Mean*	3	6	Mean*	3	6	Mean*	3	6	Mean*
Tab water control	36.8a	36.8a	36.8A	30.9a	30.9a	30.9A	30.9a	30.9a	30.9A	38.6a	38.6a	38.6A
Low Cl 2000 ppm	34.4b	21.9d	25.7B	27.0a	15.7b	19.7B	25.8b	20.3c	22.5B	31.5b	26.0c	27.6B
High Cl 2000 ppm	26.5c	20.0e		20.3b	16.0b		25.0b	19.0c		29.5b	23.4c	
Low Cl 4000 ppm	13.8f	5.5h	7.7C	10.6c	7.1cd	7.8C	14.9d	10.4e	12.0C	19.3d	14.0e	15.9C
High Cl 4000 ppm	8.4g	3.0i		8.7cd	5.0de		13.5d	9.1ef		18.1d	12.1f	
Low Cl 6000 ppm	2.4i	1.0j	1.5D	1.8e	0.5e	1.1D	7.6fg	3.9h	4.8D	9.8fg	5.1h	6.2D
High Cl 6000 ppm	1.9j	0.5j		1.4e	0.7e		6.3g	1.6i		7.9g	2.0l	
Mean**	17.7A	12.7B		14.4A	10.8B		17.7A	13.6B		27.1A	17.3B	
Means for***	Low	High		Low	High		Low	High		Low	High	
Cl : SO_4 ratio	19.5A	16.7B		15.5A	14.2A		18.1A	17.0B		22.9A	21.3B	

*, **, ***: Means refere to specific effect of salinity concentration, SAR and CL : SO_4 ratio, respectively.
values within the same column or row for any of the 3 investigated factors were individually differentiated by capital letters, while for interaction small letters were used, as means followed by same letter/s were not significantly difference.

that combination between the highest salinity concentration (6000 ppm) X SAR6 X higher $Cl:SO_4$ ratio, whereas the lower net increase of stem length was resulted. Moreover, three other combinations of 6000 ppm saline solution ranked second in an increasing order. On the other hand, the lowest decresae in net increase of stem length was detected by those seedlings irrigated with 2000 ppm saline solution of SAR3 and lower $Cl:SO_4$ ratio as compared to those continuously irrigated with tap water during both 1994 and 1995 seasons for seedlings of two studied fruit species. Moreover, it could be noticed obviously that mango seedlings were relatively more tolerant to saline solutions than apricot especially as those solutions (combinations) of the higher SAR were concerned to be compared.

1.3. Effect on number of leaves per plant:

1.3.a. Specific effect:

Concerning the specific effect of the different factors involved in this study i.e. (salinity concentration, SAR and $Cl:SO_4$ ratio) on the number of leaves per plant data as shown in Table (4) revealed that total number of leaves per seedling decreased, in general, with increasing salt concentration in the irrigation water for both apricot and mango seedlings during two seasons. Such decrease was significant within the three salts concentration of 2000, 4000 and 6000 ppm as compared to those of tap water irrigated (control) seedlings. In addition, the saline irrigation treatment of 6000 ppm salts in the irrigation water was the great injurious effect on leaf number per plant. These findings are in harmony with those obtained by Pandey and Divate (1976) on grape vine, El-Deen *et al.* (1979) on olive seedlings and Abd El-Karim (1991) on mango varieties who found that number of leaves per plant decreased considerably with increasing salt concentration in irrigation water.

Regarding the specific effect of SAR, data as shown in Table (4) revealed that the higher ratio of SAR6 resulted significantly in depressing the number of leaves/plant than the lower one i.e. SAR3 in both apricot and mango seedlings during two seasons of study. This results is in

Table (4): Number of leaves/plant of apricot and mango seedlings as influenced by salt concentration, sodium adsorption ratio, Cl : SO_4 ratio and their combinations in saline irrigation water during 1994 and 1995 seasons.

Treatments SAR / Conc.xCl ratio	Apricot						Mango					
	1994			1995			1994			1995		
	3	6	Mean*	3	6	Mean*	3	6	Mean*	3	6	Mean*
Tab water control	56.8a	56.8a	56.8A	53.3a	53.3a	53.3A	30.0a	30.0a	30.0A	36.3a	36.3a	36.3A
Low Cl	55.0a	43.0b	45.3B	50.5a	41.3bc	43.1B	28.0a	23.5b	24.9B	34.0a	30.8b	31.1B
2000 ppm High Cl	45.8b	37.5c		44.5b	36.0cd		24.3b	23.8b		30.8b	28.8bc	
Low Cl	36.3c	26.3de	28.6C	32.8de	24.5f	26.8C	21.5bc	19.5cd	19.3D	28.8bc	26.5cde	26.8C
4000 ppm High Cl	27.8d	24.0def		27.8ef	22.3f		19.5cd	16.8de		27.3cd	24.5def	
Low Cl	23.3ef	21.0f	23.0D	22.0f	22.0f	22.2D	16.5de	15.0e	15.1C	23.5efg	20.5g	20.6D
6000 ppm High Cl	24.5def	23.3ef		23.8f	21.0f		15.0f	14.0e		21.5fg	17.0h	
Mean**	48.5A	33.1B		36.4A	31.5B		22.1A	20.4B		29.0A	26.2B	
Means for***	Low	High		Low	High		Low	High		Low	High	
Cl : SO_4 ratio	39.7A	37.0B		37.4A	35.2B		23.0A	21.7B		29.6A	27 8B	

*, **, ***: Means refere to specific effect of salinity concentration, SAR and CL : SO_4 ratio, respectively.
values within the same column or row for any of the 3 investigated factors were individually differentiated by capital letters, while for interaction small letters were used, as means followed by same letter/s were not significantly difference.

agreement with that reported by El-Deen *et al.* (1979) found that increasing SAR resulted in a significant reduction of number of leaves in olive seedlings.

As for the specific effect of the $Cl:SO_4$ ratio of saline used for irrigation in number of leaves/plant, it could be observed from data in Table (4) the higher ratio resulted in a significant decrease number of leaves (plant in both fruit species than the lower one regardless salt concentration and SAR during the study similar results was also found by Kabeel (1985) on some deciduous fruit.

Reffering the interaction effect of the investigated three factors i.e. salinity concentration, SAR and $Cl:SO_4$ ratio on number of leaves. Table (4) shows a considerable and statistical effect in both seasons of study where the most depressive irrigation solution on number of leaves/plant of both apricot and mango was that combination between the highest salinity concentration (6000 ppm) X SAR3 or 6 X higher $Cl:SO_4$ ratio whereas the lowest number of leaves/plant was resulted. Moreover, four other combinations of (4000 ppm) salin solution ranked second in an increasing order. In addition, the lowest decrease in number of leaves/plant was detected by apricot and mango seedlings irrigated with 2000 ppm saline solution with SAR3 and lower $Cl:SO_4$ ratio as compared with control during 1994 and 1995 seasons. These results could be partially confirmed with those of Kabeel (1985) who stated that number of leaves per plant in some deciduous fruit seedlings was slightly decrease and not significant.

1.4. Effect on net increase in number of leaves per plant:

1.4.a. Specific effect:

The obtained results as shown in Table (5) revealed that salinizing irrigation water with $CaCl_2$, $MgSO_4$, KCl, K_2SO_4, Na_2SO_4 and NaCl at different concentrations had in general significant effect on net incresae in number of leaves/plant of apricot and mango seedlings. To clarify this, it was noticed that net increase of leaf number/plant decreased with

increasing salts concentration to reach its minimum value at the high salts concentration of 6000 ppm during 1994 and 1995 seasons, irrespective of fruit species. However, the 2000 ppm saline solution exhibited the lightest decrease. In addition, the 4000 ppm concentration was intermediate in this concern. Moreover, differences between the three salinity concentrations were significant as each was compared to two other ones with both apricot and mango seedlings during two seasons of study.

These results could be confirmed with the findings of many others investigators such as Pandey and Divate (1976) on grape vines, Jindal *et al.* (1976) on mango seedlings, Patial *et al.* (1984) on guava plants and Abd El-Karim (1991) on mango seedlings whose results revealed depressive or adverse effects for high salinity levels on the different growth parameters.

Concerning the specific effect of SAR, it was quite clear that the higher ratio i.e., SAR6 resulted significantly in decreased net increased leaf number/plant in both apricot and mango than the lower one i.e., SAR3 during two seasons of study.

As for the specific effect of the $Cl:SO_4$ ratio of saline water used for irrigation on net increase of leaf number/plant, data as shown in Table (5) revealed that higher ratio were significantly the lowest net increase of leaf number/plant as compared to the lowest one in both two fruit species under study during 1994 and 1995 seasons.

1.4.b. Interaction effect:

Table (5) indicates a significant interaction between salinity concentration, SAR and $Cl:SO_4$ ratio, on net increase of leaf number/plant. Anyhow, both apricot and mango seedlings irrigated with 6000 ppm saline water with SAR6 and high level of $Cl:SO_4$ ratio had the lowest net increase of leaf number/plant, whereas the lowest net increase of leaf number was resulted. Moreover, three other combinations of 6000 ppm saline solution in an increasing order.

Table (5): Net increase in number of leaves/plant of apricot and mango seedlings as influenced by salt concentration, sodium adsorption ratio, Cl : SO_4 ratio and their combinations in saline irrigation water during 1994 and 1995 seasons.

Treatments SAR / Conc.xCl ratio	Apricot						Mango					
	1994			1995			1994			1995		
	3	6	Mean*	3	6	Mean*	3	6	Mean*	3	6	Mean*
Tab water (, control	36.5a	36.5a	36.5A	34.3a	34.3a	34.3A	16.5a	16.5a	16.5A	20.3a	20.3a	20.3A
Low Cl	34.5b	20.3d		31.5a	19.3c		14.5b	10.5cd		17.8b	13.5c	
2000 ppm			24.4B			23.0B			11.6B			14.4B
High Cl	25.5c	17.5e		24.8b	16.3cd		11.5c	9.8d		14.5c	12.0d	
Low Cl	14.3f	5.3g		12.8d	5.0ef		8.3e	6.3f		10.5de	8 5fg	
4000 ppm			7.3C			6 8C			6.4C			8.8C
High Cl	6.5g	3.3h		6.8e	2.5fg		6.8f	4.5g		9.5ef	6.8g	
Low Cl	2.3hi	1.0i		2.0fg	1.3g		3.5g	1.3h		5.0h	2.0ij	
6000 ppm			1.6D			1.7D			1.9D			2.8D
High Cl	2.0hi	1.0i		2.5fg	1.0g		2.0h	1.0h		3.0i	1.0j	
Mean**	17.4A	15.2B		16.4A	1.4B		9.0A	7.1B		11.5A	9.2B	
Means for***	Low	High		Low	High		Low	High		Low	High	
Cl : SO_4 ratio	18.8A	16.1B		17.5A	15.3B		9.7A	8.6B		12.2A	10.9B	

*, **, ***: Means refere to specific effect of salinity concentration, SAR and CL : SO_4 ratio, respectively.
values within the same column or row for any of the 3 investigated factors were individually differentiated by capital letters, while for interaction small letters were used, as means followed by same letter/s were not significantly difference.

On the other hand, the lowest decrease in net increase of leaf number/plant was detected by those seedlings irrigated with 2000 ppm saline solutions with SAR3 and lower $Cl:SO_4$ ratio as compared with plants irrigated with tap water during two seasons of study for apricot and mango plants.

1.5. Effect on root length (cm):

1.5.a. Specific effect:

Data concerning the specific effect of salt concentration, SAR and and $Cl:SO_4$ ratio on root length are presented in Table (6).

Generally the data indicated that the depression in root length (cm) were closely associated with increasing salt concentration in irrigation water as compared with control (tap water treatment) in both two fruit species during two seasons of study. Moreover, all salt concentration significantly depressed root length, such decrease was more remarkable with the higher concentration (6000 ppm), however, the 2000 ppm saline solution exhibited the lowest decrease. Meanwhile, the 4000 ppm concentration was intermediate in this respect, whereas differences between the three salinity concentrations were significant as each was compred to two other ones with both apricot and mango seedlings during 1994 and 1995 seasons. In this concentration, the findings of Hayward and Long (1942) found that the total concentration of salts was a major factor in the general growth depression on peach. Haward and Spurr (1943) concluded that the increase in osmotic pressure of saline soil solution tended to restrict the uptake of by roots on corn.

Barakat *et al.* (1982) on guava and olive disclosed that the depressing effect of salts was ponded to the type of salts.

Concerning the specific effect of SAR, it was quite clear that, increasing sodium adsorption ratio (SAR) from 3 to 6 in irrigation water significantly in depressed the root length of seedlings in both apricot and mango during two seasons of study.

Table (6): Root length (cm) of apricot and mango seedlings as influenced by salt concentration, sodium adsorption ratio, Cl : SO_4 ratio and their combinations in saline irrigation water during 1994 and 1995 seasons.

Treatments SAR / Conc.xCl ratio	Apricot						Mango					
	1994			1995			1994			1995		
	3	6	Mean*	3	6	Mean*	3	6	Mean*	3	6	Mean*
Tab water control	36.5a	36.5a	36.5A	33.4a	33.4a	33.4A	45.1a	45.1a	45.1A	46.0a	46.0a	46.0A
Low Cl	32.8b	24.6d	27.4B	30.4b	23.8c	25.8B	43.0b	39.9cd	40.8B	43.8b	40.3cd	41.0B
2000 ppm High Cl	28.3c	24.1d		25.8c	23.4c		41.4bc	39.0d		41.5c	38.5de	
Low Cl	20.8e	16.9g	18.0C	20.9d	17.5ef	18.3C	36.4e	29.9g	31.4C	36.8e	30.0g	31.6C
4000 ppm High Cl	18.8f	15.8h		19.6e	15.1fg		32.6f	26.7h		33.5f	26.3h	
Low Cl	14.6hi	12.8jk	13.1D	13.0g	11.0j	11.2D	24.0i	17.0k	19.07D	23.5i	15.5k	17.3D
6000 ppm High Cl	13.8ij	11.4k		13.5g	7.4h		21.1j	14.2l		19.8j	10.3l	
Mean**	23.6A	20.3B		22.4A	19.0B		35.0A	30.3B		35.0A	39.6B	
Means for***	Low	High		Low	High		Low	High		Low	High	
Cl : SO_4 ratio	24.4A	23.1B		22.9A	21.4B		35.0A	33.1B		35.2A	32.8B	

*, **, ***: Means refere to specific effect of salinity concentration, SAR and CL : SO_4 ratio, respectively.
values within the same column or row for any of the 3 investigated factors were individually differentiated by capital letters, while for interaction small letters were used, as means followed by same letter/s were not significantly difference.

As for the specific effect of the $Cl:SO_4$ ratio of saline solution used for irrigation on root length. It is quite clear from the present data in Table (6) that root length significantly decreased with higher ratio than lower one in both two fruit species.

1.5.b. Interaction effect:

With respect to interaction between concentration level, SAR and $Cl:SO_4$ ratio on root length are presented in Table (6). Generally, the data indicated that root length of the irrigated either apricot or mango seedlings with saline solutions were significant depressed as compared with control during the study.

The most depressive irrigation solution root length of both apricot and mango was that combination between the highest salinity concentration (6000 ppm) X SAR6 X higher $Cl:SO_4$ ratio, whereas the lowest increase in root length was resulted. Moreover, three other combinations of 6000 ppm saline solution ranked second in an increasing order. On the other hand, the lowest decrease in root length was found by those seedlings irrigated with 2000 ppm, saline solution of SAR3 X lower $Cl:SO_4$ ratio as compared with control during 1994 and 1995 seasons for two studied fruit species.

1.6. Effect on the dry weight on plant organs (leaves, stem, roots and total plant dry weights):

Data presented in Tables (7, 8, 9 and 10) show the effect of salts concentration in irrigation water, sodium adsorption ratio (SAR), $Cl:SO_4$ ratio and their interaction on the dry weight on plant organs (leaves, stem, roots and total plant dry weight) of both apricot and mango seedlings.

1.6.a. Specific effect:

Concerning the specif effect of salinity concentration, data obtained revealed that, the plant organs dry weight were gradually decreased by increasing the level of salinity for both fruit species during two seasons. Such decrease was significant as compared to those of tap

water irrigated seedlings. On the other hand, the greatest loss in the dry weight of plant organs (leaves, stem and roots) as well as total plant dry weight were noticed at the highest level salts concentration (6000 ppm) during both seasons of study, irrespective of fruit species, however, the 2000 ppm saline solution showed the lowest loss in the dry weight of plant organs. Meanwhile, the 4000 ppm concentration was intermediate in this concern, whereas the differences between the three salinity concentrations were significant as each was compared to two other ones with both apricot and mango seedlings during two seasons of study. Such results appeared to agree with those obtained by Jindal *et al.* (1976) on mango cultivar; Rokba *et al.* (1979) on some citrus rootstocks; Behairy *et al.* (1984) on Thompson and American grape plants, Gaser (1986) on Avocado, El-Hawary (1987) on grape and Abd-El-Karim (1991) on mango seedlings, all they found that the dry weight of plant organs was decreased gradually by increasing the level of salinity in the irrigation water. Such decrease in the plant dry weight, under stress of salinity, may be due to the physiological hunger.

With respect to the specific effect of sodium adsorption ratio, it was quite clear that the increasing SAR from 3 to 6 in irrigation water significantly decreased dry weight in plant organs in both fruit species during two seasons of study. Moreover, both apricot and mango were equally the same regarding the response of their seedlings to SAR. These results is in agreement with that reported by Khamis *et al.* (1984) on guava and olive seedlings, and Behairy *et al.* (1984) on Thompson, American grape plants and Kabeel (1985) on some deciduous fruit species.

Regarding the specific effect of the $Cl:SO_4$ ratio of saline solution used for irrigation on the dry weight of plant organs (leaves, shoots, roots and total plant dry weight) are found in Tables (7, 8, 9 and 10). It is noticed from the obtained data that the dry weight of the $Cl:SO_4$ ratio, showed significant decrease in both fruit species during 1994 and 1995 seasons except leaves, roots and total plant dry weight of appricot

Table (7): Leaves dry weight (gm) of apricot and mango seedlings as influenced by salt concentration, sodium adsorption ratio, Cl : SO_4 ratio and their combinations in saline irrigation water during 1994 and 1995 seasons.

Treatments SAR / Conc.xCl ratio	Apricot						Mango					
	1994			1995			1994			1995		
	3	6	Mean*	3	6	Mean*	3	6	Mean*	3	6	Mean*
Tab water control	1.13a	1.13a	1.13A	1.10a	1.10a	1.10A	4.00a	4.00a	4.00A	5.00a	5.00a	5.00A
Low Cl	1.00b	0.90c	0.90B	0.91b	0.85bc	0.90B	3.21b	2.30d	2.60B	4.52b	4.00c	4.21B
2000 ppm High Cl	0.93c	0.86d		0.84bc	0.80bc		2.80c	2.00e		4.60b	3.70c	
Low Cl	0.90c	0.70f	0.70C	0.75c	0.53d	0.60C	2.00e	1.52g	1.60C	3.20d	2.21f	2.53C
4000 ppm High Cl	0.81e	0.50g		0.80bc	0.42e		1.54g	1.35gh		2.70e	2.01f	
Low Cl	0.24h	0.16i	0.20D	0.23f	0.20fg	0.20D	1.30gh	0.80ig	0.90D	1.60g	1.40g	1.42D
6000 ppm High Cl	0.20i	0.12k		0.20fg	0.11g		1.0hi	0.62j		1.50g	1.20g	
Mean**	0.74A	0.62B		0.70A	0.60B		2.32A	2.10B		3.30A	2.78B	
Means for***	Low	High		Low	High		Low	High		Low	High	
Cl : SO_4 ratio	0.80A	0.70B		0.70A	0.70A		2.40A	2.20B		3.30A	3.10B	

*, **, ***: Means refere to specific effect of salinity concentration, SAR and CL : SO_4 ratio, respectively.
values within the same column or row for any of the 3 investigated factors were individually differentiated by capital letters, while for interaction small letters were used, as means followed by same letter/s were not significantly difference.

Table (8): Stem dry weight (gm) of apricot and mango seedlings as influenced by salt concentration, sodium adsorption ratio, Cl : SO_4 ratio and their combinations in saline irrigation water during 1994 and 1995 seasons.

Treatments SAR / Conc.xCl ratio	Apricot						Mango					
	1994			1995			1994			1995		
	3	6	Mean*	3	6	Mean*	3	6	Mean*	3	6	Mean*
Tab water (control	5.22a	5.22a	5.22A	4.20a	4.20a	4.20A	7.73a	7.73a	7.73A	10.60a	10.60a	10.60A
Low Cl	4.22b	2.92d	3.30B	3.20b	2.40c	2.70B	6.91b	5.90c	6.30B	9.50b	8.00c	8.54B
2000 ppm												
High Cl	3.40c	2.62e		3.10b	2.10c		6.70b	5.64c		9.12b	7.60d	
Low Cl	2.48e	1.80f	1.94C	2.02cd	1.62d	1.81C	4.81d	3.44e	3.90C	6.31e	4.70g	5.31C
4000 ppm												
High Cl	1.83f	1.70f		2.20c	1.40ef		4.24e	2.90f		5.81f	4.50gh	
Low Cl	1.50g	1.05i	1.21D	1.11fg	0.80g	0.90D	2.81f	2.40f	2.40D	4.20h	3.21i	3.33D
6000 ppm												
High Cl	1.33h	0.99i		1.00fg	0.80g		2.60f	1.74g		3.50i	3.43i	
Mean**	2.85A	2.32B		2.40A	1.90B		5.11A	4.30B		7.01A	6.00B	
Means for***	Low	High		Low	High		Low	High		Low	High	
Cl : SO_4 ratio	3.05A	2.80B		2.40A	2.40A		5.71A	4.90B		7.13A	6.80B	

*, **, ***: Means refere to specific effect of salinity concentration, SAR and CL : SO_4 ratio, respectively.
values within the same column or row for any of the 3 investigated factors were individually differentiated by capital letters, while for interaction small letters were used, as means followed by same letter/s were not significantly difference.

Table (9): Root dry weight (gm) of apricot and mango seedlings as influenced by salt concentration, sodium adsorption ratio, Cl : SO_4 ratio and their combinations in saline irrigation water during 1994 and 1995 seasons.

Treatments SAR / Conc.xCl ratio	Apricot						Mango					
	1994			1995			1994			1995		
	3	6	Mean*	3	6	Mean*	3	6	Mean*	3	6	Mean*
Tab water (control	7.70a	7.70a	7.70A	4.24a	4.24a	4.24A	6.01a	6.01a	6.01A	6.30a	6.30a	6.30A
Low Cl 2000 ppm	6.53b	4.80d	5.30B	3.64b	3.30c	3.27B	5.10b	3.80cd	4.25B	5.40b	3.94d	4.45B
High Cl 2000 ppm	5.33c	4.40e		3.42bc	2.72d		4.60bc	3.50cd		4.84c	3.60e	
Low Cl 4000 ppm	4.10e	3.03f	3.30C	2.60d	1.74f	2.13C	3.21de	2.60efg	2.73C	3.40e	2.70f	3.00C
High Cl 4000 ppm	3.20f	2.90f		2.30e	1.90f		2.81ef	2.31fgh		3.20e	2.40fg	
Low Cl 6000 ppm	2.50g	2.03h	2.10D	3.40bc	1.20g	1.72D	2.00hi	1.54hi	1.73D	2.10gh	1.60ij	1.80D
High Cl 6000 ppm	2.20gh	1.70i		1.40g	0.90h		1.80hi	1.42i		1.92hi	1.44j	
Mean**	4.50A	3.80B		3.00A	2.30A		3.64A	3.02B		4.33A	3.20B	
Means for*** Cl : SO_4 ratio	Low	High		Low	High		Low	High		Low	High	
	4.81A	4.42B		2.30A	2.63A		3.80A	3.54A		4.00A	3.70B	

Interact. : Conc. x SAR x Cl. :

*, **, ***: Means refere to specific effect of salinity concentration, SAR and CL : SO_4 ratio, respectively.

values within the same column or row for any of the 3 investigated factors were individually differentiated by capital letters, while for interaction small letters were used, as means followed by same letter/s were not significantly difference.

Table (10): Total plant dry weight (gm) of apricot and mango seedlings as influenced by salt concentration, sodium adsorption ratio, Cl : SO_4 ratio and their combinations in saline irrigation water during 1994 and 1995 seasons.

Treatments SAR / Conc.xCl ratio	Apricot						Mango					
	1994			1995			1994			1995		
	3	6	Mean*	3	6	Mean*	3	6	Mean*	3	6	Mean*
Tab water ( ) control	14.30a	14.30a	14.30A	9.43a	9.43a	9.43A	17.73a	17.73a	17.73A	21.82a	21.82a	21.82A
Low Cl	11.71b	8.60cd	9.40B	7.70b	6.32c	6.75B	15.22b	11.94d	12.81B	19.40b	15.90d	17.10B
2000 ppm High Cl	9.62c	7.90cd		7.40b	5.60cd		14.03c	10.04e		18.30c	14.81e	
Low Cl	7.50de	5.50fg	6.00C	4.60e	4.10ef	4.40C	8.44f	6.90gh	7.31C	12.80f	9.60h	10.73C
4000 ppm High Cl	5.93ef	5.00gh		5.30d	3.50fg		7.30g	6.60gh		11.70g	8.82i	
Low Cl	4.20fghi	3.23hi	3.50D	2.82gh	2.10hi	2.30D	6.10hi	4.71j	4.91D	8.10j	6.20l	6.55D
6000 ppm High Cl	3.70ghi	2.80i		2.5h	1.73i		5.31ij	3.54k		6.90k	5.00m	
Mean**	8.60A	7.70B		5.70A	4.70B		10.60A	8.80B		14.14A	12.00B	
Means for* **	Low	High		Low	High		Low	High		Low	High	
Cl : SO_4 ratio	8.70A	7.61B		5.80A	5.60A		11.10A	10.30B		14.44A	13.70B	

*, **, ***: Means refere to specific effect of salinity concentration, SAR and CL : SO_4 ratio, respectively.
values within the same column or row for any of the 3 investigated factors were individually differentiated by capital letters, while for interaction small letters were used, as means followed by same letter/s were not significantly difference.

seedlings during 1995 and root dry weight of mango seedlings during 1994 seasons. This result agree with the findings of Abd El-Aziz (1985) in some citrus rootstocks and Kabeel (1985) in Thompson seedless garpe, Meet-Ghamr peach and Halywood plum seedlings.

Concerning the effect of the interaction of the three investigated three factors i.e., salinity concentration, SAR and $Cl:SO_4$ ratio, on the dry weight of plant organs leaves, stem and roots) as well as total plant dry weights are presented in Tables (7, 8, 9 and 10). It is quite clear that the effect was significantly decreased as compared with control in two fruit species during two seasons of study. In this respect; Kabeel (1985) on some deciduous species, found that dry weight of plant organs was slightly decreased with the interaction between salt concentration X SAR X chloride levels.

1.7. Effect on top/root ratio:

Data presented in Table (11) show the specific effect of salts concentration, SAR and $Cl:SO_4$ ratio and their interaction on top/root ratio of two fruit species.

1.7.a. Specific effect:

Data concerning the specific effect of salts concentration on top/root, it was quite clear that tap/root ratio in both aprico and mango seedlings did not differ by increasing salt concentration except when apricot plants irrigated with 6000 ppm in both season and mango plants irrigated with 4000 ppm during first season, the decrease in top/root ratio was significant.

As for the specific effect of both sodium adsorption ratio (SAR) and $Cl:SO_4$ ratio used for irrigation on top/root ratio, it could be noticed from data in Table (11) that top/root ratio did not differe by either increasing SAR from 3 to 6 or $Cl:SO_4$ ratio in both apricot and mango seedlings during two seasons of study. In this respect, Khamis *et al.*

Table (11): Top : root ratio of apricot and mango seedlings as influenced by salt concentration, sodium adsorption ratio, Cl : SO_4 ratio and their combinations in saline irrigation water during 1994 and 1995 seasons.

Treatments SAR / Conc.xCl ratio	Apricot						Mango					
	1994			1995			1994			1995		
	3	6	Mean*	3	6	Mean*	3	6	Mean*	3	6	Mean*
Tab water control	0.80a	0.80a	0.80A	1.22a	1.22a	1.22A	2.0abcd	2.0abcd	2.00A	2.50d	2.50d	2.50A
Low Cl 2000 ppm	0.80a	0.80a	0.80A	1.20ab	1.30a	1.20A	2.1abc	2.2a	2.00A	2.60bcd	3.00ab	2.90A
High Cl 2000 ppm	0.81a	0.80a		1.20ab	1.10ab		2.1abc	1.9abcd		2.8abcd	3.20a	
Low Cl 4000 ppm	0.81a	0.80a	0.80A	1.10ab	1.10ab	1.10A	1.63bc	1.70cd	1.68B	2.8abcd	2.55d	2.72A
High Cl 4000 ppm	0.85a	0.74a		1.30a	0.90bc		1.60d	1.8abcd		2.73bcd	2.8abcd	
Low Cl 6000 ppm	0.70a	0.60a	0.72B	0.90bc	0.70c	0.90B	2.11ab	2.04e	1.97A	2.94abc	2.9abcd	2.73A
High Cl 6000 ppm	0.70a	0.66a		0.90bc	1.00abc		2.04abc	1.73bcd		2.60bcd	2.50d	
Mean**	0.80A	0.75A		1.11A	1.10A		1.94A	1.92A		2.72A	2.70A	
Means for***	Low	High		Low	High		Low	High		Low	High	
Cl : SO_4 ratio	0.80A	0.80A		1.10A	1.10A		2.00A	1.90A		2.71A	2.70A	

*, **, ***: Means refere to specific effect of salinity concentration, SAR and CL : SO_4 ratio, respectively.
values within the same column or row for any of the 3 investigated factors were individually differentiated by capital letters, while for interaction small letters were used, as means followed by same letter/s were not significantly difference.

(1984) on guava and olive seedlings mentioned that top/root ratio was decreased in response to increasing the SAR level.

1.7.b. Interaction effect·

Table (11) show that there was no significant effect for the interaction between such three studied factors on top/root ratio in both apricot and mango seedlings during 1994 and 1995 seasons. This may indicates that such three factors did not act to gether for affecting top/root ratio.

2. Effect of salts concentration, sodium adsorption ratio (SAR) and $Cl:SO_4$ ratio in irrigation water on leaves mineral content:

The data concerning the effect of different salt concentrations, sodium adsorption ratio (SAR) and $Cl:SO_4$ ratio (chloride levels) on leaf N, P, K, Ca, Mg, Na, Zn, Fe and Mn contents of both apricot and mango seedlings are presented in Tables (12, 13, 14, 15, 16, 17, 18, 19 and 20).

2.1. Effect on leaf nitrogen content:

2.1.a. Specific effect:

Concerning the effect of different salt concentration in the irrigation water on leaf nitrogen content of both two fruit species, it is obvious from the results of the Table (12) that nitrogen level in leaves decreased significantly with increasing salts concentration in the irrigation water comparing with those of the control (tap water) in both two fruit species during two seasons of study (Nitrogen status reflects the physiology of the whole plants as well as its interaction with its surrounding) under saline conditions there were disturbances in the nitrogen metabolism in plants.

These results are similar to those obtained by Abd El-Ghani (1990) on peach, Abd El-Karim (1991) on mango, Abdel-Messih *et al.* (1979) on some citrus rootstock seedlings, Abd El-Aziz *et al.* (1985) on guava and olive seedlings, Sharaf *et al.* (1985) on Thompson seedlings and American Grape Behairy *et al.* (1985) on guava and olive seedlings and

Table (12): Leaf nitrogen content (%) of apricot and mango seedlings as influenced by salt concentration, sodium adsorption ratio, Cl : SO_4 ratio and their combinations in saline irrigation water during 1994 and 1995 seasons.

Treatments SAR / Conc.xCl ratio	Apricot						Mango					
	1994			1995			1994			1995		
	3	6	Mean*	3	6	Mean*	3	6	Mean*	3	6	Mean*
Tab water control	2.58a	2.58a	2.58A	2.38a	2.38a	2.38A	2.20a	2.20a	2.20A	1.94a	1.94a	1.94A
Low Cl	2.42b	2.25d	2.29B	2.28ab	2.16bc	2.18B	1.99ab	1.62bcd	1.73B	1.87a	1.47bc	1.58B
2000 ppm High Cl	2.33c	2.17e		2.21abc	2.07cd		1.81abc	1.48cde		1.65b	1.33cd	
Low Cl	2.11f	1.63g	1.71C	1.89de	1.53fg	1.63C	1.32def	1.2efgh	1.20C	1.23cd	0.99ef	1.08C
4000 ppm High Cl	1.66g	1.45h		1.73ef	1.37gh		1.2defg	1.06k		1.17de	0.90fg	
Low Cl	1.33i	1.23j	1.25D	1.20hi	1.04i	0.99D	0.9fghhi	0.80hi	0.83D	0.89fgh	0.78gh	0.80D
6000 ppm High Cl	1.26j	1.17k		1.13i	0.55j		0.84ghi	0.74i		0.83fgh	0.69h	
Mean**	2.00A	1.86B		1.83A	1.60B		1.47A	1.30B		1.37A	1.15B	
Means for***	Low	High		Low	High		Low	High		Low	High	
Cl : SO_4 ratio	2.17A	1.93B		1.86A	1.73B		1.53A	1.44B		1.39A	1.30B	

*, **, ***: Means refere to specific effect of salinity concentration, SAR and CL : SO_4 ratio, respectively.
values within the same column or row for any of the 3 investigated factors were individually differentiated by capital letters, while for interaction small letters were used, as means followed by same letter/s were not significantly difference.

Kabeel (1985) on three deciduous fruit species. They stated that increasing the salt concentration in irrigation water decreased leaf nitrogen content with increasing salt concentration in irrigation water.

As for the specific effect of different two levels of sodium adsorption ratio (SAR) in the irrigation water on both apricot and mango leaf nitrogen content, data are presented in Table (12). The results show that the nitrogen content in leaves was significant by decreased by increasing sodium adsorption ratio (SAR) from 3 to 6 during the study. In this respect; Abd El-Aziz *et al.* (1985) on guava and olive, Sharif *et al.* (1985) on Thompson seedless and American grape, Kabeel (1985) on three deciduous fruit seedlings and Al-Khateeb (1989) on some fig varieties. They found that leaf nitrogen content was slightly decreased by increasing sodium adsorption ratio (SAR) but not significantly.

With respect to the specific effect of $Cl:SO_4$ ratio (chloride levels) on leaf-N content, data from Table (12) show clearly that the higher ratio was significantly decrease in both two fruit species during 1994 and 1995 seasons. This results are in harmony with reported by El-Ashram *et al.* (1985) on some citrus rootstock seedlings and Kabeel (1985) on three deciduous fruit species.

2.1.b. Interaction effect:

Reffering the interaction effect of the investigated three factors i.e., salinity concentration, SAR and $Cl:SO_4$ ratio on leaf nitrogen content, data obtained in Table (12) showed obviously the variable response of both apricot and mango seedlings to the different combinations of irrigation water used during two seasons. The most depressive irrigation solution on leaf nitrogen of both apricot and mango was that combinations between the highest salinity concentration (6000 ppm X SAR6 X higher $Cl:SO_4$ ratio as compared to control during two seasons of study. Moreover, either combinations treatments are in between in this concern.

2.2. Effect on leaf phosphorus content:

2.2.a. Specific effect:

As shown in Table (13), it is clear that phosphorous level in both apricot and mango leaves was significantly affected by salt concentration in the irrigation water. In this regard, phosphorus level increased in apricot seedlings with increasing salts concentration in the irrigation water while in mango seedlings, leaf-P content decreases as salinity level increases. These results are in accordance with those obtained by El-Kholi *et al.* (1979) on oranges, and Salem (1981) on grape vines. They reported that P-content decreases as salinity level increase.

The obtained results are also in line with those reported by Jundel *et al.* (1979) on mango seedlings. They stated that leaf-P content was reduced at all salinity level (2-10 mmhos/cm) in soil to sodium chloride was added. However, significant decreases in phosphorus level at the high salt concentration of 3000 and 6000 ppm were detected in leaves but not in roots.

These results could be confirmed by those El-Azab and Minessy (1975) who observed that P-concentration in Thompson seedless grapevine leaves treated with 1500 and 3000 ppm NaCl + $CaCl_2$ (1:1 by weight) was lower than that in roots.

On the other hand, other studies have revealed that salinity treatments increased leaf and root phosphorus content, Abd El-Karim (1991) on some mango varieties El-Azab *et al.* (1978) on apricot and peach and Abdel-Messih *et al.* (1984) on the Washington Navel orange. Another trend was also obtained by Ragab (1979) and Sherif (1985) on some citrus rootstocks. They found that salinity did not significantly change leaf-P content of some citrus rootstocks. This contradiction of findings may be attributed to the different response of fruit species to the saline solutions.

Table (13): Leaf phosphorus content (%) of apricot and mango seedlings as influenced by salt concentration, sodium adsorption ratio, Cl : SO_4 ratio and their combinations in saline irrigation water during 1994 and 1995 seasons.

Treatments SAR / Conc.xCl ratio	Apricot						Mango					
	1994			1995			1994			1995		
	3	6	Mean*	3	6	Mean*	3	6	Mean*	3	6	Mean*
Tab water control	0.10h	0.10h	0.10A	0.09a	0.09a	0.09A	0.32a	0.32a	0.32A	0.30a	0.30a	0.30A
Low Cl	0.10h	0.20f	0.16B	0.10k	0.20i	0.16B	0.31b	0.25d	0.26B	0.28b	0.24d	0.25B
2000 ppm High Cl	0.15g	0.20f		0.15j	0.20i		0.28c	0.23e		0.27c	0.23d	
Low Cl	0.20f	0.30d	0.30C	0.23h	0.31f	0.28C	0.22e	0.18f	0.20C	0.20e	0.17f	0.20C
4000 ppm High Cl	0.28e	0.33c		0.27g	0.34e		0.20g	0.17h		0.20e	0.15g	
Low Cl	0.34c	0.37b	0.61D	0.37d	0.41b	0.40D	0.15i	0.11k	0.12D	0.13h	0.08j	0.24D
6000 ppm High Cl	0.36b	0.40a		0.39c	0.43a		0.13j	0.10k		0.11i	0.06k	
Mean**	0.23A	0.27B		0.23A	0.28B		0.23A	0.20B		0.27A	0.26B	
Means for*** Cl : SO_4 ratio	Low	High		Low	High		Low	High		Low	High	
	0.21A	0.24B		0.23A	0.25B		0.23A	0.21B		0.21A	0.20B	

*, **, ***: Means refere to specific effect of salinity concentration, SAR and CL : SO_4 ratio, respectively.
values within the same column or row for any of the 3 investigated factors were individually differentiated by capital letters, while for interaction small letters were used, as means followed by same letter/s were not significantly difference.

With respect to the effect of sodium adsorption ratio (SAR) from 3 to 6 under investigation, it was quite clear that the higher ratio i.e. SAR 6 resulted significantly increased the leaf phosphorus content in apricot seedlings while it was significantly decreased leaf-P content in mango seedlings during two seasons of study. In these respectic, Bernstein *et al.* (1956), in stone fruit tras and almond, El-Ashram *et al.* (1985) on some citrus rootstock seedlings, Sharaf *et al.* (1985) on guava and olive seedlings and Kabeel (1985) on three deciduous fruit seedlings. They reported that leaf-P concentration did not differ by increasing sodium adsorption ratio.

Concerning the specific effect of $Cl:SO_4$ ratio of saline solution used for irrigation used in leaf phosphorus content, it could be noticed from data in Table (13) that the higher ratio resulted in a significantly increased leaf phosphorus content in apricot but it significantly decreased leaf-P content in mango seedling during two seasons. In this respect, El-Ashram *et al.* (1985) on some citrus roodstock seedling, Sharaf *et al.* (1985) on guava and olive seedlings and Kabeel (1985) on three deciduous fruit plants.

2.2.b. Interaction effect:

Results of Table (13) showed the effect of the interaction between salts concentration, sodium adsorption ratio (SAR) and $Cl:SO_4$ ratio in the irrigation water on leaf-phosphorus content. These results revealed that phosphorus level in leaves significantly affected by the interaction between the three factor under study. On the other hand, leaf phosphorus content was significantly increased by such an interaction in apricot seedling while it was significantly decreased by such an interaction.

This conclusion means that phosphorus level in seedlings in certain species differed with the three factors in this concern.

2.3. Effect on leaf potassium content:

Results of the two seasons as shown in Table (14) show the effect of salts concentration, SAR and $Cl:SO_4$ ratio in the irrigation water and their interaction on K content in leaves of seedlings of two fruit speaces.

2.3.a. Specific effect:

It is obvious from the results of Table (14) that irrigation both apricot and mango seedlings with salinized water had significant effect on potassium level in the leaves of the seedlings.

From these results, it could be noticed that K concentration, on dry weight basis, in such seedling leaves decreased gradually with increasing salts concentration in the irrigation water from 2000 ppm to 6000 ppm. In this concern, non slinized plants appeared to contain K level usually higher than those in salinized ones in both two fruit species during 1994 and 1995 seasons. This depressive effect of salinity on K level may explain the competitive effect of Na^+ ions existed in the prepared saline growth media on the absorption of K ion.

This suggestion was based on the findings of Rains (1972) who confirmed such a competition between Na^+ and K ions in the growth media. In addition, Garton and Cooper (1952), who stated that increasing Ca content in irrigation water depressed K concentration of Grapefruit leaves. Pearson *et al.* (1957) found that increasing levels of salinity, as NaCl in irrigation water caused a decrease in leaf potassium content.

Similar findings were also reported by Jindal *et al.* (1979) they stated that leaf-K content of 4 month old mango seedlings reduced at all tested salinity levels (2-10 mmhos/cm) in soil to which sodium chloride was added. Also, Abdel-Messih *et al.* (1979) and Khamis and Darwish (1981) on some citrus rootstocks, Singh *et al.* (1983) on olive, guava and Jujube, Behairy *et al.* (1985) on guava and olive seedlings, Kabeel (1985) on three deciduous fruit plants; Al-Khateeb (1989) on some fig varieties

Table (14): Leaf potassium content (%) of apricot and mango seedlings as influenced by salt concentration, sodium adsorption ratio, Cl : SO_4 ratio and their combinations in saline irrigation water during 1994 and 1995 seasons.

Treatments / SAR / Conc.xCl ratio	Apricot						Mango					
	1994			1995			1994			1995		
	3	6	Mean*	3	6	Mean*	3	6	Mean*	3	6	Mean*
Tab water control	1.90a	1.90a	1.90A	1.90a	1.90a	1.90A	1.40a	1.40a	1.40A	1.60a	1.60a	1.60A
Low Cl 2000 ppm	1.74b	1.41cd	1.52B	1.80b	1.70c	1.70B	1.30b	1.10d	1.15B	1.40b	1.25cd	1.30B
High Cl 2000 ppm	1.54c	1.40d		1.70c	1.60d		1.20c	1.00e		1.30c	1.10e	
Low Cl 4000 ppm	1.30d	1.11e	1.20C	1.50e	1.40f	1.42C	0.80g	0.89f	0.80C	1.20d	0.80g	0.93C
High Cl 4000 ppm	1.10e	0.90f		1.50e	1.30h		0.80g	0.76h		1.00c	0 75g	
Low Cl 6000 ppm	0.73g	0.63g	0.70D	1.20g	0.80i	0.92D	0.73i	0.68j	0.69D	0.65h	0.60hi	0.60D
High Cl 6000 ppm	0.70g	0.60g		1.00h	0.70j		0.71i	0.62k		0.60hi	0.55i	
Mean**	1.33A	1.13B		1.51A	1.34B		1.00A	0.91B		1.11A	1.00B	
Means for***	Low	High		Low	High		Low	High		Low	High	
Cl : SO_4 ratio	1.33A	1.30B		1.46A	1.45B		0.99A	1.03B		1.10A	1.07B	

*, **, ***: Means refere to specific effect of salinity concentration, SAR and CL : SO_4 ratio, respectively.
values within the same column or row for any of the 3 investigated factors were individually differentiated by capital letters, while for interaction small letters were used, as means followed by same letter/s were not significantly difference.

and Abd El-Karim (1991) on mango seedlings. They reported that K content in leaves decreased by rising salts concentration.

Concerning the specific effect of sodium adsorption ratio (SAR) from 3 to 6, it is quite clear that leaf-K concentration was decreased by increasing sodium adsorption ratio (SAR), the decreased was significantly in both apricot and mango seedlings during two seasons of study. In this respect; Bower and Wedleigh (1949) reported that increasing the exchangeable Na percentage of the substrate resulted in a decrease plant K content. Similar findings were also reported by Kabeel (1985) on three deciduous fruit seedlings and Al-Khateeb (1989) on some fig varieties.

As for the specific effect of the $Cl:SO_4$ ratio of saline solution used for irrigation on leaf-K content, it could be noticed from Table (14) that the higher ratio from $Cl:SO_4$ ratio in irrigation significantly decreased leaf-potassium content in both apricot and mango seedlings. In this respect, Kabeel (1985) reported that increasing chloride level in irrigation decreased leaf-K concentration in grape, peach and plum but not significantly.

2.3.b. Interaction effect:

Reffering the interaction effect of the investigated three factors i.e., salinity concentration, SAR and $Cl:SO_4$ ratio, on leaf-K content, data obtained in Table (14) showed obviously that the interaction between concentration, SAR and $Cl:SO_4$ ratio in irrigation water had significant effect on K content in both apricot and mango seedlings to the different combinations of irrigation water used during two seasons. The most depressive irrigation solution on leaf-K content of both apricot and mango was that combination between the highest salinity (6000 ppm) X SAR6 X higher ratio, whereas the highest decrease was resulted. Moreover, the lowest decrease in leaf-potassium content was detected by those seedlings irrigated with 2000 ppm saline solution of SAR3 and

lower $Cl:SO_4$ ratio as those continuously irrigated with tap water during 1994 and 1995 seasons.

2.4. Effect on leaf calcium content:

Results pertaining the effect of salts concentration, SAR and $Cl:SO_4$ ratio in irrigation water and their interaction on calcium percentage in leaves of both apricot and mango seedlings are presented in Table (15).

2.4.a. Specific effect:

Results of Table (15) declar significant effect for saline irrigation water on calcium level in leaves of both two fruit species. In apricot and mango leaves, calcium level increased with increasing salts concentration in irrigation water up to 6000 ppm following an opposit trend to that previously obtained for both N and K levels, Tables (12 and 14).

This might be due to according to Walace *et al.* (1952) to that plants with low K content, obtained under salinity conditions, trend to compensate their low K content by either high calcium and/or magnesium contents in leaves.

These results are in partially in a accordance with those obtained by El-Hefnawy (1986) who reported that the increase in soil salinity caused an increase in Ca^{++} content in guava leaves. The same trend was also obtained by Makhija *et al.* (1980) on guava salinity, found rising salinity levels increased leaf Ca contents. Similar results were found by Kabeel (1985) on grape, peach and plum seedlings, Gaser (1986) on avocado and Abd El-Ghani (1990) on peach, and Abd El-Karim (1991) on mango seedlings, whose results showed that Ca^{++} content in salt-treated plants was increased with increasing salinity levels. On the contrary, Divate and Pandey (1981b) on grapevine, and Singh *et al.* (1983) on jujuba and guava plants, found that high NaCl in the growth media decreased calcium content.

Table (15): Leaf calcium content (%) of apricot and mango seedlings as influenced by salt concentration, sodium adsorption ratio, Cl : SO_4 ratio and their combinations in saline irrigation water during 1994 and 1995 seasons.

Treatments SAR / Conc.xCl ratio	Apricot						Mango					
	1994			1995			1994			1995		
	3	6	Mean*	3	6	Mean*	3	6	Mean*	3	6	Mean*
Tab water control	1.30l	1.30l	1.30A	1.30m	1.30m	1.30A	2.14h	2.14h	2.14A	1.84j	1.84j	1.84A
Low Cl	1.47k	1.90i	1.80B	1.44l	1.72j	1.65A	2.57f	2.58f	2.60B	1.90i	2.23g	2.12B
2000 ppm High Cl	1.73j	2.10h		1.63k	1.82i		2.44g	2.72e		2.04h	2.34f	
Low Cl	2.33g	2.67e	2.58C	1.96h	2.02g	2.18A	2.73e	2.84d	2.82C	2.47e	2.60d	2.60C
4000 ppm High Cl	2.54f	2.81d		2.20f	2.55e		2.81d	2.90c		2.56d	2.75c	
Low Cl	2.02i	3.40b	3.03D	2.70d	3.16b	3.03A	2.94c	3.27a	3.02D	2.90c	3.34b	3.00D
6000 ppm High Cl	3.24c	3.46a		2.91c	3.38a		2.70e	3.17b		2.23g	3.48a	
Mean**	2.10A	2.52B		2.02A	2.30B		2.61A	2.80B		2.30A	2.65B	
Means for***	Low	High		Low	High		Low	High		Low	High	
Cl : SO_4 ratio	2.05A	2.31B		1.95A	2.14B		2.65A	2.69B		2.40A	2.51B	

*, **, ***: Means refere to specific effect of salinity concentration, SAR and CL : SO_4 ratio, respectively.
values within the same column or row for any of the 3 investigated factors were individually differentiated by capital letters, while for interaction small letters were used, as means followed by same letter/s were not significantly difference.

Concerning the specific effect of sodium adsorption ratio (SAR), it was quite clear that the higher ratio i.e. 6 significantly increased leaf calcium content in both fruit species than the lower one i.e. SAR3 during two seasons of study. Moreover both apricot and mango equally the same regarding the response of their seedlings to SAR. These results are similar to that obtained by Kabeel (1985) on grape, peach and plum seedlins and Al-Khateeb (1989) on some fig varieties.

As for the specific effect of the $Cl:SO_4$ ratio, of saline solution used for irrigation on leaf-Ca content, it could be noticed from data in Table (15) that the higher ratio resulted in a significant increase as compared to the lower ones during two seasons of study. In this respect, Khabeel (1985) found that leaf Ca-content increased by increasing $Cl:SO_4$ ratio, but this increase was not significant.

2.4.b. Interaction effect:

Reffering the interaction effect of the investigated three factors i.e., salinity concentration, SAR and $Cl:SO_4$ ratio, on leaf-Ca content, data obtained in Table (15) showed obviously the variable response of both apricot and mango seedlings to the different combinations of irrigation water used during two seasons. The higher increase leaf Ca of two fruit species under study was that combined between highest salinity concentration (6000 ppm) X SAR6 X higher $Cl:SO_4$ ratio whereas the lowest increase leaf-Ca content was detected by those seedlings irrigated with 2000 ppm saline solution of SAR3 and lower $Cl:SO_4$ ratio as compared to those continously irrigated with tap water during both 1994 and 1995 seasons for seedlings of two studed fruit species. These may mean that the three tested factors can act together in affecting Ca level. Each factor affected Ca level in separable way.

2.5. Effect of leaf magnesium content:

The effects of salts concentration, sodium adsorption ratio (SAR) and $Cl:SO_4$ ratio in irrigation water and their interaction on magnesium

level in leaves of both apricot and mango seedlings are shown in Table (16).

2.5.a. Specific effect:

Regarding the specific effect of salinity concentration data obtained revealed that all three investigated concentration (2000, 4000 and 6000 ppm) saline solutions resulted in an obvious decrease in leaf magnesium content for apricot seedling during two seasons. Such decrease was significant as compared to those of tap water irrigated seedlings. On the other hand, generally show a gradual increase in leaf-Mg content as salinity in irrigation water increased. Moreover, data in Table (16) obviously showed that leaf Mg content was decreased significantly by using different saline solutions in irrigation water in mango seedlings as compared with those irrigated with tap water during two seasons of study. In spite of this, a general trend could be observed that leaf-Mg content in mango seedling tended, but to a little extent, to decrease with increasing salt concentration in irrigation water.

These findings could be supported with those of Wallace *et al.* (1952) who reported that plant with low K content, obtained under salinity condition tend to compensate the low K level by either high calcium and/or magniesum contents in leaves. This results is confirmed with the findings by Downton (1978) reported that Mg^{++} content tended to increase some white in avocado by salinity. On the other hand, El-Azab and Minessy (1975) on grape, guava and olive and Nasr *et al.* (1977) on plum showed that Mg^{++} content did not differ markedly with salinity condition. On the other hand, Al-Khateeb (1989) on some fig varieties mentioned that leaf Mg^{++} content was decreased significantly by using different saline solutions in irrigation water as compared with those irrigated with tap water.

Abd El-Karim (1991) on some varieties of mango found that leaf Mg^{++} content was not significantly affected by salts concentration in irrigation water.

Table (16): Leaf magnesium content (%) of apricot and mango seedlings as influenced by salt concentration, sodium adsorption ratio, Cl : SO_4 ratio and their combinations in saline irrigation water during 1994 and 1995 seasons.

Treatments SAR / Conc.xCl ratio	Apricot						Mango					
	1994			1995			1994			1995		
	3	6	Mean*	3	6	Mean*	3	6	Mean*	3	6	Mean*
Tab water control	0.61a	0.61a	0.61A	0.64a	0.64a	0.64A	1.19bc	1.19bc	1.91A	1.31a	1.31a	1.31A
2000 ppm Low Cl	0.55b	0.42bcd	0.45B	0.61b	0.42d	0.48B	1.22ab	1.20abc	1.21B	1.28ab	1.30ab	1.29B
2000 ppm High Cl	0.47bc	0.37cde		0.52c	0.38e		1.23a	1.20ab		1.28ab	1.28ab	
4000 ppm Low Cl	0.31c-f	0.22efg	0.25C	0.30f	0.21h	0.24C	1.18c	1.20abc	1.20AB	1.30a	1.30a	1.29B
4000 ppm High Cl	0.26d-g	0.19fg		0.26g	0.19h		1.21abc	1.22b		1.25b	1.29a	
6000 ppm Low Cl	0.17fg	0.13g	0.14D	0.16i	0.12j	0.13D	1.20abc	1.21abc	1.20AB	1.28ab	1.25b	1.26C
6000 ppm High Cl	0.15fg	0.12g		0.13j	0.09k		1.22ab	1.20abc		1.28ab	1.25b	
Mean**	0.36A	0.34B		0.37A	0.30B		1.20A	1.20A		1.28A	1.28A	
Means for***	Low	High		Low	High		Low	High		Low	High	
Cl : SO_4 ratio	0.38A	0.35B		0.39A	0.36B		1.21A	1.20B		1.28A	1.28A	

*, **, ***: Means refere to specific effect of salinity concentration, SAR and CL : SO_4 ratio, respectively.
values within the same column or row for any of the 3 investigated factors were individually differentiated by capital letters, while for interaction small letters were used, as means followed by same letter/s were not significantly difference.

Concerning the specific effect of SAR, it was quite clear that the higher ratio i.e., 6 significantly decreased leaf-Mg content of apricot seedlings while it was not significant between them in mango seedlings during 1994 and 1995 seasons. These results is confirmed with the findings by Al-Khateeb (1989) on some fig varieties, reported that Mg^{++} content in leaves significantly decreased with increasing SAR from 6 to 12.

These findings could be supported with that Kabeel (1985) on grape, peach and plum, found that leaf-Mg content slightly decrease but not statistically significant.

As for the specific effect of the $Cl:SO_4$ ratio, of saline solution used for irrigation on the leaf-Mg content, it could be noticed from data in Table (16) that leaf-Mg content was significantly decreased in apricot and mango during the study, except the second season in mango seedlings, leaf Mg content was not affected.

2.5.b. Interaction effect:

Reffering the interaction effect of the investigated factors i.e., salinity concentration, SAR and $Cl:SO_4$ ratio, on leaf-Mg content, data obtained in Table (16) showed obviously the variable response of both apricot and mango seedlings to the different combinations of irrigation used during two seasons.

These results indicated that the three factors can act together in affecting leaf Mg content.

2.6. Effect on leaf sodium content:

Data presented in Table (17) declare significant effects for salt concentration, SAR and $Cl:SO_4$ ratio in irrigation water and their interaction on sodium level in leaves of apricot and mango seedlings.

Table (17): Leaf sodium content (%) of apricot and mango seedlings as influenced by salt concentration, sodium adsorption ratio, Cl : SO_4 ratio and their combinations in saline irrigation water during 1994 and 1995 seasons.

Treatments SAR / Conc.xCl ratio	Apricot						Mango					
	1994			1995			1994			1995		
	3	6	Mean*	3	6	Mean*	3	6	Mean*	3	6	Mean*
Tab water control	0.16i	0.16i	0.16A	0.12m	0.12m	0.12A	0.15k	0.15k	0.15A	0.15l	0.15l	0.15A
Low Cl	0.19i	0.34h	0.40B	0.17l	0.28j	0.25B	0.29j	0.45i	0.38B	0.22k	0.34i	0.31B
2000 ppm High Cl	0.67de	0.41g		0.22k	0.34i		0.28j	0.51h		0.29j	0.39h	
Low Cl	0.45g	0.64e	0.59C	0.40h	0.57f	0.52C	0.61g	0.72e	0.68C	0.44g	0.56f	0.53C
4000 ppm High Cl	0.56f	0.71d		0.46g	0.66e		0.65f	0.74e		0.50g	0.60e	
Low Cl	0.80c	0.90a	0.87D	0.77d	0.92b	0.87D	0.080d	0.91b	0.88D	0.69d	0.83b	0.078D
6000 ppm High Cl	0.85b	0.93a		0.85c	0.96a		0.85c	0.95a		0.77c	0.93a	
Mean**	0.40A	0.58B		0.42A	0.55B		0.52A	0.63B		0.44A	0.54B	
Means for***	Low	High		Low	High		Low	High		Low	High	
Cl : SO_4 ratio	0.46A	0.56B		0.42A	0.46B		0.51A	0.54B		0.47A	0.42B	

*, **, ***: Means refere to specific effect of salinity concentration, SAR and CL : SO_4 ratio, respectively.
values within the same column or row for any of the 3 investigated factors were individually differentiated by capital letters, while for interaction small letters were used, as means followed by same letter/s were not significantly difference.

2.6.a. Specific effect:

As for the effect of salt concentration in irrigation water, it is obvious from the obtained results in Table (17) that Na level in leaves significantly increased with increasing salt concentration in irrigation water. Untreated seedlings were of least Na concentration. While the opposit was for seedlings irrigated with salinized water at 6000 ppm. In addition, sodium content was increased with increasing salt concentration in both apricot and mango seedlings during two seasons of study.

These results could be confirmed with the findings of Mobayen and Milthorope (1980) who stated that Na^+ concentration in leaves was linearly correlated to its concentration in the external solution.

Similar observations were achieved by Abdel-Messih *et al.* (1979), Khamis and Darwish (1981) and El-Ashram *et al.* (1985) on some citrus rootstocks, Makhija *et al.* (1980) on guava seedlings, Sweidan *et al.* (1982) on apricot, Saraf *et al.* (1985) on Thompson seedless and American Grape, Behairy *et al.* (1985) on guava and olive seedlings and Abd El-Karim (1991) on mango seedlings. They stated that as the salinity level of the irrigation water increased, a subsequent increase was observed in Na^+ accumulation in plants.

As for the specific effect of sodium adsorption ratio (SAR) 3 and 6 treatments on leaf Na^+ content. The obtained results showed that SAR at 6 treatment significantly increased Na^+ content in leaves than SAR3.

These result are in accordance with the findings of Abd El-Aziz *et al.* (1985) on guava and olive seedlings, El-Ashram *et al.* (1985) on some citrus rootstock seedlings, Sharaf *et al.* (1985) on Thompson seedless and American grape and Al-Khateeb (1989) on some fig varieties.

Concerning the specific effect of the $Cl:SO_4$ ratio of saline solution used for irrigation on leaf Na^+ content, it could be noticed in Table (17) that the higher ratio resulted in a significantly increased leaf Na

concentration in both two fruit species during the two seasons of study. In this respect, El-Ashram *et al.* (1985) on some citrus rootstock seedlings and Kabeel (1985) on grape, peach and plum reported that leaf sodium content was not affected by increasing chloride levels ($Cl:SO_4$ ratio) in irrigation water.

2.6.b. Interaction effect:

With respect to the interaction effcet of the investigated three factors i.e., salinity concentration, SAR and $Cl:SO_4$ ratio on leaf-Na content, data obtained in Table (17) showed obviously the variable response of both apricot and mango seedlings to the different combinations of irrigation water used during two seasons. The highest increase leaf-Na of both apricot and mango was that combination on between the highest salinity concentration (6000 ppm) X SAR X higher $Cl:SO_4$ ratio whereas the lowest increase of leaf-Na content was detected by those seedlings irrigated with 2000 ppm saline solution of SAR3 and lower $Cl:SO_4$ ratio as compared to those continuously irrigated with tap water during two seasons for seedlings of two studed fruit species.

2.7. Effect on leaf zinc content:

2.7.a. Specific effect:

Concerning the effect of different salt concentration, sodium adsorption ratio (SAR) and $Cl:SO_4$ ratio in irrigation water on leaf zinc content of apricot and mango seedlings are presented in Table (18).

It is obvious from the results that zinc concentration in the leaf of mango seedlings significantly decreased by salts concentration in irrigation water. Moreover, zinc concentrtaion in leaf of apricot seedling was not significantly affected by salts concentration in irrigation water except 2000 ppm and 4000 ppm treatments, a general trend could be observed that leaf Zn content in leaves but to a lettle extent to decrease with increasing salts concentration in irrigation water in both fruit species during two seasons of study. These findings could be supported with those of Patil and Patil (1982) on pomegranate, Patil *et al.* (1984) on

Table (18): Leaf zinc content (ppm) of apricot and mango seedlings as influenced by salt concentration, sodium adsorption ratio, Cl : SO_4 ratio and their combinations in saline irrigation water during 1994 and 1995 seasons.

Treatments SAR / Conc.xCl ratio	Apricot						Mango					
	1994			1995			1994			1995		
	3	6	Mean*	3	6	Mean*	3	6	Mean*	3	6	Mean*
Tab water control	38.00a	38.00a	38.00A	43.60a	43.60a	43.60A	24.65a	24.65a	24.65A	28.3abc	28.3a-d	28.3A
Low Cl 2000 ppm	35.00b	29.30d	30.50B	40.00b	35.30d	36.20B	24.32a	24.00a	24.24A	28.7abc	28 3a-d	28.65A
High Cl 2000 ppm	32.00c	25.65e		37.0ac	32.40e		24.65a	24.00a		29.32ab	30.0a	
Low Cl 4000 ppm	22.31f	19.65h	20.40C	29.33f	23.00h	24.40C	24.00a	23.32a	23.74B	26.7cde	25.66e	26.60B
High Cl 4000 ppm	21.65g	18.00i		25.60g	19.50i		24.00a	23.65a		27.7a-e	26.7cde	
Low Cl 6000 ppm	16.40j	13.00l	13.95D	17.33j	12.30l	14.10D	24.00a	23.32a	23.66B	28.7abc	26.0de	27.10B
High Cl 6000 ppm	15.00k	11.40m		15.00k	11.65l		23.32a	24.00a		27.2b-e	26.7cde	
Mean**	25.80A	22.14B		29.70A	25.40B		24.13A	23.84A		28.06A	27.13A	
Means for*** Cl : SO_4 ratio	Low	High		Low	High		Low	High		Low	High	
	26.50A	24.90B		30.60A	30.20A		24.11A	24.03A		28.00A	27.36A	

*, **, ***: Means refere to specific effect of salinity concentration, SAR and CL : SO_4 ratio, respectively.
values within the same column or row for any of the 3 investigated factors were individually differentiated by capital letters, while for interaction small letters were used, as means followed by same letter/s were not significantly difference.

guava leaves, Aly *et al.* (1986a) on Cleoptara mandarrin and Troyer citrange, El-Hefnawy (1986) on guava leaves and Gaser (1986) on Avocado plants.

Concerning the specific effect of sodium adsorption ratio (SAR), it was quite clear that leaf zinc content was decreased by increasing sodium adsorption ratio from 3 to 6 and the decrease was significantly in both apricot and mango leaves during 1994 and 1995 seasons.

As for the specific effect of the $Cl:SO_4$ ratio of saline solution used for irrigation on leaf Zn content, it could be noticed from data in Table (18) that the higher ratio was not affected by increasing $Cl:SO_4$ ratio in both two fruit species except in apricot plant during first season only, it was significantly decrease.

2.7.b. Interaction effect:

Reffering the interaction effect of the investigated three factors i.e., salinity concentration, SAR and $Cl:SO_4$ ratio, on leaf zinc content, data obtained in Table (18) showed obviously the variable response of both apricot and mango seedlings to the different combinations of irrigation water used during two seasons. It could be noticed that the most depressive irrigation solution on zinc concentration in mango leaves was that combination between the highest salinity concentration (6000 ppm) X SAR6 X higher $Cl:SO_4$ ratio, whereas the lowest leaf Zn content was resulted. Moreover, three other combinations of 6000 ppm saline solution remarked in an increasing order. On the other hand the lowest decrease in leaf Zn content was detected by those mango seedlings irrigated with 2000 ppm saline solution X SAR3 X lower $Cl:SO_4$ ratio as compared to control during both seasons of study. In addition to that, interaction between salt concentrations X SAR X $Cl:SO_4$ ratio on leaf Zn content in appricot seedlings under study did not affected during 1994 and 1995 seasons.

2.8. Effect on leaf iron content:

Results presented in Table (19) shown the effect of salts concentration in irrigation water, SAR and $Cl:SO_4$ ratio and their interaction on the leaf Fe content in both apricot and mango seedlins.

2.8.a. Specific effect:

In general, the specific effect of salinity concentration, the obtained results indicated that salts concentration in irrigation water had significant effect on leaf Fe content. It is also clear that all three investigated concentrations (2000, 4000 and 6000 ppm) of saline solutions resulted in an obvious decrease leaf Fe content of seedlings for both apricot and mango seedlings during two seasons of study. Such decrease was significant as compared to those of tap water irrigated seedlings.

These results could be confirmed with the findings of Ivanova (1971) in apricot, Patil and Patil (1982) in pomegranate, Abd El-Aziz *et al.* (1985) on guava and olive, Aly *et al.* (1986a) on some citrus rootstocks and El-Hefnawy (1986) in guava. They found that leaf Fe content decreased with increasing levels of salinity.

With respect to the specific effect of two levels of sodium adsorption ratio (SAR) in the irrigation water on both two fruit species, it was quite clear that increasing sodium adsorption ratio (SAR) from 3 to 6 in irrigation water significantly decreased leaf iron content in both apricot and mango seedlings during two seasons of study.

As for the specific effect of the $Cl:SO_4$ ratio of saline solution used for irrigation water on leaf iron content, it could be noticed that increasing the level of chloride ($Cl:SO_4$ ratio) in irrigation water significantly decreased leaf Fe content in both apricot and mango seedlings during the two seasons of study.

Table (19): Leaf iron content (ppm) of apricot and mango seedlings as influenced by salt concentration, sodium adsorption ratio, Cl : SO_4 ratio and their combinations in saline irrigation water during 1994 and 1995 seasons.

Treatments	Apricot						Mango					
	1994			1995			1994			1995		
SAR / Conc.xCl ratio	3	6	Mean*	3	6	Mean*	3	6	Mean*	3	6	Mean*
Tab water \ control	131.8a	131.8a	131.8A	144.0a	144.0a	144.0A	172.6a	172.6a	172.6A	157.3a	157.3a	157.3A
Low Cl	127.0b	103.6d	109.1B	133.0b	116.3d	117.5B	162.6b	145.3d	149.5B	137.0b	126.3d	129.2B
2000 ppm High Cl	113.3c	92.3e		125.1c	95.7e		156.3c	133.0e		131.3c	122.3e	
Low Cl	83.0f	69.0h	72.0C	87.7f	63.0h	70.6C	125.7f	119.3h	120.8C	118.0f	108.7h	111.1C
4000 ppm High Cl	75.3g	60.7i		77.6g	54.3i		122.4g	115.7i		111.7g	105.0i	
Low Cl	53.0j	37.3l	42.6D	42.0j	28.6l	33.3D	112.3j	94.3l	97.6D	98.3j	88.7l	90.9D
6000 ppm High Cl	47.3k	32.7m		36.0k	26.6l		98.0k	85.7m		93.3k	83.3m	
Mean**	90.1A	72.2B		92.2A	75.5B		135.7A	123.7B		121.0A	113.2B	
Means for***	Low	High		Low	High		Low	High		Low	High	
Cl : SO_4 ratio	92.1A	85.7B		94.8A	87.9B		138.1A	132.1B		123.9A	120.3B	

*, **, ***: Means refere to specific effect of salinity concentration, SAR and CL : SO_4 ratio, respectively.
values within the same column or row for any of the 3 investigated factors were individually differentiated by capital letters, while for interaction small letters were used, as means followed by same letter/s were not significantly difference.

2.8.b. Interaction effect:

Results of Table (19) show the effect of the interaction between salts concentration in the irrigation water, sodium adsorption ratio (SAR) and $Cl:SO_4$ ratio on leaf iron content in leaves of both apricot and mango seedlings.

These results revealed that iron level in leaves significantly affected by the interaction between the factors. On the other hand, it could be concluded that iron level in both fruit species were greately affected by three factors and this fcators can act together in affecting Fe level in plant leaves during two seasons of study. In addition, the pattern of Fe distribution showed that leaves of plants irrigated with high salts concentration X SAR6 and high $Cl:SO_4$ ratio had the lowest Fe concentration when compared with plants irrigated with tap water during the two seasons of study.

2.9. Effect on leaf manganese content:

The effect of salts concentration in irrigation water, SAR, $Cl:SO_4$ ratio and their interaction on leaf iron content of both two fruit species are shown in Table (20).

2.9.a. Specific effect:

Regarding the specific effect of salinity data obtained revealed that all three investigated concentrations (2000, 4000 and 6000 ppm) saline solutions resulted in an obvous decrease leaf Mn content for mango seedlings during two seasons. Such decrease in leaf Mn content was significant as compared to those of tap water irrigated seedlings. On the other the hand, manganese level decreased with increasing salts concentration in irrigation water up to 6000 ppm. In addition, increasing the level of salts concentration in irrigation water for apricot seedlings did not affected in leaf manganes content during 1994 and 1995 seasons. In this respect, Guiffen *et al.* (1979) on some citrus seedlings, Patil and Patil (1982) on pomegranate and Abd El-Aziz (1985) on guava and olive seedlings. They found that, leaf Mn content were decreased with

Table (20): Leaf manganese content (ppm) of apricot and mango seedlings as influenced by salt concentration, sodium adsorption ratio, Cl : SO_4 ratio and their combinations in saline irrigation water during 1994 and 1995 seasons.

Treatments SAR / Conc.xCl ratio	Apricot						Mango					
	1994			1995			1994			1995		
	3	6	Mean*	3	6	Mean*	3	6	Mean*	3	6	Mean*
Tab water control	55.1b	55.1b	55.1A	58.0a-d	58.0a-d	58.0A	100.3a	100.3a	100.3A	93.7a	93.7a	93.7A
Low Cl	53.7bcd	54.7abc		58.3a	55.3d		95.0b	87.7c		90.7b	84.3d	
2000 ppm			53.4A			57.4A			89.1B			86.0B
High Cl	52.1d	53.3bcd		60.7a	55.3cb		90.3c	83.3d		88.0c	81.0e	
Low Cl	53.0cd	54.0a-d		58.3abc	59.0ab		80.3d	71.7f		76.0f	69.8h	
4000 ppm			54.0A			57.7A			73.8C			71.1C
High Cl	54.0a-d	55.3ab		55.7cd	57.7a-d		75.7e	67.7g		72.3g	66.3i	
Low Cl	55.9a	52.7cd		55.6cd	59.0ab		63.0h	54.3j		63.0j	55.7l	
6000 ppm			53.9A			56.6A			56.6D			56.7D
High Cl	54.0a-d	53.3e		55.3b	56.6bcd		58.7i	50.4k		58.7k	49.3m	
Mean**	54.0A	54.0A		57.4A	57.2A		80.5A	73.6B		77.5A	71.4B	
Means for***	Low	High		Low	High		Low	High		Low	High	
Cl : SO_4 ratio	54.3A	54.1A		57.7A	57.2A		81.6A	78.3B		78.3A	75.3B	

*, **, ***: Means refere to specific effect of salinity concentration, SAR and CL : SO_4 ratio, respectively.
values within the same column or row for any of the 3 investigated factors were individually differentiated by capital letters, while for interaction small letters were used, as means followed by same letter/s were not significantly difference.

increasing salinity concentration in irrigated water. On the other hand, Badawi, *et al.* (1979) on sour orange seedlings and El-Ashram *et al.* (1985) on five citrus rootstock seedlings, reported that leaf Mn content was not affected with increasing salinity levels.

As for the specific effect of sodium adsorption ratio (SAR), it was quite clear that the higher ratio i.e. 6 resulted significantly decreased leaf manganese content in mango a seedlings while in apricot leaves was un affected during two seasons of study.

Concerning the specific effect of the $Cl:SO_4$ ratio of saline solution used in irrigation on leaf manganese content. It could be noticed that increasing the level of chloride ($Cl:SO_4$ ratio) in irrigation water caused a significantly decrease leaf. Mn content in mango seedlings while leaf Mn apricot seedlings was not affected in this concern.

2.9.b. Interaction effect:

Table (20) show that there was no significant effect for the interaction between the investigated three factors i.e., salinity concentration, SAR and $Cl:SO_4$ ratio on leaf manganese, data in Table (20) showed obviously the variable response of both apricot and mango seedlings to the different combinations of irrigation water used during two seasons. There was no significant effect for the interaction between such three studied factors on the manganese level in leaves of apricot seedlings. This may indicate that such three factors did not act together for affecting manganese level in apricot leaves, however, it is clear from Table (20) that leaf manganese content decreased significantly in mango seedlings, the most decrease was that combination between the highest salinity concentration (6000 ppm) X SAR6 X higher $Cl:SO_4$ ratio, whereas the lowest decrease leaf manganese content was resulted between 2000 ppm X SAR3 and lower $Cl:SO_4$ ratio during the two seasons of study.