RESULTS AND DISCUSSIONS

RESULTS AND DISCUSSION

- First experiment

4- Effect of different water resources irrigation and soil moisture content in different two soils on cupressue sempervirens seedlings

4 -1- Vegetative growth

4-1-1- Seedling height

The data presented in Table (9) and Fig.(1,2)obviously cleared that the irrigation with municipal wastewater effluent in the first season produced the significantly tallest seedlings in average value of 32.00 cm compared to those irrigated with Nile water in this case the seedlings were the shortest in average value of 27.00 cm, while the seedlings which are irrigated with drainage water resulted in the intermediate in average value of 31.20 cm. The differences between municipal wastewater effluent and drainage water were insignificant in the first season.

In the second season the results have been taken the same trend approximately, meanwhile municipal wastewater effluent induced significantly the maximum height seedlings in average of 34.28 cm followed by drainage water which gave the mean value of 31.69 cm while Nile water irrigation produced the minimum height in average value of 27.5 cm. The differences among the three water resources were high significant.

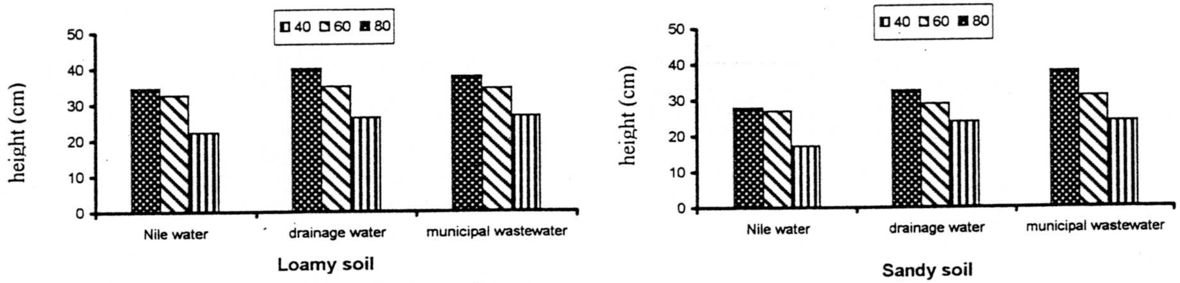
The increment in height growth was 18.5 % and 15.5 % under irrigated the seedling with municipal wastewater effluent and drainage water with compared to Nile water in the first

Table (9): **Effect of different water resources irriagtion and soil moisture content on seedling height (cm) of *Cupressus sempervirens* seedlings grown in different two soil types during 1998/1999 and 1999/2000 seasons.**

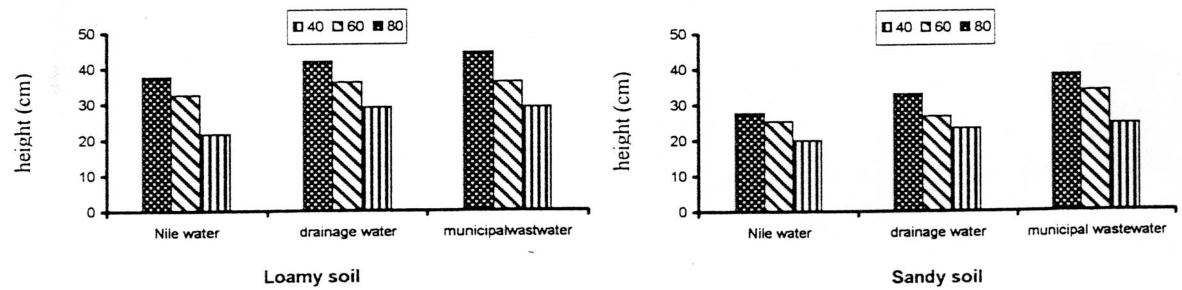
Seasons		1998-1999				1999-2000			
Water resources	Soil type / S.M.C.	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	22.33	32.67	34.67	29.89bc	21.67	32.67	37.67	30.67b
	Sandy soil	17.33	27.00	28.00	24.11d	20.00	25.33	27.67	24.33d
Mean		19.83e	29.84c	31.34c	27.00B	20.83f	29.00de	32.67cd	27.50C
Drainage water	Loamy soil	26.33	35.00	40.00	33.80a	29.00	36.00	42.00	35.70a
	Sandy soil	24.00	29.00	32.67	28.60c	23.33	26.67	33.00	27.67c
Mean		25.17d	32.00bc	36.34ab	31.20A	26.17e	31.34cd	37.50ab	31.69B
Municipal wastewater effluent	Loamy soil	26.67	34.33	37.67	32.89ab	29.00	36.00	44.33	36.44a
	Sandy soil	24.00	31.33	38.00	31.11a-c	24.33	33.67	38.33	32.11b
Mean		25.34d	32.83bc	37.84a	32.00A	26.67e	34.84bc	41.33a	34.28A
Mean		23.45c	31.56b	35.14a		24.56c	31.73b	37.17a	

S.M.C. = Soil moisture content.

* Mean values in the same column within soil type followed by the same small litters are not significant at level of 5 % probability.
* Mean values in the same column within water resources followed by the same capital litters are not significant at level of 5 % probability.
* Mean values of different soil moisture content in the same raw followed by the same small litters are not significant at level of 5 % probability.



Fig(1) Effect of different water resources irrigation and soil moisture content on seedling height(cm) of *cupressus sempervirens* seedlings grown in loamy and sandy soil during 1998-1999 season.



Fig(2) Effect of different water resources irrigation and soil moisture content on seedling height(cm) of *cupressus sempervirens* seedlings grown in loamy and sandy soil during 1999-2000 season .

Photo (1) Effect of municipal wastewater , drainage and Nile water on seedling height of *Cupressus sempervirens* grown in loamy soil at level of 80% soil moisture content .

A1 = Nile water.
A2 = Drainage water.
A3 = Municipal waste water.
B1 = Loamy soil.
B2 = Sandy soil.
C1 = 40 % of field capacity.
C2 = 60 % of field capacity.
C3 = 80 % of field capacity.

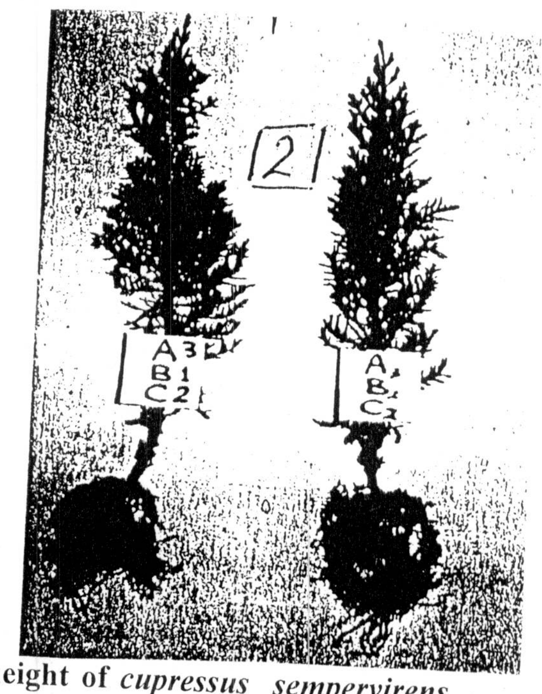


Photo (2) cleared that seedling height of *cupressus sempervirens* plalted in sandy soil and irrigated with municipal wastwater grow better than that planted in loamy soil irrigated with Nile water .

season, while these increases were 24.7 % and 15.2 % in the second season, respectively.

The results were in harmony with findings of **Hopmans *et al.* (1990)** on *Eucalyptus grandis*, **Zekri and Koo (1993)** on citrus, **Hassan *et al.* (1997)** on *Acacia Saligna* and *Leucaena Leucocephala* and **El-Said, (1999).** All of those researchers confirmed that the using of municipal wastewater effluent and drainage water caused the increase of seedling height.

These results may be due to increasing of macro and microelements in the municipal wastewater effluent and drainage water comparing with Nile water as shown in Tables (1,2,3, and 4).

As for different two types of soil the data in the same table indicated that, loamy soil in the first season induced significantly the superior seedling more than those of sandy soil when seedlings were irrigated with either Nile or drainage water while the seedlings were irrigated with municipal wastewater effluent did not gave significantly differences between the two different soil. Generally the loamy soil was the best.

In the second season the results tended to a similar trend as those obtained from the first season.

These results agreed with those obtained by **Mohamed (1993)** on *Nerium oleander* and *Adhatoda vasica*. He used two mixture of sand + clay (1:1 or 2:1) as growing media.and he reported that the mixture of 1:1 had an effect on increasing plant height and **Radwan, (1999)** on *Eucalyptus incana* mentioned that 1:1 v:v mixture of sandy: clay loam soil was good media for the seedling height.

Regarding the effects of soil moisture on seedling height the data in Table (9) demonstrated that the seedling height significantly increased at 60 and 80 % soil moisture content compared with those of 40 %.

The average values of seedling height were 35.14, 31.56 and 23.45 cm under 80, 60 and 40 % soil moisture content respectively, in the first season while they were 37.17, 31.73 and 24.56 cm under 80.60 and 40 % soil moisture content, respectively in the second one.

The reduction in height growth was 33.26 % and 10.2 % under 40 and 60 % soil moisture content when compared to 80 % soil moisture respectively, in the first season; while it was 34 % and 15 % in the second season.

The herein obtained results were confirmed by those of **Czapowsky and Grant (1986)** on Black spruce, **Rokaia (1990)** on *Ficus carica* and **Burman *et al.* (1991)** on *Azadirachta indica*.All of them cleared that high soil moisture content caused an increased seedling height comparing with low soil moisture .

4-1-2- Stem diameter

Data presented in Table (10) obviously cleared that the irrigation with municipal wastewater effluent produced the significantly thickest stems in average value of 0.36 cm compared to those irrigated with Nile water where, the seedling stem was 0.30 cm whereas those irrigated with drainage water resulted in the intermediate in average value of 0.34 cm. in the first season. The differences between municipal wastewater effluent and drainage water were insignificant. In the second season the results have been taken the same trend approximately,

Table (10): Effect of different water resources irriagtion and soil moisture content on stem diameter (cm) of *Cupressus sempervirens* seedlings grown in different two soil types during 1998/1999 and 1999/2000 seasons.

Seasons		1998-1999				1999-2000			
Water resources	Soil type / S.M.C.	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	0.20	0.33	0.37	0.30b	0.18	0.26	0.30	0.25c
	Sandy soil	0.24	0.34	0.31	0.29b	0.19	0.25	0.27	0.23d
Mean		0.22d	0.34b	0.34b	0.30B	0.18f	0.26c	0.28c	0.24C
Drainage water	Loamy soil	0.22	0.42	0.41	0.35ab	0.23	0.25	0.38	0.29b
	Sandy soil	0.26	0.35	0.39	0.33ab	0.19	0.29	0.27	0.25c
Mean		0.24d	0.38a	0.40a	0.34A	0.21e	0.27c	0.32a	0.27B
Municipal wastewater effluent	Loamy soil	0.27	0.41	0.44	0.37a	0.28	0.33	0.44	0.34a
	Sandy soil	0.30	0.36	0.38	0.34ab	0.24	0.30	0.36	0.31ab
Mean		0.28c	0.38a	0.41a	0.36A	0.26c	0.33a	0.38a	0.32A
Mean		0.25b	0.37a	0.39a		0.22c	0.29b	0.32a	

S.M.C. = Soil moisture content.

* Mean values in the same column within soil type followed by the same small litters are not significant at level of 5 % probability.
* Mean values in the same column within water resources followed by the same capital litters are not significant at level of 5 % probability.
* Mean values of different soil moisture content in the same raw followed by the same small litters are not significant at level of 5 % probability.

meanwhile municipal wastewater effluent irrigation induced significantly the thickest stems in average value of 0.32 cm followed by drainage water which gave the mean value of 0.27 cm while Nile water irrigation produced the thinnest stem in average value of 0.24 cm. The differences among the three water resources were significant.

These results were in agreement with the findings of **Hopmanes *et al.* (1990)** on *Eucalyptus grandis* and *E. saligna* and **Hassan *et al.* (1997)** on *Acacia saligna* and *Leucaena Leucocephala* seedlings irrigated with sewage water where they found that stem diameter increased compared with control. In this regard the two different used soil indicated that loamy soil induced in the first season insignificantly the thickest stem diameter more than those of sandy soil when seedlings were irrigated with Nile, drainage or municipal wastewater effluent.

In the second season the superior stem diameter in the loamy soil was more than those of sandy soil when seedling were irrigated with either Nile or drainage water while when the seedlings were irrigated with municipal wastewater effluent, the difference were not significant. However loamy soil was the best.

The results were in harmony with findings of **Singh and Sharma (1984)** on *populus ciliata* where both of them found that stem diameter was greatest in loamy soil, **Radwan, (1999)** and **Shehata *et al* (2002)** on *Eucalyptus incana*, reported that loamy soil increased stem diameter compared to sandy soil.

Stem diameter in response to different levels of soil moisture content of 40,60 and 80 % of field capacity are represented in Table (10) was obviously affected since the level of 40 % soil moisture content significantly reduced it compared to the two others levels where 80 % soil moisture content caused the maximum increase in thickness of plant and there are no significant differences between the two levels of 80 or 60 % soil moisture. This fact exhibited with three different water resource. The average of stem diameter of the plants were 0.25, 0.37 and 0.39 cm under soil moisture content of 40,60 and 80 % respectively in the first season whereas they were 0.22, 0.29 and 0.32 cm in the second season irrespective the effect of both two soil types and water resources. It means that the plants have the thickest stem under the high levels of soil moisture content.

The previous results were in the same line of those obtained results by **Morales (1981)** on Arabic coffee who showed that the stem diameter was higher of 80 % and 90 % of field capacity more than at 60 or 70 %, **Shehata (1992)** on *Cupressus sempervirens* cleared that high soil moisture content 80 % of field capacity caused an increases in stem diameter comparing with 40 %..

4-1-3- Root length

In the first season data tabulated in Table (11) showed that the irrigation with municipal water effluent produced significantly the longest root with an average value of 29.77cm compared to those irrigated with drainage water which gave the shortest root with an average of 22.39 cm, whereas those irrigated with Nile water resulted in the intermediate in average value of 27.08 cm. The differences between municipal and Nile water were insignificant.In the second season the results gave the same trend of the first season approximately, meanwhile municipal wastewater effluent induced significantly the longest roots in average value of 32.78 cm followed by Nile water which gave the mean value of 29.33 cm while drainage water irrigation produced the shortest roots in average value of 25.22 cm. The differences between municipal wastewater effluent and Nile water were not significant.

Data presented in Table (11) show that in the first season that the two different used soils had a pronounced effect on root length where the seedlings grown in loamy soil and irrigated with municipal wastewater produced significantly the longest roots in average value of 33.26 compared to those of sandy soil that gave average value of 26.28 cm. The plants irrigated with Nile water have taken the same trend since the mean values were 30.39 and 23.77 under loamy and sandy soil respectively. The differences between two used soil were not significant when the plants were irrigated with drainage water. However loamy soil surpassed than sandy soil. In the second season the results have been taken the same trend approximately.

The former results coincided with those obtained by **Singh and Sharama (1984)** on *Populus ciliata*, **Witt (1987)** on *Taxus baccata* they found that root length improved by adding clay to sandy soil and **Radwan, (1999)** mentioned that 1:1 v:v mixture of sandy: clay soil was good media for root length of *Eucalyptus incana*..

Concerning the effect of different soil moisture content on root length it can be concluded from Table (11) that the levels of 40, 60 and 80 % of field capacity significantly affected root

Table (11): Effect of different water resources irriagtion and soil moisture content on root length (cm) of *Cupressus sempervirens* seedlings grown in different two soil types during 1998/1999 and 1999/2000 seasons.

Seasons		1998-1999				1999-2000			
Water resources	Soil type / S.M.C.	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	40.33	29.17	21.33	30.39a	40.65	31.17	23.18	31.67a
	Sandy soil	31.33	22.33	17.67	23.77b	36.40	25.21	19.33	26.98ab
Mean		36.00a	25.75b	19.50c	27.08A	38.52a	28.19b	21.26c	29.33A
Drainage water	Loamy soil	31.12	24.11	18.44	24.56ab	33.09	28.14	20.11	27.11b
	Sandy soil	25.17	19.83	15.67	20.22b	30.12	22.44	17.43	23.33b
Mean		28.15ab	21.97b	17.10c	22.39B	33.60a	25.29b	20.15c	25.22B
Municipal wastewater effluent	Loamy soil	42.40	31.12	26.27	33.26a	26.12	33.65	28.14	35.97a
	Sandy soil	33.41	25.18	20.24	26.28b	38.46	28.11	22.21	29.59b
Mean		37.91a	28.15ab	23.26b	29.77A	42.29a	30.88b	25.18bc	32.78A
Mean		34.02a	25.29b	19.95c		38.14a	28.12b	22.20c	

S.M.C. = Soil moisture content.

* Mean values in the same column within soil type followed by the same small litters are not significant at level of 5 % probability.
* Mean values in the same column within water resources followed by the same capital litters are not significant at level of 5 % probability.
* Mean values of different soil moisture content in the same raw followed by the same small litters are not significant at level of 5 % probability.

A1 = Nile water.
A2 = Drainage water.
A3 = Municipal waste water.
B1 = Loamy soil.
B2 = Sandy soil.
C1 = 40 % of field capacity.
C2 = 60 % of field capacity.
C3 = 80 % of field capacity.

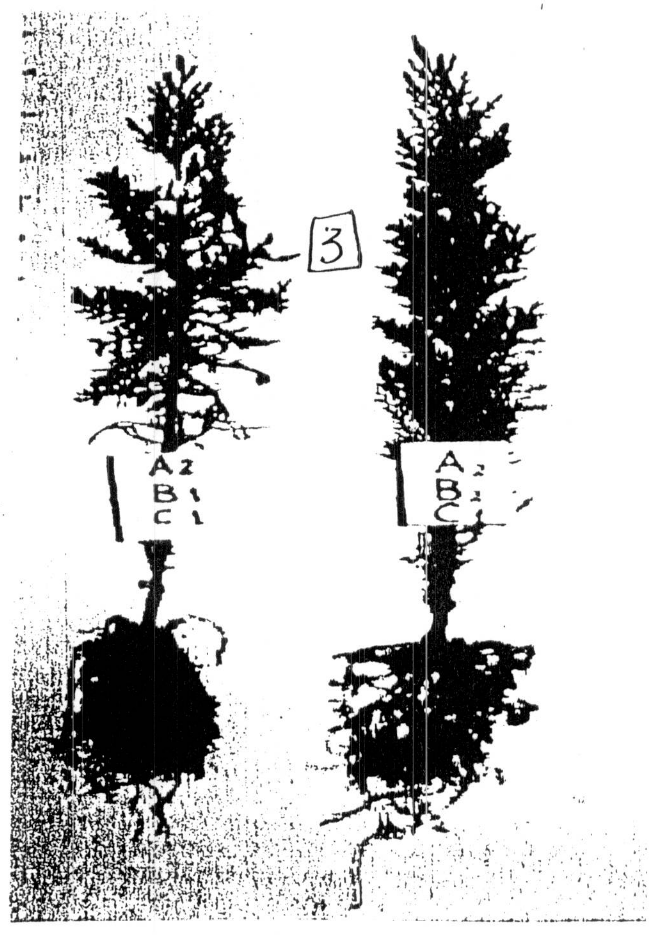


Photo (3) shows development and root distribution of *cupressus sempervirens* seedling irrigated at level of 40% soil moisture content as affected by two types of soil

length in which the averages were 34.02, 25.29 and 19.95 cm, respectively in the first season but in the second one they were 38.14, 28.12 and 22.20 cm consequently, regardless the effect of different two soils and water resources.

From the above mentioned it can be resulted that when the available water in roots media in restricting the root length of the plants is the tallest.

Generally different water resources, soil moisture content and different soils obviously affected seedling growth represented in plant height and stem diameter which significantly increased with using municipal wastewater, drainage water in addition to using 60 or 80 %, soil moisture content of field capacity when the seedlings planted in loamy soil. Meanwhile, the reduction in seedling growth was severe under drought conditions.

This depression which occurred may be attributed to that the increase in water stress caused a reduction in cell turgor pressure which consequently reduced cell enlargement and cell elongation (**Brouwer, 1963**).

4.1.4. Branch number/plant

The data presented in Table (12) cleared that the average number of branches per plant increased significantly by irrigation seedlings with municipal wastewater or drainage water as compared with those irrigated with Nile water. Seedlings irrigated with municipal wastewater effluent possessed the highest number of branches 66.50 plant followed by those irrigated with drainage water 60.00 while the lowest one 56.66 was observed in irrigated seedlings with Nile water in the first

Table (12): Effect of different water resources irriagtion and soil moisture content on branches number/plant of *Cupressus sempervirens* seedlings grown in different two soil types during 1998/1999 and 1999/2000 seasons.

Seasons		1998-1999				1999-2000			
Water resources	Soil type / S.M.C.	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	37.00	64.00	81.67	60.89b	38.67	54.67	52.67	48.67c
	Sandy soil	29.00	62.00	66.33	52.44c	30.00	49.67	56.33	45.33c
Mean		30.00d	63.00b	74.00a	56.66C	34.33d	52.17b	54.50b	47.00C
Drainage water	Loamy soil	41.67	68.33	80.33	63.44b	42.67	62.33b	63.00	56.00b
	Sandy soil	31.67	67.33	68.00	55.66c	45.00	56.67	62.00	54.78b
Mean		36.67	67.83a	74.17a	60.00B	43.83c	59.50ab	62.83a	55.39B
Municipal wastewater effluent	Loamy soil	54.33	74.00	84.67	70.77a	52.67	68.67	67.33	62.89a
	Sandy soil	37.33	74.00	75.33	62.20b	50.33	63.67	65.67	59.89ab
Mean		45.83c	74.00a	80.00a	66.50A	51.50bc	66.17a	66.50a	61.39A
Mean		38.50c	68.28b	76.10a		43.22b	59.28a	61.28a	

S.M.C. = Soil moisture content.

* Mean values in the same column within soil type followed by the same small litters are not significant at level of 5 % probability.

* Mean values in the same column within water resources followed by the same capital litters are not significant at level of 5 % probability.

* Mean values of different soil moisture content in the same raw followed by the same small litters are not significant at level of 5 % probability.

season, also the results of second season have value of 61.39 in the seedlings irrigated with municipal wastewater effluent followed by drainage water which gave the mean value of 55.39 while those irrigated by Nile water produced the lowest one in average value of 47.00. The differences among the three used water resources were significant.

These results were supported by **Zekri and Koo (1993)** on citrus trees, where both of them found that the municipal wastewater increased canopies of trees more than the trees irrigated with well water. **El-Said,(1999)**found that trees of *Citrus reticulata* irrigated with reclaimed wastewater had the largest canopies as compared with Nile waterr

Regarding the effect of soil type on branches number/plant, it can be noticed from Table (12) that the seedlings planted in loamy soil significantly surpassed in branches number more than those planted in sandy soil. This fact revealed in the three water resources used in plants irrigation, moreover loamy soil irrigated with municipal wastewater induced significantly the highest branches number/plant in average value of 70.77 and 62.29 in first and second season respectively.

The obtained results of the second season have taken the same trend and confirmed those of the first one.

It could be, also noticed from data in the same table that municipal wastewater amended the traits of sandy soil resulting in branches number more than those produced from loamy soil and irrigated with Nile or drainage water as shown in first and second season.

These results agreed with those obtained by **Farahat (1986)** on *E. camaldulensis*, reported that the mixture of sand + clay + peat produced the best vegetative growth compared to sandy soil and **Mohamed (1993)** on *Nerium oleander* and *Adhatoda vasica*, reported that the mixture of 1:1 sand + clay had an effect on increasing plant height, stem diameter and leaves numbers.

In this respect the effect of soil moisture content on branch number/plant as shown in Table (12). The results apparently cleared that the decreasing of soil moisture 40 % of field capacity significantly declined severely the branch number per plant in both seasons . In the first season the average values were 38.50, 68.50 and 76.10 under 40, 60 and 80 % of field capacity whereas they were 43.22, 59.28 and 61.28 under soil moisture content of 40, 60 and 80 % of field capacity respectively, in the second one, meanwhile there are no significant differences between 60 and 80 % level of field capacity in the second season. However, 80 % soil moisture content of field capacity was the best.

The results were in the same line with the results of **Shehata, (1992)** on *cupressus sempervirens* who stated that number of leaves was considerably less for seedlings treated with exceeding levels of soil moisture stress.

4.1.5. Fresh and dry weights in(g)

4.1.5.1. Fresh weight

Tables (13 & 14) shows the effect of different water resources irrigation, two types of soils under different soil moisture content on the fresh weight of branches, stems and roots of *Cupressus sempervirens.*

The results indicated that the municipal wastewater effluent in the first season produced the highest fresh weight of branches, stems and roots (36.16, 19.96 and 14.93 g.) respectively, compared with the other resources of irrigation water. The table shows also, that there were significant differences among the three different water resources used in irrigation in the fresh weight of branches and stems with exception the differences between those irrigated with Nile water and municipal wastewater where the differences were not significant in fresh weight of roots

In the second season the results had the same trend for those obtained from the first season in fresh weight of the stems, while there are no significant differences among those irrigated with three water resources in fresh weight of roots.

The results were in accordance with **Zekri and Koo (1993)** on citrus trees, they found that the municipal wastewater increased canopies of trees more than the trees irrigated with well water and **Maurer, *et al.* (1995)** on grapefruit trees determined the effects of canal water and reclaimed wastewater on growth of mature trees. They found that, the reclaimed wastewater produced the largest canopies and trunk more than the trees irrigated with canal water.

As for the effect of soil types the seedlings planted in loamy soil and irrigated with municipal wastewater recorded significantly the highest fresh weight of branches in comparison with sandy soil. There were significant differences in the fresh weight of branches between the two types of soils irrigated with municipal and drainage water, on the other hand there were no

Table (13): **Effect of different water resources irriagtion and soil moisture content on fresh weight of plant organs of *Cupressus sempervirens* seedlings grown in different two soil types during 1998/1999 season.**

		Branches				Stems				Roots			
Water resources	Soil type / S.M.C.	40%	60%	80%	Mean	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	17.74	25.06	34.00	25.60c	9.55	14.66	16.98	13.73d	15.85	13.03	10.36	13.08ab
	Sandy soil	19.90	27.81	27.19	24.97c	12.70	16.10	14.65	14.48cd	18.31	16.40	14.57	16.43a
Mean		18.92c	26.43bc	30.59b	25.28C	11.13c	15.38bc	15.82bc	14.11C	17.08a	14.72a-c	12.47bc	14.75A
Drainage water	Loamy soil	25.42	34.96	40.87	33.75b	12.20	20.38	21.19	17.92b	12.30	10.20	12.77	11.75b
	Sandy soil	30.00	27.66	24.32	27.32c	12.78	17.65	20.11	16.85bc	15.81	13.73	11.21	13.58ab
Mean		27.71bc	31.31b	32.59ab	30.54B	12.49c	19.02ab	20.65a	17.38B	14.05a-c	11.96c	11.99c	12.67B
Municipal wastewater effluent	Loamy soil	33.06	39.67	46.20	39.64a	16.39	22.25	25.30	21.31a	13.71	17.67	18.83	16.70a
	Sandy soil	30.99	30.18	36.87	32.68b	15.30	21.26	19.28	18.61ab	13.86	13.93	11.69	13.16ab
Mean		32.03ab	34.92ab	41.54a	36.16A	15.84bc	21.75a	22.29a	19.96A	13.78a-c	15.84ab	15.16a-c	14.93A
Mean		26.18b	30.89ab	34.91a		13.15b	18.72a	19.58a		14.97a	14.17a	13.20a	

S.M.C. = Soil moisture content.

* Mean values in the same column within soil type followed by the same small litters are not significant at level of 5 % probability.
* Mean values in the same column within water resources followed by the same capital litters are not significant at level of 5 % probability.
* Mean values of different soil moisture content in the same raw followed by the same small litters are not significant at level of 5 % probability.

Table (14): Effect of different water resources irriagtion and soil moisture content on fresh weight of plant organs of Cupressus sempervirens seedlings grown in different two soil types during 1999/2000 season.

Water resources	Soil type / S.M.C.	Branches 40%	Branches 60%	Branches 80%	Branches Mean	Stems 40%	Stems 60%	Stems 80%	Stems Mean	Roots 40%	Roots 60%	Roots 80%	Roots Mean
Nile water	Loamy soil	17.91	27.47	35.61	27.00c	9.57	11.52	14.97	12.02c	17.38	22.50	14.28	18.05a
	Sandy soil	22.43	27.54	29.24	26.40c	7.46	10.25	11.55	9.75d	14.60	13.92	13.84	14.12a
Mean		20.17e	27.50d	32.43b-d	26.70B	8.52d	10.88cd	13.26bc	10.89C	15.99ab	18.21a	14.06ab	16.09A
Drainage water	Loamy soil	21.69	30.94	36.46	29.69b	12.25	16.04	17.28	15.19b	18.15	13.55	11.13	14.28a
	Sandy soil	19.75	28.17	31.59	26.50c	9.66	14.74	13.06	12.49c	14.61	12.75	13.75	13.70a
Mean		20.72e	29.56c	34.02b	20.10B	10.96cd	15.39b	15.17b	13.84B	16.38ab	13.15ab	12.44b	13.99A
Municipal wastewater effluent	Loamy soil	26.08	39.57	43.78	36.48a	16.18	19.66	24.12	19.98a	15.58	14.85	13.21	14.54a
	Sandy soil	27.87	34.23	36.85	32.98b	10.87	19.14	17.99	16.00b	17.69	13.92	13.21	14.94a
Mean		26.97d	36.90ab	40.31a	34.73A	13.52bc	19.40a	21.06a	17.99A	16.84ab	14.38ab	13.21ab	14.74A
Mean		22.62c	31.32b	35.59a		11.00b	15.22a	16.49a		16.34a	15.25ab	13.23b	

S.M.C. = Soil moisture content.

* Mean values in the same column within soil type followed by the same small litters are not significant at level of 5 % probability.
* Mean values in the same column within water resources followed by the same capital litters are not significant at level of 5 % probability.
* Mean values of different soil moisture content in the same raw followed by the same small litters are not significant at level of 5 % probability.

significant differences between the two types of soils irrigated with Nile water. Stems and roots fresh weight of plants irrigated with different water resources had no significant effects due to soil type in the first season. In the second season a similar trend was found to that obtained from the first season, while there are significant differences between loamy and sandy soil in fresh weight of stems when seedlings irrigated with three water resources.

The previously results were in the same line of many scientists such as **El-Khateeb (1983)** on *E. angulosa* concluded that a mixture of peatmoss plus loam or sand had a great effect on increasing fresh and dry. weight of stems and fresh weight of leaves and **Mohamed (1993)** on *Nerium oleander* and *Lantana camara* reported that the mixture of 1:1 had an effect on increasing fresh and dry weight of roots, stems and leaves.

Data of fresh weight in response to different levels of soil moisture content of 40, 60 and 80 % of field capacity are represented in Tables (13 & 14). The fresh weight of both branches and stems increased with increasing the soil moisture content. Meanwhile, the fresh weight of roots decreased slightly with the increase of soil moisture content. There were no significant differences among the fresh weight of branches, stems and roots at 60 and 80 % soil moisture content of field capacity.

The former results supported by many scientists such as **Sarag (1983)** detected that fresh weight of some tomato varieties were decreased with decreasing the available soil moisture, **Rokaia (1990)** on *Ficus carica* found that the water deficit decreased fresh weight of the plant portions and **Burman, *et al.* (1991)** on *Melia azaderacht* who stated that final biomass production of seedlings was greatest at non-water stress where the plants irrigated at field capacity at 2 weeks interval and its due to larger increase in foliage weight.

In the second season the results gave the same trend of those obtained in the first season approximately.

4.1.5.2 <u>Dry weight</u>

The results presented in Tables (15 & 16) indicated that dry weight of branches, stems and roots of *Cupressus sempervirens* were more effected by water resources; different two soils under different soil moisture content in which the irrigation with municipal wastewater effluent in the first season produced the highest dry weight of branches, stems and roots in average values of 16.12, 11.47 and 5.72 g. respectively, compared to those irrigated with drainage or Nile water. The differences among different water resources were significant in the dry weight of branches and stems but insignificant in the dry weight of roots. Generally municipal wastewater effluent surpassed than the two others water resources.

The results of the second season emphasized those obtained from the first one.

The former results were coincided in the same trend of many investigators such as **Kerr and Sopper (1982)** on popular and **AbouelKhair (1988)** on *E. conzaldulensis* and **El-Said (1999)** on Citrus trees. All of them found that using wastewater increased dry weight of the whole plant.

Table (15): Effect of different water resources irriagtion and soil moisture content on dry weight of plant organs of Cupressus sempervirens seedlings grown in different two soil types during 1998/1999 season.

Water resources	Soil type / S.M.C.	Branches 40%	Branches 60%	Branches 80%	Branches Mean	Stems 40%	Stems 60%	Stems 80%	Stems Mean	Roots 40%	Roots 60%	Roots 80%	Roots Mean
Nile water	Loamy soil	7.06	11.09	13.05	10.40bc	4.60	8.85	9.26	7.57c	6.16	4.48	3.47	4.77a
	Sandy soil	8.13	11.40	10.21	9.91c	4.24	6.65	6.30	5.73a	7.32	6.73	4.24	6.10a
Mean		7.60c	11.24	11.63cd	10.16C	4.22c	7.75b	7.78b	6.65C	6.83a	5.70b	3.65b	5.43A
Drainage water	Loamy soil	8.05	15.62	15.86	13.18ab	7.60	11.45	11.98	10.34a	4.08	3.67	4.12	5.94a
	Sandy soil	11.72	11.25	14.68	12.55a-c	7.26	10.19	8.10	8.65b	6.14	5.25	8.44	5.94a
Mean		9.88de	13.44b-d	15.27a-c	12.86B	7.43b	10.82a	10.04a	9.49B	5.11ab	4.47b	5.28ab	4.95A
Municipal wastewater effluent	Loamy soil	12.70	19.23	20.35	17.43a	9.42	13.31	14.02	12.25a	5.00	5.71	7.13	5.94a
	Sandy soil	10.77	15.16	18.48	14.80b	9.10	11.37	11.61	10.69b	6.19	5.93	4.35	5.49a
Mean		11.74b-d	17.19ab	19.42a	16.12A	9.26b	12.34a	12.82a	11.47A	5.60ab	5.22ab	5.74ab	5.72A
Mean		9.74c	13.95a	15.44a		7.04b	10.30a	10.21a		5.81a	5.33a	4.95a	

S.M.C. = Soil moisture content.

* Mean values in the same column within soil type followed by the same small litters are not significant at level of 5 % probability.
* Mean values in the same column within water resources followed by the same capital litters are not significant at level of 5 % probability.
* Mean values of different soil moisture content in the same raw followed by the same small litters are not significant at level of 5 % probability.

Table (16): Effect of different water resources irriagtion and soil moisture content on dry weight of plant organs of Cupressus sempervirens seedlings grown in different two soil types during 1999/2000 season.

Water resources	Soil type / S.M.C.	Branches 40%	Branches 60%	Branches 80%	Branches Mean	Stems 40%	Stems 60%	Stems 80%	Stems Mean	Roots 40%	Roots 60%	Roots 80%	Roots Mean
Nile water	Loamy soil	6.09	13.02	11.00	10.04b	3.92	6.00	7.32	5.75d	6.42	9.04	5.57	6.46a
	Sandy soil	5.71	10.19	6.95	7.62c	3.01	11.23	9.09	5.44d	5.28	5.58	5.20	5.35a
Mean		5.90d	11.60bc	8.97cd	8.83C	3.47f	5.12ef	8.21cd	5.59C	5.85ab	6.48a	5.39ab	5.91A
Drainage water	Loamy soil	6.20	17.79	15.09	13.03a	6.52	8.93	11.75	9.10b	7.99	5.13	4.37	5.83a
	Sandy soil	8.46	8.34	13.11	9.97bc	5.87	5.27	10.81	7.32c	5.39	5.64	4.75	5.26a
Mean		7.33d	13.07ab	14.10bc	11.50B	6.20de	7.10de	11.28ab	8.19B	6.69a	5.38ab	4.56ab	5.55A
Municipal wastewater effluent	Loamy soil	8.52	16.18	18.63	13.77a	8.24	11.98	15.32	11.85a	5.60	5.71	4.62	5.31a
	Sandy soil	9.29	12.69	13.99	11.99b	9.02	7.80	11.14	9.31b	6.69	5.39	4.66	5.57a
Mean		8.90cd	14.43ab	15.31a	12.88A	8.63cd	9.68bc	13.23a	10.58A	6.15ab	5.55ab	4.63b	5.44A
Mean		7.38b	13.00a	13.00a		6.10b	8.36a	10.91a		6.23a	5.80a	5.00a	

S.M.C. = Soil moisture content.

* Mean values in the same column within soil type followed by the same small litters are not significant at level of 5 % probability.
* Mean values in the same column within water resources followed by the same capital litters are not significant at level of 5 % probability.
* Mean values of different soil moisture content in the same raw followed by the same small litters are not significant at level of 5 % probability.

As for two different type of soils the data in the same tables indicated that loamy soil induced significantly superior dry weight of branches and stems more than those of sandy soil when seedlings were irrigated with drainage and Nile water. On the other hand there were no significant differences in dry weight of roots between two types soil which irrigated with different water resources in both seasons.

These obtained results were in harmony with those obtained by **El-Khateeb, (1983)** on *E. angulosa* concluded that a mixture of peatmoss plus loam or sand had a great effect on increasing dry weight of stems and **Mohamed (1993)** on *Adhatoda rasica* and *Lantana camara* reported that the mixture of sand + clay (2:1) produced the best dry weight compared to sand + clay (1:1) v:v.

Regard to the effects of soil moisture the data in Tables (15 & 16) demonstrated that the dry weight of branches and stems significantly increased at 60 and 80 compared with 40 % soil moisture content.

In the first season the average values of dry weight of branches were 9.74, 13.95 and 15.44 g., while the values of stems were 7.04, 10.30 and 10.21 g under 40, 60, and 80 % soil moisture, respectively. In the second season dry weight of branches were 7.38, 13.00 and 13.00 g., whereas in stems the mean values were 6.10, 8.36 and 10.91 g under 40, 60 and 80 % soil moisture true content, respectively.

These results were supported by many authors such as **Schulte and Marshall (1983)** on pinus, **Rawat *et al.* (1984)** on *E. treticornis* since they found that when soil moisture content was reduced by 66 % and 84 % the reduction in dry weight was 25 % and 38 %, respectively and **Shehata, (2002)** on *Khaya senegalensis* found that dry weight was affected due to different soil moisture and it was significantly reduced in the seedlings treated with stressed water (40 % of field capacity) compared to those of 80 or 60 %.

Generally, from the previous results it could be noticed that increasing fresh and dry weights of branches and stems due to municipal or drainage water irrigation in loamy soil, this results may be due to increasing of organic matter in soil and macro, micro elements in municipal wastewater effluent and drainage water comparing with sandy soil and Nile water, respectively. Also, soil moisture content affected the fresh and dry weights of the different plant portions and as a result to the water stress increased the fresh and dry weights decreased.

4.2. Survival percentage of seedlings

As shown in Table (17) it can be noticed that the survival percentage of seedlings decreased due to municipal wastewater effluent and drainage water irrigation where it reached 85.20 and 86.13 % in the first season while it was 88.90 and 81.50 %, respectively, in the second one, the highest value was 92.6 % accompanied to Nile water irrigation in two seasons; the differences among the three water resources were insignificant.

These results were paralled with the finding of **Hegg *et al.* (1985)** on *Liriodendron tulifera* and *Populus deltoides* who reported that the treatment with Swine lagoon effluent of 0,20, 47, 74 and 144 cm/year insignificantly increased total mortality.

Table (17): Effect of different water resources irriagtion and soil moisture content on survival percentage of Cupressus sempervirens seedlings grown in different two soil types during 1998/1999 and 1999/2000 seasons.

Seasons		1998-1999				1999-2000			
Water resources	Soil type / S.M.C.	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	88.90	100.00	100.00	96.30a	88.90	100.00	88.90	92.60a
	Sandy soil	77.80	88.90	100.00	88.90a	77.80	100.00	100.00	92.60a
Mean		83.35a	94.95a	100.00a	92.60A	83.35ab	100.00a	94.45a	92.60A
Drainage water	Loamy soil	83.35	88.90	88.90	87.05a	66.70	100.00	77.80	81.50a
	Sandy soil	77.80	100.00	77.80	85.20a	77.80	77.80	88.90	81.50a
Mean		80.58ab	94.45a	83.35a	86.13A	72.25b	88.90ab	83.35a	81.50A
Municipal wastewater effluent	Loamy soil	88.90	100.00	77.80	88.90a	77.80	88.90	100.00	88.90a
	Sandy soil	77.80	77.80	88.90	81.50a	88.90	100.00	77.80	88.90a
Mean		83.35a	89.90a	83.35a	85.20A	83.35ab	94.45a	88.90a	88.90A
Mean		82.42b	92.77a	88.90a		79.65b	94.45a	88.90a	

S.M.C. = Soil moisture content.

* Mean values in the same column within soil type followed by the same small litters are not significant at level of 5 % probability.
* Mean values in the same column within water resources followed by the same capital litters are not significant at level of 5 % probability.
* Mean values of different soil moisture content in the same raw followed by the same small litters are not significant at level of 5 % probability.

As for two different types of soil the data show that there are no significantly differences in between when the seedlings were irrigated with different water resources in both seasons.

Regarding the effects of soil moisture on survival percentage, it could be observed from data that the 60 % level of soil moisture content had always the maximum in average values of 92.77 and 94.45 followed by 80 % soil moisture content in average values 88.90 and 88.90 % whereas the level of 40 % soil moisture produced the least values of 82.42 and 79.65 % respectively. There were significant differences among both of 80, 60 and 40 % meanwhile there are no significant differences between the first two levels. In the second season it is evident that the survival percentage of *Cupressus sempervirens* seedlings was decreased as a result to water stress and increased to maximum with medium moisture.

The previous results were in the same line of many investigators such as **Harrington and De Bell (1984)** on *Populus trichocarpa* and *Alnus rubra,* **Humphries *et al.* (1982)** on *Betula pendula* where they found that the mortality of seedling was markedly increased at a matric potential of (-1.6) bars and **Shehata, (1992)** on *Cupressus sempervirens* who reported that mortality increased by decreasing soil moisture content.

4.3. <u>Transpiration rate</u>

The data presented in Table (18) and fig. (3,4) showed the effect of different water resources, two types of soil and different three levels of soil moisture content on transpiration rate of *Cupressus sempervirens*, where in the first season there were no significant differences among plants were irrigated with municipal, drainage and Nile water. The averages were 78.23, 73.48 and 73.13 mg/g fresh weight/h consequently.

From the former results it can be resulted that, the water resources did not affect the rate of transpiration.

In the second season the results cleared that there are no significant differences between seedlings that irrigated with either municipal or Nile water while the significancy elucidated between plants that irrigated with drainage water and municipal or between Nile water and drainage water.

As for two different types of soils the data in the same table showed in the first season that there were significant differences between loamy soil and sandy soil when the seedlings were irrigated with municipal, drainage or Nile water. The average of plants planted in loamy and sandy soil and irrigated with municipal wastewater were 80.76 and 75.70, respectively while the transpiration rates of those plants irrigated with drainage water were 75.63 and 71.33 then it was75.91 and 70.34 mg/g fresh weight in those irrigated with Nile water, respectively.

In the second season the results gave the same line approximately.

From the aforementioned results it is evident that the plants cultivated in loamy soil transported much more than those of sandy soil.

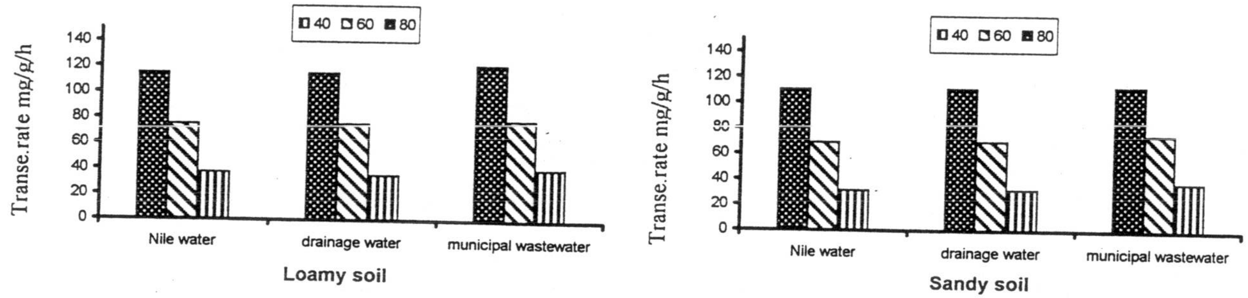
As for transpiration rates in response to different soil moisture content, the results presented in Table (18) cleared that there was a severe reduction in transpiration rate when the plants

Table (18): Effect of different water resources irriagtion and soil moisture content on transpiration rate mg/g. fresh weight/hour of *Cupressus sempervirens* seedlings grown in different two soil types during 1998/1999 and 1999/2000 seasons.

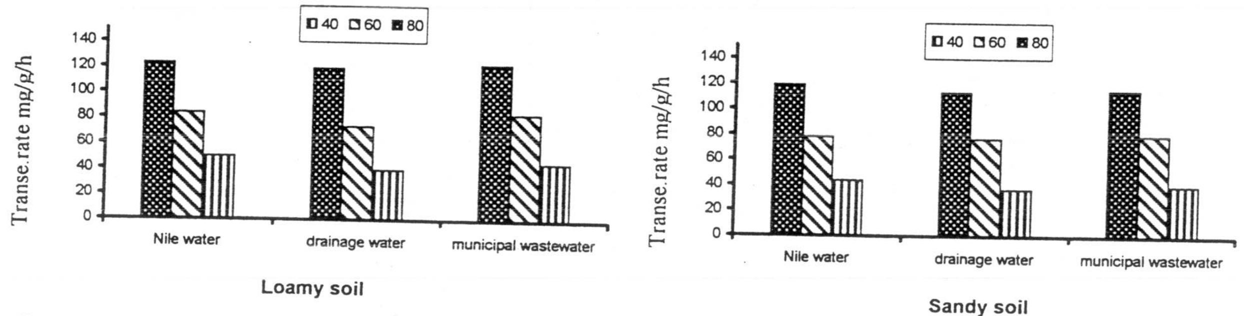
Seasons		1998-1999				1999-2000			
Water resources	Soil type / S.M.C.	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	37.42	75.14	115.17	75.91a	49.90	84.14	123.11	85.72a
	Sandy soil	31.50	69.12	110.40	70.34b	44.03	78.13	119.21	80.46b
Mean		34.46c	72.13b	112.79a	73.13B	46.97c	81.14b	121.16a	83.09A
Drainage water	Loamy soil	35.77	75.83	115.30	75.63a	39.51	73.61	119.35	77.49a
	Sandy soil	32.44	70.11	111.44	71.33b	37.03	77.14	113.70	75.96b
Mean		34.11c	72.97b	113.37a	73.48B	38.27c	75.38b	116.52a	76.73B
Municipal wastewater effluent	Loamy soil	41.00	79.10	122.17	80.76a	45.17	84.13	123.12	84.14a
	Sandy soil	38.16	75.53	113.40	75.70b	40.28	79.91	115.35	78.51b
Mean		39.58c	77.31b	117.78a	78.23B	42.73c	82.02a	119.24a	81.33A
Mean		36.05c	73.18b	114.65a		42.66c	79.51b	118.97a	

S.M.C. = Soil moisture content.

* Mean values in the same column within soil type followed by the same small litters are not significant at level of 5 % probability.
* Mean values in the same column within water resources followed by the same capital litters are not significant at level of 5 % probability.
* Mean values of different soil moisture content in the same raw followed by the same small litters are not significant at level of 5 % probability.



Fig(3) Effect of different water resources irrigation and soil moisture content on Transpiration rate mg/g fresh weight of *cupressus sempervirens* seedlings grown in loamy and sandy soil during 1998-1999 season.



Fig(4) Effect of different water resources irrigation and soil moisture content on Transpiration rate mg/g fresh weight of *cupressus sempervirens* seedlings grown in loamy and sandy soil during 1999-2000 season.

were grown under drought conditions 40 % of field capacity and as the soil moisture increased to 60 or 80 % transpiration rate increased. The differences where highly significant between the seedlings grown under soil moisture of 80 % and those grown under both 60 or 40 % of field capacity.

In the first season the highest value was 114.65mg/g fresh weight/h under soil moisture content of 80 % while the lowest was 36.05 mg/g fresh weight/h at 40 % then it was 73.18 at 60 % of field capacity. In the second season these results had the same trend for those obtained in the first one while the values were 118.97, 79.51 and 42.66 mg/g fresh weight/h under soil moisture content of 80, 60 and 40 % of field capacity, respectively.

The former results were similarly to those reported by **Torres (1980)** on orange, who found that water consumption by transpiration increased with increasing soil moisture in the root zoon, **Levy (1983)** on citrus macrophylla stated that sever water stress reduced transpiration, **Rawat (1985)** on *Eucalyptus hybrid* found that when soil moisture content is restricted transpiration rate was reduced, **Eastham *et al.* (1990)** on *Eucalyptus grandis* stated that the ratio of transpiration rate decreased linearly with decreasing mean soil water content and **Shehata (1992)** on *Cuperssus sempervirens*, who reported that when soil moisture is restricted transpiration rate was reduced.

4.4. Effect of different water resources irrigation and soil moisture content in different two soils on chemical constituents:

4.2.1 Chlorophylls and carotenoides content of leaves :

The data existed in Tables (19,20) detected that chlorophyll a,b and carotenoides content as influenced by different water resources irrigation and two types of soils under different soil moisture content .

In the first season the irrigation with municipal wastewater effluent gave the highest values of chlorophyll(a) content followed by drainage water irrigation whereas those of Nile water gave the lowest one .The average values of chlorophyll(a)were 2.66,2.59 and 2.42 mg/g fresh weight as affected by municipal, drainage and Nile water irrigation consequently .

Chlorophyll (b)in leaves had similar trend of those obtained from the previous results of chlorophyll (a)whereas the averages of leaves chlorophyll (b) content were 3.56,3.40 and 3.00 mg/g fresh weight as affected by municipal, drainage and Nile water irrigation respectively

Also, the data presented in the same table showed that carotenoides content was more effected by different water resources since the irrigation with municipal wastewater effluent produced the highest value of carotenoides 1.37 mg/g fresh weight compared to those of either Nile or drainage water in average values of 1.24 and 1.27 mg/g fresh weight, respectively.

Table (19)Effect of different water resources irrigation and soil moisture content on Chlorophylls and carotenoides in leaves (mg/g fresh weight) of *cupressus sempervirens* seedlings grown in different tow soil types during 1998- 1999 Season.

		Chlorophyll a				Chlorophyll b				Carotenoides			
Water resources	Soil type / SMC	40%	60%	80%	Mean	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	2.63	2.64	2.28	2.52	3.44	3.29	2.78	3.17	1.32	1.25	1.26	1.28
	Sandy soil	2.58	2.17	2.18	2.31	2.89	3.03	2.53	2.82	1.15	1.20	1.23	1.19
Mean		2.61	2.41	2.23	2.42	3.17	3.16	2.67	3.00	1.24	1.23	1.25	1.24
Drainage water	Loamy soil	2.88	2.76	2.46	2.71	3.72	3.64	3.38	3.58	1.54	1.26	1.14	1.33
	Sandy soil	2.67	2.40	2.33	2.47	3.51	3.01	3.15	3.22	1.38	1.14	1.10	1.21
Mean		2.78	2.58	2.40	2.59	3.62	3.33	3.27	3.40	1.46	1.20	1.14	1.27
Municipal wastewater effluent	Loamy soil	2.84	2.71	2.61	2.72	3.85	3.73	3.49	3.69	1.67	1.36	1.28	1.44
	Sandy soil	2.68	2.80	2.44	2.64	3.56	3.41	3.31	3.43	1.46	1.24	1.20	1.30
Mean		2.76	2.76	2.53	2.66	3.71	3.57	3.40	3.56	1.57	1.30	1.24	1.37
Mean		2.71	2.58	2.39	2.56	3.50	3.35	3.11	3.32	1.42	1.24	1.21	

S.M.C =Soil moisture content

Table (20)Effect of different water resources irrigation and soil moisture content on Chlorophylls and carotenoides in leaves (mg/g fresh weight) of *cupressus sempervirens* seedlings grown in different tow soil types during 1999- 2000 Season.

Water resources	Soil type / SMC	Chlorophyll a				Chlorophyll b				Carotenoides			
		40%	60%	80%	Mean	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	2.47	2.41	2.19	2.36	3.28	3.11	3.00	3.13	1.38	1.22	1.18	1.26
	Sandy soil	2.27	2.10	2.09	2.15	3.08	3.07	2.80	3.02	1.08	1.11	1.10	1.10
Mean		2.37	2.26	2.14	2.26	3.23	3.09	2.9	3.05	1.23	1.17	1.14	1.18
Drainage water	Loamy soil	2.52	2.57	2.31	2.47	3.76	3.66	3.45	3.62	1.74	1.64	1.52	1.63
	Sandy soil	2.33	2.42	2.21	2.32	3.30	3.45	2.31	3.02	1.51	1.43	1.37	1.44
Mean		2.43	2.50	2.26	2.40	3.53	3.55	2.88	3.32	1.63	1.54	1.45	1.54
Municipal wastewater effluent	Loamy soil	2.76	2.63	2.53	2.64	3.86	3.58	3.55	3.66	1.90	1.71	1.87	1.83
	Sandy soil	2.42	2.33	2.31	2.35	3.42	3.51	3.41	3.45	1.59	1.50	1.43	1.51
Mean		2.59	2.48	2.42	2.50	3.64	3.55	3.35	3.56	1.75	1.61	1.65	1.67
Mean		2.46	2.41	2.27	2.36	3.47	3.39	2.77	3.31	1.54	1.44	1.41	

S.M.C =Soil moisture content

In the second season, a similar trend to those obtained from the first season was observed , in response of chlorophyll (a,b) and carotenoides of municipal, drainage and Nile water for irrigation .

In general chlorophyll (b) was higher than chlorophyll (a).The average values of chlorophyll(a) were 2.56 and 2.36 mg/g fresh weight in the first and second season while for chlorophyll(b) they were 3.32 and 3.31 mg/g fresh weight for the first and second season respectively.

The here above obtained results were in harmony with the findings of **Narwal** ***et el.*****(1990)** and **Zekri and koo (1993)** where they found that mature citrus trees irrigated with reclaimed municipal wastewater had denser greener leaves .

As for two different types of soil the data in Tables (19 ,20) showed that, in the first season , chlorophyll (a,b) and carotenoides increased to maximum in loamy soil (2.72,3.69 and 1.44 mg/g fresh weight) respectively , while the minimum values were recorded in sandy soil (2.31,2.82 and 1.19 mg/g fresh weight) respectively , regardless the effect of different water resources. The results of second season emphasized those obtained from the first one .

The results agreed with those obtained by **Farahat (1986)** on *Eucalyptus camaldulensis* , **Mohamed (1992)** on *Asparagus sprengeri* and **Mohamed (1993)** on *Nerium oleander* and *Adhatoda vasica* where they found that the seedlings grown in clay or mixture of sand and clay 1:1 v/v increased the chlorophylls in leaves .

Concerning the effect of different levels of soil moisture content (40,60 and 80% of field capacity) on chlorophyll (a,b) and carotenoides , the results in the same Tables (19,20) in the first season indicated that soil moisture content of 40% of field capacity increased chlorophyll (a,b)and carotenoides as compared with those of soil moisture content of 80% of field capacity . The lowest values of chlorophyll (a,b) and carotenoides were 2.39, 3.11 and 1.21 mg/g fresh weight at 80% and the highest values were 2.71, 3.50 and 1.42 mg/g fresh weight at 40% soil moisture content of field capacity respectively.

In the second season a similar trend was found to that obtained from the first one were the highest average of chlorophyll(a) was 2.46 mg/g at soil moisture content of 40% while the lowest was 2.27 mg/g fresh weight at 80%.As for chlorophyll (b) the highest value was 3.47 mg/g fresh weight while the lowest was 2.77 mg/g fresh weight at 80%.

As for carotenoides content the lowest value was 1.41 mg/g fresh weight while the highest was 1.54 mg/g fresh weight at 80 and 40% soil moisture content of field capacity consequently.

In this respect , chlorophylls and carotenoides content as influenced by different soil moisture content were in agreement with finding of **EL-Ashker (1980)** on bean plants , who found that the plants grown in high soil moisture showed decreased concentration of chlorophyll (a) and (b) as well as carotenoides. Meanwhile, 40% (W.H.C) increased the concentrations of all photosynthetic pigments as compared with plants under normal conditions(65% W.H.C) and **Shehata ,(1992)** on *Cupressus sempervirens* and *Eucalyptus camaldulensis* found that the seedlings grown in low (S.M.C) 40% of field capacity showed increased concentration of chlorophyll a,b and carotenoides comparing with 80% .

4.4.2 Total carbohydrates percentage:

Table (21) showed the effect of using different water resources, two types of soil and different levels of soil moisture content on total carbohydrates percentage of *cupressus sempervirens* seedlings.

The results indicated that in the first season the highest total carbohydrates exhibited in shoots of seedlings irrigated with municipal wastewater effluent in average value of 11.93 % of dry weight compared to those irrigated with Nile water which had the lowest in average value of 9.11% whereas those irrigated with drainage water resulted the intermediate in average value of 10.28% of dry weight.

The results obtained from the second season were tended similarly to those of the first one in which the lowest average of total carbohydrate was 10.54% resulted in the seedlings irrigated with Nile water while the highest values were 11.00 and 10.95% due to irrigation with municipal and drainage water respectively.

The results of total carbohydrates may be due to the increase of chlorophyll (a,b) content in leaves of seedlings irrigated with municipal wastewater or drainage water , Tables (19,20) which enhanced photosynthetic rate and increased the accumulation of carbohydrate in shoots.

Table (21)Effect of different water resources irrigation and soil moisture content on total carbohydrates% of *cupressus sempervirens* seedlings grown in different tow soil types during 1998- 1999 and 1999-2000 Season.

Seasons		1998-1999				1999-2000			
Water resources	Soil type / SMC	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	8.08	10.23	9.42	9.24	12.50	11.25	10.42	11.39
	Sandy soil	8.75	9.50	8.67	8.97	11.70	9.17	8.17	9.68
Mean		8.42	9.87	9.05	9.11	12.1	10.21	9.30	10.54
Drainage water	Loamy soil	13.75	7.28	10.50	10.51	12.03	11.90	11.00	11.60
	Sandy soil	11.83	9.58	8.72	10.04	11.50	10.70	8.50	10.23
Mean		12.79	8.43	9.61	10.82	11.79	11.31	9.77	10.95
Municipal wastewater effluent	Loamy soil	14.17	13.17	12.00	13.11	12.17	12.33	10.33	11.61
	Sandy soil	12.42	10.50	9.33	10.75	11.67	9.58	9.92	10.39
Mean		13.30	11.84	10.67	11.93	11.92	10.96	10.13	11.00
Mean		11.50	10.05	9.78		11.94	10.82	9.73	

S.M.C =Soil moisture content

Regarding the effect of two types of soils on total carbohydrates, data in the same table in the first season showed that, the average of total carbohydrate ranged from 8.97 in sandy soil irrigated with Nil water to 13.11% of dry weight, as the loamy soil produced the highest total carbohydrates value of 13.11%, when irrigated with municipal wastewater.

In the second season, the results confirmed those of first one while the values varied from 9.68 to 11.61% of dry weight as the loamy soil produced the highest value of 11.61% in the seedlings irrigated with municipal wastewater compared with sandy soil which recorded the lowest in those irrigated with Nile water .

The herein obtained results were in harmony with many investigators such as **EL-Tantawy,(1981)**on *casuarina equesitifolia* and *cupressus sempervirens* who reported that soluble and non-soluble sugars increased by using clay as growing media , also **Nabil and EL-khateeb, (1991)**cleared that soluble sugars content decreased due to planting in sandy soil and **Shehata et al, (2002)** on *Eucalyptus incana , E-camaldulensis and E-citriodora,* they found that different growing media were more effective on total sugars since clay or the mixture of sand and clay 1:1 v/v significantly increased total sugars comparable with sandy soil.

Concerning the effect of soil moisture content it can be noticed in the first season that total carbohydrates increased with soil moisture content 40% of field capacity and it reduced with high soil moisture content 80% while the level of 60% was intermediate . The averages of total carbohydrates were 11.50, 10.05 and 9.78% of dry weight under soil moisture content 40,60 and 80%of field capacity respectively . In the second season the results have taken the same trend where the water stress of 40% soil moisture increased the total carbohydrates . compared to high moisture. The highest Value was 11.94% at soil moisture content 40% followed by 10.82% at 60% and the lowest value was 9.73% at 80%

As regard soil moisture content as affected of total carbohydrates, the results were in harmony with findings of **Shehat , (1992)** on *Eucalyptus camaldulensis,* who reported that total carbohydrates increased with reduced soil moisture content.

4.4.3.Total indoles :

In the first season the data presented in Table (22) cleared that the average of total indoles in leaves were slightly effected by irrigating seedlings with municipal or Nile water as compared with seedlings irrigated with drainage water .Seedlings irrigated with municipal wastewater effluent recorded the highest in average value of 8.72 mg/100g dry weight followed by seedlings irrigated with Nile water in average value of 8.36 mg/100g, while the lowest one 7.38 mg/100g was observed in seedlings irrigated with drainage water ,Also in the second season the results have been taken the same trend in which the average values were 8.63,8.39 and 7.53 mg/100g in the seedlings irrigated with municipal , Nile and drainage water respectively.

As for the effect of different soils, it can be noticed that, the mean value of total indoles ranged from 7.19 in the seedlings planted in sandy soil and irrigated with drainage water to 9.06 mg/100g dry weight in those planted in loamy soil and irrigated

Table (22)Effect of different water resources irrigation and soil moisture content on total indoles(mg/100g dry weight of *cupressus sempervirens* seedlings grown in different tow soil types during 1998- 1999 and 1999-2000 sason.

Seasons		1998-1999				1999-2000			
Water resources	Soil type / SMC	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	8.25	9.31	9.63	9.06	6.80	9.06	10.74	8.37
	Sandy soil	7.01	8.14	7.75	7.63	5.70	8.99	9.05	7.91
Mean		7.63	8.73	8.70	8.36	6.25	9.03	9.90	8.39
Drainage water	Loamy soil	6.80	8.14	7.75	7.56	5.40	8.16	9.11	7.56
	Sandy soil	6.76	7.74	7.08	7.19	5.07	8.21	8.18	7.50
Mean		6.78	7.94	7.42	7.38	5.24	8.19	8.65	7.53
Municipal wastewater effluent	Loamy soil	8.02	8.34	9.92	8.76	8.12	10.61	10.18	9.64
	Sandy soil	8.59	8.61	8.84	8.68	4.73	8.41	9.73	7.62
Mean		8.31	8.48	9.38	8.72	6.43	9.51	9.96	8.63
Mean		7.57	8.38	8.50		5.97	8.91	9.50	

S.M.C =Soil moisture content

with Nile water in the first season. In the second season the results were confirmed to those obtained from the first one where the highest average of total indoles was 9.64 mg/100g correlated with seedlings planted in loamy soil and irrigated with municipal wastewater , while the lowest one was 7.50 mg/100g in accompanied to those planted in sandy soil and irrigated with drainage water .

As for the effect of soil moisture content on total indoles , the results pointed that total indoles in the leaves increased as a result to soil moisture content increasing in both seasons. The highest value was 8.50 and the lowest was 7.57 mg/100g produced from the treatment of 80 and 40% respectively, in the first season, whereas in second season the values were 9.50, 8.91 and 5.97 mg/100g under 80, 60 and 40% soil moisture content , respectively

From the former results it might be resulted that total indoles were increased in high soil moisture content and declined with drought conditions.

The herein obtained results were confirmed by those of **Farahat, (1990)**on Myoporum, who found that total soluble indoles concentration decreased with prolonging the irrigation intervals, and **Said,(1990)**on apple found that total soluble indoles decreased in shoots of some apple rootstocks under water stress.

4.4.4 Total phenols:

Table (23)shows the effect of different water resources irrigation and two types of soil under different levels of soil moisture content on total phenols in leaves of *cupressus* *sempervirens* seedlings. The results indicated that irrigation with drainage water produced the highest total phenols in average value of 7.46 mg/100g dry weight compared to those irrigated with municipal wastewater effluent which gave the lowest value of 6.58 mg/100g whereas those irrigated with Nile water resulted in the intermediate in average value of 7.05 mg/100g in the first season Also in the second season the results gave the similar trend of first season, approximately where the lowest average of total phenols was 5.43 mg/100 g revealed in the seedlings irrigated with municipal wastewater while the highest average was 7.08mg/100g in seedlings irrigated with drainage water, then the seedlings irrigated by Nile water had the intermediate value of 6.11 mg/100g.

With this two respect different used soils used indicated that the average total phenols ranged from 6.46 to 7.56mg/100 g as the loamy soil produced the highest total phenols value of 7.56mg/100g in seedlings irrigated with drainage water whereas the lowest values resulted in the seedlings cultivated in sandy soil and irrigated with municipal wastwater in the first season .

The obtained results from the second season were in similar nearly to those of the first one .

Regarding total phenols as affected by different soil moisture content it can be observed the increasing in phenolic compounds with drought conditions, in the first and second seasons . The highest value was 7.65mg/100g and the lowest was 6.46 mg/100g produced from the treatment of 40 and 80% respectively, while the level of 60% soil moisture content was induced the intermediate 6.99 mg/100g in the first season. In the

Table (23)Effect of different water resources irrigation and soil moisture content on total phenoles(mg/100g dry weight of *cupressus sempervirens* seedlings grown in different tow soil types during 1998- 1999 and 1999-2000 sason.

Seasons		1998-1999				1999-2000			
Water resources	Soil type / SMC	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	7.35	7.02	7.81	7.39	8.46	6.44	5.72	6.19
	Sandy soil	7.10	6.38	6.66	6.71	8.43	6.24	5.41	6.03
Mean		7.23	6.70	7.24	7.05	6.42	6.34	5.57	6.11
Drainage water	Loamy soil	8.97	7.61	6.11	7.56	7.74	6.85	6.60	7.06
	Sandy soil	7.91	7.88	6.29	7.36	6.99	7.10	6.21	7.10
Mean		8.44	7.75	6.20	7.46	7.37	6.98	6.91	7.08
Municipal wastewater effluent	Loamy soil	7.74	6.02	6.32	6.69	6.62	5.25	4.48	5.45
	Sandy soil	6.81	7.01	5.56	6.46	6.11	5.61	4.50	5.41
Mean		7.28	6.52	5.94	6.58	6.37	5.43	4.49	5.43
Mean		7.65	6.99	6.46		6.72	6.25	5.65	

S.M.C =Soil moisture content

second season the value were 6.72,6.25 and 5.65 mg/100g under 40,60 and 80% soil moisture content consequently, irrespective the effect of water resources and soil types .

From the above mentioned results it can be concluded that phenolic compounds accumulated in leaves of the plants subjected under water deficit conditions in roots media .

These results were in agreement with findings of many investigators such as **EL-Said, (1990)** on apple rootstocks indicated that soluble phenoles content increased in shoots under water stress and **Shehata,(1992)** on *cupressus sempervirens* who stated that total soluble phenols content was markedly increased in seedlings which were grown under drought treatments.

4.4.5. Macro elements percentage in the leaves, stems and roots

4.4.5.1 Nitrogen and phosphorus percentage :

Table (24,25) show the effect of different water resources irrigation and two types of soil under different soil moisture content on Nitrogen and phosphorus percentage in leaves, stems and roots of *cupressus sempervirens*

In the first season, the results evident that ,leaves nitrogen(N) and phosphorus (p) content exceeded in the seedlings irrigated with municipal or drainage more than that of Nile water ,the values of N% obtained from drainage water were similar to those of municipal wastewater approximately in which the mean values were 1.50 and 1.58% while mean value was 1.28% in the seedlings irrigated with Nile water. The values of phosphorus were 0.21,0.17 and 0.14% when seedlings irrigated with municipal, drainage and Nile water respectively.

Table (24) Effect of different water resources irrigation and soil moisture content on Nitrogen and Phosphorus content (% of dry weight) in plant portions of *Cupressus sempervirens* grown in two soil types during 1998-1999 season.

		N												P											
		Leaves				Stems				Roots				Leaves				Stems				Roots			
Water resources	Soil type / S.M.C	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean
Nile water	Loamy soil	1.40	1.50	1.40	1.43	0.83	1.20	1.20	1.08	1.10	1.30	1.37	1.26	0.15	0.16	0.18	0.16	0.14	0.15	0.14	0.14	0.12	0.15	0.16	0.14
	Sandy soil	1.10	1.10	1.17	1.12	0.80	0.80	0.70	0.77	0.73	0.87	1.03	0.88	0.12	0.12	0.11	0.12	0.10	0.11	0.12	0.11	0.10	0.11	0.12	0.11
mean		1.25	1.30	1.29	1.28	0.82	1.00	0.95	0.93	0.92	1.09	1.20	1.07	0.13	0.14	0.15	0.14	0.12	0.13	0.13	0.12	0.11	0.13	0.14	0.13
Drainage water	Loamy soil	1.70	1.50	1.50	1.57	1.27	1.30	1.30	1.12	1.30	1.23	1.47	1.33	0.18	0.17	0.19	0.18	0.14	0.15	0.16	0.15	0.15	0.18	0.14	0.16
	Sandy soil	1.37	1.30	1.60	1.42	1.00	0.90	0.97	0.97	1.10	1.37	1.33	1.26	0.14	0.16	0.16	0.16	0.11	0.12	0.12	0.12	0.11	0.17	0.12	0.13
mean		1.54	1.40	1.55	1.50	1.14	1.10	1.14	1.05	1.20	1.30	1.40	1.30	0.16	0.17	0.18	0.17	0.13	0.14	0.14	0.14	0.13	0.18	0.13	0.15
Municipal wastewater effluent	Loamy soil	1.70	1.60	1.80	1.70	1.30	1.47	1.53	1.43	1.40	1.46	1.54	1.46	0.20	0.26	0.25	0.24	0.14	0.18	0.19	0.17	0.18	0.20	0.16	0.18
	Sandy soil	1.20	1.80	1.40	1.47	0.97	1.17	1.27	1.13	1.21	1.40	1.43	1.35	0.15	0.17	0.19	0.17	0.16	0.14	0.15	0.15	0.16	0.14	0.15	0.14
mean		1.45	1.70	1.60	1.58	1.14	1.32	1.40	1.28	1.30	1.43	1.49	1.40	0.17	0.22	0.22	0.21	0.15	0.15	0.17	0.16	0.17	0.17	0.16	0.17
Mean		1.41	1.47	1.48		1.03	1.14	1.16		1.15	1.27	1.36		0.15	0.17	0.18		0.13	0.14	0.15		0.14	0.16	0.17	

S.M.C = Soil moisture content

Table (25) Effect of different water resources irrigation and soil moisture content on Potassium and Magnesium content (% of dry weight) in plant portions of *Cupressus sempervirens* grown in two soil types during 1999-2000 season.

		N												P											
		Leaves				Stems				Roots				Leaves				Stems				Roots			
Water resources	Soil type / S.M.C	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean
Nile water	Loamy soil	1.23	1.23	1.70	1.39	0.96	0.83	1.36	1.05	1.16	1.33	1.30	1.23	0.14	0.16	0.20	0.17	0.12	0.12	0.13	0.12	0.11	0.13	0.16	0.13
	Sandy soil	1.27	1.07	1.30	1.21	0.81	1.16	0.88	0.95	0.93	1.06	1.10	1.03	0.11	0.13	0.16	0.13	0.10	0.11	0.11	0.11	0.10	0.13	0.14	0.17
mean		1.15	1.15	1.50	1.30	0.89	1.00	1.12	1.00	1.05	1.15	1.20	1.13	0.12	0.14	0.18	0.15	0.11	0.12	0.12	0.12	0.11	0.13	0.15	0.15
Drainage water	Loamy soil	1.76	1.56	1.70	1.67	1.10	1.46	1.35	1.30	1.30	1.43	1.43	1.42	0.15	0.18	0.22	0.18	0.18	0.17	0.19	0.18	0.13	0.14	0.17	0.15
	Sandy soil	1.00	1.70	0.96	1.22	1.13	0.96	1.30	1.12	1.16	1.23	1.30	1.23	0.13	0.15	0.17	0.15	0.11	0.15	0.18	0.13	0.11	0.13	0.15	0.13
mean		1.36	1.63	1.33	1.45	1.12	1.21	1.33	1.21	1.23	1.33	1.37	1.33	0.14	0.15	0.19	0.17	0.15	0.16	0.19	0.16	0.12	0.12	0.16	0.14
Municipal wastewater effluent	Loamy soil	1.73	1.70	1.86	1.76	1.43	1.33	1.40	1.39	1.33	1.40	1.46	1.40	0.17	0.19	0.23	0.20	0.22	0.20	0.21	0.21	0.13	0.15	0.18	0.15
	Sandy soil	1.37	1.63	1.60	1.47	1.10	1.23	1.43	1.25	1.30	1.23	1.46	1.33	0.13	0.15	0.19	0.16	0.16	0.18	0.18	0.17	0.11	0.14	0.17	0.14
mean		1.55	1.57	1.73	1.62	1.27	1.28	1.42	1.32	1.32	1.32	1.46	1.37	0.15	0.17	0.21	0.18	0.19	0.19	0.20	0.19	0.12	0.13	0.16	0.15
Mean		1.39	1.45	1.52		1.09	1.16	1.29		1.20	1.27	1.34		0.14	0.16	0.19		0.15	0.16	0.17		0.12	0.13	0.16	

S.M.C = Soil moisture content

In the second season, the results have taken the same trend but the values of nitrogen and phosphorus were different where they were 1.30,145 and 1.62% for nitrogen and 0.15,0.17 and 0.18% for phosphorus in the seedlings irrigated with Nile ,drainage and municipal wastewater respectively .

Results of nitrogen and phosphorus in stems and roots content have taken the similar trend as those obtained from leaves nitrogen and phosphorus content in both seasons.

The results were in agreement with the findings of **Maurer *et al* (1995)**.They reported that leaves of red blush grapefruit trees contained more N and P when irrigated with reclaimed wastewater compared with tap water and **EL-Said, (1999)**on citrus trees who found that the concentrations of N and P tended to increase by using sewage effluent irrigation compared with Nile water .

Regarding the effect of two kind of soils, it can be noticed from Tables(25,25)that nitrogen and phosphorus leaves ,stems and roots increased in loamy soil more than sandy soil in the seedlings irrigated with Nile ,drainage or municipal wastewater .The results apparently cleared that, the seedlings cultivated in sandy soil and irrigated with municipal wastewater contained a high N and P in leaves ,stems and roots than those obtained from loamy soil and irrigated with Nile water .It is evident that sandy soil traits were enhanced and amended due to irrigation with municipal wastewater.

These results agreed with those obtained by **Mohamed (1993)** on *Adhatoda vasica* who mentioned that ,leaf nutrients N and P increased with the mixture of sandy: clay(1:1),compared to sand :clay(2:1),**Radwan (1999)** and **Shehata *et al.* (2002)** on *Eucalyptus sp*. They reported that 1:1 mixture of sandy: clay soil was the most effective media for increasing the percentage of N and P in leaves .

As for the effect of different soil moisture content it can be concluded from Tables (24,25)that the values of N and P leaf ,stem and root content were the highest in the seedlings irrigated ,at level of 80% soil moisture content followed by that of 60% while 40% soil moisture content resulted in the least one .These results were emphasized for that obtained in the second season regardless the effect of different water resources and soil types .

The a forenamed results were in harmony with those obtained by **EL-Ashry *et al.* (1998)**on strelitizia plants , **Shehata ,(2002)** on *Khaya senegalensis* .All of them confirmed the herein obtained results where they reported that take up of the Nutrient elements increased with increasing soil moisture .

4.4.5.2. Potassium and Magnesium percentage:

Data presented in Tables (26,27) obviously cleared in both season, that the results of potassium and magnesium percentage in leaves, stems and roots have taken produced the same trend as those of nitrogen and phosphorus content ,but the values in the first season of potassium (K) and magnesium (Mg) were different where they were 0.55,0.65 and 0.68% for K and 1.36,1.46 and 1.50% for Mg in plant leaves irrigated with Nile, drainage and municipal waste water respectively .In the second season, the recorded results were similar to those obtained from the first one .

Potassium and magnesium percentage in stems and roots of seedlings increased markedly with irrigation by municipal wastewater while that irrigated by drainage water recorded the medium values then the seedlings irrigated with Nile water had the least values in both seasons.

As for the affected of two kind of soils the content of K and Mg in leaves, stems and roots it might be resulted that loamy soil produced high level of both K and mg more than those of sandy soil in the first and second season .this fact exhibited in the seedlings irrigated with used different water resources, moreover the seedlings planted in loamy soil and irrigated with municipal wastewater recorded the superior values compared with the two others .It can be also observed that ,the seedlings irrigated with municipal wastewater and planted in sandy soil resulted in an increases the content of K and Mg in the plant portions more than those planted in loamy soil ,which irrigated with Nile water ,meaning that the using municipal wastewater in irrigation ameliorated the properties and increased K and mg in sandy soil.

Concerning the effect of different levels of soil moisture content on potassium and magnesium percentages, it can be concluded that the both of them increased to maximum value with increasing soil moisture content and adverse effect appeared with deficit water in soil. These results revealed with using the three water resources in irrigation ,it means that ,high level of soil moisture associated in increasing K and Mg in leaves ,stems and roots . The obtained result from the second season tended to similarity to those obtained from the first one approximately.

Table (26) Effect of different water resources irrigation and soil moisture content on Potassium and Magnesium content (% of dry weight) in plant portions of *Cupressus sempervirens* grown in two soil types during 1998-1999 season.

		K												Mg											
		Leaves				Stems				Roots				Leaves				Stems				Roots			
Water resources	Soil type / S.M.C	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean
Nile water	Loamy soil	0.54	0.58	0.66	0.59	0.58	0.76	0.70	0.65	0.37	0.42	0.56	0.45	1.25	1.45	1.62	1.47	1.03	1.12	1.40	1.18	1.11	1.23	1.39	1.24
	Sandy soil	0.41	0.54	0.59	0.51	0.53	0.58	0.60	0.57	0.30	0.35	0.50	0.38	1.10	1.30	1.46	1.29	1.00	1.22	1.38	1.20	1.04	1.10	1.29	1.14
mean		0.48	0.56	0.63	0.55	0.56	0.63	0.65	0.61	0.34	0.39	0.53	0.42	1.18	1.38	1.54	1.36	1.02	1.17	1.39	1.19	1.08	1.17	1.34	1.19
Drainage water	Loamy soil	0.52	0.70	0.73	0.65	0.60	0.69	0.75	0.68	0.45	0.51	0.63	0.53	1.32	1.50	1.68	1.50	1.1	1.36	1.48	1.31	1.33	1.41	1.01	1.58
	Sandy soil	0.60	0.70	0.63	0.64	0.58	0.56	0.66	0.60	0.39	0.44	0.56	0.46	1.31	1.53	1.42	1.42	1.09	1.27	1.41	1.25	1.23	1.31	1.73	1.42
mean		0.56	0.70	0.68	0.65	0.59	0.63	0.71	0.64	0.42	0.48	0.60	0.50	1.32	1.52	1.55	1.46	1.1	1.32	1.45	1.28	1.26	1.36	1.87	1.50
Municipal wastewater effluent	Loamy soil	0.66	0.72	0.77	0.72	0.68	0.77	0.80	0.75	0.53	0.57	0.71	0.60	1.30	1.55	1.71	1.52	1.2	1.30	1.40	1.30	1.35	1.51	1.58	1.48
	Sandy soil	0.52	0.68	0.70	0.63	0.64	0.68	0.71	0.68	0.48	0.50	0.64	0.54	1.40	1.50	1.56	1.49	1.18	1.35	1.57	1.37	1.37	1.61	1.91	1.63
mean		0.59	0.70	0.74	0.68	0.66	0.73	0.76	0.72	0.51	0.54	0.68	0.57	1.35	1.53	1.64	1.50	1.19	1.33	1.49	1.34	1.36	1.56	1.75	1.56
Mean		0.54	0.65	0.68		0.60	0.66	0.71		0.42	0.47	0.60		1.28	1.48	1.58		1.10	1.27	1.44		1.24	1.36	1.65	

S.M.C = Soil moisture content

Table (27) Effect of different water resources irrigation and soil moisture content on Potassium and Magnesium content (% of dry weight) in plant portions of *Cupressus sempervirens* grown in two soil types during 1999-2000 season.

		K												Mg											
		Leaves				Stems				Roots				Leaves				Stems				Roots			
Water resources	Soil type / S.M.C	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean
Nile water	Loamy soil	0.64	0.68	0.91	0.74	0.50	0.53	0.60	0.54	0.40	0.44	0.48	0.44	1.34	1.40	1.41	1.38	1.28	1.30	1.50	1.36	1.30	1.41	1.61	1.44
	Sandy soil	0.49	0.68	0.67	0.61	0.42	0.49	0.53	0.48	0.36	0.40	0.44	0.40	1.01	1.30	1.37	1.23	1.11	1.25	1.48	1.28	1.10	1.08	1.31	1.16
mean		0.57	0.68	0.79	0.68	0.46	0.51	0.57	0.51	0.38	0.42	0.46	0.42	1.18	1.35	1.39	1.31	1.20	1.28	1.49	1.32	1.20	1.25	1.46	1.30
Drainage water	Loamy soil	0.62	0.82	0.81	0.75	0.59	0.66	0.71	0.65	0.46	0.57	0.69	0.58	1.44	1.50	1.51	1.48	1.40	1.46	1.48	1.45	1.44	1.53	1.66	1.54
	Sandy soil	0.49	0.78	0.85	0.71	0.48	0.57	0.60	0.55	0.46	0.53	0.62	0.54	1.33	1.36	1.47	1.39	1.30	1.33	1.37	1.33	1.37	1.48	1.51	1.45
mean		0.56	0.80	0.83	0.73	0.54	0.62	0.66	0.60	0.48	0.55	0.66	0.56	1.39	1.43	1.49	1.43	1.35	1.40	1.43	1.39	1.41	1.51	1.59	1.50
Municipal wastewater effluent	Loamy soil	0.74	0.82	0.98	0.85	0.51	0.78	0.79	0.79	0.57	0.61	0.75	0.64	1.34	1.58	1.62	1.51	1.30	1.37	1.56	1.41	1.53	1.63	1.97	1.71
	Sandy soil	0.62	0.80	0.84	0.75	0.42	0.48	0.63	0.51	0.46	0.48	0.61	0.52	1.12	1.51	1.56	1.40	1.17	1.19	1.38	1.25	1.20	1.31	1.43	1.31
mean		0.68	0.81	0.91	0.80	0.47	0.63	0.71	0.60	0.52	0.55	0.68	0.58	1.23	1.55	1.59	1.45	1.34	1.28	1.47	1.33	1.37	1.47	1.70	1.51
Mean		0.60	0.76	0.84		0.49	0.56	0.65		0.46	0.51	0.60		1.27	1.44	1.49		1.30	1.32	1.46		1.33	1.41	1.58	

S.M.C = Soil moisture content

The former results were in agreement with those obtained by **Farahat ,(1990)** on myoporum and **Shehata, (2002)** on *Khaya senegalensis* .Both of them reported that ,high level of soil moisture content increased K and Mg in all organs of plant while low level of soil moisture reduced it.

4.4.5.3 Calcium and Sodium percentage :

The data existed in Tables (28.29) show the effect of different water resources and different soil moisture content on Calcium and Sodium percentage of *cupressus sempervirens* seedlings grown in different two soil types.

In the first season ,the results cleared that ,leaves calcium (Ca) content increased in the seedlings irrigated with municipal or drainage more than that of Nile water, the values of Ca% obtained from drainage water were similar to those of municipal wastewater approximately in which the mean values were 0.54 and 0.52% while mean value was 0.44% in seedlings irrigated by Nile water. While leaves Na content exceeded in seedling irrigated with drainage more than municipal or Nile water, the value of Na were 0.59,0.57 and 0.46 when seedlings irrigated with drainage , municipal and Nile water consequently.

In the second season, the results have taken the same trend as those obtained from first one .

Also ,stems and roots Ca content of seedlings increased to maximum value with irrigation by municipal wastewater while that irrigated by drainage water produced the medium values then Nile water had the last one in both seasons .

Stems and roots Na content declined in seedlings irrigated by Nile water, but increased with drainage water

Table (28) Effect of different water resources irrigation and soil moisture content on Calcium and Sodium content (% of dry weight) in plant portions of *Cupressus sempervirens* seedlings grown in two soil types during 1998-1999 season.

		Ca												Na											
		Leaves				Stems				Roots				Leaves				Stems				Roots			
Water resources	Soil type / S.M.C	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean
Nile water	Loamy soil	0.50	0.48	0.37	0.45	0.22	0.54	0.56	0.47	0.67	0.77	0.90	0.78	0.48	0.46	0.26	0.40	0.33	0.29	0.27	0.30	0.32	0.32	0.31	0.32
	Sandy soil	0.47	0.43	0.39	0.43	0.33	0.41	0.49	0.41	0.59	0.69	0.85	0.71	0.52	0.53	0.52	0.52	0.31	0.27	0.24	0.27	0.29	0.28	0.27	0.28
mean		0.49	0.46	0.38	0.44	0.28	0.48	0.53	0.43	0.63	0.73	0.88	0.75	0.50	0.50	0.39	0.46	0.32	0.28	0.26	0.29	0.31	0.30	0.29	0.30
Drainage water	Loamy soil	0.68	0.65	0.54	0.59	0.46	0.50	0.58	0.51	0.65	1.01	1.01	0.89	0.58	0.52	0.72	0.61	0.38	0.30	0.29	0.33	0.38	0.35	0.33	0.35
	Sandy soil	0.49	0.46	0.38	0.44	0.41	0.49	0.51	0.48	0.61	0.83	0.97	0.80	0.61	0.55	0.55	0.57	0.34	0.28	0.27	0.30	0.34	0.32	0.30	0.34
mean		0.59	0.51	0.46	0.52	0.44	0.50	0.55	0.50	0.63	0.92	0.99	0.85	0.60	0.54	0.64	0.59	0.36	0.29	0.28	0.32	0.36	0.34	0.32	0.35
Municipal wastewater effluent	Loamy soil	0.63	0.55	0.52	0.57	0.37	0.61	0.67	0.62	1.09	1.05	0.86	1.00	0.56	0.51	0.47	0.51	0.37	0.31	0.29	0.32	0.36	0.31	0.32	0.33
	Sandy soil	0.52	0.52	0.50	0.51	0.48	0.54	0.56	0.53	0.86	0.93	0.86	0.88	0.64	0.60	0.62	0.62	0.35	0.29	0.26	0.32	0.33	0.29	0.29	0.30
mean		0.58	0.54	0.51	0.54	0.52	0.58	0.62	0.58	0.99	0.99	0.86	0.94	0.60	0.56	0.55	0.57	0.36	0.30	0.28	0.31	0.35	0.30	0.31	0.32
Mean		0.55	0.50	0.45		0.41	0.52	0.56		0.75	0.88	0.91		0.57	0.53	0.52		0.35	0.29	0.27		0.34	0.31	0.30	

S.M.C = Soil moisture content

Table (29) Effect of different water resources irrigation and soil moisture content on Calcium and Sodium content (% of dry weight) in plant portions of *Cupressus sempervirens* grown in two soil types during 1999-2000 season.

		Ca												Na											
		Leaves				Stems				Roots				Leaves				Stems				Roots			
Water resources	Soil type / S.M.C	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean
Nile water	Loamy soil	0.72	0.25	0.23	0.23	0.42	0.48	0.60	0.50	0.77	0.87	0.93	0.86	0.50	0.47	0.28	0.41	0.38	0.34	0.33	0.35	0.39	0.35	0.32	0.36
	Sandy soil	0.21	0.18	0.20	0.19	0.38	0.41	0.52	0.43	0.84	0.87	0.90	0.80	0.44	0.43	0.40	0.42	0.32	0.28	0.25	0.28	0.33	0.29	0.27	0.30
mean		0.22	0.22	0.22	0.22	0.40	0.45	0.56	0.47	0.71	0.87	0.92	0.83	0.47	0.45	0.34	0.41	0.35	0.31	0.29	0.32	0.36.	0.32	0.30	0.33
Drainage water	Loamy soil	0.50	0.41	0.26	0.39	0.42	0.53	0.55	0.50	0.70	0.95	0.98	0.88	0.79	0.50	0.44	0.48	0.40	0.43	0.42	0.42	0.43	0.36	0.35	0.38
	Sandy soil	0.42	0.35	0.21	0.32	0.44	0.50	0.52	0.49	0.69	0.92	0.82	0.81	0.50	0.40	0.33	0.41	0.39	0.31	0.28	0.33	0.36	0.30	0.31	0.32
mean		0.46	0.38	0.24	0.36	0.43	0.52	0.54	0.50	0.70	0.94	0.90	0.85	0.50	0.45	0.39	0.45	0.39	0.37	0.35	0.38	0.40	0.33	0.33	0.35
Municipal wastewater effluent	Loamy soil	0.57	0.50	0.55	0.54	0.52	0.56	0.59	0.56	0.78	0.97	1.02	0.92	0.52	0.41	0.39	0.44	0.35	0.29	0.27	0.30	0.40	0.34	0.30	0.35
	Sandy soil	0.44	0.39	0.50	0.44	0.50	0.52	0.56	0.53	0.80	0.96	1.01	0.92	0.48	0.46	0.37	0.44	0.28	0.27	0.25	0.27	0.33	0.29	0.26	0.29
mean		0.51	0.45	0.53	0.49	0.51	0.54	0.58	0.55	0.78	0.97	1.02	0.92	0.50	0.44	0.38	0.44	0.32	0.28	0.26	0.29	0.37	0.32	0.28	0.32
Mean		0.39	0.35	0.33		0.45	0.50	0.56		0.73	0.93	0.95		0.49	0.45	0.37		0.35	0.32	0.30		0.38	0.32	0.30	

S.M.C = Soil moisture content

From the above mentioned results it can be observed that roots gave the highest values of Calcium compared to leaves or stems, whereas leaves Na content have the maximum values compared to stems or roots in the first and second season .

These results were in accordance with **Maures *et al.* (1995)** on redblush grape fruit trees, reported that leaves contained more Na , N , P and K when irrigated with reclaimed wastewater compared with tap water.

Regarding the effect of two used soil it can be noticed that in Tables(28,29)calcium and sodium in leaves ,stems and roots increased in the seedlings cultivated in loamy soil more than sandy soil when they were irrigated with Nile ,drainage or municipal wastewater .The results apparently cleared that ,the seedlings planted in sandy soil and irrigated with municipal or drainage contained a high Ca and Na in plant portions more than those obtained from loamy soil and irrigated with Nile water ,meaning that sandy soil have more Ca and Na due to the irrigation by drainage or municipal water .

These results were supported by **Change *et el* (1991)** *on Deutzia gracilis* and *Cornus alba* , found that,growing media had an effect on leaf nutrients which increased (N,P,K,Ca,Mg and Na)with increasing compost levels in growing media and **Mohamed, (1993)** mentioned that ,leaf nutrients (N,p,K,Ca and Na) increased with the mixture of sandy and clay (1:1)compared to sandy : clay(2:1)for *Nerium oleander* and *Lantana camera.*

Concerning the effect of different levels of soil moisture content ,it can be concluded from Tables(28,29)that, the values of Ca and Na leaves content were the highest in the seedlings irrigated at levels of 40% soil moisture content followed by that of 60% while 80% soil moisture content resulted in the least one .Conversely ,stems and roots (Ca)content had the adverse effect. On the other hand the values of Na in stems and roots were the lowest in the seedlings irrigated at level of 80% but 40% recorded the highest values then 60% were the intermediate in both season.

These results were in agreement with the findings of **Farahat, (1990)** on *Shinus molle,*and **Shehata, (1992)** on *cupressus sempervirens* and *Eucalyptus camaldulensis*. Both of them stated that ,low level of soil moisture content increased Ca in leaves compared to high level of soil moisture content .

4.4.6. Some micro and heavy metals (ppm)in leaves ,stems and roots:

4.4.6.1 Zinc and manganese :

Tables (30,31) and Fig.(5,6) showed the effect of using different water resources, two types of soil and different levels of soil moisture content on Zinc (Zn)and manganese (Mn) ppm in leaves, stems and roots of *cupressus sempervirens* seedlings.

The results indicated that in the first season leaves (Zn) and (Mn)content exceeded in seedlings irrigated with municipal water or drainage water more than that of Nile water, the values of Zn ppm obtained from drainage water were similar to those of municipal wastewater approximately in which the mean values were 18.62 and 17.54 ppm while mean value was 13.16 ppm in leaves of seedlings irrigated with Nile water, whereas the mean values of Mn were 59.61 and 49.07 and 33.35 ppm in seedlings irrigated with municipal ,drainage and Nile water respectively .

Table (30) Effect of different water resources irrigation and soil moisture content on Zink and Manganese content (ppm) in plant portions of *Cupressus sempervirens* seedlings grown in two soil types during 1998-1999 season

		Zn												Mn											
		Leaves				Stems				Roots				Leaves				Stems				Roots			
Water resources	Soil type / S.M.C	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean
Nile water	Loamy soil	12.8	13.45	15.16	13.8	23.30	26.76	38.00	29.35	23.25	28.12	28.04	26.47	26.7	40.00	53.00	33.9	30.30	40.21	60.00	43.5	113.3	115.0	116.6	114.9
	Sandy soil	11.5	13.3	12.72	12.5	22.44	32.87	28.91	28.07	21.60	25.00	30.30	25.63	21.40	38.00	39.00	32.8	31.00	38.70	53.12	40.1	101.6	113.3	111.6	108.8
mean		12.15	13.38	13.94	13.16	22.87	39.82	33.46	28.71	22.43	26.56	29.17	26.05	24.05	39.00	37.00	33.35	30.65	39.40	56.56	42.2	107.5	114.2	114.1	111.9
Drainage water	Loamy soil	16.59	18.5	21.3	18.8	26.65	40.12	36.43	35.40	25.11	30.66	33.40	29.72	48.30	51.70	56.00	52.00	43.3	50.00	60.70	51.3	110.0	136.6	200.0	148.8
	Sandy soil	15.18	15.56	18.09	16.28	22.60	36.70	41.63	33.64	18.94	27.17	31.08	25.74	40.44	46.64	51.00	46.13	40.12	46.18	55.91	41.4	101.7	143.3	136.6	127.2
mean		15.89	17.03	19.70	17.54	26.13	38.41	39.03	34.52	22.05	28.92	32.24	27.73	44.37	49.17	53.65	49.07	41.71	48.09	58.31	49.37	105.8	139.9	168.3	137.9
Municipal wastewater effluent	Loamy soil	13.90	20.8	22.92	19.22	38.3	43.10	40.00	40.47	28.40	35.00	37.14	33.51	55.00	61.60	76.70	64.40	46.70	66.70	76.70	63.37	191.6	235.0	108.3	178.3
	Sandy soil	12.92	19.00	19.79	17.30	33.18	38.33	37.77	36.43	27.15	28.97	33.05	29.72	51.00	53.06	60.41	54.82	42.81	60.17	71.19	58.06	175.0	170.0	131.6	158.8
mean		13.44	19.90	21.44	18.62	35.74	40.72	38.89	38.45	27.78	31.99	35.09	31.62	53.00	57.33	68.56	59.61	44.81	63.44	73.75	60.71	183.3	207.0	119.9	168.5
Mean		13.82	16.77	18.36		28.25	36.31	37.12		24.08	29.16	32.17		40.5	48.5	53.07		39.04	50.33	62.94		132.2	152.2	134.1	

S.M.C = Soil moisture content

Table (55) Effect of different water resources irrigation and soil moisture content on Calcium and Sodium (% of dry weight) in plant portions of *Albizzia lebbeck* seedlings grown in two soil types during 1998-1999 season .

		Ca												Na											
		Leaves				Stems				Roots				Leaves				Stems				Roots			
Water resources	Soil type / S.M.C	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean
Nile water	Loamy soil	0.47	0.91	0.97	0.78	0.39	0.40	0.55	0.45	0.60	0.51	0.32	0.47	0.16	0.20	0.24	0.19	0.10	0.13	0.14	0.13	0.28	0.27	0.23	0.26
	Sandy soil	0.49	0.87	0.97	0.77	0.29	0.28	0.33	0.30	0.56	0.52	0.30	0.46	0.15	0.13	0.19	0.16	0.09	0.07	0.13	0.09	0.27	0.21	0.15	0.21
mean		0.48	0.89	0.97	0.78	0.34	0.34	0.44	0.38	0.58	0.52	0.31	0.47	0.16	0.17	0.22	0.17	0.10	0.10	0.15	0.11	0.28	0.24	0.19	0.24
Drainage water	Loamy soil	0.84	1.04	1.02	0.96	0.45	0.57	0.44	0.48	1.11	0.53	0.46	0.70	0.21	0.25	0.33	0.26	0.15	0.20	0.15	0.16	0.30	0.29	0.29	0.29
	Sandy soil	0.55	1.21	1.00	0.92	0.25	0.36	0.47	0.36	0.84	0.53	0.39	0.58	0.31	0.17	0.24	0.18	0.11	0.12	0.12	0.12	0.25	0.21	0.21	0.25
mean		0.70	1.13	1.01	0.94	0.35	0.47	0.46	0.42	0.98	0.53	0.43	0.64	0.17	0.21	0.29	0.22	0.13	0.16	0.14	0.14	0.28	0.25	0.25	0.26
Municipal wastewater effluent	Loamy soil	0.74	0.86	1.01	0.87	0.37	0.51	0.61	0.49	0.92	0.84	0.85	0.87	0.19	0.18	0.32	0.23	0.10	0.10	0.19	0.13	0.25	0.29	0.30	0.28
	Sandy soil	0.67	0.80	10.2	0.83	0.22	0.20	0.45	0.29	0.67	0.83	0.60	0.70	0.15	0.16	0.17	0.16	0.10	0.11	0.11	0.11	0.21	0.27	0.27	0.25
mean		0.71	0.83	1.02	0.85	0.30	0.36	0.53	0.39	0.80	0.84	0.73	0.79	0.17	0.17	0.24	0.20	0.10	0.11	0.15	0.12	0.23	0.28	0.29	0.27
Mean		0.63	0.95	1.00		0.33	0.39	0.48		0.78	0.63	0.49		0.17	0.18	0.25		0.11	0.12	0.14		0.26	0.25	0.24	

S.M.C = Soil moisture content

respectively .Also ,stems Ca and Na percentage of seedlings increased to maximum value with irrigation by drainage water while that irrigated by municipal wastewater gave the medium values then the Nile water had the last one.

In the second season .the results have taken the same pattern as those obtained from first one .On the other hand roots Ca and Na content produced the highest values when seedlings irrigated with municipal wastewater in average value of 0.79% for Ca and 0.27% for Na ,followed by those irrigated with drainage water in average values of 0.64% for Ca and 0.26% for Na whereas the seedlings irrigated with Nile water recorded the lowest one in average values of 0.47% and 0.24% for Ca and Na consequently.

In the second season a similar trend to those obtained from the first season was observed.

These results were in accordance with **Maures *et al.*(1995)** on red blush grapefruit trees reported that leaves contained more Na when irrigation with reclaimed wastewater compared to with tap water .

Regarding the effect of two used soils it can be noticed that in Tables (55,56) Ca and Na in leaves, stems and roots increased in the seedlings cultivated in loamy soil more than sandy soil when they were irrigated with Nile, drainage and municipal wastewater .

Concerning the effect of different levels of soil moisture content, it can be concluded from Tables(55,56) that the values of Ca and Na leaves and stems content were the highest in the seedlings irrigated at levels of 80% followed by that of 60%

(K,Mg,Na)with increasing compost levels in growing media and **Mohamed,(1993)**mentioned that, leaf nutrients (N,K,Mg and Ca) increased with sand : Clay (1:1)compared to sand :clay (2:1)for *Nerium oleander* and *lantana camara.*

As for the effect of different soil moisture content it can be concluded from Tables (53 ,54) that ,the values of K and Mg leaf and stem were the highest in seedlings irrigated at levels of 80% moisture content followed by that of 60% while 40% soil moisture content resulted in the least one while the adverse effect occurred in root k and Mg content. These results were emphasized for that obtained in the second season regardless the effect of different water resources and soil types.

These results were supported by **Shehata ,(2002)** on *Khaya Senegalensis* .who reported that ,high level of soil moisture content increased K in leaves of plant while low level of soil moisture reduced it.

4.4.5.3 Calcium and Sodium percentage :

Tables (55 ,56) showed the effect of using different water resources, two types of soil and different levels of soil moisture content on Calcium (Ca) and sodium (Na) percentage of *Albizzia lebbeck* seedlings .

The data indicated that in the first season the highest Ca and Na percentage exhibited in leaves of seedlings irrigated with drainage water in average values of 0.94% for Ca and 0.22% for Na compared to those irrigated with Nile water which had the lowest in average values of 0.78% for Ca and 0.17% for Na whereas irrigated with municipal wastewater resulted the intermediate in average values of 0.85 and 0.20 % for Ca and Na

Table (54) Effect of different water resources irrigation and soil moisture content on Potassium and Magnesium (% of dry weight) in plant portions of *Albizzia lebbeck* seedlings grown in two soil types during 1999-2000 season .

		K												Mg											
		Leaves				Stems				Roots				Leaves				Stems				Roots			
Water resources	Soil type / S.M.C	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean
Nile water	Loamy soil	1.19	1.40	1.66	1.42	1.18	1.25	1.92	1.45	1.77	1.55	1.47	1.60	1.21	1.34	1.30	1.28	1.03	1.10	1.22	1.12	1.11	0.91	0.85	0.96
	Sandy soil	1.13	1.41	1.41	1.32	1.11	1.19	1.34	1.21	1.53	1.16	1.10 6	1.25	1.06	1.12	1.23	1.14	0.98	1.00	1.30	1.09	0.96	0.75	0.98	0.80
mean		1.16	1.41	1.54	1.37	1.15	1.22	1.63	1.33	1.65	1.36	1.27	1.43	1.14	1.23	1.27	1.21	1.01	1.05	1.26	1.10	1.04	0.83	0.77	0.88
Drainage water	Loamy soil	1.47	1.65	1.68	1.60	1.22	1.84	1.98	1.68	1.80	1.17	1.61	1.71	1.42	1.14	1.45	1.34	1.10	1.17	1.31	1.19	1.06	1.11	1.00	1.06
	Sandy soil	1.31	1.36	1.62	1.43	1.18	1.75	1.38	1.44	1.61	1.42	1.34	1.46	1.20	1.31	1.40	1.30	1.14	1.03	1.26	1.14	0.91	0.89	0.80	0.86
mean		1.39	1.51	1.65	1.52	1.20	1.80	1.68	1.56	1.71	1.57	1.48	1.58	1.31	1.23	1.43	1.32	1.12	1.10	1.29	1.17	0.99	0.99	0.90	0.96
Municipal wastewater effluent	Loamy soil	1.51	1.73	1.82	1.69	1.22	1.83	1.91	1.65	1.93	1.58	1.18	1.56	1.32	1.38	1.53	1.41	1.17	1.32	.45	1.31	1.19	1.00	1.03	1.07
	Sandy soil	1.41	1.53	1.66	1.53	1.18	1.72	1.59	1.50	1.72	1.31	1.26	1.43	1.12	1.37	1.42	1.30	1.01	1.07	1.31	1.13	1.01	0.98	1.02	1.00
mean		1.46	1.63	1.74	1.61	1.20	1.78	1.75	1.58	1.83	1.45	1.22	1.50	1.22	1.38	1.48	1.36	1.09	1.20	1.38	1.22	1.10	0.99	1.03	1.04
Mean		1.36	1.52	1.64		1.18	1.60	1.89		1.73	1.46	1.32		1.22	1.28	1.39		1.07	1.12	1.31		1.04	0.94	0.90	

S.M.C = Soil moisture content

Table (53) Effect of different water resources irrigation and soil moisture content on Potassium and Magnesium (% of dry weight) in plant portions of *Albizzia lebbeck* seedlings grown in two soil types during 1998-1999 season .

		K												Mg											
		Leaves				Stems				Roots				Leaves				Stems				Roots			
Water resources	Soil type / S.M.C	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean
Nile water	Loamy soil	1.09	1.30	1.56	1.32	0.95	1.04	1.06	1.02	1.49	1.05	1.00	1.18	1.11	1.43	1.15	1.33	0.95	1.00	1.03	0.99	1.1	0.93	0.81	0.95
	Sandy soil	1.03	1.11	1.31	1.15	0.86	0.99	1.03	0.96	1.21	1.00	0.97	1.06	1.00	1.13	1.36	1.16	1.00	1.04	1.07	1.04	0.97	0.85	0.73	0.85
mean		1.06	1.21	1.44	1.24	0.91	1.02	1.05	0.99	1.35	1.03	0.99	1.12	1.06	1.28	1.41	1.25	0.98	1.02	1.05	1.01	1.04	0.89	0.77	0.90
Drainage water	Loamy soil	1.37	1.55	1.58	1.50	1.07	1.14	1.81	1.34	1.69	1.35	1.30	1.45	1.32	1.45	1.54	1.44	1.04	1.22	1.27	1.17	1.19	1.01	0.98	1.06
	Sandy soil	1.21	1.26	1.51	1.33	1.00	1.08	1.23	1.10	1.11	1.05	1.03	1.06	1.22	1.40	1.49	1.37	1.10	1.11	1.24	1.15	1.00	0.96	0.77	0.91
mean		1.29	1.41	1.55	1.41	1.04	1.11	1.52	1.22	1.4	1.2	1.17	1.26	1.27	1.43	1.52	1.41	1.07	1.17	1.26	1.16	1.10	0.99	0.88	0.99
Municipal wastewater effluent	Loamy soil	1.24	1.63	1.67	1.58	1.11	1.73	1.87	1.57	1.81	1.09	1.07	1.32	1.43	1.55	1.73	1.57	1.30	1.41	1.33	1.35	1.20	1.10	0.89	1.09
	Sandy soil	1.39	1.46	1.45	1.43	0.07	1.66	1.49	1.41	1.50	1.06	1.01	1.19	1.34	1.50	1.61	1.48	1.06	1.13	1.44	1.21	1.05	1.00	0.87	0.97
mean		1.42	1.55	1.56	1.51	1.09	1.70	1.68	1.49	1.66	1.08	1.04	1.26	1.39	1.53	1.67	1.53	1.18	1.27	1.39	1.28	1.13	1.05	0.92	1.03
Mean		1.26	1.39	1.51		1.01	1.27	1.42		1.47	1.1	1.07		1.24	1.41	1.53		1.08	1.15	1.23		1.09	0.98	0.86	

S.M.C = Soil moisture content

1.53,1.41 and 1.25% when seedlings irrigated with municipal ,drainage and Nile water respectively.

In the second season ,the results have taken the same trend but the values of K and Mg were different where they were 1,61,1.52 and 1.37% for K and 1.21,1.32 and 1.36% for Mg in the seedlings irrigated with Nile ,drainage and municipal wastewater respectively.

Results of K and Mg in stems and roots have taken the similar trend as those obtained from leaves K and Mg content in both seasons .

The results were in agreement with the findings of **Hopmans *et al.*(1990)** on *Eucalyptus grandis* and **Maurer *et al* (1995)** on blush grape fruit trees .They reported that leaves contained more K and Mg when irrigated with municipal wastewater compared with tap water .

Regarding the effect of two used soil it can be noticed from Table(53,54)That K and Mg leaves ,stems and roots increased in loamy soil more than sandy soil in the seedlings irrigated with Nile, drainage or municipal wastewater. The results apparently cleared that ,the seedlings cultivated in sandy soil and irrigated with municipal wastewater contained a high K and Mg in leaves, stems and roots than those obtained from loamy soil and irrigated with Nile water. It is evident that sandy soil traits were enhanced and amended due to irrigation with municipal wastewater effluent.

These results were in accordance with **chong *et al* .(1991)** on *Deutzia gracilis* and *cornus alba* ,they found that growing media had an effect on leaf nutrients which increased of sandy: clay soil was the most effective media for increasing the percentage of N and P in leaves compared to sand: clay (2:1).

Concerning the effect of different levels of soil moisture content on N and P percentage it can be concluded that both of them increased to maximum value with increasing soil moisture content while the opposite effect appeared with deficit water in soil, it means that ,high level of soil moisture associated in an increasing N and P in leaves, stems and roots .

The obtained results from the second season tended to similarity to those obtained from the first one approximately .

The a forenamed results were in harmony with those obtained by **EL- Ashry *et al* . (1998)** on strelitizia plants, **Shehata, (2002)**on *Khaya Senegalensis* .All of them confirmed the herein obtained results where they reported that uptake of the Nutrient elements increased with increasing soil moisture .

4.4.5.2 Potassium and Magnesium percentage :

The data existed in Table (53 , 54) show the effect of different water resources and different soil moisture content on Potassium (K) and Magnesium (Mg) percentage of *Albizzia lebbeck* seedlings grown in different two soils types.

In the first season, the results evident that ,leaves K and Mg percentage exceeded in the seedlings irrigated with municipal or drainage water more than that of Nile water, the values of K% obtained from drainage water were similar to those of municipal wastewater approximately in which the mean values were 1.51 and 1.41% while mean value was 1.24 % in the seedlings irrigated with Nile water, whereas the values of Mg were irrigated with Nile, drainage and municipal wastewater consequently.

Results of N and P in roots percintage tended to take the same line of those results obtained from N and P content in stems in both seasons nearly.

The results were in harmony with those obtained by **Maurer *et al* (1995)** they reported that leaves of red blush grapefruit trees contained more N and P when irrigated with reclaimed wastewater compared with tap water and **EL-Said, (1999)** on citrus trees who found that the concentration of N ,P tended to increase by using sewage effluent irrigation compared with Nile water .

Regarding the two used soil affected the content of N and P in leaves ,stems and roots it might be resulted that loamy soil produced high level of both N and P more than those of sandy soil in the first and second seasons, this fact exhibited in the seedlings irrigated with used different water resources, moreover the seedlings planted in loamy soil and irrigated with municipal wastewater recorded the superior values compared with others .Also, it can be observed that ,the seedlings irrigated with municipal wastewater and planted in sandy soil resulted in incremented the percentage of N and P in the plant portions more than those planted in loamy soil which irrigated with Nile water , meaning that the using municipal wastewater in irrigation ameliorated the properties and increased N and P in sandy soil .

These result agreed with those obtained by **Mohamed, (1993)** on *lantana camara*, **Radwan, (1999)** and **Shehata et al. (2002)** on *Eucalyptus Spp* All of them reported that 1:1 mixture

Table (52) Effect of different water resources irrigation and soil moisture on Nitrogen and Phosphorus content (% of dry weight) in plant portions of *Albizzia lebbeck* seedlings grown in two soil types during 1999-2000 season .

		N												P											
		Leaves				Stems				Roots				Leaves				Stems				Roots			
Water resources	Soil type / S.M.C	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean
Nile water	Loamy soil	2.63	2.80	2.87	2.77	2.44	2.67	2.93	2.68	2.47	2.30	2.17	3.31	0.14	0.19	0.22	0.18	0.09	0.11	0.12	0.10	0.12	0.15	0.16	0.14
	Sandy soil	2.47	2.57	2.60	2.55	1.96	2.41	2.66	2.34	2.23	1.20	2.06	2.16	0.12	0.16	0.19	0.16	0.07	0.09	0.11	0.09	0.10	0.13	0.12	0.11
mean		2.55	2.69	2.74	2.66	2.2	2.54	2.80	2.51	2.35	1.25	2.12	2.24	0.13	0.18	0.21	0.17	0.08	0.10	0.11	0.09	0.11	0.14	0.14	0.13
Drainage water	Loamy soil	2.77	2.93	2.97	2.89	2.80	2.97	3.20	2.99	2.37	2.53	2.57	2.49	0.22	0.25	0.29	0.25	0.09	0.11	0.13	0.11	0.18	0.17	0.19	0.18
	Sandy soil	2.67	2.70	2.83	2.73	1.97	2.53	2.70	2.44	2.11	2.21	2.43	2.25	0.20	0.19	0.25	0.21	0.08	0.10	0.12	0.10	0.11	0.13	0.15	0.13
mean		2.72	2.82	2.90	2.81	2.39	3.00	2.95	2.70	2.24	2.37	2.50	2.37	0.21	0.22	0.27	0.23	0.08	0.10	0.12	0.10	0.15	0.15	0.17	0.16
Municipal wastewater effluent	Loamy soil	3.03	3.07	3.47	3.19	2.70	2.72	2.23	2.98	2.37	2.77	2.69	2.61	0.24	0.26	0.28	0.26	0.16	0.20	0.22	0.19	0.12	0.14	0.14	0.13
	Sandy soil	2.91	3.00	3.21	3.04	2.03	2.86	2.75	2.50	2.12	2.55	2.55	2.30	0.19	0.23	0.26	0.23	0.13	0.17	0.19	0.16	0.11	0.15	0.12	0.12
mean		2.97	3.04	3.34	3.12	2.37	2.69	2.99	2.74	2.25	2.66	2.62	2.46	0.22	0.25	0.27	0.25	0.14	0.18	0.20	0.17	0.12	0.13	0.13	0.13
Mean		2.75	2.85	2.99		2.32	2.72	2.91		2.28	2.43	2.41		0.19	0.21	0.25		0.10	0.12	0.14		0.12	0.14	0.15	

S.M.C = Soil moisture content

Table (51) Effect of different water resources irrigation and soil moisture content on Nitrogen and Phosphorus(% of dry weight) in plant portions of *Albizzia lebbeck* seedlings grown in two soil types during 1998-1999 season

		N												P											
		Leaves				Stems				Roots				Leaves				Stems				Roots			
Water resources	Soil type / S.M.C	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean
Nile water	Loamy soil	2.3	2.9	3.10	2.77	2.10	2.40	2.40	2.30	1.90	2.00	2.3	2.07	0.12	0.18	0.19	0.16	0.07	0.08	0.06	0.07	0.10	0.12	0.14	0.12
	Sandy soil	2.1	2.7	2.9	2.57	1.47	2.20	2.11	1.93	1.83	1.70	1.90	1.81	0.11	0.15	0.17	0.14	0.05	0.07	0.08	0.06	0.09	0.10	0.11	0.10
mean		2.2	2.8	3.0	2.67	1.79	2.30	2.26	2.11	1.87	1.85	2.10	1.94	0.12	0.17	0.18	0.15	0.06	0.07	0.07	0.06	0.10	0.11	0.13	0.11
Drainage water	Loamy soil	2.9	3.1	3.5	3.17	2.50	2.50	2.90	2.63	2.00	2.11	2.51	2.21	0.20	0.23	0.27	0.23	0.08	0.07	0.09	0.08	0.11	0.12	0.14	0.11
	Sandy soil	2.8	3.00	2.6	2.80	2.31	2.17	2.80	2.43	1.93	2.20	2.30	2.14	0.18	0.19	0.22	0.20	0.07	0.07	0.09	0.07	0.08	0.11	0.14	0.11
mean		2.9	3.05	3.05	2.98	2.41	2.34	2.85	2.53	1.97	2.16	2.41	2.17	0.19	0.21	0.25	0.21	0.07	0.07	0.09	0.07	0.10	0.11	0.14	0.12
Municipal wastewater effluent	Loamy soil	3.35	3.30	3.70	3.45	2.73	2.81	2.93	2.82	2.30	2.45	2.73	2.49	0.25	0.28	0.30	0.28	0.11	0.19	0.18	0.16	0.11	0.13	0.15	0.13
	Sandy soil	3.40	3.30	3.00	3.23	2.51	2.56	2.80	2.62	2.21	2.32	2.40	2.31	0.21	0.23	0.28	0.24	0.10	0.13	0.16	0.13	0.10	0.12	0.13	0.12
mean		3.38	3.30	3.35	3.34	2.62	2.69	2.87	2.72	2.26	2.39	2.57	2.40	0.23	0.26	0.29	0.26	0.11	0.16	0.17	0.14	0.11	0.13	0.14	0.13
Mean		2.81	3.05	3.13		2.27	2.44	2.66		2.30	2.13	2.36		0.18	0.21	0.24		0.08	0.10	0.11		0.10	0.12	0.14	

S.M.C = Soil moisture content

4.4.5. Macro elements percentage in the leaves ,stems and roots.

4.4.5.1. Nitrogen and phosphorus percentage :

Tables (51, 52) showed the effect of using different water resources ,two types of soil and different levels of soil moisture content on Nitrogen (N)and Phosphorus (P)percentage leaves, stems and roots of *Albizzia lebbeck* seedlings .

The result indicated that in the first season leaves (N) and (P)percentage increased in seedlings irrigated with municipal or drainage water more than that of Nile water, the values of N% obtained from municipal waste water and drainage water were 3.34 and 2.98% respectively while mean value was 2.67% in leaves of seedlings irrigated with Nile water, whereas the mean values of P were 0.15,0.21 and 0.26% in seedlings irrigated with Nile ,drainage and municipal wastewater, respectively .

In the second season, the results have taken the same trend, meanwhile the values of N and p were different they were 3.12,2.81 and 2.66% for N and 0.25,0.23 and 0.17% for P in seedlings irrigated with Nile ,drainage and municipal wastewater respectively .

As for N and P% in stems of seedlings increased markedly with irrigation with municipal wastewater since the value was 2.72% for N and 0.14 for P while that irrigated with drainage water recorded the values of 2.53,0.07% for N and P respectively, then the stem of seedlings irrigated with Nile water had the last value of 2.11% for N and 0.06% for P in the first season. In the second season the values were 2.51,2.70 and 2.74% for N and 0.09,0.10 and 0.17% for P in the seedlings

In this regard the two different used soil indicated that in the first season, the average total phenoles ranged from 6.56 to 7.47 mg /100 g as sandy soil produced the highest total phenols value of 7.74 mg/100 g in seedlings irrigated with Nile water whereas the lowest values resulted in the seedlings cultivated in loamy soil and irrigated with municipal wastewater .

The obtained results from the second season were in similar to those of the first one.

Regarding total phenols as affect by different soil moisture content it can be observed increasing in phenolic compounds with drought conditions ,in both seasons .The highest value was 7.87 and the lowest was 6.76 mg/g dry weight produced from the treatment of 40 and 80% respectively ,while the level of 60% soil moisture content was induced the intermediate 7.20 mg/100g dry weight in the first season. In the second season the values were 8.32,7.66 and 7.24 mg/100 g under 40,60 and 80% soil moisture content consequently, irrespective the effect of water resources and soil types.

From the above mentioned results it can be concluded that phenolic compounds accumulated in leaves of the plants subjected under water deficit conditions in roots media .These results were in agreement with findings of many investigators such as **EL-Said,(1990)** on apple root stocks indicated that soluble phenolic compounds increased in shoots under water stress and **Shehata, (1992)**on *cupressus sempervirens* and *Eucalyptus camaldulensis* ,who stated that total soluble phenol content was markedly increased in seedlings which were grown under drought treatments.

Table (50)Effect of different water resources irrigation and soil moisture content on Total phenoles mg/100g dry weight of *Albizzia lebbeck* seedlings grown in different two soil types during 1998-1999 and 1999-2000 seasons.

season		1998-1999				1999-2000			
Water resources	Soil type / SMC	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	8.00	7.65	7.44	7.70	8.70	8.13	7.94	8.26
	Sandy soil	8.44	7.66	7.11	7.74	8.94	8.44	7.66	8.35
Mean		8.22	7.66	7.28	7.72	8.82	8.29	7.8	8.31
Drainage water	Loamy soil	7.83	7.12	6.55	7.17	7.77	7.52	6.95	7.41
	Sandy soil	8.11	7.00	6.44	7.18	8.51	7.33	6.74	7.53
Mean		7.97	7.06	6.50	7.17	8.14	7.43	6.85	7.47
Municipal wastewater effluent	Loamy soil	7.03	6.65	6.01	6.56	7.43	7.05	6.41	6.96
	Sandy soil	7.8	7.10	7.00	7.30	8.03	7.50	7.70	7.74
Mean		7.42	6.88	6.51	6.93	7.73	7.28	6.06	7.35
Mean		7.87	7.20	6.76		8.32	7.66	7.24	

S.M.C =Soil moisture content

* Mean values in the same column within soil type followed by the same small litters are not significant at level of 5% probability.
* Mean values in the same column within water resources followed by the same capital litters are not significant at level of 5% probability.
* Mean values of different soil moisture content in the same raw followed by the same small litters are not significant at level of 5% probability.

The highest value was 12.76 and the lowest was 7.58 mg/100g dry weight produced from the treats of 80 and 40% soil moisture, respectively ,in the first season, whereas in second season the values were 12.69,11.69 and 8.18 mg/100g under 80,60 and 40% consequently, irrespective the effect of water resources and soil type .

From the former results it might be resulted that total indoles were increased in high soil moisture content and declined with drought conditions.

The former results were confirmed by those of **Farhat,(1990)**on myporum, who found that total indoles concentration decreased with prolonging the irrigation intervals and **EL-Said,(1990**) on apple, who reported that soluble indoles decreased in shoots under water stress.

4.4.4.Total phenoles:

In the first season data presented in Table (50)obviously cleared that the irrigation with Nile water produced the highest total phenoles in average value 0f 7.72 mg/100g dry weight compared to those irrigated with municipal wastewater effluent which gave the lowest value of 6.93 mg/100g whereas those irrigated with drainage water resulted in the intermediate in average value of 7.17 mg/100 g. In the second season the similar trend of first season, approximately where the lowest average of total phonies was 7.35 mg/100g revealed in the seedlings irrigated with municipal wastewater while the highest average was 8.31 mg/100g in seedlings irrigated with Nile water ,then the seedlings irrigated with drainage water had the intermediate value of 7.47 mg/100 g dry weight.

Table (49)Effect of different water resources irrigation and soil moisture content on Total Indoles (mg/100g dry weight) of *Albizzia lebbeck* seedlings grown in different two soil types during 1998-1999 and 1999-2000 seasons.

Season		1998-1999				1999-2000			
Water resources	Soil type / SMC	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	7.48	10.21	12.82	10.17	8.67	12.21	13.40	11.43
	Sandy soil	7.06	10.30	12.03	9.80	7.78	10.04	11.79	9.87
Mean		7.27	10.26	12.43	9.98	8.23	11.13	12.60	10.65
Drainage water	Loamy soil	7.61	11.27	12.92	10.6	8.41	12.33	12.93	11.22
	Sandy soil	7.50	10.00	11.30	9.6	8.50	10.77	11.73	10.33
Mean		7.56	10.64	12.11	10.10	8.46	11.55	12.33	10.78
Municipal wastewater effluent	Loamy soil	8.30	14.20	14.46	12.32	8.56	13.22	13.48	11.75
	Sandy soil	7.53	11.17	13.04	10.58	7.17	11.53	12.81	10.50
Mean		7.92	12.69	13.75	11.45	7.87	12.38	13.15	11.13
Mean		7.58	12.20	12.76		8.18	11.69	12.59	

S.M.C =Soil moisture content

mg/100g dry weight followed by those irrigated with drainage water in average value of 10.10 mg/100g whereas the

Lowest values, was observed in seedlings irrigated with Nile water .Also in the second season the results tended to take the same line approximately, in which the average value were 11.13,10.78 and 10.65% of dry weight in the seedlings irrigated with municipal ,drainage and Nile water respectively.

The herein obtained results were coincided with those of **EL-Said,(1999)** on *citrus reticulata* ,who found that total indoles increased in leaves when trees irrigated with sewage water compared to Nile water .

In this respect, the effect of the two different used soils it can be noticed that in the first season, the mean value of total indoles ranged from 9.60 in the seedlings planted in sandy soil and irrigated with drainage to 12.32 mg/100g dry weight in those planted in loamy soil and irrigated with municipal wastewater, it is evident that the seedlings planted in loamy soil and irrigated with municipal wastewater induced the maximum values of indoles compounds .

In the second season, the results were the same line of those obtained from the first one where the highest average of total indoles was 11.75 mg /100g correlated with seedlings planted in loamy soil and irrigated with municipal wastewater ,while the lowest one was 9.87 mg/100g in accompanied to those planted in sandy soil and irrigated with Nile water

As for the effect of soil moisture content on total indoles, the results pointed that total indoles in the leaves increased as a result to soil moisture content increased in both season.

moisture 80% of field capacity and it reduced with low soil moisture content 40% while the level of 60% was intermediate .The average of total carbohydrates percentage were 11.17,12.29 and 12.44% of dry weight under soil moisture content 40%,60 and 80% of field capacity respectively. In the second season the results have taken the same trend where the water stress of 40% soil moisture content decreased the total carbohydrates compared to high moisture .the highest value was 13.00% at 80% soil moisture followed by 12.94 at 60% and the lowest value was 10.87% of dry weight at 40% soil moisture content. It may be due to that when the plants were exposed to water stress, stomata were closed at day and night and this may be resulting in limiting $C0_2$ which associating in reducing the photosynthesis subsequently reducing total carbohydrates **Bastide *et al* (1993)**.The a forenamed results were in harmony with those obtained by **EL-Ashry *et al*(1998)** on Stirilitzia plants showed that total carbohydrates gradually increased by decreasing soil moisture stress and **Shehata, (2002)** on *Eucalyptus Spp* who found that total carbohydrates was higher at 80% soil moisture content of field capacity than 40%.

4.4.3 Total indoles :

Table (49) shows the effect of different water resources irrigation and two types of soils under different soil moisture content on total indoles of *Albizzia lebbeck.* The results indicated that in the first season, the average total indoles increased by irrigation seedling with municipal or drainage water as compared with seedlings irrigated with Nile water. Seedlings irrigated with municipal wastewater gave the highest in average value of 11.45

Table (48)Effect of different water resources irrigation and soil moisture content on Total carbohydrate % of *Albizzia lebbeck* seedlings grown in different two soil types during 1998-1999 and 1999-2000 seasons.

season		1998-1999				1999-2000			
Water resources	Soil type / SMC	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	11.72	13.753	12.00	12.49	9.70	12.25	14.51	12.15
	Sandy soil	10.17	10.00	9.16	9.78	11.17	10.33	11.11	10.87
Mean		10.95	11.88	10.58	11.14	10.77	11.29	12.81	11.51
Drainage water	Loamy soil	10.92	12.90	15.83	13.22	10.50	14.33	13.88	12.90
	Sandy soil	10.32	11.40	10.88	10.87	11.42	12.00	12.50	11.97
Mean		10.62	12.15	13.36	12.05	10.96	13.17	13.19	12.44
Municipal wastewater effluent	Loamy soil	12.83	13.77	14.42	13.67	11.42	14.70	12.95	13.02
	Sandy soil	11.05	11.90	12.33	11.76	11.00	14.01	12.90	12.64
Mean		11.94	12.84	13.38	12.72	11.21	14.36	12.93	12.83
Mean		11.17	12.29	12.44		10.87	12.94	13.00	

S.M.C =Soil moisture content

irrigation induced the highest total carbohydrates in average value of 12.83% followed by drainage water which gave the mean value of 12.44% while Nile water recoded the lowest in average value of 11.51% of dry weight.

The former results were in agreement with those of **El-Said, (1999)** on *citrus reticulata*, who reported that the trees irrigated with sewage wastewater produced the highest total carbohydrates in shoots compared to Nile water.

Concerning the effect two types of soil on total carbohydrates, data in the same table showed that in the first season, the average total carbohydrates ranged from 9.78 to 13.67% of dry weight, as the loamy soil produced the highest total carbohydrates

In the second season, the results confirmed those of first one where the values ranged from 10.87 to 13.02% of dry weight as the loamy soil recorded the highest value of 13.02% in the seeding irrigated with municipal wastewater compared with sandy soil which produced the lowest in those irrigated with Nile water .

The herein obtained results were in harmony with many investigators such as **Nabil and EL-Khateeb, (1991)**who cleared that soluble sugars content decreased due to planting in sandy soil and **Radwan, (1999)** on *Eucalyptus incana* , who found that different growing meidia were more effective on total sugars since clay or mixture of sand and clay 1:1 v/v increased sugars comparable with sandy soil.

As for the effect of soil moisture content it can be noticed in the first season that total carbohydrates increased with soil while the lowest was 4.38 mg/g fresh weight at 80%. As for chlorophyll(b) the highest value was 5.52 mg/g fresh weight while the lowest value was 5.05 mg/g fresh weight at 80%

As for carotenoides content the lowest value was 2.17 mg/g fresh weight while the highest was 2.53 mg/g fresh weight at 80 and 40% soil moisture content of field capacity consequently.

In this respect the results of chlorophylls and carotenoides content as influenced by different soil moisture content were in agreement with findings of **EL-Ashker, (1980)** on bean plants, who found that the plants grown in high soil moisture showed decreased concentration of chlorophyll (a,b) as well as carotenoides. meanwhile 40% (W.H.C) increased the concentrations of all photosynthetic pigments as compared with plants under normal conditions(65% W.H.C) and **Shehata, (1992)** on *aucalyptus camaldulensis* ,who found that the seedlings grown in low (S.M.C)40% of field capacity showed increased concentration of chlorophylls and carotenoides compared with 80% .

4.4.2. Total carbohydrates percentage :

Data presented in Table (48) obviously cleared that the irrigation with municipal wastewater effluent produced in the first season the highest total carbohydrates in stems of seedlings in average value of 12.72% of dry weight compared to those irrigated with Nile water where, the total carbohydrates percentage was 11.14% of dry weight, while those irrigated with drainage water resulted in the intermediate in average value of 12.05%. In the second season the results have taken the same line approximately, meanwhile municipal wastewater effluent

As for two different type of soils the data in Tables (46,47) showed that, in the first season, chlorophyll (a,b) and carotenoides increased to maximum in loamy soil (4.73,5.81 and 2.33 mg/g fresh weight), while the minimum values were recorded in sandy soil (4.26,5.25 and 2.08 mg/g fresh weight) respectively, regardless the effect of different water resources. The results of second season emphasized those obtained from the first one .

The results agreed with those obtained by **Farahat, (1986)** on *Eucalyptus camaldulensis* , **Mohamed,(1992)**on *Asparagus sprengeri* and **Mohamed,(1993)** on *Nerium oleander* and *Adhatoda vasica* where they found that the seedlings grown in clay or mixture of sand and clay 1:1 v/v increased the chlorophyll in leaves.

Concerning the effect of different levels of soil moisture content (40,60 and 80% of field capacity) on chlorophyll (a,b) and carotenoides ,the obtained results in the same tables (46,47) in the first season indicated that soil moisture content of 40% of field capacity increased chlorophyll (a,b) and carotenoides as compared with those of soil moisture content of 80% of field capacity.

The lowest values of chlorophyll (a,b) and carotenoides were 4.37,5.36 and 2.10 mg/g fresh weight at 80% and the highest values were 4.67,5.72 and 2.31 mg/g fresh weight at 40% soil moisture content of field capacity respectively.

In the second season a similar trend was found to that obtained from the first one were the highest average of chlorophyll (a) was 4.57 mg/g at soil moisture content of 40%

Table (47) Effect of different water resources irrigation and soil moisture content on chlorophylls and carotenoides content of leaves of *Albizzia lebbeck* (mg/g fresh weight) seedlings grown in different two soil types during 1999-2000 season.

		Chlorophyll a				Chlorophyll b				Carotenoides			
Water resources	Soil type / SMC	40%	60%	80%	Mean	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	4.58	4.52	4.30	4.47	5.38	5.21	5.10	5.23	2.44	2.31	2.10	2.28
	Sandy soil	4.38	4.21	4.20	4.20	5.28	5.16	4.07	4.84	2.29	2.18	2.09	2.19
Mean		4.48	4.37	4.25	4.34	5.33	5.19	4.59	5.03	2.37	2.25	2.10	2.23
Drainage water	Loamy soil	4.63	4.68	4.42	4.58	5.67	5.66	4.56	5.63	2.63	2.45	2.21	2.43
	Sandy soil	4.44	4.53	4.32	4.43	5.41	5.55	4.43	5.13	2.46	2.40	2.10	2.32
Mean		4.54	4.61	4.37	4.51	5.54	5.61	5.00	5.38	2.55	2.43	2.16	2.38
Municipal wastewater effluent	Loamy soil	4.87	4.74	4.64	4.75	5.75	5.69	5.66	5.70	2.75	2.53	2.28	252
	Sandy soil	4.53	4.44	4.42	4.46	5.63	5.55	5.48	5.55	2.58	2.31	2.19	2.36
Mean		4.70	4.59	4.37	4.61	5.69	5.62	5.57	5.63	2.67	2.42	2.24	2.44
Mean		4.57	4.52	4.38	4.49	5.52	5.47	5.05	5.35	2.53	2.37	2.17	

SMC= soil moisture content

Table (46) Effect of different water resources irrigation and soil moisture content on chlorophylls and carotenoides content of leaves of *Albizzia lebbeck* (mg/g fresh weight) seedlings grown in different two soil types during 1998- 1999 season.

		Chlorophyll a				Chlorophyll b				Carotenoides			
Water resources	Soil type / SMC	40%	60%	80%	Mean	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	4.65	4.66	4.30	4.54	5.52	5.37	5.22	5.37	2.2	2.14	2.09	2.15
	Sandy soil	4.40	4.19	4.20	4.26	5.68	5.05	5.01	5.25	2.04	2.10	2.10	2.08
Mean		4.53	4.43	4.25	4.40	5.60	5.21	5.12	5.31	2.13	2.12	2.10	2.12
Drainage water	Loamy soil	4.90	4.78	4.48	4.72	5.81	5.75	5.56	5.71	2.43	2.15	2.10	2.23
	Sandy soil	4.55	4.50	4.22	4.42	5.60	5.38	5.23	5.40	2.27	2.03	2.00	2.10
Mean		4.73	4.64	4.35	4.57	5.71	5.57	5.40	5.56	2.35	2.09	2.05	2.17
Municipal wastewater effluent	Loamy soil	4.80	4.77	4.62	4.73	5.94	5.80	5.68	5.81	2.56	2.24	2.19	2.33
	Sandy soil	4.70	4.63	4.38	4.57	5.73	5.63	5.42	5.59	2.35	2.13	2.11	2.20
Mean		4.75	4.70	4.50	4.65	5.84	5.72	5.55	5.70	2.46	2.19	2.15	2.26
Mean		4.67	4.59	4.37	4.54	5.72	5.50	5.36	5.52	2.31	2.13	2.10	

SMC= soil moisture content

In the first season the irrigation with municipal wastewater effluent gave the highest values of chlorophyll (a)content followed by drainage water whereas those of Nile water gave the lowest one. The average values of chlorophyll(a) were 4.65,4.57 and 4.40 mg/g fresh weight as affected by municipal, drainage and Nile water irrigation consequently .

Chlorophyll (b) produced the similar trend for those existed in obtained results from the previous results of chlorophyll (a) whereas the averages of leaves chlorophyll(b) content were 5.70,5.56 and 5.31 mg/g fresh weight as affected by municipal ,drainage and Nile water respectively.

Also ,the data presented in the same table showed that carotenoides content was more effected by different water resources since the irrigation with municipal wastewater effluent produced the highest value of carotenoides 2.26 mg/g fresh weight compared to those of either Nile or drainage water in average values of 2.12 and 2.17 mg/g fresh weight respectively.

In the second season, a similar trend to those obtained from the first season was observed, in response of chlorophyll(a,b) and carotenoides to municipal ,drainage and Nile water for irrigation.

The here above obtained results were in harmony with the findings of **Norwal *et al*,(1990), Zekri and koo ,(1993)** where they found that mature citrus trees irrigated with reclaimed municipal wastewater had denser greener leaves and **EL-said,(1999)** on Egyptian mandarin reported that using of sewage water for irrigation causing increase of total chlorophyll in leaves .

water, 56.78 and 49.58% in Nile water under loamy and sandy soil, respectively .

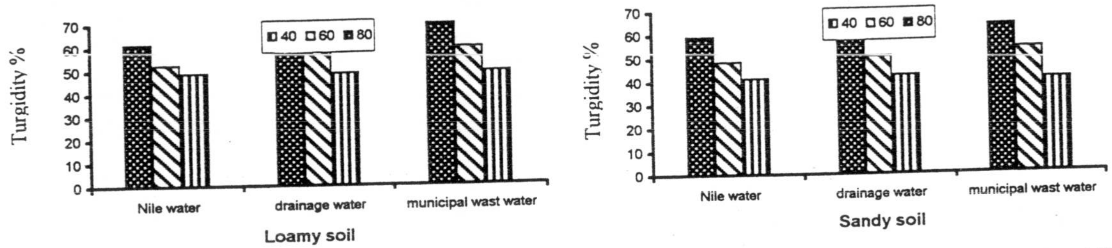
In this respect the effect of soil moisture content on leaf water relative turgidity it can be noticed that as soil moisture increased the turgidity increased and the opposite occurred under drought conditions. This may be refer to that as soil moisture content increased the water uptake increased and it resulted in cell enlargement consequently increasing in water relative turgidity .The differences were significant among the plants treated with 80,60 and 40% soil moisture content in both seasons. The highest value was 63.49 and 67.33 in the plants under soil moisture of 80% in the first and second season ,respectively while the treatment of 40% soil moisture gave the lowest value (44.94 and 45.30%)

These results were in harmony with findings of **Shehata,(1992)** on *Eucalyptus camaldulensis who* reported that as soil moisture increased the turgidity increased and adversely effect under drought conditions.

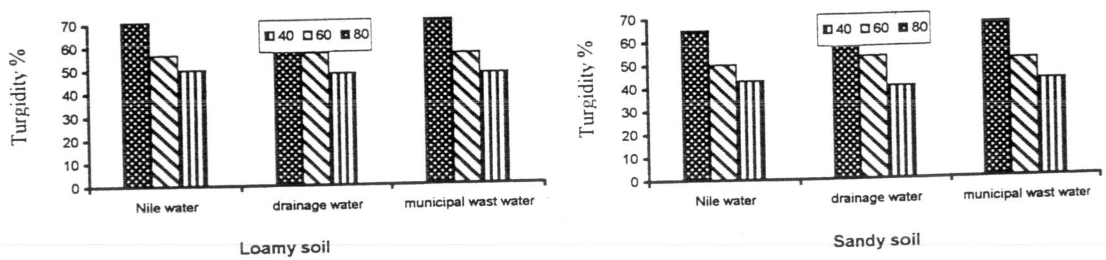
4.4. Effect of different water resources irrigation and soil moisture content in different two soil on chemical constituents:

4.4.1. Chlorophylls and carotenoides content of leaves:

Tables (46,47) show the influence of different water resources irrigation , two types of soils under different soil moisture content on chlorophyll (a, b) and carotenoides .



Fig(13) Effect of different water resources irrigation and soil moisture content on Leaf water relative turgidity % of *Albizzia labbeck* seedlings grown in loamy and sandy soil during 1998-1999 season.



Fig(14) Effect of different water resources irrigation and soil moisture content on Leaf water relative turgidity % of *Albizzia labbeck* seedlings grown in loamy and sandy soil during 1999-2000 season.

Table (45)Effect of different water resources irrigation and soil moisture content on Leaf water relative turgidity % of *Albizzia lebbeck* seedlings grown in different two soil types during 1998-1999 and 1999-2000 seasons.

season		1998-1999				1999-2000			
Water resources	Soil type / SMC	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	48.67	52.33	61.33	56.78 a	50.33	56.67	73.33	60.11 a
	Sandy soil	41.10	48.33	59.30	49.58 b	43.12	50.11	65.11	52.78 b
Mean		44.89 cd	50.33 bc	60.32 abc	53.18 A	46.73cd	53.39 b	69.22 a	56.45 A
Drainage water	Loamy soil	48.60	59.33	67.18	58.37 a	48.31	57.15	65.17	56.88 a
	Sandy soil	42.15	50.22	60.16	50.84 b	40.17	53.11	61.83	51.70 b
Mean		45.38 c	54.78 bc	63.67 ab	54.61 A	44.24 c	55.13 b	63.50 ab	54.29 A
Municipal wastewater effluent	Loamy soil	49.00	59.67	69.67	59.45 a	47.80	56.33	71.41	58.51 a
	Sandy soil	40.12	53.17	63.27	52.19 b	42.11	51.15	67.12	53.46 b
Mean		44.56 cd	56.42 ab	66.47 a	55.82 A	44.96 cd	53.74 ab	69.27 a	55.99 A
Mean		44.94 c	53.84 b	63.49 a		45.30 c	54.09 b	67.33 a	

S.M.C =Soil moisture content

* Mean values in the same column within soil type followed by the same small litters are not significant at level of 5% probability.
* Mean values in the same column within water resources followed by the same capital litters are not significant at level of 5% probability.
* Mean values of different soil moisture content in the same raw followed by the same small litters are not significant at level of 5% probability.

84.67 at medium soil moisture of 60% of field capacity .In the second season these results had the same trend for those obtained in the first one ,the values were 133.16,83.95 and 37.87 mg/g fresh weight /h at soil moisture content of 80,60 and 40% of field capacity respectively .

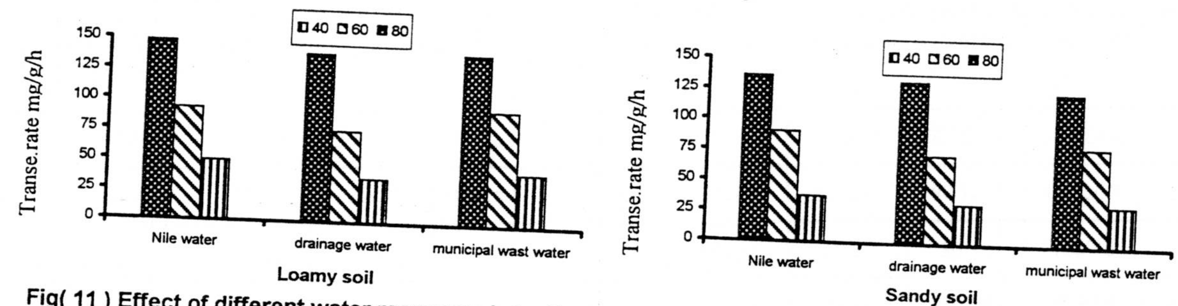
The former results were similarly to those reported by **Eastham *et al*,(1990)** on *Eucalyptus grandis who* stated that the ratio of transpiration rate decreased linearly with decreasing mean soil water content and **Shehata, (1992)** on *Eucalyptus camaldulensis*, who reported that when soil moisture restricted transpiration rate was reduced.

4.3.2. leaf water relative turgidity %:

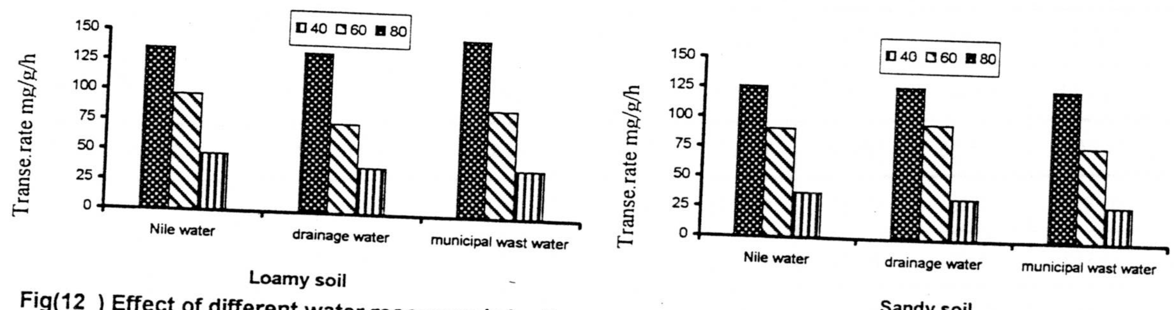
Data presented in Table (45) and Fig.(13,14)cleared that in the first season there were no significant differences among plants were irrigated with municipal, drainage and Nile water. The averages were 55.82,54.61 and 53.18% consequently.

From the aforementioned results it can be resulted that, the water resources did not affect on leaf water relative turgidity percentage .In the second season, these results had the same trend for those obtained in the first one.

Data presented in the same table show that in the first season the two different used soils had a pronounced effect on leaf water turgidity where the seedlings grown in loamy soil and irrigated with municipal wastewater produced significantly the highest water turgidity in average value of 59.45% compared to those of sandy soil that gave average value of 52.19%. The plants irrigated with drainage or Nile water have taken the same trend since the mean values were 58.37 and 50.84 in drainage



Fig(11) Effect of different water resources irrigation and soil moisture content on Transpiration rate mg/g fresh weight of *Albizzia labbeck* seedlings grown in loamy and sandy soil during 1998-1999 seasons.



Fig(12) Effect of different water resources irrigation and soil moisture content on Transpiration rate mg/g fresh weight of *Albizziz lebbeck* seedlings grown in loamy and sandy soil during 1999-2000 seasons.

Table (44)Effect of different water resources irrigation and soil moisture content on transpiration rate mg/g fresh weight/hour of *Albizzia lebbeck* seedlings grown in different two soil types during 1998-1999 and 1999-2000 seasons.

season		1998-1999				1999-2000			
Water resources	Soil type / SMC	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	49.9	93.26	148.26	97.14 a	47.44	97.11	135.51	102.35 a
	Sandy soil	38.10	90.42	136.10	88.21 b	37.70	91.24	126.16	85.03 b
Mean		44.00 c	91.84 a	142.18 a	92.68 A	42.57 c	94.18 a	130.84 a	93.69 A
Drainage water	Loamy soil	36.79	75.90	132.40	84.03 b	39.07	75.17	113.77	82.67 b
	Sandy soil	33.17	72.75	133.01	80.00 c	35.15	69.90	128.12	77.72 c
Mean		34.98 c	74.03 b	136.21 a	82.10 C	37.11 c	72.54 b	130.95 a	80.20 C
Municipal wastewater effluent	Loamy soil	44.03	95.15	141.00	93.39 a	40.53	90.16	148.14	92.94 a
	Sandy soil	33.87	81.12	125.18	80.10 c	30.82	80.14	127.19	79.38 b
Mean		38.95 c	88.14 a	133.1 a	86.75 B	35.70 c	85.15 a	137.70 a	86.16 B
Mean		39.31 c	84.67 b	137.1 a		37.87 c	83.95 b	133.16 a	

S.M.C =Soil moisture content

* Mean values in the same column within soil type followed by the same small litters are not significant at level of 5% probability.

* Mean values in the same column within water resources followed by the same capital litters are not significant at level of 5% probability.

* Mean values of different soil moisture content in the same raw followed by the same small litters are not significant at level of 5% probability.

Table (43)Effect of different water resources irrigation and soil moisture content on Survival percentage of *Albizzia lebbeck* seedlings grown in different two soil types during 1998-1999 and 1999-2000 seasons.

season		1998-1999				1999-2000			
Water resources	Soil type / SMC	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	100.00	100.00	100.00	100.00 a	100.00	100.00	100.00	100.00
	Sandy soil	77.80	100.00	100.00	92.60 a	100.00	100.00	100.00	100.00 a
Mean		88.90 a	100.00 a	100.00 a	96.30A	100.00 a	100.00 a	100.00 a	100.00 A
Drainage water	Loamy soil	77.80	100.00	100.00	92.60 a	88.90	100.00	100.00	96.30 a
	Sandy soil	98.50	100.00	98.50	99.00 a	77.80	100.00	100.00	92.60 ab
Mean		88.15	100.00	99.25	95.80 A	83.35 b	100.00	100.00	94.45 AB
Municipal wastewater effluent	Loamy soil	98.50	100.00	98.00	99.00 a	77.80	98.00	100.00	91.93 ab
	Sandy soil	77.80	77.80	88.50	81.36 a	77.00	98.90	100.00	88.90b
Mean		88.15 b	88.9 b	93.25 a	90.18 A	77.40	98.50	100.00	39.43 A
Mean		88.40 b	96.30 a	97.50 a		86.90 b	99.50 a	100.00 a	

S.M.C =Soil moisture content
* Mean values in the same column within soil type followed by the same small litters are not significant at level of 5% probability.
* Mean values in the same column within water resources followed by the same capital litters are not significant at level of 5% probability.
* Mean values of different soil moisture content in the same raw followed by the same small litters are not significant at level of 5% probability.

khaya senegalensis stated that dry weight was affected owing to different soil moisture and it was significantly reduced in the seedlings irrigated with stressed water 40% of field capacity compared to those of 80 or 60%.

4.2.Suvival percentage of seedlings:

The data presented in Table (43) showed the effect of different water resources, two types of soil and the three levels of soil moisture content on survival percentage of *Albizzia lebbeck*, seedlings where in the first season, the differences among the three water resources were insignificant, also it can be noticed that the survival percentage of seedlings slightly decreased due to municipal or drainage water irrigation where it reached 90.18 and 95.80% while it was 90.43 and 94.45% respectively in the second one, The highest values were 96.30 and 100% accompanied to Nile water irrigation in both seasons.

The former results supported by **Hegg *et al*, (1985)** on *lirioden drontulifera* and *populus deltoides* they reported that the treatment with Swine lagoon effluent of 0 , 20 , 47, 74 and 144 cm/year insignificantly increased total mortality.

Regarding the effect of different types of soil the data show that there were no significant differences in between when the seedlings were irrigated with different water resources in both season. However loamy soil was the best .

As for the effects of soil moisture on survival percentage, it could be observed from data that 80% level of soil moisture content gave the maximum average values of 97.50 and 100% followed by 60% soil moisture with average values of 96.30 and weight of stems,**Radwan,(1999)** and **Shehata *et al*,(2002)** reported that the mixture of (1:1) v/v sand+clay had an effect on increasing dry weight of roots, stems and leaves compared to (2:1) v/v.

Concerning the effect of different levels of soil moisture content the data in Tables (41,42)demonstrated that the dry weight of leaves ,stems and roots significantly increased at 60 or 80% soil moisture compared with those of 40%

The average values of dry weight of leaves and stems were 8.92, 8.25 and 6.97 for leaves and 5.10,4.59 and 3.60 g for stems while the values of roots were 7.15,6.79 and 5.99g under 80,60 and 40% soil moisture in the first season, respectively

In the second season, the dry weight of leaves and stems were 7.88,9.42 and 10.25 for leaves and 5.73,6.62 and 7.22g for stems while in rootswere as in roots the mean values were 5.73,6.63 and 7.33g under 40,60 and 80% soil moisture content, respectively.

Generally, from the former results it could be noticed that increasing fresh and dry weights of leaves ,stems and roots due to increasing of organic matter in loamy soil and elements in municipal or drainage water comparing with Nile water respectively. Also soil moisture content affected the fresh and dry weight of the different plant potions and as a result to the water stress increased the fresh and dry weight decreased.

These results were paralleled with the findings of **Rawat *et al* (1974)** on *E.treticornis* since they found that when soil moisture content was reduced 66% and 84% the reduction in dry weight was 25% and 38% respectively and **Shehata, (2002)** on

The differences among three water resources were significant in dry weight of leaves and stems, but insignificant in dry weight of roots. Generally municipal wastewater effluent surpassed than the two others water resources.

The results of the second season emphasized those obtained from the first one .

These results were in agreement with the findings of **Kree and Sopper (1982)** on popula**, Abouelkhair, (1988)** on *Eucalyptus camaldulensis* and **EL-Said, (1999)** on citrus trees .All of them found that using of wastewater increased dry weight of the plant portions.

Regarding the effect of two different types of soils, the data in the same Tables indicated that loamy soil induced superior dry weight of leaves ,stems and roots more than those of sandy soil when seedlings were irrigated with different water resources .The differences between loamy and sandy soil irrigated with drainage or municipal were insignificant, but there were significant differences between two types of soil which irrigated with Nile water .

In the second season the results tended to a similar trend as those obtained from the first one .

Also, it can be observed in the same tables that, using of municipal or drainage water for irrigation amended and enhanced the properties of sandy soil so that it had given a good results rather than loamy soil which irrigated by Nile water.

The former results coincided with those obtained by **EL-Khateeb, (1993)** on *E.angulosa* who states that a mixture of peatmoss plus loam or sand had a great effect on increasing dry

Table (42)Effect of different water resources and soil moisture content on dry weight (gm) of *Albizzia lebbeck* seedlings grown in different two soil types during 1999- 2000 Season .

		Leaves				Stems				Roots			
Water resources	Soil type / SMC	40%	60%	80%	Mean	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	6.90	7.78	9.19	7.96bc	4.24	5.08	5.60	4.98bc	6.00	6.40	7.17	6.52b
	Sandy soil	7.49	6.85	7.57	7.30bc	4.51	4.91	4.70	4.70d	5.04	6.50	7.25	6.26bc
Mean		7.20e	7.31e	8.39d	7.63C	4.38d	4.99c	5.15b	4.84C	5.52c	6.45b	7.21a	6.39B
Drainage water	Loamy soil	8.46	10.14	10.52	9.70ab	6.23	7.08	9.00	7.44b	5.13	6.32	7.55	6.33cb
	Sandy soil	7.42	8.94	9.99	8.78b	5.33	6.67	6.84	6.35bc	6.12	6.66	7.14	6.64b
Mean		7.94e	9.84d	10.25cd	9.24B	5.88b	6.88bc	7.92ab	6.89B	5.62b	6.49b	7.34a	6.48B
Municipal wastewater effluent	7.65	9.35	11.56	12.35	11.09a	7.60	8.46	8.83	8.30a	5.93	6.88	7.75	6.85ab
	7.72	7.62	10.66	11.84	10.04ab	6.24	7.55	8.33	7.37ab	6.12	7.00	7.12	6.75b
Mean		8.49c	11.11ab	12.10a	10.57A	6.92b	8.00ab	8.58a	7.84A	6.03bc	6.94	7.44a	6.80B
Mean		7.88c	9.42b	10.25a		5.73c	6.62b	7.22a		5.73c	6.63b	7.33a	

S.M.C =Soil moisture content

* Mean values in the same column within soil type followed by the same small litters are not significant at level of 5% probability.

* Mean values in the same column within water resources followed by the same capital litters are not significant at level of 5% probability.

* Mean values of different soil moisture content in the same raw followed by the same small litters are not significant at level of 5% probability.

Table (41)Effect of different water resources and soil moisture content on dry weight(g) of *Albizzia lebbeck* seedlings grown in different two soil types during 1998- 1999 Season .

		Leaves				Stems				Roots			
Water resources	Soil type / SMC	40%	60%	80%	Mean	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	6.39	6.69	7.32	6.80 b	3.44	4.71	4.80	4.32 b	6.12	7.25	7.15	6.84 b
	Sandy soil	5.95	6.21	6.43	6.19 c	3.12	3.76	4.17	3.68	5.11	6.19	6.33	5.87 c
Mean		6.17 g	6.45eg	6.88fg	6.50 C	3.28 e	4.24de	4.49de	4.00 C	5.62 c	6.72 b	6.74 b	6.36B
Drainage water	Loamy soil	7.73	8.20	8.28	8.07ab	3.60	4.58	4.85	4.34a	6.15	7.22	7.30	6.89ab
	Sandy soil	6.36	8.18	9.01	7.85bc	3.32	4.41	4.61	4.11bc	5.56	6.28	7.11	6.32b
Mean		7.40ef	8.19cd	8.65 c	7.96 B	3.46cd	4.50be	4.73ab	4.23B	5.86bc	6.75	7.20a	6.61B
Municipal wastewater effluent	7.65	7.65	10.49	11.65	9.93ab	4.12	5.08	6.18	5.13a	6.52	6.93	7.55	7.00a
	7.72	7.72	9.71	10.83	9.42ab	4.03	5.00	5.96	5.00a	6.48	6.87	7.48	6.94a
Mean		7.68de	10.10b	11.24a	9.68A	4.08bc	5.04ab	6.07a	5.06A	6.50bc	6.90b	7.52a	6.67B
Mean		6.97 c	8.25 b	8.92 a		3.60	4.59b	5.10a		5.99c	6.79b	7.15a	

S.M.C =Soil moisture content

* Mean values in the same column within soil type followed by the same small litters are not significant at level of 5% probability.
* Mean values in the same column within water resources followed by the same capital litters are not significant at level of 5% probability.
* Mean values of different soil moisture content in the same raw followed by the same small litters are not significant at level of 5% probability.

camara, **Radwan, (1999) and Shehata *et al* (2002)** on *Eucalyptus incana*. All of them reported that the mixture of (1:1)v/v sand + clay had an effect on increasing fresh and dry weight of roots, stems and leaves compared to sandy soil .

Data of fresh weight in response to different levels of soil moisture content of 40,60 and 80% of field capacity are represented in Tables (39,40).The fresh weight of both leaves and roots increased with the increasing of soil moisture content .

Where fresh weight stems increased slightly with increase soil moisture .However there were no significant differences in fresh weight of stems at 60 or 80% soil moisture content of field capacity .

In the second season the results gave the same pattern of those obtained in the first one .

These results were in harmony with obtained by **Rokaia , (1990)** on *Ficus carica* found that the water deficit decreased fresh weight of the plant portions, **Burman *et al*, (1991)**on *Melia azaderacht* and **Shehata , (2002)**on *Khaya senegalensis* ,reported that fresh weight of plant portions was greatest at 80% soil moistur content of field capacity compared to with 40%.

2.1.6.2. Dry weight

As shown in Tables (41,42) dry weight of leaves ,stems and roots of *Albizia lebeck* were more effected by water resources, different two soils and different soil moisture content in which the irrigation with municipal wastewater effluent in the first season produced the heaviest dry weight of leaves, stems and roots in average values of 9.68,5.06 and 6.67 g . respectively, compared to those irrigated with drainage or Nile water .

Table (40) Effect of different water resources and soil moisture content on fresh weight (gm) of *Albizzia lebbeck* seedlings grown in different two soil types during 1999- 2000 Season .

		Leaves				Stems				Roots			
Water resources	Soil type / SMC	40%	60%	80%	Mean	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	17.51	19.88	21.98	19.79b	13.20	14.60	16.22	14.67c	14.49	15.32	20.00	16.57a
	Sandy soil	17.65	17.46	18.04	17.71c	12.54	14.46	13.64	13.55cd	12.70	15.00	17.18	14.96b
Mean		17.52e	18.67de	20.01de	18.75C	1287c	14.53c	14.93c	14.11C	13.60c	15.12ab	18.59a	15.77A
Drainage water	Loamy soil	21.61	25.76	24.48	23.95b	15.42	17.84	20.43	17.89b	14.07	16.40	21.17	17.21a
	Sandy soil	18.71	20.91	25.76	21.79c	15.06	18.29	17.90	17.08c	11.40	14.11	18.67	14.73b
Mean		20.16de	23.33bc	25.12b	22.87B	15.24c	18.06b	19.16b	17.50B	12.74c	15.26ab	19.92a	15.97A
Municipal wastewater effluent	7.65	20.38	28.43	30.54	26.45a	19.17	20.51	32.17	20.95a	13.93	14.62	19.01	15.73b
	7.72	23.14	28.87	25.83	24.59a	17.01	19.36	21.55	19.31b	12.01	16.11	17.40	15.71b
Mean		21.76cd	28.65a	28.19a	26.90A	18.09b	19.94ab	22.36a	20.31A	12.97c	15.19ab	18.20a	15.45B
Mean		19.83c	23.55b	24.44a		15.40b	17.51a	18.82.a		13.26c	15.19b	18.90a	

S.M.C =Soil moisture content

* Mean values in the same column within soil type followed by the same small litters are not significant at level of 5% probability.
* Mean values in the same column within water resources followed by the same capital litters are not significant at level of 5% probability.
* Mean values of different soil moisture content in the same raw followed by the same small litters are not significant at level of 5% probability.

Table (39)Effect of different water resources and soil moisture content on fresh weight (gm) of *Albizzia lebbeck* seedlings grown in different two soil types during 1998- 1999 Season .

		Leaves				Stems				Roots			
Water resources	Soil type / SMC	40%	60%	80%	Mean	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	17.24	17.95	18.95	18.04 c	9.39	11.10	11.52	10.67c	14.31	16.08	18.83	16.41b
	Sandy soil	15.66	16.18	17.18	16.34 d	9.79	11.08	11.17	10.68c	12.41	13.61	18.06	14.69c
Mean		16.45d	17.06cd	18.07 c	17.19 C	9.59 e	11.09bc	11.35bc	10.68C	13.36 c	14.84bc	18.45a	15.55B
Drainage water	Loamy soil	18.36	20.27	21.17	19.93 b	10.45	11.69	11.80	11.31a	15.01	17.91	19.44	17.45a
	Sandy soil	16.94	21.05	19.27	19.05bc	10.37	10.55	11.44	10.79b	12.77	14.34	16.19	15.43b
Mean		17.65d	20.66c	20.22 c	19.51 B	10.41de	11.12 a	11.62a	11.05B	13.89bc	16.13b	17.82a	16.00AB
Municipal wastewater effluent	7.65	19.55	24.50	26.98	23.64 a	10.85	12.16	12.60	11.87a	14.50	18.80	19.01	17.44a
	7.72	19.05	23.19	26.65	22.97 a	10.59	11.80	12.02	11.47b	13.11	15.18	16.10	14.80b
Mean		19.30cd	23.85d	26.76 a	23.30 A	10.72b	11.98 a	12.31a	11.67A	13.80bc	16.99a	17.55a	16.12A
Mean		17.80c	20.68b	21.68a		10.24b	11.40 a	11.76a		18.68c	15.99b	17.94a	

S.M.C =Soil moisture content

* Mean values in the same column within soil type followed by the same small litters are not significant at level of 5% probability.

* Mean values in the same column within water resources followed by the same capital litters are not significant at level of 5% probability.

* Mean values of different soil moisture content in the same raw followed by the same small litters are not significant at level of 5% probability.

between those irrigated with drainage and municipal wastewater were not significant in fresh weight of roots. In the second season, the results had the same trend for those obtained from the first season in fresh weight of leaves and stems, while there are no significant differences between those irrigated with drainage and Nile water in fresh weight of roots.

As for the effect of soil types the seedlings planted in loamy soil and irrigated with municipal wastewater recorded significantly the highest fresh weight of leaves in comparison with sandy soil. There were significant differences in fresh weight of leaves between the two types of soils irrigated with municipal and Nile water, on the other hand there were no differences between the two types of soils irrigated with drainage water .Stems and roots fresh weight of plants irrigated with different water resources had significant effects due to soil type with exception those irrigated with Nile water in fresh weight of stems .

In the second season a similar trend was found to those obtained from the first one, meanwhile there are no significant differences between loamy and sandy soil when irrigated with municipal wastewater in case of fresh weight of roots.

Also, It can be noticed from data of the same tables that municipal and drainage water amended the traits of sandy soil which resulted heavy fresh weight of leaves and stems more than those produced from loamy soil and irrigated with Nile water as shown in first and second season.

The former results were coincided in the same trend of many investigators such as **Mohamed, (1993)** on *lantana*

The results agreed with those obtained by **Radwan, (1999)** on *Eucalyptus incana* who mentioned that 1:1 v/v mixture of sandy: clay soil was good media for leaf area

Regarding the effect of soil moisture on leaf area the data in Table (38)demonstrated that the leaf area significantly increased at 60 and 80% soil moisture content compared with those of 40%

The average values of leaf area were 115.18,131.10 and 140.32 cm^2 under 40,60 and 80%, respectively in the first season while they were 110.10,121.50 and 126.50 in the second one .

The herein obtained results were in accordance by those of **Myers and Landsperg (1998)** on *Eucalyptus maculata*, **Shehata , (1992**) on *Eucalyptus camaldulensis*, observed that high soil moisture 60% of field capacity caused an increase in leaf area compared to 40 %.

4.1.6.<u>Fresh and dry weights in (g):</u>

4.1.6.1 <u>Fresh weight</u>

The data existed in Tables (39,40) detected that fresh weight as influenced by different water resources irrigation and two types of soil under different moisture content

In soil the first season, the results indicated that the municipal effluent produced the heavest fresh weight of leaves, stems and roots (23.30,11.67 and 16.12 g.),respectively compared with the other resources of irrigation water .The same table shows also, that there were significant differences among the three different water resources with exception the differences

Table (38)Effect of different water resources irrigation and soil moisture content on leaf area (cm²) of *Albizzia lebbeck* seedlings grown in different two soil types during 1998-1999 and 1999-2000 seasons.

season		1998-1999				1999-2000			
Water resources	Soil type / SMC	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	107.40	120.30	147.80	125.20 b	102.80	108.80	116.8	109.40 bc
	Sandy soil	99.17	121.10	119.20	113.10 c	102.10	106.10	110.2	106.10 c
Mean		103.30bc	120.70 b	133.50 a	119.20 C	102.40 bc	107.40 bc	113.50 b	107.80 C
Drainage water	Loamy soil	121.40	131.20	173.40	132.00 a	116.40	118.30	133.10	122.60 a
	Sandy soil	116.80	134.70	136.80	129.40 b	111.8	118.90	123.10	117.90 b
Mean		119.10 b	132.90 a	140.10 a	130.70 B	114.10 b	118.60 b	128.10 ab	120.30 B
Municipal wastewater effluent	Loamy soil	136.10	142.70	145.50	141.50 a	117.60	140.40	149.30	135.80 a
	Sandy soil	110.20	136.10	149.20	131.80 b	109.70	136.20	126.30	124.10 b
Mean		123.15 b	139.40 ab	147.35 a	136.15AB	113.60 b	138.30 ab	137.80 ab	129.90 A
Mean		115.18 c	131.10 b	140.32 a		110.10 c	121.50 b	126.50 a	

S.M.C =Soil moisture content
* Mean values in the same column within soil type followed by the same small litters are not significant at level of 5% probability.
* Mean values in the same column within water resources followed by the same capital litters are not significant at level of 5% probability.
* Mean values of different soil moisture content in the same raw followed by the same small litters are not significant at level of 5% probability.

136.15 cm^2 compared to those irrigated with Nile water in this case the seedlings were smallest in average value of 119.20 cm^2 while the seedlings which are irrigated by drainage water resulted the intermediate in average value of 130.70 cm^2. The differences between municipal wastewater effluent and drainage water were insignificant.

In the second season the results have taken the same trend approximately, since municipal waste water effluent induced significantly the maximum leaf area of 129.90 cm^2 followed by drainage water which gave the mean value of 120.30 cm^2 while Nile water irrigation produced the minimum leaf area in average value of 107.80 cm^2. the difference among the three water resources were significant .

The herein obtained results in harmony with **Maurer *et al* (1995)** on grapefruit trees and **EL-Said,(1999)** on citrus trees found that using of sewage water was casing the increase of leaf area .

As for two different types of soil the data in the same table indicated that, in the first season, loamy soil induced significantly the superior leaf area more than those of sandy soil when seedlings were irrigated with either drainage or Nile water . The differences between two different soils were significant .

In the second season the results tended to be a similar trend as those obtained from the first one , but seedlings that were irrigated with Nile water had no significant differences between the two different soil. However the loamy soil was the best.

loamy soil irrigated with municipal wastewater induced significantly the highest leaves number/plant in average value of 8.00 and 6.44 in the first and second season respectively.

The obtained results of the second season have taken the same trend and confirmed those of the first one.

It can be , also noticed from data of Table (37) that the municipal wastewater amended the traits of sandy soil resulting in leaves number more than those produced form sandy soil and irrigated with Nile or drainage water as shown in first and second seasons.

Regarding the effect of soil moisture content on leaves number /plant as shown in Table (37).the results apparently cleared that the decreasing of soil moisture 40% of field capacity significantly declined the leaves number in both seasons .In the first season the average values were 4.45, 6.61 and 7.33 under 40,60 and 80% of field capacity while they were 4.28,5.85 and 7.39 leaves /plant in the second season respectively.

The results were in the line with the results of **Shehata, (1992)** on *Cupressus sempervirens*, who stated that number of leaves was considerably less for seedlings treated with exceeding levels of soil moisture stress .

4.1.5 Leaf area:

The data existed in Table (38) detected that leaf area as influenced by different water resources irrigation and two types of soils under different soil moisture content .

In the first season the irrigation with municipal wastewater produced the largest significantly leaf area in average value of

Table (37)Effect of different water resources irrigation and soil moisture content on number of leaves of *Albizzia lebbeck* seedlings grown in different two soil types during 1998-1999 and 1999-2000 seasons.

season		1998-1999				1999-2000			
Water resources	Soil type / SMC	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	4.33	7.33	8.00	6.55b	4.67	6.33	8.67	6.66 a
	Sandy soil	3.67	4.67	6.00	4.78 c	4.00	4.33	5.33	4.55 c
Mean		4.00 b	6.00 a	7.00 a	5.67 C	4.34 c	5.33 b	7.00a	5.61C
Drainage water	Loamy soil	4.33	8.67	8.33	7.11 a	5.00	6.67	9.00	6.89 a
	Sandy soil	4.67	4.83	5.80	5.10 b	3.66	4.75	6.33	4.91 c
Mean		4.5 b	6.5 a	6.83 a	6.10 B	4.33c	5.71 b	7.67 a	5.90 B
Municipal wastewater effluent	Loamy soil	5.67	8.67	9.67	8.00 a	4.33	7.00	8.00	6.44 a
	Sandy soil	4.00	6.00	6.67	5.56 b	4.00	6.00	7.00	5.66 b
Mean		4.84 b	7.33a	8.17 a	6.78 A	4.17 c	6.50 a	7.50 a	6.05 A
Mean		4.45 c	6.61 b	7.33 a		4.28 c	5.85 b	7.39 a	

S.M.C =Soil moisture content
* Mean values in the same column within soil type followed by the same small litters are not significant at level of 5% probability.
* Mean values in the same column within water resources followed by the same capital litters are not significant at level of 5% probability.
* Mean values of different soil moisture content in the same raw followed by the same small litters are not significant at level of 5% probability.

pressure which consequently reduced cell enlargement and cell elongation **(Brouwer, 1963)** and **(Shehata, 1992).**

4.1.4 Number of leaves:

As shown in Table (37) it is evident that the average number of leaves increased significantly by irrigation seedlings with municipal wastewater and drainage as compared with Nile water. Seedlings irrigated with municipal wastewater effluent possessed the highest number of leaves in average to 6.78 followed by those irrigated with drainage water 6.10 while the lowest one 5.67 was observed in those irrigated with Nile water in the first season, also the results of second season elucidated that seedlings irrigated with municipal wastewater effluent Produced the highest value of 6.05 followed by drainage water which gave the mean value of 5.90 while those irrigated by Nile water produced the lowest one in average value of 5.61. The differences among the three used water resources were significant .

These results were supported by **Zekri and Koo , (1993)** on citrus trees, where both of them found that the municipal wastewater increased canopies of trees more than the trees irrigated with well water and **EL-Said, (1999)** found that trees of *citrus reticulata* irrigated by reclaimed wastewater had the largest canopies as compared with Nile water .

In this respect the effect of soil type on leaves number/plant, it can be noticed from Table (37) that the seedlings planted in loamy soil significantly surpassed in leaves number more than those planted in sandy soil. This fact revealed in the three water resources used in plants irrigation, moreover

4.1.3 Root length

The data presented in Table (36) obviously cleared that the irrigation with municipal wastewater effluent in the first season produced significantly the longest root with an average value of 26.51 cm compared to those irrigated with drainage which gave the shortest root with an average of 19.38 cm, whereas those irrigated with Nile water resulted the intermediate in average value of 24.34 cm. The differences between municipal and Nile water were insignificant .In the second season the results produced the same trend as those obtained from the first one approximately, meanwhile municipal wastewater effluent irrigation induced significantly the longest roots in average value of 28.71 cm followed by Nile water which gave the mean value of 25.52 cm .while drainage water irrigation produced the shortest roots in average value of 21.01 cm. The differences between municipal wastewater effluent and Nile water were not significant.

As for two different types of soil the data in the same table indicated that , in the first season, the two different used soils had pronounced effect on root length where the seedling grown in loamy soil and irrigated with municipal wastewater produced significantly the longest roots in average value of 30.15 cm compared to those of sandy soil that gave average value of 22.87 cm.The plants irrigated with either Nile or drainage water have taken the same trend since the mean values were 28.01,21.56 and 20.66, 17.20 cm under loamy and sandy soil respectively. The differences between two used soils were significant when the plants were irrigated with three different water resources.

wastewater effluent. In the second season the results were confirmed to those obtained from the first one where the highest average of stem diameter was 0.38 cm correlated with seedlings planted in loamy soil and irrigated with municipals waste water , while the lowest one was 0.25 cm in accompanied to those planted in sandy soil and irrigated with Nile water .The differences were significant

The previous results were in the same line of these obtained results by **Singh and Sharma(1984)** on *populus ciliata*, they found that stem diameter was greatest in loamy soil, **Radwan, (1999) and Shehata *et al* (2002)** on *Eucalyptus incana*.. They found that loamy soil increased stem diameter comparing with sandy soil.

In this regard the effect of different soil moisture content on stem diameter it can be concluded from Table(35)that the levels of 40,60 or 80% of field capacity significantly effected on stem diameter in which the averages were 0.25, 0.32 and 0.37 cm, respectively, in the first and second season nearly

The differences among the three levels of soil moisture were significant in two seasons.

The results were in accordance with findings of **Morales (1981)** on Arabic coffee who showed that the stem diameter were higher in 80% and 90% of field capacity more than at 60% or 70%, **Shehata, (1992)** on *Eucalyptus camaldulensis* cleared that high soil moisture content (80%) of field capacity caused an increased stem diameter compared to 40%.

Table (35)Effect of different water resources irrigation and soil moisture content on stem diameter (cm) of *Albizzia lebbeck* seedlings grown in different two soil types during 1998-1999 and 1999-2000 seasons.

season		1998-1999				1999-2000			
Water resources	Soil type / SMC	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	0.23	0.31	034	0.29 c	0.22	0.34	0.35	0.30 c
	Sandy soil	0.19	0.27	0.35	0.27 c	0.21	0.25	0.29	0.25 d
Mean		0.21 e	0.29 cd	0.35 ab	0.29 C	0.22 f	0.30 de	0.32de	0.28 C
Drainage water	Loamy soil	0.27	0.35	0.38	0.33 b	0.25	0.37	0.42	0.35 b
	Sandy soil	0.27	0.29	0.35	0.20 c	0.24	0.28	0.31	0.28 c
Mean		0.27 d	0.32 bc	0.37 a	0.31 B	0.25 f	0.33 cd	0.36 bc	0.31 B
Municipal wastewater effluent	Loamy soil	0.29	0.39	0.39	0.35 a	0.30	0.39	0.46	0.38 a
	Sandy soil	0.27	0.30	0.38	0.31 b	0.27	0.36	0.38	0.33 b
Mean		0.28 d	0.34 a	0.38 a	0.35 A	0.29 e	0.37 b	0.42 a	0.36 A
Mean		0.25 c	0.32 b	0.37 a		0.25c	0.33 b	0.37 a	

S.M.C =Soil moisture content
* Mean values in the same column within soil type followed by the same small litters are not significant at level of 5% probability.
* Mean values in the same column within water resources followed by the same capital litters are not significant at level of 5% probability.
* Mean values of different soil moisture content in the same raw followed by the same small litters are not significant at level of 5% probability.

The results agreed with those obtained by **Rokaia, (1990)** on *Ficus carica*, **Burman *et al.*(1991)** on *Azadirachta indica* and **Shehata , (1992)**on *cupressus sempervirens* where they cleared that high soil moisture 80%. of field capacity caused an increased seedling height comparing with 40%.

4.1.2. Stem diameter

Data presented in Table (35) showed that in the first season the irrigation with municipal wastewater effluent gave significantly the thickest stems in average value of 0.35 cm compared to those irrigated with Nile water where , the stem diameter was 0.29 cm , whereas drainage water resulted in the intermediate in average value of 0.31 cm. The differences among the three water resources were significant .

In the second season the results have been taken the same trend approximately. The thickest stems in average value of 0.36 cm due to municipal wastewater followed by drainage water which gave the mean value of 0.31 cm while Nile water irrigation produced the thinnest stem in average value of 0.28, also the differences among water resources were significant.

The former results were similarly to those reported by **Hopmanes *et al.*(1990)** on *Eucalyptus grandis* and *E . saligna* and **Hassan *et al* .(1997)**on *Acacia saligna* seedlings irrigated with sewage water where they found that stem diameter increased compared with control.

Concerning the effect of two different used soils indicated that loamy soil induced in the first season significantly the thickest stem diameter more than those of sandy soil when seedlings were irrigated with Nile , drainage or municipal

All of those researchers confirmed that the using of municipal wastewater effluent and drainage water caused the increase of seedling height.

Regarding the effects of two different types of soil, the data in the same table and Fig.(9,10) indicated that loamy soil induced significantly the superior seedling more than those of sandy soil when seedlings were irrigated with municipal, drainage and Nile water. Generally the loamy soil was the best.

In the second season the results tended to a similar trend as those obtained from the first season .

The results were in harmony with findings of **Mohamed, (1993)**on *Adhatoda Vasica,*_.He reported that the mixture of 1:1 had an effect on increasing plant height, **Radwan, (1999)**,on *Eucalyptus incana*,and **Shehata, (2002)** on *Eucalyptus sp.* They mentioned that 1:1 v/v mixture of sandy: clay loam soil was good media for the seedling height.

As for the effects of soil moisture on seedling height the data in Table(34) and Fig.(9,10) demonstrated that the seedling height significantly increased at 60 or 80% soil moisture content compared with those of 40%.

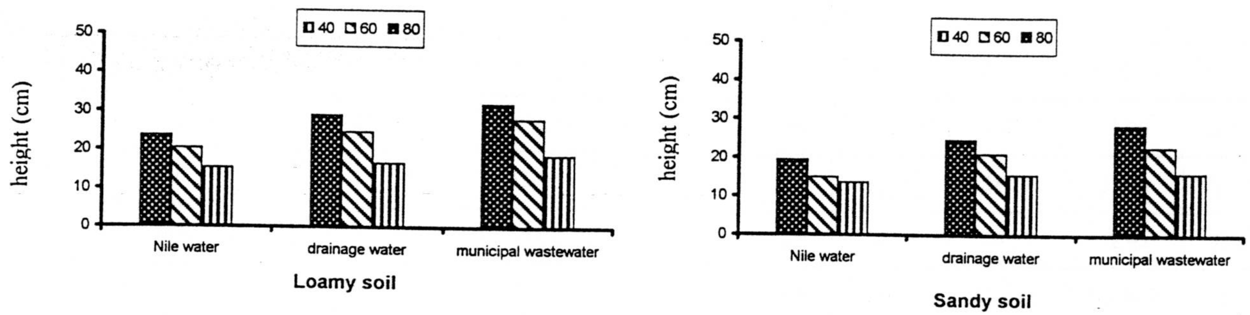
The average value of seedling height were 26.17,21.95 and 16.60 cm under 80,60 and 40% soil moisture content respectively, in the first season while they were 30.61,26.44 and 19.83 cm in the second one.

The reduction in height growth was 36.57 and under 40% and soil moisture content compared to 80% soil moisture in the first season ,while it was 35.22 in the second one.

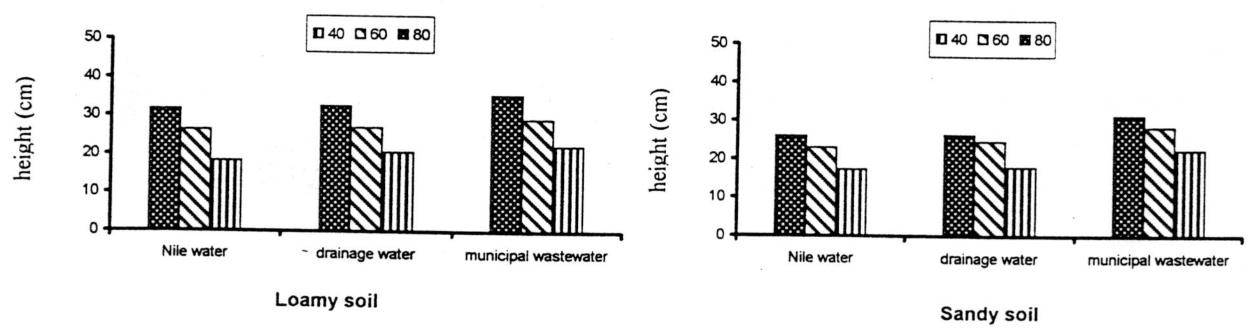
Photo (4) Effect of different water resources on seedling height of *Albizzia lebbeck* planted in loamy soil and irrigated at level of 80 % soil moisture content .

A1 = Nile water.
A2 = Drainage water.
A3 = Municipal waste water.
B1 = Loamy soil.
B2 = Sandy soil.
C1 = 40 % of field capacity.
C2 = 60 % of field capacity.
C3 = 80 % of field capacity.

Photo(5) Effect of different water resources on seedling height of *Albizzia labback* planted in sandy soil and irrigated at level of 80% soil moisture content.



Fig(9) Effect of different water resources irrigation and soil moisture content on seedling height(cm) of *Albizzia a lebbeck* seedlings grown in loamy and sandy soil during 1998-1999 season.



Fig(10) Effect of different water resources irrigation and soil moisture content on seedling height(cm) of *Albizzia lebbeck* seedlings grown in loamy and sandy soil during 1999-2000 season .

Table (34)Effect of different water resources irrigation and soil moisture content on seedling height (cm) of *Albizzia lebbeck* seedlings grown in different two soil types during 1998-1999 and 1999-2000 seasons.

season		1998-1999				1999-2000			
Water resources	Soil type / SMC	40%	60%	80%	Mean	40%	60%	80%	Mean
Nile water	Loamy soil	15.33	20.33	23.67	19.78 b	18.33	26.33	31.67	25.44 b
	Sandy soil	13.67	15.01	19.33	16.00 c	17.33	23.00	26.00	22.11 c
Mean		14.50 c	17.67b	21.50 ab	17.89 C	17.83 e	24.67 cd	28.83 b	23.78 C
Drainage water	Loamy soil	16.67	24.67	29.00	23.45 a	20.67	27.00	32.67	26.78 b
	Sandy soil	15.67	21.00	24.67	20.45 b	18.00	24.67	26.33	23.00 c
Mean		16.17c	22.84	26.84 b	21.95 B	19.33e	25.83 c	29.50 b	25.00 B
Municipal wastewater effluent	Loamy soil	18.67	28.00	32.00	26.22 a	22.33	29.33	35.67	29.11 a
	Sandy soil	16.00	22.67	28.33	22.33 b	22.33	28.33	31.33	27.33 b
Mean		17.34 c	25.33 a	30.17 a	24.28 A	22.33 d	28.83 b	33.50	28.22 A
Mean		16.60 c	21.95 b	26.17 a		19.83 c	26.44 b	30.61 a	

S.M.C =Soil moisture content

* Mean values in the same column within soil type followed by the same small litters are not significant at level of 5% probability.
* Mean values in the same column within water resources followed by the same capital litters are not significant at level of 5% probability.
* Mean values of different soil moisture content in the same raw followed by the same small litters are not significant at level of 5% probability.

Second Experiment

4- Effect of different water resources irrigation, two types of soils and different soil moisture content on *Albizzia lebbeck* seedlings:

4-1- Vegetative growth:

4-1-1 Seedling height:

The data presented in Table (34) and Fig.(9,10) show the effect of different water resources irrigation on seedling height during two seasons.

In this respect the highest significant values of such data were obtained from *Albizzia lebbeck* seedlings irrigated with municipal wastewater effluent (24.28 cm)followed by those irrigated with drainage water (21.95 cm).On the other hand the lowest increasing value was obtained from seedlings irrigated with Nile water (17.89 cm) in the first season. while seedling height declined, from (28.22 cm)when the seedlings irrigated with municipal wastewater to (25.00 cm) in seedlings treated with drainage water whereas by plants irrigated with Nile water gave the shortest length (23.78 cm) in the second season .

The height growth increment in 35.72% and 22.70% in the seedlings irrigated with municipal wastewater effluent and drainage water over to those irrigated with Nile water in the first season, while these increases were 18.70% and 5.13% in the second season, respectively .

The herein obtained results were compared by those of **Zekri and Koo (1993)** on citrus tree, **Hassan *et al.*(1997)** on *Acacia saligna* and *Leucaena Leucaena* **and EL-Said,(1999)**.

.The results were emphasized for that obtained in the second season regardless the effect of different water resources and soil types

These results were in harmony with those obtained by **EL-Nashar, (1985)** on Navel orange, **EL-Ashry *et al* (1998)**on strelitzia plants all of them reported that uptake of the nutrent element and some heavy metals i.e Cu ,Cd, Ni, Co and pb increased with increasing soil moisture content.

4.4.6.3 <u>Copper and cobalt :</u>

As for copper (cu) and cobalt (Co) content it tissues of plants i.e roots, stems and laves were found as traces specially in the roots accompanied with municipal wastewater irrigation .

respectively, it is evident the ability of the trees as a filtrates to lead ion from soil irrigated with municipal wastewater at least under these study .

The herein obtained results were confirmed by those of **Abd EL-Sabour, *et al.* (1995)** on lemon and Mandarin trees , **Hassan *et al.* 1997)**,on *leucaena leucocephala* and **EL-Said, (1999)** on citurs trees. All of them stated that ,the concentrations of Zn, Mn, Fe and pb tended to increase in shoots and leaves by using sewage water irrigation compared with Nile water.

Regarding the effect of two types of soil it can be noticed from Table (30,31)that leadoff leaves ,stems and roots increased in loamy soil more than sandy soil in the seedling irrigated with Nile ,drainage and municipal wastewater in the first and second season although the increment of pb in loamy and sandy soil there is no problems were observed on seedlings during the study, **Abd EL-Naim and EL-Awady(1989)**on citrus trees. studied the effect of irrigation with sewage water during the three years of study on heavy metals content in sandy soil and plants .They found that, the concentration of elements (Zn, Cu Mn, Cd Ni ,Fe and pb) in sandy soil and plants ,were not toxic ,no nutritive or morphological problems were observed on the plants during the study .

As for the effect of different soil moisture content it can be concluded from Tables(32,33) that the values of lead (pb) of leaves, stems and roots content were the highest in the seedlings irrigated at levels of 80% soil moisture content followed by that of 60% while 40% soil moisture content resulted in the least one and slightly transported to the shoots of seedlings that irrigated with drainage or municipal wastewater.

In this respect, the two soil types affected the content of Fe in leaves ,stems and roots where seedlings planted in loamy soil performed the high level of Fe more than sandy soil, this fact reveled with the three different water resources.

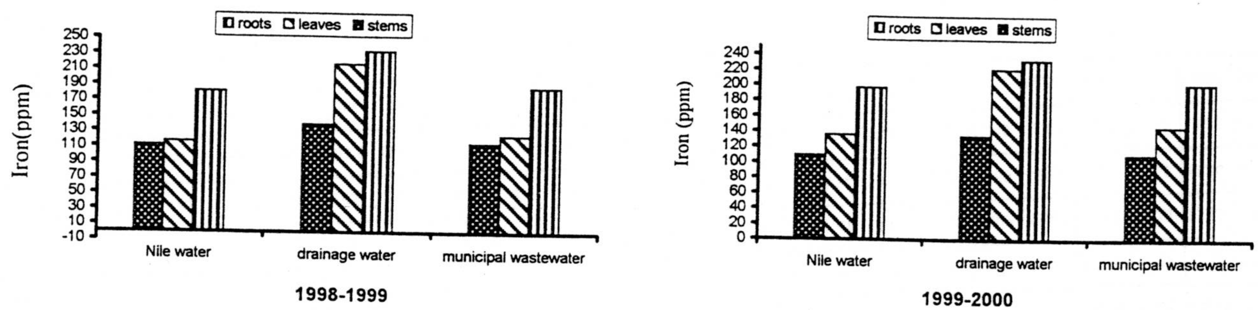
As for the effect of different soil moisture content, it can be noticed from Tables (32,33)that in the first season, the values of Fe^{++} leaves stems and roots content were the highest in seedlings irrigated at level of 80% soil moisture followed by that of 60% while 40% resulted in the least one .In the second season the results have taken the same line of those obtained from first one.

Regarding the ion of lead (pb),data presented in the same Tables (32,33)showed that in the first season, lead(pp) in leaves increased in the seedlings irrigated with municipal or drainage water more than that of Nile water where the mean values were 8.25,7.26 and 6.59 in the seedlings irrigated with municipal wastewater ,drainage water and Nile water respectively .

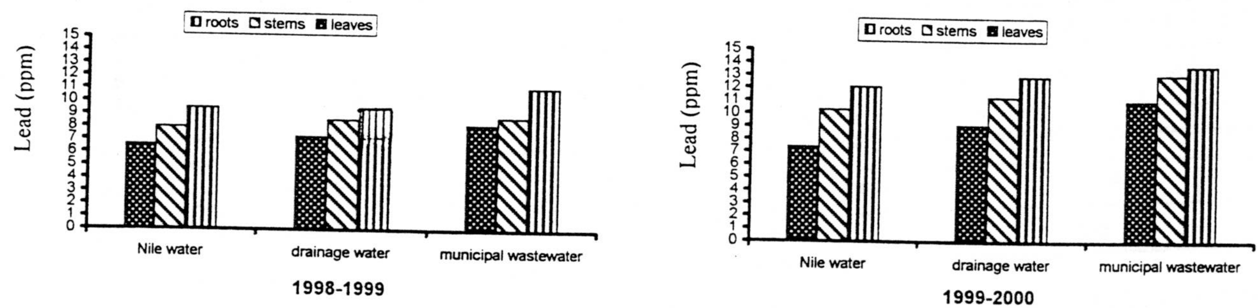
The values different in second season, in they were 7.39. 9.11 and 11.00 ppm in the seedlings irrigated with Nile ,drainage and municipal wastewater consequently.

Results of pb in stems and roots content were in parallel to those obtained from leaves pb content in both season.

From a forementioned results ,it can be observed that the values of roots pb content were the highest values of pb followed by stems while the leaves pb content recorded the lowest one in seedlings irrigated by municipal ,drainage or Nile water



Fig(7) Effect of different water resources irrigation on Iron(ppm) content in plant organs of *Cupressus sempervirens* seedlings during 1998-1999 and 1999-2000 seasons.



Fig(8) Effect of different water resources irrigation on Lead (ppm) content in plant organs of *Cupressus sempervirens* seedlings during 1998-1999 and 1999-2000 seasons.

Table (33) Effect of different water resources irrigation and soil moisture content on Iron and Lead content (ppm) in plant portions of *Cupressus sempervirens* seedlings grown in two soil types during 1999-2000 season

		Fe												Pb											
		Leaves				Stems				Roots				Leaves				Stems				Roots			
Water resources	Soil type / S.M.C	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean
Nile water	Loamy soil	130	152	163	148.3	88	109	115	104	190	205	220	205	7.01	7.44	7.89	7.45	10.11	10.38	10.76	10.42	12.18	13.01	13.40	12.86
	Sandy soil	113	121	135	123	100	118	127	115	185	190	191	188.7	7.00	7.19	7.80	7.33	10.00	10.14	10.35	10.16	11.05	11.17	11.75	11.32
mean		121.5	136.5	149	135.7	94	113.5	121	109.5	187.5	197.5	205.5	196.9	7.00	7.32	7.85	7.39	10.06	10.26	10.56	10.29	11.62	12.09	12.58	12.09
Drainage water	Loamy soil	209	225	353	262.3	123	130	151	134.7	230	250	273	251	9.11	9.71	9.93	9.85	11.12	11.27	11.48	11.29	13.17	13.60	13.74	13.50
	Sandy soil	170	177	193	180	120	133	150	134.3	207	210	230	215.7	8.15	8.40	9.37	8.64	11.01	11.13	11.70	11.28	12.15	12.36	12.55	12.35
mean		189.5	201	273	221.2	121.5	131.5	150.5	134.5	218.5	230	251.5	233.4	8.63	9.06	9.65	9.11	11.07	11.20	11.59	11.29	12.66	12.98	13.15	12.93
Municipal wastewater effluent	Loamy soil	141	160	169	156.7	100	112	120	110.7	195	210	243	216	11.17	11.41	11.82	11.47	13.09	13.44	13.61	13.38	13.80	13.91	14.40	14.04
	Sandy soil	119	141	148	136	105	117	111	111	180	186	197	188	10.17	10.52	10.91	10.53	12.50	12.62	12.93	12.68	12.90	13.11	14.09	13.37
mean		130	150.5	158.5	146.4	102.5	114.5	115.5	110.9	187.5	198	220	201.9	10.67	10.97	11.37	11.00	12.80	13.03	13.27	13.03	13.35	13.51	14.25	13.71
Mean		147	162.7	193.5		106	119.8	129		197.8	208.5	225.7		8.77	9.12	9.62		11.31	11.50	11.81		12.54	12.86	13.33	

S.M.C = Soil moisture content

Table (32) Effect of different water resources irrigation and soil moisture content on Iron and Lead content (ppm) in plant portions of *Cupressus sempervirens* seedlings grown in two soil types during 1998-1999 season

		Fe												Pb											
		Leaves				Stems				Roots				Leaves				Stems				Roots			
Water resources	Soil type / S.M.C	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean
Nile water	Loamy soil	115	127	130	124	100	117	133	116.6	180	193	195	189.3	6.16	6.88	7.14	6.73	8.15	8.70	8.75	8.53	9.12	9.67	10.11	9.63
	Sandy soil	100	109	119	109.3	90	112	117	106.3	170	175	175	173.3	6.01	6.41	6.93	6.45	7.11	7.40	7.71	7.41	9.08	9.15	9.83	9.35
mean		107.5	118	124.5	116.6	95	114.5	125	111.5	175	184	185	181.3	6.09	6.65	7.04	6.59	7.63	8.05	8.23	7.97	9.10	9.41	9.97	9.49
Drainage water	Loamy soil	203	153	250	229.3	130	155	160	148.3	250	270	275	265	7.15	7.70	7.83	7.56	9.15	9.17	9.73	9.35	9.83	10.11	10.52	10.2
	Sandy soil	190	208	215	204.3	105	130	153	129.3	195	200	210	201.7	6.82	6.91	7.14	6.96	7.40	8.03	8.17	7.87	8.66	7.70	8.21	8.19
mean		196.5	221.5	232.2	216.8	117.5	142.5	156.5	138.8	222.5	235	242.5	233.4	6.99	7.31	7.49	7.26	8.28	8.60	8.95	8.61	9.25	8.91	9.37	9.17
Municipal wastewater effluent	Loamy soil	121	133	144	132.7	110	120	128	119.3	185	190	210	195	8.10	8.63	8.91	8.55	9.19	9.63	9.90	9.57	11.13	11.35	11.60	11.36
	Sandy soil	117	115	123	118.3	100	110	125	111.7	177	181	183	180	7.83	7.94	8.08	7.95	7.85	8.12	8.30	8.09	10.61	11.00	11.22	10.9
mean		119	124	133.5	125.5	105	115	126.5	115.5	181	185	196.5	187.5	7.97	8.29	8.50	8.25	8.52	8.88	9.10	8.83	10.87	11.18	11.41	11.6
Mean		141	154.5	163.5		105.8	124	136		192.8	201.1	208		7.02	7.42	7.68		8.14	8.51	8.76		9.74	9.83	10.75	

S.M.C = Soil moisture content

The values of Mn in whole plant have taken the same trend as those obtained from the values of Zn in both season.

These obtained results were in parallel with those obtained by **EL-Nashar,(1985)**on Navel orange trees who found that Mn and Zn tended to accumulate with different degrees in leaves of orange with the prolonged sewage water utilization, and **EL-Ashry *et al.*(1998)**on stirilitzia plants , reported that uptake of the nutrient elements increased with increasing soil moisture content .

4.4.6.2. Iron and leade :

The data presented in Tables (32,33) and Fig.(7,8) obviously cleared that in the first season ,Iron (Fe) in leaves severely exceeded in the seedlings irrigated with drainage water more than that of municipal or Nile water .The mean values of Fe were 216.80,12.5 and 116.70 ppm in the seedlings irrigated with drainage ,municipal and Nile water respectively .In the second season, the results declared the same line approximately ,meanwhile the values of leaves Fe^{++} content were different where they were 221.2,146.40 and 135.70 ppm in the seedlings irrigated with drainage ,municipal or Nile water consequently .

Results of Iron (Fe) in stems and roots content have taken the similar trend as those obtained from leaves, Fe content in both seasons.

Also ,it can be observed that the roots , Fe content had an excessive values followed by leaves then the stems gave the minimum values in the seedlings irrigated with different water resources ,meaning the iron of Fe^{++} was concentrated in roots

The previous results were in harmony with the findings of **EL-Gazzar,(1996)** on cotton ,**Hassan *et al.* (1997)** on *Acacia saligina* and **Selem *et al.* (2000)** on citrus trees. All of them stated that using sewage water effluent caused the increase of micro elements viz, Fe, Ma, Zn and Pb in plants compared to Nile water .

Regarding the effect of two kind of soils it can be observed from Tables (28,29) that Zinc and manganese leaves, stems and roots content increased in loamy soil more than sandy soil in seedlings irrigated with different water resources.

It is worthily noticeable that the seedlings cultivated in sandy soil and irrigated with municipal waste water resulted an increases in the content of both Zn and Mn in leaves ,stems and roots more than those planted in loamy soil but irrigated with Nile water ,this fact exhibited that using municipal wastewater in irrigation ameliorated the properties and increased some microelements i.e Zn and Mn in sandy soil in both seasons.

As for the effect of soil moisture content on leaves, stems and roots Zinc and Mnganese content ,the results pointed that Zn and Mn in all plant portions increased as a result to excessive soil moisture content in both seasons. In the first season the highest values of Zinc in leaves ,stems and roots were 18.36,37.12 and 32.17 ppm at 80% soil moisture content while the lowest values were 13.82,28.25 and 24.08 at 40% while the level of 60% soil moisture induced the intermediate (16.77,36.31 and 29.16 ppm)in leaves ,stems and roots regardless the effect of different water resources and soil types .

In the second season , the results have taken the same trend, meanwhile the values of Zn and Mn were different they were 13.71,15.32 and 15.98 ppm for Zn and 53.62,57.44 and 59.72 for Mn in the seedlings irrigated with Nile ,drainage and municipal wastewater , respectively

Regarding Zn and Mn ppm content in stems of seedlings increased markedly with irrigation with municipal wastewater since the value attained the maximum 38.45 ppm for Zn and 60.71 ppm for Mn while that irrigated with drainage water recorded the medium values of 34.52 and 49.37 ppm for Zn and Mn, respectively .Then the stem of seedlings irrigated with Nile water had the last value of 28.71 ppm for Zn and 42.22 for Mn in the first season. The values of second season were 29.95 ,34.61 and 36.81 ppm for Zn 59.43,68.30 and 71.32 ppm for Mn in the seedlings irrigated with Nile, drainage and municipal wastewater consequently .

Results of Zn and Mn in roots content tended to take the same line of those results obtained from Zn and Mn content in stems in both seasons nearly .

From the former results it can be noticed that the stems Zn content have the maximum values followed by the roots then the leaves recorded the minimum values in the seedlings irrigated with the three water resources ,it is evident that Zn content concentrated much more in the stems than leaves and roots while conversely roots Mn content had the maximum values and leaves had the minimum values whereas the stems were induced the intermediate in the seedlings irrigated with Nile ,drainage or municipal water .

Table (56) Effect of different water resources irrigation and soil moisture content on Calcium and Sodium (% of dry weight) in plant portions of *Albizzia lebbeck* seedlings grown in two soil types during 1999-2000 season .

		Ca												Na											
		Leaves				Stems				Roots				Leaves				Stems				Roots			
Water resources	Soil type / S.M.C	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean
Nile water	Loamy soil	0.38	0.76	0.87	0.67	0.30	0.32	0.55	0.39	0.66	0.59	0.52	0.59	0.16	0.20	0.20	0.19	0.13	0.16	0.15	0.14	0.26	0.21	0.25	0.24
	Sandy soil	0.41	0.69	0.58	0.56	0.28	0.31	0.36	0.31	0.58	0.54	0.46	0.53	0.15	0.17	0.18	0.16	0.13	0.12	0.12	0.12	0.25	0.22	0.22	0.23
mean		0.40	0.73	0.73	0.62	0.29	0.32	0.46	0.35	0.62	0.57	0.49	0.56	0.16	0.19	0.19	0.17	0.13	0.14	0.14	0.13	0.26	0.22	0.24	0.24
Drainage water	Loamy soil	0.57	0.73	0.97	0.75	0.35	0.46	0.57	0.46	1.00	0.59	0.46	0.68	0.24	0.28	0.34	0.28	0.19	0.15	0.16	0.16	0.24	0.23	0.29	0.25
	Sandy soil	0.50	0.96	0.86	0.68	0.30	0.42	0.51	0.41	0.93	0.54	0.41	0.62	0.19	0.20	0.22	0.20	0.12	0.14	0.13	0.14	0.28	0.26	0.23	0.26
mean		0.54	0.71	0.92	0.72	0.33	0.44	0.54	0.43	0.97	0.57	0.44	0.65	0.22	0.24	0.28	0.24	0.16	0.15	0.15	0.15	0.26	0.25	0.26	0.25
Municipal wastewater effluent	Loamy soil	0.45	0.79	0.93	0.72	0.39	0.38	0.37	0.38	1.01	0.81	0.70	0.84	0.14	0.15	0.28	0.19	0.13	0.14	0.27	0.18	0.27	0.28	0.24	0.26
	Sandy soil	0.44	0.74	0.85	0.69	0.37	0.35	0.35	0.35	0.97	0.80	0.54	0.77	0.20	0.14	0.16	0.17	0.10	0.14	0.11	0.11	0.26	0.27	0.23	0.25
mean		0.45	0.77	0.90	0.71	0.38	0.37	0.36	0.37	0.99	0.81	0.62	0.81	0.17	0.15	0.22	0.18	0.12	0.14	0.19	0.14	0.27	0.28	0.24	0.26
Mean		0.46	0.73	0.85		0.33	0.37	0.45		0.86	0.65	0.52		0.18	0.19	0.23		0.14	0.14	0.16		0.26	0.25	0.24	

S.M.C = Soil moisture content

while 40% soil moisture content resulted in the least one. Conversely, roots Ca and Na percentage had the adverse effect in both seasons.

These results were in agreement with the findings of **Farahat, (1990)** on Myoporum, who found that long irrigation intervals decreased N, Na and Ca in the leaves and branches but increased them in roots .

4.4.6 Some micro and heavy metals(ppm) in leaves , stems and roots :

4.4.6.1 Zinc and Manganes :

The data present in Table(57, 58) and Fig.(15,16)shows the effect of different water resources and soil moisture content on Zinc (Zn)and Manganese (Mn) in plant portions of *Albizzia lebbeck* seedlings grown in two soil types .

In the first season, the results indicated that leaves (Zn) and (Mn) content increased in seedlings irrigated with municipal or drainage water more than that of Nile water, the values of Zn ppm obtained from drainage water more similar to those of municipal wastewater nearly in which the mean values were 22.84 and 19.90 ppm while the mean value was 16.32 ppm in leaves of seedlings irrigated with Nile water, whereas the mean value of Mn were 71.98,66.48 and 58.91 ppm in seedlings irrigated with municipal ,drainage and Nile water, respectively.

In the second season, the results have taken the same trend ,meanwhile the values of Zn and Mn were different they were 29.58,24.84 and 20.72 ppm for Zn and 80.55,74.28 and 62.11 for Mn in the seedlings irrigated with municipal, drainage and Nile water consequently.

Table (57) **Effect of different water resources irrigation and soil moisture content on Zinc and Manganese(ppm) in plant portions of *Albizzia lebbeck* seedlings grown in two soil types during 1998-1999 season .**

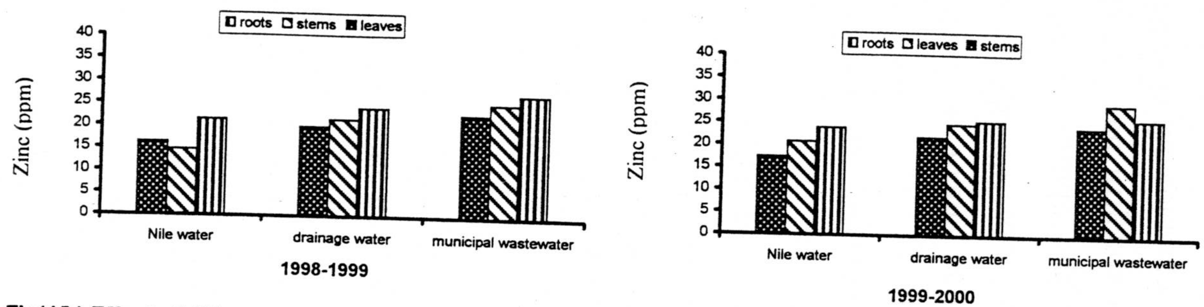
		Zn												Mn											
		Leaves				Stems				Roots				Leaves				Stems				Roots			
Water resources	Soil type / S.M.C	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean
Nile water	Loamy soil	15.10	17.80	20.01	17.64	16.30	14.15	17.33	15.93	18.03	24.70	27.19	23.21	56.70	61.72	63.30	60.57	45.43	47.39	43.46	45.40	113.2	113.1	85.21	103.8
	Sandy soil	13.10	15.17	16.77	15.01	11.60	13.31	15.45	13.45	17.01	20.61	21.18	19.60	50.89	60.13	60.73	57.25	45.31	42.47	41.93	43.24	111.2	138.1	120.4	123.2
mean		14.10	16.49	18.39	16.32	13.95	13.73	16.33	14.69	17.52	22.66	24.19	21.45	53.80	60.93	62.02	58.91	45.33	44.93	42.70	44.32	112.2	125.6	102.8	113.5
Drainage water	Loamy soil	18.60	23.73	23.92	22.08	20.44	23.40	25.14	22.99	20.00	26.07	31.03	25.70	61.76	68.33	76.17	68.74	4.51	46.70	63.27	50.16	145.7	138.6	6.2	140.2
	Sandy soil	15.11	18.18	19.87	17.72	16.12	21.55	22.44	20.04	21.93	23.17	27.13	22.41	56.15	67.41	69.12	64.23	35.77	40.93	50.70	42.47	101.1	183.1	160.1	148.1
mean		16.86	20.96	21.90	19.90	18.28	22.48	23.79	21.51	18.47	24.62	29.08	24.06	58.93	67.87	72.64	66.48	38.14	43.82	46.99	46.31	123.2	160.9	148.1	144.1
Municipal wastewater effluent	Loamy soil	23.30	26.17	31.58	27.02	23.13	26.53	31.60	27.09	27.00	28.00	23.00	29.33	61.70	78.50	85.46	75.22	50.00	58.31	48.43	52.22	151.4	168.3	138.2	152.6
	Sandy soil	16.15	16.70	23.12	18.66	20.61	24.01	26.23	23.62	14.81	25.81	25.82	25.48	58.44	71.60	76.18	68.74	46.70	50.35	45.18	47.41	135.2	178.1	100.2	137.8
mean		19.72	23.14	27.35	22.84	21.87	25.27	28.92	25.35	25.91	26.91	29.41	27.41	60.07	75.05	80.82	71.98	48.35	54.33	46.76	49.82	143.3	173.0	119.2	145.2
Mean		16.89	19.63	22.55		18.03	20.49	23.03		20.63	24.73	27.56		57.60	67.95	71.82		43.94	47.70	48.82		126.2	153.2	123.4	

S.M.C = Soil moisture content

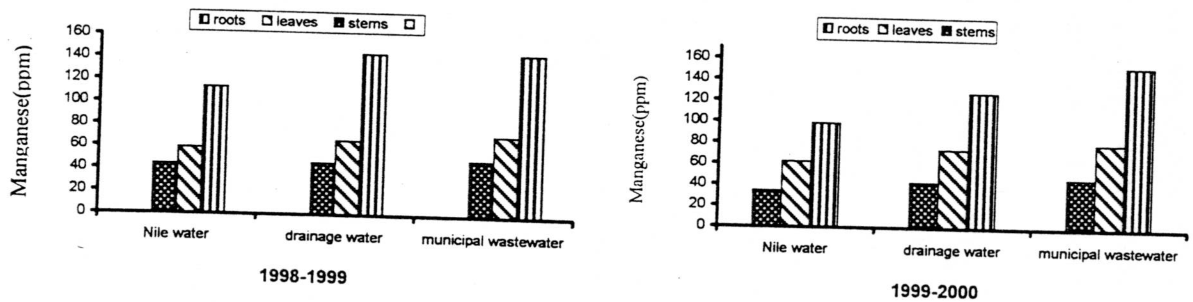
Table (58) Effect of different water resources irrigation and soil moisture content on Zink and Manganese(ppm) in plant portions of *Albizzia lebbeck* seedlings grown in two soil types during 1999-2000 season .

		Zn												Mn											
		Leaves				Stems				Roots				Leaves				Stems				Roots			
Water resources	Soil type / S.M.C	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean
Nile water	Loamy soil	20.01	24.10	25.13	23.08	18.32	19.17	20.35	19.28	22.04	25.23	33.17	26.81	60.17	66.61	71.60	66.13	35.00	28.33	35.93	33.09	100.0	122.1	97.70	106.6
	Sandy soil	15.17	18.70	21.18	18.35	13.62	15.33	17.47	15.47	18.11	20.70	24.33	21.05	53.14	58.27	62.86	58.10	26.92	38.18	41.60	35.57	86.85	117.8	66.81	90.50
mean		17.59	21.40	23.16	20.72	15.97	17.25	18.91	17.38	20.08	22.96	28.75	23.93	56.67	62.44	67.23	62.11	30.96	33.26	38.77	34.33	93.43	119.1	82.28	98.55
Drainage water	Loamy soil	19.63	30.16	36.03	28.61	21.45	24.44	27.18	24.36	30.70	22.33	24.77	25.93	68.92	75.45	84.29	76.22	41.15	53.30	48.71	47.72	135.0	157.1	118.4	136.8
	Sandy soil	17.40	21.66	24.19	21.08	15.11	20.70	22.63	19.48	25.15	24.70	25.43	25.09	64.27	75.52	77.24	72.34	33.30	38.90	43.14	38.4	115.8	145.6	97.10	119.5
mean		18.92	25.91	30.11	24.84	18.28	22.53	24.91	21.92	27.93	23.52	25.10	25.51	66.60	75.49	80.77	74.28	37.23	46.10	45.93	43.08	125.4	151.4	107.7	128.2
Municipal wastewater effluent	Loamy soil	24.63	34.19	41.40	33.41	26.15	29.18	32.53	29.29	23.30	30.08	34.09	29.16	70.71	87.62	94.58	84.30	40.60	50.43	55.61	48.43	146.7	148.3	170.0	155.0
	Sandy soil	22.60	25.19	29.48	25.76	15.12	19.24	23.40	19.25	23.36	24.90	28.15	24.80	66.56	79.72	84.20	76.81	38.60	43.51	56.72	46.28	138.2	155.0	165.9	152.8
mean		23.62	29.69	35.44	29.58	20.64	24.21	27.97	24.27	22.33	27.49	31.12	26.98	68.61	83.67	89.39	80.55	39.61	96.97	55.94	47.51	142.4	151.6	167.6	153.9
Mean		19.91	25.067	29.57		18.30	21.34	23.93		23.44	24.66	28.32		63.96	73.87	79.13		35.93	42.11	46.88		120.4	141.0	119.2	

S.M.C = Soil moisture content



Fig(15) Effect of different water resources irrigation on Zinc(ppm) content in plant organs of *Albizia lebbeck* seedlings during 1998-1999 and 1999-2000 seasons.



Fig(16) Effect of different water resources irrigation on manganese (ppm) content in plant organs of *Albizia lebbeck* seedlings during 1998-1999 and 1999-2000 seasons.

In this respect Zn and Mn ppm content in stems and roots of seedlings exceeded with irrigation by municipal wastewater while that irrigated by drainage water recorded the medium values then the seedlings irrigated with Nile water had the last values in both seasons.

From the former results it can be noticed that the roots Zn and Mn content more than leaves or stems in the seedlings values of irrigated with three water resources in the first season but in the second season conversely leaves Zn content had the maximum value and stems had the minimum values whereas the roots were induced the intermediate in the seedlings irrigated with municipal wastewater .

The previous results were in harmony with the findings of **EL-Gazzar ,(1996)** on cotton, **Hassan *et al.* 1997)** on *Acacia saligina* and **Selem *et al.*(2000)**on citrus trees. All of them stated that, using sewage water effluent caused the increase of micro elements viz Fe, Mn ,Zn and pb in plants compared to Nile water.

Regarding the effect of two used soil it can be observed from Tables (57 , 58) that Zn and Mn leaves ,stems and roots increased in loamy soil more than sandy soil in seedlings irrigated with different water resources .

It is worthily noticeable that the seedlings cultivated in sandy soil and irrigated with municipal wastewater resulted an increases in the content of both Zn and Mn in leaves, stems and roots more than those planted in loamy soil but irrigated with Nile water ,this fact exhibited that using municipal wastewater in irrigation changed the properties and increased some micro elements i.e Mn, Zn in sandy soil in the first season. In the second season the results recorded a similar to those obtained from first one approximately.

The obtained results were in parallel with those obtained by **Abd EL-Aal *et al* .(1991)** and **Abu–Seeda *et al* (1992).**All of them reported that, using of sewage water irrigation in sandy soil increased micronutrients (Zn, Mn, Fe and Cu) compared to fresh water .

As for the effect of soil moisture content on leaves ,stems and roots Zn content, the results pointed that Zn in all plant portions increased as a result to excessive soil moisture content in both seasons. In the first season the highest value of Zn in leaves ,stems and roots were 22.55,23.03 and 27.56 ppm at 80% soil moisture content while the lowest values were 16.89,18.03 and 20.63 ppm at 40% then the level of 60% soil moisture content was the intermediate (19.63,20.49 and 24.73 ppm) regardless the effect of different water resources and soil types.

Leaves, stems Mn content have taken the same trend of those obtained from the values of Zn in the first and second seasons, but the highest values of Mn in roots were 153.20 and 141.00 ppm at 60% soil moisture while the lowest values were 123.40 and 119.20 ppm at 80% in both season respectively.

The former results were in accordance with **EL-Nashar, (1985)** on Navel orange trees who found that Mn and Zn tended to accumulate with different degrees in leaves of orange with prolonged sewage water utilization and **EL-Ashry *et al.*(1998)** on strelitizia plants, they found that uptake of the nutrient elements increased with increasing soil moisture content.

4.4.6.2 Iron and lead

The results presented in Tables (59 , 60) and Fig.(17,18) indicated that in the first season leaves Iron (Fe^{++}) content increased to the maximum value in the seedlings irrigated with drainage water more than that of municipal or Nile water where the mean values of Fe^{++} 175.8 ppm while mean values were 161.5 and 116.8 ppm in seedlings irrigated with municipal and Nile water consequently.

In the second season the results declared the same line nearly, meanwhile the values of leaves Fe^{++} content were different where they were 103.9, 175.7 and 129.9 ppm in the seedlings irrigated with Nile ,drainage and municipal wastewater respectively.

Also, stems and roots Fe^{++} content of seedlings increased to maximum value with irrigation by drainage water while that irrigated by municipal wastewater recorded the medium values then Nile water had the last one in both season.

While leaves lead (pb) content exceeded in seedlings irrigated with municipal wastewater more than drainage or Nile water ,the values of Pb were 7.00 , 5.11 and 3.39 ppm when seedlings irrigated with municipal ,drainage and Nile water in the first season respectively.

In the second season the results recorded the similar trend of those obtained from the first one approximately.

Table (59) Effect of different water resources irrigation and soil moisture content on Iron and lead(ppm) in plant portions of *Albizzia lebbeck* seedlings grown in two soil types during 1998-1999 season .

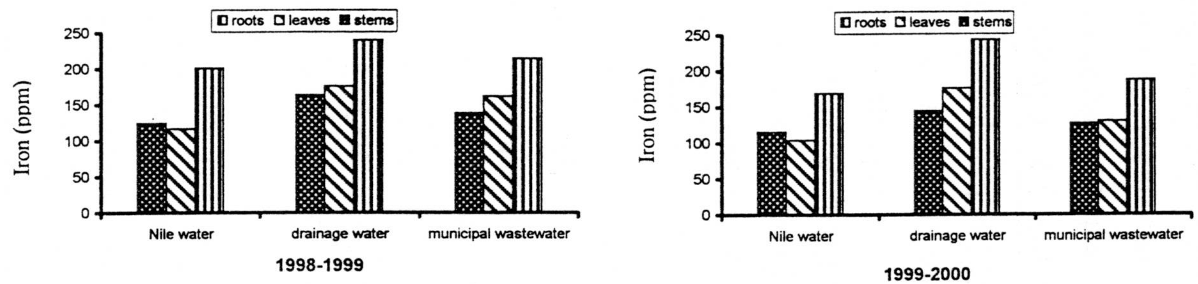
		Fe												Pb											
		Leaves				Stems				Roots				Leaves				Stems				Roots			
Water resources	Soil type / S.M.C	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean
Nile water	Loamy soil	100.0	137.0	140.0	125.7	110.0	135.0	151.0	132.0	195.0	200.0	230.0	208.3	3.01	3.44	3.89	3.45	6.11	6.38	6.76	6.42	6.18	7.01	7.40	6.86
	Sandy soil	90.0	109.0	125.0	108.0	100.0	119.0	132.0	117.0	187.0	193.0	200.0	193.3	3.00	3.19	3.80	3.33	6.00	6.44	6.35	6.16	5.05	5.17	5.75	5.32
mean		95.00	123.0	132.5	116.8	105.0	127.0	141.5	124.5	191.0	196.5	215.0	200.8	3.00	3.32	3.85	3.39	6.06	6.26	6.16	6.29	5.62	6.09	6.58	6.09
Drainage water	Loamy soil	177.0	159.0	197.0	189.7	157.0	185.0	197.0	179.7	245.0	256.0	263.0	254.7	5.11	5.71	5.93	5.58	7.12	7.27	7.48	7.29	7.17	7.60	7.74	7.50
	Sandy soil	140.0	163.0	183.0	162.0	129.0	154.0	159.0	147.3	200.0	225.0	248.0	224.3	4.15	4.40	5.37	4.64	7.01	7.13	7.70	7.28	6.15	6.36	6.55	6.35
mean		158.5	179.0	190.0	175.8	143.0	169.5	178.0	163.5	22.50	240.5	255.5	239.5	4.63	5.05	5.65	5.11	7.07	7.20	7.59	7.29	6.66	6.98	7.15	6.93
Municipal wastewater effluent	Loamy soil	151.0	163.0	190.0	168.0	130.0	147.0	173.0	150.0	210.0	230.0	251.0	230.3	7.17	7.41	7.82	7.47	9.09	9.44	9.61	9.38	7.80	7.91	8.40	8.04
	Sandy soil	130.0	148.0	187.0	155.0	113.0	131.0	137.0	127.0	190.0	195.0	209.0	198.0	6.17	6.52	6.91	6.53	8.50	8.62	8.93	8.68	6.90	7.11	8.09	7.37
mean		140.5	155.5	188.5	161.5	121.5	139.0	155.0	138.5	200.0	212.5	230.0	214.2	6.67	6.97	7.37	7.00	8.80	9.03	9.27	9.03	7.35	7.51	8.25	7.71
Mean		131.3	152.5	170.3		123.2	145.1	158.1		204.5	216.6	233.5		4.77	5.12	5.62		7.13	7.50	7.81		6.54	6.68	7.33	

S.M.C = Soil moisture content

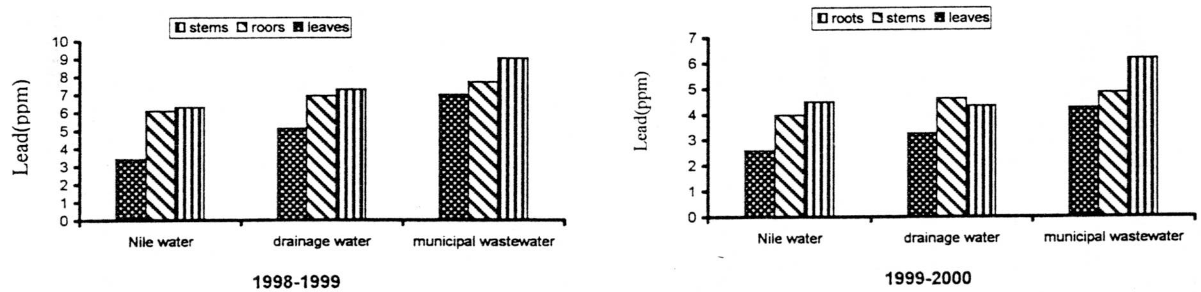
Table (60) Effect of different water resources irrigation and soil moisture content on Iron and lead(ppm)in plant portions of *Albizzia lebbeck* seedlings grown in two soil types during 1999-2000 season .

		Fe												Pb											
		Leaves				Stems				Roots				Leaves				Stems				Roots			
Water resources	Soil type / S.M.C	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean	40%	60%	80%	mean
Nile water	Loamy soil	104.0	125.0	133.0	120.7	107.0	117.0	132.0	118.7	176.0	185.0	193	184.7	2.16	2.88	3.14	2.73	4.15	4.70	4.75	4.53	4.12	4.67	5.11	4.63
	Sandy soil	63.00	91.00	107.0	87.00	95.0	123.0	119.0	112.3	162.0	137.0	157	152	2.01	2.41	2.93	2.45	3.11	3.40	3.71	3.41	4.08	4.15	4.83	4.35
mean		83.50	108.0	120.0	103.9	101.0	120.0	152.5	115.5	169.0	161.0	175	168.3	2.09	2.65	3.04	2.59	3.63	4.05	4.23	3.97	4.10	4.41	4.97	4.49
Drainage water	Loamy soil	166.0	184.0	200.0	183.0	129.0	154.0	159.0	147.3	196.0	248.0	259	234.3	3.15	3.70	3.83	3.56	5.15	5.17	5.73	5.35	4.83	5.11	5.52	5.15
	Sandy soil	151.0	169.0	184.0	168.0	123.0	147.0	152.0	140.7	187.0	221.0	238	215.3	2.82	2.91	3.14	2.96	2.96	3.40	4.03	4.17	4.66	2.70	3.21	3.52
mean		158.5	176.5	192.0	175.7	126.0	150.5	155.5	144.0	191.5	234.5	248.5	242.8	2.99	3.31	3.49	3.26	4.28	4.60	4.95	4.61	4.25	3.91	4.37	4.33
Municipal wastewater effluent	Loamy soil	115.0	144.0	163.0	140.7	120.0	131.0	137.0	129.3	183.0	210.0	231	208	4.10	4.63	4.91	4.55	5.19	5.63	5.90	5.57	6.13	6.35	6.60	6.36
	Sandy soil	100.0	121.0	137.0	119.3	115.0	128.0	140.0	127.7	145.0	166.0	187	166	3.38	3.94	4.08	3.95	3.85	4.12	4.30	4.09	5.61	6.00	6.22	5.94
mean		107.5	138.5	150.0	129.9	113.8	129.5	138.5	126.8	164.0	188.0	209	187	3.97	4.29	4.50	4.25	4.52	4.88	5.10	4.83	5.87	6.18	6.41	6.15
Mean		116.5	139.0	154.0		113.6	133.3	139.8		174.8	194.5	210.8		3.02	3.42	3.68		4.14	4.51	4.76		4.74	4.83	5.75	

S.M.C = Soil moisture content



Fig(17) Effect of different water resources irrigation on Iron (ppm) content in plant organs of *Albizia lebbeck* seedlings during 1998-1999 and 1999-2000 seasons.



Fig(18) Effect of different water resources irrigation on Lead (ppm) content in plant organs of *Albizia lebbeck* seedlings during 1998-1999 and 1999-2000 seasons.

Stems and roots Pb content increased with municipal or drainage water in both seasons.

Also, it can be observed in the same tables and Fig.(17,18)that the roots Fe^{++} content had an excessive values followed by leaves then stems produced the minimum values in the seedlings irrigated with drainage or municipal wastewater ,meaning that ion of Fe^{++} concentrated in roots and slightly transported to the shoots that irrigated with drainage or municipal wastewater .On the other hand, it can be noticed that the values of stems Pb content were the highest values followed by roots while the leaves Pb content recorded the lowest one in the seedlings irrigated with different water resources in the first season, meanwhile in the second season roots Pb content gave the highest value followed by stems and leaves when the seedlings irrigated with municipal waste water.

The herein obtained results were confirmed by those of **Abd EL-Sabour *et al.* (1995)**on lemon and mandarin trees, **Hassan *et al.* (1997)** on *Leucaena Leucocephala*, **El-Said,(1999)** on citrus trees. And **Selem *et al.*(2000)** on some plants .All of them stated that the concentration of Zn , Mn Fe and Pb tended to increase in shoots and roots by using sewage wastewater irrigation compared to Nile water .

Regarding the effect of two used soil it can be observed from Table (59,60) that Fe^{++} and Pb in leaves, stems and roots increased in loamy soil more than sandy soil in seedlings irrigated with three water resources in the first and second seasons. Although the increment of Fe and Pb in loamy and sandy soil did not cause any problems in seedlings growth during this study in agreement with. **Abd EL-Naim and EL-Awady (1989)** on citrus trees, who studied the effect of irrigation with sewage water during the three years of study on heavy metals content in sandy soil and plants where they found that the concentration of elements (Zn, Cu, Mn ,Cd ,Ni, Fe and Pb) in sandy soil and plants ,were not toxic, no nutritive or morphological problems were observed on the plants during the study.

In this respect, the effect of different soil moisture content, it can be noticed from Tables (59, 60) that in both season, the values of Fe^{++} and Pb leaves, stems and roots content were the lowest in seedlings irrigated at 40% soil moisture followed by that of 60% while 80% resulted in the highest one .

The former results were in harmony with those obtained by **El-Nashar, (1998)** on Navel orange who reported that uptake of the nutrent elements and some heavy metals i.e Cu, Cd, Ni, Co and Pb increased with increasing soil moisture content.

4.4.6.3 Copper and Cobalt :

As for copper (Cu) and cobalt (Co) content in tissues of plants i.e roots, stems and leaves as affected by municipal or drainage water irrigation were found as traces specially in the roots accompanied with municipal wastewater irrigation .

5- Effect of different water resources irrigation and soil moisture content on physical and chemical properties of two used soil types cultivated with *cupressus sempervirens* and *Albizzia lebbeck* for one year :

5.1. Physical properties

5.1.1. Organic matter %

Data presented in Table (61, 62,63 and 64) showed that the organic matter % increased in loamy and sandy soil due to the irrigation with municipal waste water compared to those irrigated with Nile water, whereas those irrigated with drainage water resulted the intermediate. It seems that the municipal wastewater was more effective in enriching soils with the organic matter than drainage or Nile water .

Concerning the effect of soil moisture content it can be noticed that organic matter % increased with high soil moisture content (80% of field capacity) specially with municipal wastewater irrigation and it was reduced with low soil moisture content (40% of field capacity) then 60% was intermediate. Similar results were obtained by **Abdel-Reheem *et al* (1986)**who concluded that the accumulation of soil organic matter was connected with increasing the intervals of sewage water irrigation, **EL-Tabey,(1993)** indicated that ,the continuous use of sewage effluent for irrigation increased organic matter specially in the surface of sandy soil layer and **EL-Sebaey,(1995)** who found that ,using the agricultural drainage water for soil irrigation led to increase its content of organic matter compared to Nile water.

Table (61) Effect of different water resources and soil moisture content on some physical and chemical properties of loamy soil cultivated with *Cupressus sempervirens* seedlings for one year at the end of experiment .

Treatments	O. M	F.C $^1/_3$ Bar%	$CaCo_3$	p^H	E.c dsm^{-1}	Soluble Cations Meq/L				Soluble Anions Meq/L				Total soluble N%	Total soluble P%
						Ca^{++}	Mg^{++}	Na^+	K^+	Co_3	HCo_3^-	CL^-	So_4^{--}		
$A_1 B_1 C_1$	1.30	39.77	2.05	7.27	0.70	4.33	3.39	1.63	0.22	-	3.15	3.20	2.55	0.067	0.032
$A_1 B_1 C_2$	1.31	39.77	2.03	7.23	0.70	4.35	3.41	1.66	0.23	-	3.19	3.27	2.60	0.068	0.032
$A_1 B_1 C_3$	1.31	39.78	2.02	7.22	0.68	4.35	3.45	1.73	0.24	-	3.20	3.38	2.63	0.068	0.034
$A_1 B_2 C_1$	1.31	39.78	2.06	7.31	0.71	4.37	3.73	2.12	0.23	-	3.27	4.00	3.12	0.069	0.036
$A_1 B_2 C_2$	1.32	39.79	2.06	7.32	0.73	4.40	3.74	2.22	0.25	-	3.31	4.12	3.30	0.070	0.039
$A_1 B_2 C_3$	1.33	39.81	2.05	7.32	0.73	4.41	3.75	2.37	0.26	-	3.32	4.18	3.37	0.070	0.041
$A_1 B_3 C_1$	1.34	39.83	2.04	7.01	0.71	4.26	3.75	2.23	0.24	-	3.20	4.09	3.03	0.080	0.035
$A_1 B_3 C_2$	1.35	39.85	2.02	7.00	0.69	4.24	3.77	2.27	0.24	-	3.22	4.13	3.10	0.090	0.036
$A_1 B_3 C_3$	1.37	39.87	2.02	6.88	0.68	4.22	3.85	2.31	0.26	-	3.26	4.15	3.17	0.010	0.037

A_1 = Loamy soil
B_1 = Nile water
B_2 = Drainage water
B_3 = Munici pal wastewater
O. M = Organic Matter.
E.C = Electrical Conductivity.
Meq/L = Millie equivalent per Liter.

C_1 = 40 % Soil moisture content of field Capacity.
C_2 = 60 % Soil moisture content of field Capacity.
C_3 = 80 % Soil moisture content of field Capacity.

Table (62) Effect of different water resources and soil moisture content on some physical and chemical properties of loamy soil cultivated with *Albizzia Lebbeck* seedlings for one year at the end of experiment. .

Treatments	O. M	F.C $^1/_3$ Bar%	$CaCo_3$	p^H	E.c dsm^{-1}	Soluble Cations Meq/L				Soluble Anions Meq/L				Total soluble N%	Total soluble P%
						Ca^{++}	Mg^{++}	Na^+	K^+	Co_3	HCo_3^-	CL^-	So_4^{--}		
$A_1 B_1 C_1$	1.31	39.77	2.03	7.25	0.70	4.30	3.40	1.75	0.21	-	3.02	3.25	2.55	0.068	0.032
$A_1 B_1 C_2$	1.31	39.77	2.03	7.23	0.70	4.31	3.41	1.83	0.22	-	3.02	3.30	2.61	0.068	0.033
$A_1 B_1 C_3$	1.32	39.78	2.01	7.20	0.67	4.32	3.46	1.92	0.22	-	3.05	3.42	2.62	0.069	0.033
$A_1 B_2 C_1$	1.34	39.80	2.05	7.30	0.72	4.33	3.71	2.40	0.22	-	3.25	4.01	3.10	0.069	0.038
$A_1 B_2 C_2$	1.34	39.82	2.04	7.32	0.73	4.35	3.71	2.48	0.25	-	3.27	4.11	3.31	0.070	0.040
$A_1 B_2 C_3$	1.35	39.81	2.05	7.32	0.73	4.37	3.75	2.51	0.25	-	3.30	4.18	3.46	0.070	0.041
$A_1 B_3 C_1$	1.34	39.86	2.02	7.00	0.70	4.23	3.77	2.33	0.23	-	3.15	4.10	3.08	0.090	0.035
$A_1 B_3 C_2$	1.36	39.86	2.01	6.83	0.68	4.23	3.80	2.37	0.24	-	3.20	4.11	3.18	0.10	0.037
$A_1 B_3 C_3$	1.37	39.91	2.00	6.83	0.68	4.21	3.83	2.44	0.26	-	3.22	4.13	3.22	0.10	0.038

A_1 = Loamy soil
B_1 = Nile water
B_2 = Drainage water
B_3 = Munici pal wastewater
O. M = Organic Matter.
E.C = Electrical Conductivity.
Meq/L = Millie equivalent per Liter.

C_1 = 40 % of field Capacity.
C_2 = 60 % of field Capacity.
C_3 = 80 % of field Capacity.

5.1.2 Field capacity %

Data in the same Tables (61 , 62,63 and 64) reveal that the field capacity of two soil types planted with *cupressus sempervirens* or *Albizzia lebbeck* have taken the same trend as those of organic matter% where ,irrigation with sewage municipal wastewater was associated in a remarkable increases in maximum water holding capacity. Moreover, increasing periods of irrigation with sewage wastewater caused an increase in maximum water holding capacity. **(Khalil 1990 and Bialkiewicz *et al* .1991)** found that, the irrigation with sewage water increased the field water capacity of the soils and the quantity of water available for the plants .

5.1.3 Calcium carbonate %

Data in Tables (61, 62,64 and 64) indicated that the highest calcium carbonate % ($CaCO_3$) in two types of soil were found during using agricultural drainage water in irrigation while the lowest values were observed in municipal wastewater specially at level of 80% soil moisture content .

These results were in harmony with the findings of **EL-Tabey, (1993)**who found that the continuous use of sewage water for irrigating at **EL-Gabal EL-Asfar** sandy soil caused decreasing $CaCO_3$% specially at above surface layer.

5.2.Chemical properties

5.2.1. soil reaction (P^H)

Data presented in Tables (61 ,62,63 and 64) obviously cleared that irrigating loamy or sandy soil cultivated with *cupressus sempervirens* or *Albizzia lebbeck* seedlings by

Table (63) Effect of different water resources and soil moisture content on some physical and chemical properties of sandy soil cultivated with *Cupressus sempervirens* seedlings for one year at the end of experiment.

Treatments	O. M	F.C$^{1}/_{3}$ Bar%	$CaCo_3$	p^H	E.c dsm^{-1}	Soluble Cations Meq/L				Soluble Anions Meq/L				Total soluble N%	Total soluble P%
						Ca^{++}	Mg^{++}	Na^{+}	K^{+}	Co_3	HCo_3^{-}	CL^{-}	So_4^{--}		
$A_2 B_1 C_1$	0.20	22	0.85	7.28	0.89	4.83	1.11	3.85	0.33	-	2.20	5.02	3.30	0.019	0.006
$A_2 B_1 C_2$	0.20	22	0.83	7.17	0.89	4.83	1.22	3.95	0.34	-	2.25	5.10	3.33	0.019	0.006
$A_2 B_1 C_3$	0.21	22	0.83	7.17	0.88	4.85	1.25	4.00	0.35	-	2.29	5.21	3.34	0.021	0.007
$A_2 B_2 C_1$	0.20	22	0.85	7.28	0.90	4.85	1.27	4.81	0.34	-	2.38	5.40	3.40	0.022	0.007
$A_2 B_2 C_2$	0.21	23	0.87	7.28	0.91	4.86	1.28	5.15	0.35	-	2.41	5.60	3.47	0.022	0.008
$A_2 B_2 C_3$	0.21	23	0.87	7.32	0.92	4.87	1.31	5.37	0.36	-	2.60	5.63	3.50	0.022	0.009
$A_2 B_3 C_1$	0.21	23	0.85	7.10	0.89	4.82	1.12	4.00	0.36	-	2.35	5.10	3.37	0.022	0.008
$A_2 B_3 C_2$	0.22	23	0.84	7.08	0.88	4.82	1.24	4.10	0.37	-	2.36	5.17	3.40	0.023	0.010
$A_2 B_3 C_3$	0.23	23	0.83	7.08	0.88	4.85	1.26	4.20	0.39	-	2.41	5.29	3.43	0.024	0.010

A_2 = sandy soil
B_1 = Nile water
B_2 = Drainage water
B_3 = Munici pal wastewater
O. M = Organic Matter.
E.C = Electrical Conductivity
Meq/L = Millie equivalent per Liter..

C_1 = 40 % Soil moisture content of field Capacity.
C_2 = 60 % Soil moisture content of field Capacity.
C_3 = 80 % Soil moisture content of field Capacity.

Table (64) Effect of different water resources and soil moisture content on some physical and chemical properties of sandy soil cultivated with *Albizzia Lebbeck* seedlings for one year at the end of experiment.

Treatments	O. M	F.C $^1/_3$ Bar%	$CaCo_3$	p^H	E.c dsm^{-1}	Soluble Cations Meq/L				Soluble Anions Meq/L				Total soluble N%	Total soluble P%
						Ca^{++}	Mg^{++}	Na^+	K^+	Co_3	HCo_3^-	CL^-	So_4^{--}		
$A_2 B_1 C_1$	0.20	22	0.84	7.2	0.89	4.90	1.10	3.86	0.33	-	2.28	5.02	3.33	0.019	0.006
$A_2 B_1 C_2$	0.20	22	0.82	7.1	0.89	4.90	1.21	3.97	0.34	-	2.30	5.10	3.36	0.017	0.007
$A_2 B_1 C_3$	0.21	22	0.82	7.1	0.87	4.91	1.25	4.01	0.34	-	2.31	5.23	3.36	0.020	0.007
$A_2 B_2 C_1$	0.20	22	0.85	7.2	0.89	4.92	1.26	4.83	0.36	-	2.40	5.44	3.41	0.022	0.007
$A_2 B_2 C_2$	0.20	23	0.86	7.2	0.90	4.93	1.28	5.18	0.36	-	2.44	5.61	3.48	0.022	0.008
$A_2 B_2 C_3$	0.21	23	0.86	7.4	0.92	4.95	1.31	5.38	0.37	-	2.61	5.68	3.50	0.023	0.009
$A_2 B_3 C_1$	0.21	23	0.85	7.08	0.89	4.89	1.11	4.02	0.36	-	2.37	5.11	3.37	0.023	0.008
$A_2 B_3 C_2$	0.23	23	0.84	7.07	0.88	4.91	1.25	4.12	0.37	-	2.37	5.17	7.40	0.023	0.01
$A_2 B_3 C_3$	0.23	23	0.84	7.06	0.88	4.92	1.28	4.22	0.39	-	2.41	5.30	3.44	0.24	0.011

A2 = Sandy soil
B1 = Nile water
B2 = Drainage water
B3 = Munici pal wastewater
O. M = Organic Matter.
E.C = Electrical Conductivity.
Meq/L = Millie equivalent per Liter.

C1 = 40 % of field Capacity.
C2 = 60 % of field Capacity.
C3 = 80 % of field Capacity.

municipal water resulted in shifting of soil P^H values towards the slight acidity such a change is probably due to decomposition of the organic matter which accumulated in the irrigated soils in relatively higher a mounts than in the virgin ones .Decompositions rate of organic matter results in releasing some organic acids besides of the dissociating microorganisms produce co_2 during exhalation which upon dissolution in water forms H_2CO_3 and consequently causes decline in soil P^H **(Sadik et al .1987).**

5.2.2 <u>Soil salinity (E c)</u>

Tables (61,62,63 and 64) showed the effect of different water resources and three levels of soil moisture content on soil salinity (E C) of loamy and sandy soil planted with *cupressus sempervirens* and *Albizzia lebbeck* seedlings the reduction in E C was found when two soil types irrigated with Nile water while the adverse effect occurred in drainage water .on the other hand municipal wastewater gave the intermediate values in particular at high soil moisture content (80 %of field capacity).The previous results had the same trend for those obtained by **Sadik et al .(1987)** who found that continuous application of sewage water to the soil was generally associated with reduction of the soluble salt in the soils content as reflected in (E C) values which were pronounced by prolonging the period of application of sewage water and **EL-Samanoudi ,(1992)** reported that using the drainage water for soil irrigation led to increase in soil E C compared to Nile water .

5.2.3. Ions content of the studied soils :

The data existed in Tables (61,62,63 and 64) show the effect of different water resources and soil moisture content on Ions content of the loamy or sandy soil which were cultivated with *cupressus sempervirens* or *Albizzia lebbeck* .

The results apparently cleared that ,the loamy or sandy soil irrigated with drainage water contained a high Ca_2 and Na more than those irrigated with municipal or Nile water

Concerning the effect of different levels of soil moisture content ,it can be concluded that the values of Ca_2 and Na content were the highest in two soils at 80% soil moisture content when irrigated with drainage water while Ca_2 content was decreased only by increasing soil moisture content specially in loamy soil irrigated with municipal wastewater .

Also ,it can be observed in the same tables that loamy or sandy soil irrigated with municipal wastewater contained a high Mg and K followed by that irrigated with drainage water whereas the Nile water gave the low content of Mg and K in both soils .

As for the effect of soil moisture content ,it can be noticed from Tables (61,62,63 and 64,) that the values of Mg and K content were the highest in two soils irrigated at levels of 80% soil moisture content followed by that of 60% while 40% resulted in the least one .

As for anions content in two soil types were affected with different water resources and soil moisture content ,it can be resulted that the irrigation with drainage water produced the highest bicarbonate ,chlorides and sulphate compared to those irrigated with Nile water which gave the lowest one whereas those irrigated with Nile water gave the lowest one whereas those irrigated with municipal wastewater resulted in the intermediate.

Regarding anions as affected by different soil moisture content it can be observed increasing in all a nons with high soil moisture content while the adverse effect occurred with drought condition.

5.4.4.Total soluble Nitrogen and Phosphrus %

Tables (61,62,63 and 64) show the effect of different water resources irrigation and different soil moisture content on total soluble Nitrogen (N) and Phosphorus (P) % in loamy and sandy soil which were planted with *cupressus sempervirens* or *Albizzia lebbeck* ,the results evident that Total soluble N and P % exceeded in loamy or sandy soil irrigated with municipal or drainage water more than Nile water .

Regarding the effect of different levels of soil moisture content on total soluble N and P % it can be concluded that, both of them increased to maximum value with increasing soil moisture content and adverse effect appeared with deficit water in soil regardless different water resources .

The former results were coincided with many investigators such as **EL-Nennah *et al* . (1982), Fawzy, (1986)** and **Khalil, (1990)Abd El-maksound (1993).**All of them found that ,irrigation sandy soil with sewage water led to an increase in total and soluble N,P and K content in soil .

5.4.5 Some micro and heavy metals of the studied soils.

Tables (65,66) showed the effect of using different water resources and different soil moisture content on total micro and heavy metals in loamy or sandy soil cultivated with *cupressus sempervirens* or *Albizzia lebbeck* seedlings .

The results indicated that Fe,Co and pb exceeded in loamy or sandy soil irrigated with drainage or municipal wast water more Nile water whereas Mn ,Cu and Zn increased with irrigation by municipal wastewater since the values attained the maximum while that irrigated with drainage water recorded the medium values then loamy or sandy soil irrigated with Nile water had the lowest values .

As for the effect of soil moisture content it can be noticed that total Fe,Mn ,Cu,Zn ,Co and Pb increased with soil moisture content at level of 80% field capacity and it declined with low soil moisture content 40% while the level of 60% was intermediate .

Generally ,the effects of irrigation with municipal or drainage on heavy metals accumulation in soil and plants (*cupressus sempervirens-Albizzia lebbeck*) were studied in Egypt. The results indicated that the concentration of Fe,Mn ,Cu ,Zn,Co and pb in irrigation water samples were lower than the maximum permissible limits .(**National Academy of Engineering 1972).**

The a forenamed results were inharmony with those obtained by **Meshref et al .(1989)** on lemon and mandarin trees, **Ibrahim *et al* . (1992)** on citrus trees and. **Hassan *et al.*(2002)** on *Albizzia lebbeck* and *Taxodium distichum* .All of them studied the effects

Table (65) Effect of different water resources and soil moisture content on total micro and some heavy metals (PPM) of two soil types cultivated with *Cupressus sempervirens* seedlings for one year at the end of experiment.

Soil type	Loamy soil						Sandy soil					
Treatments / Heavy metals	Fe	Mn	Cu	Zn	Co	Pb	Fe	Mn	Cu	Zn	Co	Pb
B_1 C_1	3350	156.60	28.21	119..03	1.11	22.03	3258	56.20	17.11	40.06	1.17	22.05
B_1 C_2	3358	156.69	28.21	119.08	1.12	22.05	3253	56.23	17.11	40.10	1.17	22.06
B_1 C_3	3380	156.80	28.22	119.08	1.11	22.10	3260	56.23	17.13	40.11	1.19	22.06
B_2 C_1	4104	157.00	28.22	120.71	1.17	22.13	3260	57.22	17.16	40.15	1.18	22.10
B_2 C_2	4115	157.40	28.23	121.03	1.20	22.83	3260	57.28	17.16	40.30	1.18	22.16
B_2 C_3	4128	157.53	28.25	122.07	1.21	23.01	3263	57.28	17.18	40.60	1.21	23.00
B_3 C_1	3380	158.04	28.26	122.17	1.13	22.12	3256	57.73	17.17	40.31	1.17	22.05
B_3 C_2	4110	158.36	26.25	125.01	1.17	22.12	3260	57.88	17.19	40.66	1.18	22.12
B_3 C_3	4120	158.44	26.26	125.31	1.19	22.40	3261	57.90	17.21	40.70	1.20	22.18

B_1 = Nile water.
B_2 = Drainage water.
B_3 = Munici pal wastewater.

C_1 = 40 % of field Capacity.
C_2 = 60 % of field Capacity.
C_3 = 80 % of field Capacity.

Table (66) Effect of different water resources and soil moisture content on total micro and some heavy metals (PPM) of two soil types cultivated with *Albizzia Lebbeck* seedlings for one year at the end of experiment.

Soil type	Loamy soil						Sandy soil					
Treatments / Heavy metals	Fe	Mn	Cu	Zn	Co	Pb	Fe	Mn	Cu	Zn	Co	Pb
B_1 C_1	3356	155.70	28.00	122.00	1.10	22.18	3252	56.19	17.04	40.03	1.13	24.17
B_1 C_2	3358	156.70	28.03	128.00	1.13	22.30	3253	56.20	17.06	40.06	1.14	24.19
B_1 C_3	3369	156.73	28.08	136.10	1.15	22.37	3253	56.22	17.16	40.10	1.15	24.19
B_2 C_1	3390	157.63	28.40	130.00	1.15	22.61	3258	56.22	17.17	40.11	1.18	24.28
B_2 C_2	4110	157.81	28.48	132.00	1.17	22.73	3260	57.25	17.18	40.20	1.20	24.28
B_2 C_3	4115	158.01	28.55	141.00	1.22	22.81	3262	57.27	17.20	40.41	1.22	24.30
B_3 C_1	3375	158.02	28.63	125.17	1.11	22.25	3255	56.37	17.20	40.25	1.16	24.22
B_3 C_2	3390	158.28	28.66	141.00	1.18	22.25	3258	57.40	17.21	40.60	1.18	24.26
B_3 C_3	4050	158.33	28.71	145.00	1.20	22.37	3260	57.58	17.23	40.68	1.19	24.26

B_1 = Nile water.
B_2 = Drainage water.
B_3 = Munici pal wastewater.

C_1 = 40 % of field Capacity.
C_2 = 60 % of field Capacity.
C_3 = 80 % of field Capacity.

of prolonged irrigation with sewage water on heavy metals accumulation in soil, where, representative soil samples were collected and analyzed for Mn ,Zn, Cu, Cd, Ni, Co and Pb, the samples were lower than the permissible limits.