RESULTS AND DISCUSSION

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THE FIRST EXPERIMENT

I. Experiments dealing with planting media :

In this regard two experiments were conducted to evaluate seven growing media each consisting of three substances. The 1st experiment was devoted for the 3 months old *Yucca filamentosa* seedlings, while the second for the one year old transplants. The response of both vegetative growth and mineral composition of such transplants of *Yucca filamentosa* were investigated.

I. A. Experiment I. "3 months old seedlings" :

I. A. 1. Vegetative growth measurements :

Concerning the vegetative growth measurements of 3 months old *Yucca filamentosa* seedlings in response to the investigated growing media (various prepared substrate mixtures), data obtained during both 1996/1997 and 1997/1998 seasons are presented in Table (1).

I. A. 1. 1. Plant height :

It is quite evident that plant height was responded obviously to the seven various growing media under study. Table (1) revealed that growing media (M1, M5 and M7) growing media i.e. the mixtures of (sand : clay : peat moss), (sand : peat moss : leaves dust) and (sand : peat moss : foam) exhibited significantly the tallest seedlings as compared to the four other substrate mixtures. Such trend was true during both seasons. However, both M1and M7 were equally effective from one hand but they tended to slightly exceed the 5th medium from the other. In addition, differences

these three superior media did not reach level of significance in most cases during both seasons of study.

On the contrary, both 2nd, 3rd growing media i.e. (sand : clay : leaves dust) and (sand :clay : dry chips of *Eichhornia speciosa* compost) were the inferior in this respect as they showed statistically the shortest seedlings during two seasons of study. Differences in plant height of Yucca seedlings grown in any of the three superior media (M1, M5 and M7) as compared with those of the inferior category (M2, M3) were highly significant during both 1996/1997 and 1997/1998 seasons.

Nevertheless, the two other mixtures (sand : clay : foam) and (sand : peat moss : dry chips of *Eichhornia speciosa* compost) i.e. the 4th and 6th treatments ranked statistically in between the above mentioned two extremes, as well as both were equally effective from the statistical standpoint in this regard.

Generally, the same conclusion of our study has been reached by earlier workers such as **El-Afaghani (1981)** on *Eucalyptus camaldulensis*, **Martinez *et al* (1982)** on *Dieffenbachia exotica*, **EL Sayed (1994)** on *Brassaia actinophylla* and **Sobhy (1998)** on *Dracaena marginata.*

I. A. 1. 2. Number of leaves :

Referring the influence of growing media under which 3 months old *Yucca filamentosa* seedlings were grown during both 1996/1997 and 1997/1998 seasons, data in Table (1) displayed an obvious response. Hence, the greatest number of leaves was statistically induced by those Yucca seedlings grown in pots filled with both mixtures of (sand : peat moss : leaves dust) and (sand : peat moss : foam) i.e. 5th and 7th treatments, respectively. The

TABLE (1):- Some vegetative growth measurements of (3 months old) of *Yucca filamentosa* seedlings as influenced by growing planting media during two successive seasons of 1996 / 1997 and 1997 / 1998 .

Treatments	Plant height (cm)		No . of Leaves		Leaf area (cm^2)		F.W. of Leaves (g.)		D.W. of Leaves (g.)	
	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.
M1	30.00	33.40	28.00	35.30	26.60	29.20	96.70	105.00	19.60	20.60
M2	21.70	24.30	23.30	25.00	23.00	22.40	48.00	67.40	11.30	13.70
M3	22.00	26.30	23.70	32.30	22.20	20.20	46.60	67.80	10.90	13.50
M4	25.20	27.00	26.70	37.00	22.80	21.40	49.30	87.00	12.00	17.00
M5	28.40	31.70	32.30	50.70	26.20	28.10	75.70	130.40	16.60	23.50
M6	25.20	28.00	25.70	24.00	25.20	21.90	58.70	85.00	15.00	16.80
M7	29.40	33.00	35.00	45.40	26.50	25.00	83.00	94.90	17.00	20.00
L.S.D 0.05	1.64	5.03	3.56	7.08	3.54	3.39	22.97	22.70	2.57	4.03
L.S.D 0.01	2.29	7.05	4.99	9.92	N.S	4.77	32.20	31.80	3.61	5.66

M1 sand : clay : peat moss , M2 sand : clay : leaves dust , M3 sand : clay : dry chips of *Eichhornia speciosa* compost, M4 sand : clay : foam , M5 sand : peat moss : leaves dust, M6 sand : peat moss : dry chips of *Eichhornia speciosa* compost and M7 sand : peat moss : foam.

increase exhibited by Yucca transplants grown in both superior growing media was highly significant as compared to the number of leaves values gained by any other mixtures during two seasons of study however, both superior mixtures were equally the same from the statistical point of view. On the other hand, transplanting 3 months old *Yucca filamentosa* seedlings in pots contained either (sand :clay : peat moss) or (sand : clay : foam) i.e. M1, or M4 respectively gained statistically the same number of leaves per seedling especially as an average of two seasons was concerned from one side and they came next to the aforesaid two superior mixtures.

In addition, the three other growing media M2, M3 and M6 i.e. (sand : clay : leaves dust), (sand : clay : dry chips of *Eichhornia speciosa* compost) and (sand : peat moss : dry chips of *Eichhornia speciosa* compost) resulted in reducing significantly the number of leaves per seedlings to the lowest value during both seasons of study.

These results agree with the findings of many previous workers, **El-Afaghani (1981)** on *Eucalyptus camaldulensis* and **EL Sayed (1994)** on *Brassaia actinophylla*. In addition, our findings are in partial agreement with that reported by **Sobhy (1998)** on *Dracaena marginata*.

I. A. 1. 3. Leaf area :

With regard to the response of the average leaf area to the growing media, data obtained during both seasons declared that transplanting 3 months old *Yucca filamentosa* seedlings on any of the 1st, 5 th or 7th mixtures i.e. (sand : clay : peat moss), (sand : peat moss : leaves dust) or (sand : peat moss : foam) exhibited

generally the greatest value of leaf area as compared to those of the other mixtures. However, the former investigated medium i.e. (sand : clay : peat moss) tended to be more effective than the two other ones especially during the second season of 1997/1998, whereas, the differences reached level of significance as each was compared to other. Contrary to that, leaf area was significantly depressed as the 3 months old Yucca seedlings were planted in pots containing any of the four other investigated substrate mixtures. Such trend was true during both 1996/1997 and 1997/1998 seasons except for Yucca plants grown in pots contained the 6th mixture (sand : peat moss : dry chips of *Eichhornia speciosa* compost) during the first season whereas, the decrease below the above mentioned three effective media was so little to be significant.

In this connection, **Nabih and El-Khateeb (1991)** on *Philodendron erubescens* reported that peat : sand showed a great effect on leaf area.

I. A. 1. 4. Fresh weight of leaves :

Concerning the leaves fresh weight of 3 months old *Yucca filamentosa* seedlings in response to the various investigated substrate mixtures, it is quits evident from data recorded in Table (1) that the plants grown in pots filled with M1, M5 or M7 media i.e. (sand : clay : peat moss), (sand : peat moss : leaves dust) or (sand : peat moss : foam), respectively induced significantly the heaviest leaves fresh weight per seedling. Such trend was true either data of each individual season or an average of both first and second seasons were compared with any of the four other mixtures. Moreover, the four other growing media i.e. M2, M3, M4 and M6 not only resulted in reducing leaves fresh weight below the above

mentioned three superior ones but also they were equally effective from the statistical point of view.

These results are supported by those found by **Nabih and El-Khateeb (1991)** on *Philodendron erubescense var. "Emerald Queen"* and **Mansour (1985)** on *Aspidstra lurida*, where they stated that peat : sand medium increased fresh weight of foliage.

I. A. 1. 5. Dry weight of leaves Dry weight :

Data in Table (1) reveal obviously that a similar trend typically coincivtent with that previously discussed for the leaves fresh weight was also detected regarding the leaves dry weight in relation to the growing media under which 3 months old Yucca seedlings were grown. Hence, the differential substrate mixtures investigated as growing media could be classified into two main categories regarding their influence on the leaves dry weight per seedlings as follows :-

a) The three substrate mixtures M1, M5 and M7 i.e. (sand : clay : peat moss), (sand : peat moss : leaves dust) and (sand : peat moss : foam) mixtures respectively, are representative of the first category "superior".

b) The four other growing media of M2 (sand : clay : leaves dust), M3 (sand : clay : dry chips of *Eichhornia speciosa* compost), M4 (sand : clay : foam) and M6 (sand : peat moss : dry chips of *Eichhornia speciosa* compost) represented the second category (less effective). The two later substrate mixture of such group tended relatively to be more effective than the two other (former) ones, especially during second season.

These results confirm earlier reports of **Nabih and El-Khateeb (1991)** on *Philodendron erubescense var. "Emerald*

Queen" and **El Sayed (1994)** on *Brassaia actinophylla* and *Ficus nitida.*

I. A. 2. Root growth measurements :

In this concern the average number of roots per seedling, root length, both fresh and dry weight of roots per 3 months old seedling of *Yucca filamentosa* were the four root measurements investigated in response to the seven substrate mixtures evaluated as planting media, whereas data obtained during both 1996/1997 and 1997/1998 seasons are presented in Table (2) :

I. A. 1. b. 1. Number of roots :

Table (2) clearly shows that the number of roots per seedling was greatly abundant when 3 months old *Yucca filamentosa* seedlings were transplanted in pots filled with either M4 (sand : clay : foam) or M1 (sand : clay : peat moss) media.

Contrary to that, the M2 (sand : clay : leaves dust) medium was the inferior in this respect, whereas 3 months old Yucca plants grown in such mixture induced significantly the least number of roots per each individual seedling. Moreove, four other ones i.e. M3 (sand : clay : dry chips of *Eichhornia speciosa* compost), M5 (sand : peat moss : leaves dust), M6 (sand : peat moss : dry chips of *Eichhornia speciosa* compost) and M7 (sand : peat moss : foam) were in between in this concern. Differences were significant as number of roots per each transplant for those seedlings grown in any mixture of the intermediate category was compared to any of those grown in either the superior or the inferior media during both seasons of study.

This result goes in line with that reported by **Zubair *et al* (1995)** on *Monstera deliciosa* plants. But on the other hand, this is

in disagreement with that mentioned by **Abo-Hassan *et al* (1994)** on *Ficus infectoria* and **Salah (1994)** on *Codieum varigatum* and *Ficus benjamina.*

I. A. 2. 2. Root length :

Regarding the effect of differential media on average root length of Yucca seedling (3 months old), data in Table (2) revealed clearly an interesting trend which pointed out that M5, M6 and M7 i.e. substrate mixtures of (sand : peat moss : leaves dust), (sand : peat moss : dry chips of *Eichhornia speciosa* compost) and (sand : peat moss : foam) respectively, were the superior as they exhibited statistically the longest root in this concern.

However, the later one i.e. M7 (sand : peat moss : foam) exceeded statistically both former ones (M5 & M6) during two seasons of study. On the contrary, the 4 other substrate mixtures i.e. M1, M2, M3 and M4 not only reduced root length in comparison with that of such seedlings grown in the aforesaid 3 mixtures (superior) but also they were equally the same from the statistical standpoint. Such trend was true during both 1996/1997 and 1997/1998 seasons, except with M1, M4 mixtures during 1997/1998 season as both were compared to each other whereas, M4 significantly surpassed M1 in this concern.

These results agree with the findings of many previous workers, **Nabih *et al* (1992)** on *Dieffenbachia amaena* cv. "Tropic Snow" and **Salah (1994)** on *Codieum varigatum* and *Ficus benjamina* where they stated that medium containing peat moss produced larger roots.

TABLE (2):- Some root system measurements of (3 months old) of *Yucca filamentosa* seedlings as influenced by growing media during two successive seasons of 1996 / 1997 and 1997 / 1998 .

Treatments	No . of roots		Root length (cm)		F.W. of Roots (g.)		D.W. of Roots (g.)	
	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.
M1	19.00	16.00	31.00	28.50	12.60	15.50	3.00	3.30
M2	12.70	8.30	31.70	30.00	14.40	12.90	3.80	2.40
M3	15.00	12.00	32.00	32.00	11.30	15.60	3.50	3.80
M4	19.00	19.30	33.30	35.00	10.90	11.60	3.40	3.20
M5	15.00	12.70	40.70	47.50	18.30	41.70	5.00	8.90
M6	16.00	11.70	42.70	44.00	19.10	34.50	5.30	9.20
M7	15.50	11.70	46.00	58.50	14.70	28.60	3.40	7.10
L.S.D 0.05	1.85	1.69	2.96	6.42	3.97	7.39	0.57	2.25
L.S.D 0.01	2.59	2.38	4.14	8.99	4.95	10.37	0.79	3.16

M1 sand : clay : peat moss , **M2** sand : clay : leaves dust , **M3** sand : clay : dry chips of *Eichhornia speciosa* compost **M4** sand : clay : foam , **M5** sand : peat moss : leaves dust , **M6** sand : peat moss : dry chips of *Eichhornia speciosa* compost and **M7** sand : peat moss : foam .

I. A. 2. 3. Fresh weight of roots :

It is quite evident that M5, M6 and M7 i.e. (sand : peat moss : leaves dust) (sand : peat moss : dry ships of *Eichhornia speciosa* compost) and (sand : peat moss : foam) mixtures respectively induced significantly the heaviest root fresh weight during two seasons of this concern. However, both M5, M6 were more effective as compared to M7 in this regard. On the other hand, 3 months old *Yucca filamentosa* seedlings grown in the four other mixtures induced statically less root fresh weight as compared to those of the above mentioned 3 superior mixtures.

In addition the less effective four mixtures were equally the same from the statistical point of view.

These results are in general agreement with those reported by **Mansour (1985)** on *Aspidstra lurida* and **Nabih and El-Khateeb (1991)** on *Philodendron erubescens* who stated that sand / peat medium showed favourable effect on fresh weight of roots.

I.A.1.b.2. Dry weigh of root :

Data recorded in Table (2) displayed obviously that the same trend previously discussed with root fresh weight was also detected for the root dry weight, regarding the response to the 7 investigated substrate mixtures. It was so worthy to be noticed that both fresh and dry weight of 3 months old *Yucca filamentosa* seedlings were in positive relationship to the root length rather than observed for the number of roots per seedling.

Similar finding was obtained by **Mansour (1985)** on *Aspidstra lurida* and **Nabih *et al*** **(1992)** on *Dieffenbachia amaena* cv.

"Tropic Snow", but this result is in disagreement with that reported by **Ali (1991)** on *Chlorophytum comasum*.

I. A. 3. Chemical composition :

In this respect, nutritional status expressed as N, P, K and total carbohydrate content of two plant organs namely leaf and root as affected by planting media (some substrate mixtures) were investigated during both experimental seasons.

I. A. 3. a. Nitrogen content :

I. A. 3. a. 1. Leaf nitrogen content :

Concerning the response of leaf N% of the 3 months old *Yucca filamentosa* seedlings to the various substrate mixtures as growing media, data in Table (3) displayed that the level was obviously influenced during both 1996/1997 and 1997/1998 seasons. Hence, the richest leaves in thier nitrogen content were statistically in closed relationship to those seedlings grown in M2 (sand : clay : leaves dust) mixture followed by those on either M1 (sand : clay : peat moss) or M6 (sand : peat moss : dry chips of *Eichhornia speciosa* compost) mixture.

Such trend was true during both seasons either the data of each season was compared separately or an average of two seasons was concerned. However, differences between these three superior substrate mixtures (growing media) were more pronounced during the second season and reached level of significance as they compared each to other.

On the contrary, the lowest leaf N% was detected by those Yucca seedlings grown in M4 (sand : clay : foam) mixture and M5 (sand : peat moss : leaves dust) mixture during both seasons and to

great extent seedlings of M7 (sand : peat moss : foam) especially during the second season. These three inferior media exhibited statistically the same leaf N% as each as compared to the two other ones during both seasons of study. In addition, the leaf N% of 3months old *Yucca filamentosa* seedlings grown in pots filled with M3 (sand : clay : dry chips of *Eichhornia speciosa* compost) mixture was in between the aforesaid two extents.

Nevertheless, it was so interesting to be observed clearly a firmer trend declared obviously that the presence of foam from one hand or the omission of clay from the other, both led to decrease the leaf N % as previously discussed with such seedlings grown in M4 (sand : clay : foam) mixture, M5 (sand : peat moss : leaves dust) mixture and M7 (sand : peat moss : foam).

Accordingly, these results could be logically explained depending upon that fact of the real role could be played by clay in keeping some essential elements from lost through leaching (especially those become more available to be absorbed in the cation form) while the foam have not such function.

These results are in harmony with that reported by **Mansour (1985)** on *Aspidistra laurida* and **Nabih and EL Khateeb (1991)** on *Philodendron erubescenes* cv. "Emrald Queen". In addition, our findings are in disagreement with that reported by **Hammad (1994)** on *Cupressus semperviens*.

I. A. 3. a. 2. Root nitrogen content :

Regarding the root N content of 3 months old Yucca seedlings in response to growing media, data in Table (3) displayed that variations were less pronounced as compared to these previously detected with leaf N%. Moreover, differences did not reach level of

significance during both seasons of study. However, it could be generally observed that roots of 3 months old Yucca seedlings grown in M6 (sand : peat moss : dry chips of *Eichhornia speciosa* compost) and M2 (sand : clay : leaves dust) showed a higher N% than those of the five other mixtures (as an average of two seasons was concerned).

Contrary to that, M7 (sand : peat moss : foam) and M3 (sand : clay : dry chips of *Eichhornia speciosa* compost) showed the least root N% during both seasons of study. However, differences were still significant compared to those of the other growing media.

Similar finding was obtained by **Nabih and EL Khateeb (1991)** on *Philodendron erubescenes* cv. "Emrald Queen" who found that clay, sand, peat moss, sand / clay or composted leaves media showed the highest N value.

I. A. 3. b. Phosphorus content :

I. A. 3. b. 1. Leaf phosphorus content :

Regarding the influence of growing media (7investigated mixtures) on leaf P content of 3 months old Yucca seedlings, tabulated data in Table (3) declared that the richest leaf P% was exhibited by such transplants grown in the M1, M2 or M5 i.e. (sand : clay : peat moss), (sand : clay : leaves dust) or (sand : peat moss:leaves dust), respectively. However, leaf P% of 3 months old seedlings grown in both 1st and 2nd mixtures tended to be more higher as compared to those in the 5th one although differences did not reach level of significance during two seasons of study. On the other hand, the reverse was detected with the 4th mixture (sand : clay : foam) which represented the inferior medium whereas, seedlings had the poorest leaves in P content during 2 experimental

TABLE (3) :- Nitrogen , Phosphorus , Potassium and Total carbohydrate content in leaves and roots of (3 months old) Yucca *filamentosa seedlings as* affected by some substrate mixtures used as planting media during the two consecutive 1996 / 1997 and 1997 / 1998 seasons .

Treatment	N %				P %				K %				Total carbohydrate %			
	Leaves		Roots		Leaves		Roots		Leaves		Roots		Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.
M1	1.55	1.40	1.25	1.10	0.425	0.445	0.223	0.209	1.48	1.44	0.68	0.91	24.92	24.29	24.09	24.22
M2	1.65	1.63	1.23	1.55	0.410	0.463	0.255	0.185	1.57	1.63	0.67	0.97	25.54	25.69	20.75	25.39
M3	1.40	1.30	1.20	1.00	0.383	0.354	0.155	0.159	1.32	1.32	0.69	0.89	23.61	23.10	20.29	20.56
M4	1.10	1.10	1.23	1.13	0.297	0.299	0.385	0.375	1.30	1.17	0.65	0.79	20.50	21.04	21.42	20.88
M5	1.13	1.07	1.23	1.17	0.402	0.385	0.137	0.138	1.19	1.10	0.61	0.65	21.00	20.38	21.47	20.95
M6	1.53	1.40	1.27	1.37	0.332	0.300	0.128	0.137	1.01	1.06	0.55	0.80	23.71	20.44	24.75	21.82
M7	1.27	1.20	1.09	1.05	0.387	0.352	0.134	0.114	1.18	1.24	0.77	0.61	23.12	23.31	24.88	24.22
L.S.D. 0.05	0.37	0.17	N.S	N.S	0.089	0.082	0.029	0.043	0.21	0.28	N.S	N.S	2.59	2.87	3.17	N.S
L.S.D. 0.01	0.52	0.24	N.S	N.S	N.S	0.115	0.040	0.059	0.30	0.40	N.S	N.S	3.64	4.03	N.S	N.S

M1 sand : clay : peat moss , **M2** sand : clay : leaves dust , **M3** sand : clay : dry chips of *Eichhornia speciosa* compost, **M4** sand : clay : foam , **M5** sand : peat moss : leaves dust , **M6** sand : peat moss : dry chips of *Eichhornia speciosa* compost and **M7** sand : peat moss : foam .

seasons. Such decrease was significant as compared with seedlings of the aforesaid three superior mixtures (M1, M2 and M5). In addition, other investigated media i.e. M3, M6 and M7 were in between and exhibited statistically the same effectiveness in this respect.

Nevertheless, it is quite evident to be observed clearly that the presence of peat moss and leaves dust as component of an investigated mixture especially either both were added together like as M5 (sand : peat moss : leaves dust) or each was provided solely in combination with clay , i.e. 1st and 2nd media (sand : clay : peat moss) and (sand : clay :leaves dust) resulted in increasing leaf P% of 3 months old Yucca seedlings.

The beneficial influence of both peat moss and leaves dust in this regard may be attributed to one or more of the following reasons :-

a) Leaves dust could be considered as a well source of phosphorus in an available form.
b) Both peat moss and leaves dust as an organic matter act in capturing the available for of phosphate i.e. anion case ($Po_4^{\cdots}$) and consequently keep it from being lost through drainage.
c) Organic matters " contained humus" prevent po_4 from reacting with cations (2^{++}) especially Ca^{++} to invert into unsoluble compounds.

On the contrary, the organic matter omission substrate mixture having the foam like as M4 (sand : clay : foam) resulted in the lowest leaf P%, this may be due to severe rate of P lost through drainage that resulted by the lower potentially of the three components (sand, clay and foam) for capturing phosphate anions.

These results agree with those reported by **Abou Dahab (1992)** on *Chlorophytum comosum* and **Nabih *et al* (1992)** on *Dieffenbachia amoena* cv. "Tropic Snow".

I. A. 3. b. 2. Root phosphorus content :

Referring the root P content of 3months old Yucca seedlings in response to the various investigated planting media, data are presented in Table (3). The tabulated data displayed that the trend of response took the other way around as compared to that previously found with leaves. Hence, the highest root P% was always coupled with those seedlings grown in 4th medium (sand : clay : foam), whereas differences were highly significant as compared to any of those other investigated mixtures during both experimental seasons.

This trend may be due to the dilution effect resulted by the unparalleled rates of both dry matter (especially carbohydrates) and absorbed phosphorus. However, further studies are needed to throw some light in this concern.

Meanwhile, both substrates mixtures of M1 and M2 i.e. (sand : clay: peat moss) and (sand : clay : leaves dust) ranked statistically second as root P% was concerned. In addition, the four other planting media i.e. M3, M5, M6 and M7 came last, since the 3 months old Yucca seedlings grown in pots contained any of them showed the least root P%. Such trend was true during two experimental seasons, whereas the differences between the above mentioned three categories were highly significant.

These results are in agreement with that reported by **Nabih and Salem (1991)** on *Brassaia actinophylla*, who found that the

plants grown in a mixture of sand : clay and clay medium gave the highest P content in roots.

I. A. 3. c. Potassium content :

I. A. 3. c. 1. Leaf potassium content :

Concerning the leaf potassium percentage of 3 months old Yucca seedlings, Table (3) indicates that the transplants grown in pots with M2, M1 and M3 had the richest leaf K content, However leaf K% of 3 months old Yucca transplants under M2 mixture (sand : clay : leaves dust) tended to be higher than that of M1 (sand : clay : peat moss) and M3 (sand : clay :dry chips of *Eichhornia speciosa* compost) but differences were significant when comparing M2 with M3. On the other hand, leaf K% of Yucca seedlings (3 months old) grown in other planting media i.e. M4, M5, M6 and M7 ranked statistically second, however K % in leaves of Yucca seedlings grown in both M4 and M7 tended to be relatively higher than those of two other ones, especially as an average of two seasons was concerned in this regard.

These results are confirmed by the work of **Nabih *et al* (1992)** on *Dieffenbachia amoena* cv. "Tropic Snow" where they recorded that a mixture of composted leaves with sand or peat moss alone increased K% leaves.

I. A. 3. c. 2. Root potassium content :

As for root K% of 3 months old Yucca seedlings in response to the investigated planting media, Table (3) shows that no specific trend could be detected during both seasons. Moreover, differences were so little to reach level of significance, however root K% of transplants grown in pots contained any of M1, M2 or M3 i.e. (sand

: clay : peat moss), (sand : clay : leaves dust) or (sand : clay : dry chips of *Eichhornia speciosa* compost) respectively, tended to be relatively higher than those exhibited with other investigated substrate mixtures especially as an average of two seasons was taken into consideration.

This may be due to the dilution effect whereas the first 3 investigated resulted in reducing root dry weight as previously discussed from Table (2).

Similar results were observed by **Mansour (1985)** on *Aspidistra laurida*, where he recorded that growing the plants in media containing peat moss (clay / peat moss or peat moss / sand and peat moss - sand - clay) increased K content in the leaves and roots.

I. A. 3. d. Total carbohydrate content :

I. A. 3. d. 1. Leaf total carbohydrate content :

Referring to the leaf total carbohydrate content of 3 months old Yucca seedlings in response to the various investigated planting media, the tabulated data in Table (3) shows that the total carbohydrate were greatly abundant when the seedlings were transplanted in pots filled with either M2 (sand : clay : leaves dust) & M1 (sand : clay : peat moss) growing media. Meanwhile, the reverse was true with M5 (sand : peat moss : leaves dust) and M4 (sand : clay : foam) during both seasons, as well as M6 (sand : peat moss : dry chips of *Eichhornia speciosa* compost) during second season, whereas differences between both groups were highly significant during two experimental seasons.

In addition, other investigated media, M3 and M7 i.e. (sand : clay : dry of *Eichhornia speciosa* compost) and (sand : peat moss : foam)

respectively were in between and exhibited statistically the same effectiveness in this respect especially.

This result is in harmony with that reported by **Sobhy (1998)** on *Dracaena marginata*, who obtained the highest total carbohydrate by using (1 soil : 1 sand : 1 peat moss) mixture.

I. A. 3. d. 2. Root total carbohydrate content :

Data concerning the effect of the investigated growing media on the root total carbohydrate content of 3 months old Yucca seedlings during 1996/1997 and 1997/1998 seasons are presented in Table (3). The obtained results revealed that the differential growing media could be classified into two main categories regarding thier effect on the root total carbohydrate percentage of 3 months old *Yucca filamentosa* seedlings.

a) The three substrate mixtures M7, M6 and M1 i.e. (sand : peat moss : foam), (sand : peat moss : dry chips of *Eichhornia speciosa* compost) and (sand : clay : peat moss) respectively, are representative of the first category (Superior).

b) The four substrate mixtures M2, M3, M4 and M5 i.e. (sand : clay : leaves dust), (sand : clay : dry chips of *Eichhornia speciosa* compost), (sand : clay : foam) and (sand : peat moss : leaves dust) mixtures respectively, represented the second category (Inferior) whereas differences between both categories were significant during the 1st experimental season.

The results of the second season showed a similar trend to those of the first season with a few differences. The superior category included M2(sand : clay : leaves dust), M7 (sand : peat moss : foam) and M1 (sand : clay : peat moss),while M3 (sand : clay : dry chips of *Eichhornia speciosa* compost), M4 (sand : clay :

foam) M5 (sand : peat moss : leaves dust) and M6 (sand : peat moss : dry chips of *Eichhornia speciosa* compost), mixtures proved to be the inferior category, whereas the differences between both groups were insignificant.

Similar results were observed by **El Sayed (1994)** who found that growing *Ficus nitida* "Hawaii" plants in peat moss alone or its mixture with sponge or foam increased the contents of total carbohydrates.

I. B. Experiment II "one year old seedlings" :

I. B. 1. Vegetative growth measurements :

I. B. 1. 1. Plant height :

Referring the response of plant height, Table (4) shows that one year old *Yucca filamentosa* seedlings reached statistically thier maximum height under growing in M1, M2, M5 and M7 media i.e. the substrate mixtures of (sand : clay : peat moss), (sand : clay : leaves dust), (sand : peat moss : leaves dust) and (sand : peat moss : foam), respectively.

Such trend was true during both 1996/1997 and 1997/1998 seasons whereas differences were significant as comparing to the three other media with an exception that transplants grown in pots of M6 (sand : peat moss : dry chips of *Eichhornia speciosa* compost) during the 1 st season showed a slight depress could be easily neglected from the statistical standpoint.

The reverse was detected when one year old *Yucca filamentosa* seedlings were grown in M3 or M4 media i.e. (sand : clay : dry chips of *Eichhornia speciosa* compost)or (sand : clay : foam) whereas, the shortest seedlings were statistically observed.

These results are confirmed by the work of **Mohamed (1992)** on *Livistonia chinensis* and **El Sayed (1994)** on *Brassaia actinophylla* and *Ficus nitida* "Hawaii", but these results disagree with that mentioned by **Hammad (1994)** on *Cupressus semperviens*.

I. B. 1. 2. Number of leaves :

Data in Table (4) declared that the number of leaves per the individual one year old seedling followed nearly the same trend previously detected with the plant height regarding the response to various investigated media. However, the promotive effect of the M5 (sand : peat moss : leaves dust) medium was more pronounced with number of leaves as compared to the three other effective substrate mixtures. Anyhow, the beneficial effect of the effective mixtures on number of leaves per one year old seedling could be arranged into the following descending order M5 (sand : peat moss : leaves dust), M1 (sand : clay : peat moss), M6 (sand : peat moss : dry chips of *Eichhornia speciosa* compost), M7 (sand : peat moss : foam) and M2 (sand : clay : leaves dust) as an average of two seasons was concerned. The opposite was true with M3 and M4 i.e. (sand : clay : dry chips of *Eichhornia speciosa* compost and (sand : clay : foam) respectively, whereas the least values of leaves number were statistically detected during both seasons of study.

These results go in line with that reported by **Mansour (1985)** on *Aspidistra lurida*, **Mohamed (1992)** on *Livistonia chinensis*, **El Sayed (1994)** on *Brassaia actionphylla* and *Ficus nitida* "Hawaii" and **Sobhy (1998)** on *Dracaena marginata*.

TABLE (4):- Some vegetative growth measurements of (one year old) of *Yucca filamentosa* seedlings as influenced by growing planting media during two successive seasons of 1996 / 1997 and 1997 / 1998 .

Treatments	Plant height (cm)		No . of Leaves		Leaf area (cm^2)		F.W. of Leaves (g.)		D.W. of Leaves (g.)	
	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.
M1	36.70	34.30	43.30	99.60	34.10	28.20	199.90	278.60	38.00	56.10
M2	35.70	31.00	40.00	86.00	37.10	34.70	212.10	331.40	44.00	81.80
M3	29.00	26.70	36.00	71.00	35.30	31.50	113.00	172.80	23.00	46.00
M4	30.00	27.70	32.70	77.00	29.40	26.40	130.00	151.90	24.80	35.30
M5	33.70	33.00	46.00	103.30	30.50	28.70	180.00	295.10	37.00	70.00
M6	32.00	28.70	42.50	95.30	27.40	23.20	130.00	209.90	25.00	53.00
M7	33.30	31.00	39.00	91.00	33.00	30.50	171.00	316.60	34.80	71.00
L.S.D 0.05	3.53	3.32	6.09	20.47	4.55	3.28	35.87	40.43	6.34	28.64
L.S.D 0.01	4.95	4.65	8.54	N.S	6.38	4.59	50.29	56.68	8.89	40.16

M1 sand : clay : peat moss , **M2** sand : clay : leaves dust , **M3** sand : clay : dry chips of *Eichhornia speciosa* compost , M4 sand : clay : foam , **M5** sand : peat moss : leaves dust , **M6** sand : peat moss : dry chips of *Eichhornia speciosa* compost and M7 sand : peat moss : foam .

I. B. 1. 3. Leaf area :

Concerning the average leaf area of one year old *Yucca filamentosa* seedlings in relation to the various investigated substrate mixtures, Table (4) shows clearly that trend was not so firmer during two seasons of study as compared to the previously detected with either plant height or number of leaves per plant. However, the shift was so slight during the first season, whereas the M1 (sand : clay : peat moss), M2 (sand : clay : leaves dust) and to great extent both M3 (sand : clay : dry chips of *Eichhornia speciosa* compost) and M7 (sand : peat moss : foam) media were still the effective mixtures in this concern. Meanwhile, during the second season, the change in trend of response rather than the plant height or number of leaves per seedlings was more pronounced and differences in leaf area due to the media became insignificant in most cases, with a relative tendency pointed out the superiority, of M2, M3 and M7 i.e. (sand : clay : leaves dust), (sand : clay : dry chips of *Eichhornia speciosa* compost) and (sand : peat moss : foam) substrate mixtures, respectively. In other words, in spite of the M3 was the inferior regarding both plant height and number of leaves measurements but it became more effective than M1,M5 and M7 i.e. (sand : clay : peat moss), (sand : peat moss : leaves dust) and (sand : peat moss : foam), substrate mixtures respectively, pertaining the effect on leaf area such changes in response of the average leaf area may be attributed directly to the negative correlation between the number of a given plant organ induced per each individual plant and its growth vigour which mainly depending upon the potentiality of both root and shoot (leaves) systems for

supplying with both raw and synthetic substances, respectively (needed for growth and development).

The results agree with the findings of **Nabih and El Khateeb (1991)** on *Philodendron erubescens var. "Emerlad Queen"* who found that peat moss alone or its combinations with the sand or clay showed a great effect on leaf size.

I. B. 1. 4. Fresh weight of leaves :

Regarding the leaves fresh weight per seedling one year old *Yucca filamentosa* in response to growing media, data in Table (4) displayed obviously that the heaviest leaves fresh weight per seedling was always in closed relationship to that seedlings grown in M2 (sand : clay : leaves dust) as well as any of M1 (sand : clay : peat moss), M5 (sand : peat moss : leaves dust) and / or M7 (sand : peat moss : foam), either data of each season or an average of two seasons were concerned. On the other hand, the opposite was found with M3, M4 and M6 media i.e. (sand : clay : dry chips of *Eichhornia speciosa* compost), (sand : clay : foam) and (sand : peat moss : dry chips *Eichhornia speciosa* compost) mixtures, respectively.

This result is in harmony with that reported by **El-Afaghani (1981)** on *Eucalyptus camadulensis*.

I. B. 1. 5. Dry weight of leaves :

It is quite clear that the leaves dry weight per one year old seedlings of *Yucca filamentosa* followed typically the same trend of response to the various media previously detected for the leaves fresh weight during both seasons of study. Since, the M2 medium (sand : clay : leaves dust) was statistically the superior, followed in a descending order by both M5 and M7 as well as M1 as an

average of two seasons was regarded. Contrary to that, M3, M4 and M6 were statistically the inferior in this regard.

These results agree with the findings of many previous workers, **Hornis *et al* (1983)** on *Codiaeum Variegatum* and *Dieffenbachia amoena* and **El Sayed (1994)** on *Brassaia actinophylla* and *Ficus nitida* "Hawaii". In addition, our findings are in partial agreement with that reported by **Hammad (1994)** on *Cupressus semperviens*.

Conclusively, for the younger (3 months old) *Yucca filamentosa* seedlings the M1, M5 and M7 media reflected thier suitability regarding the various shoot system measurements. In other words, the presence of both sand and peat moss together plus any of clay, leaves dust or foam representing the most favourable growing media for the younger seedlings which may be attributed to the lighter texture of such mixtures that associated with a well balanced properties for air economy, keeping ability for both soil moisture and nutrients from being lost by excessive drainage and leaching, respectively. Since, both sand : foam are responsible for a well aeration (permeability), while clay and peat moss are dealing with both soil moisture and nutrient balance.

Meanwhile, for the older seedlings (one year old) it could be concluded that the favourable growing media for 3 months old seedlings reflected also thier suitability with a unique shift was representative by the superiority of M2 which showed more effectiveness with the older seedlings rather than the younger ones.

Nevertheless, a logic explanation could be given for the trend of both fresh and dry weight of leaves in response to media and number of leaves per plant, since both are in closed positive

relationship from one hand. On the other hand, both physical and chemical characteristics of each component (added substance) in preparing these substrate mixtures as well as the combined reaction of the three materials used in each mixture especially those related to the economic air and keeping ability of soil moisture and nutrient elements from lost are the main responsible factors for determining the suitability of any medium. Moreover, changes in suitability of some medium / in to the 3 months old then the one year old seedlings may be due to the unparalleled requirements of both ages especially for moisture and nutrient elements and consequently the physiochemical properties of growing media which considered as a direct reflection to its / thier components.

I. B. 2. Root growth measurements :

I. B. 2. 1. Number of roots :

Data recorded in Table (5) displayed that the M4 (sand : clay : foam) medium resulted significantly in increasing the number of roots per each one year seedling as compared to the 6 other growing media during both seasons of study followed by the M6 (sand : peat moss : dry chips of *Eichhornia speciosa* compost) and M2 (sand : clay : leaves dust). However, the reverse was true with M3 and M5 i.e. (sand : clay : dry chips of *Eichhornia speciosa* compost) and (sand : peat moss : leaves dust) mixtures whereas the least number of roots per seedling was significantly induced. Moreover, the two other media i.e. M1 and M7 (sand : clay : peat moss) and (sand : peat moss : foam) were statistically in between the above mentioned two extents.

In this connection, **Hammad (1994)** found that the medium containing sand : clay : foam (3:1:1) was the best one for growing *Cupressus semperviens*.

I. B. 2. 2. Root length :

The root length of one year old *Yucca filamentosa* seedlings in response to the investigated growing media exhibited generally that M1, M5 and M7 media stimulated the penetration of root system to reach statistically the maximum length during both seasons of study. In other words, the presence of both sand and peat moss together in addition to clay, leaves dust or the foam as the third component resulted in more elongation of root length. The reverse was true with both M2 and M6 especially during second season, whereas the shortest root system was induced. Moreover, the other investigated media i.e. M3 and M4 were in between.

These results are in general agreement with those found by **Nabih *et al* (1992)** on *Dieffenbachia amoena* cv. "Tropic Snow".

I. B. 2. 3. Fresh weight of roots :

Regarding the root fresh weight of one year old *Yucca filamentosa* plants in relation to the investigated growing media during both 1996/1997 and 1997/1998 seasons, it is quite evident that the three substrate mixtures of (sand : clay : leaves dust), (sand : peat moss : leaves dust) and (sand : peat moss : foam) induced seedlings having significantly the heaviest root fresh weigh.

However, such trend was to great extent true during both seasons as data of each season was compared separately, but the trend was firmer as an average of two seasons was concerned. Contrary to that, the M3, M4, and M6 media were the inferior especially during

TABLE (5):- Some root system measurements of (one year old) of *Yucca filamentosa* seedlings as influenced by growing planting media during two successive seasons of 1996 / 1997 and 1997 / 1998 .

Treatments	No . of roots		Root length (cm)		F.W. of Roots (g.)		D.W. of Roots (g.)	
	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.
M1	23.50	29.00	61.00	57.00	33.30	58.60	7.60	14.30
M2	25.70	29.30	46.70	32.00	39.70	89.20	9.60	24.50
M3	19.50	26.00	54.70	43.00	29.80	48.90	6.50	13.60
M4	35.00	35.00	53.30	41.00	27.80	58.20	6.50	16.20
M5	19.50	26.30	59.70	55.50	34.20	86.10	8.40	24.90
M6	27.50	31.30	52.30	32.00	28.90	63.70	7.70	16.90
M7	24.30	23.00	59.70	50.00	43.60	77.90	12.10	20.00
L.S.D 0.05	2.33	3.77	6.56	4.01	4.49	5.81	1.58	4.23
L.S.D 0.01	3.27	5.28	9.20	5.62	6.29	8.15	2.22	5.93

M1 sand : clay : peat moss , **M2** sand : clay : leaves dust , **M3** sand : clay : dry chips of *Eichhornia speciosa* compost **M4** sand : clay : foam , **M5** sand : peat moss : leaves dust , **M6** sand : peat moss : dry chips of *Eichhornia speciosa* compost and **M7** sand : peat moss : foam .

the first season or an average of two seasons was taken into consideration. In addition, M1 (sand : clay : peat moss) medium was in between the aforesaid two extents.

The results are in agreement with the findings of **Mansour (1985)** on *Aspidistra lurida* and **El Sayed (1994)** on *Brassaia actinophylla* and *Ficus nitida* "Hawai" while, they are in partial agreement with the finding of **Hammad (1994)** on *Cupressus semperviens*.

I. B. 2. 4. Dry weight of roots :

It is quite clear from data tabulated in Table (5) that the root dry weight per individual one year old Yucca seedling followed typically the same trend of previously detected with the root fresh weight, regarding the response to the various substrate mixtures investigated as growing media in this experiment. The three M2, M5 and M7 media i.e. (sand : clay : leaves dust), (sand : peat moss :leaves dust) and (sand : peat moss : foam) substrate mixtures were statistically the superior as compared to any of the other investigated ones. Such trend was really during both 1996/1997 and 1997/1998 seasons either data of each season or an average of two seasons were concerned. Meanwhile, other media not only ranked second but also they were equally effective from the statistical standpoint.

Similar results were obtained by **Mansour (1985)** on *Aspidistra lurida*, and *Schefflera actinophylla* cv. compacta and **El Sayed (1994)** on *Brassaia actinophylla* and *Ficus nitida* "Hawai".

Conclusively the M1, M5 and M7 exerted thier superiority with the 3 months old seedlings, while with the one year old M2, M5 and M7 and to the great extent M1 were the superior.

Such trends were really with most measurement at the two above and underground systems.

I. B. 3. Mineral composition :

I. B. 3. a. Nitrogen content :

I. B. 3. a. 1. Leaf nitrogen content :

Referring to the leaf N content of one year old Yucca seedlings, Table (6) displays that the maximum percentage value was exhibited by those transplants grown in M1 (sand : clay : peat moss) growing medium which surpassed statistically all other investigated mixtures during both seasons of study. Moreover, the M2 (sand : clay : leaves dust) and to some extent M3 (sand : clay : dry chips of *Eichhornia speciosa* compost) growing media ranked statistically second as compared to the aforesaid superior medium. However, both M4 and M6 tended to be relatively more effective than both M2 and M3 especially with comparison to the former one during 2nd season. Such trend was true during both experimental seasons either data of each season or as an average value of two seasons were taken into consideration.

On the contrary, the leaves of one year old *Yucca filamentosa* seedlings grown in pots filled with M5 mixture (sand : peat moss : leaves dust) showed statistically the lowest nitrogen percentage as compared to any of other investigated media during both seasons of study. In addition, M7 (sand : peat moss :foam) was in between in this concern especially as an average value of two seasons was concerned.

Generally, the same conclusion of our study has been found by **Mohamed (1992)** on *Livistonia chinensis* and **Hammad (1994)** on *Cupressus semperviens*.

The slight shift in trend of leaf N% in response to growing media resulted with Yucca seedlings of two ages may be mainly due to the changes in thier characteristics especially those coupled with thier potentiality for both absorption and assimilation processes, which certainly could be varied from one stage to another. Since, determing an element as a percentage of dry weight in a given organ reflects the accumulation rates of both determined element and dry matter especially carbohydrates in such plant organ.

Consequently, in some cases the percentage of an element may be seemed to be so lower, in spite of its actual quantity absorbed was so greater.

In other words, the conflict in trends of response for 3 months and one year old seedlings may be due to the interference between the dilution effect resulted by the unparalleled accumulation rates of both synthetic matters especially carbohydrates and mineral elements from one hand, as well as the actual quantity of different elements could be absorbed by root system of two ages of Yucca seedlings from the other.

I. B. 3. a. 2. Root nitrogen content :

As for the root N% of one year old Yucca seedlings in response to investigated substrate mixtures, data in Table (6) revealed that M1 (sand : clay : peat moss) resulted in the maximum value. Meanwhile, the reverse was true with M2 (sand : clay : leaves dust) during both seasons, as well as M3 (sand : clay :dry chips of *Eichhornia speciosa* compost) during the second season

only. However, differences were still insignificant in most cases during both seasons except in 1st season when 1st and 2nd substrate mixtures were compared with each other.

These results go in line with that reported by **Korkar (1996)** on *Codiaeum varigatum*, who stated that the plants grew in (1sand : 1clay : 1peat moss) contained higher percentage of N.

I. B. 3. b. Phosphorus content :

I. B. 3. b. 1. Leaf phosphorus content :

With regard to the leaf P content in one year old Yucca seedlings in response to the differential investigated growing media, data obtained during both 1996/1997 and 1997/1998 seasons are presented in Table (6). It is quite evident that leaf P% of the one year old Yucca seedlings followed to great extent the same trend of response that previously detected from the experiment I (3months old seedlings). Since, the M1, M2 and M5 substrate mixtures proved to be the superior, while the M4 medium was the inferior, whereas differences between both categories were significant during two experimental seasons.

This trend was true either values of each season were separately compared or an average value of two seasons were concerned. Moreover, the other investigated growing media (M3, M6 and M7) came intermediately in this respect.

Similar findings were detected by **Hammad (1994)** on *Cupressus semperviens*, who stated that the highest value of P were detected in plants grow in medium contained (3 sand: 1 clay: 1 peat).

TABLE (6) :- Nitrogen , Phosphorus , Potassium and Total carbohydrate content in leaves and roots of (one year old) Yucca *filamentosa seedlings as* affected by some substrate mixtures used as planting media during the two consecutive 1996 / 1997 and 1997 / 1998 seasons .

Treatment	N %				P %				K %				Total carbohydrate %			
	Leaves		Roots		Leaves		Roots		Leaves		Roots		Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.
M1	1.93	2.00	1.25	1.30	0.455	0.292	0.108	0.109	1.15	1.13	0.62	0.55	24.67	24.01	22.44	25.26
M2	1.60	1.55	1.00	0.90	0.385	0.403	0.170	0.180	1.38	1.35	0.64	0.64	22.02	22.23	19.25	20.66
M3	1.45	1.45	1.20	0.88	0.330	0.330	0.127	0.125	0.95	1.07	0.57	0.56	20.29	21.85	22.09	20.09
M4	1.65	1.65	1.23	1.17	0.285	0.285	0.122	0.105	1.00	1.08	0.41	0.41	23.69	23.38	22.26	24.16
M5	1.05	1.09	1.10	1.00	0.385	0.403	0.102	0.108	1.03	1.02	0.48	0.45	20.22	20.85	19.54	22.75
M6	1.50	1.70	1.27	1.10	0.325	0.333	0.105	0.107	1.25	1.24	0.57	0.46	21.34	23.97	23.38	23.41
M7	1.60	1.33	1.09	1.00	0.345	0.285	0.100	0.108	1.02	1.07	0.48	0.47	23.34	20.94	24.29	21.69
L.S.D. 0.05	0.32	0.22	0.24	N.S	0.064	0.072	0.068	0.059	0.24	N.S	0.09	0.08	2.36	N.S	2.61	N.S
L.S.D. 0.01	0.45	0.31	0.33	N.S	0.089	0.102	N.S	0.084	0.33	N.S	0.13	0.12	3.31	N.S	3.67	N.S

M1 sand : clay : peat moss, **M2** sand : clay : leaves dust, **M3** sand : clay : dry chips of *Eichhornia speciosa* compost, **M4** sand : clay : foam, **M5** sand : peat moss : leaves dust, **M6** sand : peat moss : dry chips of *Eichhornia speciosa* compost and **M7** sand : peat moss : foam .

I. B. 3. b. 2. Root phosphorus content :

Referring to the root P content of one year old Yucca seedlings, Table (6) shows that the seedlings exhibited an obvious modification in trend of response to growing media as compared to the previously found with 3 months old seedlings, such trend declared that the M2 (sand : clay : leaves dust) resulted in the maximum value of root P%. Differences were significant as compared to those of other planting media, especially during second season except as compared to that of one year old Yucca seedlings grown in pots contained M3 (sand : clay : dry chips of *Eichhornia speciosa* compost) during both seasons. This modification in trend of root P% of one year old Yucca seedlings than the younger transplants (3 months old) in response to planting media may be attributed to the shift in root characteristics by the transplant aging. In other words differences in growth rates of both shoot and root system of Yucca seedlings resulted by the different planting media that finally reflected on the accumulation rates of both dry matter (especially carbohydrate) and nutrient elements (especially investigated mineral ones) could be represent an interesting base for unexpected ones.

These results go in line with that reported by **Nabih and Salem (1991)** on *Brassaia actinophylla*, who found that a mixture of sand : clay gave the highest P in roots.

I. B. 3. c. Potassium content :

I. B. 3. c. 1. Leaf potassium content :

As for the leaf K% of one year old Yucca seedlings, Table (6) displays that M2 (sand : clay : leaves dust) was still the superior

whereas, it showed the highest leaf K%. The M6 (sand : peat moss : dry chips of *Eichhornia speciosa* compost) came second while other investigated mixtures showed equally of the same effectiveness. Such trend was true during both seasons of study however, differences were significant during 1st season only.

This result is in harmony with that reported by **Nabih *et al* (1992)** on *Dieffenbachia amoena* cv."Tropic Snow", who stated that growing mixture of composted leaves with sand or peat moss alone increased K% in leaves.

I. B. 3. c. 2. Root potassium content :

Nevertheless, the root K% of one year old Yucca plants in response to planting media exhibited a slight shift in trend of response as compared to that of the younger transplants (3 months old). Such modification is mainly detected with M1, M2 and M3 whereas they resulted in a significant increase of K % in roots of Yucca transplants (especially M2) as compared to the four other ones during both seasons. On the contrary, M4 showed the lowest root K%. However, differences were not significant as compared to those of M5, M6 and M7 during two seasons.

This may be attributed to the change in transplants characteristics correlated with the advancement of age from one hand and the dilution effect resulted from the unparalleled accumulation rates of both dry matter (carbohydrates) and Potassium from the other.

Moreover, such results are in partial coincidence of the findings of **Hammad (1994)** on *Aralia longifolium* and *Cupressus semperviens* and **Korkar (1996)** on *Codiaeum varigatum*, where

they recorded that the highest value of K contents were detected in plants grow in medium contained sand : clay : peat moss.

I. B. 3. d. Total carbohydrate content :

I. B. 3. d. 1. Leaf total carbohydrate content :

With regard to the response of the leaf total carbohydrate content of one year old *Yucca filamentosa* seedlings to the various growing media, data obtained during both 1996/1997and 1997/1998 seasons are presented in Table (6) cleared that the seedlings grown in pots filled with M1 (sand : clay : peat moss) showed the highest total carbohydrate percentage as compared to any of other investigated media under study during both seasons either the data of each season was compared separately or an average of two seasons was concerned, followed by those on either M4 (sand : clay : foam) and M6 (sand :peat moss : dry ships of *Eichhornia speciosa* compost)especially during the second season. However, differences were still insignificant in most cases during both seasons.

On the contrary, the seedlings grown in M5 (sand : peat moss : leaves dust) were the inferior in this respect as they showed statistically the lowest value (20.22 and 20.85%) during the first and second seasons, respectively. In addition, M2 (sand : clay : leaves dust) and M3 (sand : clay : dry chips of *Eichhornia speciosa* compost) were in between in this respect especially as an average value of two seasons were concerned.

These results are confirmed by the work of **Hammad (1994)** on *Aralia longifolium* and *Cupressus semperviens*.

I. B. 3. d. 2. Root total carbohydrate content :

With respect to root total carbohydrate of one year old *Yucca filamentosa* seedlings as influenced by differential growing media, it is obvious from Table (6) that in the first season the roots of one year old Yucca seedlings grown in pots filled with M7 (sand : peat moss : foam), M6 (sand : peat moss : dry chips of *Eichhornia speciosa* compost) and M1 (sand : clay : peat moss) showed the highest total carbohydrate % than the other investigated mixtures.

Moreover, the four other growing media M4, M3, M5 and M2 respectively, not only resulted in reducing root total carbohydrate % below the above mentioned three superior ones but also they were equally effective from the statistical point of view as compared each to other.

The data of the second season presented in the same Table showed a different pattern of results as the first one. It is quite evident that both substrates mixtures of M1 (sand : clay : peat moss), M4 (sand : clay : foam) and M6 (sand : peat moss : dry chips of *Eichhornia speciosa* compost) gave the highest root total carbohydrate content of one year old Yucca seedlings.

Contrary to that, M5, M7, M2 and M3 showed the least total carbohydrate content however, differences were still insignificant as compared to those of the other growing media.

These results agree with those reported by **Abou Dahab (1992)** on *Chlorophytum comosum*.

THE SECOND EXPERIMENT

II. Experiments dealing with nutrition treatments :

II. A. Experiment II (3 months seedlings) :

II. A. 1. vegetative growth measurements :

Concerning the vegetative growth measurements of 3 months old *Yucca filamentosa* seedlings in response to the interaction of different combinations of F_1 & F_2 x methods of application S & D x rates of application (0.0, 0.5, 1.0 and 1.5 gm/L) data obtained during both 1996/1997 and 1997/1998 seasons are presented in Table (7).

II. A. 1. 1. Plant height :

Data in Table (7) revealed that plant height was responded obviously to the interaction between the lowest rate of both F_1 or F_2 when applied as Drench (method of application) i.e. The combination of 0.5 gm/L of F_1 x D and 0.5 gm/L of F_2 x D exhibited significantly the tallest seedlings as compared to other treatments, such trend was true during both seasons. Moreover, seedlings received 1.0 gm/L of F_1 x D and 1.0 gm/L F_2 x D ranked the second in this concern. On the other hand, seedlings sprayed by both F_1 and F_2 produced less value of plant height as compared with other combination especially at low rates of application (0.5 gm/L) but it still gave increases over control. The other combinations took intermediate place between the two extremes with variable values.

As for specific effect of the two forms of fertilizers on plant height, data in Table (7a) showed that there are no significant differences between the two fertilizers during the first season. While, F_1 was more effective in the second season. However, F_1 gave 22.92 cm plant height while F_2 gave 21.69 cm in 1997/1998 season.

TABLE (7) :- Interaction effect of different combination between two forms of fertilizers, methods and rates of application on vegetative growth of *Yucca filamentosa* / 3 months old

TREATMENTS			plant height (cm)		NO. of leaves		Leaf area (cm2)		F.W. of leaves(g.)		D.W. of leaves(g.)	
Fert. Types	Appl. Meth.	Appl. Rate	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S SPRAY	0.0	12.17	13.50	16.00	15.33	14.88	16.10	27.60	19.93	7.88	4.82
		0.5	13.00	15.00	15.33	17.67	21.25	17.96	68.90	23.38	9.80	3.97
		1.0	19.25	17.00	26.00	20.33	19.11	18.12	64.40	19.65	11.90	6.74
		1.5	26.00	24.00	20.00	30.00	24.17	23.63	43.45	28.16	9.80	8.16
	D DRENCH	0.0	12.17	13.50	16.00	15.33	14.88	16.10	27.60	19.93	7.88	4.82
		0.5	35.67	35.00	34.50	50.67	30.94	30.28	165.23	161.92	29.67	33.53
		1.0	31.17	34.33	45.50	57.00	33.04	32.59	181.75	192.97	27.20	36.71
		1.5	28.00	31.00	30.50	47.67	31.76	30.64	108.40	131.87	18.47	29.74
F2	S SPRAY	0.0	12.17	13.50	16.00	15.33	14.88	16.10	27.60	19.93	7.88	4.82
		0.5	18.00	15.67	15.67	18.00	18.50	17.56	34.00	22.39	3.85	2.40
		1.0	16.33	20.50	17.50	24.67	22.44	18.28	42.83	40.01	7.33	11.82
		1.5	26.33	24.00	39.00	30.33	28.21	25.20	162.75	128.16	19.20	25.62
	D DRENCH	0.0	12.17	13.50	16.00	15.33	14.88	16.10	27.60	19.93	7.88	4.82
		0.5	35.67	32.00	36.50	52.00	27.99	30.37	189.35	147.67	26.40	31.27
		1.0	30.50	27.33	33.67	17.67	32.08	31.63	121.87	117.52	21.50	16.43
		1.5	28.00	27.00	37.00	40.33	28.31	29.82	135.70	124.96	22.00	18.64
L.S.D		0.05	1.89	2.95	2.89	5.43	2.18	N.S	18.85	22.32	N.S	6.80
		0.01	2.55	3.98	3.89	7.31	2.93	N.S	25.39	30.05	N.S	9.16

Concerning the specific effect of methods of application, it obvious from Table (7a) that the fertilizers applied as drench resulted in highly significantly increases of plant height during both seasons of study which gave (26.67 and 26.71 cm) during first and second seasons, respectively. On the contrary, spraying with fertilizers induced the least values (17.91 and 17.89cm) in 1996/1997 and 1997/1998 seasons.

With regard to the specific effect of rates of application, Table (7a) show that the high rate of application gave the tallest seedlings compared with control and other rates of application. Moreover, other investigated rates were statistically inducing highly significant increase in plant height over control. The same trend was found during first and second seasons.

Furthermore, Table (7a) indicate a significant effect as a results of interaction between form of fertilizers and methods of application on plant height. Data obtained showed that F_1 x D is more effective combination followed by F_2 x D as compared with the F_1 x S and F_2 x S.

As for the specific effect of interaction between forms of fertilizers and applied rates, Table (7a) briefly all combinations of F_1 x all rates and F_2 x all rates significantly increases plant height over control. F_1 and F_2 at high rates (1.5 gm/L) gave the most promising effect in this respect.

Regarding the interaction effect of (methods of application x rates of application) on plant height of seedlings of *Yucca filamentosa*, data obtained in Table (7a) indicates that in both seasons applied fertilizer by drench method of application (D) at low rates more effective as compared with Spraying (S) even at high level of application. In general all combinations of (D) with all rates of application significantly increased seedlings height as compared with (S) at all levels and control.

TABLE (7a) :- Specific effect of two forms of fertilizers , methods and rates of applcation and their interaction effect on (Plant height) of *Yucca filamentosa* (3 months old) during 1996/1997 & 1997/1998 seasons .

Specific effect of form of fertilizers (F)

Season	1 st S .	2 nd S .
F1	22.18	22.92
F2	22.39	21.69
L.S.D 0.05	N.S	1.04
L.S.D 0.01	N.S	N.S

Specific effect of methods of application (M)

Season	1 st S .	2 nd S .
S	17.91	17.89
D	26.67	26.71
L.S.D 0.05	0.67	1.04
L.S.D 0.01	0.90	1.41

Specific effect of rates of application (R)

Season	0.0	0.5	1.0	1.5	L.S.D	
					0.05	0.01
1 st S .	12.17	25.58	24.31	27.08	0.95	1.28
2 nd S .	13.50	24.42	24.79	26.50	1.48	1.99

Specific effect of interaction between F & M

	Season	1 st S .	2 nd S .
F1	S	17.60	17.38
	D	26.75	28.46
F2	S	18.21	18.42
	D	26.58	24.96
L.S.D	0.05	N.S	1.48
	0.01	N.S	1.99

Specific effect of interaction between F & R

	Season	1 st S .	2 nd S .
F1	0.0	12.17	13.50
	0.5	24.33	25.00
	1.0	25.21	25.67
	1.5	27.00	27.50
F2	0.0	12.17	13.50
	0.5	26.83	23.83
	1.0	23.42	23.92
	1.5	27.17	25.50
L.S.D	0.05	1.34	N.S
	0.01	1.81	N.S

Specific effect of interaction between M & R

	Season	1 st S .	2 nd S .
S	0.0	12.17	13.50
	0.5	15.50	15.33
	1.0	17.79	18.75
	1.5	26.17	24.00
D	0.0	12.17	13.50
	0.5	35.67	33.50
	1.0	30.83	30.83
	1.5	28.00	29.00
L.S.D	0.05	1.34	2.09
	0.01	1.81	2.81

In this connection, our results agree with the findings of **Al-Bahrany *et al* (1991)** on *Schefflera actinophylla*, **El Sayed (1994)** on *Brassaia actinophylla* and *Ficus nitida* "Hawaii" and **Hammad (1994)** on *Aralia longifolium* and *Cupressus sempervirens*.

II. A. 1. 2. Number of leaves :

Regarding the response of number of leaves to interaction between fertilizer form x method of application x application rate, it is obvious from data in Table (7) that F_1 at 1.0 gm/L applied as drench gave a highly significant increases in this respect followed by F_1 at 0.5 gm/L x D, F_2 at 0.5 gm/L x D and F_2 x D at 1.5gm/L in a descending order. This trend is true if the average of the two seasons was to taken in consideration. In spite of F_1 and F_2 at low rates application (0.5 & 1.0 gm/L) applied as sprays were the inferior regarding both plant height and number of leaves measurements but it become more effective than control.

As for specific effect of form of fertilizer, Table (7b) shows that there is no significant differences between the tow applied fertilizers in the first season. On the other hand, F_1 produced highly significant effect in 1997/1998.

With regard to the specific effect of methods of application, the data in Table (7b) cleared that drench gave the most promising effect as compared with spraying method. Moreover, it is obvious that in both seasons the number of leaves significantly increased by drench as a method of applied fertilizer. The values were (31.21 & 37.00) compared with (20.69 & 21.46) in first and second seasons, respectively.

Concerning the specific effect of rates of application of fertilizers, Table (7b) revealed that in both seasons the number of leaves/seedling tended to be greater with increasing the rate of applied fertilizer. In the general, the averages for the studied concentrations (0.00, 0.50, 1.00 and

1.50 gm/L) were (16.00, 25.50, 30.67 and 31.63) in the first seasons and (15.33, 34.58, 29.92 and 37.08) in the second season, respectively.

Regarding the response of number of leaves to interaction between forms of fertilizers and methods of application, Table (7b) shows in both seasons that F_1 x D gave the best of interactions followed by F2 x D. On the contrary, sprayed with F_1 and F_2 showed the lowest values. The percentage of increases of F_1 x D over F_1 x S reached to 63.6 and 104.8 % in the first and second seasons, respectively.

Concerning the specific effect of interaction of the forms of fertilizers and rates of application. Data in Table (7b) revealed that all combinations of F_1 and F_2 at all rates of application significantly increased number of developed leaves in Yucca seedlings over control. This trend was true during both seasons of study. However, F_2 at 1.5 gm/L tended to declare its own relative superiority over other combinations in the first season while, F_1 at 1.5 gm/L showed the same tendency of effectiveness in the second season and the differences between the prementioned two treatments were so small to be significant in most cases.

Furthermore, Table (7 b) indicate a significant effect as a result of interaction between methods of application S and D x rates of application of the two fertilizers at (0.0, 0.5, 1.0 and 1.5 gm/L). Briefly all the combinations of drench method and applied rates significantly increased the number of leaves as compared with spraying method and control. Moreover, fertilizers applied as drench x 0.5 gm/L gave the highest number of leaves followed by 1.5 gm/L and 1.0 gm/L, if the mean of two seasons was taken in consideration, the values were (43.41, 38.87and 38.45), respectively.

These results go in line with that reported by **Rodriguez and Cibes (1977)** on *Dracaena deremensis* "Warneckii", **Conover and Poole (1981)**

TABLE (7b) :- Specific effect of two forms of fertilizers , methods and rates of applcation and their interaction effect on (No. Of. leaves) of *Yucca filamentosa* (3 months old) during 1996/1997 & 1997/1998 seasons .

Specific effect of form of fertilizers (F)

Season	1 st S .	2 nd S .
F1	25.48	31.75
F2	26.42	26.71
L.S.D 0.05	N.S	1.92
L.S.D 0.01	N.S	2.58

Specific effect of methods of application (M)

Season	1 st S .	2 nd S .
S	20.69	21.46
D	31.21	37.00
L.S.D 0.05	1.02	1.92
L.S.D 0.01	1.38	2.58

Specific effect of rates of application (R)

Season	0.0	0.5	1.0	1.5	L.S.D	
					0.05	0.01
1 st S .	16.00	25.50	30.67	31.63	1.45	1.95
2 nd S .	15.33	34.58	29.92	37.08	2.71	3.65

Specific effect of interaction between F & M

	Season	1 st S .	2 nd S .
F1	S	19.33	20.83
	D	31.63	42.67
F2	S	22.04	22.08
	D	30.79	31.33
L.S.D	0.05	1.45	2.71
	0.01	1.95	3.65

Specific effect of interaction between F & R

	Season	1 st S .	2 nd S .
F1	0.0	16.00	15.33
	0.5	24.92	34.17
	1.0	35.75	38.67
	1.5	25.25	38.83
F2	0.0	16.00	15.33
	0.5	26.08	35.00
	1.0	25.58	21.17
	1.5	38.00	35.33
L.S.D	0.05	2.04	3.84
	0.01	2.75	5.17

Specific effect of interaction between M & R

	Season	1 st S .	2 nd S .
S	0.0	16.00	15.33
	0.5	15.50	17.83
	1.0	21.75	22.50
	1.5	29.50	30.17
D	0.0	16.00	15.33
	0.5	35.50	51.33
	1.0	39.58	37.33
	1.5	33.75	44.00
L.S.D	0.05	2.04	3.84
	0.01	2.75	5.17

on *Brassaia actinophylla*, **El Sayed (1994)** on *Brassaia actinophylla* and *Ficus nitida* "Hawaii" and **El Gendy *et al* (1995)** on *Dracaena draco*.

II. A. 1. 3. Leaf area :

Data concerning the effect of different combinations between forms of fertilizers, methods of application and rates of application on the leaf area measurements of *Yucca filamentosa* "three months old" seedlings are shown in Table (7):

Data revealed that F_1 x D at 1.0 gm/L was achieved the highest value in leaf area followed in a descending order by F_2 at the same rate x D and F_1 x D at 1.5 gm/L and F_1 & F_2 at 0.5 gm/L x D. These results were true during both seasons of study. The other combinations were in between the above mentioned treatments and control with variable values.

Concerning the specific effect of the two forms of fertilizers, data presented in Table (7 c) indicated that in both seasons of study, there was no significant differences in leaf area in response to F_1 and F_2 fertilizers. Thus, F_1 and F_2 are equal in this concern.

Regarding the specific effect of methods of application, it is obvious from results presented in Table (7c) that the highest value of leaf area was induced by these seedlings received fertilizers by the drench method which showed a highly significant effect during both seasons of study, the values were (26.74 and 27.19 cm^2) compared with spraying values (20.43 and 19.12 cm^2), respectively.

Regarding the specific effect of rates of application, data in Table (7c) showed that leaf area was positively proportioned to concentration used from fertilizers. Such trend was true during both first and second seasons. Leaf area increased continuously with increasing the rate of application to attain a high value (28.11 and 27.32 cm^2) at 1.5 gm/L in the first and second seasons, respectively.

TABLE (7c) :- Specific effect of two forms of fertilizers , methods and rates of applcation and their interaction effect on (Leaf area) of *Yucca filamentosa* (3 months old) during 1996/1997 & 1997/1998 seasons .

Specific effect of form of fertilizers (F)

Season	1 st S .	2 nd S .
F1	23.75	23.18
F2	23.41	23.13
L.S.D 0.05	N.S	N.S
L.S.D 0.01	N.S	N.S

Specific effect of methods of application (M)

Season	1 st S .	2 nd S .
S	20.43	19.12
D	26.74	27.19
L.S.D 0.05	0.77	0.97
L.S.D 0.01	1.04	1.31

Specific effect of rates of application (R)

Season	0.0	0.5	1.0	1.5	L.S.D	
					0.05	0.01
1 st S .	14.88	24.67	26.67	28.11	1.09	1.47
2 nd S .	16.10	24.04	25.16	27.32	1.37	1.85

Specific effect of interaction between F & M

	Season	1 st S .	2 nd S .
F1	S	19.85	18.95
	D	27.66	27.40
F2	S	21.01	19.28
	D	25.82	26.98
L.S.D	0.05	1.09	N.S
	0.01	1.47	N.S

Specific effect of interaction between F & R

	Season	1 st S .	2 nd S .
F1	0.0	14.88	16.10
	0.5	26.09	24.12
	1.0	26.07	25.36
	1.5	27.97	27.13
F2	0.0	14.88	16.10
	0.5	23.25	23.96
	1.0	27.26	24.95
	1.5	28.26	27.51
L.S.D	0.05	1.54	N.S
	0.01	2.07	N.S

Specific effect of interaction between M & R

	Season	1 st S .	2 nd S .
S	0.0	14.88	16.10
	0.5	19.88	17.76
	1.0	20.78	18.19
	1.5	26.19	24.41
D	0.0	14.88	16.10
	0.5	29.47	30.32
	1.0	32.56	32.11
	1.5	30.04	30.23
L.S.D	0.05	1.54	1.94
	0.01	2.07	2.62

Concerning the specific effect of interaction between forms of fertilizers and methods of application, Table (7c) indicates that during both seasons F_1 x D and F_1 x D gave (27.66 & 27.40 cm^2) and (25.82 & 26.98 cm^2) leaf area, respectively. Whereas, F_1 x S and F2 x S produced (19.85 & 18.95 cm^2) and (21.01 & 19.28 cm^2) leaf area, respectively. The differences were absent in 1997/1998 season.

As for specific effect of interaction between form of fertilizer and rate of application. Data tabulated in Table (7 c) shows regardless of the methods of application that increasing the rate of both F_1 & F_2 fertilizers gave the highest values of leaf area, all results statistically in increasing towards raising rates from (0.0) as control to (1.5 gm/L) which tended to be more effective during both seasons of study.

Concerning the specific effect of interaction between methods of application and rates of application, Table (7c) it is quite evident that, the greatest value of leaf area was obtained with a drench as a method of applied fertilizers and medium rate of application at 1.0 gm/L followed in descending order by 1.5 gm/L and 0.5 gm/L. The increase was significant as compared to those treated with spraying method or control during 1996/1997 and 1997/1998 seasons. Any how, it could be concluded that drench is the most effective method for application of fertilizers and economically reduce the doses which needed by seedlings of *Yucca filamentosa*.

The obtained results are in general agreement with that reported by **El Sayed (1994)** on *Brassaia actinophylla* and *Ficus nitida* "Hawaii", but they are in disagreement with that reported by **Mohamed (1992)** on *Livistonia chinensis*.

II. A. 1. 4. Fresh weight of leaves :

Concerning the interaction effect of different fertilizers x methods of application x rates of application on vegetative growth of *Yucca filamentosa* seedlings (3 months old) are shown in Table (7). Data obtained show clearly during two seasons that F_1 (Stimufol) at 1.0 gm/L applied as drench, could be noticed clearly as the best combination in increasing the fresh weight of leaves. In general the prementioned treatment gave the highest value of leaves fresh weight (181.75 & 192.97 gm) as compared with control (27.60 & 19.93 gm) in the first and second seasons, respectively. In addition, the other investigated combinations showed its own relative superiority especially both F_2 and F_1 at 0.5 gm/L applied as drench over all other investigated combinations (respective of spraying application).

As for the specific effect of forms of fertilizers, it is obvious from Table (7 d) that prepared fertilizer (F_2) was statistically more effective than F_1 (Stimufol) at the level of 5% in the first season. While in the second one this trend did not clearly evident.

With respect to the specific effect of method of application data in Table (7 d) show a quite evident that drench method was the superior in both seasons.

As for specific effect of rates of applications, Table (7d) shows clearly that increasing rate of applied fertilizers (irrespective to the methods of application) resulted significantly in inducing its promising effect, this was true with the two forms of fertilizers.

Concerning the specific effect of interaction between forms of fertilizer x methods of application, data in Table (7 d) revealed that all combinations of drench method of application with the two forms of fertilizers (F_1 and F_2) resulted in the superiority in this respect. Moreover, both treatments of

TABLE (7d) :- Specific effect of two forms of fertilizers , methods and rates of applcation and their interaction effect on (F. W. of leaves) of *Yucca filamentosa* (3 months old) during 1996/1997 & 1997/1998 seasons .

Specific effect of form of fertilizers (F)

Season	1 st S .	2 nd S .
F1	85.92	74.73
F2	92.71	77.57
L.S.D 0.05	6.67	N.S
L.S.D 0.01	N.S	N.S

Specific effect of methods of application (M)

Season	1 st S .	2 nd S .
S	58.94	37.70
D	119.69	114.59
L.S.D 0.05	6.67	7.89
L.S.D 0.01	8.98	10.63

Specific effect of rates of application (R)

Season	0.0	0.5	1.0	1.5	L.S.D	
					0.05	0.01
1 st S .	27.60	114.37	102.71	112.58	9.43	12.69
2 nd S .	19.93	88.84	92.54	103.28	11.16	15.03

Specific effect of interaction between F & M

	Season	1 st S .	2 nd S .
F1	S	51.09	22.78
	D	120.75	126.67
F2	S	66.79	52.62
	D	118.63	102.52
L.S.D	0.05	9.43	11.16
	0.01	N.S	15.03

Specific effect of interaction between F & R

	Season	1 st S .	2 nd S .
F1	0.0	27.60	19.93
	0.5	117.07	92.65
	1.0	123.08	106.31
	1.5	75.93	80.01
F2	0.0	27.60	19.93
	0.5	111.68	85.03
	1.0	82.35	78.76
	1.5	149.23	126.56
L.S.D	0.05	13.33	15.78
	0.01	17.95	21.25

Specific effect of interaction between M & R

	Season	1 st S .	2 nd S .
S	0.0	27.60	19.93
	0.5	51.45	22.89
	1.0	53.62	29.83
	1.5	103.10	78.16
D	0.0	27.60	19.93
	0.5	177.29	154.79
	1.0	151.81	155.24
	1.5	122.05	128.42
L.S.D	0.05	13.33	15.78
	0.01	17.95	21.25

spraying and form of fertilizer ranked second to the above mentioned superior combinations.

As for the interaction effect of forms of fertilizers x rates of applications, data obtained during 1996/1997 and 1997/1998 seasons as shown in Table (7 d) indicated obviously that a high rate (1.5 gm/L) of prepared fertilizer (F_2) as well as the medium rate (1.0 gm/ L) of Stimufol resulted in the most effective combinations. Moreover, both combinations of low rate (0.5 gm/L) of the two fertilizers ranked the second to the above mentioned two superior combinations. In general all combinations of F_1 and F_2 x all applied rates gave a high significant effect over control. Such trend was true during two seasons of study.

Concerning the interaction between the methods of application and rates of application of fertilizers, data obtained in Table (7 d) showed that all combinations had a significant effect over control during both seasons of study. Regardless to the forms of fertilizers, drench method of applied fertilizers especially at low rate 0.5 gm/L gave the most promising effect followed in descending order by medium & high rates of application. Anyway spraying method treatments proved to be the less effective treatments.

Our results are in harmony with that reported by **Conover and Poole (1981)** on *Brassaia actinophylla*, **Broschat (1982)** on *Ficus benjamina* and **El.Gendy *et al* (1995)** on *Dracaena draco.*

II. A. 1. 5. Dry weight of leaves :

With respect to the dry weight of leaves of three months old *Yucca filamentosa* seedlings, data obtained in Table (7), showed that the dry weight of leaves took similar trend of fresh weight of leaves. Moreover, all combinations treatments were statistically insignificant during the first season and significant during the second one.

TABLE (7e) :- Specific effect of two forms of fertilizers , methods and rates of applcation and their interaction effect on (D. W. of leaves) of *Yucca filamentosa* (3 months old) during 1996/1997 & 1997/1998 seasons .

Specific effect of form of fertilizers (F)

Season	1 st S .	2 nd S .
F1	15.33	16.06
F2	14.51	14.48
L.S.D 0.05	N.S	N.S
L.S.D 0.01	N.S	N.S

Specific effect of methods of application (M)

Season	1 st S .	2 nd S .
S	9.71	8.54
D	20.13	21.99
L.S.D 0.05	1.23	2.41
L.S.D 0.01	1.66	3.24

Specific effect of rates of application (R)

Season	0.0	0.5	1.0	1.5	L.S.D	
					0.05	0.01
1 st S .	7.88	17.43	16.98	17.37	1.75	2.35
2 nd S .	4.82	17.79	17.92	20.54	3.40	4.58

Specific effect of interaction between F & M

Season		1 st S .	2 nd S .
F1	S	9.85	5.92
	D	20.80	26.19
F2	S	9.57	11.16
	D	19.45	17.79
L.S.D	0.05	N.S	3.40
	0.01	N.S	4.58

Specific effect of interaction between F & R

Season		1 st S .	2 nd S .
F1	0.0	7.88	4.82
	0.5	19.73	18.75
	1.0	19.55	21.72
	1.5	14.13	18.95
F2	0.0	7.88	4.82
	0.5	15.13	16.84
	1.0	14.42	14.12
	1.5	20.60	22.13
L.S.D	0.05	2.47	4.81
	0.01	3.33	N.S

Specific effect of interaction between M & R

Season		1 st S .	2 nd S .
S	0.0	7.88	4.82
	0.5	6.83	3.18
	1.0	9.62	9.28
	1.5	14.50	16.89
D	0.0	7.88	4.82
	0.5	28.03	32.39
	1.0	24.35	26.57
	1.5	20.24	24.19
L.S.D	0.05	2.47	4.81
	0.01	3.33	6.48

These results agree with that reported by **Abou Dahab (1992)** on *Asparagus sprengeri*, **El Sayed (1994)** on *Brassaia actinophylla* and *Ficus nitida* "Hawaii" and **El Gendy *et al* (1995)** on *Dracaena draco*.

II. A. 2. Root growth measurements :

II. A. 2. 1. Number of roots :

It is clear from the data in Table (8) that the largest number of roots per seedling of *Yucca filamentosa* as 23.33 and 21.67 were produced with the combination of F_1 (Stimufol) at 0.5 gm/L applied by drench method in the first and second seasons, respectively. Moreover, all treatments (combinations) between the investigated two fertilizers and drench method of application "irrespective to the rate of application" gave the highest number of roots per seedlings. While, the treatments of the two fertilizers F_1& F_2 especially F_2 at the high level of application (1.5 gm/L) applied by spraying method not only ranked second to aforesaid superior treatments but also were statistically of the same effectiveness as each was compared to other. On the contrary, the lowest number of roots was obtained by those combinations of the lowest rates (0.5 gm/L and 1.0 gm /L) of F_2 applied by spraying method so they were statically the inferior during the two seasons of study.

Regarding the specific effect of forms of fertilizers. Data in Table (8 a) showed that in 1996/1997 and 1997/1998 seasons, Stimufol was the best for Yucca seedling as the number of developed roots per seedling was increased as compared with the prepared fertilizer but the differences did not reach the level of highly significant in the second season.

With respect to the specific effect of methods of application, data in Table (8 a) declared that the differences were highly significant whereas, drench method exhibited not only significant variance but also showed approximately a firm trend as the best method of applied fertilizers.

TABLE (8) :- Interaction effect of different combination between two forms of fertilizers, methods and rates of application on root growth of *Yucca filamentosa* / 3months old

TREATMENTS			NO. of roots		Length of roots(cm)		F.W. of roots(g.)		D.W. of roots(g.)	
Fert. Types	Appl. Meth.	Appl. Rate	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S SPRAY	0.0	12.33	10.67	21.33	28.75	5.33	6.17	2.17	2.81
		0.5	19.00	10.00	43.00	45.33	12.67	10.37	3.00	2.69
		1.0	16.50	11.00	34.50	43.00	8.67	9.03	2.10	3.17
		1.5	15.67	18.00	47.00	46.00	10.47	16.03	2.95	4.84
	D DRENCH	0.0	12.33	10.67	21.33	28.75	5.33	6.17	2.17	2.81
		0.5	23.33	21.67	32.50	31.00	28.47	32.17	6.40	8.24
		1.0	20.67	17.00	45.17	40.33	18.07	25.36	4.30	5.74
		1.5	15.00	12.67	58.33	51.33	14.27	21.99	3.93	5.58
F2	S SPRAY	0.0	12.33	10.67	21.33	28.75	5.33	6.17	2.17	2.81
		0.5	7.00	9.33	37.75	50.50	6.80	6.52	1.70	1.73
		1.0	10.00	9.00	21.33	24.50	5.20	18.88	1.07	2.85
		1.5	21.33	17.67	45.33	41.50	12.70	28.28	4.77	5.56
	D DRENCH	0.0	12.33	10.67	21.33	28.75	5.33	6.17	2.17	2.81
		0.5	14.00	11.67	58.50	56.50	34.20	31.89	5.20	10.69
		1.0	21.50	16.33	44.67	40.00	13.20	13.30	3.30	3.63
		1.5	21.50	15.67	50.00	45.67	18.67	23.34	3.47	4.33
L.S.D		0.05	2.41	3.32	6.36	5.97	4.87	6.70	0.93	1.43
		0.01	N.S	4.47	8.58	8.04	N.S	9.03	N.S	1.93

Concerning the specific effect of applied rates regardless the forms of fertilizers and method of application, data in Table (8 a) shows that, all tested rates of fertilizers significantly increased number of roots / seedling over the control during the two seasons of study, the increase in number of roots continuously observed with increasing fertilizer rates. Whereas, differences between all concentrations were significant during two seasons.

Concerning the specific effect of interaction between forms of fertilizers and methods of application on the number of initiated roots, it is noticed that both fertilizers (F_1 and F_2) gave significantly in the first season only the highest number of roots per seedling when applied by drench method as compared with those of sprayed ones, Table (8 a).

As for the interaction effect of (F_1 & F_2) x (0.0, 0.5, 1.0 and 1.5 gm/L) on the number of roots developed per seedling, Table (8 a) show clearly that F_1 (Stimufol) at low levels 0.5 and 1.0 gm/L gave the most promising effect, while F_2 (prepared fertilizer) was more effective at the highest rate of application (1.5 gm/L) in the two seasons.

Regarding the specific effect of interaction of methods of application (S and D) x rates of application of two fertilizers (0.0, 0.5, 1.0 and 1.5 gm/L), it obvious from Table (8 a) that drench method of application exhibits a firm trend in increasing the number of roots per seedling regardless of the forms of fertilizers at all rates of applications and spray at 1.5 gm/L as compared to control and other combinations.

Furthermore, seedlings of *Yucca filamentosa* at 3 months old needs a high rates of completed nutrient solutions if it will be used as spray. It may be due to the presence of waxy layer on leaves surface.

These results are agree with that reported by **Salah (1994)** on *Codieum variegatum* and **El-Gendy *et al* (1995)** on *Dracaena draco.*

TABLE (8a) :- Specific effect of two forms of fertilizers , methods and rates of applcation and their interaction effect on (No. of roots) of *Yucca filamentosa* (3 months old) during 1996/1997 & 1997/1998 seasons .

Specific effect of form of fertilizers (F)

Season	1 st S .	2 nd S .
F1	16.85	13.96
F2	15.00	12.63
L.S.D 0.05	0.85	1.17
L.S.D 0.01	1.15	N.S

Specific effect of methods of application (M)

Season	1 st S .	2 nd S .
S	14.27	12.04
D	17.58	14.54
L.S.D 0.05	0.85	1.17
L.S.D 0.01	1.15	1.58

Specific effect of rates of application (R)

Season	0.0	0.5	1.0	1.5	L.S.D	
					0.05	0.01
1 st S .	12.33	15.83	17.17	18.38	1.20	1.62
2 nd S .	10.67	13.17	13.33	16.00	1.66	2.23

Specific effect of interaction between F & M

	Season	1 st S .	2 nd S .
F1	S	15.88	12.42
	D	17.83	15.50
F2	S	12.67	11.67
	D	17.33	13.58
L.S.D	0.05	1.20	N.S
	0.01	1.62	N.S

Specific effect of interaction between F & R

	Season	1 st S .	2 nd S .
F1	0.0	12.33	10.67
	0.5	21.17	15.83
	1.0	18.58	14.00
	1.5	15.33	15.33
F2	0.0	12.33	10.67
	0.5	10.50	10.50
	1.0	15.75	12.67
	1.5	21.42	16.67
L.S.D	0.05	1.70	2.35
	0.01	2.29	3.16

Specific effect of interaction between M & R

	Season	1 st S .	2 nd S .
S	0.0	12.33	10.67
	0.5	13.00	9.67
	1.0	13.25	10.00
	1.5	18.33	17.83
D	0.0	12.33	10.67
	0.5	18.67	16.67
	1.0	21.08	16.67
	1.5	18.25	14.17
L.S.D	0.05	1.70	2.35
	0.01	2.29	3.16

II. A. 2. 2. Length of roots :

The obtained results regarding root length in response to treatments of (F_1 and F_2) x (S and D) x (0.0, 0.5, 1.0 and 1.5 gm/L) are in Table (8), showed that all combination treatments increased the root length (cm) per seedling of *Yucca filamentosa* in comparison to root length of untreated plants (control) in the two seasons of 1996/1997 and 1997/1998. Results revealed also that the significant tallest root was obtained by those seedlings treated with either F_2 at 0.5 & 1.5 gm/L applied as drench or F_1 at 1.5 gm/L applied as drench in the two seasons. In this respect root length of 3 months Yucca seedlings response to the above mentioned treatments were taller than those treated with spray F_1 or F_2 (irrespective to the rates of application). However, seedling sprayed with F_1 at 1.5 gm/L came the second followed in descending order by those sprayed with F_1 and F_2 at low rate of application during the two seasons of study.

Regarding the specific effect of the forms of fertilizers used, data presented in Table (8 b) revealed that both forms of fertilizers were nearly equal in their effectiveness on the root length of Yucca seedling so the differences were so small to be significant.

As for the specific effect of the methods of application, Table (8 b) indicated that in the first season seedlings received fertilizers as drench had significantly taller roots as compared with those ones received fertilizers as spray. While, in the second season differences were so small to be significant. In general, drench method gave the highest value of root length (41.48 and 40.29 cm) as compared with spraying (33.95 and 38.54 cm) in the first and second seasons, respectively.

Regarding the specific effect of applied rates of fertilizers data in Table (8 b) showed clearly that in both seasons, it could be descendingly arranged the three applied rates regarding in their specific effect of root length as

follows: 1.5 gm/L (50.17 and 46.13 cm), 0.5 gm/L (42.94 and 45.84 cm) and 1.0 gm/L (36.42 and 36.96 cm) for the first and second seasons, respectively. The differences between the three tested rates were significant at 1% level. These results are in disagreement with that reported by **Salah (1994)** on *Codieum variegatum* who found that the tallest roots were obtained by using Kristalon fertilizer at 1000 ppm.

Concerning the specific effect of combination of fertilizers and methods of application on root length, data in Table (8 b) indicated that combinations of F2 x D gave the highest values in this respect (43.63 and 42.73 cm) in the first and second seasons, respectively. On the contrary, F_2 x S was the inferior treatment. Other treatments took intermediate place between the two extremes with variable values.

Concerning the specific effect of interaction between fertilizer forms and rates of application on length of root of 3 months Yucca seedlings data in Table (8 b) indicated that in both seasons the tallest root length was concomitant to those seedlings received Stimufol (F_1) at high rate (1.5 gm/L). In addition prepared fertilizer (F_2) at 0.5 gm/L was more effective in increasing root length significantly over control (48.13 and 53.50 cm) for 1996/1997 and 1997/1998 seasons, respectively. On the contrary, zero fertilized seedlings (as control) was inferior treatment (21.33 and 28.75 cm) during first and second seasons, respectively. Other treatments took intermediate place between the two extremes with variable values.

As for the specific effect of interaction between methods of applications (S and D) x rates of applications (0.0, 0.5, 1.0, 1.5 gm/L) data in Table (8 b) showed clearly that drench at high rate 1.5 gm/L had significantly the tallest root of seedling (54.17 and 48.50 cm) while, both spraying at 1.5 gm/L and drench at 0.5 gm/L produced nearly the same

TABLE (8b) :- Specific effect of two forms of fertilizers , methods and rates of application and their interaction effect on (Length of roots) of *Yucca filamentosa* (3 months old) during 1996/1997 & 1997/1998 seasons .

Specific effect of form of fertilizers (F)

Season	1 st S .	2 nd S .
F1	37.89	39.31
F2	37.53	39.52
L.S.D 0.05	N.S	N.S
L.S.D 0.01	N.S	N.S

Specific effect of methods of application (M)

Season	1 st S .	2 nd S .
S	33.95	38.54
D	41.48	40.29
L.S.D 0.05	2.25	N.S
L.S.D 0.01	3.03	N.S

Specific effect of rates of application (R)

Season	0.0	0.5	1.0	1.5	L.S.D	
					0.05	0.01
1 st S .	21.33	42.94	36.42	50.17	3.18	4.28
2 nd S .	28.75	45.84	36.96	46.13	2.98	4.02

Specific effect of interaction between F & M

	Season	1 st S .	2 nd S .
F1	S	36.46	40.77
	D	39.33	37.85
F2	S	31.44	36.31
	D	43.63	42.73
L.S.D	0.05	3.18	2.98
	0.01	4.28	4.02

Specific effect of interaction between F & R

	Season	1 st S .	2 nd S .
F1	0.0	21.33	28.75
	0.5	37.75	38.17
	1.0	39.83	41.67
	1.5	52.67	48.67
F2	0.0	21.33	28.75
	0.5	48.13	53.50
	1.0	33.00	32.25
	1.5	47.67	43.58
L.S.D	0.05	4.49	4.22
	0.01	6.05	5.68

Specific effect of interaction between M & R

	Season	1 st S .	2 nd S .
S	0.0	21.33	28.75
	0.5	40.38	47.92
	1.0	27.92	33.75
	1.5	46.17	43.75
D	0.0	21.33	28.75
	0.5	45.50	43.75
	1.0	44.92	40.17
	1.5	54.17	48.50
L.S.D	0.05	4.49	4.22
	0.01	6.05	5.68

effect on root length (46.17 and 43.75 cm) and (45.50 and 43.75 cm) in the first and second seasons, respectively.

The outlined results agree with that obtained by **El Sayed (1994)** on *Brassaia actinophylla* and *Ficus nitida* "Hawaii".

II. A. 2. 3. Fresh weight of roots :

with regard to the interaction effect of fertilizer forms x methods of applications x rates of applications, data in Table (8) declared obviously that both prepared fertilizer (F_2) and Stimufol (F_1) at all rates of applications especially 0.5 g/L applied as drench gave the most heaviest root (34.20 and 31.89 gm) and (28.47 and 32.17 gm) in the first and second seasons, respectively. On the contrary, untreated seedlings (control) resulted in the lowest value in this respect during the two seasons (5.33 and 6.17gm). Moreover, other investigated combinations were in between with variable degree of variations. In addition, F_1 at 1.0 gm/L as drench followed in descending order by F_2 at 1.5 gm/L as drench and the same combination as spray produced a dense root much more than other combinations. The statistical increase was not reach the 1% significant in the first season but reached it in the second one.

Concerning the specific effect of forms of fertilizers on root fresh weight of 3 months *Yucca filamentosa* seedlings data in Table (8 c) indicated that there is no significant differences between F_1 (Stimufol) and prepared fertilizers (F_2) whereas, all obtained data exhibited not only insignificant variance but also showed approximately the same value of fresh weight of root per seedling.

Regarding the specific effect of methods of application, it was quite evident shown Table (8 c) that the heaviest roots were produced by fertilizers applied as drench (irrespective to form of fertilizer). This trend was statistically highly significant is both seasons of study.

With respect to the specific effect of the rates of applied fertilizers on root fresh weight of 3 months Yucca seedlings, Table (8 c) shows in both 1996/1997 and 1997/1998 seasons that fertilized seedlings with low rate 0.5 gm/L recorded a pronounced effect in increasing root fresh weight more than other rates of application (20.53 and 20.24gm) in both seasons, respectively. Meanwhile, applied fertilizer at 1.5 gm/L ranked second in this concern and gave (14.03 and 22.41gm) in 1996/1997 and 1997/1998, respectively.

As for specific effect of interaction between (F_1 & F_2) and (S & D) on fresh weight of 3 months *Yucca filamentosa* seedlings data in Table (8 c) reveals that in the first & second seasons both fertilizers applied as drench were more effective for increasing root fresh weight than spray treatments. It is worth to be mentioned that F_2 x D gave the highest values (17.85 gm) in the first season and F_1 x D gave (21.42 gm) in the second season. While, the lowest values obtained from F_1 x S and F_2 x S which ranged from (9.28 and 10.39 gm) and (7.51 and 14.96 gm) in the first and second seasons, respectively. The differences between all treatments were insignificant during first season only.

As for the specific effect of interaction between two forms of x rates of applications, it is noticed that in the first season, F_1 at low rate 0.5 gm/L gave the heaviest fresh weight of roots followed designedly by F2 at 0.5 gm/L and F_2 at 1.5 gm/L, Table (8 c) as compared to control and other combinations. Meanwhile, in the second season the results revealed that F_2 at 1.5 gm/L produced the heaviest root weight of Yucca seedling followed in descending order by F_1 x 0.5 gm/L and F_2 x 0.5 gm/L respectively, and finally the control ranked last as representative of the inferior one.

The response of fertilizers for producing heavy root system conceded with the findings of **El - Gendy *et al* (1995)** on *Dracaena draco* which

TABLE (8c) :- Specific effect of two forms of fertilizers , methods and rates of applcation and their interaction effect on (F. W. of roots) of *Yucca filamentosa* (3 months old) during 1996/1997 & 1997/1998 seasons .

Specific effect of form of fertilizers (F)

Season	1 st S .	2 nd S .
F1	12.91	15.91
F2	12.68	16.82
L.S.D 0.05	N.S	N.S
L.S.D 0.01	N.S	N.S

Specific effect of methods of application (M)

Season	1 st S .	2 nd S .
S	8.39	12.68
D	17.19	20.05
L.S.D 0.05	1.72	2.37
L.S.D 0.01	2.32	3.19

Specific effect of rates of application (R)

Season	0.0	0.5	1.0	1.5	L.S.D	
					0.05	0.01
1 st S .	5.33	20.53	11.28	14.03	2.44	3.28
2 nd S .	6.17	20.24	16.64	22.41	3.35	4.51

Specific effect of interaction between F & M

	Season	1 st S .	2 nd S .
F1	S	9.28	10.39
	D	16.53	21.42
F2	S	7.51	14.96
	D	17.85	18.67
L.S.D	0.05	N.S	3.35
	0.01	N.S	4.51

Specific effect of interaction between F & R

	Season	1 st S .	2 nd S .
F1	0.0	5.33	6.17
	0.5	20.57	21.27
	1.0	13.37	17.19
	1.5	12.37	19.01
F2	0.0	5.33	6.17
	0.5	20.50	19.20
	1.0	9.20	16.09
	1.5	15.68	25.81
L.S.D	0.05	3.45	4.74
	0.01	N.S	N.S

Specific effect of interaction between M & R

	Season	1 st S .	2 nd S .
S	0.0	5.33	6.17
	0.5	9.73	8.44
	1.0	6.93	13.96
	1.5	11.58	22.16
D	0.0	5.33	6.17
	0.5	31.33	32.03
	1.0	15.63	19.33
	1.5	16.47	22.67
L.S.D	0.05	3.45	4.74
	0.01	4.64	6.38

found that fertilizer application increased root weights compared with unfertilized controls.

Concerning the specific effect of interaction of methods of applications (S and D) and rates application (0.0, 0.5, 1.0, 1.5 gm/L) data in Table (8 c) cleared that all combinations treatments increased significantly the fresh weight, of roots (gm) in comparison to those untreated seedlings (control) in the two seasons of study. The results revealed also that the heaviest roots among all combinations were obtained after applied fertilizers as drench especially at low rate 0.5 gm/L (irrespective to fertilizer forms) in the two seasons followed decently by D x 1.5 gm/L. The other combinations came in within the above two mentioned extents during the two seasons.

Our findings are in partial agreement with that reported by **Mohamed (1992)** on *Livistonia chinensis*.

II. A. 2. 4. Dry weight of roots :

Data dealing with the interaction effect of forms of fertilizers x methods of application x rates of application on dry weight of roots are shown in Table (8), all combination treatments significantly increased the dry weight of roots. It is obvious that all interactions showed a similar firm trend on their effects on dry weight of roots of 3 months old *Yucca filamentosa* seedlings as it was in a fresh weight combinations.

These results are in harmony with that reported by **El Sayed (1994)** on *Brassaia actinophylla* and *Ficus nitida* "Hawaii" and **El-Gendy *et al* (1995)** on *Dracaena draco*.

II. A. 3. Chemical composition :

The interaction effect of different combinations between forms of fertilizer x methods of applications x rates of application on chemical composition of leaves of *Yucca filamentosa* seedlings :

TABLE (8d) :- Specific effect of two forms of fertilizers , methods and rates of applcation and their interaction effect on (D. W. of roots) of *Yucca filamentosa* (3 months old) during 1996/1997 & 1997/1998 seasons .

Specific effect of form of fertilizers (F)

Season	1 st S .	2 nd S .
F1	3.38	4.49
F2	2.98	4.30
L.S.D 0.05	0.33	N.S
L.S.D 0.01	N.S	N.S

Specific effect of methods of application (M)

Season	1 st S .	2 nd S .
S	2.49	3.31
D	3.87	5.48
L.S.D 0.05	0.33	0.51
L.S.D 0.01	0.44	0.68

Specific effect of rates of application (R)

Season	0.0	0.5	1.0	1.5	L.S.D	
					0.05	0.01
1 st S .	2.17	4.08	2.69	3.78	0.46	0.63
2 nd S .	2.81	5.84	3.85	5.08	0.72	0.96

Specific effect of interaction between F & M

Season		1 st S .	2 nd S .
F1	S	2.56	3.38
	D	4.20	5.59
F2	S	2.43	3.24
	D	3.53	5.37
L.S.D	0.05	N.S	N.S
	0.01	N.S	N.S

Specific effect of interaction between F & R

Season		1 st S .	2 nd S .
F1	0.0	2.17	2.81
	0.5	4.70	5.46
	1.0	3.20	4.46
	1.5	3.44	5.21
F2	0.0	2.17	2.81
	0.5	3.45	6.21
	1.0	2.18	3.24
	1.5	4.12	4.95
L.S.D	0.05	0.66	N.S
	0.01	0.88	N.S

Specific effect of interaction between M & R

Season		1 st S .	2 nd S .
S	0.0	2.17	2.81
	0.5	2.35	2.21
	1.0	1.58	3.01
	1.5	3.86	5.20
D	0.0	2.17	2.81
	0.5	5.80	9.46
	1.0	3.80	4.69
	1.5	3.70	4.96
L.S.D	0.05	0.66	1.01
	0.01	0.88	1.36

II. A. 3. a. Nitrogen content :

II. A. 3. a. 1. Leaf nitrogen content :

Data in Table (9) revealed that N leaf % was considerably affected by interaction combinations of the two forms of fertilizers (F_1& F_2) x the two methods of application (S & D) x rates of applications (0.5, 1.0 and 1.5 gm/L).. In addition, F_2 at 1.5gm/L applied as D yielded the highest leaf N % (1.75 and 1.85 %) in the first and second seasons, respectively. Moreover, if an average of the two seasons was concerned F_2 at 1.0 gm /L as drench ranked statistically second (1.64%) and followed descendingly by both F_1 and F_2 at 0.5gm/ L as spray (1.50 & 1.48 %) respectively, and F_1 at 0.5gm/ L as drench (1.45 %). In general, other combinations were in between as compared to the previously mentioned treatments and control plants, whereas differences among all combinations treatments did not reach to the level of significance during two seasons.

As for specific effect of the forms of fertilizers, Table (9 a) declared that the differences between the two forms (F_1 and F_2) were so little to be significant in the first season, whereas the two fertilizers gave not only insignificant variance but also showed approximately the same value of nitrogen content in the leaves of *Yucca filamentosa* seedlings. While, in the second season F_2 significantly increased N content of leaves over F_1.

Concerning the specific effect of methods of applied fertilizers, Table (9 a) revealed the superiority of drench method of applied fertilizers in increasing leaf N%. Nevertheless, it was so interesting to be observed clearly a firmer trend declared obviously that the presence of waxy layers on *Yucca filamentosa* leaves may decreased to some extent the efficiency of fertilizers solutions to be absorbed well through leaf tissues

As regard to specific effect of the rates of application,Table (9 a) shows that all tested rates significantly increased nitrogen content in the seedlings leaves over control during the two seasons of study. However, the

TABLE (9) :- Interaction effect of different combination between two forms of fertilizers , methods and rates of application on N, P and K % of *Yucca filamentosa* / 3 months old

TREATMENT			N %				P %				K%			
			Leaves		Roots		Leaves		Roots		Leaves		Roots	
Fert. Types	Appl.Meth.	Appl.Rate	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S SPRAY	0.0	1.13	1.03	0.85	0.77	0.245	0.260	0.135	0.124	1.10	1.10	0.67	0.70
		0.5	1.53	1.47	1.10	1.20	0.473	0.483	0.180	0.185	1.48	1.51	0.75	0.78
		1.0	1.63	1.25	1.23	1.20	0.478	0.483	0.210	0.218	1.43	1.40	0.85	0.90
		1.5	1.17	1.40	1.23	1.27	0.455	0.463	0.171	0.163	1.46	1.51	0.88	0.88
	D DRENCH	0.0	1.13	1.03	0.85	0.77	0.245	0.260	0.135	0.124	1.10	1.10	0.67	0.70
		0.5	1.50	1.40	1.33	1.40	0.410	0.418	0.189	0.209	1.44	1.45	0.66	0.68
		1.0	1.27	1.35	0.93	1.23	0.332	0.350	0.163	0.163	1.49	1.44	0.69	0.73
		1.5	1.57	1.30	1.00	1.13	0.412	0.420	0.270	0.260	1.51	1.59	0.81	0.81
F2	S SPRAY	0.0	1.13	1.03	0.85	0.77	0.245	0.260	0.135	0.124	1.10	1.10	0.67	0.70
		0.5	1.53	1.43	1.17	1.35	0.475	0.415	0.190	0.193	1.50	1.51	0.84	0.89
		1.0	1.43	1.47	1.27	1.30	0.373	0.368	0.242	0.237	1.47	1.41	0.90	0.99
		1.5	1.27	1.37	1.33	1.37	0.463	0.460	0.168	0.184	1.46	1.49	0.91	1.04
	D DRENCH	0.0	1.13	1.03	0.85	0.77	0.245	0.260	0.135	0.124	1.10	1.10	0.67	0.70
		0.5	1.33	1.30	1.07	1.10	0.397	0.250	0.173	0.194	1.42	1.38	0.86	0.89
		1.0	1.57	1.70	1.20	1.30	0.350	0.319	0.189	0.189	1.44	1.45	0.83	0.82
		1.5	1.75	1.85	1.30	1.40	0.364	0.350	0.324	0.340	1.50	1.49	0.87	0.88
L.S.D		0.05	N.S	N.S	N.S	N.S	N.S	0.058	N.S	N.S	N.S	N.S	N.S	N.S
		0.01	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S

increase in nitrogen content continually observed with increasing fertilizer doses especially during the second season of study whereas, differences between all rates were significant during both seasons.

With respect to the specific effect of interaction between forms of fertilizers (F_1 & F_2) and methods of application (S & D), it obvious form Table (9 a) that the highest value of N content in the leaves of Yucca 3 months old seedlings was obtained after combination treatments of F2 (prepared fertilizer) x D (drench method of applications) in the two seasons. In addition other combination treatments showed a variable response. However, the differences between the above mentioned treatments were insignificant during the two seasons of study.

As for the specific effect of interaction between fertilizers and rates of application, data presented in Table (9 a) revealed that F_2 (prepared fertilizer) at 1.5gm/ L gave the highest values of N content in the leaves (1.51 and 1.61 %) in the first and second seasons respectively, followed in descending order by F_2 at 1.0 gm/L (1.50 and 1.58 %) in 1996/1997 and 1997/1998, respectively. Statistical variance between combinations treatments did not reach to the level of significance during the two seasons of this experiment.

Concerning the specific effect of interaction between methods of applications and rates of applied fertilizers irrespective to the fertilizer forms. Table (9 a) shows that in 1996 / 1997 and 1997 /1998 seasons, all six treatments of (S and D) x (0.5, 1.0 and 1.5 gm/ L) produced leaves with a highly N content comparison to the untreated ones (control). Moreover, D (drench method of applied fertilizer) x 1.5gm/L resulted in the highest N content (1.66 and 1.58 %) in the first and second seasons respectively, as compared to the others combination treatments. On contrary, the lowest leaf N % of 3 months old *Yucca filamentosa* seedlings was obtained by spraying at 1.5 gm/L in the first season (1.22%) and

drenching at 0.5 gm/L in the second season (1.35%). However, differences between combinations treatments were more pronounced during the first season and reached level of significance at 5% as they compared each to other.

In this connections, our results agree with that reported by **Shen and Seely (1983)** on *Peperomia obtusifolia*, **Mansour (1985)** on *Chamaedorea sp.* and **Anuradha *et al* (1988)** on marigold and they are in disagreement with that obtained by **Mohamed (1992)** on *Livistonia chinensis*.

II. A. 3. a. 2. Root nitrogen content :

Concerning the interaction effect of two forms of fertilizers, methods of application and rates of application on N % of *Yucca filamentosa* roots (3 months old), data tabulated in Table (9) indicated that no significant differences were observed between all combinations under study during both seasons. However, both F_2 x S at 1.5 gm/L , F_1 x D at 0.5 gm/L and F_2 x D at 1.5 gm/L showed their own relative superiority in this regard with mean % (1.33 , 1.33 and 1.30 %) and (1.37 , 1.40 and 1.40 %) during the first and second seasons, respectively. Moreover, if an average of the two seasons was taken in consideration F_2 x S at 1.0 gm/L ranked second (1.29%). On the other hand, the other combinations were in between the above mentioned treatments and control with variable values.

Regarding the specific effect of two forms of fertilizers, it is obvious from Table (9 a) that during both seasons F_2 gave insignificantly the highest value of N % in roots (1.13 and 1.17 %) compared with F_1 (1.07 and 1.12 %) during the first and second seasons, respectively.

As for the specific effect of methods of application, Table (9 a) showed clearly that the differences between two methods were so little to be significant in both seasons, whereas the two methods produced not only insignificant variance but also showed nearly the same percentage of N content in root of Yucca seedlings.

TABLE (9a) :- Specific effect two of forms of fertilizers , methods and rates of application and their interaction effect on (N % in leaves and roots) of Yucca *filamentosa* (3 months old) during 1996 - 1997 / 1997 - 1998 seasons.

Specific effect of form of fertilizers (F)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	1.37	1.28	1.07	1.12
F2	1.39	1.39	1.13	1.17
L.S.D 0.05	N.S	0.11	N.S	N.S
L.S.D 0.01	N.S	N.S	N.S	N.S

Specific effect of methods of application (M)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
S	1.35	1.31	1.13	1.15
D	1.41	1.37	1.07	1.14
L.S.D 0.05	N.S	N.S	N.S	N.S
L.S.D 0.01	N.S	N.S	N.S	N.S

Specific effect of rates of application (R)

Season		0.0	0.5	1.0	1.5	L.S.D	
						0.05	0.01
Leaves	1 st S.	1.13	1.48	1.48	1.44	0.21	0.28
	2 nd S.	1.03	1.40	1.44	1.48	0.16	0.22
Roots	1 st S.	0.85	1.17	1.16	1.22	0.14	0.19
	2 nd S.	0.77	1.26	1.26	1.29	0.19	0.27

Specific effect of interaction between F & M

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S	1.37	1.29	1.10	1.11
	D	1.37	1.27	1.03	1.13
F2	S	1.34	1.33	1.15	1.19
	D	1.45	1.47	1.10	1.14
L.S.D	0.05	N.S	N.S	N.S	N.S
	0.01	N.S	N.S	N.S	N.S

Specific effect of interaction between F & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	0.0	1.13	1.03	0.85	0.77
	0.5	1.52	1.43	1.22	1.30
	1.0	1.45	1.30	1.08	1.22
	1.5	1.37	1.35	1.12	1.20
F2	0.0	1.13	1.03	0.85	0.77
	0.5	1.43	1.37	1.12	1.23
	1.0	1.50	1.58	1.23	1.30
	1.5	1.51	1.61	1.32	1.38
L.S.D	0.05	N.S	N.S	N.S	N.S
	0.01	N.S	N.S	N.S	N.S

Specific effect of interaction between M & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
S	0.0	1.13	1.03	0.85	0.77
	0.5	1.53	1.45	1.13	1.28
	1.0	1.53	1.36	1.25	1.25
	1.5	1.22	1.38	1.28	1.32
D	0.0	1.13	1.03	0.85	0.77
	0.5	1.42	1.35	1.20	1.25
	1.0	1.42	1.53	1.07	1.27
	1.5	1.66	1.58	1.15	1.27
L.S.D	0.05	0.29	N.S	N.S	N.S
	0.01	N.S	N.S	N.S	N.S

Referring the specific effect of rates of application, outlined data in Table (9 a) cleared that the superiority of all rates in significantly increasing root N % compared with control, which differences between all rates were insignificant during the two seasons of study. The high rate (1.5 gm/L) gave the highest value followed by the medium and low rates which gave approximately the same value of N % in roots.

With respect to the specific effect of interaction between forms of fertilizers and methods of application, it is obvious from Table (9 a) that the combination between F_2 and D was the effective interaction compared with the other combinations during 1996/1997 and 1997/1998 seasons. However, the differences between the all interaction were insignificant during both seasons of study.

As for the specific effect of interaction between two forms of fertilizers and rates of application, data in Table (9 a) revealed that F_2 at 1.5 gm/L gave the highest percentage of N in roots followed by F_2 at 1.0 gm/L and F_1 at 0.5 gm/L with mean values (1.32, 1.23 and 1.22 %) and (1.38, 1.30 and1.30 %) in the first and second seasons, respectively. Statistical differences between all combinations did not reach to the level of significance during the two seasons of study.

With regard to the specific effect of interaction between two methods of application and rates of applied fertilizers, data in Table (9 a) cleared that all applied rates of spray method approximately raised N % in roots in comparison to the all rates applied as drench and control. Moreover, S x 1.5 gm/L gave insignificantly the highest N content with an increase 50.6 and 71.4 % over control during the first and second seasons, respectively.

These results go in line with that reported by **Mansour (1985)** on *Chamaedorea sp.* and **Abou Dahab (1992)** on *Asparagus sprengri.*

II. A. 3. b. Phosphorus content :

II. A. 3. b. 1. Leaf phosphorus content :

Regarding the influence of combinations of fertilizers forms x methods of applications x applied rates on leaf P content of 3 months old Yucca seedlings, tabulated data in Table (9) revealed that the richest leaf P % was exhibited by such transplants sprayed with two forms of fertilizes (Stimufol & prepared one) at all rates of applications especially 1.0gm/ L and 0.5gm/L of F_1 x S which gave (0.478 and 0.483 %) and (0.473 and 0.483%) in the first and second seasons respectively, followed descending by F_2 x S at 1.5 gm/L and 0.5 gm/L (0.463 and 0.460 %) and (0.475 and 0.415 %) in both season, respectively. However, leaf P % of 3 months old seedlings treated by spraying both F1 and F2 tended to be more higher as compared to those treated by drench method (irrespective to fertilizer form) although differences did not reach the level of significance during the first season of study. On fact this may be due to severe rate of P lost through drainage that resulted by adding fertilizers by drench method which consequently act as encouraging agent for escaping of phosphate anion case.

As for the specific effect of the two forms of fertilizers (F_1) Stimufol and (F_2) prepared one on leaf P content of 3 months old Yucca seedlings, data are presented in Table (9 b) showed that in the first season there is no significant variance in leaf P % in response to different forms of fertilizers while, in the second season F_1 was more effective than F_2. Hence, differences were highly significant as compared to the first season of study.

Concerning the specific effect of methods of applied fertilizers as S and D on leaf P content of 3 months old Yucca seedling, Table (9 b). The data declared that the highest leaf P % was always coupled with those

seedlings treated by spraying method of application. This trend was true during both experimental seasons and the differences were highly significant.

Concerning the specific effect of rates of applied fertilizers on leaf P content, Table (9 b) shows that in both 1996/1997 and 1997/1998 seasons, the 3 months old Yucca seedlings treated with fertilizers at high doses (1.5 gm/L) produced the highest leaf P % if the mean of two experimental seasons was taken into consideration. Whereas, the differences between the above mentioned rate and other rates of application were significant.

With regard to the interaction effect of two forms of fertilizers (F_1 and F_2) x methods of applications (S and D) on leaf P %, data obtained during two seasons as shown in Table (9 b) show clearly that, in both seasons seedlings treated with F_1 (Stimufol) x S (spray) had significantly higher values of leaf P % (0.413 and 0.422 %) followed descendingly by F_2 (Prepared fertilizer) x S (spray) (0.389 and 0.376 %) in the first and second seasons, respectively. On the contrary, the lowest values of P leaf content were resulted from F_2 applied by drench (0.339 and 0.295 %) in the first and second seasons respectively, it could be concluded that drench as a method of applied fertilizer may cause high rate of P lost through drainage.

Concerning the specific effect of interaction between forms of fertilizers (F_1 and F_2) x rates of application (0.0, 0.5, 1.0 and 1.5 gm /L) on the leaf P % , data presented in Table (9 b) revealed that in the first season both F_1 and F_2 at 0.5 gm/L produced seedlings had the richest leaves in P content followed in descending order by F_1 and F_2 at 1.5 gm/ L however, differences did not reach level of significant. While, in the second season similar trend of results were obtained except F_2 at 0.5gm/ L which produced the poorest leaves of phosphorus contents (after control) as compared with those of other combinations treatments.

Concerning the specific effect of interaction of methods of applied fertilizer (S and D) x rates of application on leaf P % in 3 month old Yucca seedlings, Table (9 b) indicated that all fertilizers rates (0.5, 1.0 and 1.5 gm/L) applied as spray increased the leaf P content in comparison to those plants fertilized by drench method at all rates of application (0.5, 1.0, 1.5 gm/L) and untreated plants (0.0 gm/L) in the two seasons. The variance among those combinations were significant in the second season only.

These results go in line with that reported by **Smith (1978)** on *Zamia integrifolia*, **Shen and Seely (1983)** on *Peperomia obtusifolia* and **El.Fadaly (1994)** on *Jasminum sambac*, but they are in disagreement with that found by **Anuradha *et al* (1988)** on marigold.

II. A. 3. b. 2. Root phosphorus content :

It is clear from Table (9) as a result of interaction between forms of fertilizers, methods and rates of application, that all combinations increased insignificantly P % in *Yucca filamentosa* roots compared with control. In general, during both seasons seedlings fertilized by F_2 at high rate (1.5 gm/ L) applied as drench, their roots contained the highest P % as (0.324 and 0.340 %) in the first and second seasons respectively, followed by F_1 x D at 1.5 gm/ L (0.270 and 0.260 %), F_2 x S at 1.0 gm /L (0.242 and 0.237 %) and F_1 x S at 1.0 gm/L (0.210 and 0.218 %) in 1996/1997 and 1997/1998 seasons, respectively. The other investigated treatments came second in this respect but still gave the highest % over control.

With regard to the specific effect of two forms of fertilizers, data in Table (9 b) showed that F_2 was more effective than F_1 although the differences between F_1 (Stimufol) and F_2 (prepared fertilizer) were so small to be significant.

Concerning the specific effect of methods of application, obtained data in Table (9 b) indicated that drench method gave roots had the richest % of

TABLE (9b) :- Specific effect of two forms of fertilizers , methods and rates of application and their interaction effect on (P% in leaves and roots) of Yucca *filamentosa* (3 months old) during 1996/1997 & 1997/1998 seasons.

Specific effect of form of fertilizers (F)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	0.381	0.392	0.182	0.181
F2	0.364	0.335	0.194	0.198
L.S.D 0.05	N.S	0.021	N.S	N.S
L.S.D 0.01	N.S	0.028	N.S	N.S

Specific effect of methods of application (M)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
S	0.401	0.399	0.179	0.178
D	0.344	0.328	0.197	0.200
L.S.D 0.05	0.032	0.021	N.S	N.S
L.S.D 0.01	0.043	0.028	N.S	N.S

Specific effect of rates of application (R)

Season		0.0	0.5	1.0	1.5	L.S.D	
						0.05	0.01
Leaves	1 st S.	0.245	0.439	0.383	0.423	0.045	0.061
	2 nd S.	0.260	0.391	0.379	0.423	0.029	0.039
Roots	1 st S.	0.135	0.183	0.201	0.233	0.045	0.060
	2 nd S.	0.124	0.195	0.202	0.237	0.062	0.083

Specific effect of interaction between F & M

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S	0.413	0.422	0.174	0.172
	D	0.349	0.362	0.189	0.189
F2	S	0.389	0.376	0.184	0.184
	D	0.339	0.295	0.205	0.212
L.S.D	0.05	N.S	N.S	N.S	N.S
	0.01	N.S	N.S	N.S	N.S

Specific effect of interaction between F & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	0.0	0.245	0.260	0.135	0.124
	0.5	0.441	0.450	0.185	0.197
	1.0	0.405	0.416	0.187	0.190
	1.5	0.433	0.441	0.221	0.211
F2	0.0	0.245	0.260	0.135	0.124
	0.5	0.436	0.333	0.181	0.193
	1.0	0.362	0.344	0.215	0.213
	1.5	0.414	0.405	0.246	0.262
L.S.D	0.05	N.S	0.041	N.S	N.S
	0.01	N.S	0.055	N.S	N.S

Specific effect of interaction between M & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
S	0.0	0.245	0.260	0.135	0.124
	0.5	0.474	0.449	0.185	0.189
	1.0	0.426	0.425	0.226	0.227
	1.5	0.459	0.461	0.169	0.173
D	0.0	0.245	0.260	0.135	0.124
	0.5	0.403	0.334	0.181	0.202
	1.0	0.341	0.335	0.176	0.176
	1.5	0.388	0.385	0.297	0.300
L.S.D	0.05	N.S	0.041	0.063	0.087
	0.01	N.S	0.055	0.085	N.S

P (0.197 and 0.200 %) as compared with spraying (0.179 and 0.178 %) during 1996/1997 and 1997/1998 seasons, respectively.

As for the specific effect of rates of application, Table (9 b) revealed that all applied rates significantly raised phosphorus content in the seedlings roots over control during the two seasons. However, the increase in P content continuously observed with increasing the rates of applied fertilizers.

Referring the specific effect of interaction between two forms of fertilizers and methods of application, Table (9 b) demonstrated that no significant differences were mentioned between the four combinations. However, F_2 x D was the most effective interaction in comparison with the other interactions which gave nearly the same value during both seasons of study.

No significant differences were observed as result of the specific effect of interaction between two forms of fertilizers and rates of application, Table (9 b) revealed that F_1 and F_2 at all rates under study increased P % in roots of *Yucca filamentosa* seedlings especially with F_2 at 1.5 gm/L which gave the highest % followed by in descending order F1 at 1.5 gm/ L and F_2 at 1.0 gm/L.

With regard to the specific effect of interaction between methods of application and rates of application, It is obvious from Table (9 b) that S & D at all rates increased P % in roots over control especially with D at 1.5 gm/L followed by S at 1.0 gm/L which gave the most promising effective over control with a significant effect. Anyway, the four other combinations proved to be the less effective treatments.

The obtained results agree with that reported by **Conover and Poole (1974)** on *Philodendron oxycardium* and **Anuradha *et al* (1988)** on marigold but they are in disagreement with the findings of **Smith (1978)** on *Zamia integrifolia* and **El-Fadaly (1994)** on *Jasminum sambac.*

II. A. 3. c. Potassium content :

II. A. 3. c. 1. Leaf potassium content :

Concerning the leaf potassium percentage of 3 months old Yucca seedlings as affected by combination of (F_1 & F_2) x (S & D) x (0.0, 0.5, 1.0, and 1.5 gm/L), Table (9) revealed that in both seasons of study seedlings received F_1 (Stimufol) at high rate 1.5 gm/ L applied as drench produced the richest leaf K content. In addition, leaf K % of 3 months old Yucca seedlings increased when they were sprayed by F_1 or F_2 at 0.5 gm/ L and statistically ranked second. However, K percentage in leaves of Yucca seedlings tended to be higher when they received F_2 at 1.5gm/L as drench, especially as an average of two seasons was concerned. Furthermore, other investigated treatments came last, since the differences between the all treatments did not reach the level of significant.

Regarding the specific effect of fertilizers form on the leaf K % of 3 months Yucca seedlings, data in Table (9 c) demonstrated that the differences between (F_1) Stimufol and (F_2) prepared fertilizer were so small to be significant, whereas the two forms of fertilization exhibited not only insignificant variance but also showed approximately the same value on leaf K % in seedlings of 3 months *Yucca filamentosa* during the two seasons of study.

Concerning the specific effect of methods of applied fertilizers S and D on the leaf K content, data in Table (9 c) showed that both methods showed nearly the same values on leaf K %. So, they did not have any significant variance during both experimental seasons.

Regarding the specific effect of applied rates of fertilizers (0.0, 0.5, 1.0 and 1.5 gm/L) on leaf K % of 3 months old Yucca seedlings ,Table (9 c) indicated that all rates of applied fertilizers (irrespective to fertilizer forms or applied methods) significantly increased leaf K % over untreated plants (control). However, differences between the first two levels of

TABLE (9c) :- Specific effect of two forms of fertilizers, methods and rates of application and their interaction effect on (K% in leaves and roots) of *Yucca filamentosa* (3 months old) during 1996/1997 & 1997/1998 seasons.

Specific effect of form of fertilizers (F)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	1.38	1.39	0.75	0.77
F2	1.38	1.36	0.82	0.86
L.S.D 0.05	N.S	N.S	0.02	0.03
L.S.D 0.01	N.S	N.S	0.03	0.04

Specific effect of methods of application (M)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
S	1.38	1.38	0.81	0.86
D	1.38	1.37	0.76	0.78
L.S.D 0.05	N.S	N.S	0.02	0.03
L.S.D 0.01	N.S	N.S	0.03	0.04

Specific effect of rates of application (R)

Season		0.0	0.5	1.0	1.5	L.S.D	
						0.05	0.01
Leaves	1 st S.	1.10	1.46	1.46	1.48	0.10	0.14
	2 nd S.	1.10	1.46	1.42	1.52	0.10	0.14
Roots	1 st S.	0.67	0.78	0.82	0.86	0.03	0.04
	2 nd S.	0.70	0.81	0.86	0.90	0.04	0.05

Specific effect of interaction between F & M

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S	1.37	1.38	0.79	0.81
	D	1.38	1.39	0.71	0.73
F2	S	1.38	1.38	0.83	0.90
	D	1.37	1.35	0.81	0.82
L.S.D	0.05	N.S	N.S	0.03	N.S
	0.01	N.S	N.S	N.S	N.S

Specific effect of interaction between F & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	0.0	1.10	1.10	0.67	0.70
	0.5	1.46	1.48	0.70	0.73
	1.0	1.46	1.42	0.77	0.81
	1.5	1.49	1.55	0.84	0.84
F2	0.0	1.10	1.10	0.67	0.70
	0.5	1.46	1.44	0.85	0.89
	1.0	1.46	1.43	0.86	0.90
	1.5	1.48	1.49	0.89	0.96
L.S.D	0.05	N.S	N.S	0.05	0.06
	0.01	N.S	N.S	0.06	0.08

Specific effect of interaction between M & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
S	0.0	1.10	1.10	0.67	0.70
	0.5	1.49	1.51	0.79	0.84
	1.0	1.45	1.40	0.88	0.94
	1.5	1.46	1.50	0.89	0.96
D	0.0	1.10	1.10	0.67	0.70
	0.5	1.43	1.41	0.76	0.79
	1.0	1.47	1.44	0.76	0.77
	1.5	1.50	1.54	0.84	0.84
L.S.D	0.05	N.S	N.S	0.05	0.06
	0.01	N.S	N.S	0.06	0.08

The results are in harmony with that found by **Conover and Poole (1974)** on *Philodendron oxycardium* and **Anuradha *et al* (1988)** on marigold.

II. A. 3. c. 2. Root potassium content :

It is clear from the data in Table (9) that the highest percentage of K in *Yucca filamentosa* roots as 0.91 and 1.04 % were obtained with the combination of F_2 x S at1.5 gm/ L in the first and second seasons respectively. The other treatments ranked the second with variable degrees. This trend was true during both seasons of study as an average of two seasons was taken in consideration. The statistical analysis showed that no significant differences were observed as a result of interaction between two forms of fertilizers, two methods of application and rates of application.

Concerning the specific effect of forms of fertilizers, data tabulated in Table (9 c) indicated that F_2 (prepared fertilizers) gave highly significant increase over F_1 (Stimufol) as 9.3 and 11.7% as comparing with F1.

With respect to the specific effect of the two methods of application, tabulated data in Table (9 c) cleared that spray method was more effective method compared with drench method. The differences between two applied methods were highly significant during 1996 / 1997 and 1997/1998 seasons.

Referring the specific effect of investigated rates of application, data in Table (9 c) revealed that K % in roots increased continuously with increasing the rate of application. In other wards, 1.5gm/L was significantly the most favourable rate followed by 1.0 and 0.5 gm/ L compared with control treatment. This trend was true during both seasons or as an average of two seasons.

Concerning the specific effect of interaction between forms of fertilizers and methods of application, it is clear from Table (9 c) that F_2 x S gave significantly the highest value (0.83 and 0.90 %) during the first

and second seasons, respectively. On the contrary, F_1 x D was the inferior combination in this respect. The two other treatments took intermediate place in this respect.

As for the specific effect of interaction between two forms of fertilizers and rates of application, it is obvious from Table (9 c) that F_2 at all rates increased significantly the percentage of K in roots over F_1 at all rates and control. F_2 at 1.5 gm/L showed its own relative superiority over all combinations and control.

With regard to the specific effect of interaction between two methods of applications and rates of application. Data presented in Table (9 c) indicated clearly that S at 1.5 gm/ L gave the highest value of K % in Yucca seedlings roots followed by S at 1.0 gm/ L and D at 1.5 gm/ L . The other treatments ranked significantly the second in this respect.

The results agree with that reported by **Conover and Poole (1977a)** on *Ficus benjamina* and **Shen and Seely (1983)** on *Peperomia obtusifolia.*

II. A. 3. d. Calcium content :

II. A. 3. d. 1. Leaf calcium content :

No significant response was recorded during two experimental seasons as a result of interaction between two forms of fertilizer x two methods of application x rates of application on leaf Ca % of 3 months old *Yucca filamentosa* seedlings, data tabulated in Table (10) showed clearly that F_1 (Stimufol) applied as spray or drench at all rates gave the less Ca % in leaves compared to the other combinations but still gave increase over control, it may due to that the chemical composition of Stimufol did not include Calcium element. In general, spraying F_2 at 0.5 gm/L gave the richest leaf Ca %. Whereas, F_2 x S at 1.0 gm / L ranked the second in this

TABLE (10) :- Interaction effect of different combination between two forms of fertilizers, methods and rates of application on Ca, Mg and Total carbohydrate % of *Yucca filamentosa* / 3 months old

TREATMENT			Ca %				Mg %				Total carbohydrates %			
			Leaves		Roots		Leaves		Roots		Leaves		Roots	
Fert. Types	Appl.Meth.	Appl.Rate	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S SPRAY	0.0	3.17	3.18	0.92	0.93	0.298	0.292	0.156	0.161	16.81	17.75	16.75	17.25
		0.5	3.92	3.94	1.43	1.44	0.321	0.323	0.159	0.174	20.38	20.56	19.31	20.28
		1.0	3.53	3.53	1.25	1.26	0.326	0.339	0.237	0.243	23.59	18.00	20.32	18.11
		1.5	3.36	3.37	1.43	1.45	0.340	0.343	0.243	0.252	18.50	19.81	22.35	21.81
	D DRENCH	0.0	3.17	3.18	0.92	0.93	0.298	0.292	0.156	0.161	16.81	17.75	16.75	17.25
		0.5	3.92	3.94	1.57	1.58	0.361	0.364	0.313	0.316	20.07	20.66	22.69	21.00
		1.0	3.61	3.62	1.63	1.60	0.370	0.368	0.335	0.337	19.94	18.35	17.07	18.94
		1.5	3.89	3.92	1.91	1.85	0.328	0.333	0.256	0.282	21.69	18.25	19.35	18.61
F2	S SPRAY	0.0	3.17	3.18	0.92	0.93	0.298	0.292	0.156	0.161	16.81	17.75	16.75	17.25
		0.5	4.85	4.84	1.81	1.91	0.322	0.324	0.158	0.170	20.63	20.01	20.88	22.25
		1.0	4.63	4.82	1.67	1.69	0.302	0.294	0.182	0.183	20.19	20.88	21.41	20.81
		1.5	4.26	4.31	1.79	1.70	0.337	0.338	0.258	0.266	18.38	19.38	27.25	22.94
	D DRENCH	0.0	3.17	3.18	0.92	0.93	0.298	0.292	0.156	0.161	16.81	17.75	16.75	17.25
		0.5	4.16	4.19	1.84	1.85	0.330	0.341	0.368	0.371	18.19	17.48	21.76	19.13
		1.0	4.27	4.29	1.85	2.08	0.357	0.357	0.346	0.388	22.81	24.28	20.44	20.44
		1.5	4.22	4.25	1.74	1.78	0.370	0.377	0.406	0.424	23.81	23.82	25.88	25.88
L.S.D		0.05	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	2.75	N.S	1.58	3.28
		0.01	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S

concern followed by F_2 x S at 1.5 gm/L and F_2 x D at 1.0 gm/L. This trend was true during both seasons of study.

Concerning the specific effect of fertilizer forms, it is quite evident from Table (10 a) that F_2 (prepared fertilizer) showed in highly significant its own relative superiority in this respect. The increase over F1 (Stimufol) was 14.6 and 15.0 % during the first and second seasons respectively.

With regard to the specific effect of applied methods, data in Table (10 a) cleared that both spray and drench methods have nearly the same percentage. So they are equal in their effectiveness.

As for the specific effect of rates of application, tabulated data in Table (10 a) showed obviously that all applied rates resulted in highly significant increases of Ca % in leaves over control. Generally, leaf Ca % was negatively proportioned to concentrations used of both fertilizers. Ca % decreased continuously with increasing the rate of application to attain a less value at 1.5 gm/L.

Regarding the specific effect of interaction between two forms of fertilizer and two methods of application. Data recorded in Table (10 a) indicated that applied F_2 (prepared fertilizer) as spray was significantly the most effective combination which gave (4.23 and 4.29 %) in the first and second seasons respectively followed by F_2 x D. On the contrary, both F_1 x S and F_1 x D were less effective in this respect.

With respect to the specific effect of interaction between fertilizer forms and rates of application on leaf Ca % of 3 months old *Yucca filamentosa*, tabulated data in Table (10 a) revealed that F2 at all applied rates increased significantly Ca % in leaves compared to F1 at all rates and control. F_2 at both 0.5 and 1.0 gm/L were the most effective combinations followed in descending order by F_2 at 1.5 gm/L. On the contrary, F_1 applied

at 1.0 gm/L gave the less percentage in this respect but it was highly significant over control.

Referring to the specific effect of interaction between (S & D) and (0.0, 0.5, 1.0 and 1.5 gm/L). Table (10 a) showed that regardless two fertilizer forms, spraying at 0.5 gm/L as (4.39 and 4.39 %) during the first and second seasons respectively, was more effective treatment followed by S at 1.0 gm/L. On the contrary, spraying 1.5 gm/L gave seedlings with leaves contained the less % of Ca.

These results are in partial agreement with that observed by **Thomas (1979)** on *Camellia japonica.*

II. A. 3. d. 2. Root calcium content :

Concerning the interaction effect of different forms of fertilizers x methods of application x rates of application on Ca% in *Yucca filamentosa* roots (3 months old) are shown in Table (10). Data obtained show obviously that all investigated combinations increased Ca % over control. Both F_2 x D at 1.0 gm/ L , F_1 x D at 1.5 gm/ L , F_2 x S at 0.5 gm/ L and F_2 x D at 0.5 gm/ L were more effective than other interactions. On the contrary, F_1 applied as spray or drench at all rates except F_1 x D at 1.5 gm/ L gave the less value in this respect but still gave an increase over control. The other combinations were in between the two above mentioned extremes. Differences between these treatments were so little to be significant.

As for these specific effect of two forms of fertilizers, it is obvious from Table (10 a) that F_2 (prepared fertilizer) was statistically more effective than F1 (Stimufol) at the levels of 5 and 1% in two seasons of study. The mean % of F_2 was (1.57 and 1.61%) compared with F_1 (1.38 and 1.38%) during 1996/1997 and 1997/1998 seasons, respectively.

TABLE (10a) :- Specific effect of two forms of fertilizers , methods and rates of application and their interaction effect on (Ca% in leaves and roots) of *Yucca filamentosa* (3 months old) during 1996/1997 & 1997/1998 seasons.

Specific effect of form of fertilizers (F)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	3.87	3.89	1.38	1.38
F2	4.09	4.13	1.57	1.61
L.S.D 0.05	0.16	0.09	0.08	0.15
L.S.D 0.01	0.22	0.13	0.11	0.20

Specific effect of methods of application (M)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
S	3.86	3.90	1.40	1.41
D	3.80	3.82	1.55	1.58
L.S.D 0.05	N.S	N.S	0.08	0.15
L.S.D 0.01	N.S	N.S	0.11	N.S

Specific effect of rates of application (R)

Season		0.0	0.5	1.0	1.5	L.S.D	
						0.05	0.01
Leaves	1 st S.	3.17	4.21	4.01	3.93	0.22	0.29
	2 nd S.	3.18	4.23	4.07	3.96	0.14	0.18
Roots	1 st S.	0.92	1.66	1.60	1.72	0.12	0.16
	2 nd S.	0.93	1.69	1.66	1.69	0.21	0.29

Specific effect of interaction between F & M

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S	3.50	3.51	1.26	1.27
	D	3.65	3.67	1.51	1.49
F2	S	4.23	4.29	1.55	1.56
	D	3.96	3.98	1.59	1.66
L.S.D	0.05	0.22	0.14	0.22	N.S
	0.01	0.29	0.18	N.S	N.S

Specific effect of interaction between F & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	0.0	3.17	3.18	0.92	0.93
	0.5	3.92	3.94	1.49	1.51
	1.0	3.57	3.58	1.44	1.43
	1.5	3.63	3.65	1.67	1.65
F2	0.0	3.17	3.18	0.92	0.93
	0.5	4.51	4.52	1.83	1.88
	1.0	4.45	4.56	1.76	1.88
	1.5	4.24	4.28	1.77	1.74
L.S.D	0.05	0.31	0.19	0.17	N.S
	0.01	0.42	0.26	N.S	N.S

Specific effect of interaction between M & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
S	0.0	3.17	3.18	0.92	0.93
	0.5	4.39	4.39	1.62	1.68
	1.0	4.08	4.18	1.46	1.48
	1.5	3.81	3.84	1.61	1.58
D	0.0	3.17	3.18	0.92	0.93
	0.5	4.04	4.07	1.70	1.71
	1.0	3.94	3.96	1.74	1.84
	1.5	4.06	4.09	1.83	1.82
L.S.D	0.05	N.S	0.19	N.S	N.S
	0.01	N.S	0.26	N.S	N.S

With respect to the specific effect of methods of application , Table (10 a) declared that drench (as applied method) gave highly significant increase over spray method in both seasons of study.

Regarding the specific effect of rates of application, Table (10 a) shows clearly that all rates increased highly significant Ca % in roots over control treatment, but the differences between all applied rates were insignificant. In the first season, 1.5 gm/L was the superior rate followed by 0.5 and 1.0 gm/ L , the trend was true during the second seasons except that 1.5 and 0.5 gm/ L had the same value.

With regard to the specific effect of interaction between two forms of fertilizers and two applied methods, data presented in Table (10 a) showed obviously that F_2 x D resulted in increasing root Ca content followed by F_2 x S. On the contrary, both F_1 x D and F_1 x S were the inferior in this respect.

Concerning the specific effect of interaction between forms of fertilizers and rates of application, the outlined data in Table (10 a) indicated that F_2 at all rates and F_1 at high rate gave significantly especially in the first seasons an increase over other interactions and control. F_2 at 0.5 gm/ L showed to be the superior combination in this regard.

Furthermore, no significant response was observed as a result of interaction between two methods of application and rates of application, Table (10 a) indicated that drench method at all rates increased Ca % in roots comparing with spray at all rates and control treatment. D at 1.5 gm/ L and D at 1.0 gm/ L were the superior combinations. This trend was tree during both seasons of study.

Our results go in line with that reported by **Thomas (1979)** on *Camellia japonica*.

II. A. 3. e. Magnesium content :

II. A. 3. e. 1. Leaf magnesium content :

Referring to the leaf Magnesium content in response to the differential combinations of (F_1 and F_2) x (0.0, 0.5, 1.0, 1.5 gm/L) x (S and D) during both 1996/1997 and 1997/1998 seasons , data obtained are tabulated in Table (10). It is obvious that in both seasons two forms of fertilizers x all concentrations x two applied methods had no significant effect on increasing leaf Mg content. In general the highest leaf Mg % was detected by those Yucca seedlings treated by F_2 at 1.5 gm /L followed by F_1 at 1.0 gm/L when they applied by drench method (0.370 & 0.377%) and (0.370 & 0.367%) for the first and second treatments in 1996/1997 and 1997/1998, respectively. Briefly, we could be concluded that Magnesium rate of uptake can be strongly depressed by other cations such as K^+ and NH_4 (**Kurvits and Kirkby , 1980**).

As for the specific effect of fertilizer forms, Table (10 b) indicated that there was no significant differences between the two fertilizers used on Mg leaf % in both seasons of study.

With respect to the specific effect of methods of applied fertilizers on leaf Mg content, it was quite evident shown from Table (10 b) that the richest leaves in their Mg content were statistically in closed relationship to those seedlings treated by drench method of applied fertilizer (irrespective to forms of fertilizers). This firmer trend declared obviously in both seasons of study.

As for the specific effect of rates of applied fertilizers on Mg leaf content. Table (10 b) shows in both seasons, that treated 3 months Yucca seedlings with different doses of F_1 and F_2 produced a significant increase in Mg leaf content than those treated with water only (control). Regardless the fertilizer used, it was evident that leaf Mg content positively correlated with raising fertilizers doses. Highest values of Mg content in leaves (0.344

With respect to the specific effect of interaction of form of fertilizers (F_1 & F_2) x methods of application (S and D) on leaf Mg content, data obtained during two seasons as shown in Table (10 b) revealed that both treatments of F_1 (Stimufol) and F_2 (prepared fertilizer) applied as D (drench) were more effective in increasing leaf Mg content of Yucca seedlings as compared with S (spray) method. On the other hand, the increases did not reach the level of significant in both seasons of study.

As for the specific effect of interaction between form of fertilizers x rates of application on Mg leaf percentage of 3 months *Yucca filamentosa* seedlings, Table (10 b). It is obvious from the data tabulated that the F_2 (prepared fertilizer) at 1.5 gm/L had a pronounced effect in increasing Mg content in leaves. Whereas, F_1 (Stimufol) at 1.0 gm / L ranked statically second. This was true in both 1996/1997 and 1997/1998, although differences were so little to reach level of significant in the second season. Other combinations gave variable values and exhibited statistically the same effectiveness in the two seasons of study.

Concerning the specific effect of interaction between methods of applications x rates of applied fertilizers, data obtained in Table (10 b) showed that leaf Mg % was positively correlated to drench method of both fertilizers applied especially at rates 1.0 and 1.5 gm/L. Moreover the highest values were (0.363 and 0.352%) as an average of two seasons was calculated for the first and second seasons, respectively.

Nevertheless, it was so interesting to be observed clearly a firm trend that spray as a method of applied fertilizers was less effective in the case of 3 months old seedlings of *Yucca filamentosa*, while drench was the superior one. These results could be explained depending upon the fact of uptake mechanisms of plants must therefore be selective. Thus, the macronutrients either are constituents of organic compounds, such as proteins and nucleic acids or act as osmotic, these differences in function

are reflected in the average concentrations of mineral nutrients in plant shoots that are sufficient for adequate growth. The values can be vary considerably depending on plant species, plant age and concentration of other mineral elements.

Also, it depends upon the pathway of solutes from the external solution into the roots or leaves and the main barriers against passive solute movement such as cutin, suberin, (casparian) strip.). The volume of root tissue or shoot tissues available for passive solute movement.

II. A. 3. e. 2. Root magnesium content :

Regarding the specific effect of interaction between form of fertilizers, methods and rates of application, data presented in Table (10) cleared that drench method of either F_1 or F_2 at all applied rates gave the promising effect in raising Mg% in roots comparing with other combinations and control, i.e. F_2 x D at 1.5 gm/ L produced roots with maximum concentration of Mg . While, both F2 x S at 0.5 gm/ L , F_1 x S at 0.5 gm/L and control gave the less value of this character. In general, other combinations were in between as compared to the previously mentioned two extremes (superior and inferior), whereas differences between all combinations did not reach to the level of significant during two seasons of study.

As for the specific effect of two forms of fertilizers, it is obvious from Table (10 b) that there was no significant difference between F_1 and F_2. Thus they were equal in this respect although F_2 gave the highest value (0.254 and 0.266 %) during 1 st and 2 nd seasons, respectively.

With respect to the specific effect of methods of application, data in Table (10 b) showed obviously that drench method was highly significant the superior method with an increase 50.5 and 51.7 % during the first and second seasons, respectively.

TABLE (10b) :- Specific effect of two forms of fertilizers, methods and rates and their interaction effect on (Mg % in leaves and roots) of *Yucca filamentosa* (3 months old) during 1996/1997 &1997/1998 seasons.

Specific effect of form of fertilizers (F)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	0.330	0.332	0.232	0.241
F2	0.327	0.327	0.254	0.266
L.S.D 0.05	N.S	N.S	N.S	N.S
L.S.D 0.01	N.S	N.S	N.S	N.S

Specific effect of methods of application (M)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
S	0.318	0.318	0.194	0.201
D	0.339	0.341	0.292	0.305
L.S.D 0.05	0.01	0.01	0.03	0.03
L.S.D 0.01	0.01	0.02	0.04	0.04

Specific effect of rates of application (R)

Season		0.0	0.5	1.0	1.5	L.S.D	
						0.05	0.01
Leaves	1 st S.	0.298	0.334	0.339	0.344	0.015	0.019
	2 nd S.	0.292	0.338	0.339	0.348	0.018	0.024
Roots	1 st S.	0.156	0.250	0.275	0.291	0.037	0.049
	2 nd S.	0.161	0.258	0.288	0.306	0.037	0.049

Specific effect of interaction between F & M

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S	0.321	0.324	0.199	0.207
	D	0.339	0.339	0.265	0.274
F2	S	0.315	0.312	0.189	0.195
	D	0.339	0.342	0.319	0.336
L.S.D	0.05	N.S	N.S	0.037	0.037
	0.01	N.S	N.S	N.S	0.049

Specific effect of interaction between F & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	0.0	0.298	0.292	0.156	0.161
	0.5	0.341	0.343	0.236	0.245
	1.0	0.348	0.354	0.286	0.289
	1.5	0.334	0.338	0.249	0.267
F2	0.0	0.298	0.292	0.156	0.161
	0.5	0.326	0.333	0.263	0.271
	1.0	0.329	0.326	0.264	0.286
	1.5	0.353	0.357	0.332	0.345
L.S.D	0.05	0.021	N.S	0.052	N.S
	0.01	N.S	N.S	N.S	N.S

Specific effect of interaction between M & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
S	0.0	0.298	0.292	0.156	0.161
	0.5	0.322	0.323	0.159	0.172
	1.0	0.314	0.317	0.209	0.213
	1.5	0.338	0.341	0.251	0.259
D	0.0	0.298	0.292	0.156	0.161
	0.5	0.346	0.353	0.341	0.343
	1.0	0.363	0.363	0.341	0.362
	1.5	0.349	0.355	0.331	0.353
L.S.D	0.05	0.021	N.S	0.052	0.052
	0.01	N.S	N.S	0.069	0.069

Concerning the specific effect of rates of application, tabulated data in Table (10 b) showed highly significant differences between all applied rates and control. Generally, the increase in Mg% in roots continuously observed with increasing fertilizers rates. This trend was true during both seasons of study .

Referring the specific effect of interaction between forms of fertilizers and methods of application, data presented in Table (10 b) cleared that all combinations of drench method with the two forms of fertilizers resulted in significantly the superiority in this respect. On the contrary, both interaction of spraying and forms fertilizers ranked second to the above observed combinations.

With regard to the specific effect of interaction between forms of fertilizers and rates of application, it is clear from Table (10 b) that a high rate of (1.5 gm/L) of F_2 (prepared fertilizer) as well as the medium rate (1.0 gm/L) of F1 (Stimufol) resulted in the most effective combinations. Moreover, F_2 at 1.0 gm/L and F_2 at 0.5 gm/L ranked statistically (especially in the first season) the second to the above mentioned two superior combinations. Such trend was true during two seasons of study or as an average of both seasons.

Concerning the specific effect of two methods of applications and rates of application, data presented in Table (10 b) showed that all combinations except S at 0.5 gm/ L had a significant effect over control during both seasons of study. Drench method at the medium rate (1.0gm/L) followed by D at low rate (0.5gm/L) and high rate (1.5 gm/L) gave the most promising effect. Anyway, spraying method treatments proved highly significant to be the less effective treatments. These results are in disagreement with that found by **Thomas (1979)** on *Camellia japonica.*

II. A. 3. f. Total carbohydrate content :

II. A. 3. f. 1. Leaf total carbohydrate content :

Regarding to the leaf total carbohydrate content in response to the differential combinations of (F1 & F2) x (S & D) x (0.0, 0.5, 1.0 and 1.5 gm/L) during both experimental seasons, data tabulated in Table (10) showed that the differences between all combinations in the second season were so small to reach the level of significance at 5%. Generally, the highest value was detected by those seedlings treated by F_2 x D at 1.5 gm/L followed by F1 x S at 1.0 gm/L and F_2 x D at 1.0 gm / L followed by F_2 x D at 1.5 gm/L during 1996/1997 and 1997/1998 seasons, respectively. The differences between the two superior treatments were insignificant during the first season. On the contrary, both F_2 x D at 0.5 gm/L and control treatments produced roots with the less percentage of total carbohydrate. In addition, the other combinations were in between as compared to the previously two mentioned extremes (Superior and Inferior).

As for the specific effect of two forms of fertilizer, it is clear from Table (10 c) that the differences between F_1 (Stimufol) and F_2 (Prepared fertilizer) were so small to reach the level of significance. Thus, they are equal in their effectiveness.

With respect to the specific effect of two methods of application on the leaf total carbohydrate content, data in Table (10 c) showed nearly the same values of this character. So they did not have any significant variance during both seasons of study.

Referring the specific effect of applied rates of fertilizers, tabulated data in Table (10 c) cleared that all rates of application significantly increased leaf total carbohydrate % over control during the first season only. The medium rate (1.0 gm/L) gave the highest % followed by the high rate (1.5 gm/L) and low rate (0.5 gm/L). This trend was true during both

seasons of study or if an average of two seasons was concerned, although the differences in the second season was so small to be significant.

Concerning the specific effect of interaction between two forms of fertilizer and two methods of application, data are presented in Table (10c) revealed that all combinations between F_1 (Stimufol) and F_2 (prepared fertilizer) applied by spray or drench methods were nearly equally effective from the statistical point of view during 1996/1997 and 1997/1998 seasons.

With regard to the specific effect of interaction between two forms of fertilizer and rates of application, it is quite evident from data recorded in Table (10 c) that all applied rates of both F_1 and F_2 increased insignificantly the leaf total carbohydrate % of 3 months old *Yucca filamentosa* seedlings, but F_1 at 1.0 gm/L and F_2 at 1.0 gm/L followed descendingly by F_2 at 1.0 gm/L and F_2 at 1.5 gm/L produced seedlings with high total carbohydrate % during the first and second seasons, respectively.

As for the specific effect of interaction between (S & D) and (0.0, 0.5, 1.0 and 1.5 gm/L). It is obvious from Table (10 c) that in the first season, all applied rates of both S and D methods except S at 1.5 gm / L increased significantly the leaf total carbohydrate % over control. The high rate (1.5 gm/L) of drench method i.e. D at 1.5 gm/L was more effective treatment in this respect. On the other hand, during the second season, all applied rates of both S and D methods were approximately equal from the statistical point of view as the results of the differences between all combinations were so small to be significant.

These results go in line with that reported by **El-Fadaly (1994)** on *Jasminum sambac* who found that most of the NPK ratios tended to increase the content of total carbohydrates in the different plant parts.

II. A. 3. f. 2. Root total carbohydrate content :

TABLE (10c) :- Specific effect of two forms of fertilizers, methods and rates of application and their interaction effect on (Total carbohydrates% in leaves and roots) of *Yucca filamentosa* (3 months old) during 1996/1997 & 1997/1998 seasons.

Specific effect of form of fertilizers (F)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	19.72	18.89	19.32	19.16
F2	19.70	20.17	21.39	20.74
L.S.D 0.05	N.S	N.S	0.56	1.16
L.S.D 0.01	N.S	N.S	0.75	1.56

Specific effect of methods of application (M)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
S	19.41	19.27	20.63	20.09
D	20.02	19.79	20.09	19.81
L.S.D 0.05	N.S	N.S	N.S	N.S
L.S.D 0.01	N.S	N.S	N.S	N.S

Specific effect of rates of application (R)

Season		0.0	0.5	1.0	1.5	L.S.D	
						0.05	0.01
Leaves	1 st S.	16.81	19.82	21.63	20.59	1.37	1.85
	2 nd S.	17.75	19.68	20.38	20.32	N.S	N.S
Roots	1 st S.	16.75	21.16	19.81	23.71	0.79	1.06
	2 nd S.	17.25	20.67	19.58	22.31	1.64	2.21

Specific effect of interaction between F & M

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S	19.82	19.03	19.68	19.36
	D	19.63	18.75	18.97	18.95
F2	S	19.00	19.51	21.57	20.81
	D	20.41	20.83	21.21	20.68
L.S.D	0.05	N.S	N.S	N.S	N.S
	0.01	N.S	N.S	N.S	N.S

Specific effect of interaction between F & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	0.0	16.81	17.75	16.75	17.25
	0.5	20.23	20.61	21.00	20.64
	1.0	21.77	18.18	18.69	18.53
	1.5	20.09	19.03	20.85	20.21
F2	0.0	16.81	17.75	16.75	17.25
	0.5	19.13	18.75	21.32	20.69
	1.0	21.50	22.58	20.93	20.63
	1.5	21.09	21.60	26.57	24.41
L.S.D	0.05	N.S	N.S	1.11	2.32
	0.01	N.S	N.S	1.50	N.S

Specific effect of interaction between M & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
S	0.0	16.81	17.75	16.75	17.25
	0.5	20.51	20.29	20.09	21.27
	1.0	21.89	19.44	20.87	19.46
	1.5	18.44	19.59	24.80	22.38
D	0.0	16.81	17.75	16.75	17.25
	0.5	19.13	19.07	22.23	20.07
	1.0	21.38	21.32	18.76	19.69
	1.5	22.75	21.04	22.62	22.25
L.S.D	0.05	1.94	N.S	1.11	N.S
	0.01	2.62	N.S	1.50	N.S

Concerning to the interaction between forms of fertilizers, methods of application and rates of application on root total carbohydrate content of 3 months old *Yucca filamentosa*, data are presented in Table (10) indicated that F_2 x D at 1.5 gm/L and F_2 x S at 1.5 gm/L were significantly more effective combinations followed by F1 x D at 0.5 gm/ L and F_2 x S at 0.5 gm/L during 1996/1997 and 1997/1998 seasons, respectively. F_1 x S at 1.5 gm/L treatment ranked the second. On the contrary, both control, F_1 x D at 1.0 gm/L, F_1 x D at 1.5 gm/L, F_1 x S at 1.0 gm/L and F_1 x S at 0.5 gm/L treatments came last in this respect. Furthermore, the other investigated combinations were in between the superior and inferior treatments.

With respect to the specific effect of fertilizer forms, it is clear from Table (10 c) that the differences between F_1 and F_2 were highly significant during both experimental seasons. F_2 (prepared fertilizer) showed its own relative superiority over F_1 (Stimufol).

As for the specific effect of two applied methods (S & D) on root total carbohydrate % of 3 months old *Yucca filamentosa* seedlings. Data are presented in Table (10 c) show that no significant effect was observed between spray and drench methods. Thus, they are equal in this concern during both seasons of study.

Regarding the specific effect of rates of application, tabulated data in Table (10 c) revealed in both seasons 1996/1997 and 1997/1998 seasons, that fertilized seedlings with the high rate (1.5 gm/L) recorded a pronounced effect in increasing root total carbohydrate % more than other rates of application (23.71 and 22.31%) in both seasons respectively. Meanwhile, the low rate (0.5 gm/L) ranked the second in this regard and gave (21.16 and 20.67%) in the first and second seasons, respectively.

With regard to the specific effect of interaction between two forms of fertilizer and two methods of application, data in Table (10 c) showed clearly in both seasons of study that F_2 x S gave the highest values (21.57

and 20.81%) in two seasons, respectively. While, the lowest values obtained from F_1 x D and F_1 x S which produced (18.97 and 18.95%) and (19.68 and 19.36%) in the first and second seasons, respectively. The differences between all treatments were insignificant in both seasons of study.

Referring to the specific effect of interaction between (F_1 & F_2) and (0.0, 0.5, 1.0 and 1.5 gm/L). It is worth to be mentioned from Table (10 c) that F_2 (prepared fertilizer) applied at high rate (1.5 gm/L) gave significantly the highest percentage of total carbohydrate in roots of Yucca seedlings (26.57 and 24.41%) in the first and second seasons respectively, followed in descending order by F_2 at 0.5 gm / L and F_1 at 0.5 gm/L. On the contrary, control treatment gave significantly the lowest % as compared to the other combinations.

Concerning the specific effect of interaction between two applied methods and rates of application. Table (10 c) shows that Spray method at the high rate (1.5 gm/L) was more effective treatment (24.80 and 22.38%) in 1996/1997 and 1997/1998 seasons respectively, followed by D at 1.5 gm/L as compared to others combination treatments. The differences between all combinations were insignificant during the second season only.

Our results agree with that found by **El-Fadaly (1994)** on *Jasminum sambac* and **El Sayed (1994)** on *Brassaia actinophylla*.

II. A. 3. g. Iron content :

II. A. 3. g. 1. Leaf iron content :

Referring to the leaf iron % in response to the differential combinations of (F_1) Stimufol and (F_2) prepared fertilizer x rates of application (0.0, 0.5, 1.0 and 1.5 gm/L) x (S) spray and (D) drench methods of applications during both 1996/1997 and 1997/1998 seasons, Table (11). Data revealed that the highest recorded values of leaf iron %

TABLE (11) :- Interaction effect of different combination between two forms of fertilizers , methods and rates of application on Fe, Zn and Mn ppm of *Yucca filamentosa* / 3 months old

TREATMENT			Fe p.p.m.				Zn p.p.m.				Mn p.p.m.			
			Leaves		Roots		Leaves		Roots		Leaves		Roots	
Fert. Types	Appl.Meth.	Appl.Rate	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S SPRAY	0.0	65.47	63.95	615.95	663.80	49.55	50.36	59.64	60.46	55.12	55.45	141.35	142.16
		0.5	134.41	133.21	858.76	846.75	53.84	54.55	66.18	66.99	61.27	61.33	190.28	191.55
		1.0	135.73	137.39	940.29	944.03	67.41	70.70	71.56	74.06	79.37	80.50	212.82	213.43
		1.5	147.03	149.59	1013.47	1103.57	66.82	67.77	86.09	85.52	88.21	89.28	250.61	256.83
	D DRENCH	0.0	65.47	63.95	615.95	663.80	49.55	50.36	59.64	60.46	55.12	55.45	141.35	142.16
		0.5	110.37	111.86	1154.65	1145.20	54.44	55.70	77.21	77.72	61.11	61.15	302.56	302.73
		1.0	115.29	116.38	1456.49	1458.16	60.49	60.69	80.47	81.20	61.96	61.93	322.87	323.78
		1.5	125.09	126.90	1164.56	1173.85	51.78	52.19	70.97	72.66	53.96	53.96	285.03	285.05
F2	S SPRAY	0.0	65.47	63.95	615.95	663.80	49.55	50.36	59.64	60.46	55.12	55.45	141.35	142.16
		0.5	145.80	146.81	867.29	870.59	56.98	57.62	66.18	67.40	64.88	66.43	186.81	186.81
		1.0	123.61	124.50	1081.96	1127.73	61.07	61.22	72.31	73.53	65.58	66.48	219.79	221.77
		1.5	144.65	145.72	1168.79	1167.10	70.47	70.59	74.35	75.16	86.72	88.81	263.63	264.26
	D DRENCH	0.0	65.47	63.95	615.95	663.80	49.55	50.36	59.64	60.46	55.12	55.45	141.35	142.16
		0.5	130.54	131.51	1452.13	1561.61	54.23	54.89	79.52	80.48	61.97	62.16	371.42	373.09
		1.0	142.32	145.66	1545.51	1555.19	58.66	58.65	82.54	85.00	61.92	62.29	331.19	333.48
		1.5	159.97	160.91	1576.17	1575.64	61.99	63.98	87.75	88.63	66.67	68.33	232.50	240.00
L.S.D		0.05	N.S	16.51	106.12	121.89	N.S	N.S	8.62	8.87	N.S	N.S	N.S	N.S
		0.01	N.S	N.S	142.91	164.16	N.S	N.S	11.61	N.S	N.S	N.S	N.S	N.S

were obtained by F_2 at 1.5 gm / L applied as drench (159.97 and 160.91ppm) in the first and second seasons respectively, followed descendingly by spraying each of F_1 at 1.5 gm/L, F_2 at 0.5 gm/L and F_2 at 1.5 gm/L. On the contrary, treatment by water only as control produced the lowest leaf Fe content (65.47 and 63.95 ppm) during first and second seasons, respectively. Other treatments took intermediate place between the two extremes with variable values. The differences between the tested combinations were significant at 5 % level in the second season only.

As for specific effect of fertilizer form on Fe leaf of 3 months old Yucca seedlings. It is obvious from data recorded in Table (11 a) that prepared fertilizer was more effective in increasing leaf iron content, it may be due to high percentage of iron content in prepared fertilizer . Such increase was significantly in both seasons of study.

With respect to the specific effect of methods of applied fertilizers on leaf Fe content, data obtained during two seasons as shown in Table (11 a) shows clearly that spray method had a pronounced effect in increasing leaf iron content but the differences among S and D methods were so small to reach the level of significant in the first season and also did not reach the 1 % in the second season.

As for the specific effect of rates of application, it is quite evident that increasing concentration of both fertilizers applied were in a positive relationship to leaf iron content of 3 months old *Yucca filamentosa* seedlings. In addition, the highest values were coincided with the highest rates of fertilizers at 1.5 gm/L (144.19 and 145.78 ppm) in the first and second season respectively. The differences between either above mentioned rate and other rates of application or control were significant at 1 % level in both seasons.

Concerning the combination effect of fertilizer forms (F_1) & (F_2) and methods of application (S) & (D), data in Table (11 a) showed that F_2

(prepared fertilizer) was more effective in increasing leaf iron content when applied by drench method. On the contrary, F_1 was more effective when applied by spraying method and ranked second in this concern. We could explain these results according to the form of Fe (source), it may be chelated or mineral forms.

As for the specific effect of interaction between F_1 or F_2 x rates of application (0.0, 0.5, 1.0 and 1.5 gm/L) on leaf iron content, data in Table (11 a) revealed that the highest rate of F_2 gave the highest content of leaf Fe of Yucca seedlings and followed in descending order by F_2 at 0.5 gm/ L and F_1 at 1.5 gm/L. This trend was true in both seasons of study, although the differences between all combination treatments were insignificant.

Concerning the specific effect of interaction between methods of application x rates of application on leaf iron content of 3 months old *Yucca filamentosa* seedlings, Table (11 a) show that all combination treatments increased leaf iron ppm over control during the two seasons of study, while differences between all treatments were insignificant. In addition, spraying seedlings with 1.5 gm/L had a pronounced effect in comparison with drench at the same rate which ranked the second in this respect. Moreover, spraying seedlings with 0.5 gm/L took the third position. Such trend was true during two experimental seasons.

These results are in disagreement with the findings of **Rodriguez and Lopez (1976)** on *Dracaena sanderiana* and **Smith (1978)** on *Zamia integrifolia* and they are go in line with that reported by **Taleb and Sohair (1995)** on *Dracaena fragrans*.

II. A. 3. g. 2. Root iron content :

Concerning to the interaction between forms of fertilizers, methods of application and rates of application on root Fe content of 3 months old *Yucca filamentosa* seedlings. Data tabulated in Table (11) showed clearly that all combinations gave highly significant increase over control.

TABLE (11a) :- Specific effect of two forms of fertilizers, methods and rates of application and their interaction effect on (Fe ppm in leaves and roots) of *Yucca filamentosa* (3 months old) during 1996/1997 & 1997/1998 seasons.

Specific effect of form of fertilizers (F)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	112.36	112.90	977.51	999.89
F2	122.23	122.88	1115.54	1148.18
L.S.D 0.05	6.49	5.83	37.52	43.09
L.S.D 0.01	8.75	7.86	50.53	58.04

Specific effect of methods of application (M)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
S	120.27	120.64	895.31	923.42
D	114.31	115.14	1197.74	1224.66
L.S.D 0.05	N.S	5.83	37.52	43.09
L.S.D 0.01	N.S	N.S	50.53	58.04

Specific effect of rates of application (R)

Season		0.0	0.5	1.0	1.5	L.S.D	
						0.05	0.01
Leaves	1 st S.	65.47	130.28	129.24	144.19	9.19	12.37
	2 nd S.	63.95	130.85	130.98	145.78	8.25	11.11
Roots	1 st S.	615.95	1083.21	1256.06	1230.88	53.06	71.46
	2 nd S.	663.80	1106.04	1271.28	1255.04	90.95	82.08

Specific effect of interaction between F & M

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S	120.66	121.03	857.12	889.54
	D	104.06	104.77	1097.91	1110.25
F2	S	119.88	120.25	933.49	957.31
	D	124.57	125.51	1297.58	1339.06
L.S.D	0.05	9.19	8.25	53.06	60.95
	0.01	12.37	11.11	71.46	82.08

Specific effect of interaction between F & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	0.0	65.47	63.95	615.95	663.80
	0.5	122.39	122.54	1006.71	995.98
	1.0	125.51	126.89	1198.39	1201.09
	1.5	136.06	138.25	1089.01	1138.71
F2	0.0	65.47	63.95	615.95	663.80
	0.5	138.17	139.16	1159.71	1216.10
	1.0	132.96	135.08	1313.74	1341.46
	1.5	152.31	153.31	1372.76	1371.37
L.S.D	0.05	N.S	N.S	75.04	86.19
	0.01	N.S	N.S	101.05	116.08

Specific effect of interaction between M & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
S	0.0	65.47	63.95	615.95	663.80
	0.5	140.1	140.01	863.02	858.67
	1.0	129.67	130.95	1011.13	1035.88
	1.5	145.84	147.65	1091.13	1135.34
D	0.0	65.47	63.95	615.95	663.80
	0.5	120.46	121.69	1303.39	1353.41
	1.0	128.81	131.02	1500.99	1506.67
	1.5	142.53	143.91	1372.76	1371.37
L.S.D	0.05	N.S	N.S	75.04	86.19
	0.01	N.S	N.S	101.05	116.08

In general, during both seasons of study seedlings treated by F_2 x D at 1.5 gm/L gave roots contained the highest Fe content as (1576.17 and 1575.64 ppm) in the first and second seasons respectively, followed by F_2 x D at 1.0 gm/L, F_2 x D at 0.5 gm/L and F_1 x D at 1.0 gm/L. The differences between the four superior treatments were insignificant especially in the second season. The other investigated treatments came second in this respect but still gave the highest values over control.

Referring the specific effect of fertilizer forms on the root Fe ppm of 3 months Yucca seedlings, data recorded in Table (11 a) demonstrated that F_2 (prepared fertilizer) resulted in highly significant the accumulation of iron in roots of Yucca seedlings compared to F_1 (Stimufol).

With respect to the specific effect of methods of application, it is obvious from Table (11 a) that during both experimental seasons, the richest statistically in closed relationship to those seedlings treated by drench method of applied fertilizers. On the contrary, spray method was the inferior in this respect.

Concerning the specific effect of rates of application on root Fe content, it was quite evident from Table (11 a) that treated seedlings with different rates of F_1 and F_2 produced a significant increase in Fe content of roots than those treated with water (control). Moreover, the highest values of Fe content in roots (1256.06 & 1271.28 ppm) and (1230.88 & 1255.04 ppm) for the medium rate (1.0 gm/L) and high rate (1.5 gm/ L) during 1996/1997 and 1997/1998 seasons, respectively. The differences between the two superior rates and the low rate (0.5 gm/L) were high significant during both seasons of study.

With regard to the specific effect of interactions between forms of fertilizer and methods of application, the data are presented in Table (11 a) showed that F_2 (prepared fertilizer) showed its own relative superiority in increasing root iron content when applied by drench method followed in

descending order by F_1 x D. On the contrary, both F_2 x S and F_1 x S were the inferior combinations in this respect. The differences between all combinations were highly significant during both seasons of study expect the difference between F_2 x S and F_1 x S during 1997/1998 season.

As for the specific effect of interaction between forms of fertilizer and rates of application, data in Table (11 a) cleared that all applied rates of both F_1 or F_2 increased highly significant Fe content in roots over control. The highest rate (1.5 gm/L) of F_2 (prepared fertilizer) gave the highest value (1372.76 and 1371.37 ppm) during 1996/1997 and 1997/1998 seasons respectively, followed by F_2 at 1.0 gm/L and F_1 at 1.0 gm/L. This trend was true in both seasons of study.

With regard to the specific effect of interaction between two methods of application and rates of application, Table (11 a) show that all tested rates of fertilizers applied as drench significantly increased the root Fe content as compared with those applied as spray and control plants. Anyhow, the highest value (1500.99 and 1506.67 ppm) were gained by drenching plants with 1.0 gm/L in the first and second seasons, respectively.

Our results disagree with that reported by **Rodriguez and Lopez (1976)** on *Dracaena sanderiana*.

II. A. 3. h. Zinc content :

II. A. 3. h. 1. Leaf zinc content :

Regarding to the leaf zinc content in response to the different combinations of (F_1 and F_2) x (S and D) x (0.0, 0.5, 1.0 and 1.5 gm /L) during both 1996/1997 and 1997/1998 seasons, data obtained are tabulated in Table (11) revealed that, spraying F_2 at 1.5 gm/L gave the richest leaf Zn%. Whereas, F_1 sprayed at 1.0 gm/L ranked the second in this concern followed by spraying F1 at 1.5 gm/L. This trend was true in both seasons of study. Generally, the F1 and F_2 applied by drench method yielded low

values of leaf Zn content. The differences between all combinations treatments did not reach the level of significance in both seasons of study.

As for the specific effect of two fertilizer forms on leaf Zn content. Table (11 b) show that, it is quite evident that both two fertilizers F_1 (Stimufol) and F_2 (prepared fertilizer) were equally the same from the statistical point of view in both 1996/1997 and 1997/1998 seasons.

With regard to the specific effect of methods of applications S and D on leaf Zn content, Table (11 b) shows clearly that spraying method significantly increased the leaf Zn content (59.46 and 60.39 ppm) in the first and second seasons, respectively.

There are additional Phosphorus–Zinc interactions in plants including inhibition of Zinc translocation from the roots to the shoot **(Burleson and Page, 1967 ; Trier and Bergmann, 1974)** and physiological inactivation of Zinc within the shoots, however the spraying method may cause increases of Zinc within the leaves of Yucca seedling more than drench one.

Concerning the specific effect of rates of applied fertilizers on leaf Zn content. Table (11 b) indicated that all rates of applied fertilizers significantly increased Zn content over control. Moreover, there was a gradual increase in leaf Zinc content due to increasing the doses of applied fertilizers until reach the highest level (1.5 gm/L). Such increases were significant in both seasons of study.

As for the specific effect of interaction between fertilizers forms (F_1 and F_2) x methods of application (S and D) on the leaf Zn content. Data in Table (11 b) indicated that in the first season F_2 x S gave the highest values of leaf Zn content (59.52 ppm) followed by F_2 x S (59.41ppm). Similar results were obtained in the second season, although the differences were so little to reach the level of significance. On contrary, F_1 x D and F_2 x D gave the lowest values in both seasons, respectively.

Regarding the specific effect of interaction between forms of fertilizers x rates of application on the leaf Zinc content, data recorded in Table (11 b) displayed obviously that F_2 (prepared fertilizer) at 1.5 gm /L gave the richest leaf Zn content (66.23 and 67.29 ppm) in the first and second seasons, respectively. Regarding the response to the other investigated combinations. It was so worthy to be noticed that medium concentration of F_1 at 1.0 gm/L ranked the second in this concern. While, F_2 at 1.0 gm/L and F_1 at 1.5 gm/L exhibited statistically the same leaf Zn content as compared to the above mentioned treatments during both seasons of study.

As for the specific effect of interaction between methods of application and rates of applied fertilizers (irrespective to the fertilizer form) on leaf zinc content, data in Table (11 b) showed that in both seasons all tested doses of fertilizers applied as spray significantly increased the leaf Zn content as compared with those applied as drench and control plants. Anyhow, spraying at 1.5 gm/L gave the highest values (68.65 and 69.18 ppm) followed in a descending order by spraying at 1.0 gm/L (64.24 and 65.96 ppm) in the first and second seasons, respectively.

In addition, adding fertilizers at low rate 0.5 gm/L by both methods S and D were always coupled with those seedlings had the lowest leaf zinc content as compared to any other investigated combinations during both experimental seasons.

Our results agree with that obtained by **Smith (1978)** on *Zamia integrifolia* who found that raising N level had no effect on micro element.

II. A. 2. H. 2. Root zinc content :

Concerning the specific effect of interaction between two forms of fertilizers, methods of application, and rates of application on root zinc content of 3 months old *Yucca filamentosa* seedlings, data in Table (11) indicated that in both seasons of study all applied treatments increased

TABLE (11b) :- Specific effect of two forms of fertilizers, methods and rates of application and their interaction effect on (Zn ppm in leaves and roots) of *Yucca filamentosa* (3 months old) during 1996/1997 & 1997/1998 seasons.

Specific effect of form of fertilizers (F)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	56.74	57.79	71.47	72.39
F2	57.82	58.46	72.74	73.89
L.S.D 0.05	N.S	N.S	N.S	N.S
L.S.D 0.01	N.S	N.S	N.S	N.S

Specific effect of methods of application (M)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
S	59.46	60.39	72.39	70.45
D	55.09	55.85	73.89	75.83
L.S.D 0.05	2.10	2.16	3.05	3.14
L.S.D 0.01	2.83	2.91	4.11	4.23

Specific effect of rates of application (R)

Season		0.0	0.5	1.0	1.5	L.S.D	
						0.05	0.01
Leaves	1 st S.	49.55	54.88	61.91	62.77	2.97	4.00
	2 nd S.	50.36	55.69	62.82	63.64	3.05	4.11
Roots	1 st S.	59.64	72.27	76.73	79.79	4.31	5.81
	2 nd S.	60.46	73.15	78.45	80.49	4.44	5.98

Specific effect of interaction between F & M

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S	59.41	60.85	70.87	71.76
	D	54.07	54.74	72.07	73.01
F2	S	59.52	59.95	68.12	69.14
	D	56.11	56.97	77.36	78.64
L.S.D	0.05	N.S	N.S	4.31	4.44
	0.01	N.S	N.S	N.S	N.S

Specific effect of interaction between F & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	0.0	49.55	50.36	59.64	60.46
	0.5	54.14	55.13	71.69	72.36
	1.0	63.95	65.69	76.02	77.63
	1.5	59.30	59.98	78.53	79.09
F2	0.0	49.55	50.36	59.64	60.46
	0.5	55.61	56.26	72.85	73.94
	1.0	59.87	59.94	77.43	79.27
	1.5	66.23	67.29	81.05	81.89
L.S.D	0.05	4.20	4.31	N.S	N.S
	0.01	5.66	5.81	N.S	N.S

Specific effect of interaction between M & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
S	0.0	49.55	50.36	59.64	60.46
	0.5	55.41	56.09	66.18	67.19
	1.0	64.24	65.96	71.94	73.79
	1.5	68.65	69.18	80.22	80.34
D	0.0	49.55	50.36	60.46	60.46
	0.5	54.34	55.29	78.37	79.10
	1.0	59.58	59.67	81.51	83.10
	1.5	56.89	58.09	79.36	80.65
L.S.D	0.05	4.20	4.31	6.09	6.28
	0.01	5.66	5.81	8.21	N.S

significantly Zn content (ppm) in roots of Yucca seedlings over control except both F_1 and F_2 applied as spray at 0.5 gm/L which gave an insignificant increase compared to control. Generally, the highest root Zn content was detected by those Yucca seedlings treated by F_2 x D at 1.5 gm/L and F_1 x S at 1.5 gm/L (87.75 & 86.09 ppm) and (88.63 & 85.52 ppm) during 1996/1997 and 1997/1998 seasons, respectively. Whereas, the other combinations ranked the second in this concern. This trend was true if an average of two seasons was taken in consideration.

As for the specific effect of two forms of fertilizers, tabulated data in Table (11 b) revealed that both Stimufol (F_1) and prepared fertilizer (F_2) were approximately equal in their influence on root Zn content from the statistical point of view.

Regarding the specific effect of methods of applications on root Zn content of 3 months old *Yucca filamentosa* seedlings, data in Table (11 b) showed that drench method had a pronounced effect in increasing root zinc content, but the differences among S and D methods were so small to be significant in the first season. Whereas, in the second season the differences were highly significant.

With respect to the specific effect of rates of applications, it is obvious from Table (11 b) that increasing concentration of both F_1 and F_2 were in a positive relationship to Zn content of Yucca seedlings. In addition, the highest values were recorded with 1.5 gm/L (79.79 and 80.49 ppm) during 1996/1997 and 1997/1998 seasons, respectively. The differences between all applied rates and control were highly significant in both seasons of study.

Referring the specific effect of interaction between two forms of fertilizers and two applied methods. The outlined results in Table (11 b) indicated that F_2 x D was significantly the superior combination followed

by F_1 x D. Whereas, both F_1 x S and F_2 x S were the inferior in this respect.

No significant response was observed during both seasons of study as a result of the specific effect of interaction between two forms of fertilizers and rates of application, data in Table (11 b) cleared that the highest rate (1.5 gm/L) of F_2 was the superior combination followed in descending order by F_1 at 1.5 gm/L and F_2 at 1.0 gm/L. This trend was true during two seasons of study or an average of two seasons of study.

With respect to the specific effect of interaction between methods of application (S & D) and rates of application (0.0, 0.5, 1.0 and 1.5 gm/L) on root Zn content of 3 months old *Yucca filamentosa* seedlings, Table (11 b) showed that all combinations increased significantly root Zn ppm over control during both seasons of study. In addition, drenching seedlings at 1.0 gm/L had a pronounced effect in this respect followed by S at 1.5 gm/L and D at 1.5 gm/L. The other combinations took intermediate place between the superior and inferior combinations.

These results agree with that reported by **Smith (1978)** on *Zamia integrifolia.*

I. A. 3. i. Manganese content :

I. A. 3. i. 1. Leaf manganese content :

Referring to leaf Mn content of 3 months old Yucca seedlings in response to combinations of (F_1 and F_2) x (S and D) x (0.0, 0.5, 1.0, 1.5 gm/L), data are presented in Table (11). The tabulated data showed that spraying with both F_1 and F_2 at the highest rate 1.5 gm / L gave the richest leaf Mn content (88.21 and 89.28 ppm) for F_1 x 1.5 gm/L and (86.72 and 88.81 ppm) for F_2 x 1.5 gm/L in the first and second season, respectively. However, leaf Mn content of 3 months old seedlings tended to be more higher with spraying method of applied rates (even at low rates) of F_1 and F_2 as compared to those received by drench method. Hence seedlings has

the poorest leaves in manganese content were obtained by F_1 at 1.5 gm/L added by drench method, although differences did not reach level of significance during two seasons of study.

Referring the response of leaf Mn content of 3 months Yucca seedlings to specific effect of the two fertilizers forms, data in Table (11 c) indicated that both Stimufol (F_1) and prepared fertilizer (F_2) were approximately equal in their effect on leaf Mn content from the statistical point of view.

As for the specific effect of methods of applied fertilizers on leaf Mn content of 3 months Yucca seedlings, data recorded in Table (11 c) declared that the richest leaf Mn content was exhibited by such transplants sprayed with fertilizers as compared to those received by adding it to the media. Such increase was highly significant in both 1996/1997 and 1997/1998 seasons.

Concerning the specific effect of applied rates of fertilizers on leaf Mn content of 3 months Yucca seedlings, Table (11 c). It is quite evident to be observed clearly that there was a positive correlation between increasing leaf Mn content and raising doses level of the applied fertilizers. However, Mn content in leaves of Yucca seedlings tended to be higher towards the highest rates of applied fertilizers and reached its maximum values at 1.5 gm/L (73.88 and 75.09 ppm) in the first and second seasons, respectively. Whereas, the differences between all doses and control plants were highly significant.

Regarding the specific effect of interaction between fertilizers forms (F_1 and F_2) x two applied methods (S and D) on the leaf Mn content of Yucca seedlings, data presented in Table (11 c) shows that, it is quite evident to be observed clearly that spray both F_1 and F_2 were more effective in increasing leaf Mn content as compared by those added to soil.

Hence, it could be concluded that spraying is a favourable method for micronutrient application.

As for the leaf Mn content of younger (3 months old) Yucca seedlings response to specific effect to combination interaction between F_1 and F_2 and its adding doses. Table (11 c), displayed similar previously detected trend with zinc. The highest rates of both applied fertilizers (at 1.5 gm/L and 1.0 gm/L) were statistically the superior as compared to any of other doses investigated ones. Such trend was really during both 1996/1997 and 1997/1998 seasons. Meanwhile other doses not only ranked second but also they were equally effective from the statistical standpoint.

As for specific effect of combinations of methods of applied fertilizers (S & D) x doses (0.0, 0.5, 1.0 and 1.5 gm/L) on leaf Mn content of 3 months Yucca seedlings, data tabulated in Table (11 c) revealed that spraying method exerted its superiority with increasing leaf Mn content at all doses especially at high rates compared with drench method and control. This trend was true in both seasons of study and the differences were highly significant.

These results are in harmony with the findings of **Smith (1978)** on *Zamia integrifolia* and **Taleb and Sohair (1995)** on *Dracaena marginata* and *D. fragrans*.

I. A. 3. i. 2. Root manganese content :

Regarding the specific effect of interaction between three factors under study i.e. forms of fertilizer (F_1 & F_2), methods of application (S & D) and rates of application (0.0, 0.5, 1.0 and 1.5 gm/L) on Mn content in roots of *Yucca filamentosa* seedlings, data recorded in Table (11) showed that no significant response was observed between all treatments under study during both seasons of study, although all combinations increased Mn content in roots compared to control. Results revealed also that the richest roots in their Mn content was obtained by those seedlings treated with both

TABLE (11c) :- Specific effect of two forms of fertilizers, methods and rates of application and their interaction effect on (Mn ppm in leaves and roots) of *Yucca filamentosa* (3 months old) during 1996/1997 & 199/1998 seasons.

Specific effect of form of fertilizers (F)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	64.51	64.88	230.86	232.21
F2	64.75	65.68	236.01	237.97
L.S.D 0.05	N.S	N.S	N.S	N.S
L.S.D 0.01	N.S	N.S	N.S	N.S

Specific effect of methods of application (M)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
S	69.53	70.47	200.83	202.37
D	59.73	60.09	266.04	267.81
L.S.D 0.05	4.75	4.38	32.16	31.92
L.S.D 0.01	6.39	5.89	43.26	42.99

Specific effect of rates of application (R)

Season		0.0	0.5	1.0	1.5	L.S.D	
						0.05	0.01
Leaves	1 st S.	55.12	62.31	67.21	73.88	6.72	9.05
	2 nd S.	55.45	62.77	67.79	75.09	6.19	8.34
Roots	1 st S.	141.35	262.77	271.67	257.95	45.43	61.19
	2 nd S.	142.16	263.55	273.12	261.54	45.15	60.79

Specific effect of interaction between F & M

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S	70.99	71.64	198.77	200.99
	D	58.04	58.12	262.95	263.43
F2	S	68.07	69.29	202.89	203.75
	D	61.42	62.06	269.12	272.18
L.S.D	0.05	N.S	N.S	N.S	N.S
	0.01	N.S	N.S	N.S	N.S

Specific effect of interaction between F & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	0.0	55.12	55.45	141.35	142.16
	0.5	61.19	61.24	246.42	247.14
	1.0	70.66	71.22	267.85	268.61
	1.5	71.09	71.62	267.82	270.94
F2	0.0	55.12	55.45	141.35	142.16
	0.5	63.42	64.29	279.12	279.95
	1.0	63.75	64.38	275.49	277.63
	1.5	76.69	78.57	248.07	252.13
L.S.D	0.05	N.S	N.S	N.S	N.S
	0.01	N.S	N.S	N.S	N.S

Specific effect of interaction between M & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
S	0.0	55.12	55.45	141.35	142.16
	0.5	63.07	63.88	188.55	189.18
	1.0	72.48	73.49	216.31	217.60
	1.5	87.46	89.05	257.12	260.55
D	0.0	55.12	55.45	141.35	142.16
	0.5	61.54	61.66	336.99	337.91
	1.0	61.94	62.11	327.03	328.63
	1.5	60.31	61.15	258.77	262.53
L.S.D	0.05	9.50	8.76	64.25	63.85
	0.01	12.79	11.79	86.53	85.98

of F_2 or F_1 at 0.5 and 1.0 gm/L applied as drench in the two seasons. Moreover, if an average of the two seasons was concerned F_1 x D at 1.5 gm/L ranked the second and followed descendingly by both F_2 x S at 1.5 gm/L and F_1 x S at 1.5 gm/L. In general, the other treatments were in between as compared to the previously mentioned treatments and control plants.

As for the specific effect of fertilizer forms, it is clear from Table (11 c) that both F_1 (Stimufol) and F_2 (prepared fertilizer) were nearly equal in their effectiveness on the root Mn content of Yucca seedlings. So, the differences were so small to be significant.

With respect to the specific effect of methods of application. Data recorded in Table (11 c) showed obviously that drench method gave highly significant increase over spray method. The increases were 32.5 32.3 % during 1996/1997 and 1997/1998 seasons, respectively.

Concerning the specific effect of rates of application, data in Table (11 c) indicated that during both seasons, it could be descendingly arranged the three rates regarding in their specific effect on root Mn content as follows : 1.0 gm/L (271.67 & 273.12 ppm), 0.5 gm/L (262.77 & 263.55 ppm) and 1.5 gm/L (257.95 & 261.54 ppm) for the first and second seasons respectively. The differences between the three applied rates were so small to reach the level of significance but they gave highly significant increases over control.

No significant response was observed as a result of the specific effect of interaction between two forms of fertilizer and two methods of application. The data in Table (11 c) cleared that F_2 x D gave the highest values in this respect (269.12 and 272.18 ppm) in the first and second seasons, respectively. On the contrary, F_1 x S was the inferior treatment. The two other combinations were in between the two extremes with variable values.

Referring the specific effect of interaction between F_1 & F_2 and (0.0, 0.5, 1.0 and 1.5 gm/L) on root Mn content of *Yucca filamentosa* seedlings, data in Table (11 c) showed that in both seasons, the richest root in their Mn content was concomitant to those seedlings received F_2 at either 0.5 and 1.0 gm/L followed by F_1 at 1.5 gm/L and F_1 at 1.0 gm/L. On the contrary, control treatment was the inferior one (141.35 and 142.16 ppm) during the first and second seasons, respectively. The differences between all combinations were so small to be significant.

Concerning the specific effect of interaction between two methods of application and rates of application, Table (11 c) revealed that drench method applied at either 0.5 and 1.0 gm/L increased significantly Mn content in roots of Yucca seedlings compared to the other combinations and control. D at 1.5 gm/L and S at 1.5 gm/L took intermediate place between the two extremes with variable values.

These results agree with the findings of **Smith (1978)** on *Zamia integrifolia.*

II. B. Experiment II (one year old seedlings) :

II. B. 1. Vegetative growth measurements :

II. B. 1. 1. Plant height :

Concerning the influence of interaction between the two forms of fertilizers, methods of application and rates of application, data tabulated in Table (12) cleared that prepared fertilizer (F_2) at 1.5 gm/L and F_2 at 1.0 gm/L applied as drench gave the tallest Yucca plants followed by Stimufol (F_1) at 0.5 gm/L x D and F_2 at 0.5 gm/L x D. Such trend was true either data of each individual season or an average of both seasons were compared with control treatment. On the contrary, the lowest plant height was obtained by the combination of the highest rate of F_2 (prepared one)

TABLE (12): Interaction effect of different combination between two forms of fertilizers, methods and rates of application on vegetative growth of *Yucca filamentosa* / one years old

TREATMENTS			plant height (cm)		NO. of leaves		Leaf area (cm2)		F.W. of leaves(g.)		D.W. of leaves(g.)	
Fert. Types	Appl. Meth.	Appl. Rate	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S SPRAY	0.0	26.17	20.50	20.33	41.33	28.89	23.45	61.19	91.23	10.71	22.01
		0.5	32.33	32.00	35.00	55.67	41.21	30.53	162.27	140.10	26.25	34.24
		1.0	35.67	24.67	30.00	51.00	30.89	25.36	223.75	121.72	28.10	27.84
		1.5	32.67	25.00	31.00	80.33	31.72	24.52	158.00	152.86	32.40	39.39
	D DRENCH	0.0	26.17	20.50	20.33	41.33	28.89	23.45	61.19	91.23	10.71	22.01
		0.5	37.33	35.00	44.00	113.67	44.75	37.93	255.40	227.03	49.95	49.64
		1.0	35.33	34.67	39.00	68.00	42.24	34.41	172.75	356.11	32.80	83.32
		1.5	36.17	34.00	35.50	84.00	45.28	37.89	194.60	339.39	34.65	80.89
F2	S SPRAY	0.0	26.17	20.50	20.33	41.33	28.89	23.45	61.19	91.23	10.71	22.01
		0.5	30.33	25.33	28.00	47.67	32.37	27.28	124.25	116.67	25.40	29.89
		1.0	30.33	24.67	28.00	53.33	32.14	27.78	80.83	122.46	17.00	31.85
		1.5	28.17	23.00	21.50	63.67	34.35	31.07	100.65	146.18	16.53	40.11
	D DRENCH	0.0	26.17	20.50	20.33	41.33	28.89	23.45	61.19	91.23	10.71	22.01
		0.5	37.00	35.33	40.00	88.00	48.06	44.50	240.75	300.36	44.85	70.94
		1.0	37.50	36.00	55.00	106.00	30.57	32.67	226.25	272.06	34.63	65.71
		1.5	39.00	40.33	39.00	93.33	35.68	35.63	239.75	343.15	43.45	78.14
L.S.D		0.05	3.15	N.S	2.78	11.27	3.84	3.06	35.71	24.18	5.07	4.96
		0.01	N.S	N.S	3.75	15.18	5.17	4.13	48.09	32.56	6.83	6.68

applied by spraying method and control, so they were the inferior during the two seasons of study. The other combinations were in between the superior treatments and inferior ones.

Regarding the specific effect of two forms of fertilizers, data in Table (12 a) indicated that during 1996/1997 and 1997/1998 seasons of study, no significant differences was observed in plant height in response to F_1 and F_2 fertilizers, so F_1 and F_2 were equal in this regard. Whereas, the two forms of fertilizers gave not only insignificant variance but also showed approximately the same value of plant height of *Yucca filamentosa* seedlings.

With regard to the specific effect of methods of application, data in Table (12 a) showed that drench method resulted in highly significant increase in plant height during both seasons of study as compared with spraying method. The values were (34.33 & 32.04 cm) and (30.23 & 24.46 cm) in first and Second seasons, respectively.

With respect to plant height of one year old of *Yucca filamentosa* as influenced by the specific effect of rates of application, Table (12 a) showed that the medium rate of application (1.0 gm/L) gave statistically the tallest plants compared with control during the first season of study, whereas the low rate (0.5 gm/L) increased plant height over control and other rates of application during the second one.

Regarding the specific effect of interaction between forms of fertilizers (F_1 & F_2) and methods of application (S & D) on plant height, data tabulated in Table (12 a) cleared in both seasons that both two forms of fertilizers applied as drench were more effective for increasing plant height than spray treatment. It is worth to mentioned that F_2 x D gave the highest value (34.92 and 33.04 cm) in both seasons, respectively. While, the lowest

values obtained from F_2 x S and F_1 x S which ranged from (28.75 and 23.38 cm) and (31.71 and 25.54 cm) in the first and second seasons, respectively. The differences between the prementioned two groups were significant.

Furthermore, Table (12 a) showed no significant effect as a result of interaction between forms of fertilizers and rates of application. Briefly, all combinations of F_1 and F_2 at all rates of application increased plant height of Yucca seedlings over control. This trend was true during both seasons of study. It is quite clear to be noticed that the variable degrees of response to the differential combinations during two seasons of study. Since, combinations between F_1 at the rate of 1.0 gm/L from one hand and F_2 at the rate of 1.0 gm/L from the other exhibited statistically the tallest seedlings in the first season only. While, F1 at 0.5 gm/L and F2 at 1.5 gm/L gave the best results in the second one. In addition, other investigated combinations were intermediate as compared to the above mentioned treatments and control.

Data concerning the specific effect of the interaction between methods of application (S & D) and rates of application (0.0, 0.5, 1.0 and 1.5 gm/L) on the plant height of one year old *Yucca filamentosa* plants are presented in Table (12 a). Data showed that all combinations treatments increased significantly the seedling height in comparison to untreated plants (control) during two seasons of study. The results revealed also that the tallest seedlings were obtained after applied fertilizers as drench especially at high rate i.e. 1.5 gm/L of both F_1 and F_2. The other combinations came in between the above superior treatments and control.

The obtained results go in line with that reported by the findings of **Poole and Conover (1986)** on *Dracaena surculosa* cv. Florida Beauty and **Chase and Poole (1987)** on *Fatsia japonica*.

TABLE (12a) :- Specific effect of two forms of fertilizers , methods and rates of applcation and their interaction effect on (Plant height) of *Yucca filamentosa* (one year old) during 1996/1997 & 1997/1998 seasons .

Specific effect of form of fertilizers (F)

Season	1 st S .	2 nd S .
F1	32.73	28.29
F2	31.83	28.21
L.S.D 0.05	N.S	N.S
L.S.D 0.01	N.S	N.S

Specific effect of methods of application (M)

Season	1 st S .	2 nd S .
S	30.23	24.46
D	34.33	32.04
L.S.D 0.05	1.11	1.58
L.S.D 0.01	1.49	2.12

Specific effect of rates of application (R)

Season	0.0	0.5	1.0	1.5	L.S.D	
					0.05	0.01
1 st S .	26.17	34.25	34.71	34.01	1.57	2.12
2 nd S .	20.50	31.92	30.01	30.59	2.23	3.00

Specific effect of interaction between F & M

Season		1 st S .	2 nd S .
F1	S	31.71	25.54
	D	33.75	31.04
F2	S	28.75	23.38
	D	34.92	33.04
L.S.D	0.05	1.57	2.23
	0.01	2.12	N.S

Specific effect of interaction between F & R

Season		1 st S .	2 nd S .
F1	0.0	26.17	20.50
	0.5	34.83	33.50
	1.0	35.50	29.67
	1.5	34.42	29.50
F2	0.0	26.17	20.50
	0.5	33.67	30.33
	1.0	33.92	30.34
	1.5	33.59	31.67
L.S.D	0.05	N.S	N.S
	0.01	N.S	N.S

Specific effect of interaction between M & R

Season		1 st S .	2 nd S .
S	0.0	26.17	20.50
	0.5	31.33	28.67
	1.0	33.00	24.67
	1.5	30.42	24.00
D	0.0	26.17	20.50
	0.5	37.17	35.17
	1.0	36.42	35.34
	1.5	37.59	37.17
L.S.D	0.05	2.23	3.15
	0.01	2.99	4.24

II. B. 1. 2. Number of leaves :

Concerning the number of leaves of one year old *Yucca filamentosa* seedlings as affected by combination of (F_1 & F_2) x (S & D) x (0.0, 0.5, 1.0 and 1.5 gm/L), data in Table (12) revealed that the number of developed leaves/plant was responded clearly to the interaction between F_1 or F_2 when applied as drench i.e. the combination of F_2 at 1.0 gm/L x D and 0.5 gm/L of F_1 x D produced significantly the greatest number of leaves especially during 1997/1998 season as compared to other treatments. Moreover, seedlings received F_2 received 0.5 and 1.5 gm/L x D ranked the second treatments in this concern. On the contrary, the plants sprayed by F_1 or F_2 produced the lowest value of number of leaves as compared with other combinations but they still gave increases over control.

As for the specific effect of forms of fertilizers, Table (12 b) cleared that there is no significant response between (F_1) Stimufol and (F_2) prepared fertilizer during both seasons of study.

Concerning the specific effect of methods of application, it obvious from Table (12b) that the drench method gave highly significant increases in number of leaves during both seasons of study. The percentage of increases of (D) over (S) reached to 36.9 and 46.4 % during 1996/1997 and 1997/1998 seasons, respectively.

With regard to the specific effect of rates of application, data in Table (12 b) indicated that the medium rate of application (1.0 gm/L) and the high rate (1.5 gm/L) produced statistically the highest number of leaves compared with control and other rates of application during the first and second seasons, respectively. In general, the averages for the studied concentrations (0.0, 0.5, 1.0 and 1.5 gm/L) were (20.33, 36.75, 38.00 and

TABLE (12b) :- Specific effect of two forms of fertilizers , methods and rates of applcation and their interaction effect on (No. of leaves) of *Yucca filamentosa* (one year old) during 1996/1997 & 1997/1998 seasons .

Specific effect of form of fertilizers (F)

Season	1 st S .	2 nd S .
F1	31.89	66.92
F2	31.52	66.83
L.S.D 0.05	N.S	N.S
L.S.D 0.01	N.S	N.S

Specific effect of methods of application (M)

Season	1 st S .	2 nd S .
S	26.77	54.29
D	36.65	79.46
L.S.D 0.05	0.98	3.99
L.S.D 0.01	1.33	5.37

Specific effect of rates of application (R)

Season	0.0	0.5	1.0	1.5	L.S.D	
					0.05	0.01
1 st S .	20.33	36.75	38.00	31.75	1.39	1.87
2 nd S .	41.33	76.26	69.59	80.34	5.64	7.59

Specific effect of interaction between F & M

	Season	1 st S .	2 nd S .
F1	S	29.08	57.08
	D	34.71	76.75
F2	S	24.46	51.50
	D	38.58	82.17
L.S.D	0.05	1.39	5.64
	0.01	1.87	7.59

Specific effect of interaction between F & R

	Season	1 st S .	2 nd S .
F1	0.0	20.33	41.33
	0.5	39.50	84.67
	1.0	34.50	59.50
	1.5	33.25	82.17
F2	0.0	20.33	41.33
	0.5	34.00	67.84
	1.0	41.50	79.67
	1.5	30.25	78.50
L.S.D	0.05	1.97	7.97
	0.01	2.65	10.73

Specific effect of interaction between M & R

	Season	1 st S .	2 nd S .
S	0.0	20.33	41.33
	0.5	31.50	51.67
	1.0	29.00	52.17
	1.5	26.25	72.00
D	0.0	20.33	41.33
	0.5	42.00	100.84
	1.0	47.00	87.00
	1.5	37.25	88.67
L.S.D	0.05	1.97	7.97
	0.01	2.65	10.73

31.75) and (41.33, 76.26, 69.59 and 80.34) in 1996/1997 and 1997/1998 seasons, respectively.

Furthermore, Table (12 b) indicate a significant effect as a result of interaction between forms of fertilizers and methods of application on number of leaves. Data obtained showed that F_2 x D is the most effective combination followed by F_1 x D compared with F_1 x S and F_2 x S.

Regarding the specific effect of interaction between forms of fertilizers and rates of application, the data in Table (12 b) cleared that all combinations of F_1 x all rates and F_2 x all rates significantly increased the number of leaves over control. It is worthy to mentioned that F_2 at 1.0 gm/L and F_1 at 0.5 gm/L during 1996/1997 and 1997/1998 seasons respectively, gave the most promising effect in this respect.

Data in Table (12 b) revealed that the number of leaves responded obviously to the interaction between the applied methods and rates of application. In both seasons of study, applied fertilizer by drench method of application at low rate is more effective as compared with spraying method even at high rates of application. Generally, all interactions of (D) with all rates of application were highly significant in increasing the number of leaves as compared with spraying method at all levels and control treatment.

The outlined results agree with that reported by **Conover and Poole (1981)** and **Al-Bahrany *et al* (1991)** on *Brassaia actinophylla* and **El.Gendy *et al* (1995)** on *Dracaena draco*.

II. B. 1. 3. Leaf area :

As for leaf area of one year old *Yucca filamentosa* in response to the interaction between (F_1 & F_2), (S & D) and (0.0, 0.5, 1.0 and 1.5 gm/L),

Table (12) shows obviously that prepared fertilizer (F_2) at 0.5 gm/L applied as drench gave highly significant increases in this respect especially during 1997/1998 season followed by F_1 at 0.5 and 1.5 gm/L applied as drench method. Such trend could be noticed clearly as the best combinations in increasing leaf area. On the other side, F_1 and F_2 at all rates of application (0.5 & 1.0 & 1.5 gm/L) applied as spray were the inferior but they still become more effective than 0.0 gm/L (control) treatment.

Concerning the specific effect of forms of fertilizers, it obvious from Table (12 c) that the fertilizer as F_1 resulted in high significant increases of leaf area as compared with F_2 during 1996/1997 season only. On the other hand, during 1997/1998 season, the differences between the superior fertilizer (F_2) and the inferior one (F_1) were so small to be significant.

Furthermore, Table (12 c) indicate a high significant effect as a result of the specific effect of methods of application during both seasons of study. However, drench method was the superior in this respect (38.05 and 33.74cm^2) during 1996/1997 and 1997/1998 seasons, respectively.

Concerning the specific effect of rates of application, it is quite obvious from Table (12 c) that during the two seasons of study, the low rate of application (0.5 gm/L) showed significantly the most effective rate (as compared with control) followed by the high and medium rates (1.5 and 1.0 gm/L), respectively. The percentage of increases of (0.5, 1.0 and 1.5 gm/L) over control were (43.9, 17.6 and 27.2 %) and (49.5, 28.2 and 37.7 %) during 1996/1997 and 1997/1998 seasons, respectively.

Referring to leaf area of *Yucca filamentosa* seedlings as influenced by the interaction between forms of fertilizers and methods of application, it is clear from the obtained results presented in Table (12 c) that in both seasons, F_1 x D and F_2 x D produced (40.29 & 35.80 cm^2)and (33.42 &

TABLE (12c) :- Specific effect of two forms of fertilizers , methods and rates of applcation and their interaction effect on (Leaf area) of *Yucca filamentosa* (one year old) during 1996/1997 & 1997/1998 seasons .

Specific effect of form of fertilizers (F)

Season	1 st S .	2 nd S .
F1	36.73	29.69
F2	33.87	30.73
L.S.D 0.05	1.36	N.S
L.S.D 0.01	1.83	N.S

Specific effect of methods of application (M)

Season	1 st S .	2 nd S .
S	32.56	26.68
D	38.05	33.74
L.S.D 0.05	1.36	1.08
L.S.D 0.01	1.83	1.46

Specific effect of rates of application (R)

Season	0.0	0.5	1.0	1.5	L.S.D 0.05	L.S.D 0.01
1 st S .	28.89	41.60	33.97	36.76	1.92	2.58
2 nd S .	23.45	35.06	30.06	32.28	1.53	2.06

Specific effect of interaction between F & M

	Season	1 st S .	2 nd S .
F1	S	33.18	25.97
	D	40.29	33.42
F2	S	31.94	27.39
	D	35.80	34.06
L.S.D	0.05	1.92	N.S
	0.01	N.S	N.S

Specific effect of interaction between F & R

	Season	1 st S .	2 nd S .
F1	0.0	28.89	23.45
	0.5	42.98	34.23
	1.0	36.57	29.89
	1.5	38.50	31.21
F2	0.0	28.89	23.45
	0.5	40.22	35.89
	1.0	31.36	30.23
	1.5	35.02	33.35
L.S.D	0.05	N.S	N.S
	0.01	N.S	N.S

Specific effect of interaction between M & R

	Season	1 st S .	2 nd S .
S	0.0	28.89	23.45
	0.5	36.79	28.91
	1.0	31.52	26.57
	1.5	33.04	27.79
D	0.0	28.89	23.45
	0.5	46.41	41.22
	1.0	36.41	33.54
	1.5	40.48	36.76
L.S.D	0.05	2.71	2.17
	0.01	3.65	2.92

34.06 cm^2), respectively. Whereas, F_1 x S and F_2 x S gave (33.18 & 31.94 cm^2) and (25.97 & 27.39 cm^2) in the first and second seasons, respectively. The differences were insignificant in the second season.

As for the specific effect of interaction between forms of fertilizers and rates of application, it is cleared from Table (12 c) that all interactions of F_1 and F_2 at all rates of application resulted in increasing leaf area of Yucca seedlings over control. 0.5 gm/L of F_1 and F_2 tended to declare its own relative superiority over other combinations. The differences between the applied rates were so small to be significant.

Regarding the specific effect of interaction between methods of application and rates of application on leaf area of Yucca plants, data in Table (12 c) showed highly significant increase as a result of interaction between drench and all applied concentrations compared with spraying method and control. Moreover, both fertilizers applied at 0.5 gm/L x D gave the highest value of leaf area followed by D x 1.5 gm/L. This trend was true during both seasons of this investigation or if the average of two seasons was taken in consideration.

Our findings are in agreement with that reported by **Conover and Poole (1979a)** on *Chamaedora elegans*, **Conover *et al* (1982)** on *Draceana marginata* and **Martinez *et al* (1982)** on *Dieffenbachia exotica* which they found that higher fertilizer levels had little effect on plant quality.

II. B. 1. 4. Fresh weight of leaves :

Referring the influence of the interaction between forms of fertilizers, methods and rates of application on the fresh weight of Yucca leaves during 1996/1997 and 1997/1998 seasons, data in Table (12) displayed an obvious response. Hence, the greatest fresh weight of leaves statistically induced by Yucca plants feeded with 0.5 gm/L of F_1 x D and 1.0 gm/L of

F_1 x D followed by F_2 at 0.5 gm/L x D and F_2 at1.5 gm/L x D during the first and second seasons, respectively. Contrary to that, plants sprayed by F_1 or F_2 produced less value of fresh weight as compared with other combinations but it was still significantly more effective than control. The other combinations took intermediate place between the two extremes.

As for the specific effect of two forms of fertilizers on fresh weight of leaves, data in Table (12 d) showed that F_1 produced the highest fresh weight compared with F_2 whereas, the differences were highly significant during 1996/1997 season but in the second season the differences were so small to be significant, thus, F_1 and F_2 are equal in this concern.

In regard to fresh weight of *Yucca filamentosa* leaves as influenced by the specific effect of methods of application, data are presented in Table (12 d). Generally it could be noticed that drench as applied method resulted in highly significant increases on leaves fresh weight. The values were (181.11 and 252.57 gm) during 1996/1997 and 1997/1998 seasons, respectively. On the other hand, spraying method induced the least values (121.52 and 122.81 gm) in 1st and 2nd seasons, respectively.

Concerning the specific effect of rates of application, outlined data in Table (12 d) showed that during 1996/1997 season, fresh weight of leaves decreased continuously with increasing the rate of application. Whereas, 0.5gm/L was significantly the most effective rate in this concern (195.67 gm) as compared with the other rates and control. On the contrary, the reverse was true with 1997/1998 season whereas this character was positively proportioned to concentration used from fertilizers.

With regard to the interaction between two forms of fertilizers and methods of application, data are presented in Table (12 d) cleared that in both seasons F_2 x D and F_1 x D gave (191.24 & 170.99 gm) and (251.70&

TABLE (12d) :- Specific effect of two forms of fertilizers , methods and rates of applcation and their interaction effect on (F. W. of leaves) of *Yucca filamentosa* (one year old) during 1996/1997 & 1997/1998 seasons .

Specific effect of form of fertilizers (F)

Season	1 st S .	2 nd S .
F1	161.14	189.96
F2	141.48	185.42
L.S.D 0.05	12.62	N.S
L.S.D 0.01	17.00	N.S

Specific effect of methods of application (M)

Season	1 st S .	2 nd S .
S	121.52	122.81
D	181.11	252.57
L.S.D 0.05	12.62	8.55
L.S.D 0.01	17.00	11.51

Specific effect of rates of application (R)

Season	0.0	0.5	1.0	1.5	L.S.D 0.05	L.S.D 0.01
1 st S .	61.19	195.67	175.89	173.25	17.85	24.04
2 nd S .	91.23	196.04	218.09	245.39	12.09	16.28

Specific effect of interaction between F & M

	Season	1 st S .	2 nd S .
F1	S	151.30	126.48
	D	170.99	253.44
F2	S	91.73	119.14
	D	191.24	251.70
L.S.D	0.05	17.85	N.S
	0.01	24.04	N.S

Specific effect of interaction between F & R

	Season	1 st S .	2 nd S .
F1	0.0	61.19	91.23
	0.5	208.84	183.57
	1.0	198.25	238.92
	1.5	176.30	246.13
F2	0.0	61.19	91.23
	0.5	182.50	208.52
	1.0	153.54	197.26
	1.5	170.20	244.67
L.S.D	0.05	N.S	17.09
	0.01	N.S	23.02

Specific effect of interaction between M & R

	Season	1 st S .	2 nd S .
S	0.0	61.19	91.23
	0.5	143.26	128.39
	1.0	152.29	122.09
	1.5	129.33	149.52
D	0.0	61.19	91.23
	0.5	248.08	263.69
	1.0	199.50	314.09
	1.5	217.18	341.27
L.S.D	0.05	25.25	17.09
	0.01	34.00	23.02

253.44 gm) fresh weight of leaves during the first and second seasons, respectively. On the contrary, F_1 x S and F_2 x S produced the lowest values, the differences were non significant in 1997/1998 season.

Referring the specific effect of interaction between two forms of fertilizers and rates of application, data in Table (12 d) indicate that F_1 and F_2 x all rates raised fresh weight of leaves as compared with control. The most effective treatments were F_1 x 0.5 gm/L which gave (208.84 gm) and F_1 x 1.5 gm/L which gave (246.13 gm) during 1996/1997 and 1997/1998 seasons, respectively.

Regarding the interaction effect of methods of application (S & D) x rates of application (0.0, 0.5, 1.0 and 1.5 gm/L) on fresh weight of *Yucca filamentosa* leaves, data in Table (12 d) cleared a high significant effect as a result of applied drench method x all rates of application as compared with spraying method at all rates and control. However, D at 0.5 gm/L and D at 1.5 gm/L gave the highest values as 248.08 and 341.27 gm in the first and second seasons, respectively.

These results are in harmony with the findings of **Kamal (1995)** on *Polianthes tuberosa* who found that treated plants with NPK at low levels "20,24,48 Kg/fed" 3 times monthly increased fresh weight of leaves.

II. B. 1. 5. Dry weight of leaves :

With respect to dry weight of *Yucca filamentosa* leaves as influenced by the interaction between forms of fertilizers x methods of application x rates of application, data from Table (12) show that dry weight of leaves was responded significantly to all combination treatments under study comparing to control treatment. However, the heaviest leaves dry weight as 49.95 and 83.32 gm were produced with the combination of F_1 (Stimufol) applied as drench at rates 0.5 and 1.0 gm/L in the first and

second seasons, respectively. Moreover, all combinations of two forms of fertilizers and drench method at all applied rates followed the aforesaid superior treatments.

Concerning the specific effect of forms of fertilizers, data in Table (12 e) indicated that F_1 was Statistically more effective in the first season. While,, during the second season there is no significant difference between the two fertilizers. However, F_1 gave (28.19 & 44.92 gm) while F_2 gave (25.41 & 45.08 gm) during 1996/1997 and 1997/1998 seasons, respectively.

As for the specific effect of methods of application, it is clear from data in Table (12 e) that the heaviest dry weight of leaves was induced by those plants received fertilizers by the drench method (32.72 and 59.08 gm) which showed highly significant effect during the first and second seasons, respectively. The increases over spraying methods were 56.6 and 91.1% during 1996/1997 and 1997/1998 seasons, respectively .

Referring the specific effect of rates of application, data in Table (12 e) revealed that during 1996/1997 season, dry weight of leaves was responded significantly to low rate of application (0.5 gm/L) followed by (1.5 gm/L) as compared with (1.0 gm/L) and control. On the other hand, during the second season, the high rate of application (1.5gm/L) induced highly significant increases of dry weight of leaves as compared with the other rates and control.

Furthermore, Table (12 e) indicate a high significant effect as a result of the specific effect of interaction between two forms of fertilizers (F_1 & F_2) and methods of application (S & D) on dry weight of leavesin the first season only. Data showed that F_2 x D was the more effective combination

TABLE (12e) :- Specific effect of two forms of fertilizers , methods and rates of applcation and their interaction effect on (D. W. of leaves) of *Yucca filamentosa* (one year old) during 1996/1997 & 1997/1998 seasons .

Specific effect of form of fertilizers (F)

Season	1 st S .	2 nd S .
F1	28.19	44.92
F2	25.41	45.08
L.S.D 0.05	1.79	N.S
L.S.D 0.01	2.41	N.S

Specific effect of methods of application (M)

Season	1 st S .	2 nd S .
S	20.89	30.92
D	32.72	59.08
L.S.D 0.05	1.79	1.75
L.S.D 0.01	2.41	2.36

Specific effect of rates of application (R)

Season	0.0	0.5	1.0	1.5	L.S.D 0.05	L.S.D 0.01
1 st S .	10.71	36.62	28.14	31.76	2.54	3.41
2 nd S .	22.01	46.18	52.18	59.64	2.48	3.34

Specific effect of interaction between F & M

	Season	1 st S .	2 nd S .
F1	S	24.37	30.87
	D	32.03	58.97
F2	S	17.41	30.97
	D	33.41	59.20
L.S.D	0.05	2.54	N.S
	0.01	3.41	N.S

Specific effect of interaction between F & R

	Season	1 st S .	2 nd S .
F1	0.0	10.71	22.01
	0.5	38.10	41.94
	1.0	30.45	55.58
	1.5	33.53	60.14
F2	0.0	10.71	22.01
	0.5	35.13	50.42
	1.0	25.82	48.78
	1.5	29.99	59.13
L.S.D	0.05	N.S	3.51
	0.01	N.S	4.72

Specific effect of interaction between M & R

	Season	1 st S .	2 nd S .
S	0.0	10.71	22.01
	0.5	25.83	32.07
	1.0	22.55	29.85
	1.5	24.47	39.75
D	0.0	10.71	22.01
	0.5	47.40	60.29
	1.0	33.72	74.52
	1.5	39.05	79.52
L.S.D	0.05	3.59	3.51
	0.01	4.83	4.72

followed by F_1 x D as compared with F_1 x S and F_2 x S. This trend was true during both seasons of study.

Regarding the specific effect of the interaction between two forms of fertilizers and the rates of application, Table (12 e) showed that all combinations of F_1 x all rates and F_2 x all rates increased dry weight of leaves over control especially during the 2nd season, while the differences during the first season were so small to reach a level of significant. So it is clear that, F_1 at 0.5 gm/L with mean value (38.10 gm) and F_1 at 1.5 gm/L with mean value (60.14 gm) gave the most promising effect in this respect during 1996/1997 and 1997/1998 seasons, respectively.

With respect to the specific effect of the interaction between methods of application and rates of application, data presented in Table (12 e) indicated that all tested doses of fertilizers applied as drench induced highly significant increases in leaves dry weight as compared with those applied as spray and control plants during both seasons of this concern. Anyhow, drenching at 0.5 gm/L gave the highest value (47.40 gm) in the first season, whereas drenching at 1.5 gm/L gave the highest one (79.52 gm) in the second season.

These results are in agreement with that obtained by **El–Gendy *et al.* (1995)** on *Dracaena draco*.

II. B. 2. Root growth measurements :

II. B. 2. 1. Number of roots :

Data concerning the effect of the interaction between forms of fertilizers x methods of application x rates of application on the number of roots of *Yucca filamentosa*, it is clear from data tabulated in Table (13) that in both seasons F_1 at 1.0 gm/L applied as drench method exceeded all other

TABLE (13) :- Interaction effect of different combination between two forms of fertilizers, methods and rates of application)on root growth of *Yucca filamentosa* / one year old

TREATMENTS			NO. of roots		Length of roots(cm)		F.W. of roots(g.)		D.W. of roots(g.)	
Fert. Types	Appl. Meth.	Appl. Rate	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S SPRAY	0.0	14.00	23.50	33.50	39.25	15.04	29.56	4.20	8.86
		0.5	23.67	29.00	56.00	47.00	42.53	60.16	8.50	11.95
		1.0	26.00	24.33	53.67	51.33	83.30	77.12	18.70	23.81
		1.5	16.00	28.67	35.00	31.50	46.25	42.13	10.10	16.89
	D DRENCH	0.0	14.00	23.50	33.50	39.25	15.04	29.56	4.20	8.86
		0.5	27.33	33.67	60.50	51.67	52.30	50.94	16.40	13.38
		1.0	30.33	36.00	44.67	53.33	57.25	78.90	11.65	18.63
		1.5	22.67	31.00	35.50	40.00	24.75	39.29	6.00	12.04
F2	S SPRAY	0.0	14.00	23.50	33.50	39.25	15.04	29.56	4.20	8.86
		0.5	22.67	35.00	47.00	44.50	51.75	54.02	10.93	15.42
		1.0	24.00	33.00	42.67	42.00	26.60	45.42	8.73	13.00
		1.5	14.50	24.33	39.67	35.00	25.50	35.93	7.33	9.71
	D DRENCH	0.0	14.00	23.50	33.50	39.25	15.04	29.56	4.20	8.86
		0.5	22.67	27.33	53.00	50.33	43.65	79.48	8.23	19.52
		1.0	26.00	26.00	43.00	40.67	50.00	48.08	14.20	24.65
		1.5	22.33	34.00	42.25	43.67	36.75	61.82	8.50	16.37
L.S.D		0.05	N.S	3.78	N.S	N.S	5.79	9.92	1.90	4.29
		0.01	N.S	5.09	N.S	N.S	7.81	13.35	2.56	5.78

investigated treatments followed by F_1 at 0.5 gm/L x D and F_2 at 0.5 gm/L x S during the first and second seasons, respectively. On the other side, plants sprayed by 1.5 gm/L of F_2 produced less value of number of roots as compared with other interactions but it still gave increases over control (0.0 gm/L). The other combinations ranked in between the two above extremes. The differences were so small to be significant especially during 1996/1997 season.

Concerning the specific effect of two forms of fertilizers, data in Table (13 a) showed that in 1996/1997 season F_1 (Stimufol) gave highly significant effect with an increase 8.6% over F_2. On the other hand, there is no significant differences between the two forms of fertilizers in the second season, so they were equal in their effectiveness on the number of roots.

With respect to the specific effect of methods of application, Table (13 a) cleared that drench method was significantly the most effective as compared with spray method. The increases over spray methods were 15.8 and 6.2 % during the first and second seasons, respectively.

As for the specific effect of applied rates of two forms of fertilizers, it is clear from Table (13 a) that all concentrations raised significantly the number of roots compared with control. However, the best rate was 1.0 gm/L as (26.59) and 0.5 gm/L as (31.25) during the 1st and 2nd seasons, respectively.

With regard to the specific effect of interaction between two forms of fertilizers and applied methods, Table (13 a) revealed that F_1 x D gave the largest number of roots followed by F_2 x D in the first season and F_2 x S in the second season. The differences were absent during 1996/1997 season. On the contrary, the other combinations gave the lowest number of roots.

TABLE (13a) :- Specific effect of two forms of fertilizers , methods and rates of applcation and their interaction effect on (No. of roots) of *Yucca filamentosa* (one year old) during 1996/1997 & 1997/1998 seasons .

Specific effect of form of fertilizers (F)

Season	1 st S .	2 nd S .
F1	21.75	28.71
F2	20.02	28.33
L.S.D 0.05	0.84	N.S
L.S.D 0.01	1.14	N.S

Specific effect of methods of application (M)

Season	1 st S .	2 nd S .
S	19.36	27.67
D	22.42	29.38
L.S.D 0.05	0.84	1.34
L.S.D 0.01	1.14	N.S

Specific effect of rates of application (R)

Season	0.0	0.5	1.0	1.5	L.S.D 0.05	L.S.D 0.01
1 st S .	14.00	24.09	26.59	18.88	1.19	1.61
2 nd S .	23.50	31.25	29.84	29.50	1.89	2.55

Specific effect of interaction between F & M

	Season	1 st S .	2 nd S .
F1	S	19.92	26.38
	D	23.58	31.04
F2	S	18.79	28.96
	D	21.25	27.71
L.S.D	0.05	N.S	1.89
	0.01	N.S	2.55

Specific effect of interaction between F & R

	Season	1 st S .	2 nd S .
F1	0.0	14.00	23.50
	0.5	25.50	31.34
	1.0	28.17	30.17
	1.5	19.34	29.84
F2	0.0	14.00	23.50
	0.5	22.67	31.17
	1.0	25.00	29.50
	1.5	18.42	29.17
L.S.D	0.05	1.69	N.S
	0.01	N.S	N.S

Specific effect of interaction between M & R

	Season	1 st S .	2 nd S .
S	0.0	14.00	23.50
	0.5	23.17	32.00
	1.0	25.00	28.67
	1.5	15.25	26.50
D	0.0	14.00	23.50
	0.5	25.00	30.50
	1.0	28.17	31.00
	1.5	22.50	32.50
L.S.D	0.05	1.69	2.68
	0.01	2.27	3.60

Referring the specific effect of interaction between forms of fertilizer and rates of application data tabulated in Table (13 a) displayed that during the two seasons, both low and medium rates of both F_1 and F_2 gave the highest values of number of roots. However, F_1 at 1.0 gm/L tended to declare its own relative superiority over other interactions especially in the first season.

Furthermore, Table (13 a) indicated a significant response as a result of the specific effect of interaction between methods of application and applied rates on number of roots. Whereas, data obtained showed that drench method is more suitable at all rates of application followed by spraying method at low and medium rates.

These results are in harmony with the findings of **Salah (1994)** on *Codieum variegatum* and **El-Gendy *et al* (1995)** on *Dracaena draco*.

II. B. 2. 2. Length of roots :

Data recorded in Table (13) displayed obviously that no significant response was recorded as result of interaction between two forms of fertilizers, methods and rates of application. The results revealed clearly an interesting trend which pointed out that all low rates of application resulted in more root elongation followed by medium concentrations as compared with other combinations. In other words, F_1 x D at 0.5 gm/L and F_1 x D at 1.0 gm/L followed by F_1 x S at 0.5 gm/L and F_1 x D at 0.5 gm/L during the first and second seasons respectively, were the most effective combinations in this respect. On the other hand, all high rates of application not only reduced root length but also they were equally the same from the statistical standpoint.

Concerning the specific effect of fertilizers forms, it obvious from Table (13 b) that during the first season, F_1 showed highly significant

effect on roots length. The increase over F_2 was 5.3 %. On the contrary, the reverse was true in the second season where no significant response was observed as a result of different fertilizers.

As regard to the specific effect of methods of application, it is clear from results presented in Table (13 b) that the longest roots were induced by those plants received fertilizers by the drench method which showed a highly significant effect during the second season only.

Referring the specific effect of rates of application, data tabulated in Table (13 b) indicated that length of roots decreased continuously with increasing the rates of application. However, 0.5 gm/L exhibited to be the favourable rate as compared with other rates. Such trend was true during both seasons of study whereas, the differences between all rates were significant especially during the first season.

Table (13 b) cleared that the root length of one year old *Yucca filamentosa* in response to the specific effect of interaction between forms of fertilizers and applied methods exhibited generally that F_1 x S and F_2 x D stimulated the penetration of root system to reach the maximum length during 1996/1997 and 1997/1998 seasons respectively, followed by F_1 x D combination.

Concerning the specific effect of interaction between forms of fertilizers and rates of application, Table (13 b) showed that during the first and second seasons of study, F_1 at 0.5 gm/L and F_1 at 1.0 gm/L stimulated the penetration of roots to reach the maximum length during the first and second seasons, respectively. The other combinations were statistically in between the superior combination and control treatment expect F_1 at 1.5 gm/L which gave the least value in the second season only.

TABLE (13b) :- Specific effect of two forms of fertilizers , methods and rates of applcation and their interaction effect on (Length of roots) of *Yucca filamentosa* (one year old) during 1996/1997 & 1997/1998 seasons .

Specific effect of form of fertilizers (F)

Season	1 st S .	2 nd S .
F1	44.04	44.17
F2	41.82	48.04
L.S.D 0.05	1.30	N.S
L.S.D 0.01	1.76	N.S

Specific effect of methods of application (M)

Season	1 st S .	2 nd S .
S	42.63	41.23
D	43.24	50.98
L.S.D 0.05	N.S	2.56
L.S.D 0.01	N.S	3.45

Specific effect of rates of application (R)

Season	0.0	0.5	1.0	1.5	L.S.D 0.05	L.S.D 0.01
1 st S .	33.50	54.13	46.01	38.11	1.84	2.48
2 nd S .	39.25	48.38	46.84	37.55	3.62	4.87

Specific effect of interaction between F & M

	Season	1 st S .	2 nd S .
F1	S	44.54	42.27
	D	43.54	46.06
F2	S	40.71	40.19
	D	42.94	55.89
L.S.D	0.05	1.84	N.S
	0.01	N.S	N.S

Specific effect of interaction between F & R

	Season	1 st S .	2 nd S .
F1	0.0	33.50	39.25
	0.5	58.25	49.34
	1.0	49.17	52.33
	1.5	35.25	35.75
F2	0.0	33.50	39.25
	0.5	50.00	47.42
	1.0	42.84	41.34
	1.5	40.96	39.34
L.S.D	0.05	2.61	5.12
	0.01	3.51	6.89

Specific effect of interaction between M & R

	Season	1 st S .	2 nd S .
S	0.0	33.50	39.25
	0.5	51.50	45.75
	1.0	48.17	46.67
	1.5	37.34	33.25
D	0.0	33.50	39.25
	0.5	56.75	51.00
	1.0	43.84	47.00
	1.5	38.88	41.84
L.S.D	0.05	2.61	N.S
	0.01	3.51	N.S

As respect to the specific effect of interaction between methods of application and rates of application, Table (13 b) showed that 0.5 gm/L applied as drench method exerted significantly its superiority with increasing the length of roots compared with the other combinations. This trend nearly true in both seasons of study, but the differences were so small to be significant in the second season.

Our results are in partial agreement with that reported by **Salah (1994)** on *Codieum variegatum* who stated that using Kristalon fertilizer at 1000 ppm gave the tallest roots.

II. B. 3. 3. Fresh weight of roots :

Regarding the root fresh weight of one year old *Yucca filamentosa* in relation to the interactions between the three factors under study i.e. forms of fertilizers, methods of application and rates of application. It is quite evident from Table (13) that nearly all of combinations induced plants having significantly the heaviest root fresh weight. However, such trend was to great extent true especially during the first season. In other words, 1.0 gm/L of F_1 x S and 0.5 gm/L of F_2 x D were more effective during 1996/1997 and 1997/1998 seasons respectively, as compared to other combinations. On the contrary, F_1 x D at 1.5 gm/L and F_1 x S at 1.5 gm/L showed less value of root fresh weight but it still more than control. The other combinations ranked statistically in between the two above mentioned extremes.

As for the specific effect of different forms of fertilizers, data tabulated in Table (13 c) showed that during both seasons of study, F_1 (Stimufol) exhibited the heaviest root fresh weight as compared to F_2 (prepared fertilizer). The difference between F_1 and F_2 was highly significant during

the first season but it was so small to be significant during the second season.

Concerning the specific effect of methods of application, Table (13 c) indicated that during the first season, spray method was the superior method in this respect, whereas the reverse was true in the second season where drench method was effective compared with spray method. The differences between the two methods were so small to be significant.

With regard to the specific effect of applied rates of fertilizer, data in Table (13 c) showed obviously that during both seasons, it could be descendingly arranged the rates concerning in their specific effect on roots fresh weight as follows : 1.0 gm/L (54.29 and 62.38 gm), 0.5 gm/L (47.56 and 61.15 gm), 1.5 gm/L (33.32 and 44.79 gm) and 0.0 gm/L (15.04 and 29.56 gm) in the first and second seasons, respectively. The differences between the tested rates were significant at 1 % level in most cases.

Furthermore, Table (13 c) showed a significant response as a result of interaction between forms of fertilizers and methods of application on root fresh weight. Results obtained cleared that F_1 x S gave the highest values (46.78 and 52.24 gm) followed by F_1 x D which gave (37.34 and 49.67 gm) in 1996/1997 and 1997/1998 seasons, respectively. On the contrary, both F_2 x S and F_2 x D were the inferior combinations in this respect.

Referring the specific effect of interaction between two forms of fertilizers and rates of application, it is clear from Table (13 c) that all applied rates induced highly significant the heaviest root fresh weight compared with control. Such trend was true during two seasons of study however, F_1 at 1.0 gm/L gave the highest values of roots fresh weight

TABLE (13c) :- Specific effect of two forms of fertilizers , methods and rates of application and their interaction effect on (F. W. of roots) of *Yucca filamentosa* (one year old) during 1996/1997 & 1997/1998 seasons .

Specific effect of form of fertilizers (F)

Season	1 st S .	2 nd S .
F1	42.06	50.96
F2	33.04	44.71
L.S.D 0.05	2.05	N.S
L.S.D 0.01	2.76	N.S

Specific effect of methods of application (M)

Season	1 st S .	2 nd S .
S	38.25	46.74
D	36.85	48.93
L.S.D 0.05	N.S	3.51
L.S.D 0.01	N.S	4.72

Specific effect of rates of application (R)

Season	0.0	0.5	1.0	1.5	L.S.D 0.05	L.S.D 0.01
1 st S .	15.04	47.56	54.29	33.32	2.89	3.90
2 nd S .	29.56	61.15	62.38	44.79	4.96	6.68

Specific effect of interaction between F & M

	Season	1 st S .	2 nd S .
F1	S	46.78	52.24
	D	37.34	49.67
F2	S	29.72	41.23
	D	36.36	48.19
L.S.D	0.05	2.89	4.96
	0.01	3.90	6.68

Specific effect of interaction between F & R

	Season	1 st S .	2 nd S .
F1	0.0	15.04	29.56
	0.5	47.42	55.55
	1.0	70.28	78.01
	1.5	35.50	40.71
F2	0.0	15.04	29.56
	0.5	47.70	66.75
	1.0	38.30	46.75
	1.5	31.13	48.88
L.S.D	0.05	4.09	7.01
	0.01	5.52	9.44

Specific effect of interaction between M & R

	Season	1 st S .	2 nd S .
S	0.0	15.04	29.56
	0.5	47.14	57.09
	1.0	54.95	61.27
	1.5	35.88	39.03
D	0.0	15.04	29.56
	0.5	47.98	65.21
	1.0	53.63	63.49
	1.5	30.75	50.56
L.S.D	0.05	N.S	N.S
	0.01	N.S	N.S

(70.28 and 78.01 gm) followed in descending order by F_2 at 0.5 gm/L (47.70 and 66.75 gm) in the first and second seasons, respectively. The other combinations took intermediate place compared to control.

No significant response was observed as a result of the specific effect of interaction between applied methods and rates of application. Data presented in Table (13 c) cleared that S and D both at 1.0 gm/L were the most effective interactions in increasing the fresh weight of roots. This trend was true during both seasons of this regard.

These results go in line with that reported by **Haggag (1987)** on *Ficus elastica* plants who found that good root system were obtained with the medium level of NPK.

II. B. 2. 4. Dry weight of roots :

Concerning the specific effect of interaction between forms of fertilizers, methods of application and rates of application on dry weight of roots. It is quite clear to be noticed from data tabulated in Table (13) the variable degrees of response to the differential treatments during two seasons of study. Since, F_1 applied as spray at 1.0 gm/L (18.70 gm) followed by F_1 applied as Drench at 0.5 gm/L (16.40 gm) increased significantly dry weight of roots as compared with other treatments during the first season. Whereas, F_2 applied as drench at 1.0 gm/L (24.65 gm) followed by F_1 x S at 1.0 gm/L (23.81 gm) had the same trend during the second season.. On the other hand, F_1 x D at 1.5 gm/L and F_2 x S at 1.5 gm/L and as well as control treatment gave the lowest value of dry weight. The other combinations were in between the above mentioned extremes with variable means.

As for the specific effect of forms of fertilizers, Table (13 d), showed that F_1 resulted in highly significant increase of roots dry weight during the

first season. The increase over F_2 was 20.3 % , while there was no significant difference between the two fertilizers during the second season.

Referring the specific effect of methods of application, data in Table (13 d) indicated that drench method was the superior method in this respect as compared with spray method although the difference was so small to be significant in the first season and significantly in the second one.

Data presented in Table (13 d) gave a high significant response as a result of the specific effect of applied rates. However, the dry weight of roots tended to be higher at the medium rate of application (1.0 gm/L) which reached its maximum values (13.33 and 20.03 gm) in the first and second seasons, respectively.

Regarding the specific effect of interaction between forms of fertilizers and methods of application. Data tabulated in Table (13 d) showed that F_1 x S and F_2 x D increased significantly the roots dry weight during the first and second seasons respectively, compared with the other combinations.

With respect to the specific effect of interaction between forms of fertilizers and applied rates Table (13 d) declared that all applied doses of both F_1 and F_2 increased significantly the roots dry weight compared to control. The medium rate (1.0 gm/L) of F_1 gave the heaviest weight (15.18 and 21.22 gm) during 1996/1997 and 1997/1998 seasons respectively, the other interactions ranked the second in this respect.

Referring the specific effect of interaction between methods of application and rates under study, Table (13 d) indicated that the medium rate of both spray and drench methods resulted in significantly increase of dry weight of roots over other combinations and control.

TABLE (13d) :- Specific effect of two forms of fertilizers , methods and rates of applcation and their interaction effect on (D. W. of roots) of *Yucca filamentosa* (one year old) during 1996/1997 & 1997/1998 seasons .

Specific effect of form of fertilizers (F)

Season	1 st S .	2 nd S .
F1	9.97	14.30
F2	8.29	14.55
L.S.D 0.05	0.67	N.S
L.S.D 0.01	0.91	N.S

Specific effect of methods of application (M)

Season	1 st S .	2 nd S .
S	9.09	13.56
D	9.17	15.29
L.S.D 0.05	N.S	1.52
L.S.D 0.01	N.S	N.S

Specific effect of rates of application (R)

Season	0.0	0.5	1.0	1.5	L.S.D 0.05	L.S.D 0.01
1 st S .	4.20	11.02	13.33	7.99	0.95	1.28
2 nd S .	8.86	15.07	20.03	13.76	2.15	2.89

Specific effect of interaction between F & M

	Season	1 st S .	2 nd S .
F1	S	10.38	15.38
	D	9.56	13.23
F2	S	7.79	11.75
	D	8.78	17.36
L.S.D	0.05	0.95	2.15
	0.01	N.S	2.89

Specific effect of interaction between F & R

	Season	1 st S .	2 nd S .
F1	0.0	4.20	8.86
	0.5	12.45	12.67
	1.0	15.18	21.22
	1.5	8.05	14.47
F2	0.0	4.20	8.86
	0.5	9.58	17.47
	1.0	11.47	18.83
	1.5	7.92	13.04
L.S.D	0.05	1.35	3.04
	0.01	1.81	4.09

Specific effect of interaction between M & R

	Season	1 st S .	2 nd S .
S	0.0	4.20	8.86
	0.5	9.72	13.69
	1.0	13.72	18.41
	1.5	8.72	13.30
D	0.0	4.20	8.86
	0.5	12.32	16.45
	1.0	12.93	21.64
	1.5	7.25	14.21
L.S.D	0.05	1.35	N.S
	0.01	1.81	N.S

These results disagree with that obtained by **El Sayed (1994)** who found foliar fertilizer treatment did not have an effect of dry weight of roots of *Brassaia actinophylla* and *Ficus nitida* "Hawaii".

II. B. 2. Chemical composition :

II. B. 3. a. Nitrogen content :

II. B. 3. a. 1. Leaf nitrogen content :

Regarding the influence of three factors under study i.e. forms of fertilizers, methods of application and rates of application on leaf N percentage of one year old *Yucca filamentosa* seedlings, data in Table (14) indicated the trend was inconstant during both seasons of study, whereas the richest leaf N % was exhibited by such seedlings drenching with F_2 (prepared fertilizer) at 1.5 gm/L and 1.0 gm/L which gave 1.73 and 1.67% respectively, followed descendingly by F_2 x S at 1.5gm/L in the first season. But, in the second season, both F_2 applied as spray at 1.0 gm/L and F_1 (Stimufol) applied as drench at 1.5 gm/L showed their own superiority in increasing leaf N %. On the contrary, control treatment was the inferior which gave (1.10 and 1.03 %) in the first and second seasons, respectively. The other combinations were in between in this respect. The differences between all treatments were so small to reach the level of significance during both seasons of study.

Statistical analysis of the data in Table (14 a) indicated that N % of one year old *Yucca filamentosa* leaves had responded during the first season only to the specific effect of form of fertilizer. F_2 was the superior form which increased N % in leaves by 8.8 and 2.3 % over F_1 during 1996/1997 and 1997/1998 seasons, respectively.

TABLE (14) :- Interaction effect of different combination between two forms of fertilizers , methods and rates of application on N , P and K % of *Yucca filamentosa* / one year old

TREATMENT			N %				P %				K%			
			Leaves		Roots		Leaves		Roots		Leaves		Roots	
Fert. Types	Appl.Meth.	Appl.Rate	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S SPRAY	0.00	1.10	1.03	1.00	1.30	0.29	0.22	0.13	0.14	1.07	1.08	0.44	0.45
		0.50	1.60	1.43	1.05	1.00	0.37	0.40	0.14	0.15	1.07	1.09	0.72	0.73
		1.00	1.38	1.18	1.25	1.10	0.32	0.36	0.17	0.19	1.08	1.09	0.75	0.76
		1.50	1.40	1.33	1.45	1.67	0.38	0.33	0.15	0.17	1.17	1.18	0.89	0.89
	D DRENCH	0.00	1.10	1.03	1.00	1.30	0.29	0.22	0.13	0.14	1.07	1.08	0.44	0.45
		0.50	1.40	1.15	1.40	1.45	0.37	0.38	0.17	0.19	1.18	1.19	0.60	0.60
		1.00	1.53	1.47	1.15	1.25	0.35	0.34	0.12	0.14	1.20	1.23	0.63	0.63
		1.50	1.45	1.60	1.15	1.30	0.36	0.37	0.22	0.21	1.26	1.26	0.67	0.68
F2	S SPRAY	0.00	1.10	1.03	1.00	1.30	0.29	0.22	0.13	0.14	1.07	1.08	0.44	0.45
		0.50	1.60	1.50	1.50	1.50	0.33	0.33	0.10	0.13	0.99	1.00	0.61	0.61
		1.00	1.45	1.60	1.10	1.37	0.36	0.40	0.12	0.14	1.10	1.10	0.60	0.61
		1.50	1.65	1.35	1.17	1.40	0.39	0.35	0.15	0.15	1.12	1.12	0.62	0.63
	D DRENCH	0.00	1.10	1.03	1.00	1.30	0.29	0.22	0.13	0.14	1.07	1.08	0.44	0.45
		0.50	1.60	1.10	1.17	1.35	0.34	0.36	0.26	0.16	1.11	1.15	0.59	0.60
		1.00	1.67	1.27	1.30	1.25	0.38	0.40	0.30	0.30	1.14	1.24	0.61	0.61
		1.50	1.73	1.57	0.95	1.20	0.33	0.30	0.31	0.30	1.20	1.25	0.64	0.65
L.S.D		0.05	N.S	N.S	0.22	N.S	N.S	0.04	N.S	N.S	N.S	N.S	N.S	N.S
		0.01	N.S	N.S	0.29	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S

at 1.0 gm/L (1.60 %) were insignificantly the most effective treatments in

the first season, whereas D at 1.5 gm/L and S at 1.5 gm/L showed their own superiority in the second season.

These results agree with that reported by **Shen and Seely (1983)** on *Peperomia obtusifolia*, **Mansour (1985)** on *Chamaedorea Sp.*, **Anuradha *et al* (1988)** on marigold and **Abou Dahab (1992)** on *Asparagus sprengri* who found that raising N rates increased the N content in its foliage.

II. B. 3. a. 2. Root nitrogen content :

As for the root N % of one year old *Yucca filamentosa* in response to the interaction between forms of fertilizers (F_1 & F_2), methods of application (S & D) and rates of application (0.0, 0.5, 1.0 and 1.5 gm/L), data in Table (14) revealed that in both seasons of study, seedlings received F_1 at 1.5 gm/L and F_2 at low rate applied as spray resulted in the maximum percentage of N in roots. Meanwhile, the reverse was true with F_2 x D at 1.5 gm/L and F_1 x S at 0.5 gm/L during 1996/1997 and 1997/1998 seasons, respectively. However, differences were still insignificant in most cases during both seasons except in first season when the two superior combinations were compared with other combinations.

Concerning the specific effect of forms of fertilizers, it is obvious from Table (14 a) that there is no significant variance between F_1 and F_2. Thus, F_1 and F_2 were equally affected in this concern.

Regarding to specific effect of methods of application on N % in Yucca roots, data in Table (14 a) showed that spray method was more effective than drench method. The increases of S over D were 4.4 and 2.3 % during 1st and 2nd seasons, respectively. The differences were not significant during both seasons of study.

With regard to the specific effect of applied rates, the results in Table (14 a) cleared that 0.5 gm/L showed the highest % of N followed by 1.0

TABLE (14a) :- Specific effect of two forms of fertilizers, methods and rates of application and their interaction effect on (N % in leaves and roots) of *Yucca filamentosa* (one year old) during 1996/1997 & 1997/1998 seasons.

Specific effect of form of fertilizers (F)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	1.37	1.28	1.18	1.29
F2	1.49	1.31	1.15	1.33
L.S.D 0.05	0.10	N.S	N.S	N.S
L.S.D 0.01	N.S	N.S	N.S	N.S

Specific effect of methods of application (M)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
S	1.41	1.31	1.19	1.33
D	1.45	1.28	1.14	1.30
L.S.D 0.05	N.S	N.S	N.S	N.S
L.S.D 0.01	N.S	N.S	N.S	N.S

Specific effect of rates of application (R)

Season		0.0	0.5	1.0	1.5	L.S.D	
						0.05	0.01
Leaves	1 st S.	1.10	1.55	1.51	1.56	0.14	0.19
	2 nd S.	1.03	1.30	1.38	1.47	0.18	0.24
Roots	1 st S.	1.00	1.29	1.20	1.18	0.11	0.15
	2 nd S.	1.30	1.33	1.25	1.39	0.16	0.21

Specific effect of interaction between F & M

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S	1.37	1.24	1.19	1.27
	D	1.37	1.31	1.18	1.33
F2	S	1.45	1.37	1.19	1.39
	D	1.53	1.24	1.11	1.28
L.S.D	0.05	N.S	N.S	N.S	N.S
	0.01	N.S	N.S	N.S	N.S

Specific effect of interaction between F & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	0.0	1.10	1.03	1.00	1.30
	0.5	1.50	1.29	1.23	1.23
	1.0	1.46	1.33	1.20	1.18
	1.5	1.43	1.47	1.30	1.49
F2	0.0	1.10	1.03	1.00	1.30
	0.5	1.60	1.30	1.34	1.43
	1.0	1.56	1.44	1.20	1.31
	1.5	1.69	1.46	1.06	1.30
L.S.D	0.05	N.S	N.S	0.16	N.S
	0.01	N.S	N.S	N.S	N.S

Specific effect of interaction between M & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
S	0.0	1.10	1.03	1.00	1.30
	0.5	1.60	1.47	1.28	1.25
	1.0	1.42	1.39	1.18	1.24
	1.5	1.53	1.35	1.31	1.54
D	0.0	1.10	1.03	1.00	1.30
	0.5	1.50	1.13	1.29	1.40
	1.0	1.60	1.37	1.23	1.25
	1.5	1.59	1.59	1.05	1.25
L.S.D	0.05	N.S	0.25	0.16	N.S
	0.01	N.S	N.S	N.S	N.S

gm/L, during the first season only. Whereas, in the second season 1.5 gm/L rate was more effective as compared with other rates under study. The differences between the tested doses (0.5, 1.0 and 1.5 gm/L) were so small to reach the level of significance.

Referring the specific effect of the interaction between forms of fertilizers and applied methods, data in Table (14 a) showed insignificantly that F_2 x S during both seasons of study as well as F_1 x S during the first season gave the highest value of N % followed by F_1 x D. The other combinations under study ranked the second in this study.

With respect to the specific effect of interaction between forms of fertilizers and rates of application, data tabulated in Table (14 a) indicated that all combinations of F_1 x all rates and F_2 x all rates increased N % in roots over control. F_1 at 1.5 gm/L and F_2 at 0.5 gm/L gave the most promising effect in this respect which gave 1.30 and 1.34 % in the first season and 1.49 and 1.43 % in the second season. Treating seedlings with F_1 at 0.5 and 1.0 gm/L gave the least N % in roots in the second season only, whereas control was the inferior treatment in the first season. The other combinations were in between the two above mentioned extents.

Data regarding the specific effect of interaction between applied methods and rates of application, Table (14 a) showed that spray method applied at 1.5 gm/L followed by drench method at 0.5 gm/L gave the highest value of N % in both seasons compared with control in first season and spray at 1.0 gm/L in the second one.

These results agree with that reported by **Smith (1978)** on *Zamia integrifolia* and **Mohamed (1992)** on *Livistonia chinensis*.

II. B. 3. b. Phosphorus content :

II. B. 3. b. 1. Leaf phosphorus contents :

Referring to the leaves P content of one year old *Yucca filamentosa* seedlings, Table (14) showed that Yucca seedlings exhibited an obvious modification in trend of response to the interaction between forms of fertilizers, methods of application and rates of application. Such data declared that F_2 x S at 1.5 gm/L and F_2 x D at 1.0 gm/L resulted in maximizing values of leaves P % followed by F_1 x S at 1.5 gm/L and F_2 x S at 1.0 gm/L during 1996/1997 and 1997/1998 seasons, respectively. Differences were insignificant as compared to those of other treatments especially during first season. On the other hand, F_1 x S at 1.0 gm/L and F_2 x D at 1.5 gm/L were the inferior treatments during the first and second seasons respectively, but they became more effective than control.

As for the specific effect of two forms of fertilizers, data presented in Table (14 b) declared that the differences between F_1 (Stimufol) and F_2 (prepared fertilizer) were so small to be significant, whereas the two applied forms produced not only insignificant variance but also showed nearly the same % of P in leaves of one year old *Yucca filamentosa* seedlings in both seasons of study.

Concerning the specific effect of methods of application, data in Table (14 b) showed obviously that in both seasons of study, there was no significant differences in leaves P % in response to spray and drench methods. Thus, they were equal in this concern.

Data in Table (14 b) concerning the specific effect of applied rates indicated that all applied rates increased significantly leaves P % over control. However, 1.5 gm/L and 1.0 gm/L were more effective than the

two rates which gave increases by 26.2 and 68.2 % over control during the first and second seasons, respectively. The uptake rates of phosphorus (**Jager. de, 1979, Drew *et al*, 1984**) and potassium are more closely related to the corresponding contents of these nutrients in the shoots than to their contents in the roots.

With regard to the specific effect of interaction between forms of fertilizers and methods of application, data in Table (14 b) showed that differences between all combinations were so small to reach level of significance. On the other hand, F_1 x D and F2 x S were more effective in comparison to both F_1 x S and F_2 x D. Such trend was true during both seasons of study.

Regarding the specific effect of interaction between forms of fertilizers and rates of application, it is obvious from Table (14 b) that F_1 x all rates and F_2 x all rates increased P % in Yucca leaves over control. The differences were significant during the second season only. Moreover, F_1 at 1.5 gm/L (0.373 %) and F_2 at 1.0 gm/L (0.401 %) were more effective combinations in the first and second seasons respectively, compared with other interactions.

Furthermore, Table (14 b) indicated a non significant effect as a result of interaction between methods of application and rates of application of two fertilizers. Briefly S x 1.5 gm/L and S x 1.0 gm/L followed by D x 1.0 gm/L increased P % in leaves during the first and second seasons respectively, as compared with other combinations and control.

The results are in harmony with that reported by **Mansour (1985)** on *Chamaedorea Sp.*, **Anuradha *et al* (1988)** on marigold and **Habib (1992)** on *Pelargonium peltatum*.

II. B. 3. b. 2. Root phosphorus content :

Data concurring the effect of different combinations between fertilizer forms, methods of application and rates of application, roots P % of *Yucca filamentosa* are shown in Table (14), data revealed that in both seasons, all investigated combinations had no significant effect on increasing root P content. Generally, the highest % of P was gained by treated one year old plants with F_2 (prepared fertilizer) at rates 1.5 gm/L and 1.0 gm/L when they applied by drench method. These results were true during both seasons of study. F_2 x S at 0.5 gm/L and control produced the less values of phosphorus in roots. The other combinations were in between the two above mentioned treatments with variable means. In intact plants, the feedback mechanism regulating phosphorus uptake can be delayed for several days, because rapid phosphorus translocation into the shoot prevents a marked increase in phosphorus concentration within the roots (**Horst, 1986**).

With respect to the specific effect of forms of fertilizers, Table (14 b) showed that there was no significant difference between F_1 and F_2. However, F_2 was more effective than F_1 during both seasons of study.

As for the specific effect of methods of application, it is obvious from results presented in Table (14 b) that the highest % of P was induced by these seedlings received fertilizers by the drench methods which showed significantly effect during the first seasons of study. The values were (0.204 and 0.198%) compared with spraying values (0.134 and 0.150%) during first and second seasons, respectively.

Referring the specific effect of rates of application, Table (14 b) revealed that in both seasons the roots P % tended to be greater with increasing the rate of applied fertilizer. Generally, the average % for rates

TABLE (14b) :- Specific effect of two forms of fertilizers, methods and rates of application and their interaction effect on (P % in leaves and roots) of *Yucca filamentosa* (one year old) during 1996/1997 & 1997/1998 seasons.

Specific effect of form of fertilizers (F)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	0.342	0.326	0.153	0.165
F2	0.338	0.324	0.185	0.183
L.S.D 0.05	N.S	N.S	N.S	N.S
L.S.D 0.01	N.S	N.S	N.S	N.S

Specific effect of methods of application (M)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
S	0.342	0.326	0.134	0.150
D	0.339	0.324	0.204	0.198
L.S.D 0.05	N.S	N.S	0.054	N.S
L.S.D 0.01	N.S	N.S	N.S	N.S

Specific effect of rates of application (R)

Season		0.0	0.5	1.0	1.5	L.S.D 0.05	L.S.D 0.01
Leaves	1 st S.	0.290	0.354	0.353	0.366	0.043	0.057
	2 nd S.	0.223	0.366	0.375	0.337	0.021	0.028
Roots	1 st S.	0.125	0.169	0.176	0.207	N.S	N.S
	2 nd S.	0.140	0.157	0.192	0.208	N.S	N.S

Specific effect of interaction between F & M

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S	0.341	0.326	0.146	0.160
	D	0.344	0.327	0.159	0.169
F2	S	0.343	0.327	0.122	0.140
	D	0.333	0.321	0.248	0.226
L.S.D	0.05	N.S	N.S	0.076	N.S
	0.01	N.S	N.S	N.S	N.S

Specific effect of interaction between F & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	0.0	0.290	0.223	0.125	0.140
	0.5	0.372	0.387	0.157	0.167
	1.0	0.336	0.349	0.144	0.164
	1.5	0.373	0.347	0.186	0.189
F2	0.0	0.290	0.223	0.125	0.140
	0.5	0.335	0.345	0.182	0.148
	1.0	0.369	0.401	0.207	0.220
	1.5	0.359	0.327	0.228	0.226
L.S.D	0.05	N.S	0.029	N.S	N.S
	0.01	N.S	0.039	N.S	N.S

Specific effect of interaction between M & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
S	0.0	0.290	0.223	0.125	0.140
	0.5	0.350	0.366	0.122	0.139
	1.0	0.342	0.378	0.140	0.163
	1.5	0.386	0.339	0.149	0.159
D	0.0	0.290	0.223	0.125	0.140
	0.5	0.357	0.366	0.216	0.175
	1.0	0.363	0.372	0.211	0.222
	1.5	0.346	0.334	0.264	0.256
L.S.D	0.05	N.S	N.S	N.S	N.S
	0.01	N.S	N.S	N.S	N.S

II. B. 3. c. Potassium content :

II. B. 3. c. 1. Leaf potassium content :

Data concerning the response of K % in Yucca leaves to the interaction between forms of fertilizers, methods of application and rates of application are presented in Table (14). The obtained results indicated that both high rate of F_1 (Stimufol) or F_2 (prepared fertilizer) applied as drench i.e. F_1 x D at 1.5 gm/L and F_2 x D at 1.5 gm/L gave the most promising effect in this respect as compared to the other combinations. Such trend was true during both seasons of study. On the other hand, seedlings sprayed by F_2 at 0.5 gm/L produced less value of K %. The other combinations took insignificantly intermediate place between the two extremes with variable values. At high external concentrations, however, ions with lower uptake rates (So_4^{-2} and Ca^{+2}) depress the uptake rate of K^+ and Cl^- considerably.

As for the specific effect of two forms of fertilizers, it is clear from Table (14 c) that F_1 (Stimufol) showed insignificantly the effective form in this respect. The increases over F_2 were 3.6 and 1.8 % during 1996/1997 and 1997/1998 seasons, respectively.

Furthermore, Table (14 c) indicated highly significant effect as a result of the specific effect of applied methods on K % in leaves. Data obtained showed that drench method was more effective than Spray method. The mean values of drench was (1.15 and 1.18%) during the first and second seasons, respectively. Leaching and weathering release the potassium ions from the clay lattices, making them available to the plant root.

Regarding the specific effect of rates of application, data tabulated in Table (14 c) cleared that leaves K % increased continuously with increasing the rate of application to attain high values (1.19 and 1.20 %) at 1.5 gm/L in the first and second seasons, respectively. The differences

between rates were insignificant during both seasons except with the high rate and both of low rate and control which showed highly significant response. When large amounts of magnesium are present, potassium may become less available.

With respect to the specific effect of interaction between forms of fertilizers and methods of application under study, data in Table (14 c) cleared that both of F_1 and F_2 applied as drench gave the highest percentage of K in leaves compared with F_1 x S and F_2 x S. Such trend was true during both seasons of study. The differences between all combination treatments were so small to reach the level of significance at 5 %.

Concerning the specific effect of interaction between forms of fertilizers and rates of application, it is obvious from Table (14 c) that all applied rates of both F_1 or F_2 increased K % in leaves. However, F_1 at 1.5 gm/L gave the most promising effect during the first season. Whereas, F_2 at 1.0 gm/L was the most effective combination during the second season.

With regard to the specific effect of interaction between (spray & drench) as methods of application and all applied rates (0.0, 0.5, 1.0 and 1.5 gm/L), data in Table (14 c) indicated that no significant response was observed in both seasons of study. Moreover, drench method at 1.5 and 1.0 gm/L showed their superiority in this study. Seedlings received fertilizers as spray at the low rate (0.5 gm/L) gave the least values during both seasons of study. The other combination treatments were in within the two above mentioned extents.

These results are in general agreement with the findings of **Conover and Poole (1977a)** on *Ficus benjamina.*

TABLE (14c) :- Specific effect of two forms of fertilizers, methods and rates of application and their interaction effect on (K % in leaves and roots) of *Yucca filamentosa* (one year old) during 1996/1997 & 1997/1998 seasons.

Specific effect of form of fertilizers (F)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	1.14	1.15	0.64	0.65
F2	1.10	1.13	0.57	0.58
L.S.D 0.05	N.S	N.S	0.06	0.06
L.S.D 0.01	N.S	N.S	N.S	N.S

Specific effect of methods of application (M)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
S	1.08	1.09	0.63	0.64
D	1.15	1.18	0.58	0.58
L.S.D 0.05	0.05	0.05	N.S	N.S
L.S.D 0.01	0.07	0.06	N.S	N.S

Specific effect of rates of application (R)

Season		0.0	0.5	1.0	1.5	L.S.D	
						0.05	0.01
Leaves	1 st S.	1.07	1.09	1.13	1.19	0.07	0.09
	2 nd S.	1.08	1.11	1.17	1.20	0.07	0.09
Roots	1 st S.	0.44	0.63	0.65	0.70	0.09	0.17
	2 nd S.	0.45	0.64	0.65	0.71	0.08	0.11

Specific effect of interaction between F & M

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S	1.10	1.11	0.70	0.71
	D	1.18	1.19	0.58	0.59
F2	S	1.07	1.08	0.57	0.57
	D	1.13	1.18	0.57	0.58
L.S.D	0.05	N.S	N.S	0.09	0.08
	0.01	N.S	N.S	N.S	N.S

Specific effect of interaction between F & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	0.0	1.07	1.08	0.44	0.45
	0.5	1.13	1.14	0.66	0.67
	1.0	1.14	1.16	0.69	0.70
	1.5	1.22	1.22	0.78	0.78
F2	0.0	1.07	1.08	0.44	0.45
	0.5	1.05	1.07	0.60	0.61
	1.0	1.12	1.27	0.61	0.61
	1.5	1.16	1.19	0.63	0.64
L.S.D	0.05	N.S	N.S	N.S	N.S
	0.01	N.S	N.S	N.S	N.S

Specific effect of interaction between M & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
S	0.0	1.07	1.08	0.44	0.45
	0.5	1.03	1.04	0.66	0.67
	1.0	1.09	1.10	0.68	0.68
	1.5	1.15	1.15	0.75	0.76
D	0.0	1.07	1.08	0.44	0.45
	0.5	1.14	1.17	0.59	0.60
	1.0	1.17	1.23	0.62	0.62
	1.5	1.23	1.26	0.66	0.66
L.S.D	0.05	N.S	N.S	N.S	N.S
	0.01	N.S	N.S	N.S	N.S

II. B. 3. c. 2. Root Potassium content :

With regard to the roots K content in one year old Yucca seedlings in response to the interaction between form of fertilizer, methods of application and rates of application, data obtained during both 1996/1997 and 1997/1998 seasons are presented in Table (14). It is quite evident that the seedlings received F_1 x S at 1.5 gm/L followed by F_1 x S at 1.0 gm/L and F_1 x S at 0.5 gm/L showed the highest K percentage as compared to any of other investigated combinations under study. However, differences were still insignificant during both seasons. On the contrary, the seedlings received F_2 x D at 0.5 gm/L, F_1 x D at 0.5 gm/L and control were the inferior in this respect as they showed the lowest roots % during both seasons of study. In addition, the other combinations came intermediately in this respect.

It is quite evident from tabulated data in Table (14 c) that roots K % was responded significantly to the specific effect of forms of fertilizers. Moreover, F_1 gave the highest % with increases by 12.3 and 12.1 % during the first and second seasons respectively, as compared with F_2.

Concerning the specific effect of methods of application, data presented in Table (14 c) cleared that there was no significant effect in this concern. In spite of this, spray method was more effective which gave (0.63 and 0.64%) than drench method which gave (0.58 and 0.58 %) in the first and second seasons, respectively.

As for the specific effect of rates of application, it is obvious from Table (14 c) that all applied rates resulted in highly significant increases in root K % compared with control, but the differences between the three rates under study were so small to reach a level of significance. Moreover, K % in roots was positively proportioned to concentrations used, whereas K %

increased continuously with increasing the rate of application to attain a high value at 1.5 gm/L.

Referring the specific effect of interaction between forms of fertilizers and methods of application, data in Table (14 c) showed that F_1 x S increased significantly K % in leaves compared with other combinations followed by F_1 x D. The two other combinations i.e. F_2 x D and F_2 x S were the inferior in this respect.

Regarding the specific effect of interaction between forms of fertilizers and rates of application, it is clear from Table (14 c) that applied F_1 (Stimufol) at all rates especially at the high rate (1.5 gm/L) was more effective compared with F_2 at all rates. The differences of variances did not reach the level of significance were during both seasons of study.

With respect to the specific effect of interaction between methods of application and rates of application, it is obvious from Table (14 c) that all the combinations of spray method and applied rates insignificantly increased K % in roots as compared with drench method with all rates and control. Moreover, fertilizer applied as spray x 1.5 gm/L gave the highest K% (0.75 and 0.76%) in the first and second seasons respectively, followed descendingly by 1.0 and 0.5 gm/L.

These results go in line with that reported by **Conover and Poole (1977a)** on *Ficus benjamina* who stated that the increase the fertilization level from the low to the high increased Potassium content.

II. B. 3. d. Calcium content :

II. B. 3. d. 1. Leaf calcium content :

Concerning leaf Ca % in response to the interaction between forms of fertilizers, methods of application and rates of application, data tabulated in

TABLE (15) :- Interaction effect of different combination between two forms of fertilizers , methods and rates of application on Ca,Mg and Total carbohydrate % of *Yucca filamentosa* / one year old

TREATMENT			Ca %				Mg %				Total carbohydrates %			
			Leaves		Roots		Leaves		Roots		Leaves		Roots	
Fert. Types	Appl.Meth.	Appl.Rate	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S SPRAY	0.0	3.65	3.65	1.09	1.03	0.259	0.257	0.189	0.179	19.00	20.13	19.31	20.01
		0.5	4.42	4.44	1.14	1.18	0.490	0.473	0.204	0.208	22.66	23.25	20.69	18.81
		1.0	4.74	4.79	1.19	1.21	0.337	0.335	0.228	0.232	15.57	19.56	22.54	19.69
		1.5	3.95	3.98	1.44	1.48	0.379	0.388	0.240	0.241	19.38	23.38	25.15	25.75
	D DRENCH	0.0	3.65	3.65	1.09	1.03	0.259	0.257	0.189	0.179	19.00	20.13	19.31	20.01
		0.5	4.44	4.45	1.23	1.29	0.379	0.383	0.219	0.223	19.41	19.63	24.54	26.57
		1.0	4.94	4.95	1.48	1.55	0.458	0.456	0.224	0.225	23.51	25.63	21.57	19.48
		1.5	4.90	4.93	1.44	1.45	0.482	0.485	0.265	0.266	21.59	26.01	21.82	19.07
F2	S SPRAY	0.0	3.65	3.65	1.09	1.03	0.259	0.257	0.189	0.179	19.00	20.13	19.31	20.01
		0.5	5.41	5.42	1.17	1.19	0.439	0.467	0.217	0.221	25.79	26.41	25.13	25.13
		1.0	5.68	5.70	1.16	1.17	0.341	0.351	0.256	0.257	26.32	29.00	20.86	20.86
		1.5	5.38	5.40	1.11	1.12	0.517	0.517	0.290	0.295	26.31	26.75	22.16	21.82
	D DRENCH	0.0	3.65	3.65	1.09	1.03	0.259	0.257	0.189	0.179	19.00	20.13	19.31	20.01
		0.5	5.07	5.08	1.17	1.24	0.535	0.537	0.260	0.267	23.88	20.94	22.44	22.44
		1.0	4.72	4.74	1.39	1.40	0.395	0.389	0.342	0.339	23.82	21.32	22.75	20.04
		1.5	5.18	5.39	1.81	1.85	0.432	0.424	0.253	0.255	27.97	26.69	19.22	19.55
L.S.D		0.05	0.44	N.S	0.17	0.15	0.074	0.064	N.S	0.052	3.54	3.45	1.31	2.16
		0.01	N.S	N.S	0.22	0.20	0.099	0.086	N.S	N.S	4.77	4.64	1.76	2.91

Table (15) declared that in both seasons of study, F_2 (prepared fertilizer) applied as spray at all rates gave the highest Ca % in Yucca leaves, it may be due to the presence of Calcium in the chemical composition of prepared fertilizer only. The highest percentage of Ca as 5.68 and 5.70 % were produced with the combination of F_2 x S at 1.0 gm/L in the first and second seasons respectively, followed in descending order by both of F_2 x S at 0.5 gm/L and F_2 x S at 1.5 gm/L. Moreover, added prepared fertilizer as drench to the soil at rates 0.5 and 1.5 gm/L ranked the second to the aforesaid superior treatments. On the contrary, control treatment was the inferior as compared to all investigated treatments. The other combinations were in between in this respect. During the second season, the differences between all other combinations were small to reach the level of significance at 1 %.

With respect to the specific effect of fertilizer forms, data in Table (15 a) showed that F_2 (prepared fertilizer) induced highly significant effect compared with F_1 (Stimufol). The increases were 11.5 and 11.9 % during the 1st and 2nd seasons, respectively.

No significant response was observed during both seasons of study. However, spray method was the superior method in this respect (4.61 and 4.63 %) during first and second seasons, respectively.

Regarding the specific effect of applied rates, it is obvious from Table (15 a) that all rates under study took a highly significant response in raising Ca % in *Yucca filamentosa* leaves over control although the differences between the applied rates were small to be significant. In other words, 1.0 gm/L gave the highest values (5.02 and 5.05 %) in the first and second seasons, respectively.

Data in Table (15 a) showed clearly a significant response as a result of the specific effect of interaction between form of fertilizers and applied method. Results obtained indicated that prepared fertilizer (F_2) applied as spray and drench gave significantly the highest percentage of Ca in leaves, i.e. F_2 x S gave (5.03 and 5.04 %) and F_2 x D gave (4.66 and 4.72%) in the first and second seasons, respectively. The other combinations ranked the second in this regard.

With respect to the specific effect of interaction between forms of fertilizers and rates of application, it is obvious from Table (15 a) that all interactions under study raised significantly Ca % of *Yucca filamentosa* leaves over control. Both 1.5 gm/L and 0.5 gm/L of F_2 gave the most promising effect. On the contrary, F_1 at 0.5 and 1.5 gm/L were the inferior combinations compared to other combinations but they still statistically more effective than control.

It is clear from Table (15 a) as a result of interaction between methods of application x rates of application at that all combinations increased significantly Ca % in the of one year old seedlings leaves in comparison to those untreated seedlings (control) in the two seasons of study. Obtained results showed also that the highest % among all treatments were obtained after added both fertilizers as spray at the medium rate (1.0 gm/L) followed by D at 1.5 gm/L. Other treatments came in within the two above mentioned extents in both seasons.

Our findings agree with **Rodriguez and Lopez (1976)** on *Dracaena sanderiana*.

II. B. 3. d. 2. Root calcium content :

Mean values of Ca % in roots during both seasons of study are given in Table (15). The differences in this character due to the interaction between

TABLE (15a) :- Specific effect of two forms of fertilizers, methods and rates of application and their interaction effect on (Ca% in leaves and roots) of *Yucca filamentosa* (one year old) during 1996/1997 & 1997/1998 seasons.

Specific effect of form of fertilizers (F)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	4.34	4.36	1.26	1.28
F2	4.84	4.88	1.25	1.25
L.S.D 0.05	0.16	0.16	N.S	N.S
L.S.D 0.01	0.21	0.21	N.S	N.S

Specific effect of methods of application (M)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
S	4.61	4.63	1.17	1.18
D	4.57	4.61	1.34	1.36
L.S.D 0.05	N.S	N.S	0.06	0.05
L.S.D 0.01	N.S	N.S	0.08	0.07

Specific effect of rates of application (R)

Season		0.0	0.5	1.0	1.5	L.S.D	
						0.05	0.01
Leaves	1 st S.	3.65	4.84	5.02	4.85	0.22	0.30
	2 nd S.	3.65	4.85	5.05	4.93	0.22	0.30
Roots	1 st S.	1.09	1.18	1.31	1.45	0.09	0.12
	2 nd S.	1.03	1.23	1.33	1.48	0.07	0.10

Specific effect of interaction between F & M

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S	4.19	4.22	1.22	1.23
	D	4.48	4.50	1.31	1.33
F2	S	5.03	5.04	1.13	1.13
	D	4.66	4.72	1.37	1.38
L.S.D	0.05	0.22	0.22	0.09	0.07
	0.01	0.30	0.30	N.S	0.10

Specific effect of interaction between F & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	0.0	3.65	3.65	1.09	1.03
	0.5	4.43	4.45	1.19	1.24
	1.0	4.84	4.87	1.34	1.38
	1.5	4.43	4.46	1.44	1.47
F2	0.0	3.65	3.65	1.09	1.03
	0.5	5.24	5.25	1.17	1.22
	1.0	5.20	5.22	1.28	1.29
	1.5	5.28	5.40	1.46	1.49
L.S.D	0.05	0.31	0.32	N.S	N.S
	0.01	0.42	0.43	N.S	N.S

Specific effect of interaction between M & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
S	0.0	3.65	3.65	1.09	1.03
	0.5	4.92	4.93	1.16	1.19
	1.0	5.21	5.25	1.18	1.19
	1.5	4.67	4.69	1.28	1.30
D	0.0	3.65	3.65	1.09	1.03
	0.5	4.76	4.77	1.20	1.27
	1.0	4.83	4.85	1.44	1.48
	1.5	5.04	5.16	1.63	1.65
L.S.D	0.05	0.31	0.32	0.12	0.10
	0.01	N.S	0.43	0.16	0.14

forms of fertilizers, methods of application and rates of application were statistically significant in the two seasons. The plants received 1.5 gm/L of F_2 applied as drench having the richest roots Ca content which increased by 66.1 and 79.6% over control in first and second seasons, respectively. Both 1.0 gm/L of F_1 x D and 1.5 gm/L of F_1 x S came in the second category in this concern. On the other hand, seedlings sprayed by 0.5 gm/L of F_1 and 1.5 gm/L of F_2 produced less values as compared with other combinations but it was still gave increases over control.

Concerning the specific effect of fertilizer forms, data in Table (15 a) cleared that there was no significant differences between the two investigated fertilizers. Thus, F_1 and F_2 were equal in this regard.

Referring the specific effect of methods of application, it is obvious from Table (15 a) that drench method resulted in highly significant increase of Ca content in roots during both seasons of study. However, drench method was the superior in this respect (1.34 and 1.36 % Ca) during first and second seasons, respectively.

With regard to the specific effect of applied rates, the data obtained in Table (15 a) showed that Ca % in roots was positively proportioned to concentration used, Ca content increased continuously with increasing the rate of application to attain the high % at 1.5 gm/L which gave (1.45 and 1.48 %) in the first and second seasons, respectively.

Data in Table (15 a) concerning the specific effect of interaction between forms of fertilizers and methods of application, indicated that in 1996/1997 and 1997/1998 seasons, F_2 x D and F_1 x D gave (1.37& 1.31 %) and (1.38 & 1.33 %) respectively, whereas F_1 x S and F_2 x S produced (1.22 & 1.13 %) and (1.23 & 1.13 %), respectively. The differences were so small to be significant in first season.

Regarding the specific effect of interaction between forms of fertilizers and rates of application, it is clear form Table (15 a) that all applied rates of F_1 (Stimufol) or F_2 (prepared fertilizer) raised Ca % in roots over control. F_2 at 1.5 gm/L gave the highest values of Ca content in roots (1.46 and 1.49 %) followed by F_1 at 1.5 gm/L (1.44 and 1.47 %) in 1996/1997 and 1997/1998 seasons, respectively. Statistical variance between combinations did not reach to the level of significance in the two seasons.

As for the specific effect of interaction between methods of application and rates of application, data presented in Table (15 a) showed that in both seasons applied fertilizer as Drench method of application at all applied rates and S at 1.5 gm/L significantly increased Ca % as compared to control. D at 1.5 gm/L resulted in the highest Ca content as compared to the other combination treatments. On the contrary, the lowest Ca % of one year old *Yucca filamentosa* seedlings was obtained by Spraying at 0.5 and 1.0 gm/L.

These results are in harmony with that reported by **Rodriguez and Lopez (1976)** on *Dracaena sanderiana*.

II. B. 3. e. Magnesium content :

II. B. 3. e. 1. Leaf magnesium content :

Referring the leaves Mg content of one year old Yucca plants in response to the interaction between forms of fertilizers, methods of application and rates of application, the tabulated data in Table (15) displayed that the highest leaves Mg % was always coupled over control with those seedlings received F_2 (prepared fertilizer) applied as drench at 0.5 gm/L or spray at 1.5 gm/L i.e. F_2 x D at 0.5 gm/L or F_2 x S at 1.5 gm/L. Meanwhile, both 1.5 gm/L of F_1 x D and 0.5 gm/L of F_1 x S ranked statistically second as leaves Mg % was concerned. In addition, the other

combinations came last in this respect but they were still higher than control treatment. This trend was true in both seasons of study.

Data concerning the specific effect of forms of fertilizers during both seasons of study are presented in Table (15 b). It is quite evident that both applied fertilizer forms, F_1 and F_2 were equally effective in their influence on Mg % in leaves of *Yucca filamentosa* seedlings.

With regard to the specific effect of methods of application, data presented in Table (15 b) showed that Drench method was the superior method in this respect (0.400 and 0.399 %) during the first and second season respectively, but the differences between the two mentioned methods were not significant.

As for the specific effect of rates of application, data in Table (15 b) showed that the differential applied rates could be arranged as follow 0.5, 1.5, 1.0 and 0.0 gm/L. The difference between the two first rates were so small to be significant, but on the other hand, the differences between the superior combinations and the two others were highly significant. Such trend was true during both seasons of study.

Concerning the specific effect of interaction between forms of fertilizers and methods of application, data presented in Table (15 b) showed that no significant response was observed in both seasons of study. However, both of F_2 x D, F_1 x D and F_2 x S combinations gave nearly the same percentage of Mg content in leaves of one year old *Yucca filamentosa* especially in the second season of study.

Regarding the specific effect of interaction between F_1 & F_2 and all applied rates (0.0, 0.5, 1.0 and 1.5 gm/L), data in Table (15 b) indicated that all combinations of F_1 and F_2 at all rates of application insignificantly increased Mg % in leaves over control. This trend was true during both

seasons of study. However, F_2 at 0.5 gm/L tended to be declare its own relative superiority over other combinations.

As for the specific effect of interaction between methods and rates of application (irrespective to the fertilizer form), data presented in Table (15 b) cleared that in both seasons all tested doses of fertilizers applied as spray or drench increased significantly the leaf Mg % as compared with control plants. Anyhow, spraying at 0.5 gm/L gave the highest values followed by D at 0.5 and 1.5 gm/L.

These results agree with **Thomas (1979)** on *Camellia japonica.*

II. B. 3. e. 2. Root magnesium content :

Regarding the interaction between the three investigated factors i.e. forms of fertilizers, methods and rates of application on root Mg % of Yucca plants. Table (15) indicated that roots Mg % were greatly abundant when the seedlings received F_2 x D at 1.0 gm/L and F_2 x S at 1.5 gm/L. Meanwhile, the reverse was true with control treatment and F_1 x S at 0.5 gm/L during both seasons, whereas differences between two groups were significant during the second season of study only. On the other hand, other investigated combinations were in between the two above mentioned extremes.

Data in Table (15 b) showed that the fertilizer (F_2) gave a highly significant effect as a result of specific effect of forms of fertilizers. However, F_2 (prepared fertilizer) gave increases 13.7 and 13.7% over F_1 (Stimufol) during 1996/1997 and 1997/1998 seasons, respectively.

As for the specific effect of methods of application, data in Table (15 b) cleared that the differences among S and D methods were so small to reach the level of significance in the two seasons, so they were equally effective in this study.

TABLE (15b) :- Specific effect of two forms of fertilizers, methods and rates of application and their interaction effect on (Mg % in leaves and roots) of *Yucca filamentosa* (one year old) during 1996/1997 & 1997/1998 seasons.

Specific effect of form of fertilizers (F)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	0.381	0.379	0.219	0.219
F2	0.397	0.400	0.249	0.249
L.S.D 0.05	N.S	N.S	0.019	0.019
L.S.D 0.01	N.S	N.S	0.026	0.025

Specific effect of methods of application (M)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
S	0.378	0.381	0.227	0.227
D	0.400	0.399	0.243	0.242
L.S.D 0.05	N.S	N.S	N.S	N.S
L.S.D 0.01	N.S	N.S	N.S	N.S

Specific effect of rates of application (R)

Season		0.0	0.5	1.0	1.5	L.S.D	
						0.05	0.01
Leaves	1 st S.	0.259	0.461	0.383	0.453	0.037	0.049
	2 nd S.	0.257	0.465	0.383	0.454	0.032	0.043
Roots	1 st S.	0.189	0.226	0.263	0.262	0.028	0.037
	2 nd S.	0.179	0.230	0.264	0.265	0.026	0.036

Specific effect of interaction between F & M

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S	0.366	0.363	0.215	0.215
	D	0.395	0.395	0.224	0.223
F2	S	0.389	0.398	0.238	0.238
	D	0.405	0.402	0.262	0.260
L.S.D	0.05	N.S	N.S	N.S	N.S
	0.01	N.S	N.S	N.S	N.S

Specific effect of interaction between F & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	0.0	0.259	0.257	0.189	0.179
	0.5	0.435	0.428	0.212	0.216
	1.0	0.398	0.396	0.226	0.229
	1.5	0.431	0.437	0.253	0.254
F2	0.0	0.259	0.257	0.189	0.179
	0.5	0.487	0.502	0.239	0.244
	1.0	0.368	0.370	0.299	0.298
	1.5	0.475	0.471	0.272	0.275
L.S.D	0.05	N.S	0.045	N.S	N.S
	0.01	N.S	N.S	N.S	N.S

Specific effect of interaction between M & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
S	0.0	0.259	0.257	0.189	0.179
	0.5	0.465	0.470	0.211	0.215
	1.0	0.339	0.343	0.242	0.245
	1.5	0.448	0.453	0.265	0.268
D	0.0	0.259	0.257	0.189	0.179
	0.5	0.457	0.460	0.241	0.245
	1.0	0.427	0.423	0.283	0.282
	1.5	0.457	0.455	0.259	0.261
L.S.D	0.05	0.052	0.045	N.S	N.S
	0.01	N.S	N.S	N.S	N.S

Regarding the specific effect of rates of application, the obtained data in Table (15 b) showed that both 1.0 and 1.5 gm/L were the most influenced combinations in this respect. The differences between the two superior treatments and the two inferior combinations were highly significant.

With respect to the specific effect of interaction between forms of fertilizers and methods of application, results in Table (15 b) revealed that in both seasons generally, F_2 applied as drench or spray gave the most promising effect. On the contrary, F_1 applied as drench or spray showed the lowest values. The differences were so small to be significant.

No significant response was observed as a result of specific effect of interaction between forms of fertilizers and applied rates. Data in Table (15 b) cleared that increasing concentration of both F_1 and F_2 had positively relationship with roots Mg % of *Yucca filamentosa* seedlings. In addition, F_2 at 1.0 and 1.5 gm/L gave the highest values in the two seasons of study. The differences between all tested combinations were so small to reach the level of significance at 5 %.

Referring the specific effect of interaction between applied methods and applied rates, data presented in Table (15 b) indicated insignificant effect as a result of this interaction. Briefly all applied rates of spray or drench methods raised Mg content in roots over control. Moreover, D x 1.0 gm/L gave the highest percentage followed by S x 1.5 gm/L. Magnesium rate of uptake can be strongly depressed by other cations, such as K^+, NH_4^+ **(Kurvits and Kirkby, 1980)**, Ca^{2+} and Mn^{2+} **(Heenan and Campbell, 1981)**.

These results are in disagreement with that found by **Rodriguez and Lopez (1976)** on *Dracaena sanderiana* who mentioned that fertilizing plants with N at different rates had no effect on Mg content.

II. B. 3. f. Total carbohydrate content :

II. B. 3. f. 1. Leaf total carbohydrate content :

Concerning the influence of combinations of fertilizers forms (F_1 & F_2), methods of application (S & D) and rates of application (0.0, 0.5, 1.0 and 1.5 gm/L) on leaf total carbohydrate content of one year old *Yucca filamentosa* seedlings, data presented in Table (15) showed that the richest leaves in their total carbohydrate content was always coincided with such transplants treated with F_2 (prepared fertilizer) applied as spray at rates 1.0 and 1.5 gm/L, as well as F_2 applied as drench at rate 1.5 gm/L. On the contrary, control, F_1 x S at 1.0 gm/L and F_1 x D at 0.5 gm/L gave statistically the least values as compared to the other investigated combinations. Furthermore, other investigated treatments were in between the two above mentioned extents. This trend was true if the average of two seasons was taken into consideration or during the two seasons of study. As rule however, the carbohydrate content of leaves is either unaffected or even increased by Zinc deficiency as a result of the concentration effect caused by impaired growth. In extreme cases, this can lead to excretion (leakage) of sugars at the leaf surface (**Rahimi and Bussler, 1978**).

With regard to the specific effect of form of fertilizer, it is clear from Table (15 c) that F_2 increased with highly significant the percentage of total carbohydrate in leaves compared with F_1. The mean values of F_2 were (24.01 and 23.92%) compared with (20.02 and 22.22%) for F_1 during 1996/1997 and 1997/1998 seasons, respectively.

Referring the specific effect of methods of application, it is obvious from Table (15 c) that drench method was more effective than spray method during the first seasons. Whereas, the reverse was true during the second season. The differences were insignificant during both seasons of study.

As for the specific effect of applied rates of fertilizers on leaf total carbohydrate % of one year old Yucca seedlings, Table (15 c) showed that all rates under study resulted in highly significant increased in the total carbohydrate content of in leaves over untreated plants (control). 1.5 gm/L showed to be the most effective rate in this regard which gave 23.81 and 25.71 % in the first and second seasons, respectively.

Regarding the specific effect of interaction between forms of fertilizers and methods of application, results tabulated in Table (15 c) indicated a highly significant response during the second season only when compared with F_2 when applied as spray i.e. F_2 x S at other combinations. On the other hand, spraying with F_1 gave the least values in the respect.

Concerning the specific effect of interaction between F_1 & F_2 and all applied rates. Data in Table (15 c) cleared that all applied rates of F_2 significantly increased the mean values of total carbohydrates % especially during the first season. F_2 at high rate (1.5 gm/L) gave the highest values (27.14 and 26.72 %) in the first and second seasons respectively, comparing with other interactions.

With respect to the specific effect of interaction between methods of application and rates of application. Table (15 c) showed obviously that all applied rates used as spray or drench expect D at 0.5 gm/L increased significantly total carbohydrate % in leaves in comparison to untreated seedlings (control). D x 1.5 gm/L gave the most promising effect in this

TABLE (15c) :- Specific effect of two forms of fertilizers, methods and rates of application and their interaction effect on (Total carbohydrate % in leaves and ro (one year old) during 199/1997 & 1997/1998 seasons.

Specific effect of form of fertilizers (F)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	20.02	22.22	21.87	21.17
F2	24.01	23.92	21.39	21.23
L.S.D 0.05	1.25	1.22	0.46	N.S
L.S.D 0.01	1.69	1.64	N.S	N.S

Specific effect of methods of application (M)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
S	21.75	23.58	21.89	21.51
D	22.27	22.56	21.37	20.89
L.S.D 0.05	N.S	N.S	0.46	N.S
L.S.D 0.01	N.S	N.S	N.S	N.S

Specific effect of rates of application (R)

Season		0.0	0.5	1.0	1.5	L.S.D	
						0.05	0.01
Leaves	1 st S.	19.00	22.94	22.31	23.81	1.77	2.38
	2 nd S.	20.13	22.56	23.88	25.71	1.72	2.32
Roots	1 st S.	19.31	23.20	21.93	22.09	0.65	0.88
	2 nd S.	20.01	23.24	20.02	21.55	1.08	1.45

Specific effect of interaction between F & M

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S	19.15	21.58	21.92	21.07
	D	20.88	22.85	21.81	21.28
F2	S	24.36	25.57	21.87	21.96
	D	23.67	22.27	20.93	20.51
L.S.D	0.05	N.S	1.72	N.S	1.08
	0.01	N.S	2.32	N.S	N.S

Specific effect of interaction between F & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	0.0	19.00	20.13	19.31	20.01
	0.5	21.04	21.44	22.62	22.69
	1.0	19.54	22.59	22.06	19.59
	1.5	20.49	24.69	23.49	22.41
F2	0.0	19.00	20.13	19.31	20.01
	0.5	24.84	23.68	23.79	23.79
	1.0	25.07	25.16	21.81	20.45
	1.5	27.14	26.72	20.69	20.69
L.S.D	0.05	2.50	N.S	0.92	1.53
	0.01	3.37	N.S	1.25	N.S

Specific effect of interaction between M & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
S	0.0	19.00	20.13	19.31	20.01
	0.5	24.23	24.83	22.91	21.97
	1.0	20.95	24.28	21.70	20.28
	1.5	22.85	25.07	23.66	23.79
D	0.0	19.00	20.13	19.31	20.01
	0.5	21.65	20.29	23.49	24.51
	1.0	23.67	23.48	22.16	19.76
	1.5	24.78	26.35	20.52	19.31
L.S.D	0.05	2.50	2.44	0.92	1.53
	0.01	N.S	N.S	1.25	2.06

respect which gave 30.4 and 30.9 % increases over control in 1996/1997 and 1997/1998 seasons, respectively.

These results go in line with **El Fadaly (1994)** on *Jasminum sambac* who found that most of the NPK ratios tended to increase the content of total carbohydrates in different plant parts.

II. B. 3. f. 2. Root total carbohydrate content :

Referring the response of root total carbohydrate to the interaction between forms of fertilizers, methods of application and rates of application, Table (15) showed that one year old *Yucca filamentosa* seedlings reached statistically their maximum total carbohydrate % when the seedling received both of F_1 at 0.5 gm/L applied as drench, F_1 applied as spray at 1.5 gm/L and F_2 at 0.5 gm/L applied as spray. Such trend was true during both 1996/1997 and 1997/1998 seasons whereas, differences were significant as compared to the other investigated treatments. The reverse was detected when the seedlings were received F_2 x D at 1.5 gm/L and F_1 x S at 0.5 gm/L whereas, the poorest roots in their total carbohydrate content were statistically observed. On the other hand, other treatments were in between the above mentioned extremes.

As for specific effect of form of fertilizer on roots total carbohydrate, data in Table (15 c) showed that F_1 was statistically more effective than F_2 in the first season, whereas F_1 gave 21.87 % while F_2 gave 21.39 % in first season. Whereas, in the second season there was no significant differences between the two fertilizers.

Concerning the specific effect of methods of application, it is obvious from Table (15 c) that the richest roots in their total carbohydrate content were in closed relationship to those seedlings treated by spray method of applied fertilizer. The mean values of spray were 21.89 and 21.51 % in the

first and second seasons, respectively. The difference was so small to be significant in the second season only.

With respect to the specific effect of rates of application, data in Table (15 c) showed that the 0.5 gm/L gave highly significant increase in total carbohydrate % compared with 1.0, 1.5 and 0.0 gm/L. The increases of 0.5 gm/L over control were 20.1 and 16.1 % during the first and second seasons, respectively.

Regarding the specific effect of interaction between forms of fertilizers and methods of application, Table (15 c) cleared that there was no significant differences between the combinations under study during both seasons. F_1 x S and F_2 x S were the most effective combinations in the first and second seasons, respectively.

With regard to the specific effect of interaction between forms of fertilizers and rates of application, it is clear from Table (15 c) that applied rates of either F_1 or F_2 increased significantly roots total carbohydrate as compared with control . However, F_2 at 0.5 gm/L was the most effective combination followed in descending order by F_1 at 1.5 and 0.5 gm/L. Such trend was true during two seasons of study.

Referring the specific effect of interaction between methods of application and applied rates, it is quite evident from Table (15 c) that spraying seedlings at 1.5 gm/L and drenching at 0.5 gm/L had a pronounced effect in comparison with spray at 0.5 gm/L which ranked the second in this respect. Such trend was true during the two experimental seasons.

The outlined results are in harmony with that finding of **El-Fadaly (1994)** on *Jasminum sambac* who found that most of the NPK ratios tended to increase the content of total carbohydrates in different plant parts.

II. B. 3. g. Iron content :

II. B. 3. g. 1. Leaf iron content :

Data regarding the interaction between forms of fertilizers, methods and rates of application. Table (16) showed that regardless of forms of fertilizers, spray method at all rates especially at high and medium rates were more effective combinations. However, F_2 x S at 1.5 and 1.0 gm/L resulted in increasing Fe content in Yucca leaves, F_1 x S at 1.5 gm/L and F_1 x S at 1.0 gm/L came second in this respect. On the contrary, both F_2 x D at 0.5 gm/L, F_1 x D at 0.5 gm/L and control gave the lowest Fe content in leaves as compared with other treatments. The differences between all investigated combinations were so small to reach level of significance at 5 % during both seasons of study.

Concerning the specific effect of forms of fertilizers, Table (16 a) declared that no significant differences were obtained between F_1 and F_2. So, F_1 and F_2 had equal effect in this concern.

Statistical analysis showed a highly significant effect as a result of the specific effect of methods of application. Data presented in Table (16 a) indicated that applied fertilizers by spraying was the favourable method in increasing leaves Fe content. The increases over drench method were 24.6 and 23.6 % during 1996/1997 and 1997/1998 seasons, respectively. Foliar spray is much more efficient than the soil application of expensive iron chelates (**Horesh and Levy, 1981**).

Furthermore, Table (16 a) showed a significant effect as a result of the specific effect of rates of application. Clearly all rates showed highly significant increases of leaves Fe content as compared with control. Moreover, the high rate (1.5 gm/L) gave the highest value followed by 1.0,

TABLE (16) :- Interaction effect of different combination between two forms of fertilizers , methods and rates of application on Fe , Zn and Mn ppm of *Yucca filamentosa* / one year old

TREATMENT			Fe p.p.m.				Zn p.p.m.				Mn p.p.m.			
			Leaves		Roots		Leaves		Roots		Leaves		Roots	
Fert. Types	Appl.Meth.	Appl.Rate	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S SPRAY	0.0	59.27	58.77	859.21	890.39	48.71	46.39	53.92	54.46	41.01	43.04	142.50	145.92
		0.5	86.98	87.62	726.58	801.83	59.72	59.73	68.52	68.65	37.03	37.43	162.51	162.98
		1.0	94.65	96.19	903.02	903.52	55.31	55.33	68.67	67.68	47.01	46.72	201.37	203.00
		1.5	113.67	114.05	961.06	970.88	67.04	59.15	60.42	63.14	50.09	50.91	207.39	210.19
	D DRENCH	0.0	59.27	58.77	859.21	890.39	48.71	46.39	53.92	54.46	41.01	43.04	142.50	145.92
		0.5	63.73	64.28	1225.18	1118.16	58.28	59.93	64.51	65.99	44.47	44.96	223.33	230.84
		1.0	83.37	84.74	1190.44	1191.27	48.40	47.77	64.82	68.37	42.72	46.52	245.94	252.70
		1.5	91.92	92.91	1292.05	1303.83	62.69	63.95	68.88	67.11	65.65	66.36	300.57	302.27
F2	S SPRAY	0.0	59.27	58.77	859.21	890.39	48.71	46.39	53.92	54.46	41.01	43.04	142.50	145.92
		0.5	89.29	89.02	802.90	806.29	55.55	56.41	65.59	65.99	44.73	45.92	158.51	163.83
		1.0	115.61	115.28	1046.13	1051.39	86.02	86.22	57.65	59.13	174.05	172.97	213.33	220.12
		1.5	136.23	135.33	1169.14	1208.92	94.64	96.42	64.82	66.50	196.54	197.46	275.00	276.39
	D DRENCH	0.0	59.27	58.77	859.21	890.39	48.71	46.39	53.92	54.46	41.01	43.04	142.50	145.92
		0.5	74.73	75.01	1158.63	1150.55	94.89	94.89	73.24	73.59	138.80	140.38	295.16	310.78
		1.0	86.64	88.57	1206.14	1226.01	101.20	102.73	57.78	56.95	133.78	133.49	322.10	325.04
		1.5	86.92	87.70	1295.54	1301.50	69.31	71.60	71.55	72.39	85.84	83.86	262.63	263.75
L.S.D		0.05	N.S	N.S	N.S	N.S	14.10	15.67	N.S	N.S	67.64	66.75	N.S	N.S
		0.01	N.S	N.S	N.S	N.S	18.99	21.11	N.S	N.S	N.S	N.S	N.S	N.S

0.5 and 0.0 gm/L if the mean of the two seasons was taken into consideration the values were (107.35, 95.64, 78.84 and 59.02 ppm), respectively.

As for the specific effect of interaction between form of fertilizer and applied methods, it is clear from data tabulated in Table (16 a) that spraying both of F_2 and F_1 respectively, showed to be the superior combinations in two seasons. On the contrary, F_1 x D and F_2 x D were the inferior ones. The differences were insignificant in both seasons of study.

Referring the specific effect of interaction between forms of fertilizers and rates of application, results presented in Table (16 a) indicated that all applied rates of F_1 or F_2 gave insignificantly increases over control especially with high rates. However, F_2 at 1.5 gm/L followed by F_1 at 1.5 gm/L gave the most promising effect in this respect.

With respect to the specific effect of interaction between methods of application and rates of application, tabulated data in Table (16 a) indicated that most fertilizers rates (1.5 and 1.0 gm/L) applied as spray increased the leaf Fe content in comparison to those seedlings fertilized by drench method at all applied rates, spray at the low rate (0.5 gm/L) and untreated plants (control). The variance among all combinations were non significant in the two seasons.

These results go in line with that obtained by **Taleb and Sohair (1995)** on *Dracaena fragrans* who found that the highest leaf Fe was obtained with the high rate of slow release fertilizer.

II. B. 3. g. 2. Root iron content :

Data tabulated in Table (16) indicated that Fe content of one year old *Yucca filamentosa* leaves was responded obviously to the interaction between the high rate of both F_1 or F_2 when applied as drench. In other

words, 1.5 gm/L of F_1 x D and 1.5 gm/L of F_2 x D exhibited insignificantly the highest value of this character as compared to other combinations. On the contrary, both F_1 and F_2 x S at 0.5 gm/L were the inferior treatments in this respect. Other combinations took intermediate position between the two extremes with variable values.

As for the specific affect of the two forms of fertilizers on Fe content of one year old *Yucca filamentosa* seedlings, it is clear from data in Table (16 a) that F_2 gave insignificantly the highest values (1049.62 and 1065.68 ppm) in the first and second seasons respectively, it might be owing to of high content of iron in (F_2) in comparison to Stimufol.

Referring the specific effect of methods of application under which one year old *Yucca filamentosa* seedling were grown during both seasons of study, data in Table (16 a) displayed an obvious response. Hence, the greatest content of Fe (1135.80 and 1134.01 ppm) was statistically induced by drench method in the first and second seasons, respectively. The increase exhibited by Yucca plants treated by the superior method was highly significant as compared to the inferior method.

With regard to the response of Fe content in roots to the specific effect of applied rates, data obtained during both season declared that all rates under study exhibited generally the greatest value of Fe content in roots as compared to control. However, the third investigated rate (1.5 gm/L) tended to be more effective than the two other ones.

As for the specific effect of interaction between form of fertilizer and methods of application, it is obvious from Table (16 a) that in the first and second seasons respectively, F_1 x D gave (1141.72 and 1125.91 ppm) and F_2 x D gave (1129.88 and 1142.11 ppm), although the differences were so

TABLE (16a) :- Specific effect of two forms of fertilizers, methods and rates of application and their interaction effect on (Fe ppm in leaves and roots) of *Yucca filamentosa* (one year old) during 1996/1997 & 1997/1998 seasons.

Specific effect of form of fertilizers (F)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	81.61	82.17	1002.09	1008.79
F2	88.49	88.56	1049.62	1065.68
L.S.D 0.05	N.S	N.S	N.S	N.S
L.S.D 0.01	N.S	N.S	N.S	N.S

Specific effect of methods of application (M)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
S	94.37	94.38	915.91	940.46
D	75.73	76.34	1135.80	1134.01
L.S.D 0.05	9.36	9.46	93.57	92.97
L.S.D 0.01	12.61	12.74	126.01	125.20

Specific effect of rates of application (R)

Season		0.0	0.5	1.0	1.5	L.S.D 0.05	L.S.D 0.01
Leaves	1 st S.	59.27	78.69	95.07	107.19	13.24	17.84
	2 nd S.	58.77	78.99	96.20	107.50	13.37	18.01
Roots	1 st S.	859.21	978.32	1086.43	1179.45	132.33	178.21
	2 nd S.	890.39	969.21	1093.05	1196.28	131.48	177.06

Specific effect of interaction between F & M

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S	88.64	89.16	862.47	891.66
	D	74.57	75.18	1141.72	1125.91
F2	S	100.10	99.60	969.35	989.25
	D	76.89	77.51	1129.88	1142.11
L.S.D	0.05	N.S	N.S	N.S	N.S
	0.01	N.S	N.S	N.S	N.S

Specific effect of interaction between F & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	0.0	59.27	58.77	859.21	890.39
	0.5	75.36	75.95	975.88	959.99
	1.0	89.01	90.47	1046.73	1047.39
	1.5	102.79	103.48	1126.56	1137.36
F2	0.0	59.27	58.77	859.21	890.39
	0.5	82.01	82.02	980.77	978.42
	1.0	101.13	101.93	1126.14	1138.70
	1.5	111.58	111.52	1232.34	1255.21
L.S.D	0.05	N.S	N.S	N.S	N.S
	0.01	N.S	N.S	N.S	N.S

Specific effect of interaction between M & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
S	0.0	59.27	58.77	859.21	890.39
	0.5	88.14	88.32	764.74	804.06
	1.0	105.13	105.74	974.58	977.46
	1.5	124.95	124.69	1065.10	1089.90
D	0.0	59.27	58.77	859.21	890.39
	0.5	69.23	69.65	1191.91	1134.36
	1.0	85.01	86.66	1198.29	1208.64
	1.5	89.42	90.31	1293.79	1302.67
L.S.D	0.05	N.S	N.S	187.14	N.S
	0.01	N.S	N.S	N.S	N.S

small to reach the level of significance. On the contrary, F_1 x S and F_2 x S gave the lowest values in the two seasons.

Concerning the specific effect of interaction between forms of fertilizers and rates of application, it is quite evident from data recorded in Table (16 a) that all applied rates of both F_1 and F_2 induced insignificantly the richest roots in their contents of Fe as compared to control. The most effective combination was F_2 applied at the high rate (1.5 gm/L) followed F_2 at 1.0 gm/L and F_1 at 1.5 gm/L. On the contrary, both F_1 at 0.5 gm/L, F_2 at 0.5 gm/L and control were the inferior combinations. Such trend was true during both seasons of study .

Regarding the specific effect of interaction between methods of application and rates of application, data obtained in Table (16 a) indicated that in both seasons, applied fertilizer by drench method at all rates were more effective as compared with spraying method even at high rates of application. Anyhow, D at 1.5 gm/L gave the highest values (1293.79 and 1302.67 ppm) in the first and second seasons, respectively. The differences were so small to be significant in the second seasons among all investigated combinations.

Our findings are in agreement with that reported by **Taleb and Sohair (1995)** on *Dracaena fragrans* and they are in disagreement with that obtained by **Rodriguez and Lopez (1976)** on *Dracaena sanderiana* and **Smith (1978)** on *Zamia integrifolia*.

II. B. 3. h. Zinc content :

II. B. 3. h. 1. Leave zinc content :

Data concerning the interaction between forms of fertilizers, methods of application and rates of application on Zn content in leaves of *Yucca*

filamentosa one year old seedlings are shown in Table (16). Data revealed that, the differential combinations investigated could be classified into two main categories regarding their influence on the leaves Zn content per seedlings as follows :

a) The four combination i.e. F_2 x D at 1.0 gm/L, F_2 x S at 1.5 gm/L, F_2 x D at 0.5 gm/L and F_2 x S at 1.0 gm/L respectively, are representative of the first category "Superior".

b) The other combinations represented the second category (less effective) inferior.

The differences were significant as leaves Zn content for those seedlings received any combination of the superior category was compared to any of those seedlings received any combination of the inferior category.

As for the specific effect of forms of fertilizers, data in Table (16 b) showed obviously that F_2 (prepared fertilizer) gave a highly significant increase over F_1. The increases were 33.5 and 37.0 % during the first and second seasons, respectively.

Regarding the specific effect of methods of application, data in Table (16 b) revealed that there was no significant differences in Zn content in response to S (spray) and D (drench) methods. Thus, spray and drench were equal in this concern. This firmer trend declared obviously in both seasons of study.

With respect to the specific effect of rates of application, it is clear from Table (16 b) that all applied rates (0.5, 1.0 and 1.5 gm/L) resulted in highly significant increases in leaves Zn content compared with control. 1.5 gm/L showed to be the most effective rate which gave the increase by 50.7

% over control during 1996/1997 season. Whereas in second season, 1.0 gm/L gave increase by 57.4% over control.

Referring the specific effect of interaction between forms of fertilizers and methods of application. Data tabulated in Table (16 b) showed that applied F_2 (prepared fertilizer) as drench and spray represented respectively, the superior combinations in this concern. On the other hand, F_1 x S and F_1 x D showed to be the inferior interactions, the differences between the two groups were significant during the first season only.

Concerning the specific effect of interaction between forms of fertilizers and rates of application. Data in Table (16 b) displayed obviously that added F_2 at all applied rates gave significantly increases in leaves Zn content as compared with F_1 at all rates and control. Moreover, F_2 at 1.0 gm/L showed its own relative superiority combination followed by F_2 at 1.5 gm/L. The other combinations ranked the second in this respect.

With regard to the specific effect of interaction between methods of application and rates of application, data presented in Table (16 b) indicated that all rates under study applied as spray or drench increased statistically the Zn content over control. Moreover, (S) spray at 1.5 gm/L followed by D x 0.5 gm/L gave the highest values in this respect.

These results disagree with the finding of **Smith (1978)** on *Zamia integrifolia* who found that raising N level had no effect on micro elements.

II. B. 3. h. 2. Root Zinc content :

Concerning the Zn content of *Yucca filamentosa* roots in relation to the interaction between (F_1 & F_2) & (S & D) and (0.0, 0.5, 1.0 and 1.5 gm/L), data in Table (16) displayed an obvious response. Hence, the greatest concentration of Zinc in Yucca roots was insignificantly induced by those plants received F_2 (prepared fertilizer) at 0.5 gm/L added as drench to the

TABLE (16b) :- Specific effect of two forms of fertilizers,methods and rates and their interaction effect on (Zn ppm in leaves and roots) of *Yucca filamentosa* (one year old) during 1996/1997 & 1997/1998 seasons.

Specific effect of form of fertilizers (F)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	56.11	54.83	62.96	63.73
F2	74.88	75.13	62.31	62.93
L.S.D 0.05	4.99	5.54	N.S	N.S
L.S.D 0.01	6.72	7.46	N.S	N.S

Specific effect of methods of application (M)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
S	64.46	63.26	61.69	62.50
D	66.52	66.71	63.58	64.17
L.S.D 0.05	N.S	N.S	N.S	N.S
L.S.D 0.01	N.S	N.S	N.S	N.S

Specific effect of rates of application (R)

Season		0.0	0.5	1.0	1.5	L.S.D	
						0.05	0.01
Leaves	1 st S.	48.71	67.11	72.74	73.42	7.05	9.49
	2 nd S.	46.39	67.74	73.02	72.78	7.84	10.55
Roots	1 st S.	53.92	67.97	62.23	66.42	3.65	4.92
	2 nd S.	54.46	68.56	63.03	67.29	3.33	4.48

Specific effect of interaction between F & M

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S	57.69	55.15	62.88	63.48
	D	54.52	54.51	63.03	63.98
F2	S	71.23	71.36	60.49	61.52
	D	78.53	78.90	64.12	64.35
L.S.D	0.05	7.05	N.S	N.S	N.S
	0.01	N.S	N.S	N.S	N.S

Specific effect of interaction between F & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	0.0	48.71	46.39	53.92	54.46
	0.5	59.00	59.83	66.52	67.32
	1.0	51.86	51.55	66.75	68.03
	1.5	64.87	61.55	64.65	65.13
F2	0.0	48.71	46.39	53.92	54.46
	0.5	75.22	75.65	69.42	69.79
	1.0	93.61	94.48	57.72	58.04
	1.5	81.98	84.01	68.19	69.45
L.S.D	0.05	9.97	11.08	5.17	4.71
	0.01	13.43	14.93	6.96	6.34

Specific effect of interaction between M & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
S	0.0	48.71	46.39	53.92	54.46
	0.5	57.63	58.07	67.06	67.32
	1.0	70.67	70.78	63.16	63.41
	1.5	80.84	77.79	62.62	64.82
D	0.0	48.71	46.39	653.92	54.46
	0.5	76.59	77.41	68.88	69.79
	1.0	74.80	75.25	61.30	62.66
	1.5	66.00	67.78	63.33	69.75
L.S.D	0.05	9.97	11.08	N.S	N.S
	0.01	13.43	14.93	N.S	N.S

medium followed by F_2 x D at 1.5 gm/L as compared to other treatments. Such trend was true during both seasons of study. Moreover, seedlings supplied by both F_2 x D at 1.0 gm/L and F_2 x S at 1.0 gm/L produced less value of Zn content as compared with other combinations but they still gave high values over control. Other treatments took intermediate place between the two extremes with variable values.

From data in Table (16 b), no significant effect was detected as a result of specific effect of forms of fertilizers. Thus, F_1 and F_2 were equal in this respect. Moreover, F_1 was effective fertilizer (62.96 and 63.73 ppm) than F_2 (62.31 and 62.93 ppm) in the first and second seasons, respectively.

As for the specific effect of methods of application, results in Table (16 b) indicated that applied method had no significant effect on Zn content in Yucca roots. However, drench method tended to be more effective than spray method.

Regarding the specific effect of applied rates on root Zn content of one year old *Yucca filamentosa* tabulated data in Table (16 b) declared that all investigated rates significantly exceeded control treatment. The low rate (67.97 & 68.56 ppm) showed to be more influenced than the medium (62.23 & 63.03 ppm) and high rates (66.42 & 67.29 ppm) in the first and second seasons, respectively.

Referring the root Zn content of the seedlings in response to the specific effect of interaction between form of fertilizer and method of application, data presented in Table (16 b) displayed that F_2 x D followed by F_1 x D were the superior combinations in this respect. Meanwhile, F_1 x S and F_2 x S were the inferior ones although differences did not reach level of significance in the two seasons of study.

Concerning the specific effect of interaction between forms of fertilizers and rates of application, data in Table (16 b) indicated obviously that F_2 (prepared fertilizer) at 0.5 gm/L had a pronounced effect in increasing Zn content in roots. Whereas, F_2 at 1.5 gm/L ranked the second in this respect. Both control and F_2 at 1.0 gm/L were the inferior combinations in comparison to the other combinations. Applied phosphorus fertilizers in large quantity to soil contain low level of available Zinc may induce Zinc deficiency and increase in Zinc requirement of plants (**Loneragan *et al*, 1979**).

With regard the specific effect of interaction between applied methods and applied rates. It is obvious from Table (16 b) that 0.5 gm/L added as drench was the most effective treatment which gave 27.7 and 28.1 % increase over control in the first and second seasons, respectively. The other investigated combinations were in between the two above mentioned two extents. The difference were so small to be significant.

These results agree with **Smith (1978)** on *Zamia integrifolia* who found that raising N level had no effect on micro elements.

II. B. 3. i. Manganese content :

II. B. 3. i. 1. Leaf manganese content :

Concerning the effect of interaction between forms of fertilizers, methods of application and rates of application, obtained data in Table (16) showed that leaves of *Yucca filamentosa* seedling received F_2 x S at 1.5 gm/L (196.54 & 197.46 ppm) had statistically the highest Mn content followed by F_2 x S at 1.0 gm/L (174.05 & 172.97 ppm) and F_2 x D at 0.5 gm/L (138.80 & 140.38 ppm) as compared with other combinations during the first and second seasons, respectively. On the other hand, The seedling received either F_1 x S at 0.5 gm or control showed lower Mn % in their

leaves with variable values in both seasons of study. The other treatments were in between the two above mentioned extremes.

With regard to the specific effect of forms of fertilizers, data presented in Table (16 c) revealed that F_2 induced a highly significant increase in Mn content as compared with F_1. The increases were 131.9 and 118.9 % during 1996/1997 and 1997/1998 seasons, respectively.

Furthermore, Table (16 c) indicated non significant effect as a result of specific effect of methods of application. However, spray method showed to be more effective (78.94 and 79.69 ppm) than drench method (74.16 and 75.21ppm) in 1996/1997 and 1997/1998 seasons, respectively.

As for the specific effect of rates of application Table (16 c) cleared that both 1.0 and 1.5 gm/L gave a highly significant increases in Mn content as compared with control. On the other hand, there was no significant differences between the low rate (0.5 gm/L) and the other applied rates.

Referring the specific effect of interaction between form of fertilizer and methods of application, results in Table (16 c) revealed that F_2 applied as spray and drench gave the highest values of Mn content in leaves compared with F_1 x D and F_1 x S. The differences were so small to reach the level of significance.

With respect to the specific effect of interaction between forms of fertilizers and rates of application, data presented in Table (16 c) showed that F_2 at 1.0 gm/L followed by F_2 at 1.5 gm/L increased significantly Mn content in leaves compared with other combination with mean values (153.92 & 141.19 ppm) and (153.23 & 140.66 ppm) in 1996/1997 and 1997/1998 seasons, respectively.

TABLE (16c) :- Specific effect of two forms of fertilizers, methods and rates of application and their interaction effect on (Mn ppm in leaves and roots) of *Yucca filamentosa* (one year old) during 1996/1997 & 1997/1998 seasons.

Specific effect of form of fertilizers (F)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
F1	46.13	47.38	203.27	206.73
F2	106.97	107.52	226.47	231.47
L.S.D 0.05	23.91	23.60	N.S	N.S
L.S.D 0.01	32.21	31.78	N.S	N.S

Specific effect of methods of application (M)

Season	Leaves		Roots	
	1 st S.	2 nd S.	1 st S.	2 nd S.
S	78.94	79.69	187.89	191.05
D	74.16	75.21	241.84	247.15
L.S.D 0.05	N.S	N.S	32.17	32.21
L.S.D 0.01	N.S	N.S	43.33	43.38

Specific effect of rates of application (R)

Season		0.0	0.5	1.0	1.5	L.S.D	
						0.05	0.01
Leaves	1 st S.	41.01	66.26	99.39	99.53	33.82	45.55
	2 nd S.	43.04	67.17	99.93	99.65	33.38	44.95
Roots	1 st S.	142.50	209.88	245.69	261.39	45.50	61.28
	2 nd S.	145.92	217.11	250.22	263.15	45.55	61.35

Specific effect of interaction between F & M

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	S	43.79	44.53	178.44	180.52
	D	48.46	50.22	228.09	232.93
F2	S	114.08	114.85	197.34	201.57
	D	99.86	100.19	255.59	261.37
L.S.D	0.05	N.S	N.S	N.S	N.S
	0.01	N.S	N.S	N.S	N.S

Specific effect of interaction between F & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
F1	0.0	41.01	43.04	142.50	145.92
	0.5	40.75	41.19	192.92	196.91
	1.0	44.87	46.62	223.66	227.85
	1.5	57.87	58.64	253.98	256.23
F2	0.0	41.01	43.04	142.50	145.92
	0.5	91.77	93.15	226.84	237.31
	1.0	153.92	153.23	267.72	272.58
	1.5	141.19	140.66	268.82	270.07
L.S.D	0.05	47.83	47.20	N.S	N.S
	0.01	N.S	N.S	N.S	N.S

Specific effect of interaction between M & R

Season		Leaves		Roots	
		1 st S.	2 nd S.	1 st S.	2 nd S.
S	0.0	41.01	43.04	142.50	145.92
	0.5	40.88	41.68	160.51	163.41
	1.0	110.53	109.85	207.35	211.56
	1.5	123.32	124.19	241.19	243.29
D	0.0	41.01	43.04	142.50	145.92
	0.5	91.64	92.67	259.25	270.81
	1.0	88.25	90.01	284.02	288.87
	1.5	75.75	75.11	281.60	283.01
L.S.D	0.05	47.83	47.20	N.S	N.S
	0.01	N.S	N.S	N.S	N.S

Regarding the specific effect of interaction between methods of application and investigated rates, it is clear from Table (16 c) that all applied rates added as spray or drench increased significantly Mn content compared with control except S at 0.5 gm/L and D at 1.0 gm/L which produced the lowest Mn content in leaves of Yucca seedlings. S at 1.5 gm/L was the most effective combination as (123.32 & 124.19 ppm) followed by S at 1.0 gm/L (110.53 & 109.85 ppm) in the first and second seasons, respectively.

Our outlined results agree with that reported by **Taleb and Sohair (1995)** on *Dracaena marginata* who recorded that applying Osmocote slow release at high rate resulted in the greatest leaf Mn concentration.

II. B. 3. i. 2. Root manganese content :

Referring the response of Mn content in roots to the interaction between two forms of fertilizers, methods of and rates of application, data tabulated in Table (16) showed clearly that applied F_1 or F_2 as drench at all rates, in addition F_2 x D at 1.5 gm /L resulted in increasing Mn content in roots as compared to the other combinations and control during two experimental seasons. Drenching F_2 (prepared fertilizer) at the medium rate (1.0 gm/L) showed to be the superior treatment (322.10 and 325.04 ppm) in the first and second seasons, respectively. Such trend was true either data of each individual season or an average of both 1996/1997 and 1997/1998 seasons was concerned.

Concerning the specific effect of forms of fertilizers, Table (16 c) clearly showed that Mn content in roots was greatly abundant when applied F_2. Contrary to that, F_1 was the inferior fertilizer in this respect.

With respect to the specific effect of methods of application, results are presented in Table (16 c) showed the superiority of drench method of

applied fertilizers in increasing root Mn content. Nevertheless, it was so interesting to be mentioned clearly a firmer trend declared obviously that the presence of waxy layer on Yucca leaves may depressed the efficiency of fertilizer to be absorbed completely through leaf tissues.

As for the specific effect of rates of application, data in Table (16 c) showed that increasing the rate of both F_1 and F_2 fertilizers applied gave the richest roots in their Mn content, all results statistically increasing towards raising rates from (0.0 gm/L) as control to (1.5 gm/L) which tended to be more effective during both seasons of study.

Referring the specific effect of interaction between forms of fertilizers and methods of application, data tabulated in Table (16 c) cleared that drench method of both F_1 and F_2 fertilizers showed insignificantly effect in increasing Mn content of roots compared with the two others. Hence, the differential combinations could be classified as follows, F_2 x D (255.59 & 261.37 ppm), F_1 x D (228.09 & 232.93 ppm), F_2 x S (197.34 & 201.57 ppm) and F_1 x S (178.44 & 180.52 ppm) in the first and second seasons, respectively.

No significant response was observed as a result of the specific effect of interaction between forms of fertilizers and rates of application, Table (16 c) cleared that the medium and high rates of both F_1 and F_2 raised Mn content over low rate and control. However, 1.0 and 1.5 gm/L of F_2 were the most effective combinations in this respect. Such trend was true during both seasons of study.

Concerning the specific effect of interaction between methods of application and rates of application, Table (16 c) showed that the greatest content of Mn in roots was obtained with drench as a method of applied fertilizers and medium rate of application (1.0 gm/L) followed in

descending order by 1.5 gm/L and 0.5 gm/L applied also as drench. The differences between these combinations were not significant in two experimental seasons.

Our results agree with **Taleb and Sohair (1995)** on *Dracaena marginata* and they are in disagreement with **Smith (1978)** on *Zamia integrifolia.*