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PHYSIOLOGICAL STUDIES ON *WASHINGTONIA FILIFERA*, WENDL. PLANTS
II-EFFECT OF CHEMICAL AND ORGANIC FERTILIZATION ON VEGETATIVE GROWTH AND CHEMICAL COMPOSITION OF SANDY SOIL-GROWN SEEDLINGS

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ABSTRACT

The present trial aimed to study the effect of ammonium sulphate fertilizer and two organic fertilizers, filter mud (F.M.) and chickenyard manure (Ch. M.) on the growth and chemical composition of *Washingtonia filifera* seedlings grown in sandy soil at the Experimental Farm, Fac. of Agric., Minia Univ., during 2000 and 2001 seasons.

Different vegetative growth characters, including plant height, petiole length, longitudinal and across length of leaf blade and leaves and roots fresh and dry weights, as well as, chemical composition including leaves % of N, P and K and leaves contents of chlorophyll a and b and carotenoids were significantly enhanced due to the use of ammonium sulphate. The use of the medium rate, 8g/pot gave the highest values in this concern. On the other hand, both filter mud and chicken yard manure, especially at the high rate of each one (100g/pot) gave the best results of different vegetative growth and chemical constituents. The Interactions between chemical and organic fertilizers were mostly significant with the best overall results being obtained due to the use of ammonium sulphate at 8g/pot and F.M. or Ch.M. at 100 g/pot.

INTRODUCTION

Washingtonia filifera, Wendl. (California fan palm) belongs to Family Palmaceae and native to California, Arizona and Northern Mexico. It grows fast to 25 m. tall with evergreen, fan-shaped, gray-green leaves. It takes poor soil, desert heat, drought and survives well along the seashores exposed to direct salinized sea winds. However, it grows better and faster with good soil and environmental conditions. Young trees could be planted in containers. In landscape, they can serve as street trees, parkway planting or as single trees in large gardens. Therefore, and during the last three decades, such palm trees were extensively cultivated in Egypt, especially in the landscape of almost all tourist villages along the beaches of Mediterranean and Red seas.

The present experiment was planned in order to reach the most suitable chemical nitrogen fertilization rate, as well as, the response of California fan palm to different sources and rates of organic fertilizers. Concerning chemical N fertilization, Taha (1994) on *Parkinsonia aculeata*, Shehata (1995) on *Poinciana regia*, Saleh *et al* (1998) on *Ficus benjamina*, El-Mahrouk *et al* (1999) on *Jasminum grandiflorum*, Badran *et al* (2001) on guar and Abdou and Hassanein (2003) on *Jasminum sambac* revealed that

different vegetative growth characters, as well as, the leaf contents of the photosynthetic pigments, nitrogen, phosphorus and potassium were greatly increased due to the use of various rates of chemical nitrogen fertilizers. In agreement with these findings concerning the positive response of vegetative growth, as well as, N and/or NPK leaf contents to N-chemical fertilization were those on *Livistonia chinensis* (Badran and Aly, 1988); *Swietenia* and *Khaya* (El-Labban *et al.*, 1988); poplar (Ali *et al*, 2002) and *Peltophorum africanum* (Abdou and El-Sayed, 2002). Moreover, Koriesh and Helmy (1986) on *Ficus* species and Transfiguracion (1992) on *Eucalyptus camaldulensis* emphasized that mineral nitrogen fertilizers effectively promoted different vegetative traits of such plants.

In regard to organic fertilization, Abdou (1987) on *Khaya senegalensis*, Abd-Elrahim *et al* (1996) on *Leucaena*, Ezz-Eldeen and Abd-Elmoaz (1998) and Ahmed *et al.*, (1998) on roselle, Ahmed *et al* (2000) on grapevines, Ali *et al* (2001) on *Khaya* and Ali *et al* (2002) on poplar revealed that the addition of farmyard manure (F.Y.M.) at different rates caused noticeable increases in different vegetative growth characters. Meanwhile, the supplement of filter mud (F.M.) which known as one of cheapest industrial waste product was also effective in promoting growth characters as pointed out by Ahmed *et al.* (2001) on roselle and Ali *et al.*, (2002) on poplar. Such organic materials were also effective in promoting chlorophyll a and b and carotenoids of *Khaya* (Abdou, 1987) and roselle (Ahmed, 2001) and effectively gave rise to leaf contents of N, P and K as reported by Abd-Elrahim *et al* (1996) on *Leucaena*, Ahmed *et al* (2000) on grapervines, Ali *et al* (2001) on *khaya* and Ali *et al.*, (2002) on poplar.

MATERIALS AND METHODS

A pot experiment was carried out during two successive seasons of 2000 and 2001 at the Experimental Farm, Fac. of Agric., Minia Univ. in order to compare between chemical and organic nitrogenous fertilization, as well as their combined effect, on *Washingtonia filifera* seedlings. Three years old uniform and healthy seedlings were potted in 50-cm clay pots, filled with sandy soil, whose physical and chemical properties are shown in Table (a), on the first week of February of both seasons.

A split plot design with three replicates, was followed where ammonium sulphate (20.6% N) was assigned to the main plots and two kinds of organic fertilizers were designated to the sub-plots. Ammonium sulphate fertilizer was added at four rates, 0, 4, 8 and 12 g/pot after 4 and 8 weeks from potting date. The two organic fertilizers used were filter mud (F.M.) and chicken manure (Ch.M.) with chemical analysis shown in Table (b). Each one was used at two rates, 50 and 100 g/pot. The assigned amounts of each organic fertilizer were mixed throughly with the soil of each pot before planting. In addition, calcium superphosphate (15.5% P_2O_5) and potassium sulphate (48% K_2O) fertilizers were supplied to all pots including control ones (no organic fertilizer) at the rate of 4 g/pot of each fertilizer, at the same time

of the first application of ammonium sulphate. Each experimental unit was consisted of 5 pots. All other agricultural treatments were performed as usual.

On the first week of Dec. for both seasons, data were recorded for plant height (cm), number of leaves/plant, petiole length, longitudinal and across length of leaf blade (cm) and leaves and roots fresh and dry weights/plant (g). Moreover, nitrogen, phosphorus and potassium % in the leaves ware determined according to Page *et al.* (1982) and chlorophyll a and b and carotenoids contents in the leaves were estimated as described by Fadl and Seri-Eldeen (1978). Obtained data were statistically analyzed according to the L.S.D. Method described by Litte and Hills (1978).

Table (a): Physical and chemical properties of the used soil.

Character	Value	Character	Value
Sand %	91.0	EC (mmohos/cm)	1.07
Silt %	5.80	Org. matter %	0.08
Clay %	3.20	Total N %	0.02
$CaCO_3$ %	10.10	Avail P ppm	11.9
pH	8.10	Exch. K (mg/100 g)	0.20

Table (b): Chemical analysis of filter mud (F.M.) and chicken manure(Ch.M.) used in the experiment.

Content	F.M.	Ch. Y.M.
Org. matter %	22.1	44.8
N %	3.50	3.47
P %	0.02	0.88
K %	0.12	2.02
C/N ratio	6.31	12.92

RESULTS AND DISCUSSION

Vegetative Growth Traits:

All vegetative growth studied traits, except leaf number/plant, were significantly increased in both seasons as a result of supplying *Washingtonia filifera* seedlings with ammonium sulphate at the low and medium rates (4 and 8 g/pot), in comparison with those of unfertilized seedlings. However, the medium rate was much more effective than the low one. While, increasing the applied N rate to 12 g/pot caused a noticeable reduction in all traits as clearly shown in Tables (1, 2 and 3). It is worth mentioning that plant height, petiole length and longitudinal and across length of leaf blade were increased by about 20%, while leaves and roots fresh and dry weights were increased by about 50% due to the use of the medium N rate over those of control treatment. These results are in harmony with those obtained by Koriesh and Helmy (1986) on *Ficus sp.*, Transfiguracion (1992) on *Eucalyptus camaldulensis*, El-Mahrouk *et al* (1999) on *Jasminum grandiflorum*, Abdou and Hassanein (2003) on *Jasminum sambac* Abdou and El-Sayed (2002) on *Peltophorum africanum* and Ali *et al.*, (2002) on poplar. Some other authors emphasized the role of nitrogen fertilization, especially at the medium rate, in

augmenting various vegetative growth characteristics of different plants such as *Livistonia chinensis* (Badran and Aly, 1988), *Swietenia* and *Khaya* (El-Labban *et al.*, 1988), *Parkinsonia aculeata* (Taha, 1994) and *Poinciana regia* (Shehata, 1995).

Table (1): Effect of ammonium sulphate and organic fertilization on vegetative growth of *Washingtonia filifera* seedlings during 2000 and 2001 seasons.

Org. Fert. g/pot	First season				Mean B	First season				Mean B
	Amm. Sulph. G/ pot					Amm. Sulph. g/pot				
	0	4	8	12		0	4	8	12	
	Plant height (cm)									
Control 0	51.1	59.2	65.4	54.2	57.5	53.6	60.7	65.8	56.0	59.0
F.M 50	61.4	70.4	73.2	55.2	65.1	62.4	70.7	72.9	59.1	66.3
F.M. 100	66.3	75.2	77.5	57.1	69.0	67.7	75.9	77.0	61.2	70.5
Ch.M. 50	58.4	67.7	70.5	56.3	63.2	59.7	67.7	70.0	58.5	64.0
Ch.M. 100	62.4	71.2	74.4	57.0	66.3	63.4	71.9	73.8	60.5	67.4
Mean A	59.9	68.7	72.2	56.0		61.4	69.4	71.9	59.1	
L.S.D. 5%	**A: 5.4**		**B: 5.1**	**AB: 10.2**		**A: 6.0**		**B: 4.7**	**AB: 9.4**	
	Number of leaves/plant									
Control 0	7.65	8.00	8.50	7.75	7.98	7.92	8.20	8.56	8.00	8.17
F.M. 50	8.59	8.80	9.15	7.90	8.61	8.72	8.84	9.10	8.44	8.78
F.M. 100	9.28	9.40	9.69	8.16	9.13	9.48	9.48	9.62	8.72	9.33
Ch.M. 50	8.17	8.47	8.82	8.04	8.38	8.36	8.46	8.75	8.36	8.48
Ch.M. 100	8.73	8.90	9.30	8.14	8.77	8.88	8.98	9.22	8.64	8.93
Mean A	8.48	8.71	9.09	8.00		8.67	8.79	9.05	8.43	
L.S.D. 5%	**A: N.S.**		**B: 0.61**	**AB: N.S.**		**A: N.S.**		**B: 0.54**		**AB: N.S.**
	Petiole length (cm)									
Control 0	26.6	31.4	34.7	28.3	30.3	28.0	32.2	34.9	29.2	31.1
F.M 50	31.3	37.3	39.0	28.8	34.1	31.8	37.5	38.6	30.8	34.7
F.M. 100	33.8	39.9	41.3	29.8	36.2	34.5	40.2	41.0	31.9	36.9
Ch.M. 50	29.8	35.9	37.6	29.4	33.2	30.5	35.9	37.2	30.9	33.6
Ch.M. 100	31.8	37.7	39.6	29.7	34.7	32.4	38.1	39.2	31.6	35.3
Mean A	30.7	36.4	38.4	29.2		31.4	36.8	38.2	30.9	
L.S.D. 5%	**A: 3.4**		**B: 2.7**	**AB: 5.4**		**A: 2.9**		**B: 2.4**		**AB: 4.8**

Ammonium sulphate : Factor A
Organic fertilization : Factor B

Table (2): Effect of ammonium sulphate and organic fertilization on vegetative growth of *Washingtonia filifera* seedlings during 2000 and 2001 seasons.

Org. Fert. g/pot	First season				Mean B	First season				Mean B
	Amm. Sulph. g/ pot					Amm. Sulph. g/ pot				
	0	4	8	12		0	4	8	12	
	Longitudinal length of leaf blade(cm)									
Control 0	25.6	31.4	35.3	28.5	30.2	27.2	32.4	35.2	29.4	31.1
F.M 50	30.7	38.0	39.6	29.3	34.4	31.5	38.2	39.3	31.3	35.1
F.M. 100	33.2	40.6	41.9	30.3	36.5	34.3	40.9	41.6	32.4	37.3
Ch.M. 50	29.2	36.6	38.1	29.8	33.4	29.9	36.6	37.8	31.0	33.8
Ch.M. 100	31.2	38.4	40.0	29.6	34.8	31.8	38.8	39.8	32.1	35.6
Mean A	30.0	37.0	39.0	29.5		30.9	37.4	38.7	31.2	
L.S.D. 5%	A: 4.1	B: 3.0		AB: 6.0		A: 3.4	B: 3.2			AB: 6.4
	Across length of leaf blade (cm)									
Control 0	29.2	33.9	37.6	31.0	32.9	30.6	34.9	38.2	31.9	33.9
F.M. 50	35.0	40.3	42.1	31.6	37.3	35.4	40.7	42.3	33.7	38.0
F.M. 100	37.8	43.0	44.7	32.7	39.6	38.5	43.7	44.7	34.8	40.4
Ch.M. 50	33.3	38.7	40.6	32.2	36.2	33.9	39.0	40.7	33.4	36.8
Ch.M. 100	35.6	40.6	42.8	32.7	37.9	36.0	41.4	42.9	34.5	38.7
Mean A	34.2	39.3	41.6	32.0		34.9	39.9	41.8	33.7	
L.S.D. 5%	A: 4.4	B: 3.7		AB: 7.4		A: 3.9	B: 2.8			AB: 5.6
	Leaves fresh weight/plant (g)									
Control 0	127	161	190	132	153	131	168	197	140	159
F.M 50	142	198	211	138	172	144	204	216	152	179
F.M. 100	149	212	235	148	186	157	222	236	161	194
Ch.M. 50	135	186	207	142	168	142	199	208	151	175
Ch.M. 100	144	201	223	148	179	151	215	221	160	187
Mean A	139	192	213	142		145	202	216	153	
L.S.D. 5%	A: 12	B: 9		AB: 18		A: 10	B: 9			AB: 18

Ammonium sulphate : Factor A
Organic fertilization : Factor B

Table (3): Effect of ammonium sulphate and organic fertilization on vegetative growth of *Washingtonia filifera* seedlings during 2000 and 2001 seasons.

Org. Fert. g/pot	First season				Mean B	First season				Mean B
	Amm. Sulph. g/ pot					Amm. Sulph. g/ pot				
	0	4	8	12		0	4	8	12	
	Leaves dry weight/plant (g)									
Control 0	26.9	32.3	39.9	27.0	31.5	28.8	33.9	41.5	29.4	33.4
F.M 50	30.2	38.7	46.3	29.0	36.1	33.2	41.4	47.7	32.0	38.6
F.M. 100	31.5	40.8	52.0	31.4	38.9	34.6	44.5	51.9	34.2	41.3
Ch.M. 50	28.7	36.5	45.8	29.9	35.2	31.7	40.6	45.5	31.8	37.4
Ch.M. 100	30.5	39.0	49.5	31.3	37.6	33.2	43.7	48.8	34.1	40.0
Mean A	29.6	37.5	46.7	29.7		32.3	40.8	47.1	32.3	
L.S.D. 5%	A: 3.8	B: 3.1		AB: 6.2		A: 4.5	B: 3.6		AB: 7.2	
	Roots fresh weight/plant (g)									
Control 0	38.0	51.6	58.8	42.0	47.6	40.5	54.6	62.0	45.4	50.6
F.M. 50	46.9	67.4	68.5	48.2	57 8	47.8	69.3	71.3	53.9	60.6
F.M. 100	53.7	76.0	79.9	54.9	66.1	56.8	79.9	80.0	60.4	69.3
Ch.M. 50	43.3	61.4	68.3	48.2	55.3	47.0	65.7	68.7	51.9	58.3
Ch.M. 100	50.6	70.3	75.7	53.2	62.5	53.5	75.3	75.1	58.2	65.5
Mean A	46.5	65.3	70.2	49.3		49.1	69.0	71.4	54.0	
L.S.D. 5%	A: 4.2	B: 4.0		AB: 8.0		A: 4.6	B: 4.4		AB: 8.8	
	Roots dry weight/plant (g)									
Control 0	11.7	15.7	17.7	12.8	14.5	12.2	16.0	17.8	13.6	14.9
F.M 50	14.1	19.6	19.5	14.5	16.9	14.0	19.7	20.0	15.5	17.3
F.M. 100	15.6	21.3	22.0	15.9	18.7	15.9	21.8	21.6	16.9	19.1
Ch.M. 50	13.2	18.0	19.4	14.6	16.3	14.0	18.7	19.2	15.0	16.7
Ch.M. 100	14.9	19.8	20.7	15.5	17.7	15.8	20.7	20.3	16.2	18.3
Mean A	13.9	18.9	19.9	14.7		14.4	19.4	19.8	15.4	
L.S.D. 5%	A: 1.4	B: 1.0		AB: 2.0		A: 2.0	B: 1.3		AB: 2.6	

Ammonium sulphate : Factor A
Organic fertilization : Factor B

Concerning the two organic fertilizers, filter mud and chickenyard manure, they effectively and significantly increased all of the nine vegetative growth characters in the two seasons, in comparison with those of the untreated seedlings. Meanwhile, filter mud (F.M.) was superior to chickenyard (Ch.M.) in this concern. The highest values, in descending order, were obtained from F.M. at 100 g/pot, Ch.M. at 100 g/pot, F.M. at 50 g/pot and then Ch.M. at 50 g/pot as indicated in Table (1, 2 and 3). In accordance with these results are those revealed by Abdou (1987) on *Khaya*,Abd-Elrahim *et al*(1996) on *Leucaena*, Ezz-Eldeen and Abd-Elmoaz (1998) and Ahmed *et al* (1998) on roselle, Ahmed *et al* (2000) on grapevines and Ali *et al.*, (2002) on poplar.

In regard to the interaction between ammonium sulphate and organic fertilizers, it was significant for all vegetative growth characters in both seasons, except number of leaves/plant. The best results were obtained due to supplying the seedlings with ammonium sulphate at 8 g/pot in combination with 100g/pot of filter mud or 100 g/pot chickenyard manure as illustrated in Tables (1, 2 and 3).

Leaves Percentage of Nitrogen, Phosphorus and Potassium:

Table (4) shows that the percentage of each of nitrogen, phosphorus and potassium in the leaves was significantly increased, in the two seasons, due to ammonium sulphate application. Such increase was gradual parallel to the increase in the applied fertilization rate up to 12 g/pot for nitrogen % and up to 8 g/pot for phosphorus and potassium %. For the three nutrients, the highest values were resulted from using the medium fertilization rate (8 g/pot). These results are in agreement with the findings of El-Labban *et al* (1988) on *Swietinia* and *Khaya*, Taha (1994) on *Parkinsonia*, Saleh *et al.*, (1998) on *Ficus benjamina*, El Mahrouk *et al* (1999) on *Jasminum grandiflorum* and Ali *et al.*, (2002) on poplar. Other investigators concluded the role of chemical nitrogen fertilization in increasing leaf % of nitrogen such as Badran and Aly (1988) on *Livistonia chinensis*, Shehata (1995) on *Poinciana*, Badran *et al.*, (2001) on guar, Abdou and El-Sayed (2002) on *Peltophorum* and Abdou and Hassanein (2003) on *Jasminum sambac*.

In relation to organic fertilizers, Table (4) clearly shows that filter mud (F.M.) at 100 g/pot caused significant increase in leaf % of N, P and K in the two seasons, in comparison with the untreated plants. In agreement with these results are those pointed out by Abd-Elrahim *et al* (1996) on *Leucaena*, Ahmed *et al* (2000) on grapevines, Ali *et al* (2001) on *Khaya* and Ali *et al* (2002) on poplar.

The interaction between chemical and organic fertilizers was significant for leaf % of nitrogen and potassium in the two seasons and phosphorus in the first one. The highest values were obtained due to ammonium sulphate at 8 g/pot and F.M. at 100 g/pot for leaf nitrogen %. While the highest ones concerning P and K leaf % were obtained due to ammonium sulphate at 12 g/pot and 100 g/pot of F.M., Table (4).

Table (4): Effect of ammonium sulphate and organic fertilization on leaves % of N, P and K of *Washingtonia filifera* seedlings during 2000 and 2001 seasons.

Org. Fert. g/pot	First season				Mean B	First season				Mean B
	Amm. Sulph. g/ pot					Amm. Sulph. g/ pot				
	0	4	8	12		0	4	8	12	
	Leaves nitrogen %									
Control 0	1.03	1.15	1.21	1.23	1.16	1.02	1.15	1.23	1.28	1.17
F.M 50	1.19	1.32	1.38	1.41	1.33	1.10	1.24	1.37	1.39	1.28
F.M. 100	1.27	1.40	1.45	1.48	1.40	1.14	1.31	1.39	1.42	1.32
Ch. .M. 50	1.16	1.28	1.34	1.39	1.29	1.07	1.21	1.34	1.36	1.25
Ch..M. 100	1.22	1.33	1.39	1.42	1.34	1.09	1.26	1.38	1.40	1.28
Mean A	1.17	1.30	1.35	1.39		1.08	1.23	1.34	1.37	
L.S.D. 5%	A:0.08	B:0.06		AB:0.12		A:0.07	B:0.06		AB:0.12	
	Leaves phosphorus %									
Control 0	0.243	0.271	0.291	0.273	0.270	0.248	0.273	0.281	0.267	0.267
F.M. 50	0.252	0.288	0.313	0.288	0.285	0.269	0.286	0.294	0.275	0.281
F.M. 100	0.271	0.294	0.317	0.296	0.295	0.274	0.291	0.298	0.281	0.286
Ch.M. 50	0.248	0.284	0.310	0.283	0.281	0.262	0.283	0.290	0.271	0.277
Ch.M. 100	0.269	0.291	0.314	0.289	0.291	0.273	0.287	0.292	0.273	0.281
Mean A	0.257	0.286	0.309	0.286		0.265	0.284	0.291	0.273	
L.S.D. 5%	A:0.021	B:0.016		AB:0.032		A:0.018	B:0.012		AB:NS	
	Leaves potassium %									
Control 0	0.88	1.05	1.11	1.10	1.04	0.99	1.18	1.24	1.21	1.16
F.M 50	1.03	1.21	1.27	1.22	1.18	1.04	1.24	1.29	1.24	1.20
F.M. 100	1.07	1.23	1.32	1.24	1.22	1.09	1.28	1.33	1.27	1.24
Ch.M. 50	1.01	1.20	1.26	1.21	1.17	1.01	1.21	1.27	1.23	1.18
Ch.M. 100	1.05	1.21	1.31	1.23	1.20	1.06	1.25	1.30	1.25	1.22
Mean A	1.01	1.18	1.25	1.20		1.04	1.23	1.29	1.24	
L.S.D. 5%	A:0.07	B:0.05		AB:0.10		A:0.06	B:0.04		AB:0.08	

Ammonium sulphate : Factor A
Organic fertilization : Factor B

Leaves Contents of Chlorophyll a and b and Carotenoids:

It is clear from Table (5) that the three photosynthetic pigments were gradually increased by the gradual increase in ammonium sulphate rate up to 8 g/pot, then decreased by further increase in the fertilizer rate. The differences between control plants and the 8 g/pot-fertilized plants, for the three pigments in the two seasons were statistically significant as shown in Table (5). In agreement with these results are those stated by Taha (1994), Shehata (1995), Saleh *et al* (1998), El-Mahrouk *et al* (1999), Badran *et al* (2001) and Abdou and Hassanein (2003) on *Parkinsonia*, *Poinciana*, *Ficus benjamina*, *Jasminum gradiflorum*, guar and *Jasminum sambac*, respectively.

Similarly, the two examined organic fertilizers, F.M. and Ch.M. significantly promoted the three photosynthetic pigments in the two seasons, in comparison with those of untreated plants as indicated in Table (5). The highest values were obtained due to the use of F.M. at 100 g/pot, followed by Ch.M. at 100 g/pot. In accordance with these results are those declared by Abdou (1987) on *Khaya senegalensis* and Ahmed (2001) on roselle plants.

The interactions were significant, in both seasons, for chlorophyll b and carotenoids with the best results being obtained due to ammonium

sulphate at 8 g/pot in combination with F.M. at 100 g/pot as shown in Table (5).

The noticeable increase in different vegetative growth parameters of *Washingtonia filifera* seedlings, including plant height, leaves number/plant, petiole length, longitudinal and across length of leaf blade and fresh and dry weights of leaves and roots due to the application of nitrogen fertilization rates might be explained in the light of the unique physiological roles of nitrogen element. It is well-known to be essential for plant growth as a constituent of the protoplasm. So, more available nitrogen supply would allow the meristematic system to be more active and would, consequently, stimulates and enhances various vegetative growth aspects. Devlin (1975) mentioned that if a plant is supplied with adequate quantities of nitrogen, there is a tendency to increase cell number and cell size with an overall increase in leaf, stem and roots growth. The increase in the leaf contents of N, P, K as well as, the three photosynthetic pigments might be understood in the light of the vital physiological roles of such macronutrient in plant growth and development. Increasing nitrogen supply results in promoting leaf area, thereby the plant is more capable of carrying out photosynthesis and increasing photosynthetic pigments in the leaves. Also, increasing vegetative growth and expanding and extending root system by the supplement of nitrogen fertilizer encourages the absorption of different nutrients, including N, P and K by roots and translocating them to the leaves.

Table (5): Effect of ammonium sulphate and organic fertilization on leaves % of N, P and K of *Washingtonia filifera* seedlings during 2000 and 2001 seasons.

Org. Fert. g/pot	First season				Mean B	First season				Mean B
	Amm. Sulph. g/ pot					Amm. Sulph. g/ pot				
	0	4	8	12		0	4	8	12	
	Chlorophyll a content mg/g F.W.									
Control 0	2.26	2.38	2.49	2.36	2.37	2.32	2.45	2.57	2.42	2.44
F.M 50	2.44	2.60	2.70	2.58	2.58	2.49	2.58	2.70	2.57	2.59
F.M. 100	2.49	2.64	2.74	2.61	2.62	2.53	2.66	2.74	2.61	2.64
Ch.M. 50	2.42	2.56	2.63	2.54	2.54	2.44	2.59	2.68	2.54	2.56
Ch.M. 100	2.46	2.61	2.68	2.56	2.58	2.48	2.62	2.73	2.63	2.62
Mean A	2.41	2.56	2.65	2.53		2.45	2.58	2.68	2.55	
L.S.D. 5%	A: 0.18	B: 0.16	AB: N.S.			A: 0.15	B: 0.11	AB: N.S.		
	Chlorophyll b content mg/g F.W.									
Control 0	0.722	0.773	0.819	0.794	0.777	0.804	0.853	0.891	0.872	0.855
F.M. 50	0.835	0.860	0.888	0.855	0.860	0.851	0.907	0.956	0.924	0.910
F.M. 100	0.853	0.885	0.927	0.878	0.886	0.886	0.934	0.988	0.960	0.942
Ch.M. 50	0.794	0.842	0.876	0.831	0.836	0.838	0.869	0.930	0.907	0.886
Ch.M. 100	0.820	0.857	0.911	0.862	0.863	0.864	0.882	0.962	0.942	0.913
Mean A	0.805	0.843	0.884	0.844		0.849	0.889	0.945	0.921	
L.S.D. 5%	A: 0.042	B: 0.033	AB: 0.066			A: 0.057	B: 0.050	AB: 0.100		
	Carotenoids content mg/g F.W.									
Control 0	1.15	1.28	1.33	1.24	1.25	1.36	1.49	1.55	1.46	1.47
F.M 50	1.26	1.39	1.49	1.37	1.38	1.49	1.64	1.70	1.49	1.58
F.M. 100	1.29	1.42	1.53	1.41	1.41	1.52	1.69	1.76	1.53	1.63
Ch.M. 50	1.20	1.36	1.54	1.35	1.34	1.45	1.60	1.68	1.48	1.55
Ch.M. 100	1.24	1.38	1.50	1.38	1.39	1.50	1.61	1.73	1.52	1.59
Mean A	1.23	1.37	1.47	1.35		1.46	1.61	1.68	1.50	
L.S.D. 5%	A: 1.10	B: 0.08	AB: 0.16			A: 0.12	B: 0.09	AB: 0.18		

Ammonium sulphate : Factor A
Organic fertilization : Factor B

Organic manuring has a wide range in utilization as fertilizers to different plants. It showed beneficial effects on plant growth and exerted significant influence on physical, chemical and biological properties of soil. Moreover, organic manures have been reported to enhance the efficiency and reduce the requirements of chemical fertilizers. Several beneficial effects of filter mud (F.M.) were reported by many authors such as a source of nutrients and microbial activity, increased the availability of these elements in the soil, thereby enhancing plant growth (Golden, 1975), containing organic matter and much of nutrients and could be used as a fertilizer (Patura, 1989) and successfully improving physical properties of both clay and sandy soils (Saleh, 1996). Concerning chickenyard manure (Ch.M.), Mahmoud (1988) reported that it increased total nitrogen, organic matter and humans in soil, contained the principle nutrient elements needed for plant growth and has a great water holding capacity. Pritam *et al* (1994) attributed its favorable effect on growth to the synthesis of certain growth stimulating substances, improving the root CEC, microbial population and physical properties of soil. The role of both organic fertilizers as sources of nutrients and microbial activities have, probably, increased the availability of these elements in the soil, and this in turn, enhanced the uptake of N, P and K which were well correlated with improving growth of the studied plants and, consequently, nutritional status. In regard to the photosynthetic pigments, Genchev *et al* (1979) stated that high N content promoted chlorophylls a and b and carotenoids accumulation.

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دراسات فسيولوجيه على نباتات البرتشارديا
٢- تأثير التسميد الكيماوى والتسميد العضوى على النمو الخضرى والتركيب الكيماوى للشتلات النامية فى تربة رملية

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تهدف هذه التجربة إلى دراسة تأثير سماد سلفات النشادر ومصدرين من الأسمدة العضوية (طين المرشحات وزرق الدواجن) على النمو والتركيب الكيماوى لشتلات البرتشارديا النامية فى تربة رملية بالمزرعة التجريبية بكلية الزراعة جامعة المنيا خلال موسمى ٢٠٠٠،٢٠٠١

حدث تحسن معنوى فى الصفات الخضرية (طول النبات – طول عنق الورقة – القطر الطولى والعرضى لنصل الورقة – والوزن الطازج والجاف للأوراق والجذور وكذلك التركيب الكيماوى متضمنا نسبة النيتروجين والفوسفور والبوتاسيوم فى الأوراق ومحتواها من صبغات التمثيل الضوئى نتيجة لاستعمال سلفات النشادر ولقد أدى استعمال المعدل المتوسط (٨ جرام للاصيص) إلى الحصول على احسن النتائج . ومن ناحية أخرى فلقد أدى استعمال أى من طين المرشحات أو زرق الدواجن بالمعدل العالى (١٠٠جرام للاصيص) إلى الحصول على أحسن النتائج من ناحية النمو الخضرى والمكونات الكيماوية وفيما يخص التفاعل بين السماد الكيماوى والأسمدة العضوية فلقد كان فى الغالب معنويا وكانت احسن النتائج هى الناتجة عن استعمال سلفات النشادر بمعدل ٨جرام للاصيص مع أى من طين المرشحات أو زرق الدواجن بمعدل ١٠٠جرام للاصيص .