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EFFECT OF GROWING MEDIA AND CHEMICAL FERTILIZATION ON GROWTH AND CHEMICAL COMPOSITION OF *Khaya senegalensis* (DESR.) AFRICAN MAHOGANY

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ABSTRACT

This investigation was carried out at the Ornamental Horticulture Department, Faculty of Agriculture, Cairo University, Egypt during two successive seasons; 2007 and 2008, aiming to study the effect of different growing media (clay, sand, and clay + sand 1:1 by volume) and NPK (4:4:1) fertilization at different rates (0, 2, 4 and 6 g/pot) on the growth and chemical composition of *Khaya senegalensis* seedlings.

The results showed that growing the plants in clay medium gave the highest values of plant height, stem diameter, number of leaflets/plant, chlorophyll (a and b) contents and total carbohydrates in the root, in both seasons. Whereas sand medium gave the highest value of carotenoids in the first season, but in the second season clay medium gave the highest value of carotenoids. While the clay + sand medium gave the highest values of total carbohydrates in the leaves and the stems.

NPK at 6 g/plant increased plant height, stem diameter, number of leaflets/plant and chlorophyll (a and b) contents. Whereas NPK at 4 g/plant increased total carbohydrates content in the leaves and the application of NPK at 2 g/plant increased total carbohydrates content in the stems and the roots in both seasons. All NPK fertilization treatments gradually decreased carotenoids content as compared with the control plants in the first season, but all NPK fertilization treatments significantly increased carotenoids contents compared with the control plants in the second season.

Using clay combined with NPK at 6 g/plant gave the highest values of most characters. The highest value of carotenoids content was obtained from 2 g NPK/plant combined with sand soil in the first season, but in the second season the highest value of carotenoids content. While using clay + sand or clay medium fertilized with NPK at 4 g/plant gave the highest values of total carbohydrates in the leaves. Plants grown in clay + sand medium and treated with 2 g NPK/plant gave the highest values of total carbohydrates in the stems, in both seasons. Whereas using clay soil treated with NPK at 2 g/plant gave the highest values of total carbohydrates in the roots in the first and second seasons.

***Key words**: African mahogany, Khaya senegalensis, meliaceae, NPK fertilization, soil media.*

1. INTRODUCTION

African mahogany (*Khaya senegalensis* Desr.) Fam. Meliaceae is a tree. The natural distribution area of Khaya tree is from Senegal to Sudan and Uganda. *Khaya* tree can reach (15m to 24m) in height with a stem diameter of about (1.0 m.), it is semi-deciduous. Leaves are compound (18-30 cm.) long. Flowers are white, the fruit is capsule with 4 valves. *K. senegalensis* wood used for many purposes, as furniture, cabinet's veneers interiors, turning and interior accent. *Khaya* is an important timber tree for industry, in addition to its medicinal values, especially the bark, which is used to treat a number of diseases, such as fever, lumbago, cough, rheumatism and stomach ache and also gastiric pains (Kerharo and Bouquet, 1950). The bark is also used in the treatment of worm infestation, ulcer and mucous diarrhea in horses and camels (Dalziel, 1948).

Therefore, growing media is one of the most important factors affecting plant growth and chemical composition. Several investigators revealed that the growing media had a marked effect on vegetative growth and chemical composition; El-Sallami (2003) on *Leucaena leucocephala*; Kathiravan *et al.* (2008) on *Jatropha curcas*; El- Mahrouk et al., (2009) on Cestrum aurantiacum and Azza *et al.* (2010) on *Jatropha curcas* L.

Chemical fertilization, especially NPK

promotes the vegetative growth of tree seedlings. Nitrogen is the most effective element, since it is an essential constituent of proteins, amino acids, alkaloids, some vitamins and co-enzymes. Thus, it plays very important role in metabolism, growth reproduction. Phosphorus is closely concerned with the vital growth processes in plants and as it is present in all cell nuclei as phosphoric acid combined with other constituents to form nucleic acids. It is also of great importance in root growth. Potassium plays an important role in metabolism such as the formation of carbohydrates and proteins, the regulation of water conditions within the plant cell and water loss by transpiration and the photosynthesis process (Jain, 1983).

Also, NPK fertilization affects plant growth and chemical composition; Fan *et al.* (2000) on *Spathiphyllum palls*; Jiang *et al.* (2000) on *Phyllostachys iridensce*; Kandeel *et al.* (2002) on *Taxodium distichum* and El-Mahrouk *et al.* (2009) on *Cestrum aurantiacum*;

The aim of this investigation was to find out the best growing media (clay, sand, and mixture of them 1:1 by volume) and NPK fertilizer application for the growth and chemical composition of *Khaya senegalensis* plant.

2. MATERIALS AND METHODS

This investigation was carried out at the Ornamental Horticulture Department, Faculty of Agriculture, Cairo University, Egypt during two successive seasons of 2007 and 2008.The aim was to investigate the effect of growing media and NPK (4:4:1) fertilization on the growth and chemical composition of *Khaya senegalensis* seedlings.

Homogenous seedlings of African mahogany *Khaya senegalensis* (one-year-old, 20-25 cm height, and 4-6 compound leaf/plant in average) were used as a plant material. The seedlings were introduced from the Forestry Department, Agricultural Research Center, Giza, Egypt.

The seedlings were planted in April 15th 2007 and 2008 for the first and second seasons, respectively. They were planted in 30 cm plastic pots (one seedling/pot) filled with one of the different growing media used, *i.e.,* clay, sand, and the mixture of them 1:1 (V/V).

The plants received the first application of fertilizer after two months from transplanting .The *Khaya senegalensis* plants were fertilized with different rates (0, 2, 4 and 6 g/pot) of a mixture containing (ammonium nitrate N 33.0% + calcium superphosphate P_2O_5 15.5% + potassium sulphate K_2O 48.0%) at the ratio of (4: 4: 1). Plants were fertilized 6 times during the growing season starting from June 15th till November 15th at 30 day- intervals. The fertilizers were applied as top dressing to the pots then irrigation water was added.

The layout of the experiment was a completely randomized in factorial design as including 12 treatments with 9 replicates. Growing media represented as main plot, while chemical fertilization treatments represented as sub plot. Each replicate contained one plant.

The following data were recorded at the end of the experiment: plant height (cm), stem diameter (cm), number of leaflets, pigments (chlorophyll a, chlorophyll b and carotenoids) content in the leaves (mg/g F.W.) and total carbohydrates content in the leaves, the stems and the roots (% D.W.) were determined.

Chlorophyll a, b and total carotenoid contents were determined in leaf samples (mg/gm F.W.) according to Nornai (1982). Total carbohydrates content was determined according to Dubois *et al*. (1956).

Data recorded on vegetative growth, were statistically analyzed, and separation of means was performed using the Least Significant Difference (L.S.D.) test at the 5% level, as described by (Snedecor and Cochran, 1980).

3. RESULTS AND DISCUSSION

3.1.Effect of growing media and NPK fertilization on the vegetative growth of *Khaya senegalensis*

3.1.1. Plant height

The results in Table (1) indicate that using various growing media had significant effect between three growing media on the plant height. Plants grown in clay soil resulted in the best results (83.46 and 85.38 cm) in the first and second seasons, respectively as compared with sand soil or clay + sand soil. Similar results were obtained by Darwish (1994) on *Casuarina glauca* and *Populus nigra*, Kathiravan *et al.* (2008) on *Jatropha curcas* and Azza *et al.* (2010) on *Jatropha curcas* L.

High rate of NPK fertilizer (6 g/ plant) stimulated plant height (71.61 and 89.06 cm) compared with the control and other treatments of fertilizers (2 or 4 g/plant) in the first and second seasons, respectively. These results are in agreement with those obtained by El-Mahrouk *et al.* (2009) on *Cestrum aurantiacum*,

Interaction between growing media and chemical fertilization had a significant effect on plant height. Clay soil supplemented with 6

g/plant of NPK gave the highest increment (94.83 and 99.67 cm) in the first and second seasons, respectively. While the untreated plants grown in sandy soil were the shortest as with values (32.17 and 39.33 cm) in the first and second seasons, respectively. The results go in line with those obtained by El-Mahrouk *et al.* (2009) on *Cestrum aurantiacum.*

3.1.2. Stem diameter

The data in Table (1) pointed out that clay soil as a growing medium gave the best results of stem diameter followed by clay + sand and sand media in the first and second seasons. These results were confirmed with those obtained by Abdullah and Ali (1985) on *Pinus brutia*, Darwish (1994) on *Casuarina glauca* and *Populus nigra*, El-Mahrouk *et al.* (2009) on *Cestrum aurantiacum* and Azza *et al.* (2010) on *Jatropha curcas*.

Fertilization with NPK at 6g/plant produced the highest values (1.28 and 1.48 cm) of stem diameter in both seasons, respectively. While gradual decreasing of NPK fertilization to 4, 2 or 0 g/plant decreased stem diameter to the lowest values, in the first and second seasons. Similar results were obtained by Kandeel *et al.* (2002) on *Taxodium distichum* and El-Mahrouk *et al.* (2009) on *Cestrum aurantiacum.*

Interaction between growing media and chemical fertilization had a non significant effect on stem diameter in the first season and a significant effect in the second season. The highest values (1.42 and 1.85 cm) were obtained from the plants growing in clay + 6g NPK/plant in the first and second seasons, respectively as compared with other treatments whereas the least values were obtained from the plant growing in sand soil without fertilization. The results go in line with those obtained by El-Mahrouk *et al.* (2009) on *Cestrum aurantiacum.*

Table (1): Effect of growing media and NPK fertilization on plant height (cm), stem diameter (cm) and number of leaflets of *Khaya senegalensis* Desr. during the two seasons 2007 and 2008.

Fertilization (B)	Soil media (A)							
	Sand	Clay	Sand+ Clay	Mean	Sand	Clay	Sand+ Clay	Mean
	2007				2008			
Plant height (cm)								
Control	32.17	73.93	53.83	53.39	39.33	67.83	61.50	56.22
2gm NPK	41.33	79.83	61.17	60.78	56.83	80.17	74.83	70.61
4gm NPK	45.17	85.00	60.00	63.72	62.17	93.83	85.67	80.56
6gm NPK	50.17	94.83	64.17	71.61	72.50	99.67	95.00	89.06
Mean	42.71	83.46	61.83		57.71	85.38	79.25	
LSD at 0.05 for:								
A			1.36				1.04	
B			1.57				1.20	
AB			2.72				2.08	
Stem diameter (cm)								
Control	0.73	1.15	1.05	0.98	0.76	1.10	0.94	0.93
2gm NPK	0.88	1.25	1.13	1.09	0.85	1.26	1.22	1.11
4gm NPK	1.00	1.36	1.18	1.18	0.93	1.53	1.42	1.29
6gm NPK	1.10	1.42	1.27	1.28	1.01	1.85	1.57	1.48
Mean	0.93	1.31	1.16		0.89	1.43	1.29	
LSD at 0.05 for:								
A			0.20				0.29	
B			0.24				0.34	
AB			N.S.				0.59	
Number of leaflets/plant								
Control	21.33	108.00	67.00	65.44	41.67	114.67	97.33	84.56
2gm NPK	49.33	156.00	99.33	101.55	91.00	126.67	169.00	128.89
4gm NPK	85.33	196.67	73.33	118.44	103.00	146.67	145.33	131.67
6gm NPK	71.67	246.33	72.00	130.00	73.33	179.33	144.67	132.44
Mean	56.92	176.75	77.92		77.25	141.84	139.08	
LSD at 0.05 for:								
A			7.11				6.93	
B			8.21				8.01	
AB			14.23				13.87	

3.1.3. Number of leaflets/plant

Concerning the effect of different growing media, it is evident from Table (1) that clay soil significantly increased the number of leaflets formed per plant (176.75 and 141.84) in the first and second seasons , respectively compared with sand or clay + sand soil, which gave the lowest values. These results are in agreement with those obtained by Darwish (1994) on *Populus nigra*, and Kathiravan *et al.* (2008) on *Jatropha curcas.*

Fertilization with various rates of NPK had a significant effect on the number of leaflets/plant compared with the control. The highest values (130.00 and 132.44) were obtained when 6 g NPK/plant was used in the first and second seasons, respectively as compared with the control, which gave the lowest values. These results are in harmony with those obtained by Kandeel *et al.* (2002) on *Taxodium distichum.*

Interaction between growing media and chemical fertilization had a significant effect on the number of leaflets/plant in both seasons. The highest values (246.33 and 179.33) were obtained from the plants growing in clay soil supplemented with 6 g NPK/plant in the first and second seasons, respectively. Whereas the lowest values were obtained from the plants growing in sandy soil without fertilization. The promoting effect of clay soil on vegetative growth may due to its effect as a result of absorption more N, P and K as well as to enhance the vegetative growth; El-Sallami and Makary (2001) on *Thuja orientalis*.

3.2. Effect of growing media and NPK fertilization on chemical compositions of *Khaya senegalensis*

3.2.1. Pigments content in the leaves.

As shown in Table (2) plants grown in clay soil gave the highest chlorophyll a and chlorophyll b contents in the leaves followed by (sand + clay) and sand media in the first and second seasons, respectively. These results are in harmony with those obtained by El-Sallami and Makary (2001) on *Thuja orientalis*, El-Sallami (2003) on *Leucaena leucocephala*, El-Mahrouk *et al.* (2009) on *Cestrum aurantiacum* and Azza *et al.* (2010) on *Jatropha curcas*. On the other hand, plants grown in sandy soil gave the best results of carotenoids content (0.35) compared with (sand + clay) or clay soil in the first season. Whereas in the second season, plants grown in clay soil gave the highest value of carotenoids content (0.43) compared with (sand + clay) or sandy soil. Similar results were obtained by Mohamed (1993) on *Adhatoda vasica, Nerium oleander*, El-Sallami (2003) on *Leucaena leucocephala* and Azza *et al.* (2010) on *Jatropha curcas*.

Chemical fertilization treatments significantly increased chlorophyll (a and b) contents compared with the control in the first and second seasons. The best results were obtained from 6 g NPK/plant in the first and second seasons. These results are in agreement with those obtained by Collared *et al.* (1977) on *Ficus benjamina* and El-Khateeb (1983) on *Eucalyptus torquata* and *Eucalyptus angulosa*. On the other hand, all NPK fertilization treatments gradually decreased carotenoid contents compared with the control in the first season. While all fertilization treatments significantly increased carotenoids compared with the control in the second season. The best value (0.31) was produced from the control plants and the lowest value (0.23) was obtained from 6 g NPK/plant in the first season. Similar results were obtained by El-Khateeb (1983) on *Eucalyptus torquata* and *Eucalyptus angulosa*,. While in the second season the best value (0.47) was obtained from 6 g NPK/plant and the lowest value was produced from the control plants. Similar results were obtained by Mansour (1985) on *Chamaedorea* spp. and Farahat (1986) on *Eucalyptus camaldulensis*.

Interaction between growing media and chemical fertilization had a significant effect on chlorophyll (a) and carotenoid contents in the first season. While it had no significant effect in the second season on chlorophyll (a , b) and carotenoid content. Plants grown in clay soil and fertilized with 6 g NPK/plant gave the highest chlorophyll (a , b) contents in the first and second seasons. The lowest values were obtained from the plants growing in sandy soil and untreated (control) in both seasons. On the other hand, the highest value of carotenoids (0.44) was obtained from 2 g NPK/plant combined with sandy soil in the first season. Whereas in the second season, the highest value (0.52) was obtained from plants fertilized by 6 g NPK/plant combined with clay soil. While, the lowest values (0.24 and 0.19) were obtained from plants growing in sandy soil and untreated (control) in the first and second season, respectively.

3.2.2. Total carbohydrate contents in the leaves

The results presented in Table (3) showed that using various growing media had significant effect on the total carbohydrates in the leaves. Plants grown in (clay + sand) media gave the highest total carbohydrates in the leaves, when compared with clay and sand media in the first and second seasons. These results are in agreement with those obtained by El-Sallami (1996) on *Ficus benjamina*

and El-Mahrouk *et al.* (2009) on *Cestrum aurantiacum.*

All chemical fertilization treatments increased total carbohydrates in the leaves as compared with the control plants except NPK at 6 g/plant, which decreased it, in the first season. Whereas in the second season, all the treatments increased the total carbohydrates in the leaves compared with the control plants. The best results (30.78 and 22.00 %) in the first and second seasons, respectively were obtained from plants treated with NPK at 4 g/plant. Similar results were obtained by El-Khateeb (1983) on *Eucalyptus torquata* and *E. angulosa*, Mansour (1985) on *Chamadorea elegans*, and El-Khateeb and Salem (1988) on *Thuja oriantalis*.

The interaction between soil media and chemical fertilization had a non significant effect on total carbohydrates in the leaves, in the first season and it had a significant effect in the second season. Plants grown in clay and sand media and treated with NPK 4 g/plant gave the highest total carbohydrates in the leaves (35.65%), in the first season. While in the second season, the plants grown in clay soil and treated with NPK at 4 g/plant gave the highest total carbohydrate content in the leaves (25.53%) followed by plants grown in clay and sand soil and treated with NPK at 4 g/plant (25.45%).Whereas the lowest result was

Table (2): Effect of growing media and NPK fertilization on chlorophyll a (mg/g. F.W.) and chlorophyll b (mg/g. F.W.) and carotenoids (mg/g. F.W.)of *Khaya senegalensis* **Desr. during the two seasons 2007 and 2008.**

Fertilization (B)	**Soil media (A)**							
	Sand	**Clay**	**Sand+ Clay**	**Mean**	**Sand**	**Clay**	**Sand +Clay**	**Mean**
	2007				**2008**			
Chlorophyll a (mg/g. F.W.)								
Control	0.33	0.75	0.69	0.59	0.30	0.85	0.69	0.61
2gm NPK	0.64	0.86	0.72	0.74	0.79	1.04	0.88	0.90
4gm NPK	0.87	0.90	0.79	0.85	0.94	1.17	1.05	1.05
6gm NPK	0.98	1.03	0.84	0.95	0.97	1.35	1.13	1.15
Mean	0.71	0.89	0.76		0.75	1.10	0.94	
LSD at 0.05 for:								
A			0.30				0.31	
B			0.35				0.36	
AB			0.61				N.S.	
Chlorophyll b (mg/g. F.W.)								
Control	0.12	0.28	0.23	0.21	0.23	0.49	0.40	0.37
2gm NPK	0.29	0.48	0.45	0.41	0.38	0.61	0.47	0.49
4gm NPK	0.32	0.49	0.48	0.43	0.53	0.67	0.55	0.58
6gm NPK	0.38	0.54	0.53	0.48	0.60	0.82	0.72	0.71
Mean	0.28	0.45	0.42		0.44	0.65	0.54	
LSD at 0.05 for:								
A			0.13				0.25	
B			0.15				0.29	
AB			N.S.				N.S.	
Carotenoids (mg/g. F.W.)								
Control	0.24	0.33	0.36	0.31	0.19	0.34	0.27	0.27
2gm NPK	0.44	0.25	0.20	0.30	0.40	0.41	0.31	0.37
4gm NPK	0.38	0.25	0.19	0.27	0.41	0.45	0.37	0.41
6gm NPK	0.33	0.19	0.17	0.23	0.42	0.52	0.47	0.47
Mean	0.35	0.26	0.23		0.36	0.43	0.36	
LSD at 0.05 for:								
A			0.10				0.13	
B			0.11				0.15	
AB			0.20				N.S.	

obtained from plants growing in sand soil and fertilized with NPK at 6 g/plant (15.91%) in the first. While the lowest result in the second season was obtained from the plants grown in sand soil and unfertilized (the control) which gave (17.76%).

3.2.3. Total carbohydrates content in the stems

As shown in Table (3) plants grown in clay + sandy soil gave the highest total carbohydrate content in the stems as compared with the plants grown in clay or sandy soil in both seasons. These results are in harmony with those obtained by Farahat (1986) on *Eucalyptus camaldulensis*, El-Sallami (1996) on *Ficus benjamina* and El-Mahrouk *et al.* (2009) on *Cestrum aurantiacum.*

All chemical fertilizations increased the total carbohydrate content in the stems compared with the control plants in the first and the second seasons. The best results were obtained from plants treated with NPK at 2 g/plant followed by 4 g NPK /plant and 6 g NPK /plant in the first and second seasons. These results are in agreement with those obtained by Mansour (1985) on *Chamadorea elegans* and El-Khateeb and Salem (1988) on *Thuja oriantalis.*

The interaction between growing media and chemical fertilization had a significant effect on the total carbohydrates content in the stems in the first and second seasons. The best results were obtained from plants grown in clay + sand soil and treated with NPK at 2 g/plant, in both seasons. Whereas the lowest values were obtained from plants growing in sand soil and untreated with fertilizer (control) followed by plants grown in sand soil and treated with NPK at 6 g/plant, in the first season. In the second season; plants grown in

Table (3): Effect of growing media and NPK fertilization on total carbohydrates content in the leaves, the stems and the roots (%)of *Khaya senegalensis* Desr. during the two seasons 2007 and 2008.

Fertilization (B)	Soil media (A)							
	Sand	Clay	Sand+ Clay	Mean	Sand	Clay	Sand +Clay	Mean
	2007				2008			
Total carbohydrates content in the leaves (%)								
Control	19.90	26.77	29.39	25.35	17.76	18.86	19.22	18.61
2gm NPK	22.76	27.83	30.11	26.90	18.34	19.52	21.32	19.73
4gm NPK	25.41	31.29	35.65	30.78	20.03	25.53	25.45	22.00
6gm NPK	15.91	20.31	25.48	20.57	19.70	17.79	20.86	19.45
Mean	21.00	26.55	30.16		18.96	19.17	21.71	
LSD at 0.05 for:								
A	1.58				1.02			
B	1.82				1.18			
AB	N.S.				2.05			
Total carbohydrates content in the stems (%)								
Control	51.03	52.25	54.25	52.51	15.60	17.13	17.68	16.80
2gm NPK	54.01	63.06	63.36	60.14	23.82	29.74	30.31	27.96
4gm NPK	52.92	55.82	55.18	54.64	19.05	25.14	27.80	24.00
6gm NPK	52.21	52.82	53.25	52.76	14.19	21.81	24.26	20.09
Mean	52.54	55.99	56.51		18.17	23.46	25.01	
LSD at 0.05 for:								
A	2.07				1.40			
B	2.38				1.62			
AB	4.13				2.80			
Total carbohydrates content in the roots (%)								
Control	39.66	37.24	32.07	36.32	27.46	18.39	16.68	20.84
2gm NPK	53.34	64.16	45.91	54.47	32.45	35.98	35.60	34.68
4gm NPK	41.81	51.47	39.33	44.20	22.38	25.27	23.17	23.61
6gm NPK	32.99	41.33	31.16	35.16	19.22	23.47	19.83	20.84
Mean	41.95	48.55	37.12		25.38	25.78	19.83	
LSD at 0.05 for:								
A	1.25				N.S.			
B	1.44				3.14			
AB	2.50				5.45			

sand soil combined with NPK at 6 g/plant followed by plants growing in sand soil and untreated with fertilizer (control) gave the lowest value.

3.2.4. Total carbohydrates contents in the roots

The data in Table (3) showed that clay media gave the highest total carbohydrates content in the roots as compared with sand soil and clay + sand medium, in the first seasons. Whereas in the second season, growing media had no significant effect on total carbohydrates content in the roots. These results are in agreement with those obtained by El-Sallami (1996) on *Ficus benjamina* and El-Mahrouk *et al.* (2009) on *Cestrum aurantiacum.*

Chemical fertilization treatments significantly increased total carbohydrate contents in the roots compared with the control plants except NPK at 6 g/plant, in the first and second seasons. The best results were obtained from plants fertilized by 2 g NPK/plant in the first and second seasons. While the lowest value was obtained from plants fertilized with 6 g NPK/plant and the control in the first and second seasons. These results are in harmony with those obtained by Mansour (1985) on *Chamadorea elegance*; l-Khateeb and Salem (1988) on *Thuja oriantalis* and Jiang *et al.* (2000) on *Phyllostachys iridenscens.*

The interaction between growing media and chemical fertilization had a significant effect on total carbohydrate contents in the roots. The highest values were obtained from the plants growing in clay soil and treated with NPK (2 g/plant) in both seasons. Whereas the lowest values were obtained from plants growing in clay + sandy soil and treated with 6 g NPK/plant followed by plants growing in clay + sandy soil and untreated (control), in the first season, while in the second season, plants growing in clay + sandy soil and untreated with fertilizer (control) followed by plants growing in sand soil and treated with NPK at 6 g/plant. These results are in harmony with those obtained by El- Tantawy (1981) on *Casuarina equisetifolia*.

The results of this experiment can be discussed as follows:

Clay medium improved the vegetative growth of *Khaya senegalensis* seedlings, compared with the mixture of clay and sand (1:1) or sand soil. These results may be due to the physical and chemical characteristics of the growing media used in this experiment, clay contained higher NPK, it has a higher field capacity (EC = 40%), and its electric conductivity (EC) did not exceed 0.71mmhos/cm. The morphological results were confirmed by the parameters of chemical compositions, since clay medium increased chlorophyll (a and b) in the branchlets; also this growing medium decreased carotenoids content, whereas sugars content may be affected by moisture content of the plant tissue more than by the growing medium itself.

Khaya senegalensis responded to NPK fertilization at the ratio of (4:4:1), the vegetative growth was correlated with raising NPK rates from 2 g/plant to 4 g/plant, and the most vigorous growth was obtained with 6 g/plant. This ratio of (4:4:1) with the optimum rate 6 g/plant might render the balance between N, P and K that enhanced growth (Devlin, 1975), as under this balance the availability of minerals (NPK) might be higher to be absorbed by roots of the plants.

These results can be interpreted according to the role of individual element N, P and K. Nitrogen is the most effective element, since it is an essential constituent of proteins, nucleic acids, prophyrins, alkaloids, some vitamins and co-enzymes. Thus, it plays a very important role in metabolism, growth, reproduction and heredity. Phosphorus promotes root growth, and Potassium plays an important role in metabolism such as photosynthesis and chlorophyll synthesis (Jain, 1983)

In conclusion , clay soil significantly gave the highest values of the most vegetative characters and chemical constituents of *Khaya senegalensis* seedlings, compared with the mixture of clay and sand (1:1) or sand soil in both seasons.

Fertilization with NPK at 6 g/ plant produced the highest values of plant height, stem diameter, number of leaflets/plant and chlorophyll (a and b).

Using clay soil treated with NPK at 6 g/plant gave the best results of most characters.

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تأثير أوساط الزراعة والتسميد الكيماوي على النمو والتركيب الكيماوي
لنبات الكايا سينجالينسيس *Khaya senegalensis* **الماهوجانى الأفريقى**

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ملخص

أجريت هذه الدراسة في قسم بساتين الزينة بكلية الزراعة – جامعة القاهرة خلال موسمي الزراعة ٢٠٠٧، ٢٠٠٨ لدراسة تأثير أوساط الزراعة المختلفة (طمي، رمل، طمي + رمل بنسبة ١:١) والتسميد الكيماوي (نيتروجين، فوسفات، بوتاسيوم) بنسبة (١:٤:٤) بمعدلات مختلفة (0،2،4،6 جم/إصيص) على النمو والتركيب الكيماوي لشتلات الكايا.

أظهرت النتائج أن النباتات النامية في وسط الطمي أعطت أعلى القيم من حيث إرتفاع النبات وقطر الساق وعدد الوريقات/نبات و محتوى كللوروفيل (أ، ب) ومحتوى الكربوهيدرات الكلية في الجذور في كلا الموسمين، وقد أظهرت النباتات النامية في الرمل أفضل النتائج من حيث محتوى الكاروتينيدات وذلك في الموسم الأول فقط أما بالنسبة للموسم الثاني فقد حققت التربة الطمييية أفضل النتائج لمحتوى الكاروتينيدات، بينما أعطت النباتات النامية في وسط الطمي+ الرمل أعلى القيم لمحتوى الكربوهيدرات الكلية في الأوراق والسيقان.

تشير النتائج الى أن المعاملة بالسماد الكيماوي (نيتروجين-فوسفات-بوتاسيوم) بمعدل ٦ جم/نبات أدت إلى حدوث زيادة في كل من ارتفاع النبات وقطر الساق وعدد الوريقات/نبات ومحتوى الكللوروفيل (أ،ب) بينما أدت المعاملة السمادية بمعدل ٤ جم (نيتروجين-فوسفات-بوتاسيوم)/نبات إلى زيادة محتوى الكربوهيدرات الكلية في الأوراق، كما أدت المعاملة السمادية بمعدل ٢ جم (نيتروجين- فوسفات- بوتاسيوم) /نبات إلى زيادة محتوى الكربوهيدرات الكلية في السيقان والجذور في كلا الموسمين. وأوضحت النتائج أن كل المعاملات السمادية في الموسم الأول أدت إلى خفض محتوى الكاروتينيدات تدريجيا مقارنة بالكنترول بينما أظهرت كل المعاملات السمادية في الموسم الثاني زيادة معنوية مقارنة بالكنترول.

وقد حقق استخدام الطمي كوسط زراعي للنباتات بالإضافة إلى معاملة النباتات ب ٦ جم سماد كيماوي/نبات أعلى القيم لمعظم الصفات الخضرية. أما بالنسبة لمحتوى الكاروتينيدات فقد ظهرت أعلى القيم عند استخدام التربة الرملية بالإضافة إلى معاملة النباتات ب ٢ جم سماد كيماوي/نبات وذلك في الموسم الأول بينما حقق استخدام التربة الطمييية بالإضافة إلى معاملة النباتات ب ٦جم سماد كيماوي/نبات أعلى قيمة لمحتوى الكاروتينيدات. و قد ظهرت أفضل النتائج لمحتوى الكربوهيدرات الكلية في الأوراق عند استخدام الطمي + الرمل أو الطمي فقط كوسط زراعي مع إضافة ٤ جم سماد كيماوي/نبات. بينما حققت النباتات النامية في وسط الطمي + الرمل بنسبة (١:١) والمضاف إليها ٢ جم سماد كيماوي/نبات أفضل النتائج من حيث محتوى الكربوهيدرات الكلية في السيقان في الموسمين وكذلك حققت تربة الطمي فقط والمضاف إليها ٢جم سماد كيماوي/نبات أعلى القيم بالنسبة لمحتوى الكربوهيدرات الكلية في الجذور في كلا الموسمين .

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