J. Plant Production, Mansoura Univ., Vol. 3 (7): 2163 - 2172, 2012

EFFECT OF CLUTURE MEDIA AND MINERAL NPK FERTILIZATION ON THE PRODUCTION OF *F. benjamina* AND *F. hawaii* TRANSPLANTS UNDER GREEN HOUSE CONDITIONS

Sharaf El-Din, M. N.; M. Y. A. Abdalla ;A. A. E. Helaly and D. Y. Sulaeiman
Veget. and Flor. Dept., Fac. of Agric., Mansoura Univ.

ABSTRACT

This experiment was conducted at the Experimental Station of Vegetable and Floriculture Department, Faculty of Agriculture, Mansoura University under green house conditions during the two successive seasons of 2010 and 2011 to study the effect of different culture media and levels of mineral NPK fertilization and their interaction on vegetative growth and chemical composition of *Ficus benjamina* and *Ficus hawaii* transplants grown in pots.

Four culture media were tested (peat, peat moss + perlite, peat moss + sand and peat moss + perlite +sand). Each medium received three levels of NPK fertilizer (0, 2 or 4 g/pot).

Regarding the effect of culture media, the obtained results indicated that *Ficus benjamina* transplants grown in the medium of peat moss+perlite+sand induced the highest values for plant height (cm), number of leaves per plant and number of branches per plant in the first season, while in the second one, the values of these characters were higher when the transplants grown in the medium of peat and perlite. NPK concentrations (%) in the leaves increased in both seasons when *F. benjamina* transplants grown in the culture medium of peat moss+perlite+sand, while the highest values of total chlorophyll content (mg/g fresh weight) in leaves were recorded in the transplants grown in the medium of peat and sand in both seasons. For *Ficus hawaii*, the highest data for plant height (cm), number of leaves and number of branches per plant were recorded when the transplants were grown in the culture medium of peat+perlite+sand in the first season, while in the second one, the best results in plant height and number of leaves/plant were recorded by the transplants grown in peat+sand medium, while the medium of peat+perlite gave the highest number of branches/plant. The highest values of N, P and K (%) as well as total chlorophyll content were recorded when *F. hawaii* transplants grown in the culture medium of peat moss+perlite+sand in both seasons.

Concerning the effect of NPK fertilization on *F. benjamina* transplants, data showed that in the first season the addition of NPK at the rate of 2 g/pot increased plant height and number of leaves and branches per plant. In the second season, the previous parameters were the highest by the application of 4 g/pot. For *Ficus hawaii*, the highest value for plant height was obtained when 4 g/pot NPK was applied, while fertilization with 2 g/pot was more effective in increasing number of leaves and branches per plant in the first season. In the second one the application of 4 g/pot recorded the highest values in all vegetative measurements. The highest values of N, P and K (%) as well as total chlorophyll content (mg/g fresh weight) were belonged to *F. benjamina* and *F. hawaii* transplants fertilized with 4 g/pot in both seasons.

The interaction between culture media and NPK treatments were the most effective on the previous parameters. Vegetative growth characters (expressed as plant height, number of leaves and branches per plant) of *F. benjamina* transplants were improved as a result for planting in peat moss+perlite+sand medium and fertilization with 2 g/pot NPK in the first season, while in the second one that was true

when the transplants were planted in peat+perlite medium and received 4 g/pot NPK. In case of *Ficus hawaii*, the transplants grown in peat moss+perlite+sand medium gave the best results in plant height, number of leaves and branches per plant when received 4 g/pot NPK in the first season. In the second one, the transplants fertilized with 4 g/pot NPK showed the best results in plant height and number of leaves per plant when grown in peat moss+sand medium and the highest value in number of branches per plant when grown in peat moss+perlite+sand medium. The superiority in N, P and K percentages as well as total chlorophyll content (mg/g fresh weight) for both plant species in both seasons was for the interaction treatment of moss+perlite+sand culture medium plus fertilization with 4 g/pot NPK.

According to the aforementioned results, it could be recommended under conditions of the present research to use peat moss+perlite+sand (1:1:1 by volume) as a culture medium for *Ficus benjamina* and *Ficus hawaii* transplants in combination with NPK fertilizer (20:20:20) at the rate of 2 or 4 g/plant.

INTRODUCTION

The Genus *Ficus* has about 800 species of trees, shrubs or vines, commonly called figs, and belongs to the family Moraceae. Many are tall forest trees with great spreading roots, other are planted as ornamentals (Frenssen, 1986). They are fast growers, tolerant of most soil and light conditions and develop wonderfully fat, smooth and intricately gnarled roots that can be raised up above the soil level for a fantastic ornamental effect.

Ficus benjamina L., commonly known as a weeping fig, is a native species to tropical South-east Asia and Australia. It is a evergreen tree with a dense, rounded canopy and gracefully drooping branches which grows to a height of ten meters or more. The common variety has shiny deep green, ovate leaves up to ten centimeters long, tapering to a slender point (Frith *et al.* 1976). *F. benjamina* is widely used as indoor container plant or outdoors as a large landscape tree or trimmed into a hedge. It also makes a good bonsai subject for indoor growers.

F. hawaii is a slow-growing, evergreen and round tree reaching 8 meters tall, with grey-green, elliptic leaves to 10 cm long, heavily mottled with white. It is grown as container plant for the beauty its variegated leaves. Also, it is suited as formal specimen because of their ability to tolerate heavy shearing.

The growth media for production of seedlings is considered as one of the important factors for production of healthy and vigour seedlings. Saleh (2000) mentioned that using peat moss media gave the best results on *F. benjamina* compared with peat moss + sand media. El-Khattib *et al.* (2006) found that the nursery mixture of clay, peat moss and perlite produced the tallest plants and the highest number of leaves of *Ficus alii*. According to Khan *et al*. (2006), sand+peat (1:1) was proved to be a superior potting medium for rough lemon rootstock followed by sand + peat + spent compost of Button mushroom (1:1:1). Abo-Rezq *et al*. (2009) reported that *Chlorophytum comosum* plants cultured in the mixture of perlite: peat moss: sand at ratios of 1:1:2 produced plants with highest values of heights and number of leaves.

The fertilization with NPK improves plant growth and provides plants with their requirements of essential elements needed for growth. Oliet *et al*.

(2005) found that the height of containerized *Acacia salicina* seedlings fertilized with 7 g/l of 16-8-9 NPK reached 49.7 cm with highly significant differences when compared to 19.3 cm for control seedlings (non-fertilized). Seedlings of *Tetrapleura tetraptera* treated with NPK 15:15:15 at the rate of 40 kg N/ha produced the tallest plants, greatest number of branches and leaves (Offiong, *et al*., 2010). Patil *et al*. (2010) found that fertilizer level of 75:150:75 NPK g/plant had positive effect on height of *Acacia mangium* seedlings followed by 50:100:50 NPK g/plant as compared to the 25:50:25 NPK g/plant. The results of Shi *et al*. (2010) indicated that application of NPK fertilizer at concentration of 100 mg nutrient per kg of soil to walnut saplings increased shoot length, tree height and trunk girth.

The present investigation was conducted to study the influence of different culture media and levels of NPK fertilizer on growth and quality of *F. benjamina* and *F. hawaii* transplants under plastic greenhouse conditions.

MATERIALS AND METHODS

The current research was carried out under plastic house conditions at Experimental Station of Vegetable and Floriculture Department, Faculty of Agriculture, Mansoura University, Egypt during the two successive seasons of 2010 and 2011 to study the effect of different growing media and mineral NPK rates on some vegetative growth characters and chemical constituents of *Ficus benjamina* and *Ficus hawaii* transplants.

Uniform rooted cuttings of *Ficus benjamina* and *Ficus hawaii* (6 and 8 cm long, respectively) obtained from a previous experiment were planted on May, 1st for both seasons in 15-cm-diameter plastic pots (one transplant/pot) filled with the following tested media: peat moss, a mixture of peat moss and perlite (1:1, v/v), a mixture of peat moss and sand (1:1, v/v) and a mixture of peat moss, perlite and sand (1:1:1, v/v/v). The analysis of used media materials was shown in Table (a). After planting, the transplants were irrigated as needed.

Table (a): Analysis of used media materials in both seasons

Sample	EC	pH	Total %		
			N	P	K
Peat moss	1.63	5.60	0.74	2.97	1.99
Perlite	0.98	6.18	1.53	0.98	0.49
			Available (ppm)		
			N	P	K
Sand	1.73	7.40	24	2.39	244

After one month from planting (on June, 1st), a commercial NPK fertilizer (fert plus 20:20:20) was applied. Fert plus also contains Zn (0.014%) and Cu (0.0025%). The plants received the first batch as a soil drench at the rates of 0, 2 and 4 g/pot. Two months later (on August, 1st), the second batch was added, while the third and last one was applied on October, 1st.

The layout of this experiment during both seasons was split plot design for each plant species with three replicates as each replicate contained three plants (Mead *et al*., 1993). Different culture media were

assigned to the main plots, while the sub plots were devoted to NPK rates. Therefore, the interaction treatments were 12 treatments.

At the end of experiment (on November, 1st), the following data were recorded: plant height (cm), number of leaves per plant, number of branches per plant. In fresh leaf samples total chlorophyll content (mg/g fresh weight) were determined according to Moran (1982), while in dry leaf samples the percentages of N (Pregl, 1945), P (Luatanab and Olsen, 1965) and K (Jackson, 1973) were assessed.

The recorded data were subjected to analysis of variance and the method of L.S.D. at 5% was used to differentiate the means (Mead *et al*., 1993).

RESULTS AND DISCUSSION

Effect of culture media, mineral fertilizer NPK and their interactions on vegetative growth parameters of:

1- *F. benjamina* transplants

Data presented in Table (1) revealed that, in the first season, the transplants grown in peat moss+perlite+sand medium gave the highest values of plant height, number of leaves and number of branches per plant (33.42, 22.59 and 7.1, respectively). In the second season, the highest values of previous parameters were belonged to transplants grown in peat+perlite medium.

Data in the same Table disclosed that fertilization with 2 g/pot NPK induced the highest values of plant height (30.4 cm), number of leaves per plant (20.64) and number of branches per plant (6,98) in the first season. Whereas, in the second season, the highest increase in these parameters was obtained when the transplants received 4 g/pot NPK.

The interaction between culture media and NPK treatments was the most effective on the previous parameters. Vegetative growth characters of *F. benjamina* transplants were improved as a result for planting in peat moss+perlite+sand medium and fertilization with 2 g/pot NPK in the first season, while in the second one that was true when the transplants were planted in peat+perlite medium and received 4 g/pot NPK.

These results are in accordance with those reported by Oliet *et al*. (2005) on *Acacia salicina*, Offiong *et al. (*2010) on *Tetrapleura tetraptera* and Patil *et al*. (2010) on *Acacia mangium*. Al-Menaie *et al*. (2012) reported that Cassia seedlings exhibited maximum plant height and number of leaves when NPK was applied at 1g/l in a growing medium comprising of sand: peat moss: humus (1:1:1 v/v) compared to other fertilizer levels.

The aforementioned results, however, indicate the important role of N, P and K in the different physiological processes within the plant, which in turn affect the plant growth. Nitrogen is necessary to structure amino acids, nucleic acids, many enzymes, energy transferring compounds ADP and ATP in the plant tissue (Taiz and Zeiger, 2002). Also, phosphorus has effects on many processes such as cell division and growth, fat and albumin formation, energy transfer, signal transduction, biosynthesis of macromolecules, photosynthesis and respiration (Raghothama, 1999). While potassium is essential in the formation and transportation of sugar and starch, synthesis of

proteins and cell division and aids in the uptake of other nutrients and their movement within the plant (Taiz and Zeiger, 2002; Obreza, 2003).

Table (1): Effect of culture media and mineral fertilizer NPK on some vegetative growth parameters of *F. benjamina* transplants during 2010 and 2011 seasons

Growing media (A)	Rate of mineral NPK (g/pot) (B)							
	2010				2011			
	0.0	2.0	4.0	Mean (A)	0.0	2.0	4.0	Mean (A)
	Plant height (cm)							
Peat	12.27	22.03	22.21	20.50	17.70	26.53	23.17	22.47
Peat+perlite	16.90	17.93	21.07	18.63	24.50	29.13	36.70	30.11
Peat+sand	17.13	39.77	34.27	30.39	22.63	35.50	29.67	29.27
Peat+sand+perlite	22.30	42.03	35.93	33.42	25.90	27.00	31.67	28.19
Mean (B)	18.40	30.44	28.37	------	22.68	29.54	30.30	------
L.S.D. at 5%	A: 3.17	B: 2.66		AB:5.03	A: 2.97	B:1.97		AB: 4.05
	Number of leaves/plant							
Peat	10.03	13.00	14.70	12.58	8.93	15.43	13.80	12.72
Peat+perlite	9.60	12.25	13.77	11.87	14.77	22.43	27.83	21.68
Peat+sand	10.17	27.77	27.87	21.93	13.43	27.50	21.40	20.78
Peat+sand+perlite	12.20	29.57	26.00	22.59	11.03	17.93	20.63	16.53
Mean (B)	10.50	20.64	20.58	------	12.04	20.82	20.91	------
L.S.D. at 5%	A:2.94	B: 2.16		AB:4.05	A: 2.58	B: 1.50		AB:3.27
	Number of branches/plant							
Peat	3.70	4.97	6.40	5.02	2.83	5.40	4.46	4.30
Peat+perlite	3.10	3.97	4.90	3.99	4.50	8.23	9.93	7.56
Peat+sand	3.27	9.10	8.33	6.90	4.00	8.10	7.00	6.36
Peat+sand+perlite	3.43	9.87	8.00	7.10	3.00	4.90	6.60	4.83
Mean (B)	3.38	6.98	6.91	------	3.58	6.66	7.05	------
L.S.D. at 5%	A:0.82	B: 1.01		AB:1.76	A: 1.36	B: 0.97		AB:1.93

2- F. Hawaii transplants

Table (2) indicated that the transplants grown in peat+perlite+sand medium gave the highest values in plant height, number of leaves/plant and number of branches/plant in the first season. In the second one, the best results in plant height and number of leaves/plant were recorded by the transplants grown in peat+sand medium, while the medium of peat+perlite gave the highest number of branches/plant.

Results in the same Table showed also that in the first season, the application with 4 g/pot NPK induced the tallest plants, but the highest values for number of leaves and branches per plant were recorded when NPK at the rate of 2 g/pot was used. In the second season, all previous parameters recorded the highest values when the transplants were fertilized with 4 g/pot NPK. El-Sayed *et al*. (2008) on *F. macrocarpa* L. var hawaii transplants explained that all fertilization treatments improved plant height, branch and leaf No./plant with superiority of NPK treatment at the rate of 6 g/per pot.

Regarding the interaction treatments, transplants grown in peat+perlite+sand medium and fertilized with 4 g/pot NPK gave the highest values compared to the other treatments in the first season. In the second one, the treatment of peat+sand in combination with 4 g/pot NPK was more effective for plant height and number of leaves/plant, while number of branches/plant was the highest when the transplants were cultured in peat+perlite+sand medium and fertilized with 4 g/pot NPK.

Table (2): Effect of culture media and NPK mineral fertilizer on some vegetative growth parameters of *F. hawaii* transplants during 2010 and 2011 seasons

Growing media (A)	Rate of mineral NPK (g/pot) (B)							
	2010				2011			
	0.0	2.0	4.0	Mean (A)	0.0	2.0	4.0	Mean (A)
	Plant height (cm)							
Peat	9.43	9.80	10.57	9.93	11.33	10.10	12.50	11.31
Peat+perlite	10.33	12.17	10.77	11.09	11.27	14.50	13.43	13.07
Peat+sand	9.13	10.90	10.50	10.18	12.77	14.17	18.33	15.09
Peat+sand+perlite	10.33	11.40	13.27	11.67	10.60	12.33	12.67	11.87
Mean (B)	9.81	11.07	11.28	------	11.49	12.78	14.23	------
L.S.D. at 5%	A: 1.11	B: 0.72		AB:1.49	A: 1.13	B: 1.01		AB:1.87
	Number of leaves/plant							
Peat	12.43	13.50	12.77	12.90	11.50	12.00	12.22	13.51
Peat+perlite	11.50	14.17	12.10	12.59	14.87	15.50	14.50	14.96
Peat+sand	11.70	12.17	13.43	12.22	14.00	15.23	19.67	16.30
Peat+sand+perlite	13.10	15.13	15.33	14.52	13.67	14.67	14.33	14.22
Mean (B)	12.03	13.74	13.41	------	13.51	14.35	15.18	------
L.S.D. at 5%	A: 1.48	B: 0.82		AB:1.83	A: 0.83	B: 0.82		AB:1.48
	Number of branches/plant							
Peat	3.23	3.67	3.60	3.50	2.67	3.23	3.33	3.08
Peat+perlite	3.03	3.70	2.43	3.05	3.87	4.53	3.87	4.09
Peat+sand	2.93	3.77	3.70	3.47	3.20	3.83	4.50	3.84
Peat+sand+perlite	2.89	3.80	3.93	3.54	2.77	3.90	4.93	3.87
Mean (B)	3.02	3.74	3.42	------	3.13	3.88	4.16	------
L.S.D. at 5%	A: 0.58	B: 0.47		AB:0.89	A: 0.60	B: 0.42		AB: 0.84

Effect of culture media, mineral fertilizer NPK and their interactions on leaf N, P and K (%) as well as total chlorophyll content (mg/g fresh weight) in leaves of:

1- *F. benjamina* transplants

The obtained results in Table (3) showed that the transplants of *F. benjamina* grown in the culture medium of peat+perlite+sand medium gave the greatest values of N, P and K (%) in both seasons. Otherwise, the transplants induced the greatest values of total chlorophyll content when grown in the medium of peat+sand in both seasons (0.879 and 0.893 mg/g fresh weight in the first and second season, respectively).

Concerning the effect of NPK fertilizer rates, it is clear from the same Table that the application of 4 g/pot NPK resulted in the highest values in N, P and K (%) as well as total chlorophyll content (mg/g fresh weight) in both seasons. This increase in the NPK % in leaves was explained by Jain (1983) who reported that raising the level of NPK fertilization in the root medium resulted in an increase in vegetative growth and this may be accompanied by an increase in the absorption of these essential elements. Similar results are reported by Abd El-Aziz (2007) on *Codiaeum variegatum* plants.

The increase in total chlorophyll could be attributed to the important role of NPK nutrients in photosynthesis, energy compounds and other physiological processes, which reflected directly on increasing the content of chlorophyll a and b (Devlin, 1972). This increase in the concentrations of chlorophyll resulted in an increase in the rate of photosynthesis and a promotion in carbohydrate synthesis and in turn, enhancing of growth.

The interaction between culture media and NPK treatments was the most effective on the previous parameters. The highest records for all parameters were achieved when the transplants were raised in the medium composed of peat+perlite+sand and fertilized with 4 g/pot NPK.

2- F. hawaii transplants

Data in Table (4) disclosed that the greatest values of N, P and K (%) as well as total chlorophyll content (mg/g fresh weight) were recorded when *F. hawaii* transplants raised in the culture medium of peat moss+perlite+sand in both seasons.

Likewise, the best results for N, P and K (%) as well as total chlorophyll content (mg/g fresh weight) were belonged to *F. hawaii* transplants fertilized with 4 g/pot NPK in both seasons.

Concerning the interaction between culture media and NPK rates, the highest values in the previous parameters were recorded when the transplant grown in the culture medium of peat+perlite+sand and received 4 g/pot NPK. Similar results were found by Nicodemus *et al*. (2008) on *Juglans nigra* seedlings.

Table (3): Effect of culture media and NPK mineral fertilizer on percentage of NPK (%) and total chlorophyll (mg/g fresh weight) at leaves of *F. benjamina* transplants during 2010 and 2011 seasons

Growing media (A)	Rate of mineral NPK (g/pot) (B)							
	2010				2011			
	0.0	2.0	4.0	Mean (A)	0.0	2.0	4.0	Mean (A)
	N%							
Peat	2.00	2.31	2.80	2.37	2.07	2.43	2.95	2.48
Peat+perlite	2.07	2.43	2.89	2.46	2.13	2.54	2.72	2.46
Peat+sand	1.92	2.28	2.59	2.26	1.98	2.37	2.73	2.36
Peat+sand+perlite	2.15	2.55	3.02	2.57	2.25	2.65	3.16	2.89
Mean (B)	2.03	2.39	2.82	------	2.11	2.50	2.89	------
	P%							
Peat	0.29	0.33	0.38	0.33	0.28	0.33	0.37	0.33
Peat+perlite	0.30	0.35	0.38	0.34	0.29	0.34	0.35	0.33
Peat+sand	0.28	0.32	0.37	0.32	0.28	0.32	0.37	0.32
Peat+sand+perlite	0.31	0.36	0.39	0.36	0.27	0.35	0.39	0.34
Mean (B)	0.29	0.34	0.38	------	0.28	0.33	0.37	------
	K%							
Peat	2.15	2.71	3.36	2.74	2.30	2.84	3.56	2.90
Peat+perlite	2.30	2.94	3.39	2.88	2.42	3.09	3.52	3.00
Peat+sand	2.05	2.65	3.19	2.63	2.15	2.77	2.32	2.75
Peat+sand+perlite	2.43	3.09	3.46	3.00	2.55	3.23	3.61	3.13
Mean (B)	2.23	2.84	3.35	------	2.35	2.98	3.50	------
	Total chlorophyll content (mg/g f.w.) (B)							
Peat	0.747	0.819	0.883	0.817	0.748	0.825	0.893	0.822
Peat+perlite	0.767	0.840	0.808	0.805	0.771	0.849	0.809	0.810
Peat+sand	0.851	0.876	0.911	0.879	0.854	0.899	0.928	0.893
Peat+sand+perlite	0.783	0.860	0.923	0.856	0.789	0.867	0.932	0.863
Mean (B)	0.787	0.849	0.881	------	0.790	0.860	0.898	------

Table (4): Effect of culture media and mineral fertilizer NPK on percentage of NPK (%) and total chlorophyll content (mg/g fresh weight) at leaves of *F. hawaii* transplants during 2010 and 2011 seasons

Growing media (A)	Rate of mineral NPK (g/pot) (B)							
	2010				2011			
	0.0	2.0	4.0	Mean (A)	0.0	2.0	4.0	Mean (A)
	N%							
Peat	1.67	2.19	2.53	2.13	1.73	2.24	2.65	2.21
Peat+perlite	1.81	2.43	2.57	2.27	1.89	2.51	2.65	2.35
Peat+sand	1.61	2.09	2.44	2.05	1.66	2.15	2.54	2.12
Peat+sand+perlite	1.95	2.44	2.64	2.34	2.01	2.58	2.75	2.44
Mean (B)	1.76	2.29	2.55	------	1.82	2.37	2.65	------
	P%							
Peat	0.27	0.28	0.35	0.30	0.26	0.31	0.34	0.30
Peat+perlite	0.28	0.33	0.35	0.32	0.27	0.32	0.35	0.31
Peat+sand	0.26	0.30	0.34	0.30	0.27	0.32	0.34	0.31
Peat+sand+perlite	0.28	0.33	0.36	0.32	0.27	0.32	0.35	0.31
Mean (B)	0.27	0.31	0.35	------	0.27	0.32	0.34	------
	K%							
Peat	1.97	2.38	2.83	2.36	1.96	2.39	2.87	2.40
Peat+perlite	1.98	2.51	2.91	2.49	1.92	2.49	3.00	2.49
Peat+sand	1.81	2.28	2.77	2.29	1.82	2.36	2.88	2.35
Peat+sand+perlite	2.13	2.65	3.06	2.62	2.18	2.67	3.14	2.66
Mean (B)	1.95	2.45	2.89	------	1.97	2.48	2.97	------
L.S.D. at 5%	A:0.02	B: 0.02		AB:0.04	A: 0.03	B: 0.03		AB:0.05
	Total chlorophyll content (mg/g f.w.) (B)							
Peat	0.523	0.584	0.631	0.579	0.532	0.606	0.641	0.593
Peat+perlite	0.552	0.595	0.641	0.596	0.548	0.596	0.641	0.595
Peat+sand	0.515	0.574	0.624	0.571	0.527	0.584	0.629	0.580
Peat+sand+perlite	0.561	0.611	0.656	0.609	0.567	0.620	0.661	0.616
Mean (B)	0.537	0.591	0.638	------	0.543	0.601	0.643	------

REFERENCES

Abd El-Aziz, N. G. (2007). Stimulatory effect of NPK fertilizer and benzyladenine on growth and chemical constituents of *Codiaeum variegatum* L. Plant.American-Eurasian. J. Agri. and Eviron. Sci., 2 (6): 711-719.

Abo-Rezq, H.; M. Albaho and B. Thomas (2009). Effect of sand in growing media on selected plant species. European Journal of Scientific Research, 26 (4): 618-623.

Al-Menaie, H. S.; O. Al-Ragom; A. Al-Shatti; M. Mathew and N. Suresh (2012). Effect of fertilizer concentration on the growth performance of *Cassia nodosa* Buch.-Ham. ex Roxb. and *Cassia fistula* L. seedlings under greenhouse conditions of Kuwait. International Research Journal of Plant Science, 3 (2):19-22.

Devlin, R. M. (1972). Plant Physiology. 3rd Edn. Van Nostrand Company, New York, 1001.

El-Khattib, M. A.; E. E. El-Maaddawi and A. B. El-Attar (2006). Effect of growing media on growth and chemical composition of *Ficus alii* plants. Plant Physiology and Biochemistry, 44 (1): 175-193.

El-Sayed, B. A.; A. S. A. El-Fouly and A. H. El-Feky (2008). Response of *Ficus macrocarpa* L var. Hawaii transplants to some fertilization treatments. Egypt. J. Appl. Sci., 23 (5): 350-359.

Frenssen, D. (1986). Ficus. The new encyclopedia Britannica. 4: 762.

Frith, H. J.; F. H. J. C. Rome and T. O. Wolfe (1976). Food of fruit-pigeons in New Guinea. Emu., 76 (2): 49-58.

Jackson, M. L. (1973). Soil Chemical Analysis. Prentice-Hall of India Private Limited M-97, New Delhi, India, 498.

Jain, V. K. (1983). Fundamental of Plant Physiology. 4th Ed. S. Chand and Co., Ltd. Ram Nagar, New Delhi, 140-141.

Khan, M. M.; M. A. Khan; M. Abbas; J. M. Jaskani; M. A. Ali and H. Abbas (2006). Evaluation of potting media for the production of rough lemon nursery stock. Pak. J. Bot., 38 (3): 623-629.

Luatanab, F. S. and S. R. Olsen (1965). Test of an ascorbic acid method for determining phosphorus in water and $NaHCO_3$ extracts from soil. Soil Sci. Soc. Amer. Proc, 29: 677-678.

Mead, R.; R. N. Curnow and A. M. Harted (1993). Statistical Methods in Agriculture and Experimental Biology, 2nd Ed., Chapman & Hall Ltd., London, 335.

Moran, R. (1982). Formula for determination of chlorophyllous pigment extracted with N-N-dimethyl formamid. Plant Physiol., 69:1376-1381.

Nicodemus, M. A.; F. K. Salifu and D. F. Jacobs (2008). Growth, nutrition, and photosynthetic response of black walnut to varying nitrogen sources and rates. Journal of Plant Nutrition, 31: 1917-1936.

Obreza, T. A. (2003). Importance of potassium in a Florida citrus nutrition programm. Better Crops, 87: 19-22.

Offiong, M. O.; S. I. Udofia; P. W. Owoh and G. O. Ekpenyong (2010). Effects of fertilizer on the early growth of *Tetrapleura tetraptera* (DEL). Nigerian Journal of Agriculture Food and Environment, 6 (1&2): 53-59.

Oliet, J. A.; R. Planelles; F. Artero and D. F. Jacobs (2005). Nursery fertilization and tree shelters affect long-term field response of *Acacia salicina* Lindl. planted in Mediterranean semiarid conditions. Forest Ecology and Management, 215: 339–351.

Patil, S. J.; H. Y. Patil; S. M. Mutanal; G. Shahapurmath and V. Maheswarappa (2010). Performance of *Acacia mangium* in transitional tract of Karnataka. Karnataka J. Agric. Sci., 23 (3): 464-466.

Pregl, F. (1945). Quantitative Organic Micro-Analysis, 4th Ed., J. and A. Churchill Ltd., London, 203-209.

Raghothama, K. G. (1999). Phosphate acquisition. Ann. Rev. Plant Physiol. Plant Mol. Biol., 50: 665-693.

Saleh, S. I. I. (2000). Effect of different planting media on the growth and chemical composition of *Ficus benjamina* "Starlight" plants grown under two locations "outdoor and plastic house" conditions. Egyptian Journal of Horticulture, 27 (4): 543-568.

Shi, Y.; H. Wang ; W. Liu ; Y. Gao ; Z. Zhang; H. Duan and J. Fang (2010). The effect of different NPK fertilizer levels on growth of walnut saplings. Acta Hort., 861: 183-190.

Taiz, L. and E. Zeiger (2002). Plant Physiology. 3rd Ed., Sinauer Associate, Inc. Publishers, Sunderland, Massachusetts, USA, 109-110.

تأثير بيئة الزراعة والتسميد المعدنى على أنتاج شتلات فيكس بنجامين وفيكس هاواى تحت ظروف البيوت المحمية

محمد نزيه شرف الدين ، محمد يونس علي عبدالله ، أحمد عبد المنعم السيد هلالي و دانيال يوسف سليمان

قسم الخضر والزينة - كلية الزراعة - جامعة المنصورة – مصر

أجري هذا البحث فى محطة تجارب قسم الخضر والزينة بكلية الزراعة جامعة المنصورة تحت ظروف الصوب البلاستيكية خلال الموسمين 2010 و2011 لدراسة تأثير كل من بيئة الزراعة ومعدلات السماد المعدني المركب (NPK) وكذلك التفاعل بينهم على بعض صفات النمو الخضرى والتركيب الكيماوى لشتلات نباتى فيكس بنجامين وفيكس هاواى النامية فى أصص.

استخدمت فى هذا البحث أربعة أنواع من بيئة الزراعة (بيت موس بمفرده، خليط من بيت موس مع برليت أو رمل بنسبة 1:1 بالحجم واخيرا خليط من بيت موس مع برليت ورمل بنسبة 1:1:1 حجما). تم إضافة السماد المعدنى المركب للنباتات النامية فى كل بيئة زراعة بمعدل صفر، 2 و 4 جم/نبات (اصيص).

وكانت أهم النتائج المتحصل عليها:

أولا: بيئة الزراعة:

١ - **الفيكس بنجامين:**

بيئة الزراعة المكونة من البيت موس+البرليت+الرمل بنسبة (1:1:1) حجما أفضل النتائج بالنسبة للقراءات الخضرية (ارتفاع النبات (سم)،عدد الأفرع وعدد الأوراق/نبات). كانت النسبة المئوية للعناصر (النتروجين والفوسفور والبوتاسيوم) في أعلى مستوياتها تحت ظروف هذه البيئة. في حين أن أعلى قيم لمحتوى الكلوروفيل الكلى (مجم/جم وزن طازج) تم تسجيلها في بيئة بيت موس+رمل.

٢ - **الفيكس هاواى:**

كانت بيئة الزراعة المكونة من البيت موس+البرليت+الرمل أفضل البيئات تحت الدراسة للحصول على أفضل النتائج لكل من (ارتفاع النبات،عدد الأفرع وعدد الأوراق) وكذلك النسبة المئوية لعناصر النتروجين والفوسفور والبوتاسيوم وكذلك محتوى الكلوروفيل الكلى .

ثانيا: معدلات التسميد بالعناصر المعدنية(ن،فو،بو):

استجابة شتلات فيكس بنجامين للسماد المركب(ن،فو،بو) بمعدل 4 جرام/أصيص كما استجابة الفيكس هاواي لنفس المعدل في إعطاء أفضل القراءات لكل من ارتفاع النبات وعدد الأفرع وعدد الأوراق. وكذلك النسبة المئوية لمحتوى الأوراق من النتروجين والفوسفور والبوتاسيوم بالإضافة لمحتواها من الكلوروفيل الكلى .

ثالثا: التفاعل بين بيئة الزراعة ومعدلات التسميد المعدني المكونة من النتروجين والفوسفور والبوتاسيوم: كانت أفضل النتائج لكل من النباتين تحت الدراسة تحت ظروف بيئة الزراع المكونة من البيت موس+البرليت+الرمل بنسبة (1:1:1 حجما) مع استخدام السماد المركب المكون من النتروجين والفوسفور والبوتاسيوم بمعدل 2 أو 4 جم/أصيص. ولما كان الفرق غير واضح بين المعدلين فينصح باستخدام بمعدل 2 جرام /أصيص اقتصاديا.

قام بتحكيم البحث

أ.د / حسين على أحمد	**كلية الزراعة – جامعة المنصورة**
أ.د / درويش محمد ابراهيم	**كلية الزراعة – جامعة الزقازيق**