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Effect of Some Rooting Media and IBA treatments On Rooting, Growth and Chemical Composition of Stem Cuttings of *Ficus benjamina* Cv. Vivian

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Abstract

This work was carried out during 2017/2018 and 2018/2019 seasons at the nursery of Horticulture .Dept, Faculty of Agric., Benha Univ., Qalubia Governorate to study the effect of some different rooting media and IBA concentrations on vegetative propagation of *Ficus benjamina* Cv. Vivian. Terminal soft wood cuttings of *Ficus benjamina* Cv. Vivian were collected in October from three years old trees, the cutting were finally treated with IBA concentrations at 0.0, 1000, 2000 and 3000 ppm. Each cutting was inserted in a 8 cm diameter plastic pot containing different rooting media as follows: 1- Sand 2- Sand + vermiculite (v:v) 3- Sand + peatmoss (v:v) and 4- Sand + peatmoss + vermiculite (v:v). The obtained results showed that all combinations between rooting media and IBA concentration increased rooting percentage of *Ficus benjamina* Cv Vivian cuttings, especially those treated with IBA at 3000 ppm and rooted at M4 medium in the two seasons. Furthermore, the highest values of seedling length, branches number, fresh and dry weights of leaves and roots, leaf nitrogen, phosphorus, potassium and total carbohydrates contents were scored by the combination of M3 and M4, particularly those treated with IBA at the highest concentration in the two seasons.

Key words: *Ficus benjamina* cv. Vivian, propagation, stem cuttings and rooting percentage.

Introduction

Ficus benjamina L. plant (weeping fig) is a tree species belongs to Moraceae family, it is native to tropical Southeast Asia. Since it has been adapted to indoor conditions, it represents an important component of the foliage interior landscape (**Abdou et al., 2004; Veneklass et al., 2002**). This plant is propagated through vegetative method (**Siddiqui and Hussain, 2007**). Vegetative propagation is used to maintain the genetic integrity of a plant and multiply it into a population of the same identical genotype without limit, ensuring those desirable characteristics that will be carried into the next generation (**Hartmann *et al*., 2002**).

Rooting hormones are very necessary for easy to root and difficult to root plants for its role in improve the quality of root system developed, decrease rooting time and improve the percentage of cutting rooted. Also, **Hartmann *et al.*, (2002)** states that treating cuttings with Auxins increase the percentage of cutting that form roots, hastens root initiation and it is useful in propagating plants, and can increase production efficiency time from propagate to rooted liner. In contrast, too much rooting hormone can hinder root growth, so care has been taken to find the right concentration to use (**Ruchala, 2002**). **Hammo *et al.*, (2009)** found that Increase IBA from 750 to 3000 mg.l-1 concentration causes significantly increase in rooting percentage of shoot tip cutting of *Myrtus communis* when compared with other treatments, also increase this concentration from 2250 to 3750 mg.l-1 causes significantly increase in total roots length, roots dry weight and shoots number. **Alsup and Cole, (2000)** obtained that optimum rooting for Caddo Sugar Maple *Acer saccharum* was obtained with shoot tip cuttings taken at the green softwood stage and treated with 5000 mg.l-1 IBA, and the average number of roots per cutting increased as IBA concentration increased, also root length was greatest with the 5000 mg.l-1 IBA treatment. It is important to choose the correct rooting media to get optimum rooting in the shortest time; Peat moss is the most commonly used peat in horticulture (**Hartmann *et al.*, aa**the soil such as porosity and tissues soil and water holding capacity (**Nyamangara, 2001**). The main purpose of using organic amendments is to loosen the soil and create large pores to increase (1- aeration, 2- drainage, 3- usable water holding capacity, 4- nutrient holding capacity and 5- decrease growing media weight as compared to soil (**Reed, 2005**). **Hammo *et al*, (2009**) found that uses peatmoss medium cause significantly increased in all shoot tip cutting characters when compared with that propagate in sand and the increasing percentage reach 10.40%, 33.70%, 87.66%, 43.61%, 180.37%, 210.39, 167.41, and 140.71 for rooting percentage, total roots length, roots fresh weight, roots dry weight, shoots number, total shoots length, shoots fresh weight, and dry weight respectively. Vermiculite has a very high water holding capacity, excellent ex-change, buffering capacities and aid in aeration and drainage it is less durable than sand and perlite (**El-Khateeb et al., 2006**). The following study was undertaken to investigate the effect of IBA application and some rooting media as well as their combinations on the rooting of *Ficus benjamina cv.* stem cuttings, some growth parameters and chemical composition of seedlings.

Materials and Methods

This work was carried out during 2017/2018 and 2018/2019 seasons at the nursery of Horticulture .Dept, Faculty of Agric., Benha Univ., Qalubia Governorate to study the effect of some different rooting media and IBA concentrations on vegetative propagation of *Ficus benjamina* Cv. Vivian.

- Plant material : terminal soft wood cuttings of *Ficus benjamina* Cv. Vivian were used, the cuttings were collected in October for each season from three years old trees, the cuttings were 7-8 cm long and about 1.7-1.8 mm diameter. The leaves of the cuttings were shortened, then the cuttings were disinfected with Rhizolex fungicide powder at 0.3% concentration, the cutting were finally treated with the following IBA concentrations:

1- IBA at 0.0 ppm (control) 2- IBA at 1000 ppm 3- IBA at 2000 ppm 4- IBA at 3000 ppm. Each cutting was inserted in a 8 cm diameter plastic pot containing different rooting media as follows:

1- Sand 2- Sand + vermiculite (v:v) 3- Sand + peatmoss (v:v)

4- Sand + peatmoss + vermiculite (v:v). Each treatment was represented by three replicates and each replicate included 20 pots.

All inserted cuttings were held in the greenhouse under tunnels and 90 days later the following data were recorded:

1-Rooting percentage

2- Growth parameters:-

-Number of roots. ,-Roots fresh weight (g)., -Roots dry weight (g).,

-Plant height (cm) above the soil surface directly., -Number of leaves/seedling., -Leaves fresh weight/ seedling (g)., -Leaves dry weight/ seedling (g).

Chemical composition measurements:-

At the end of the experiment (……. both seasons) the following chemical composition measurements were recorded:

Nitrogen, phosphors potassium and total carbohydrates % in the dried leaves were determined.

Statistical analysis

The obtained data were statistically analyzed using randomized complete block design according to **Snedecor and Cochran (1980)**, . Means were compared using L.S.D test at 5% level.

Results and Discussion

Effect of IBA and rooting media as well as their combinations on rooting percentage, growth and chemical composition of *Cupressus macrocarpa* plants:

I- Effect of IBA and rooting media as well as their combinations on rooting percentage, of *Ficus benjamina Cv Vivian* cuttings:

Table 1. Effect of some rooting media and IBA treatments as well as their combination on rooting percentage of *Ficus benjamina* cv. Vivian during 2017 and 2018 seasons.

IBA / Media	0.0	1000 ppm	2000 ppm	3000 ppm	Mean
		1st season			
M1	42.6	51.8	63.4	71.8	57.4
M2	48.2	59.3	70.6	79.3	64.35
M3	56.1	68.6	78.3	84.2	71.8
M4	61.4	71.1	82.6	91.7	76.7
Mean	52.08	62.7	73.73	81.75	67.56
L.S.D at 0.05 for	IBA= 3.21	Media =3.21	Interaction=6.42		
		2nd season			
M1	48.2	54.6	68.9	76.2	61.98
M2	51.1	59.3	71.0	79.3	65.18
M3	62.4	71.2	78.3	86.8	74.68
M4	65.2	76.5	85.7	94.6	80.5
Mean	56.73	65.4	75.98	84.23	70.59
L.S.D at 0.05 for	IBA=2.41	Media =2.41	Interaction=4.82		

Where, M_1= Sand, M_2= Sand+vermiculite, M_3=Sand+peatmoss, M_4=Sand+vermiculite+peatmoss

Data presented in Table (1) reveal that all tested concentrations of IBA statistically increased rooting percentage of *Ficus benjamina* Cv Vivian cuttings as compared with untreated cuttings in both seasons. However, the highest value of rooting percentage was gained by 3000 ppm IBA- treated cuttings as it gave 81.75% and 84.23 % , followed by 2000 ppm IAB- treated cuttings which scored 73.73 and 75.98 % in the first and second seasons, respectively. Also, 1000 ppm-treated cuttings increased rooting percentage as it scored 62.7 and 65.4 % in the first and second seasons, respectively. On contrary, the lowest rooting percentage of *Ficus benjamina* Cv Vivian cuttings was gained by un-treated cuttings (control) as it registered 52.08 and 56.73% in the first and second seasons, respectively. As for the effect of rooting media, data in the same Table show that using M4 (sand+peatmoss +

vermiculite) medium showed to be the most effective one for inducing the highest rooting percentage as it scored 76.7and 80.5 %, followed in descending order by M3 (sand + peatmoss) medium which gave 71.8 and 74.68% in the first and second seasons, respectively. In addition, M2 (sand + vermiculite) medium significantly increased rooting percentage as it gave 64.35 and 65.18 % in the first and second seasons, respectively. On contrary, the lowest rooting percentage was recorded by using M1 (sand) medium which scored 57.4 and 61.98%, in the first and second seasons, respectively. Regarding the interaction effect between IBA concentrations and rooting media data in Table (1) show that all resulted combinations between rooting media and IBA concentrations increased rooting percentage of *Ficus benjamina* Cv Vivian, with superior for those treated with IBA at 3000ppm and rooted in medium containing peatmoss and sand (M5) as it recorded 91.7 and 94.6% in the first and second seasons, respectively. Also, the cuttings which received IBA at 3000 ppm and rooted in M3 medium gave highly increment in this parameter as it registered 84.2 and 86.8 %, in the first and second seasons, respectively. On the reverse, the lowest rooting percentage was recorded by using M1 medium and received no IBA treatment as it scored 42.6 and 48.2 %, in the first and second seasons, respectively. The aforementioned results of IBA treatments are in parallel with those obtained by **Hansen (1990)** on *Cupressus macrocarpa,* **Jayasankar *et al.*, (1990)** on *Ficus infectoria* Roxb cuttings, **Bhattacharjee and Thimmapaa (1991)** on *Pelargonium graveolens,* **Davies *et al.*, (1991)** on *Ficus pumila*, **Shirol *et al.*, (1992)** on *poinsettias,* **Singh (1993)** on *Bongainvillea* cv. Thimma**, Sun and Bassuk (1993)** on rose cuttings, **Menguo and Zencrikiran (1994)** on *Lagerstromia indica,* **Mccracken *et al.*, (1996)** on *Magnolia grandiflora* cv. Brown Velvet, **Hosni *et al.*, (2000)** on *Bouginvillea xbuttiana*, M'rs Butt, **Reddy *et al.*, (2001)** on *Givotia rottleriformis* Griff, **Blythe *et al.*, (2004)** on *Aglaonema modestum* Schott Ex Engler , **Bharmal *et al.*, (2005)** on *Chrysanthemum morifolium,* **Ercisli *et al.*, (2005)** on *Rosa dumalis,* **Kazankaya *et al.*, (2005)** on hardwood cuttings of *Rosa canina* , **Reddy *et al.*, (2006)** on *Pelargonium graveolens* cuttings, **Limbasiya *et al.* (2007)** on *Jatropha curcas* and **Hegazey (2014)** on *Conocarpus erectus* cuttings. The results of rooting media are coincided with those obtained by **Singh *et al.* (2002)** on *Maranta bicolor*, **Gad (2003 a)** on *Schefflera actinophylla,* **Gad (2003 b)** on *Ficus benjamena* cuttings, **Singh and Nair (2003)** on Coleus, Syngonium, Dieffenbachia, Drecaena and Sansevieria plants, **Kathiravan *et al.* (2008)** on *Jatropha curcas* and **Hegazey (2014)** on *Conocarpus erectus* cuttings.

II-Effect of IBA and rooting media as well as their combinations on growth of *Ficus benjamina* Cv Vivian **seedlings:**

1- On root number/cutting:

Table 2. Effect of some rooting media and IBA treatments as well as their combination on number of roots/ seedling of *Ficus benjamina* cv. Vivian during 2017 and 2018 seasons.

IBA / Media	0.0	1000 ppm	2000 ppm	3000 ppm	Mean
			1st season		
M1	6.82	10.14	14.27	15.39	11.655
M2	7.68	9.82	16.10	16.84	12.61
M3	9.74	11.26	17.26	18.11	14.09
M4	10.04	12.17	16.98	19.43	14.655
Mean	8.57	10.85	16.15	17.29	13.25
L.S.D at 0.05 for	IBA= 1.11	Media = 1.11	Interaction= 2.22		
			2nd season		
M1	7.37	9.84	15.26	16.46	12.23
M2	8.04	10.21	16.29	17.28	12.955
M3	9.85	12.64	18.21	19.30	15
M4	9.32	13.14	18.92	19.84	15.43
Mean	8.77	11.46	17.17	18.22	13.90
L.S.D at 0.05 for	IBA= 1.05	Media =1.05	Interaction=2.10		

Where, M_1= Sand, M_2= Sand+vermiculite, M_3=Sand+peatmoss, M_4=Sand+vermiculite+peatmoss

Data in Table (2) clear that all tested application of IBA increased the root number of *Ficus benjamina* Cv Vivian cuttings, with superior for IBA at 3000 ppm as it recorded 17.29 and 18.22 roots/cutting, followed by those received IBA at 2000 ppm as it recorded 16.15 and 17.17 roots/cutting in the first and second seasons, respectively. Moreover, IBA at 1000 ppm significantly increased roots number of cutting as it scored 10.85 and 11.46 roots/cutting in the first and second seasons, respectively. Regarding the effect of rooting media, data in Table (2) refer that using M4 medium is being the most effective one for producing the highest number of roots/ cutting as it gave 14.65 and 15.43 roots/cutting, followed by using M3 medium which recorded 14.09 and 15.00 roots/cutting in the first and second seasons, respectively. Considering the interaction effect between IBA and rooting media data in Table (2)

indicate that all combinations between rooting media and IBA concentration increased roots number of *Ficus benjamina* Cv Vivian cuttings, especially those treated with IBA at 3000 ppm and rooted at M4 medium as it scored 19.43 and 19.84 roots/cutting in the first and second seasons, respectively.

2- On root length (cm):

Table 3. Effect of some rooting media and IBA treatments as well as their combination on root length / seeding of *Ficus benjamina* cv. Vivian during 2017 and 2018 seasons.

IBA / Media	0.0	1000 ppm	2000 ppm	3000 ppm	Mean
			1st season		
M1	8.64	9.82	11.36	14.52	11.09
M2	11.32	14.31	16.21	17.81	14.91
M3	10.82	11.96	14.62	16.30	13.43
M4	11.68	14.93	17.82	19.34	15.94
Mean	10.62	12.76	15.0	16.99	13.84
L.S.D at 0.05 for	IBA= 1.07	Media = 1.07	Interaction=2.14		
			2nd season		
M1	10.36	12.48	14.26	15.37	13.12
M2	14.12	16.18	18.34	18.92	16.89
M3	13.26	16.0	17.81	18.25	16.33
M4	14.68	16.32	18.02	19.82	17.34
Mean	13.11	15.37	17.11	18.09	15.92
L.S.D at 0.05 for	IBA= 1.02	Media = 1.02	Interaction=1.04		

Where, M_1= Sand, M_2= Sand+vermiculite, M_3=Sand+peatmoss, M_4=Sand+vermiculite+peatmoss

Data in Table (3) cleared that all examined IBA concentrations increased the root length of *Ficus benjamina* Cv Vivian plant when compared with control plants in both seasons. On the other side, the increase in root length of *Ficus benjamina* Cv Vivian plants is linearly increased with the increment of IBA concentration, so the tallest root was recorded by 3000 ppm IBA-treated cuttings as it scored 16.99 and 18.09 cm, followed in descending order by 2000 ppm IBA-treated cuttings which recorded 15.00 and 17.11 cm in the first and second seasons, respectively. The differences between the abovementioned two treatments were not significant in both seasons. Respecting the effect of planting media, data in Table (3) reveal that the highest values of root length were gained by using M4 medium which scored 15.94 and 17.34 cm, followed in descending order by M2 medium as it recorded 14.91 and 16.89 cm in the first and second seasons, respectively. Referring to the interaction effect between IBA concentrations and rooting media data in Table (3) show that the combination of M4 medium significantly induced the greatest values of root length, particularly those treated with IBA at the highest concentration as it recorded 19.34 and 19.82 cm, in the first and second seasons, respectively.

4- On roots fresh and dry weights / cutting (g):

Table 4. Effect of some rooting media and IBA treatments as well as their combination on fresh weight of roots of *Ficus benjamina* cv. Vivian during 2017 and 2018 seasons.

IBA / Media	0.0	1000 ppm	2000 ppm	3000 ppm	Mean
			1st season		
M1	0.71	0.96	1.14	1.26	1.02
M2	0.94	1.17	1.29	1.32	1.18
M3	1.15	1.26	1.38	1.43	1.31
M4	1.19	1.31	1.41	1.48	1.35
Mean	1.0	1.18	1.31	1.37	1.22
L.S.D at 0.05 for	IBA= 0.07	Media =0.07	Interaction=0.14		
			2nd season		
M1	0.82	1.18	1.26	1.30	1.14
M2	1.14	1.25	1.36	1.42	1.29
M3	1.21	1.37	1.52	1.68	1.45
M4	1.26	1.49	1.64	1.74	1.53
Mean	1.11	1.32	1.45	1.54	1.35
L.S.D at 0.05 for	IBA= 0.8	Media = 0.08	Interaction=0.16		

Where, M_1= Sand, M_2= Sand+vermiculite, M_3=Sand+peatmoss, M_4=Sand+vermiculite+peatmoss

Table 5. Effect of some rooting media and IBA treatments as well as their combination on dry weight of roots of *Ficus benjamina* cv. Vivian during 2017 and 2018 seasons.

IBA / Media	0.0	1000 ppm	2000 ppm	3000 ppm	Mean
		1st season			
M1	0.084	0.115	0.136	0.152	0.122
M2	0.113	0.141	0.155	0.159	0.142
M3	0.138	0.151	0.166	0.172	0.157
M4	0.143	0.158	0.170	0.178	0.162
Mean	0.120	0.141	0.157	0.165	0.146
L.S.D at 0.05 for	IBA= 0.04	Media = 0.04	Interaction=0.08		
		2nd season			
M1	0.114	0.165	0.176	0.182	0.159
M2	0.159	0.175	0.191	0.199	0.181
M3	0.170	0.189	0.211	0.235	0.201
M4	0.176	0.209	0.230	0.243	0.215
Mean	0.155	0.185	0.202	0.215	0.189
L.S.D at 0.05 for	IBA= 0.03	Media = 0.03	Interaction=0.06		

Where, M_1= Sand, M_2= Sand+vermiculite, M_3=Sand+peatmoss, M_4=Sand+vermiculite+peatmoss

Data in Tables (4 and 5) showed that the fresh and dry weights of roots per cutting increased progressively with increasing IBA concentrations in both seasons. Hence, the highest concentrations of IBA showed to be the most effective one for inducing the heaviest root fresh and dry weights/ cutting, followed by 2000 ppm IBA-treated cuttings in the first and second seasons, respectively. As for the effect of rooting media, data in the same Table show that using M4 medium showed to be the most effective one for inducing the highest values of roots fresh and dry weights / cutting, followed in descending order by M3 medium in the two seasons. With respect for the interaction effect between IBA and rooting media data in Tables (4 and 5) show that the combination of M4 medium significantly induced the heaviest roots fresh and dry weights / cutting, particularly those treated with IBA at the highest concentration, followed by those rooted in M3 and treated with IBA at 3000 ppm in the two seasons.

5- On seedling height (cm):

Table, 6 Effect of some rooting media and IBA treatments as well as their combination on seeding length of *Ficus benjamina* cv. Vivian during 2017 and 2018 seasons.

IBA / Media	0.0	1000 ppm	2000 ppm	3000 ppm	Mean
		1st season			
M1	11.3	12.8	14.6	15.3	13.5
M2	11.8	13.1	14.9	16.2	14.0
M3	12.8	14.0	16.1	17.0	15.02
M4	12.9	14.8	16.3	17.2	15.3
Mean	12.2	13.68	15.48	16.43	14.45
L.S.D at 0.05 for	IBA= 0.83	Media = 0.83	Interaction=1.66		
		2nd season			
M1	12.1	13.8	15.8	16.2	14.48
M2	12.8	14.1	16.0	17.2	15.02
M3	13.6	15.8	17.2	17.9	16.13
M4	13.9	16.1	17.7	18.8	16.63
Mean	13.1	14.95	16.68	17.53	15.57
L.S.D at 0.05 for	IBA= 0.92	Media = 0.90	Interaction=1.84		

Where, M_1= Sand, M_2= Sand+vermiculite, M_3=Sand+peatmoss, M_4=Sand+vermiculite+peatmoss

Data tabulated in Table (6) revealed that all studied concentrations of IBA increased seedling height of *Ficus benjamina* Cv Vivian plant as compared with un-treated control in both seasons. Anyhow, it was found that there was a positive correlation between the values of plant height and the concentration of IBA. So, as the concentration of IBA increased the values of plant height increased until reach to the maximum increment at the high level in both seasons. Anyway, 3000 ppm IBA-treated cuttings induced the highest values in this concern as it scored 16.43 and 17.53 cm, followed by 2000 ppm-

treated cuttings as it recorded 15.48 and 16.68 cm in the first and second seasons of this study. Considering the effect of rooting media, data in the same Table show that using M4 medium approved to be the most pronouncing one for inducing the highest values of seedling length as it scored 15.30 and 16.63 cm, followed in descending order by M3 medium which gave 15.02 and 16.13 in the first
and second seasons, respectively. Regarding the interaction effect between IBA and rooting media data in Table (6) indicate that the combination of M4medium statistically induced the tallest seedlings, particularly those received IBA at the highest concentration as it recorded 17.2 and 18.8 cm, followed by those treated with IBA at 3000 ppm and rooted in M3 medium as it registered 17.0 and 17.9 cm in the first and second seasons, respectively.

7- On branches number / seedling:

Table 7. Effect of some rooting media and IBA treatments as well as their combination on number of branches /seedling of *Ficus benjamina* cv. Vivian during 2017 and 2018 seasons.

IBA / Media	0.0	1000 ppm	2000 ppm	3000 ppm	Mean
		1st season			
M1	2.15	2.28	2.93	3.18	2.64
M2	2.18	2.31	2.14	3.82	2.86
M3	3.14	3.92	4.26	4.73	4.01
M4	3.02	3.45	4.28	4.62	3.84
Mean	2.62	2.99	3.65	4.09	3.34
L.S.D at 0.05 for	IBA= 0.16	Media = 0.16	Interaction=0.32		
		2nd season			
M1	2.19	2.31	2.42	2.46	2.35
M2	2.26	3.21	3.81	3.92	3.30
M3	3.24	3.96	4.62	4.94	4.19
M4	3.11	3.98	4.52	4.68	4.07
Mean	2.7	3.36	3.84	4	3.48
L.S.D at 0.05 for	IBA=0.18	Media = 0.18	Interaction=0.36		

Where, M_1= Sand, M_2= Sand+vermiculite, M_3=Sand+peatmoss, M_4=Sand+vermiculite+peatmoss

The data obtained in Table (7) on branches number / seedling show that all tested concentrations of IBA statistically increased the values of branches number / seedling of *Ficus benjamina* Cv Vivian cuttings in both seasons. However, the highest values were gained by 3000 ppm IBA-treated cuttings as it gave 4.09 and 4.00 branches / seedling, followed by 2000 ppm IAB- treated cuttings which scored 3.65 and 3.84 branches / seedling in the first and second seasons, respectively. With studying the effect of rooting media data in Table (7) clear that the highest branches number / seedling was gained by M3 medium as it recorded 4.01 and 4.19 branches / seedling, followed by M4 medium which scored 3.84 and 4.07 branches / seedling in the first and second seasons, respectively. Respecting the interaction effect between rooting media and IBA concentrations, data in the same Table refer that the greatest values of branches number / seedling were gained by the combination of M3, particularly those treated with IBA at the high concentration (3000 ppm) as it scored 4.73 and 4.94 branches / seedling, followed by those received IBA at 3000 ppm and rooted in M4 medium as it recorded 4.62and 4.68 branches / seedling in the first and second seasons, respectively.

8- On leaves fresh and dry weights / seedling (g):

Data in Tables 8 and 9 pointed out that the fresh and dry weights of leaves per seedling strongly increased with increasing IBA concentrations in both seasons. Hence, the highest concentrations of IBA (3000 ppm) exhibited to be the most effective one for producing the heaviest leaves fresh and dry weights weight/ seedling in the two seasons. As for the effect of rooting media, data in the same Tables show that using M3 medium is being the most effective one for inducing the highest values of leaves fresh and dry weights / seedling, followed in descending order by M4 medium in the first and second seasons, respectively. As for the interaction effect between IBA and rooting media data in Tables (8 and 9) demonstrate that the combination of M3 medium significantly induced the heaviest leaves fresh and dry weights / seedling, especially those treated with IBA at the highest concentration, followed by those treated with IBA at 3000 ppm and rooted in M4 medium in the two seasons.

Table 8. Effect of some rooting media and IBA treatments as well as their combination on fresh weight of leaves of *Ficus benjamina* cv. Vivian during 2017 and 2018 seasons.

IBA / Media	0.0	1000 ppm	2000 ppm	3000 ppm	Mean
			1st season		
M1	2.04	2.16	2.93	3.16	2.57
M2	2.12	2.84	3.06	3.29	2.83
M3	2.86	3.17	3.94	4.12	3.52
M4	2.76	3.08	3.82	4.05	3.43
Mean	2.45	2.81	3.44	3.66	3.09
L.S.D at 0.05 for	IBA= 0.23	Media = 0.23	Interaction= 0.46		
			2nd season		
M1	2.13	2.64	3.08	3.28	2.78
M2	2.18	2.84	3.11	3.46	2.90
M3	2.92	3.41	4.12	4.32	3.70
M4	2.86	3.37	4.06	4.28	3.64
Mean	2.52	3.07	3.59	3.84	3.26
L.S.D at 0.05 for	IBA= 018	Media = 0.18	Interaction= 0.36		

Where, M_1= Sand, M_2= Sand+vermiculite, M_3=Sand+peatmoss, M_4=Sand+vermiculite+peatmoss

Table 9. Effect of some rooting media and IBA treatments as well as their combination on dry weight of leaves of *Ficus benjamina* cv. Vivian during 2017 and 2018 seasons.

IBA / Media	0.0	1000 ppm	2000 ppm	3000 ppm	Mean
			1st season		
M1	0.326	0.346	0.469	0.506	0.412
M2	0.340	0.454	0.490	0.526	0.453
M3	0.457	0.508	0.631	0.660	0.564
M4	0.442	0.493	0.612	0.649	0.549
Mean	0.391	0.450	0.551	0.585	0.494
L.S.D at 0.05 for	IBA= 0.082	Media = 0.082	Interaction=0.164		
			2nd season		
M1	0.362	0.449	0.524	0.558	0.474
M2	0.371	0.483	0.529	0.588	0.493
M3	0.497	0.580	0.740	0.743	0.640
M4	0.486	0.572	0.690	0.728	0.619
Mean	0.429	0.521	0.620	0.654	0.557
L.S.D at 0.05 for	IBA= 0.073	Media = 0.073	Interaction=0.146		

Where, M_1= Sand, M_2= Sand+vermiculite, M_3=Sand+peatmoss, M_4=Sand+vermiculite+peatmoss

The obtained results of IBA treatments are in agreement with those gained by **Standardi and Mariani (1994)** on *Nerium Oleander* cuttings (cultivars Album plenum, laura and Gambelta), **Dunn *et al.*, (1996)** on *Pistancia. chinensis*, **Reddy *et al.*, (2001)** on *Givotia rottleriformis* Griff, **Jan *et al.*, (2003)** on litchi (*Litchi chinensis)*, **Blythe *et al.*, (2004)** on *Aglaonema modestum* Schott Ex Engler, **Bharmal *et al.*, (2005)** on *Chrysanthemum morifolium*, **Ercisli *et al.*, (2005)** on *Rosa dumalis* , **Kazankaya *et al.*, (2005)** on hardwood cuttings of *Rosa canina* , **Knight *et al.*, (2005)** on azalea, **Reddy *et al.*, (2006)** on *Pelargonium graveolens* cuttings and **Hegazey (2014)** on *Conocarpus erectus* cuttings, while the results of rooting media go on line with those obtained by **Aurange *et al.* (2000)** on *Tecoma stans* seedlings, **Papafotiou *et al.* (2001)** on *Euphorbia pulchcrrima* "Peterstar", *Codiaeum variegatum* var. "Pictum", *Syngonium podophvllum* and *Ficus benjamina*, **Singh *et al.* (2002)** on *Maranta bicolor*, **El-Khalifa (2003)** on *Dalbergia melanoxyton*, **Gad (2003 a)** on *Schefflera actinophylla*, **Gad (2003 b)** on *Ficus benjamena* cuttings, **Singh and Nair (2003)** on Coleus, Syngonium, Dieffenbachia, Drecaena and Sansevieria plants, **, Abd El-Azeem (2006)** on *Ruscus hypoglossum*, **El-Attar (2006)** on *Ficus alii* cvs. Green and Variegate, **Kathiravan *et al.* (2008)** on *Jatropha curcas*, **Haidar (2010)** on *Dracaena marginata* "Bicolor" cuttings, **Mazher *et al.* (2010)** on *Jatropha curca* L and **Hegazey (2014)** on *Conocarpus erectus* cuttings.

III- Effect of IBA and rooting media as well as their combinations on chemical composition of *Ficus benjamina* Cv Vivian **seedlings:**

Table 10 Effect of some rooting media and IBA treatments as well as their combination on leaf nitrogen percentage of *Ficus benjamina* cv. Vivian during 2017 and 2018 seasons.

IBA / Media	0.0	1000 ppm	2000 ppm	3000 ppm	Mean
		1st season			
M1	1.21	1.29	1.36	1.38	1.31
M2	1.24	1.38	1.43	1.41	1.37
M3	1.31	1.42	1.39	1.46	1.40
M4	1.28	1.38	1.41	1.43	1.38
Mean	1.26	1.37	1.40	1.42	1.37
L.S.D at 0.05 for	IBA= 0.12	Media =0. 12	Interaction=0.24		
		2nd season			
M1	1.16	1.29	1.26	1.39	1.28
M2	1.26	1.31	1.38	1.37	1.32
M3	1.36	1.41	1.52	1.56	1.45
M4	1.34	1.40	1.51	1.52	1.44
Mean	1.28	1.35	1.40	1.46	1.37
L.S.D at 0.05 for	IBA=0.10	Media = 0.10	Interaction=0.20		

Where, M_1= Sand, M_2= Sand+vermiculite, M_3=Sand+peatmoss, M_4=Sand+vermiculite+peatmoss

Table, 11 Effect of some rooting media and IBA treatments as well as their combination on leaf phosphorus percentage of *Ficus benjamina* cv. Vivian during 2017 and 2018 seasons.

IBA / Media	0.0	1000 ppm	2000 ppm	3000 ppm	Mean
		1st season			
M1	0.126	0.136	0.132	0.141	0.134
M2	0.129	0.138	0.142	0.141	0.138
M3	0.138	0.151	0.149	0.158	0.149
M4	0.135	0.148	0.150	0.152	0.148
Mean	0.132	0.143	0.143	0.148	0.142
L.S.D at 0.05 for	IBA= 0.012	Media = 0.012	Interaction=0.024		
		2nd season			
M1	0.117	0.119	0.136	0.134	0.127
M2	0.121	0.134	0.131	0.140	0.132
M3	0.128	0.139	0.138	0.145	0.138
M4	0.127	0.141	0.142	0.143	0.189
Mean	0.123	0.133	0.137	0.141	0.133
L.S.D at 0.05 for	IBA=0.014	Media = 0.014	Interaction=0.028		

Where, M_1= Sand, M_2= Sand+vermiculite, M_3=Sand+peatmoss, M_4=Sand+vermiculite+peatmoss

Table, 12 Effect of some rooting media and IBA treatments as well as their combination on leaf potassium percentage of *Ficus benjamina* cv. Vivian during 2017 and 2018 seasons.

IBA / Media	0.0	1000 ppm	2000 ppm	3000 ppm	Mean
		1st season			
M1	1.12	1.19	1.17	1.26	1.19
M2	1.15	1.21	1.29	1.28	1.23
M3	1.26	1.34	1.42	1.49	1.38
M4	1.24	1.36	1.38	1.45	1.36
Mean	1.19	1.28	1.32	1.37	1.29
L.S.D at 0.05 for	IBA= 0.06	Media = 0.06	Interaction=0.12		
		2nd season			
M1	1.18	1.24	1.29	1.32	1.26
M2	1.29	1.27	1.34	1.37	1.32
M3	1.31	1.38	1.43	1.51	1.41
M4	1.29	1.41	1.39	1.48	1.39
Mean	1.27	1.33	1.36	1.42	1.35
L.S.D at 0.05 for	IBA= 0.09	Media = 0.09	Interaction=0.18		

Where, M_1= Sand, M_2= Sand+vermiculite, M_3=Sand+peatmoss, M_4=Sand+vermiculite+peatmoss

Table,13 Effect of some rooting media and IBA treatments as well as their combination on leaf total carbohydrates % of *Ficus benjamina* cv. Vivian during 2017 and 2018 seasons.

IBA / Media	0.0	1000 ppm	2000 ppm	3000 ppm	Mean
		1st season			
M1	8.29	9.17	12.31	13.21	10.75
M2	9.61	10.83	10.61	11.24	10.57
M3	10.37	11.42	12.92	13.25	11.99
M4	10.21	12.84	12.73	13.12	12.23
Mean	9.62	11.07	12.14	12.71	11.39
L.S.D at 0.05 for	IBA= 1.14	Media =1.14	Interaction=2.28		
		2nd season			
M1	9.14	11.32	11.29	11.86	10.90
M2	9.82	11.63	12.13	12.10	11.42
M3	10.68	12.06	13.42	13.94	12.53
M4	10.42	11.84	13.12	13.62	12.25
Mean	10.02	11.71	12.49	12.88	11.78
L.S.D at 0.05 for	IBA= 1.02	Media =1.02	Interaction=2.04		

Where, M_1= Sand, M_2= Sand+vermiculite, M_3=Sand+peatmoss, M_4=Sand+vermiculite+peatmoss

Data presented in Tables (10-13) showed that leaf chemical composition of *Ficus benjamina* Cv Vivian plant were greatly increased by using all tested levels of IBA as compared with control plants in both seasons. However, the richest leaf nitrogen, phosphorus, potassium and total carbohydrates contents were gained by 3000 ppm IBA-treated cuttings followed in descending order by 2000 ppm IBA-treated cuttings in the two seasons. As for the effect of rooting media data in Tables (10-13) clear that M3 and M4 media recorded the highest values of leaf nitrogen, phosphorus, potassium and total carbohydrates contents in both seasons. Studying the interaction effect between rooting media and IBA concentrations, data in Tables (10-13) indicate that the highest values of leaf nitrogen, phosphorus, potassium and total carbohydrates contents were scored by the combination of M3 and M4, particularly those treated with IBA at the highest concentration in the two seasons. On contrary, the lowest values of these parameters were gained by the combination of M1 medium, especially those received no IBA treatments in the two seasons of this study. The aforementioned results of IBA treatments concerning chemical composition go on line with those obtained by **Read and Yang (1992)** on *Ligustrum vulgaris* cutting, **Mccracken *et al.*, (1996)** on *Magnolia grandiflora* cv. Brown Velvet, **Bharmal *et al.*, (2005)** on *Chrysanthemum morifolium*, **Kazankaya *et al.*, (2005)** on hardwood cuttings of *Rosa canina*, **Knight *et al.*, (2005)** on azalea, **Reddy *et al.*, (2006)** on *Pelargonium graveolens* cuttings and **Hegazey (2014)** on *Conocarpus erectus* cuttings, while the results of rooting media coincided with **El-Fouly (1994)** on *Scindapsus aureus*, **El-Sayed (1994)** on *Brassaia actinophylla*, **Saleh (2000)** on *Ficus benjamina* "Starlight", **Gad (2003 a)** on *Schefflera actinophylla*, **Gad (2003 b)** on *Ficus benjamena* cuttings, **Kandeel and Abd El-Gayed (2004)** on *Hedera helix*, var. Variegate, **Mazher *et al.* (2010)** on *Jatropha curca* L and **Hegazey (2014)** on *Conocarpus erectus* cuttings.

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دراسات فسيولوجيه على اكثار بعض الاشجار

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الملخص العربى

تم تنفيذ هذا العمل خلال موسمي 2018/2017 و 2019/2018 في مشتل البستنة قسم كلية الزراعة جامعة بنها محافظة القليوبية لدراسة تأثير بعض وسائط التجذير المختلفة وتركيزات IBAعلى التكاثر الخضري للبخ. benjamina Cvفيفيان. قصاصات الخشب الناعمة الطرفية من Ficus benjamina Cv.تم جمع Vivianفي أكتوبر من أشجار عمرها ثلاث سنوات ، وتم معالجة القطع أخيرًا بتركيزات IBAعند 0.0 و 1000 و 2000 و 3000 جزء في المليون. تم إدخال كل قطعة في وعاء بلاستيك بقطر 8 سم يحتوي على وسط تجذير مختلف على النحو التالي: 1– الرمل 2– الرمل + الفيرميكوليت (3– (v :vالرمل + الطحالب ((v :vو 4– الرمل + الطحالب + الفيرميكوليت (الخامس: ت). أظهرت النتائج المتحصل عليها أن جميع التوليفات بين وسط التجذير وتركيز IBAأدت إلى زيادة نسبة تجذير عقل Ficus benjamina Cv Vivian، خاصة تلك المعالجة بـ IBAعند 3000 جزء في المليون والمتأصلة عند وسط M4في الموسمين. علاوة على ذلك ، تم تسجيل أعلى قيم طول الشتلة ، وعدد الأفرع ، والأوزان الطازجة والجافة للأوراق والجذور ، والنيتروجين ، والفوسفور ، والبوتاسيوم ، ومحتويات الكربوهيدرات الكلية من خلال توليفة M3و M4، خاصة تلك المعالجة بـ IBAبأعلى تركيز. في الموسمين.