

EFFECT OF PLANTING DATE AND DIFFERENT LEVELS OF INDOLE BUTYRIC ACID ON ROOTING OF *Ficus retusa* CV. *Hawaii* CUTTINGS.

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ABSTRACT

This trial was carried out during two successive seasons of 1997-1998 and 1998-1999 at Zohria Garden Ministry of Agriculture. Terminal cuttings of *Ficus retusa* cv. *Hawaii* including 5 leaves and 15 cm in length have taken at monthly interval from August to July and dipped in IBA for 10 seconds at different concentrations of 1000, 2000 and 3000 ppm as well as the control which did not receive any concentration of IBA and planted immediately in plastic pots 15 cm in diameter in green house and subjected under intermittent mist conditions.

The obtained results indicated that cuttings cultivated from May to July failed to form any roots while the other cuttings planting dates differed significantly in their effect on rooting ability, since the initial roots formation enhanced in the cuttings cultivated in March subsequently, the successful cuttings percentages increased to maximum ranking 75.03% followed. by February planting 73.8 %while August planting produced the minimum 36.9%,thereafter rooting percentages progressively increased linearly from August to March regardless the effect of IBA.

Cuttings treated with IBA ameliorated the successful of rooting compared with untreated in particular the level of 2000 ppm which increased the rooting percentage from 52% in control up to 70.3 %, whereas both of 1000 and 3000 ppm produced 65.4 and 61.9% respectively regardless the effect of planting dates. The cuttings cultivated in March and treated with 2000 ppm IBA improved roots number, stem height,, fresh and dry weight of roots while 3000ppm produced the longest roots where the mean values of those parameters were maximized . On the other hand the cuttings cultivated in December produced the minimum values. The superior growth parameter exhibited in March, February and August planting respectively and the reduction of growth was in slope descending in the cuttings planted from August to December.

The cutting planted in March induced the highest mean values in total phenols, Indole compounds in above roots of basal cutting portion and total carbohydrates in leaves, followed by February planting while the least values accompanied August planting.

There is no noticeable effect on total phenol and Indole content in above roots of cutting basal portion due to IBA treatments, while the effect was more pronounced on total carbohydrates in leaves specially the level of 2000 ppm, which increased it to maximum values compared with control.

Therefore it can be recommended that March month is the best planting date followed by February and it should not plant the cuttings of *Ficus retusa* cv. *Hawaii* through summer months (May, June, July) where the cuttings failed entirely to form any initial roots even though they were treated with IBA

Keywords: Planting dates, Terminal cuttings, Hardwood cuttings, Variegated leaves

INTRODUCTION

Ficus Hawaii is a cultivar from *Ficus retusa* and known by its variegated leaves (white and green colour) and this variety is very sensitive and needs many special management techniques to attain their full growth.

The cutting is the most familiar method for *Ficus* propagation and the ability of hardwood cuttings to produce roots varied from variety to another and may differ between the genus and species.

The best planting date varied according to different species of *Ficus* genus since Atef (1970) and Zakaria (1970) on *Ficus retusa* indicated that the best results for rooting ability were found when the cuttings were planted in February and March. Straver (1980) on *Ficus lyrata* proved that the cuttings were collected in autumn and winter hastened the growth and improved the percentage of rooting success. Souidan et al (1986) on *Ficus retusa* propagated the hardwood cuttings at monthly intervals between January and December and found that the rooting occurred throughout the months except July and August and the best results were obtained between March and May months. Zayed et al (1988) on *Ficus retusa* found that the cuttings taken in July and August gave the poorest while those taken in March and April gave the best rooting. El-malt (1989) on *Ficus benjamina* stated that the cutting gave the highest rooting percentage in March and April, while Abo Hassan et al (1994) on *Ficus infectoria* reported that the planting date of January resulted in the best results, also El-torky and El-Sennawy (1995) on *Ficus deltoidea* proved that the maximum percentage was obtained with cuttings that were taken in February. Younis (1999) on *Ficus retusa* found that the high rooting percentage was in mid-March and April while root length was in Mid April and March.

The growth regulators such as IBA, IAA and NAA were much superior to the inducement of rooting because of their greater chemical stability and their low mobility in the plants, resulted in improved persistence and more prolonged action giving a better chance of success, Audus (1963).

Many researchers have investigated the effect of growth regulators on roots formation of *Ficus* species cuttings as mentioned by Souidan et al (1986) on *Ficus retusa* where they reported that dipping the hardwood cuttings at monthly intervals with IBA at rate up to 2000 ppm resulted in enhancement of rooting percentage, El-sayed (1989) on *Ficus retusa* proved that treating the terminal cutting with IBA at rates of 500, 1000 and 2000 ppm quick dipping increased the rooting percentage. Sultan et al (1994) on *Ficus elastica* mentioned that the best rooting was correlated with application of IBA at level of 3000 ppm also El-Torky and El-Sennawy (1995) on *Ficus deltoidea* reported that the maximum rooting of cutting was obtained with 3000 ppm level IBA and significantly increased root length and root number/cutting. Younis (1999) on *Ficus retusa* indicated that treated hardwood cuttings with IBA or NAA at 2000 ppm gave the highest rooting percentage and the highest dry or fresh weight of stem and roots.

The objectives of this trial were to investigate the best planting date and the effect of different concentrations of IBA on the terminal cuttings of *Ficus Hawaii* to enhance and hasten the cutting rooting percentage.

MATERIALS AND METHODS

This investigation was conducted at Zohria garden Agriculture Ministry throughout two successive seasons of 1997- 1998 and 1998-1999.

The terminal cuttings of *Ficus retusa* cv. Hawaii including 5 leaves and 15cm in length have been taken at monthly intervals from August 1997 to July 1998 in the first season from mature trees grown in Zohria garden and the trial was repeated again in the second season otherwise the cuttings have been taken only in October, January, March and July 1999 represented seasons of autumn, winter, spring and summer respectively. The cuttings were dipped in three levels of IBA using talk powder for 10 seconds, namely 1000,2000 and 3000 ppm while the control did not receive any substance and planted immediately in plastic pots 15 cm in diameter filled with mixture of peat moss and sand (2:1 v/v)in green house under intermittent mist condition, then the cuttings succeeded to root were transplanted after one month to biggest plastic pots, 25 cm in diameter with three bottom holes to regulate the drainage each pot hold 4kg mixture of sand and peat moss (2:1). The seedlings were irrigated with Nile water and the soil moisture content maintained at 65% of field capacity.

The experiment was subjected in three replicates each of contains 36 cuttings including the treatments of 4 hormone concentrations and 9 of planting dates every treatment contained 5 cuttings. The statistical analysis was split plot design where the main plot was the different levels of IBA and the sub plot was planting dates of cuttings. The data were analyzed statistically by using L.S.D according to Snedecor and Cochran (1982) The original rooting percentages of cuttings were transferred firstly to arcsine and analyzed statistically.

The following parameters were recorded as follows after two months from transplanting date.

1-Rooting percentage

2-Root length (cm)

3-Root number.

4-Stem height (cm)

5-Fresh and dry weight of roots (gm)

6-Total carbohydrates in dry leaves as percentage of dry weight were determined as method mentioned by Smith *et al* (1956)

7-Total soluble Indole (mg/g fresh weight) was determined at above root area of cutting base according to Larsen *et al* (1962) and Selim *et al* (1978)

8-Total free phenol compounds (mg/g fresh weight) were estimated at the same previous samples according to A.O.A.C (1970) and modified by Daniel and Geroge (1972).

RESULTS AND DISCUSSION

1- Rooting percentage

Data presented in Table (1) obviously cleared that both cutting planting dates and IBA treatments at different concentrations were more effective on rooting percentage in which planting the cuttings in May, June and July failed to form any roots, even though they were treated with IBA. March planting

enhanced the rooting and gave the highest value percentage, (75.03 %) followed by February planting which gave mean value of (73.83) whereas those planted in August produced the least one (36.9%). The rooting percentage raised up gradually from August to March where the mean values were 36.9, 53.58, 57.2, 64.28, 68.93, 70.23, 73.83 and 75.03 % respectively in the first season and the results obtained from the second season indicated that the cuttings were planted in March gave the best value 77.4 % followed by January 72.63 % while the least value exhibited in October planting 60.7 % on the other hand the cuttings planted in July failed to form any roots

Concerning the effect of IBA treatments it can be concluded from Table (1) that 2000 ppm level gave the highest rooting percentage 70.25 and 79.37% in the first and second season respectively followed by 1000 ppm which gave the mean values of 65.48 and 73.03 then 3000 ppm resulted the least rooting percentage, however it was better than the control.

The interaction between cuttings planting date and the levels of IBA indicated that March planting combined with 2000 ppm IBA produced the best rooting percentage

Figure (1) cleared that the cutting rooting exceeded gradually due to planting dates from August to March and the treatments of IBA increased the rooting percentages specially the level of 2000 ppm more than the two others level.

The above mentioned results were in accordance with the findings of Atef (1970) and Zakaria (1970) who stated that the most rooting of *Ficus retusa* cuttings appeared in February and March planting than the other months. The herein obtained results cleared that the poorest rooting correlated with August planting in harmony with the obtained results of Zayed *et al* (1988) on *Ficus retusa* also Khalil *et al* (1997) on *Ficus benghlensis* and Younis (1999) on *Ficus retusa* where they found that the highest rooting percentage was in March and the poorest was in July and August

As for the growth regulators effect the herein obtained results were in agreement with those obtained by Kumer (1985) on *Ficus elastica* and El-Malt (1989) on *Ficus benjamina*, El-Sayed (1989) and Desouky (1989) on *Ficus retusa*, Sultan (1994) on *Ficus elastica* and Younis (1999) on *Ficus retusa* since all of them stated that the most treatments of IBA increased rooting percentage.

2-Root length.

Results of Table (1) obviously cleared that both planting dates and treating the cuttings by different levels of IBA were considerable affected the root length since March planting produced significantly the longest root length (22.2cm) in both seasons while cutting planted in December gave the shortest roots (13.8 cm).

The root length reduced gradually from August to December where the values were 19.25, 18.5, 17.0, 15.2 and 13.8 cm respectively after that it increased from December to March planting in the first season while in the second season the shortest roots exhibited in the cuttings planted in January 15.4 cm and the longest roots were in March planting. Regarding the effect of IBA concentrations, it can be noted from data that 3000 ppm gave

significantly the longest root length 20.43 and 21.5 cm in both seasons respectively followed by 2000 ppm while the level of 1000 produced the least. However it was better than the untreated cuttings as shown in Figure (2).

The interaction between planting dates and IBA treatments showed that the cuttings planted in March and treated with 3000 ppm IBA resulted the longest root.

The aforementioned results were in harmony with those obtained by many scientists such as EL-Malt (1989) on *Ficus benjamina* var *exatica*, also Younis (1999) on *Ficus retusa* where both of them emphasized the herein obtained results.

Concerning the effect of growth regulators on root length, Haggag (1987) on *Ficus elastica*, El-Torky and El-Sennawy (1995) on *Ficus deltoidea*. Stated that treated cutting with IBA especially 3000 ppm gave the longest root length in accordance with the herein obtained results.

3-Roots number

Data of Table (1) apparently cleared that both planting date and application of different levels of IBA gave adverse effect on root number/cutting. Since cutting planting dates in March induced significantly the largest root number where the mean value was 8.93 while those planted in December produced the least values of 5.9 in the first season and in the second season the results have taken the same trend where the mean values of roots number in March planting was the highest (9.3).

Regarding the influence of IBA treatments it might be concluded from Tables (1) that the level of 2000 ppm produced significantly the highest root number (8.43 and 8.7) followed by the level of 1000 ppm (7.1 and 7.8) then the level of 3000 ppm produced the lowest mean values of 6.8 and 7.3. On the other hand, the control gave the inferior root number 6.2 and 7.0 in the first and second season respectively.

The interaction between planting dates and supplemented application of IBA levels was significantly influenced where the data existed in Table (1) exhibited that the best results of root number/cutting appeared in March planting combined with treating the cuttings with 2000 ppm IBA level.

As shown in Figure (3) it is evident that root number reduced gradually from August to December planting after that it raised up linearly from December to March, it also might be resulted from Figure (3) that treating the cuttings with 2000 ppm IBA promoted the initiation roots and incremented the root number, followed by the level of 1000 ppm and as the level increased to 3000 ppm the root number lessed, however it was better than the control.

These results were coincided with the finding of El-Malt (1989) on *Ficus benjamina* who mentioned that the highest number of roots/cutting revealed in February and March planting, also Younis (1999) on *Ficus retusa* indicated that cuttings planted in mid of March produced the best results in number of roots / cutting.

Table (1): Effect of planting dates and different concentrations of (IBA) on rooting percentage, root length and root number of *Ficus retusa* cv. Hawaii in 1997/1998 and 1998/1999 seasons

		Season of 1997/1998														
BA ppm(A)	Planting date B	Rooting percentage					Root length (cm)					Roots number				
		Cont	1000	2000	3000	Mean	Cont	1000	2000	3000	Mean	Cont	1000	2000	3000	Mean
	August	14.20	42.90	47.60	42.90	36.90	16.30	18.60	20.40	21.70	19.25	6.00	6.80	8.50	6.50	6.90
	September	42.90	57.10	61.90	52.40	53.58	15.20	18.00	19.80	21.00	18.50	5.80	6.50	8.20	6.50	6.80
	October	52.40	57.10	66.70	52.40	57.20	14.00	16.80	17.70	19.50	17.00	5.70	6.30	7.70	6.20	6.50
	November	57.10	66.70	71.40	61.90	64.28	12.50	14.50	15.80	18.80	15.20	5.20	6.30	7.30	5.80	6.20
	December	57.10	71.40	76.20	71.00	68.93	11.20	13.00	14.30	16.70	13.80	5.20	5.70	7.00	5.70	5.90
	January	61.90	71.40	76.20	71.40	70.23	15.80	17.20	18.80	19.80	17.90	6.70	7.70	8.80	7.20	7.60
	February	66.70	76.20	81.00	71.40	73.83	18.20	20.00	20.80	22.20	20.30	7.30	8.30	9.70	8.00	8.30
	March	66.70	81.00	81.00	71.40	75.03	19.50	21.50	23.20	24.50	22.20	7.80	9.20	10.20	8.50	8.93
	May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	June	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	July	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mean	52.38	65.48	70.25	61.85	62.5	15.30	17.50	18.90	20.43	18.00	6.20	7.10	8.43	6.80	7.20
	L.S.D at 0.05 (A)				3.62					0.71						0.31
	L.S.D at 0.05 (B)				5.11					0.54						0.42
	L.S.D at 0.05 (AxB)				6.78					0.73						0.54

Season of 1997/1998

		Season of 1997/1998														
IBA ppm(A)	Planting date B	Rooting percentage					Root length cm					Roots number				
		Cont	1000	2000	3000	Mean	Cont	1000	2000	3000	Mean	Cont	1000	2000	3000	Mean
	October	52.40	61.90	71.40	57.10	60.70	16.80	18.40	20.40	21.80	19.40	6.80	7.10	8.10	7.00	7.30
	January	61.90	76.20	81.00	71.40	72.6	12.30	14.40	16.40	18.30	15.40	6.00	6.80	7.30	6.30	6.60
	March	66.70	81.00	85.70	76.20	77.40	20.10	21.50	22.90	24.40	22.20	8.20	9.50	10.80	8.70	9.30
	July	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mean	60.30	73.03	79.37	68.20	70.30	16.40	18.10	19.90	21.50	19.00	7.00	7.80	8.70	7.30	7.70
	L.S.D at 0.05 (A)				4.14					0.79						0.20
	L.S.D at 0.05 (B)				5.16					0.61						0.50
	L.S.D at 0.05 (A x B)				7.04					0.68						0.40

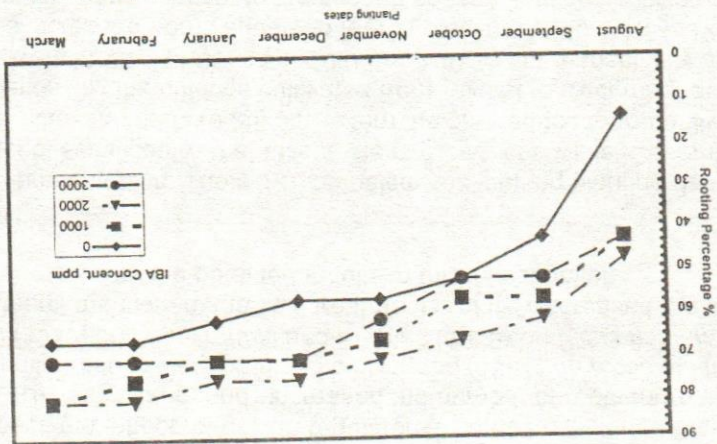


Fig. (1) Effect of planting dates and different concentrations of indole butyric acid (IBA) on Rooting percentage of *F. retusa* cv. Hawaii during 1997-1998 season.

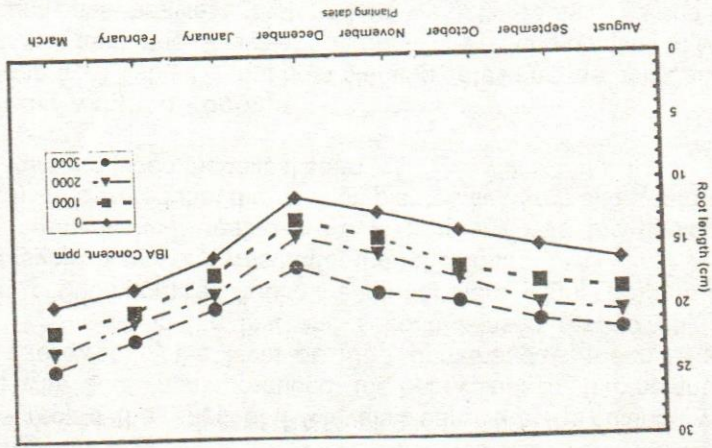


Fig. (2) Effect of planting dates and different concentrations of indole butyric acid (IBA) on Root length of *F. retusa* cv. Hawaii during 1997-1998 season.

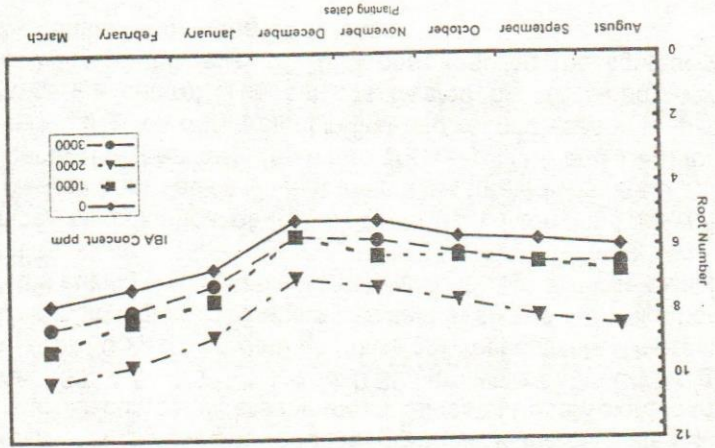


Fig. (3) Effect of planting dates and different concentrations of indole butyric acid (IBA) on Root Number of *F. retusa* cv. Hawaii during 1997-1998 season.

In this respect the effect of growth regulators it can be concluded that all treatments of IBA stimulated and increased the number of roots more than the control. Similar results were obtained by Haggag (1987) on *Ficus elastica* and El-Sayed (1989) on *Ficus retusa* and El- Malt (1989) on *Ficus benjamina* where all of them mentioned that all treatments of IBA increased the root number in agreement with the obtained results in this investigation.

4-Stem height

The data presented in Table (2) revealed that cutting planting date in March produced significantly the tallest stem 12.43 cm while December planting gave the shortest 10.25 cm. Stem height reduced gradually in linearly correlation in the cuttings cultivated from August to December since mean values were 11.83, 11.35, 11.1, 10.65 and 10.25 cm respectively after that the values increased from January to March planting 11.43, 11.94, 12.43 respectively in the first season. In the second season, cuttings cultivated in March resulted the tallest stem 13.1 cm whereas January planting induced the shortest 10.7 cm

With this regard the effect of IBA levels cleared that the cuttings, which were treated with 2000 ppm produced the best values in stem height 12.3 and 13.3 cm followed by the level of 1000 ppm that gave mean values of 11.50 and 12.10 cm in the first and second season respectively. The concentration of 3000 ppm resulted in the inferior stem height compared with the two other levels, however it was better than the control.

The prementioned results were in harmony with the findings of Younis (1999) who stated that the cuttings planted in March and treated with growth regulators produced the tallest stem

5- Fresh and dry weight of roots

It is clear from Table (2) that both planting dates and the application of IBA affected the fresh and dry weight of roots. The cutting planting in March gave significantly the heaviest fresh and dry weight of roots (2.65 and 0.93) respectively while those planted in November and December produced the lightest one.

The fresh and dry weight reduced gradually in the cultivated cuttings from August to December where the mean values of fresh weight in the first season were 1.68, 1.51, 1.30, 1.1 and 0.89 gm while in the dry weight the values were 0.77, 0.7, 0.61, 0.49 and 0.39 gm. respectively. The results of the second season indicated that the heaviest fresh and dry weight of roots appeared in the cuttings cultivated in March while the lightest one exhibited in January planting.

Concerning the influence of IBA treatment on fresh and dry weight of roots it is cleared from Tables (2) that the cutting treated with 2000 ppm IBA gave significantly the heaviest fresh and dry weight (1.8 and 1.83) for fresh and (0.81 and 0.82) for dry weight in first and second season respectively compared with the control. The cuttings treated by 1000 ppm were the intermediate whereas the level of 3000 ppm resulted the lightest weight however it was better than untreated cuttings.

Table (2): Effect of planting dates and different concentrations of (IBA) on stem height (cm), fresh and dry weight, of *Ficus retusa* cv. Hawaii roots in 1997/1998 and 1998/1999 seasons

Planting date B	IBA ppm(A)	Season of 1997/1998														
		Stem height(cm.)				Fresh weight of root (gm)				Dry weight of roots (gm)						
		Cont	1000	2000	3000	Mean	Cont	1000	2000	3000	Mean	Cont	1000	2000	3000	Mean
August		11.10	11.90	12.70	11.60	11.83	1.22	1.79	2.10	1.60	1.68	0.57	0.85	0.93	0.74	0.77
September		10.50	11.50	12.10	11.30	11.35	1.10	1.59	1.84	1.50	1.51	0.49	0.74	0.88	0.69	0.70
October		10.20	11.20	11.90	11.10	11.10	0.97	1.43	1.60	1.20	1.30	0.45	0.67	0.77	0.56	0.61
November		9.70	10.80	11.40	10.70	10.65	0.74	1.10	1.30	0.96	1.10	0.42	0.48	0.59	0.45	0.49
December		9.40	10.30	11.10	10.20	10.25	0.84	0.90	0.96	0.88	0.89	0.38	0.39	0.43	0.38	0.39
January		10.40	11.70	12.20	11.30	11.43	0.95	1.56	1.80	1.32	1.41	0.44	0.73	0.85	0.61	0.66
February		10.80	12.10	13.00	11.70	11.94	1.93	1.88	2.20	1.72	1.80	0.58	0.89	0.96	0.81	0.81
March		11.20	12.70	13.70	12.10	12.43	1.60	1.99	2.70	1.90	2.65	0.78	0.93	1.10	0.93	0.93
May		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
June		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
July		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mean		10.40	11.50	12.30	11.25	11.40	1.11	1.53	1.80	1.40	1.46	0.51	0.71	0.81	0.65	0.67
	L.S.D at 0.05(A)				0.44				0.44					0.05		
	L.S.D at 0.05(B)				0.32				0.16					0.03		
	L.S.D at 0.05(A x B)				0.53				0.14					0.06		

Planting date B	IBA ppm(A)	Season of 1997/1998														
		Stem height(cm.)				Fresh weight of root (gm)				Drv weight of roots(g)						
		Cont	1000	2000	3000	Mean	Cont	1000	2000	3000	Mean	Cont	1000	2000	3000	Mean
October		11.10	12.30	13.30	11.90	12.20	1.20	1.80	1.90	1.60	1.63	0.54	0.81	0.91	0.74	0.75
January		9.90	10.60	12.00	10.30	10.70	0.88	0.93	0.98	0.90	0.92	0.39	0.42	0.45	0.41	0.42
March		11.40	13.30	14.50	12.90	13.10	1.60	1.96	2.60	1.96	2.03	0.77	0.91	1.10	0.59	0.92
July		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mean		10.80	12.10	13.30	11.70	12.00	1.23	1.56	1.83	1.49	1.53	0.57	0.71	0.82	0.58	0.70
	L.S.D at 0.05(A)				0.42				0.21					0.07		
	L.S.D at 0.05(B)				0.63				0.13					0.04		
	L.S.D at 0.05(A x B)				0.55				0.12					0.03		

The interaction between planting dates and IBA treatments obviously cleared that the cuttings cultivated in March and treated with 2000 ppm IBA resulted in considerable root formation consequently the heaviest in fresh and dry weight. The above mentioned results were emphasized by findings of Haggag (1987) on *Ficus elastica* var *decora*, and Younis (1999) on *Ficus retusa* who mentioned that planting the cutting in March and treated with IBA enhanced the fresh and dry weight of roots

Chemical constituents

1-Total free phenol compounds

Data presented in Table (3) pronounced that total free phenol compounds content in the above roots of cutting basal portion gradually increased in the cuttings planted from August to March where the mean values were (0.14, 0.17, 0.19, 0.21, 0.25, 0.29, 0.35 and 0.42 mg/g. F.w) respectively in the first season. In the second season the cuttings, which were planted in March, recorded significantly the highest value of 0.42 mg/g compared to October planting (0.20 mg/g. F.w) followed by January planting 0.25mg/g. F.w

The whole treatments of IBA were not noticeable effected on total free phenols compounds compared to the control and the obtained values were closed approximately. On the other hand planting the cuttings in March and treating with IBA at 2000 ppm increased total free phenols compounds. The previous results were confirmed and supported by many investigators such as Mohamed (1988) on *Sambucus nigra* who mentioned that total phenols were high in the cuttings which cultivated in Spring season, Desouky (1989) On *Ficus retusa* and *Ficus elastica* var. *decora* pointed out that total phenols content increased in *Ficus retusa* cuttings cultivated during February and *Ficus decora* planted in March. Abo -Hassan et al (1994) on *Ficus infectoria* showed that the total phenols compounds in the basal parts of cuttings increased gradually from November to March planting also Younis (1999) on *Ficus retusa* reported that the total phenols increased gradually from mid February to mid March.

2-Total indole compounds

The resulted existed in Table (3) apparently cleared that the total Indole content in the above roots of cutting basal portion were increasable arrangement from August to March planting and reached the maximum in the cutting planted in March 1.1 mg while the minimum value was recorded in August planting (0.22 mg/g. F.w). The results of the second season were confirmed to those obtained from the first one where March planting gave the best value followed by January while October resulted the lowest value.

In this regard the effect of IBA applications, it can be concluded that all treatments slightly increased the values of Indole compounds compared to control and the differences were insignificant.

As for the interaction between planting dates and IBA levels, the cuttings planted in March and treated with 2000 ppm IBA induced a slight increase in values of Indole compounds.

Table (3): Effect of planting dates and different concentrations of (IBA) on total indole, phenols and carbohydrates in *Ficus retusa* cv. Hawaii in 1997/1998 and 1998/1999 seasons

		Season of 1997/1998														
IBA ppm(A)	Planting date B	Total phenols (mg / g)					Total Indole(mg/g)					Total Carbohydrates %				
		Cont	1000	2000	3000	Mean	Cont	1000	2000	3000	Mean	Cont	1000	2000	3000	Mean
	August	0.13	0.14	0.14	0.14	0.14	0.22	0.22	0.23	0.22	0.22	1.04	1.20	1.20	1.04	1.12
	September	0.14	0.18	0.18	0.18	0.17	0.31	0.31	0.31	0.31	1.04	1.30	1.33	1.14	1.21	
	October	0.18	0.20	0.20	0.19	0.19	0.33	0.34	0.34	0.34	1.20	1.33	1.34	1.21	1.27	
	November	0.19	0.22	0.22	0.22	0.21	0.46	0.46	0.46	0.46	1.33	1.43	1.54	1.33	1.41	
	December	0.22	0.25	0.26	0.25	0.25	0.56	0.56	0.57	0.56	1.40	1.80	1.80	1.80	1.70	
	January	0.28	0.29	0.30	0.30	0.29	0.65	0.67	0.67	0.67	1.70	1.98	3.04	2.80	2.63	
	February	0.32	0.35	0.36	0.35	0.35	0.79	0.92	0.93	0.89	2.50	4.30	4.92	4.30	4.01	
	March	0.39	0.42	0.43	0.42	0.42	0.91	1.10	1.10	1.10	3.60	5.96	6.10	5.50	5.30	
	May	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	June	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	July	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Mean	0.23	0.26	0.26	0.26	0.25	0.53	0.57	0.58	0.57	0.56	1.73	2.54	2.66	2.39	2.33
	L.S.D at 0.05(A)	N.S					N.S					0.49				
	L.S.D at 0.05(B)	0.08					0.26					0.37				
	L.S.D at 0.05(A x B)	0.17					0.19					0.51				

		Season of 1997/1998														
IBA ppm(A)	Planting date B	Total phenols (mg / g)					Total Indole(mg/g)					Total Carbohydrates %				
		Cont	1000	2000	3000	Mean	Cont	1000	2000	3000	Mean	Cont	1000	2000	3000	Mean
	October	0.16	0.21	0.21	0.20	0.20	0.34	0.35	0.35	0.34	0.35	1.20	1.34	1.40	1.34	1.32
	January	0.22	0.26	0.26	0.25	0.25	0.56	0.57	0.56	0.56	0.57	1.40	1.92	1.93	1.90	1.79
	March	0.41	0.42	0.43	0.42	0.42	0.91	1.10	1.11	1.11	1.10	3.80	6.60	7.170	6.13	5.91
	July	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mean	0.26	0.30	0.30	0.29	0.29	0.60	0.67	0.68	0.67	0.67	2.10	3.29	3.48	3.12	3.00
	L.S.D at 0.05(A)	N.S					N.S					0.77				
	L.S.D at 0.05(B)	0.09					0.23					0.34				
	L.S.D at 0.05(A x B)	0.15					0.32					0.43				

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Generally total indole compounds were higher than total phenols in above area of roots near to cutting base

The previous results were in harmony with those obtained by many investigators such as Fedoravo (1974) on *Larix siberica*, Mohamed (1988) on *Sambucus nigra*, El-Malt (1989) on *Ficus benjamina* and Younis (1999) on *Ficus retusa*. All of them reported that the total Indole compounds were increased in the cuttings planted in mid February and mid March.

Total Carbohydrates in leaves.

Table (3) demonstrated that the total carbohydrates in leaves gradually increased in cuttings planted from August to March where the mean values were 1.12, 1.21, 1.27, 1.41, 1.7, 2.63, 4.01 and 5.3 % respectively. It is evident that in the first season the cuttings of March planting had significantly the superior value of 5.3 % followed by February planting 4.01% while January value was 2.63 % after that a dramatic decreases were occurred. Similar results were recorded in the second one where March planting produced significantly the highest total carbohydrates 5.91 % and sharply decreased in both of January and October planting which gave 1.79 and 1.32 % respectively.

Regarding the effect of different concentrations of IBA on total carbohydrates content, it is evident that the treated cuttings with 2000 ppm IBA produced the best results 2.66 % followed by 1000 ppm 2.54% then the level of 3000 ppm 2.39%, it is meaning that the application of IBA resulted in an increases in total carbohydrates compared with untreated cuttings.

The interaction between IBA treatments and planting dates clearly revealed that the highest values of total carbohydrates obtained from the cuttings cultivated in March and treated by 2000 ppm IBA. These results confirmed that as total carbohydrates increased the rooting ability hastened and ameliorated.

The former obtained results were in agreement with those obtained by Nouman (1982) on olive, Desouky (1989) on *Ficus retusa* and *Ficus decora*, El-Malt (1989) on *Ficus benjamina* and Younis (1999) on *Ficus retusa*. All of those investigators demonstrated that total carbohydrates percentages were higher in March planting.

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تأثير ميعاد الزراعة والمعاملة بحمض اندول بيوتيريك على تجذير عقل الفيكس العادي صغير الاوراق صنف هاواي

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أجريت هذه الدراسة خلال موسمين متتاليين ١٩٩٧-١٩٩٨ و١٩٩٨-١٩٩٩ في حديقة الزهريّة التابعة لوزارة الزراعة على نبات الفيكس صغير الاوراق صنف هاواي حيث جمعت عقل الفيكس هاواي محتوية على خمسة اوراق وبطول ١٥ سم شهريا اعتبارا من أغسطس حتى شهر يوليو ثم عوملت قواعد العقل بتركيزات ١٠٠٠، ٢٠٠٠، ٣٠٠٠ جزء في المليون من اندول بيوتيريك أسيد ثم زرعت لعقل مباشرة في قساري بلاستيك بقطر ١٥ سم ووضعت في صوبة زجاجية تحت نظام الانضباب المتقطع كانت النتائج المتحصل عليها قد أوضحت أن العقل المنزرعة من شهر مايو حتى يوليو قد فشلت في تكوين مجموع جذري. بينما زراعة العقل في الأشهر من أغسطس حتى مارس قد اختلفت معنويا في تأثيرها على نسبة التجذير حيث وجد أن العقل المنزرعة في شهر مارس زاد فيها تكوين المبادئ الجذرية وزادت النسبة المئوية لنجاحها فوصلت إلى ٧٥,٣% أما العقل المنزرعة في فبراير كانت نسبة التجذير ٧٣,٨% بينما العقل المنزرعة في شهر أغسطس قد أنتجت أقل نسبة تجذير ٣٦,٩% بصرف النظر عن تأثير الاندول بيوتيريك أسيد ثم زادت بعد ذلك نسبة التجذير تدريجيا من شهر أغسطس إلى مارس. معاملة العقل بحامض اندول بيوتيريك أسيد قد حسن وزاد من نسبة التجذير إذا ما قورنت بالعقل الغير معاملة ففي العقل المعاملة بتركيز ٢٠٠٠ جزء في المليون كانت نسبة التجذير ٧٠,٣% بينما كانت في العقل المعاملة بتركيز ١٠٠٠ جزء كانت ٦٥,٤ وفي المعاملة بتركيز ٣٠٠٠ جزء في المليون كانت ٦١,٩ بصرف النظر عن تأثير ميعاد الزراعة. العقل المنزرعة في شهر مارس والمعاملة بالاندول بيوتيريك أسيد بتركيز ٢٠٠٠ جزء في المليون قد أدى ذلك إلى تحسين وزيادة النمو ممثلا في عدد الجذور و طول الساق- الوزن الطازج والجاف للجذور للدرجة القصوى بينما زاد طول الجذور عند معاملة العقل بتركيز ٣٠٠٠ جزء في المليون وكانت القيم أقل ما يمكن عند زراعة العقل في شهر ديسمبر وكان النقص في عناصر النمو خطيا في العقل المنزرعة من شهر أغسطس حتى ديسمبر. زراعة العقل في شهر مارس زادت نسبة المركبات الفينولية والاندولات في الجزء العلوي من الجذور بالقرب من قاعدة العقلة والكربوهيدرات الكلية في الاوراق في حين زراعة العقل في شهر أغسطس أنتجت أقل القيم ثم زادت القيم تدريجيا من أغسطس حتى مارس بصرف النظر عن تأثير معاملات الاندول بيوتيريك أسيد. لم يكن هناك تأثير ملحوظ لمعاملات حمض الاندول بيوتيريك على المركبات الاندوليتيما الفينولية بينما كان للتأثير واضحا على الكربوهيدرات الكلية خاصة عند المعاملة بتركيز ٢٠٠٠ جزء في المليون حيث زادت نسبة الكربوهيدرات مقارنة بالكنترول. وبناء على ذلك فإنه يمكن التوصية بزراعة عقل الفيكس هاواي في شهر مارس او فبراير ومعاملتها بحمض اندول بيوتيريك بتركيز ٢٠٠٠ جزء في المليون حيث اعطت العقل اعلى نسبة نجاح ولا ينصح بزراعة العقل خلال اشهر الصيف اعتبارا من شهر مايو حتى يوليو حيث فشلت العقل في تكوين جذور حتى ولو عوملت بحمض الاندول بيوتيريك.