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## In vitro Studies on Growth and Rooting of Some Fig Cultivars

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### ABSTRACT

The shoots regenerated from shoot tips of three Fig cultivars (Aboudi, Gizy and Sultany) plantlets from the establishment stage were cultured individually on Murashige and Skoog (MS) medium supplemented with 0.5 mg/l 6-benzylaminopurine. Different cytokinin types (kinetin, 6-benzylaminopurine, 2ip (Isopentyl adenine) and cytokinin like compound (Thidiazuron (TDZ) were tested. Moreover, Murashige and Skoog (MS) and woody plant medium (WPM) were studied in proliferation and rooting stage. Data indicated that using of solid woody plant medium supplemented with 0.5 mg/l kinetin enhanced the highest number of shoots, shoot length and numbers of leaves in all fig cultivars. Moreover, woody plant medium was better than Murashige and Skoog medium at proliferation and rooting stage. In addition, woody plant medium supplemented with 2mg/l IBA enhanced the root length and number of roots. Also, the highest values of leaves number during rooting stage were obtained when using of free solid Murashige and Skoog medium.

**Keywords:** Fig cultivars, Kinetin, Murashige and Skoog Medium (MS), Proliferation, Rooting.

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## INTRODUCTION

The cultivated fig (*Ficus carica* L) is well known for its nutritive value and is consumed both fresh and process dried. The seeds of fig are non-viable, hence the fig is propagated through vegetative propagated in sores uniformity, relatively low multiplication rates are because those materials can be obtained only from upright branches which result in poor rooting Kumar *et al* [1].

Micropropagation in fig serves the purpose of mass scale production of high quality planting material Rout *et al.* [2].

The most important technique of micropagation of *Ficus carica* was affected by many factors [3] and [4], these factors included explants type.

Medium type, medium strength, axillaries buds were used to regenerate multiple shoots and growth regulators. Gharbia *et al.* [5] showed that, the best medium for shoot multiplication shown in the medium supplemented with 0.4mg/l kinetin and 4.0mg/l<sub>2</sub>, 4 –D.

In addition, rooting of individual shoots was attained in a medium supplemented with 0.5 mg/l IBA and NAA Thidiazuron has been used for induction of somatic embryogenesis with a higher efficiency and frequency compared to other cytokinin of the combination treatments of auxin and Cytokinin [6] , [7] and [8].

The highest values of rooting were observed with MA medium supplemented with 1.0mg/l IBA for rooting of fig Dhage *et al.* [9], 1.0 mg/l Soliman *et al.* [10] and hormone free medium [11] and [12] .

Thus, the objective of our study was the effect of different cytokinin, cytokinin like and medium type on in vitro proliferation and rooting of three fig cultivars (Aboudi–Gizy and Sultany).

## MATERIALS AND METHODS

This study was carried out in the tissue culture laboratory of Pomology Dept, National Research center, during the period, from 2012-2015.

Shoot tips of three fig cultivars (Sultany, Gizy and Aboudi) plantlets from the establishment stage were cultured individually and Murashige and Skoog [13] as a basal medium supplemented with 0.5 mg/l 6-benzylaminopurine (BAP), 30g/l sucrose and 6 g/l Difco Bacto agar, the pH of the medium was adjusted 5.7 and autoclaved at 121°C and 15 lB/inc<sup>2</sup> for 20 minutes. The cultured explants were incubated under 16 hours of artificial light (Fluorescent light at 30 UM/Sec) and 8 hours of darkness at average temperature 23±2°C [4].

Sub culturing was done regularly every 6 weeks intervals in all stages and experiments. This investigation was carried out as follow:

- 1- Effect of cytokine type, medium type and cytokinin in like compound: kinetin, 6-benzylaminopurine, 2ip (Isopentyladenine and Thidiazuron (TDZ) were applied to both Murashige and Skoog and woody plant medium at 0.5 mg/level either alone or in combinations to detect the optimum cytokinin and medium type which induce the largest proliferation [14].
- 2- Effect of medium type on Rooting.

Both of Murashige and Skoog and woody plant medium (Lloyd, G. and B.H. McCown) [15] were tested as free medium or supplemented with Indol - 3- butyric acid (2 mg/l) to find out the best medium which give the greatest rooting at the end of experiments, average, shoot number, leaf number, shoot length (cm), root length (cm) and number of roots were recorded after 6 weeks of culturing.

### Statistical design:

Treatments were arranged in complete randomized design; each treatment was replicated 5 times. Means were compared according to the method described by [16].

**RESULTS AND DISCUSSION**

**1. Proliferation stage:**

**1-a- Number of shoots:**

Table (1) and (Fig. 1) show the effects of different medium types on number of shoots parameter of different Fig cultivars. It is clear that woody plant medium (WPM) supplement with 0.5 mg/l kinetin Significantly increased number of shoots followed by Murashige and Skoog medium (MS) Supplemented with 3 mg/l BA+0.1mgGA<sub>3</sub> as compared with MS medium +2mgTDZ+4mg/l 2iP in a descending order. On the other hand, Number of shoots parameter was not statistically affected by different used *Ficus carica* cultivars.

Dealing with the interaction between medium types and *Ficus carica* cultivars, it is quite evident that different interactions failed to induce any statistical differences when number of shoots was concerned.

**Table (1): Effect of different medium type on number of shoots during multiplication stage of different Ficus Carica cultivars.**

Growth parameter	shoot number(No)					
	Cultivar	Treatment	Sultany	Gizy	Aboudi	Mean
		MS+2mgTDZ+4mg2iP	17.67	30.33	22.00	23.33
		WP+0.5 Kin	75.78	52.80	49.00	59.19
		MS+3 mgBA+0.1mgGA <sub>3</sub>	45.59	44.11	29.66	39.79
		Mean	46.34	42.41	33.56	
		LSD cultivar	NS			
		LSD Treatment	13.13			
		LSD C*T	NS			

**b- Shoot length:**

It is clear from table (2) and (Fig. 1) that shoot length was significantly increased as woody plant medium (WPM) supplemented with 0.5 mg/l kinetin was used. On the other hand, MS medium supplemented with 2mgTDZ+4mg2iP and MS+3mg/l BA+0.1mgGA<sub>3</sub> had similar statistical effect on shoot length. On contrast, statistical differences were lacked between Sultany, Gizy and Aboudi cultivars concerning shoot length parameter. In addition, different combinations investigated failed to induce statistical differences with shoot length parameters..

**Table (2): Effect of different medium types on shoot length during multiplication stage of different Ficus Carica cultivars.**

Growth parameter	shoot length (cm)					
	Cultivar	Treatment	sultany	Gizy	Aboudi	Mean
		MS+2mgTDZ+4mg2iP	1.40	0.76	1.61	1.26
		WP+0.5 Kin	2.88	2.60	2.37	2.62
		MS+3 BA+0.1mgGA <sub>3</sub>	1.73	2.04	1.52	1.76
		Mean	2.00	1.80	1.83	
		LSD cultivar	NS			
		LSD Treatment	0.56			
		LSD C*T	NS			

**1-c- Number of leaves:**

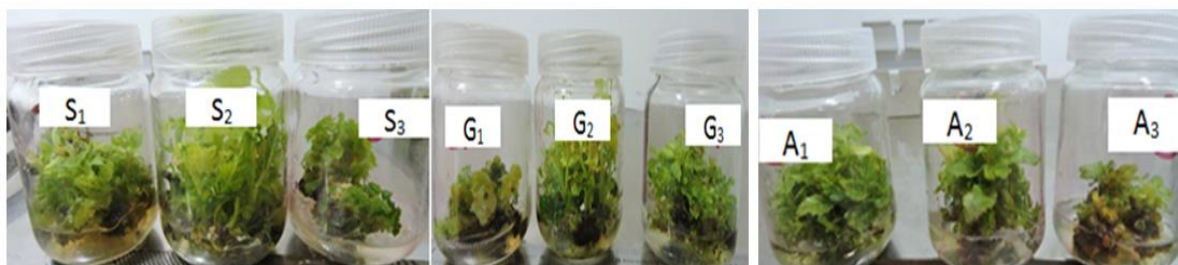
It appears from table (3) and (Fig. 1) that sultany fig cultivars was significantly superior in maximizing number of leaves as compared with both of Gizy and Aboudi fig cultivars. Meanwhile, using woody plant medium supplemented with 0.5 mg/l kinetin was recommended because significant increasing number of leaves followed by using MS medium MS+3 mg/l BA+0.1mg GA<sub>3</sub> as compared with using MS medium+2mg TDZ+4mg 2iP in a descending order. On the other hand, different combinations investigated failed to induce statistical differences with number of leaves.

In general, the aforementioned results indicated that woody plant medium (WPM) supplemented with 0.5 mg/l kinetin is the most suitable. This result may be due to kinetin surpassed BA, TDZ and 2ip in increasing all parameters under study.

These results confirm the findings of [10] and [4] they found that the best shoot proliferation of fig (*Ficus carica* L) was observed on medium contained kinetin.

**Table (3): Effect of different medium type on number of leaves during multiplication stage of different *Ficus Carica* cultivars.**

Growth parameter	Number of leaves (number)					
	Cultivar	Treatment	sultany	Gizy	Aboudi	Mean
		MS+2mgTDZ+4mg2iP	2.84	1.04	1.50	1.79
		WP+0.5 Kin	4.53	2.97	4.03	3.84
		MS+3mg/l BA+0.1mgGA <sub>3</sub>	4.09	3.61	2.99	3.56
		Mean	3.82	2.54	2.84	
	LSD cultivar		1.02			
	LSD Treatment		1.02			
	LSD C*T		NS			



**Figure 1: showed growth performance of three *Ficus carica* cultivars (S: sultany, G: Gizy, A: Aboudi) meanwhile numbers indicates to medium type**

**2- Rooting stage:**

**2-a- Number of roots:**

Table (4) and photo (4) indicate that using woody plant media plus IBA (2mg/l) was the best media as it significantly has increased number of roots followed by using Murashige and Skoog media + IBA(2mg/l) then Murashige and Skoog media free as compared with woody plant media free in a descending order. On the other hand, using different *Ficus carica* cultivars failed to induce any statistical differences when number of roots parameter was considered. Dealing with the interaction between treatments and different *Ficus carica* cultivars, it is quite evident from table (4) that different interactions failed to induce any statistical differences when number of roots was concerned.

**Table (4): Effect of different medium type on number of roots during rooting stage of different Ficus Carica cultivars.**

Growth parameter Cultivar Treatment	Number of roots (number)			
	sultany	Gizy	Aboudi	Mean
MS+2mg /l IBA	13.00	7.67	18.00	12.89
WP+2mg/l IBA	19.00	12.67	18.33	16.67
Free WP	10.67	4.00	8.00	7.56
Free MS	8.33	10.00	8.50	8.94
Mean	12.75	8.58	13.21	
LSD cultivar	NS			
LSD Treatment	5.19			
LSD C*T	NS			

**2-b- Root length:**

Table (5) and Fig. 2) showed the effect of different medium types on root length during rooting stage of different *Ficus carica* cultivars. It is clear that using woody plant media plus 2mg/l IBA was more effective in increasing root length followed by Murashige and Skoog media plus 2mg/l IBA then Murashige and Skoog medium free as compared with woody plant media. Furthermore, it is clear from table (5) that root length of Aboudi and sultany fig cultivars significantly surpassed Gizy fig cultivar.

On the other hand, both Aboudi and sultany fig cultivars failed to exhibit any significant differences when root length parameter was concerned.

Dealing with the interaction between different fig cultivars and different treatments, it is quite evident from table (5) that different interactions failed to induce any statistical differences when root length was concerned.

**Table (5): Effect of different medium type on root length during rooting stage of different Ficus Carica cultivars.**

Growth parameter Cultivar Treatment	Root length (cm)			
	sultany	Gizy	Aboudi	Mean
MS+2mg /l IBA	3.21	1.40	3.15	2.59
WP+2mg/l IBA	4.49	2.44	3.60	3.51
Free WP	1.73	0.60	1.45	1.26
Free MS	1.29	1.22	3.75	2.08
Mean	2.68	1.41	2.99	
LSD cultivar	0.87			
LSD Treatment	1.00			
LSD C*T	NS			

**1-c- Number of leaves per shoot:**

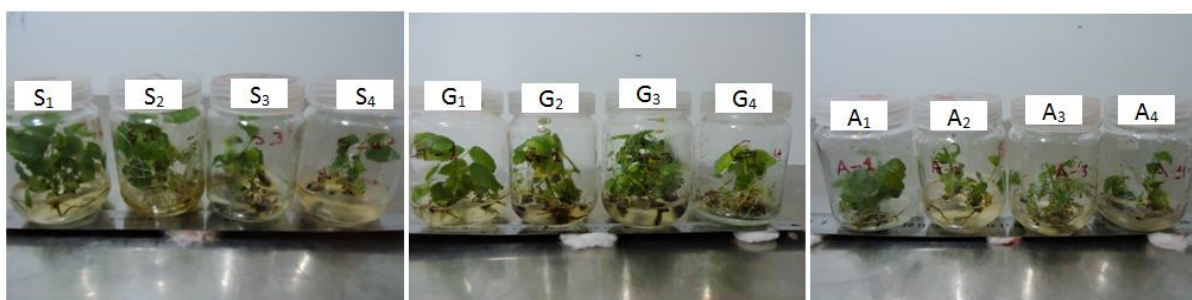
It is well noticed from table (6) and (fig. 2) that Aboudi cultivar was significantly superior in number of leaves per shoot parameters as compared with both sultany and Gizy fig cultivars. However, using Murashige and Skoog as free hormone media significantly increased number of leaves per shoot as compared with other medium treatments. On the other hand, using different medium treatments failed to induce any statistical differences when number of leaves per shoot parameter was considered as compared with MS media free. Moreover, table (6) explains that different combinations investigated failed to induce statistical differences with number of leaves per shoot.

From the aforementioned results on any explants conclude that woody plant media plus 2mg/ IBA is most suitable for increasing root length and number of roots. Also, Murashige and Skoog medium free is suitable for increasing number of leaves per shoot.

These results are in harmony with the findings of HepaKsoy and Aksoy[17]found that the media with an auxin concentration that is suitable for root number of length of *Ficus carica*. In addition Nobre and Romano [18]and Gharbia *et al.* [5] recommended IBA concentrations for encouraging rooting of *Ficus carica* L. However, the above results can recommended that Aboudi fig cultivar gave the highest root length and number of leaves per shoot. These results from the findings of Mustafa *et al.* [4] stated Aboudi fig cultivars gave the best fig cultivars.

**Table (6): Effect of different medium type on number of leaves during rooting stage of different Ficus Carica cultivars.**

Growth parameter Cultivar Treatment	Number of leaves/ shoot number			
	sultany	Gizy	Aboudi	Mean
MS+2mg /l IBA	6.89	5.78	6.00	6.22
WP+2mg/l IBA	6.75	5.89	6.99	6.55
Free WP	6.33	7.89	6.78	6.99
Free MS	7.22	6.78	8.33	7.44
Mean	6.79	6.58	7.03	
LSD cultivar	1.88			
LSD Treatment	2.17			
LSD C*T	Ns			



**Figure 2:** showed growth performance of three *Ficus carica* cultivars (S: sultany, G: Gizy, A: Aboudi) meanwhile numbers indicate to medium type

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