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RESPONSE OF DATE PALM (*PHOENIX DACTYLIFERA* L.) CV. ZAGHLOUL OFFSHOOTS TO PHLOROGLUCINOL AND HUMIC ACID UNDER NURSERY CONDITION

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ABSTRACT

An investigation was conducted at the nursery of Hort. Res. Inst., Giza, Egypt during 2008/2009 and 2009/2010 seasons to study the effect of drenching soil mixture with phloroglucinol (a tri-hydroxyphenol, PG) at 0, 81, 162 and 324 mg/L, humic acid (NPK liquid organic fertilizer, HA) at 0, 5 and 10 ml/L and their interactions on survival and rooting percentages, growth and chemical composition of date palm (*Phoenix dactylifera* L.) cv. Zaghloul offshoots grown in 50-cm-diameter plastic bags filled with about 35.0 kg of sand + clay soil mixture (2:1, v/v) under nursery conditions. The drenching was done 4 times with 2 months interval through the growth period starting from end of April to end of October.The obtained results indicated that survival (%), rooting (%), root length (cm) and No. roots/offshoot were progressively increased with increasing concentration of either PG or HA. A similar trend was also obtained regarding rooting efficiency index (REI %), leaf length (cm), No. new formed leaves/offshoot and their fresh and dry weights(g). In addition, the percentages of N, P and K in the new formed leaves showed a marked increase in response to application of either PG or HA. However, the prevalence in all previous parameters was due to the combined treatment between PG at 324 mg/L and HA at 10 ml/L, as this combination recorded the utmost high means compared to control and all other treatments.So, in order to get highest survival and rooting percentages, best growth and chemical composition from date

palm (*Phoenix dactylifera* L.) cv. Zaghloul offshoots. it could be recommended to drench the soil mixture with phloroglucinol at 324 mg/L + humic acid at 10 ml/L, four times with two months interval through the period from end of April to end of October.

INTRODUCTION

Phoenix dactylifera L., Date Palm, which belongs Fam. Palmae, is considered a common fruit grown in tropical and subtropical areas. It is a dioecious feather palm, up to 30 m high with a solitary trunk covered by rather spaced leaf bases. Every part of the plant is utilized, chiefly its delicious fruits, which constitute the major component of the daily diet and play an important role in exportation in some countries. Date palmes are intimately connected with the Egyptian landscape, as the trees grow in everywhere (El-Hadidi and Boulos, 1979).

Propagation of date palm by seeds usually gives rise to variations in fruit quality and the productivity. So, offshoots that produce at the base of trunk are mainly used for vegetative propagation. The availability of these offshoots is limited because the number produced by each palm tree is low according to the variety and non-sufficient for the commercial production. Moreover, offshoots exhibit high mortality rate when separated from the mother trees and translocate to the nursery for rooting. Decay of the detachment surface seems to be the major reason for this failure (Corner, 1966). Therefore, many trials were conducted to rise the survival percentage of the transplanted offshoots and improve number and quality of the new formed roots. In this regard, Hassan *et al.,* (2005) found that phloroglucinol (PG) at 162 and 324 mg/L in the presence of 0.1 mg/L NAA greatly increased growth vigor, root number and length of date palm dry cultivar Sakkoty plantlets. PG at the rate of 162 mg/L + NAA at 0.1 mg/L gave the highest survival (%) during adaptation stage. Likewise, Abdel-Galeil (2007) reported that PG at 40 mg/L stimulated root number and length of Zaghloul cv. *in vitro* through either direct or indirect somatic embryogensis.

The beneficial effects of PG may be due to its ability to depress the peroxidase activity within the cell, thereby protecting the auxin from peroxidase-catalyzed oxidation (De Clerk *et al.,* 1999), or acts as an auxin synergist during the auxin-sensitive phase of root initiation

(James and Thurbon, 1981). Preconditioning of shoot cultures by PG has been reported to initiate adventitious roots in different woody species *in vitro* (James, 1983).

On the other plants, Joenes (1976) stated that phloroglucinol enhances growth and rate of axillary shoot proliferation from shoot tip cultures of several woody plants. Aklan *et al.,* (1997) demonstrated that the best rooting (90%) in M26 and MM106 clonal apple rootstock was achieved with 1 µM IBA + 162 mg/L PG treatment, whereas Sarker and Naik (2000) mentioned that PG induced rooting of potato shoot tips without exogenous application of auxin in the shoot tips proliferation medium. On *Citrus sinensis*, Schmidt *et al.,* (2000) clarified that the percentage of rooted shoots increased linearly in relation to the concentration of PG in the multiplication medium, reaching 80% in shoots derived from cultures supplemented with 120 mg/L PG. In addition, Gururaj *et al.,* (2004) pointed out that phloroglucinol had a synergistic effect on shoot multiplication of *Decalepis hamiltonii* (an endangered shrub) when added with N6-benzyladenine and gibberellic acid. The long shoots were rooted well on 5.38 µM NAA + 400 µM PG containing medium. The plantlets were hardened and their field survival rate was 90%.

Humic acid (HA) is being used widely now for production of most crops, as it provides soil microbs with energy, improve nutrients retention in the soil and enhance the water holding capacity (Dorer and Peacock, 1997). In this respect, Evans and Li (2003) revealed that HA at 2500 and 5000 mg/L increased lateral root number, lateral root length and roots dry weight of *Catharanthus roseus, Pelargonium hortorum, Tagetes patula* and *Viola tricolor.* On Schefflera, El-Sayed and El-Shal (2008) declared that humic acid at either 5 ml/L as a foliar spray or 10 ml/L as a soil drench greatly improved vegetative and root growth, as well as leaves content of N, P, K, Zn, Fe and Mn. On the same line, were those results of Abdel-Fattah *et al.,* (2008) on Tifway bermudagrass, and the same author *et al.,* (2009) on Dracaena and Ruscus.

This work, however aims to detect the response of date palm soft cv. Zaghloul offshoots to phloroglucinol, as one of the most active rooting hormones under nursery conditions in the presence or absence of humic acid, a liquid organic fertilizer.

MATERIALS AND METHODS

A study was carried out in the open field at the nursery of Hort. Res. Inst., Giza, Egypt during the two successive seasons of 2008/2009 and 2009/2010 in order to rise the rooting percentage of date palm cultivar Zaghloul offshoots under nursery conditions, and consequently decrease the loss.

So, good health and strong offshoots of date palm (*Phoenix dactylifera* L.) soft Zaghloul cultivar with about 46.0 cm circumference at the base and carry about 6.0 leaves, were carefully separated from adult trees grown at Giza Governorate. Adventitious roots, older leaves and other external tissues were carefully removed from the selected offshoots and the apical meristem was surrounded by the left leaves by tieing them together with a rope. Afterwards, offshoots were dipped in a 0.5% solution of Topsin-M, 70% WP (Sumitomo Chemical Co., Ltd, Osaka, Japan) for 30 minutes, and then planted on April, 15th for both studied seasons in 50-cm-diameter plastic bags (one offshoot/bag) filled with about 35.0 kg of sand+clay soil mixture (2:1, by volume). Some physical and chemical properties of the used soil mixture were determined according to the standard methods described by Richards (1954) and illustrated in Table (a).

Table (a): Some physical and chemical properties of the used soil mixture in the two seasons.

Season	Particle size distribution (%)				S.P.	pH	E.C. (ds/m)	Cations (meq/L)				Anions (meq/L)		
	Coarse sand	Fine sand	Silt	clay				Ca^{++}	Mg^{++}	Na^{+}	K^{+}	HCO_3^-	Cl^-	SO_4^{--}
2008/09	67.02	7.48	11.80	13.70	25.86	7.63	4.51	24.12	10.00	36.55	1.56	3.60	25.16	43.47
2009/10	65.70	9.50	10.27	14.53	26.03	7.58	4.13	25.71	9.38	37.21	1.42	3.48	24.33	45.91

After one week from planting, the cultivated offshoots were irrigated with 8 liters of fresh water/bag, while after another week (at the end of April), they were subjected to the following treatments:

A. Phloroglucinol (PG) treatments:

Phloroglucinol dehydrate (98%), a tri-hydroxyphenol ($C_6H_6O_3$, FW 126.11) manufactured by Alfa Aesar Gambll & Cokg,

Zepplinstrabe 7-76185 Korlsruhe, Germany, was applied bimonthly as a soil drench at the level of 0, 81, 162 and 324 mg/L.

B. Humic acid (HA) treatments:

Actosol, a humic acid NPK (10:10:10) liquid organic fertilizer, was also added bimonthly as a soil drench at the rates of 0, 5 and 10 ml/L. the different constituents of the used liquid organic fertilizer (actosol) are shown in Table (b).

Table (b): Main characteristics of actosol® used in the two seasons.

Components	Value	Components	Value	Components	Value
Humic acid (%)	2.9	EC(dS/m)	59.3	B (mg/L.)	70.00
Organic matter/total solid (%)	42.51	N (%)	10.00	Fe (mg/L.)	900.00
Total HA/total solid	165.80	P (%)	10.00	Mn (mg/L.)	90.00
Organic carbon (%)	24.64	K (%)	10.00	Zn (mg/L.)	90.00
C/N ratio	2.46	Ca (%)	0.06		
pH	8.10	Mg (%)	0.05		

C. PG and HA interaction treatments:

Each level of PG was combined with each one of HA to form twelve interaction treatments.

The previous treatments have been applied four times starting from the end of April till the end of October (once every two months). The quantity of the added solution of each treatment was 500 ml/offshoot, added a day before irrigation, except for the first time, which added a week after irrigation as mentioned before.

The layout of the experiment in the two seasons was a complete randomized design in factorial experimental type (Mead *et al.,* 1993), with 3 replicates, as each one contained 3 offshoots. The usual agricultural practices recommended for such plantation were followed whenever needed.

At the terminal of October in the second year of each season, the following data were recorded: survival (%), rooting (%) from the present equation: Rooting (%)= R/Tx100 (where R: Number of rooted offshoots and T: Total number of offshoots in the treatment), root length (cm), number of roots/offshoot, length of the first new formed leaf (cm), number of the new formed leaves/offshoot, as well as fresh and dry weights of the new formed leaves (g). Moreover, the rooting

efficiency index (REI%) was calculated as described by Ruter *et al.,* (2004) from the following equation:

REI (%) = Mean root length of the treated offshoot/Mean root length of untreated one x 100.

In dry leaf samples, the percentages of N, P and K were determined according to the methods indicated by Jackson (1973).

The data were then tabulated and SAS program (1994) was used for statistical analysis, whereas Duncan's Multiple Range Test (1955) was employed to verify the differences among the means of various treatments.

RESULTS AND DISCUSSION

Effect of PG, HA and their interactions on:

1- Survival (%) and rooting parameters:

From data averaged in Tables (1 and 2), it could be concluded that survival (%), rooting (%), root length(cm) and No. roots/offshoots were progressively increased as the concentration of either PG or HA was increased with significant differences in most cases of the two seasons. However, the prevalence in all previous parameters was due to the combination between the highest rates of both PG (324 mg/L) and HA (10 ml/L), as this combined treatment gave, in general the utmost high records in both seasons compared to control and other treatments.

A similar trend was also gained concerning the rooting efficiency index (REI%), as a real indicator for rooting strength in offshoots of date palm soft cv. Zaghloul under nursery conditions, where such measurement was gradually increased in response to elevating level of either PG or HA, with the superiority of 324 mg PG/L + 10 ml HA/L combined treatment, that registered the highest means in the first and second seasons.

In general, the effect of phloroglucinol (a tri-hydroxyphenol) on improving survival % and rooting parameters of Zaghloul offshoots was more pronounced than the effect of humic acid (Actosol®). This may be attributed to its ability to depress the peroxidase activity, thereby protecting the endogenous auxins from peroxidase-catalyzed

oxidation (De Klerk *et al.,* 1999). Moreover, James and Thurbon (1981) stated that PG may act as an auxin synergist during the auxin-sensitive phase of root initiation. Humic acid, on the other hand provides soil microbs with energy and improves nutrients retention in the soil (Dorer and Peacock,1997), beside containing NPK and some micronutrients necessary for healthy growth (as indicated in Table, b).

The aforementioned results are in parallel with those attained by Hassan *et al.,* (2005) on date palm dry cv. Sakkoty, Abdel-Galeil (2007) on soft cv. Zaghloul and Abdel-Fattah *et al.,* (2009) on *Dracaena* and *Ruscus*.

Table (1) Effect of phloroglucinol,(PG) humic acid(H.A) and their interactions on survival and rooting percentages of . cv. Zaghloul offshoots during 2008/09 and 2009/10 seasons.

H.A level (ml/L) / P.G. level (mg/L)	Survival (%)				Rooting (%)			
	00.00	5.00	10.00	Mean	00.00	5.00	10.00	Mean
	First season: 2008/09							
00.00	10.00 g	60.00 f	60.00 f	43.33 c	15.00 i	30.00 h	40.00 g	28.33 d
81.00	66.67 e	80.33 c	80.67 bc	75.89 b	41.67 g	43.33 g	50.00 f	45.00 c
162.00	70.00 de	81.67 bc	80.00 c	77.22 b	55.00 e	60.00 d	81.67 b	65.56 b
324.00	73.33 d	85.00 b	91.67 a	83.33 a	70.00 c	78.33 b	93.33 a	80.55 a
Mean	55.00 b	76.75 a	78.08 a		45.42 c	52.92 b	66.25 a	
	Second season: 2009/10							
00.00	13.33 h	57.00 g	60.67 g	43.67 d	15.67 i	29.80 h	42.54 g	29.33 d
81.00	66.67 f	80.00 cd	78.33 d	75.00 c	50.00 f	79.33 c	80.10 c	69.78 c
162.00	70.00 ef	85.33 b	80.00 cd	78.44 b	59.67 e	83.00 b	84.67 b	75.44 b
324.00	73.33 e	83.33 bc	91.67 a	82.78 a	66.70 d	85.67 b	95.33 a	82.56 a
Mean	55.83 b	76.42 a	77.67 a		48.01 c	69.20 b	75.64 a	

* H.A.: humic acid and P.G.: Phloroglucinol.

* Means within a column or row having the same letters are not significantly different according to Duncan's Multiple Range Test (DMRT) at 5% level.

Table (2) Effect of phloroglucinol(PG), humic acid(HA) and their interactions on root length and number and rooting efficiency of . cv. Zaghloul offshoots during 2008/09 and 2009/10 seasons.

H.A level (ml/L) / P.G. level (mg/L)	Root length (cm)				Root number/ offshoot				Rooting efficiency (%)			
	00.00	5.00	10.00	Mean	00.00	5.00	10.00	Mean	00.00	5.00	10.00	Mean
	First season: 2008/09											
00.00	16.67 c	22.00 bc	22.67 b	20.44 c	10.33 f	13.00 f	15.33 f	12.89 d	100.00 c	100.00 c	100.00 c	100.00 d
81.00	22.40 b	22.67 b	25.00 b	23.35 b	18.00 f	56.67 cd	53.33 d	42.67 c	134.37 a	103.05 c	110.28 cb	115.90 c
162.00	22.00 bc	26.67 ab	25.67 ab	24.78 ab	37.50 e	62.33 cd	66.84 c	55.56 b	131.97 ab	121.23 b	113.23 cb	122.14 b
324.00	24.33 b	27.50 ab	30.81 a	27.55 a	60.00 cd	82.33 b	96.67 a	79.67 a	145.95 a	125.00 b	135.91 a	135.62 a
Mean	21.35 b	24.71 b	26.04 a		31.50 b	53.58 a	58.00 a		128.07 a	112.32 b	114.86 b	
	Second season: 2009/10											
00.00	17.00 d	23.00 c	23.33 c	21.11 d	12.33 e	14.00 e	18.00 e	14.78 d	100.00 d	100.00 d	100.00 d	100.00 d
81.00	22.67 c	23.80 c	25.20 bc	23.89 c	19.00 e	57.00 c	58.33 c	44.78 c	133.35 ba	103.48 c	108.02 c	114.95 c
162.00	23.33 c	28.00 bc	29.33 ab	26.89 b	40.67 d	63.33 c	66.33 c	56.78 b	137.24 ab	121.74 b	125.72 b	128.23 b
324.00	25.33 bc	29.33 ab	33.67 a	29.44 a	56.67 c	82.33 b	93.33 a	77.44 a	149.00 a	127.52 b	144.32 a	140.28 a
Mean	22.08 b	26.03 a	27.88 a		32.17 b	54.17 a	59.00 a		129.90 a	113.19 c	119.52 b	

* H.A.: humic acid and P.G.: Phloroglucinol.

* Means within a column or row having the same letters are not significantly different at 5% level.

2- Vegetative growth:

Data in Tables (3 and 4) show that leaf length (cm), No. new formed leaves/offshoots, as well as fresh and dry weights of the new formed leaves were significantly increased, with few exceptions in both seasons as a result of drenching the soil mixture with either PG or HA at various levels used in the current work. Higher concentrations of both chemicals gave higher means, but the mastery in most cases of the two seasons was for the combination of 324 mg/L PG+ 10 ml/L HA, which recorded the highest averages in all previous characters compared to the values of control and other treatments. This may be ascribed to the synergistic effect of both PG, as an indirect promotive agent for growth and development, and HA, as an organic fertilizer provides the new formed organs with some nutrients necessary for the best growth. As mentioned before in case of survival and rooting percentages, PG treatments exhibited better effect on vegetative growth of date palm soft cv. Zaghloul offshoots than HA ones.

Analogus results were also obtained by Hassan *et al.,* (2005) on date palm dry cv. Sakkoty, Cururaj *et al.,* (2004) on *Decalepis hamiltonii* shrub and El-Sayed and El-Shal (2008) on Schefflera.

Table (3) Effect of phloroglucinol,(PG) humic acid(HA)and their interactions on leaf length and number of new formed leaves/offshoot of cv. Zaghloul offshoots during 2008/09 and 2009/10 seasons.

H.A level (ml/L) / P.G. level (mg/L)	Leaf length (cm)				No. new formed leaves/offshoot			
	00.00	5.00	10.00	Mean	00.00	5.00	10.00	Mean
	First season: 2008/09							
00.00	35.00 f	54.00 d	58.33 cd	49.11 d	1.33 c	1.33 c	1.33 c	1.33 c
81.00	38.33 f	65.00 ab	60.51 bc	54.61 c	1.67 c	1.67 c	2.00 c	1.78 bc
162.00	46.67 e	66.00 ab	61.67 abc	58.11 b	1.67 c	2.00 c	2.33 bc	2.00 b
324.00	60.00 bc	63.33 ab	67.18 a	63.50 a	2.00 c	3.00 b	4.00 a	3.00 a
Mean	45.00 b	62.11 a	61.92 a		1.67 b	2.17 b	2.42 a	
	Second season: 2009/10							
00.00	39.67 g	40.67 g	48.33 f	42.89 d	1.33 d	1.33 d	1.67 cd	1.44 c
81.00	62.00 e	64.33 de	65.00 cde	63.78 c	1.67 cd	1.67 cd	2.33 c	1.89 b
162.00	65.67 cd	66.10 cd	63.67 cd	66.15 b	1.67 cd	2.33 c	2.33 c	2.11 b
324.00	66.75 cd	64.33 bc	73.33 a	69.80 a	2.00 cd	3.33 b	4.33 a	3.22 a
Mean	58.52 b	60.11 b	63.33 a		1.67 c	2.17 b	2.67 a	

* H.A.: humic acid and P.G.: Phloroglucinol.

* Means within a column or row having the same letters are not significantly different at 5% level.

Table (4) Effect of phloroglucinol, ,(PG) humic acid(HA) and their interactions on fresh and dry weights of cv. Zaghloul offshoots during 2008/09 and 2009/10 seasons.

H.A level (ml/L) / P.G. level (mg/L)	Fresh weight (g)				Dry weight (g)			
	00.00	5.00	10.00	Mean	00.00	5.00	10.00	Mean
	First season: 2008/09							
00.00	60.22 f	65.58 de	67.14 cd	64.31 c	29.78 e	32.80 d	33.43 dc	32.00 c
81.00	69.35 bcd	70.81 bc	75.09 ab	71.75 b	34.60 c	35.46 cb	37.28 b	35.78 b
162.00	72.12 bc	73.00 bc	73.50 bc	72.87 b	35.18 cb	36.71 bc	37.75 ba	36.55 ab
324.00	76.30 ab	74.38 ab	81.35 a	77.34 a	38.15 ab	37.20 b	40.68 a	38.68 a
Mean	69.50 b	70.94 b	74.27 a		34.43 b	35.54 b	37.29 a	
	Second season: 2009/10							
00.00	61.83 f	65.13 ef	67.81 de	64.92 c	29.15 e	31.70 d	33.00 dc	31.28 c
81.00	69.22 cd	73.67 bc	76.06 ab	72.98 b	33.610	35.58 c	37.50 b	35.56 b
162.00	70.80 cd	74.00 bc	76.51 ab	73.77 b	35.40 c	36.93 cb	38.00 b	36.78 ab
324.00	76.60 ab	76.41 ab	81.96 a	78.32 a	37.24 b	38.20 b	40.78 a	38.74 a
Mean	69.61 c	72.30 b	75.59 a		33.85 c	35.60 b	37.32 a	

* H.A.: humic acid and P.G.: Phloroglucinol.
* Means within a column or row having the same letters are not significantly different at 5% level.

3- Nitrogen, phosphorus and potassium content in the new formed leaves:

It is clear from data presented in Table (5) that the percentages of N, P and K in the new formed leaves of the treated offshoots were cumulatively increased with rising the concentration of either PG or HA with significant differences in most cases of both seasons. However, the rate of increment in N and P content due to either chemicals used in this trial was higher than that was in K content, but the dominance was for the interaction between PG at 324 mg/L and HA at 10 ml/L, which scored, in general the highest content in the aforestated nutrients. This may indicate the role of HA in providing the new formed organs with macro-and micro- elements, beside its role in improving nutrients retention in the soil and enhancing the water holding capacity (Dorer and Peacock, 1997).

On the same line, were those results of Abdel-Galeil (2007) on date palm soft cv. Zaghloul, El-Sayed and El-Shal (2008) on Schefflera and Abdel-Fattah *et al.,* (2009) who reported that application of humic acid to *Dracaena* and *Ruscus*, either as a foliar spray (5 ml/L) or as a soil drench (10 ml/L) caused a marked increment in the leaf content of total carbohydrates, N, P and K as percentages.

Table (5) Effect of phloroglucinol,(PG)humic acid(HA) and their interactions on N, P and K content in the leaves of cv. Zaghloul offshoots during 2008/09 and 2009/10 seasons.

H.A level (ml/L) / P.G. level (mg/L)	N (%)				P (%)				K (%)			
	00.00	5.00	10.00	Mean	00.00	5.00	10.00	Mean	00.00	5.00	10.00	Mean
	First season: 2008/09											
00.00	1.83 e	2.10 d	2.56 c	2.16 c	0.10 h	0.28 g	0.41 e	0.26 c	0.30 d	0.35 cb	0.33 c	0.33 b
81.00	2.50 c	2.86 bc	3.00 b	2.79 b	0.31 f	0.41 e	0.62 c	0.45 b	0.32 cd	0.36 bc	0.35 cb	0.34 b
162.00	2.66 cb	3.15 ba	3.31 ab	3.05 ab	0.39 e	0.53 d	0.73 b	0.55 ab	0.34 c	0.36 bc	0.40 b	0.37 ab
324.00	2.97 b	3.30 ab	3.58 a	3.28 a	0.50 de	0.68 c	1.00 a	0.73 a	0.36 bc	0.46 ba	0.51 a	0.44 a
Mean	2.49 c	2.85 b	3.11 a		0.33 b	0.48 b	0.69 a		0.33 b	0.38 a	0.40 a	
	Second season: 2009/10											
00.00	1.74 f	1.90 f	2.33 de	1.99 c	0.12 g	0.30 f	0.39 e	0.27 c	0.33 d	0.35 cd	0.38 c	0.35 b
81.00	2.26 e	2.63 d	2.89 c	2.59 b	0.37 ef	0.38 e	0.56 d	0.44 b	0.34	0.38 c	0.41 bc	0.38 b
162.00	2.47	2.91 c	3.29 b	2.89 ab	0.40 e	0.48 ed	0.84 b	0.57 ab	0.36 cd	0.40 cb	0.47 b	0.41 ab
324.00	2.83 cd	3.18 b	3.67 a	3.23 a	0.60 d	0.72 c	1.07 a	0.80 a	0.40 cb	0.47 b	0.58 a	0.48 a
Mean	2.33 b	2.66 b	3.05 a		0.37 b	0.47 b	0.72 a		0.36 b	0.40 a	0.46 a	

* H.A.: humic acid and P.G.: Phloroglucinol. different

* Means within a column or row having the same letters are not significantly **diffierent** at 5% level.

From results of the current study, it could be recommended to treat offshoots of *Phoenix dactylifera* L. cv. Zaghloul grown in 50-cm-diameter plastic bags with 324 mg/L PG + 10 ml/L HA, four times with 2 months interval to get the best rooting and highest survival accompanied with good vegetative growth and chemical composition under nursery conditions.

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استجابة فسائل نخيل البلح (صنف الزغلول) للفلوروجلوسينول و حمض الهيوميك تحت ظروف المشتل

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أجري هذا البحث بمشتل معهد بحوث البساتين، الجيزة، مصر خلال موسمي ٢٠٠٨/٢٠٠٩ و ٢٠٠٩/٢٠١٠ و ذلك لدراسة تأثير الإضافة الأرضية للفلوروجلوسينول (Phloroglucinol, PG) بمعدلات: صفر، ٨١، ١٦٢ و ٣٢٤ ملجم/لتر، حمض الهيوميك (Humic acid, HA) بمعدلات: صفر، ٥ و ١٠ مل/لتر و التفاعلات بينهما على النسبة المئوية للبقاء و التجذير، النمو و التركيب الكيميائي فسائل نخيل البلح (*Phoenix dactylifra* L.) صنف الزغلول الرطب (Soft cv. Zaghloul) المنزرع في أكياس بلاستيك قطرها ٥٠ سم و مملوءة بحوالي ٣٥ كجم من مخلوط الرمل و الطين (بنسبة ١:٢ حجماً). و لقد أضيفت هذه المواد أربع مرات بفاصل زمني شهرين بين كل مرتين بدءاً من نهاية أبريل و حتى نهاية أكتوبر.

و لقد أوضحت النتائج المتحصل عليها أن النسبة المئوية للنباتات الحية، النسبة المئوية للتجذير، طول الجذر (سم) و عدد الجذور/فسيلة قد زادت بشكل تصاعدي كلما زاد تركيز الفلوروجلوسينول أو حمض الهيوميك. و لقد تم الحصول على اتجاه مشابه فيما يتعلق بالنسبة المئوية لمعامل كفاءة التجذير (REI%)، و كذلك عدد الأوراق الجديدة المتكونة على كل فسيلة و الوزن الطازج و الجاف لها (جم). إضافة إلى ذلك، فان النسبة المئوية لعناصر النيتروجين، الفوسفور و البوتاسيوم قد زادت بشكل واضح في الأوراق المتكونة حديثاً استجابة لإضافة الفلوروجلوسينول و حمض الهيوميك بالمعدلات المختلفة. إلا أن السيادة في جميع القياسات السابقة كانت للمعاملة المشتركة بين الفلوروجلوسينول بمعدل ٣٢٤ ملجم/لتر + حمض الهيوميك بمعدل ١٠ مل/لتر، حيث أعطت هذه التوليفة أعلى المتوسطات مقارنة بالكنترول و جميع المعاملات الأخرى.

و عليه، فلكي نحصل على أعلى نسبة للنباتات الحية و التجذير، و كذلك أفضل نمو و محتوى كيماوي من فسائل نخيل البلح صنف الزغلول ، فإننا نوصي بالإضافة الأرضية لكلٍ من الفلوروجلوسينول بمعدل ٣٢٤ ملجم/لتر و حمض الهيوميك بمعدل ١٠مل/لتر، و ذلك ٤ مرات خلال موسم النمو و بفاصل شهرين بين الإضافة و الأخرى.