

PHYSIOLOGICAL STUDIES ON ROOTING ABILITY OF OFFSHOOTS OF SOME DATE PALM CULTIVARS

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This study was conducted at the nursery of the Pomology Unit, Desert Research Center during the years of 2000 and 2001 on six date palm cultivars, i.e., Halawie, Bent Aisha, Orabi, Hayany, Zaghloul and Sammany. Offshoot of each variety were separated on August 1st 2000. The average weight of offshoots ranged from 10 to 15 kg. They were planted in sand soil. The obtained results can be summarized as follows:

- 1- Rooting percent decreased after 12 months compared with that after seven months from transplanting. The lowest rooting percent was observed with the cultivars Sammany and Zaghloul (44.4 and 66.7%, respectively).
- 2- There were significant differences among the cultivars concerning number of leaves, average leaf length, number of roots and average root diameter/offshoot. The Sammany cultivar showed the least values in all these traits except for rooting %, number of leaves, average leaf length and number of roots.
- 3- The contents of N, P, K, Fe and Mn in the apical bud tissue were the highest in the cultivar Zaghloul in both years of the study. On the contrary, the cultivar Halawie showed the lowest contents of these mineral constituents. In addition, moisture percent was significantly the lowest in both of Sammany and Orabi cultivars.
- 4- Concerning the content of gibberellic acid in tissue of the apical bud, the cultivar Zaghloul showed the highest value (25.48 mg/g), while Sammany showed the least one (11.68 mg/g). The content of indole acetic acid in the apical bud was the least in both of Sammany and Zaghloul cultivars (0.209 and 0.213 mg/g, respectively). The content of abscisic acid in the apical bud was the highest (0.079 mg/g) in the Sammany cultivar.
- 5- It can be stated that the easiness or difficulty in rooting of offshoots is associated with their content of endogenous hormones. So, one can recommend the use of auxin

application exogenously to overcome the rooting difficulties of date palm cultivars offshoots.

Keywords: date palm propagation, offshoots, mineral content, indole acetic acid content, abscissic acid content, gibberellic acid content, rooting percent.

Owing to the vast extension in the cultivation of date palm trees, it is now essential to propagate offshoots of the best cultivars with a big number that is enough to meet this extension. The use of offshoots, which evolve at the base of palm trees, is considered the cheapest method for vegetative propagation.

At the top of the date palm tree there is a single apical bud, which dominates and leads its growth. This bud is white, unconsolidated block that contains a sweet secretion. This meristematic block is called "gommara". For its great importance to the date palm growth, the almighty God provided it with great protection. Fiber rolls and sheets of leaf bases (Kernaf sheets) roll around it in so many layers to protect it. In so doing, this bud is completely out of physical damage and the attack of predators such as insects, fungi and other pests (Wally *et al.*, 1979).

There is a great variation in the successful growth of the offshoots among different cultivars of date palm (Wally *et al.*, 1979). So, the objective of this research work was devoted towards the identification of substances and/or agents that are responsible for promoting the rooting of the date palm offshoots.

MATERIALS AND METHODS

This experiment was carried out during the two seasons of the years 2000 and 2001 at the nursery of the Desert Research Center, Egypt. The considered date palm varieties were Halawy, Bent Aisha, Orabi, Jayany, Zaghloul and Sammany.

Nine offshoots of each variety were separated on August 1st, 2000. The average weight of offshoots ranged from 10 to 15kg. They were distributed into plots of 1.5 x 1.5 m. On the first of March 2001, i.e., seven months after planting, the number of successfully growing offshoots was counted for every cultivar. Also, the number of green leaves and the average leaf length per offshoot were recorded. After removing of these offshoots for the planting in the permanent field place, the number of roots and root diameter per offshoot were counted and recorded. Then the rooting region at the base of every offshoot was photographed.

On the first of March of the years 2000 and 2001, three offshoots of all the adopted cultivars were chosen at random. The leaf bases surrounding the apical bud were separated for the determination of growth hormones, i.e.,

indole acetic acid (IAA), gibberellic acid (GA) and abscissic acid (ABA), as well as mineral composition, i.e. N, P, K, Fe, Mn, and Zn.

Twenty-gram portion of the apical bud was extracted by cold methyl alcohol for the determination of indole acetic acid, gibberellins, and abscissic acid in the fresh tissue according to Shindy and Smith (1975). These plant hormones were determined using the high performance liquid chromatography (HPLC) according to the method of Rizzolo *et al.* (1991).

Dry matter content and mineral composition were determined in 100-gram sample of the apical bud: total nitrogen was determined by a modified micro-kjldahl according to (Huphries, 1959). Phosphorus was determined colorimetrically using ascorbic acid according to the method described by (John, 1970). Potassium were determined using flame photometer and heavy metal (Fe, Mn and Zn) were determined by the Unicam 929 Atomic Absorption using the wet ashing procedure of the dry powdered sample recommended by (Jackson, 1958).

All the obtained data were statistically analyzed using the analysis of variance according to Snedecor and Cochran (1980). The least significant range (LSR) of Duncan (1955) was recruited to differentiate among the overall means of the cultivars in all measured trials.

RESULTS AND DISCUSSION

From table (1), it can be observed that after seven months from transplanting of the offshoots, the rooting percentage was significantly less for the two cultivars Sammany and Zaghloul, while the rooting percentage was 100% for other cultivars. In addition, there were no significant differences among the cultivars regarding number of leaves. Concerning the average length of leaf, the cultivar; Zaghloul, was significantly the best compared with all other cultivars, while Sammany was the least one. In addition, there were no significant differences among the cultivars Halawi, Orabi, and Hayany with respect to leaf length.

After 12 months from transplanting, rooting percentage was significantly the least for Sammany, while there were no significant differences among other cultivars. Generally, rooting percentage was the highest in the cultivars Orabi and Hayany, while being the least in Sammany and Zaghloul cultivars. Concerning the number of leaves per palm tree, the cultivars Halawi, Bent-Aisha, and Hayany showed the highest number, followed by the cultivars Orabi and Zaghloul, while Sammany showed significantly the least number.

TABLE (1). Vegetative growth parameters and rooting of some date palm cultivar offshoots in the years 2000 and 2001.

Cultivar	After 7 months			After 12 months from transplanting				
	Rooting	No. of leaves/ offshoot	Leaf length (cm)	Rooting %	No. of leaves/ offshoot	Leaf length (cm)	No. of roots/ offshoot	Root length (cm)
Hallawy	100.0 a	2.00 a	85.33 bc	77.80 a	4.33 a	137.33 bc	26 c	0.75 a
Bent Aisha	100.0 a	1.67 a	79.3 c	77.80 a	4.00 a	130.60 c	28 c	0.75 a
Orabi	100.0 a	1.33 a	92.67 b	88.90 a	3.07 b	153.33 a	35 b	0.78 a
Hayany	100.0 a	2.00 a	88.33 b	88.90 a	4.00 a	141.67 b	45 a	0.55 b
Zaghloul	88.90 b	1.33 a	101.00 a	66.70 a	3.10 b	155.27 a	39 b	0.55 b
Samany	66.70 c	1.00 a	44.33 d	44.43 b	2.22 c	75.00 d	4 d	0.70 a

Mean values in the same column sharing one alphabet or more are not significantly different at 5% level.

Number of roots per offshoot was significantly the highest in Hayany followed by Zaghloul and Orabi cultivars, then Bent-Aisha and Halawy, while Sammany had significantly the least number. It can also be noticed from plate (1) that root diameter was the least in the two cultivars Hayany and Zaghloul.

In general, rooting percentage of the offshoots was significantly less for all studied cultivars after 12 months as compared with that after 7 months after transplanting. Sammany and Zaghloul were significantly the least regarding the percent of rooting of the offshoots. After 12 months, there were significant differences among cultivars concerning number of leaves/offshoot, and average leaf length. Sammany was the least performer concerning these traits.

Table (2) shows the mineral composition of the apical bud tissue of the offshoots of all the studied cultivars. N, P and K content as percentage in the apical bud tissue was significantly the highest in the Hayany cultivar in both seasons of the study, while it was the lowest in Halawy. The contents of Fe and Mn were the highest in the Zaghloul cultivar in both seasons, while it was significantly the least in Halawy. Regarding Zn content, there were significant differences among the studied cultivars in the year 2000 only. Concerning moisture content as a percentage in the apical bud tissue, there were significant differences among the studied cultivars in both seasons. In general, the cultivar; Zaghloul, exhibited the highest percentage of N, P, Fe, and Mn nutrients in the apical bud tissue of the offshoot as compared

with all other studied cultivars, while Halawy cultivars exhibited the lowest values. On the other hand, moisture percentage was significantly the lowest in Sammany cultivar.

Table (3) exhibits that the content of the growing tip from gibberellin was the least in Sammany and Bent-Aisha cultivars in both seasons of study, while it was the highest in Zaghloul. The content of indole acetic acid was the least in the growing tip of the cultivars Sammany and Zaghloul, while it was highest in Hayany and Orabi cultivars.

These findings might agree with those of Reuveni *et al.* (1972), who reported that offshoots of medium size (8-12 kg) were able to root after treating them with plant hormones (auxins). They agree also with those of El-Hodairi *et al.* (1992), who stated that the best rooting was observed for the date palm cultivar. Taaghiyaat offshoots after treating with naphthalene acetic acid at 50 ppm. In addition, El-Rahmaan *et al.*, (1986) found that propagating the apical and lateral buds of the cultivars Dashky, Khadrawy, and Zahidi on Morashig-Shug medium was successful when applying gibberellin at 5 mg/litre. They could have the buds develop long leaves and rhizoids on this medium.

TABLE (2) Mineral and moisture content in the apical bud tissue of some date palm cultivars offshoots in the seasons of 2000 and 2001.

Cultivar	N %		P %		K %		Fe (ppm)		Mn (ppm)		Zn (ppm)		Moisture %	
	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001
Hallawy	1.24 c	1.31 f	0.15 d	0.16 d	0.62 d	0.70 c	111.0 cd	110.0 e	79.00 d	76.00 d	76.00 a	51.00 a	89.41 a	89.35 a
Bent Aisha	1.44 bc	1.37 c	0.21 b	0.21 b	0.70 c	0.72 c	81.3 c	112.7 d	81.33 c	79.67 c	75.00 a	72.33 a	88.32 b	88.18 b
Orabi	1.66 ab	1.61 d	0.15 d	0.16 d	0.69 c	0.70 c	73.3 b	118.0 b	73.67 c	73.00 e	72.67 bc	70.67 a	89.34 a	89.24 a
Hayany	1.89 a	1.94 a	0.24 a	0.24 a	0.85 b	0.89 ab	121.7 a	120.7 a	85.00 b	87.00 b	70.00 c	72.67 a	89.52 a	89.43 a
Zaghloul	1.53 b	1.71 c	0.19 c	0.19 c	0.91 a	0.92 a	108.0 d	114.3 c	90.67 a	92.33 a	70.67 c	69.00 a	89.36 a	89.36 a
Samany	1.76 ab	1.79 b	0.21 b	0.21 b	0.90 a	0.87 b	117.0 b	119.3 b	83.33 b	85.00 b	77.00 a	52.67 a	87.94 b	88.04 b

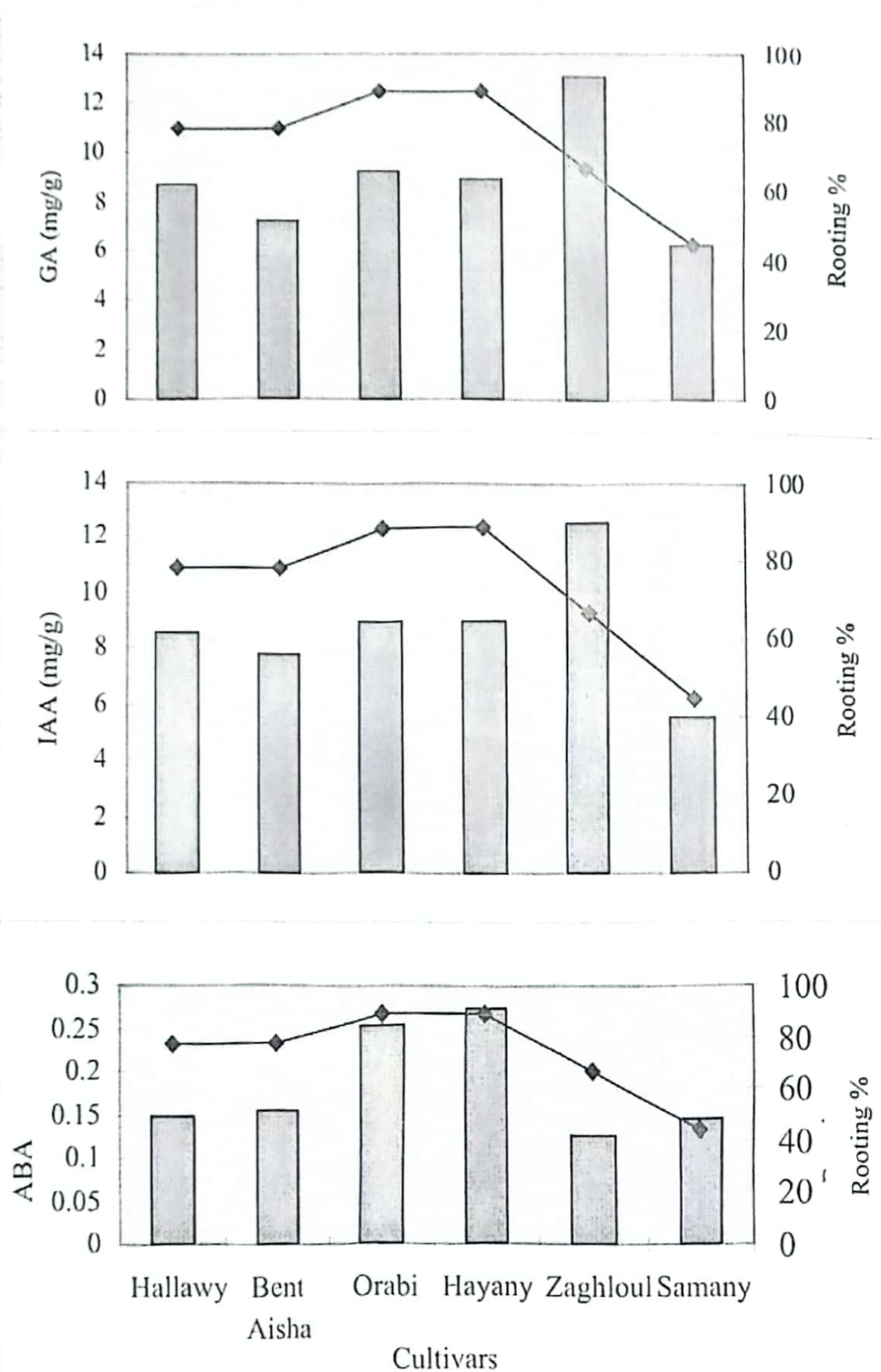


Fig. (1). Rooting percentage as influenced by level of different endogenous hormones, one year after transplanting.

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Plate (1). Rooting ability of date palm offshoots under the present study.

1. Halawy 2. Bent Aisha 3. Orabi 4. Hayany 5. Zaghloul 6. Sammany

TABLE (3). Gibberellins (GA), indol acetic acid (IAA) and abseissic acid (ABA) content in the apical bud tissue of some date palm cvs. offshoots in the seasons of 2000 and 2001.

Cultivar	GA (mg/g)		IAA (mg/g)		ABA (mg/g)	
	2000	2001	2000	2001	2000	2001
Hallawy	16.97	17.11	0.259	0.261	0.039	0.035
Bent Aisha	14.11	15.66	0.273	0.280	0.036	0.034
Orabi	18.03	18.11	0.454	0.451	0.061	0.055
Hayany	17.28	18.01	0.495	0.496	0.051	0.053
Zaghloul	25.88	25.10	0.215	0.210	0.033	0.039
Samany	12.20	11.15	0.211	0.208	0.077	0.080

Generally, the content of gibberellin in the apical bud of the growing tip was the highest in Sammany cultivar offshoots and least in Zaghloul one. In addition, leaf length was the least in the cultivar Sammany. Indole acetic acid content in the same tissue was least in Sammany and Zaghloul, while it was the highest in Hayany and Orabi cultivars. This explains the high rooting percentage in the cultivars Orabi and Hayany, as well as the low rooting percentage in the Sammany and Zaghloul one. In addition, the

abseessic acid content was the highest in the tissue of the Sammany date palm offshoots compared with other cultivars in this study.

On the light of the obtained results, it can be recommended, that using of auxin application exogenously to over come the rooting difficulties of date palm cultivars offshoots.

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دراسات فسيولوجية على القدرة التجذيرية لفسائل بعض أصناف نخيل البلح

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أجريت هذه الدراسة خلال موسمي ٢٠٠٠، ٢٠٠١ بمشمل وحدة الفاكية بمركز بحوث الصحراء - القاهرة - مصر على ستة أصناف من نخيل البلح وهي الحلاوى، بنت عيشة، عرابي، الحياني، الزغلول، والسماي.

ويمكن تلخيص أهم النتائج المتحصل عليها فيما يلي:

١ - يلاحظ أن النسبة المئوية للتجذير تقل بعد ١٢ شهرا من الزراعة بالمقارنة بالنسبة للتجذير بعد ٧ شهور، وقد أعطى صنف السماي والزغلول أقل نسبة مئوية للتجذير (٤٠،٤% و ٦٦،٧%، على التوالي).

٢ - وجود فروق معنوية بين فساتل /الأصناف المختلفة في عدد الأوراق، متوسط طول الورقة، عدد الجذور، ومتوسط طول الجذر لكل فسيلة، وكان الصنف السماي هو الأقل معنويا في عدد الأوراق ومتوسط طول الورقة وعدد الجذور/فسيلة.

٣ - محتوى البرعم الطرفي لفسائل نخيل البلح من عناصر النتروجين، الفوسفور، الحديد، والمنجنيز كان أعلى في الصنف الحياني للموسمين، وعلى العكس من ذلك كان الصنف الحلاوى الأقل في المحتوى المعدني بالمقارنة بباقي الأصناف.

٤ - بالنسبة لمحتوى القمة النامية من الجبرلين لوحظ أن الصنف زغلول أعطى أعلى قيمة (٢٥٠،٤٨ مللجم/جم)، وعلى العكس من ذلك أعطى الصنف السماي أقل قيمة (١١٠،٦٨ مللجم/جم).

٥ - محتوى القمة النامية من اندول حمض الخليك أعطى أقل قيمة في صنف السماي والزغلول (٠٠٢٠٩، ٠٠٢١٣ مللجم/جم) على التوالي، وبالإضافة إلى ذلك لوحظ ارتفاع قيمة محتوى البرعم الطرفي من حمض الأبسيسيك (٠٠٠٧٩ مللجم/جم) في فساتل نخيل البلح السماي.

٦ - يلاحظ عموما وجود ارتباط بين سهولة وصعوبة تجذير الفساتل ومحتواها من الهرمونات الداخلية، لذلك ينصح باستخدام الأكسينات كمعاملة خارجية لتشجيع تجذير فساتل الأصناف الصعبة التجذير من نخيل البلح.