Evaluation of Aerial Offshoots Rooting of Three International Date Palm Varieties *

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ملخص:

تقدمت زراعة نخيل التمر (Phoenix dactylifera L.) في السنوات الأخيرة بشكل كبير في منطقة أريحا والأغوار– فلسطين. يتم إكثار نخيل التمر بشكل عام بواسطة الفسائل على الرغم من نجاح طرق إكثار أخرى مثل زراعة الأنسجة. بناءً على ما سبق، فقد قمنا بدارسة تجذير الفسائل الهوائية لثلاثة أصناف عالمية من نخيل التمر في مزرعة فيصل اسعيد–اريحا خلال الموسم 2013. الهدف من هذه الدراسة هو تقييم قدرة التجذير وتحفيز النمو الخضري لثلاثة أصناف من نخيل التمر هي مجول، دجلة نور وبرحي.

تم جمع البيانات المتعلقة بالمجموع الجذري والمجموع الخضري للفسائل الهوائية المجذرة بعد مرور ستة أشهر على الترقيد الهوائي. أظهرت النتائج تفوق الصنف برحي في معظم المعايير المتعلقة بالمجموع الجذري والمجموع الخضري التي تم دراستها في التجربة، يليه الصنف دجلة نور ثم الصنف مجول.

قد يعزى تفوق الصنف برحي لأسباب وراثية، بالإضافة إلى توفر مواد غذائية أكثر ونتيجة القطف المبكر لثمار هذا الصنف مقارنة بالأصناف الأخرى المستخدمة في هذه التجربة.

الكلمات المفتاحية: نخيل التمر، Phoenix dactylifera، الإكثار الخضري، الترقيد الهوائي، الفسائل الهوائية، التجذير، مجول، دجلة نور، برحي.

Abstract:

Date palm (Phoenix dactylifera L.) cultivation for commercial purposes has gained popularity in Jericho and Jordan valley in Palestine. In the last years, considerable progress has been made in this subject. Date palm is generally propagated by offshoots. Propagation by offshoots is the mainstay of date palm and is likely to remain despite the success of other propagation methods such as in vitro techniques (tissue culture). Therefore, the rooting of the aerial offshoots of three international date palm varieties were studied at Faisal Isaid farm, Jericho-Palestine during the year 2013. The objective of this study was to evaluate the rooting ability and the shoot enhancement of three date palm varieties viz., Medjool, Deglet Noor and Barhi. Observations of root and shoot parameters of the aerial offshoots were recorded after six months from air layering for the three varieties. Results indicated that Barhi variety was significantly superior in almost all the root and shoot parameters studied in the experiment, the next best variety was Deglet Noor, while the last one was Medjool. The best root induction and shoot enhancement in aerial offshoots of Barhi variety is believed due to the genetic factors and to the more availability of photosynthates (food materials) due to early fruit harvesting of Barhi trees as compared to other varieties studied in this experiment.

Key words: Date palm, Phoenix dactylifera, vegetative propagation, air layering, aerial offshoots, rooting, Medjool, Deglet Noor, Barhi

INTRODUCTION:

Date palm (Phoenix dactylifera) cultivation has gained popularity in Jericho and Jordan valley in Palestine, especially Medjool variety concerning productivity and fruit quality, and considerable progress has been made in this subject (Abu-Qaoud, 2015).

Date palm is generally propagated by offshoots (Zaid and Wet, 2002). Furthermore, vegetative propagation by offshoots is the mainstay of date palm and is likely to remain, despite the success of other propagation methods such as in vitro techniques (tissue culture). Rooted offshoots are preferred because they produce true-to-type trees with fruit quality identical to that of the mother tree. Meanwhile, some abnormalities have been reported in date palm trees which are propagated by tissue culture (Al-Manzouri et al., 2007). These reported abnormalities include plant dwarfism, excessive vegetative growth, bleached white leaves, various color leaflet, leaf black burn, twisted curly inflorescence, and parthenocarpic fruits production.

Offshoots are used in date palm propagation due to their ability of root regeneration. This ability is highly cultivar dependent (Zaid and Wet, 2002). An independent plant needs a good

root development and is dependent on a good development of the root initiation zone (RIZ) of the offshoot (Hodel et al., 1998; Pittenger et al., 2000; Hodel and Pittenger, 2003; Afzal et al., 2011). Keeping all these aspects in view, the present study was aimed to evaluate the rooting of the aerial offshoots of three international date palm varieties viz., Medjool, Deglet Noor and Barhi.

MATERIAL AND METHODS

The study was conducted during the year 2013 at Faisal Isaid farm, Jericho-Palestine. The experimental design followed was a completely randomized block design (CRBD) with five replicates. The experiment consisted of three date palm genotypes viz., Medjool, Deglet Noor and Barhi. The plot size was a single offshoot. Every offshoot was wrapped using transparent polyethylene bag, which was wrapped around the offshoot base, tied at the bottom and filled properly with an equal amount of wet wood shavings. The polyethylene bag was then tightly tied.

The offshoots of the three cultivars were separated from their mother plants after six months from air layering. In all root and shoot parameters, the observations were recorded at the same time from five offshoots / treatment.

The main roots that arise directly from the base of offshoots was counted and expressed as the number of main roots / offshoot. The length of the longest root and the diameter of the thickest root were measured and expressed in centimeters. The rooting zone on the basal portion of the offshoots which successfully produced the roots was measured and expressed in centimeters.

Offshoots were weighed and expressed in kilograms. The length of shoot was measured and expressed in centimeters. The total number of leaves emerged per offshoot was counted. Out of many leaves, the largest one was measured from base to tip and expressed in centimeters. The length of the stem of an offshoot was measured and expressed in centimeters. Trunk circumference and diameter of the base of the offshoots were measured and expressed in centimeters.

Recorded observations were subjected to statistical analysis according to Little and Hills (1978). ANOVA analysis for the data was carried out and the significant differences to the treatment means were separated according to LSD test at 5 % level.

RESULTS

Data pertaining to root and shoot parameters of Medjool, Deglet Noor and Barhi date palm offshoots are presented in Table 1 and Table 2.

Root parameters:

Barhi recorded the highest significant number (20.8) of main roots as compared to Deglet Noor (14.8) and Medjool (13.6). However, there were no significant differences between the three varieties for the length of the longest root (Table 1). The maximum diameter of the root (1.32 cm) was recorded with Barhi offshoot as compared to Medjool (1.12 cm) and Deglet Noor (1.11 cm). The maximum length of rooting zone(37.8 cm) was recorded with the Barhi offshoot, this was followed by Medjool (29.5 cm) and least (18.3 cm) found in Deglet Noor.

Table 1

Some root parameters of aerial offshoots of Medjool, Deglet Noor and Barhi date palm.

Treatment	Number of main roots/ offshoot	Length of the longest root (cm)	Diameter of the root (cm)	Length of rooting zone (cm)
Medjool	13.6 b	43.6 a	1.12 b	29.5 ab
Deglet Noor	14.8 b	27.2 a	1.11 b	18.3 b
Barhi	20.8 a	30.6 a	1.32 a	37.8 a
LSD 0.05	3.56	17.44	0.13	15.66

Shoot parameters:

The highest weight of an offshoot (23.08 kg) was recorded with Barhi which was on par with the Deglet Noor (21.40 kg), and the lowest of 11.0 kg was recorded by the Medjool offshoot. The maximum length of an offshoot and length of the largest leaf were recorded with Barhi, and the minimum was recorded with Medjool which was on par with Deglet Noor. However, Deglet Noor recorded the highest significant number (14.4) of leaves as compared to Medjool (8.0) and Barhi (6.6). The maximum length of the stem (60.2 cm) was recorded with Deglet Noor which was on par with the Barhi (59.8 cm), and the minimum of 36.0 cm was recorded with the Medjool offshoot. The maximum trunk circumference (73.2 cm) was recorded with Barhi which was on par with the Deglet Noor (69.6 cm), and the minimum of 50.2 cm was recorded with the Medjool offshoot. The maximum diameter of the base of an offshoot (10.2 cm) was recorded with Deglet Noori which was on par with the Barhi (7.5 cm), and the minimum of 7.2 cm was recorded with Medjool offshoot (Table 2).

Table 2

Some shoot parameters of aerial offshoots of Medjool, Deglet Noor and Barhi date palm.

Treatment	Weight of an offshoot (kg)	Length of an offshoot (cm)	Length of largest leaf (cm)	Number of leaves/ offshoot	Length of the stem (cm)	Trunk circumference (cm)	Diameter of the base of an offshoot (cm)
Medjool	11.00 b	156.4 b	88.2 b	8.0 b	36.0 b	50.2 b	7.2 b
Deglet Noor	21.40 a	159.2 b	110.0 b	14.4 a	60.2 a	69.6 a	10.2 a
Barhi	23.08 a	275.4 a	183.2 a	6.6 b	59.8 a	73.2 a	7.5 ab
LSD 0.05	3.19	32.03	30.01	4.70	11.21	12.93	2.73

DISCUSSION

The experimental results obtained from the present investigation regarding root and shoot parameters of the aerial offshoots of three international date palm varieties viz., Medjool, Deglet Noor and Barhi are discussed and compared with previous studies.

Root parameters:

It is known that adventitious root formation is a development process involving sequence of histological events with each stage having different requirements for growth substances like auxins, cytokinins, gibberellic acids etc. Thus, establishing the time intervals of adventitious root initiation and development has made possible the correlation of sequential physiological and histological events in rooting (Hartmann et al., 1997). Genotypes have the greatest influence on root initiation as well as root development. Among different genotypes tested in present study, root parameters were significantly superior in Barhi (Table 1). The variation in rooting among the different date palm varieties is due to the genotype differences which occur normally. The high performance of Barhi in rooting might be due to high storage C:N ratio in the offshoots. These results are in conformity with those obtained by Al-Obeed (2005) who evaluated the rooting of aerial offshoots of four date palm cultivars by air layering method using polyethylene bags. Similar findings were also reported by Reuveni and Adato (1974).

Shoot parameters:

Present investigation results indicate that Barhi variety was superior in offshoot weight, length, length of largest leaf and trunk circumference (Table 2). The best shoot enhancement in aerial offshoots of Barhi variety might be attributed to more availability of photosynthates (food materials) due to early fruit harvesting of Barhi trees as compared to other varieties studied in this experiment. Also, it was observed that shoot growth and subsequent dry matter accumulation in Barhi was higher compared to Deglet Noor and Medjool.

On the other hand, the number of leaves/ offshoot, the length of the stem and the diameter of the base of the offshoot were better in Deglet Noor compared to other varieties studied in this experiment (Table 2). This variation in some shoot parameters among the different date palm varieties might be due to genotype differences.

These results are in conformity with many other reports of earlier workers (Gupta and Godara, 1984; Al-Ghamdi, 1988; AL-Mana et al., 1996; Qaddoury and Amssa, 2003: Rahmana and Rahkhodaei, 2013).

It could be concluded from this study that Barhi variety was significantly superior in almost all the root and shoot parameters studied in the experiment. The next best variety was Deglet Noor while the last one was Medjool. Further research on the anatomical and physiological changes of induced rooted offshoots of date palm varieties should be carried out.

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