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IMPACT OF SOME FACTORS AFFECTING THE SUCCESS OF PLANTING SEWY DATE PALM OFFSHOOTS IN CALCAREOUS SOIL

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ABSTRACT

This study was conducted during 2006 and 2007 seasons in a newly reclaimed private orchard situated at Assiut district to study the effect of offsshoot size (small and large) and soil media (calcareous sandy , calcareous sandy : loamy at 1 : 3 and calcareous sandy : loamy : farmyard manure at 1 : 3 : 1) on some vegatative growth characters , root development and nutritional status of the young Sewy date palms grown under calcareous sandy soil .

Results showed that the maximum survival percentage, number of leaves per palm ,number of pinna per leaf, width and length of pinna , leaf area , fresh weight of top roots as well as root length and diameter and nutrients (N ,P and K) were recorded in larger offshoots rather than in smaller ones. The maximum values were recorded on offshoots planted in medium containing calcareous sandy : loamy : farmyard manure at 1 : 3 : 1 compared to using the media namely calcareous sandy: loamy at 1 : 3 and calcareous sandy soil only.

For producing healthly Sewy date palm offshoots growing in calcareous sandy soil and increasing survival percentage, it is suggested to select the large offshoots (15 – 20 kg) in planting medium containing calcareous sandy : loamy : farmyard manure at 1 : 3 : 1 .

INTRODUCTION

Date palm (*Phoenix dactylifera* L.) is an arborescent monocotyledonous plant that matures into a single stem (Bailey, 1976). A juvenile phase occurs in herbaceous, annual, and perennial species (Bonga, 1982). Date palm juvenile phase lasts up to 10 years (Ammar and Benbades, 1989). When date palm had sufficient size and vigor, usually around the fourth year of development, vegetative axillary bud out growth (often called offshoots or suckers). As the palm mature (7-10 years) axillary bud development is devoted almost exclusively to inflorescence production and offshoot formation ceases (Tisserat and DeMason, 1985). Off shoots develop slowly and their numbers are limited. The low number of transplantable off shoots varies from 5-30 according to the cultivar and the cultivation practices used (Bouguedoura, 1983).

Due to the strong apical dominance, axillary buds do not usually differentiate and grow as branches. Date palm produces limited number of offshoots in the early years of growth. Date palm is usually reproduced by juvenile palms. The rapid propagation, as well as propagation from mature specimen, is impossible due to limited number of offshoots produced and the fact that offshoot production is restricted to a certain period in the palm's life span (Bakhshi, 1976).

For commercial planting, date palms are vegetatively propagated by offshoots which arise from lateral buds as young shoots, and varying in size and morphology. Unfortunately, reliable quantities of offshoots cannot always be obtained whenever needed for large offshoots by some date palm cultivars in infrequent or erratic (Bougenudoura, 1983).

Factors affecting sewy date offshoots in calcareous soil

In Egypt, date palm are distributed in Nile Valley Oasis and desert districts. It considered one of the suitable trees which could be cultivated in the new reclaimed desert regions.

The potential for offshoot production also decreases with parent age. Other problems associated with this standard propagation technique are the low percentage of successful establishment of transplanted offshoots and the high portion of unsuitable offshoots that are damaged during detachment of needed offshoots. Other problems associated with this standard propagation technique are the low percentage of successful establishment of transplanted offshoots and the high portion of unsuitable offshoots that are damaged during detachment of needed offshoots (Al-Mana and Said 1993).

Because of its high nutritional value, high yield and long life (yielding up to 100 years) the date palm was already mentioned as the "tree of life", in addition date palms grown on different types of soils, but the best yields can be reached with calcareous sandy loam.

Date palm cultivars were classified into three types: soft, semi dry and dry cultivars. "Sewy" cultivar is the most important semi-dry date palm cultivar.

The propagation of date palm trees through offshoots has been the main method, ground offshoots of large sizes are usually used for this purpose, however, the use of small and aerial (High and unrooted) ones is not paratical due to their low survival .

One of the most important factors affecting the success cultivation of the offshoots especially under new reclaimed lands is rooting medium. Hence, the present work aimed to study the effect of different rooting medium for root development on small and large size of ground "Sewy" offshoots.

MATERIALS AND METHODS

The present investigation was conducted for the two seasons of 2006 and 2007 in a newly reclaimed orchard located at "Assuit" governorate on "Sewy" date palm offshoots.

The experiment involved two factors (A and B) . The first factor (A) contained two treatments from offshoot size namly a1) small (less than 10 kg) and a2) large (15 – 20 kg) . while the second factor (B) consisted from three types of medium namly b1) calcareous sandy at 100% , b2) calcareous sandy + loam at 1 : 3 and b3) calcareous sandy : loam : farmyard manure at 1 : 3 : 1 . Therefore, the present experiment included six treatments, each treatment was replicated five times , two palms per each . Complet randomized block design in split - plot arrangement was adopted . The two offshoots sizes and the three types of medium occupied the main and sub plots , respectively .

Stripped of their lower leaves and their remained leaf bases, cleaned of their outer fibrous sheathes, pruned to one spread (mature) leaf beside the internal wrapped (immature) leaves and made 1-to 2-inch- deep wound inside the remained internal bases of the leaves ,as Beauchesne *et al.* (1986). All separated offshoots were sterilized by soaking in fungicide solution for 30 minutes .

The offshoots were cultivated in hole of 1m length x 1m width x 1m depth in the first week of April (Aziz and Al-Hatamany 1993) and irrigated using surface irrigation system. The physical and chemical characteristics of the reclaimed soil were determined by the procedures outlined by Wilde *et al.* (1985) and the data are shown in Table 1.

Table 1: Analytical data for reclaimed soil under experiment

Character	Value
Particle size distribution:-	
Sand %	85.4
Silt %	8.7
Clay %	5.9
Texture	Calcareous sandy
E.C. (mmhos/ 1cm / 25 cm)	0.59
$CaCo_3$ %	32.15
pH (1-2.5 extract)	8.21
Total N %	0.06
Total K %	0.14

Nine months later, the offshoots were dug out and the survival percentage of every treatment was calculated according to the equation:-

$$\% \text{ Survival} = \frac{\text{Number of successful offshoots/treatment}}{\text{Total number of offshoot/treatment}}$$

In addition , number of leaves per palm , nunber of pinna per leaf as well as length and width of pinna (m) were mesured . Pinna area (cm2) was calculated using the following equation outlined by Ahmed and Morsy (1999) .

Pinna area (cm2) = 0.37 (length × width) + 10.29

Leaf area (cm2) was calculated by multiplying number of pinna by pinna area and dividing by 100.

The length and diameter of the longest roots were determined, and average of length and diameter (cm.) were calculated. All newly formed roots were removed and their total fresh weights (g) of each offshoot were recorded.

Samples of offshoots leaves were taken from the middle part of the selected developed leaves of the offshoots. The sample included 15 pinnae for each replicate. The collected pinnae samples were washed with tap water, then rinsed in distilled water, and dried at 70°C. The dried samples were ground, and the sample was digested with H_2O_2 and H_2SO_4 according to Evenhuis and Dewaard (1980). Total nitrogen was determined colorimetrically according to Evenhuis (1976). Potassium was determined by Petracourt PEP1 flame photopmeter. Phosphorus analyzed standard procedures by (Jackson 1958).

The obtained data were subjected to the analysis of variance according to Snedecor and Cochran (1990). The means were compared using New L.S.D. test at (0.05) level .

RESULTS AND DISCUSSION

Survival percentage:-

It is evident from the data in Table 3 that the size of offshoots had a siginificant and determined effect on survival percentage . Selecting large offshoots significantly increased survival percentage of young Sewy date palms growing under calcareous sandy soil compared to using small offshoots in the two experimental seasons .

Data concerning the effect of different medium on survival percentage of youing Sewy date palms, reveal that varying medium had significant effect on the percentage of survival . The maximum values were recorded when the palms were planted in medium namely calcareous sandy, calcareous sandy : loamy , calcareous sandy :loam : farmyard manure , in ascending order . Planting in medium containing calcareous sandy :loam : farmyard manure at 1 : 3 : 1 gave the maximum percentage . The minimum percentage was recorded with using calcareous sandy soil medium. These results were true in both seasons .

Selecting large offshoots of Sewy date palms and planting them in medium containing calcareous sandy : loam : farmyard manure at 1 : 3 : 1 gave the highest survival percentage during the two expriment seasons . These results are in accordance with those of Reuveni *et al* (1972) who reported that carbohydrates stored in the offshoot, which provide the energy for root growth, and unnamed, naturally occurring, root-prommoting and root-inhibiting substances, which control the intiation of root growth, are critical factors. Later, Reuveni and Adato (1974) concluded that the larger the offshoot is the greater the carbohydrate conntent and the smaller the content of root-inhibiting. In addition Donald and Dennis (2003) reported that, the highest survival rates offshoots size probably have more roots when initially removed from the mother palm, stored more carbohydrates to provide energy for root growth and increased leveles of naturally occurring, root-promoting substances. Also, Al-Mana *et al.* (1996) showed that

calcareous sandy medium was found to be inferior to other medium mixtures. Also results showed that values of rooting % of large offshoots were higher than those of small ones under all rooting medium treatments. These results are in harmony with those of Hussein *et al.* (1979). The best growth and the best rooting percentage were found by using offshoots weight exceeded > 15 kg, whereas, Openheimer *et al.* (1969) found that 35% of rooting percentage from small date palm offshoots (2-8Kg). Zaid (1999) reported that offshoots of a wide range of sizes, weights, and ages will root and establish successfully.

Root characters :

Data in Table 2 show that selecting large offshoots for plantation in calcareous sandy soil was significantly responsible for stimulating fresh weight of top roots as well as length and diameter of root compared to small offshoots in both seasons .

Varying planting medium caused a significant variation on root characters . Using loam and \ or farmyard manure with calcareous sandy significantly stimulated growth of roots compared with using calcareous sandy soil only . Selecting medium cotaining calcareous sandy, loam and farmyard manure at 1 : 3 : 1 , respectively resulted in the highest root development, while the lowest values were recorded when medium containing calcareous sandy soil only was used. These results were true in both seasons .

Table 2 : Effect of offshoot weight and rooting media on weight of top roots, root length and root diameter of Sewy date palm offshoots during 2006 and 2007 seasons.

Rooting media (B)	2006			2007		
	Offshoot weight (A)					
	a_1 small	a_2 large	Mean (B)	a_1 small	a_2 large	Mean (B)
	Fresh weight of top roots (g.)					
b_1 calcareous sandy (cal. sandy)	0.0	23.7	11.9	0.0	23.0	11.5
b_2 cal. sandy and loamy (1 : 3)	27.3	29.5	28.4	32.7	29.9	31.3
b_3 cal. sandy:loamy: F.Y.M.(1:3:1)	28.0	30.0	29.0	33.0	31.3	32.1
Mean (A)	18.4	31.1		21.9	28.1	
New L.S.D at 5% For A		1.1			1.3	
B		0.6			0.7	
AB		0.8			0.9	
	Root length (cm)					
b_1 calcareous sandy (cal. sandy)	0.0	37.0	18.5	0.0	37.0	18.5
b_2 cal. sandy and loamy (1 : 3)	28.0	38.8	33.4	28.9	39.0	34.0
b_3 cal. sandy:loamy: F.Y.M.(1:3:1)	32.8	39.9	36.4	33.0	41.5	37.3
Mean (A)	20.3	38.6		20.6	39.2	
New L.S.D at 5% For A		3.3			3.0	
B		2.9			2.8	
AB		4.1			3.9	
	Root diameter (cm)					
b_1 calcareous sandy (cal. sandy)	0.0	1.05	0.53	0.0	0.99	0.5
b_2 cal. sandy and loamy (1 : 3)	1.22	1.31	1.27	1.25	1.31	1.28
b_3 cal. sandy:loamy: F.Y.M.(1:3:1)	1.31	1.35	1.33	1.33	1.40	1.37
Mean (A)	0.84	1.24		0.86	1.23	
New L.S.D at 5% For A		0.26			0.15	
B		0.04			0.08	
AB		0.06			0.11	

The interaction between size of offshoots and planting medium had significant effect on root characters . The maximum values were recorded when large offshoots were planted in medium containing calcareous sandy : loam : farmyard manure at 1 : 3 : 1. Planting small offshoots in medium containing calcareous sandy soil only gave the lowest values . These results were true in both seasons . These result are in agreement with El-Deeb *et al.* (2008) who found that the mixture of calcareous sandy, peat moss and vermiculite medium induced a significant increase in total main roots fresh weight as compared with hydroponic pot medium.

Vegetative growth characters :

Data in Tables 3 and 4 clearly show that varying offshoot sizes caused significant differences on the studied vegatative growth characters namely number of leaves\ palm ,number of pinna per leaf ,width and length of pinna and leaf area . Using large offshoots significantly improved these growth characters compared to using small ones. These results were true in both seasons.

Growth characters were highly affected with varying the medium used in planting offshoots. Planting in medium containing loamy or farmyard manure with calcareous sandy soil was preferable in stimulating growth characters rather than using medium containing calcareous sandy soil only. The maximum values were recorded on palms planted in medium containing calcareous sandy: loam: farmyard manure at 1 : 3 : 1, respectively. While, using medium containing calcareous sandy soil only gave the lowest values and calcareous sandy : loam medium gave in between values. These results were nearly the same in both seasons.

The interaction between offshoot sizes and soil medium types had significant effect on all investigated growth characters. Planting large offshoots (15–20kg) in medium cotaining calcareous sandy : loam : farmyard manure at 1 : 3 : 1 effectively maximized these growth characters in both seasons. The lowest values were recorded on small palms growing under calcareous sandy soil only.

Table 3 : Effect of offshoot weight and rooting media on survival percentage, number of leaves/ palm and number of pinna/ leaf of Sewy date palm offshoots during 2006 and 2007 seasons.

Rooting media (B)	2006			2007		
	Offshoot weight (A)					
	a_1 small	a_2 large	Mean (B)	a_1 small	a_2 large	Mean (B)
	Survival %					
b_1 calcareous sandy (cal. sandy)	0.0	60.0	30.0	0.0	60.0	30.0
b_2 cal. sandy and loamy (1 : 3)	60.0	100	80.0	60.0	100	80.0
b_3 cal. sandy:loamy: F.Y.M.(1:3:1)	80.0	100	90.0	80.0	100	90.0
Mean (A)	46.7	86.7		46.7	86.7	
New L.S.D at 5% For A	7.0			7.0		
B	5.3			5.3		
AB	7.5			7.5		
	Number of leaves / palm					
b_1 calcareous sandy (cal. sandy)	0.0	4.0	2.0	0.0	5.0	2.5
b_2 cal. sandy and loamy (1 : 3)	6.0	7.0	6.5	7.0	7.0	7.0
b_3 cal. sandy:loamy: F.Y.M.(1:3:1)	7.0	9.0	8.0	9.0	9.0	8.5
Mean (A)	4.3	6.7		5.0	7.0	
New L.S.D at 5% For A	1.3			1.4		
B	1.0			1.1		
AB	1.4			1.5		
	Number of pinna / leaf					
b_1 calcareous sandy (cal. sandy)	0.0	66.0	33.0	0.0	69.0	34.5
b_2 cal. sandy and loamy (1 : 3)	70.0	75.0	72.5	55.0	80.0	67.5
b_3 cal. sandy:loamy: F.Y.M.(1:3:1)	75.0	81.0	78.0	71.0	84.0	77.5
Mean (A)	40.3	74.0		42.0	77.7	
New L.S.D at 5% For A	1.5			1.8		
B	2.0			2.1		
AB	2.8			3.0		

Table 4 : Effect of offshoot weight and rooting media on pinna length ,widthe and leaf area of Sewy date palm offshoots during 2006 and 2007 seasons.

Rooting media (B)		2006			2007		
		Offshoot weight (A)					
		a_1 small	a_2 large	Mean (B)	a_1 small	a_2 large	Mean (B)
		Pinna Width (cm)					
b_1 calcareous sandy (cal. sandy)		0.0	1.3	0.7	0.0	1.3	0.7
b_2 cal. sandy and loamy (1 : 3)		1.3	1.6	1.5	1.5	1.7	1.6
b_3 cal. sandy:loamy: F.Y.M.(1:3:1)		1.7	1.8	1.8	1.7	1.8	1.8
Mean (A)		1.0	1.6		1.1	1.6	
New L.S.D at 5% For	A	0.2			0.3		
	B	0.2			0.2		
	AB	0.3			0.3		
		Pinna length (cm)					
b_1 calcareous sandy (cal. sandy)		0.0	28.0	14.0	0.0	33.0	16.5
b_2 cal. sandy and loamy (1 : 3)		30.0	36.0	33.0	29.0	41.0	35.0
b_3 cal. sandy:loamy: F.Y.M.(1:3:1)		36.0	40.0	38.0	35.0	44.0	39.5
Mean (A)		22.0	34.7		21.3	39.3	
New L.S.D at 5% For	A	2.1			2.3		
	B	2.0			2.0		
	AB	2.8			3.0		
		Leaf area (cm2)					
b_1 calcareous sandy (cal. sandy)		0.0	0.16	0.08	0.0	0.18	0.09
b_2 cal. sandy and loamy (1 : 3)		0.17	0.24	0.21	0.15	0.29	0.22
b_3 cal. sandy:loamy: F.Y.M.(1:3:1)		0.25	0.30	0.28	0.23	0.33	0.28
Mean (A)		0.14	0.23		0.13	0.27	
New L.S.D at 5% For	A	7.0			7.0		
	B	5.3			5.3		
	AB	7.5			7.5		

4- Percentages of N , P and K in the leaves:

Table 5 shows that percentages of N , P and K in the leaves of Sewy date palms were significantly affected by varying size of offshoots. They were significantly maximized when large offshoots were selected for planting in calcareous sandy soil. This trend was observed in both seasons.

The nutritional status of the offshoots was significantly affected by types of medium. The maximum values of nutrients were recorded when offshoots of Sewy date palms were planted in medium containing calcareous sandy : loam : farmyard manure at 1 : 3 : 1, respectively, while medium containing calcareous sandy soil only significantly minimized these essential nutrients. In between results were obtained when medium containing calcareous sandy : loam at 1 : 3 was used. Similar results were recorded during the two seasons.

The three nutrients were significantly affected by the studied interaction. The maximum values were detected on large offshoots planted on medium containing calcareous sandy : loam : farmyard manure at 1 : 3 : 1. The minimum values were recorded on small offshoots planted in medium containing calcareous sandy soil only. Similar results were found in both seasons.These results are in line with those obtained by Druege *et al.* (2000) who reported that the higher root numbers produced with increasing nitrogen supply can be interpreted as reflecting root initiation, while increased root length can be the consequence of both accelerated root initiation and development.

Table 5 : Effect of offshoot weight and rooting media on leaf nitrogen ,phosphorus and potassium content of Sewy date palm offshoots during 2006 and 2007 seasons.

Rooting media (B)	2006			2007		
	Offshoot weight (A)					
	a_1 small	a_2 large	Mean (B)	a_1 small	a_2 large	Mean (B)
	N %					
b_1 calcareous sandy (cal. sandy)	0.0	1.90	0.95	0.0	1.92	0.96
b_2 cal. sandy and loamy (1 : 3)	2.46	2.55	2.51	2.41	2.62	2.52
b_3 cal. sandy:loamy: F.Y.M.(1:3:1)	2.73	2.81	2.77	2.49	2.90	2.70
Mean (A)	1.73	2.42		2.08	2.48	
New L.S.D at 5% For A		0.22			0.20	
B		0.18			0.17	
AB		0.25			0.24	
	P %					
b_1 calcareous sandy (cal. sandy)	0.0	0.19	0.10	0.0	0.18	0.09
b_2 cal. sandy and loamy (1 : 3)	0.24	0.25	0.25	0.23	0.26	0.25
b_3 cal. sandy:loamy: F.Y.M.(1:3:1)	0.30	0.33	0.32	0.28	0.30	0.29
Mean (A)	0.18	0.26		0.17	0.25	
New L.S.D at 5% For A		0.05			0.06	
B		0.05			0.03	
AB		0.07			0.04	
	K %					
b_1 calcareous sandy (cal. sandy)	0.0	4.1	2.0	0.0	4.5	2.3
b_2 cal. sandy and loamy (1 : 3)	4.2	4.4	4.3	4.4	4.6	4.5
b_3 cal. sandy:loamy: F.Y.M.(1:3:1)	4.6	4.8	4.7	4.6	4.8	4.7
Mean (A)	2.9	4.4		3.0	4.6	
New L.S.D at 5% For A		0.6			0.8	
B		0.3			0.5	
AB		0.4			0.7	

In conclusion, planting large offshoots of young Sewy date palms (15-20 kg) in medium containing calcareous sandy : loam : farmyard manure effectively counteracted the adverse effects of planting in calcareous soil on survival % ,growth and nutritional status .

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Factors affecting sewy date offshoots in calcareous soil

تقييم بعض العوامل المؤثره على نجاح زراعة فسائل نخيل البلح السيوى فى الأراضى الجيرية

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أجريت هذه الدراسه فى مزرعه خاصه مستصلحه حديثا تقع فى محافظة اسيوط خلال موسمي ٢٠٠٦و ٢٠٠٧ لدراسة تأثير حجم الفسيله وكذا البيئه التى تتم زراعة الفسائل فيها وذلك على فسائل نخيل البلح السيوى والذى يتميز بحساسيته وأنخفاض نسبة نجاحه فى الأراضى ذات نسبة الجير العاليه وذلك بمحافظة أسيوط بصعيد مصر.

تم أختيار حجمين للفسائل هما فسائل كبيرة الحجم (١٥ – ٢٠ كجم) و فسائل صغيرة الحجم (أقل من ١٠ كجم). وتمت الزراعه فى جور طولها ١ م × عرضها ١ م × عمقها ١ م مع أستخدام ٣ أنماط من بيئة الزراعة هى الرمل الجيرى (كونترول) (أراضى المزرعه العاديه) والرمل الجيرى : الطمي ٣:١ و الرمل الجيرى : الطمي : سماد بلدى ١ : ٣ : ١ .

أوضحت النتائج أن أعلى نسبة نجاح للفسائل وأعلى قيمة لعدد الأوراق على الفسيلة وعدد الوريقات فى الورقة وطول وعرض الوريقة ومساحة الورقة والوزن الطازج للجذور وطول وسمك الجذور والنسبة المئوية للنيتروجين والفوسفور والبوتاسيوم تم تسجيلها فى الفسائل الكبيرة الوزن مقارنة بالفسائل صغيرة الوزن. كذلك تم تسجيل أعلى القيم لهذه الصفات فى الفسائل التى تم زراعتها فى بيئة تتكون من الرمل الجيرى والطمى والسماد البلدى بنسبة ١ : ٣ : ١ على التوالى .

وذلك مقارنة باستخدام البيئات التى تحتوى على الرمل الجيرى والطمى وتلك التى تحتوى على الرمل الجيرى فقط.

لآجل انتاج فسائل نخيل بلح سيوى قوية فى الاراضى الرملية الجيرية ولأجل زيادة نسبة نجاح الفسائل فانه يقترح اختيار الفسائل الكبيرة الوزن (التى وزنها ما بين ١٥ – ٢٠ ك) وزراعتها فى بيئة تتحوى على رمل جيرى والطمى والسماد البلدى بنسبة ١ : ٣ : ١ على التوالى .