COMPARETIVE STUDIES ON THE PHYSICAL AND CHEMICAL PROPERTIES OF DATE FRUITS OF SAKKOTY VARIETY PROPAGATED BY OFF-SHOOTS AND TISSUE CULTURE TECHNIQUES

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Abstract

This study was conducted to compare the physical and chemical properties of date palm fruits of Sakkoty variety propagated by off-shoots and tissue culture techniques grown at Abou El-Reesh, Aswan Governorate during 2004 and 2005 seasons. The data showed that, Sakkoty date palm produced by tissue culture techniques gave the lowest bunch weight, total yield and seed weight in comparison with those produced by off-shoots in the two seasons. Sakkoty date palm propagated by tissue culture techniques gave the highest fruit and pulp weight, fruit length and fruit volume in the two seasons. Fruit moisture content and total acidity percentages were significantly higher in fruit from Sakkoty variety produced by off-shoots during in the two seasons. On the other side, Sakkoty variety produced by off-shoots gave the highest total soluble solids, but gave the lowest total and reducing sugars, and tannins content in both seasons as compared with there of Sakkoty date palm produced by tissue culture techniques.

Generally, it could be concluded that Sakkoty date palm produced by tissue culture techniques produced highest fruit weight with high quality.

INTRODUCTION

Date palm (*Phoenix dactylifera L.*) is widely distributed in different regions of the world, and is one of the important fruit species grown in Egypt. In Egypt, date palms are distributed in Nile valley, Oases and desert districts. Date palms could grow under drastic environmental conditions which many of other fruit species may not grow. Sakkoty cultivar is the most important dry date palm cultivars grown at Aswan Governorate.

Off shoots propagation method is the most common conventional one for date palm propagation. It helps to attain identical breeds, that are also identical to the mother parent date palm tree. On the average, a date palm tree produces typically 10 to 25 off-shoots during the first 20 years of its life span, mainly during the first 10 years. Owing to the fast increasing demand of palm growers to off-shoots, the produced number is not enough (Hussein, *et al.*, 1976).

At present time, the emerging tissue culture technique has gained a certified rank concerning the production of a huge number of date palm off-shoots in an

amazingshort time period. In addition, it helpe bring up healthy off-shoots that are of high friut quality and are also out of and tolerant to diseases (El-Wasel, 1999).

The aim of this study was to confirm whether tissue culture- derived technique produced identical propagules of the elite date palm cultivars or not.

MATERIALS AND METHODS

This study was conducted during two successive seasons 2004 and 2005 on nine female from each Sakkoty date palm variety produced by off-shoots and tissue culture techniques, of about 9 years old grown at Abou-Elreesh, Aswan Governorate, date palm trees were grown in a clay soil.

The experimental palms were nearly healthy, uniform in growth, vigor, height and fruiting capacity. The trees were subjected to the normal cultural practices. Only ten female spathes of nearly equal size were selected on each selected palm tree.

The experimental palms were arranged in a randomized complete block design with three replications, (three palms for each replication). The yield of experimental palms was harvested by mid-October in each season to determine the following estimates:

1- Yield per palm (kg).

2- The average bunch weight (kg).

3- Fruit physical properties.

Samples of 75 fruits per tree (5 fruits/ bunch) were randomly taken for the determination of fruit weight, pulp weight, seed weight, fruit size and fruit dimensions.

4- Fruit chemical properties.

Preparation of sample for chemical analysis:

Ten date fruits from per tree were divided into pieces and seed were omitted. Fifty grams of pieces were mixed with 100-ml. distilled water using special electric mixer for extraction, then filtered and the filtrate was used for the determinations.

Moisture content, total soluble solids (TSS) percentages by using hand refractometer. Acidity percentage as malic acid and total, reducing and non-reducing sugars percentages were determined according to A.O.A.C. (1995).

All collected data were subjected to statistical analysis according to the procedure reported by Snedecor and Cochran (1980).

5- Vegetative characteristics.

Trunk girth and the leaf were assessed for various vegetative characteristics such as leaf length, leaflet area length, thorn area length, number of leaflet per leaf, number of thorn per leaf and numbers of off-shoots per tree.

RESULTS AND DISCUSSION

Data presented in (Table 1) show the average yield, weight of bunches and fruit physical properties of Sakkoty date palm variety produced by off-shoots and tissue culture techniques.

1- Yield (Kg):

Data clearly indicated that significant differences in total yield of the studied female Sakkoty date palm produced by off-shoots and tissue culture techniques in the two seasons. Sakkoty date palm produced by tissue culture techniques produced the lowest yield (66.20 and 62.90 kg) as compared with the same cultivar produced by off-shoots (75.40 and 71.20 kg) in the first and second seasons, respectively.

2- Bunch weight (Kg):

The bunch weight gave a similar trend to the yield. Since Sakkoty date palm produced by tissue culture techniques gave the lower bunch weight (6.62 and 6.29 kg), compared to Sakkoty date palm produced by off-shoots (7.54 and 7.12 kg) in the first and second seasons, respectively.

3- Fruit physical properties.

3-1- Fruit dimensions (cm):

3-1-1- Fruit length (cm):

Data indicated significant differences in fruit volume of Sakkoty date palm produced by off-shoots and tissue culture techniques in the first season only. Since Sakkoty date palm produced by tissue culture techniques gave the largest fruit length (5.40 and 5.29 cm) as compared with fruits produced by off-shoots (5.20 and 5.10 cm) in the first and second seasons, respectively.

3-1-2- Fruit diameter (cm):

Sakkoty date palm produced by off-shoots gave the largest fruit diameter (2.70 and 1.94 cm) as compared with the Sakkoty date palm produced by tissue culture techniques (1.81 and 1.90 cm) in the first and second seasons, respectively.

3-2- Fruit weight (g):

Data indicated significant differences in fruit weight of Sakkoty date palm produced by off-shoots and tissue culture techniques in the two seasons. Sakkoty date palm produced by tissue culture techniques gave the highest fruit weight (10.30, 11.15 g) than those the same cultivar produced by off-shoots (7.84, 9.04 g) in the first and second seasons, respectively.

3-3- Pulp weight (g):

Regarding the pulp weight, the results indicated significant differences between Sakkoty date palm produced by off-shoots and tissue culture techniques in the two seasons. Since Sakkoty date palm produced by tissue culture techniques gave

the highest pulp weight (9.11 and 9.97 g) as compared with the Sakkoty date palm produced by off-shoots (6.63 and 7.84 g) in the first and second seasons, respectively.

3-4- Seed weight (g):

No significant differences were obtained in seed weight between Sakkoty date palm produced by off-shoots and tissue culture techniques in both seasons. Sakkoty date palm produced by tissue culture techniques gave the lowest seed weight (1.19 and 1.18 g) as compared with the Sakkoty date palm produced by off-shoots (1.21 and 1.20 g) in the first and second seasons, respectively.

3-5- Fruit size (cm^3):

Data indicated that significant differences in fruit volume of Sakkoty date palm produced by off-shoots and tissue culture techniques in the two seasons. Sakkoty date palm produced by tissue culture techniques gave the highest fruit volume (11.20 and 12.00 cm^3) as compared with the same cultivar produced by off-shoots (8.90 and 9.00 cm^3) in the first and second seasons, respectively.

4- Fruit chemical properties.

Data of the chemical properties of fruits, i.e. moisture percentage, total soluble solids percentage, total acidity, tannins content and sugars content are listed in Table (2).

4-1- Moisture content (%):

Significant differences were detected in moisture content percentage in the first season. Sakkoty dates produced by off-shoots contained the highest moisture percent (19.27 %) as compared with the Sakkoty date fruits produced by tissue culture techniques (15.01 %).

4-2- Total soluble solids (TSS %):

Results indicated that fruit total soluble solids percentage was significantly different in Sakkoty date palm produced by off-shoots and tissue culture techniques in the two seasons. Sakkoty dates produced by off-shoots gave the highest total soluble solids percentage (62.80 and 60.41 %) as compared with the same cultivar produced by tissue culture techniques (52.21 and 51.19 %) during the two seasons.

4-3- Total acidity (%):

Data indicated that the total acidity percentage was significantly different in fruits Sakkoty date palm produced by off-shoots and tissue culture techniques in the first season only. Since Sakkoty dates produced by off-shoots gave the highest total acidity percentage (0.0246 %) as compared with those of date palm produced by tissue culture techniques (0.0195 %) in the first season.

4-4- Sugar contents:

4-4-1- Total sugars (%):

The data indicated that the total sugars values were significantly different in Sakkoty dates produced by off-shoots and tissue culture techniques in the two seasons. Sakkoty dates produced by tissue culture techniques gave the highest total sugars percentage (73.39 and 75.11 %) as compared with those produced by off-shoots (70.43 and 69.89 %) in the first and second seasons, respectively.

4-4-2- Reducing sugars (%):

Data indicated that the reducing sugars percentage to of the same trend the total sugars Sakkoty date palm found in produced by off-shoots and tissue culture techniques in the two seasons. Since Sakkoty dates produced by tissue culture techniques gave the highest total sugars percentage (69.62 and 71.38 %) as compared with the same cultivar produced by off-shoots (65.85 and 66.01 %) in the first and second seasons, respectively.

4-4-3- Non-reducing sugars (%):

No significant differences were obtained in non-reducing sugars percentage for the Sakkoty date palm produced by off-shoots and tissue culture techniques in both seasons. Sakkoty date palm produced by off-shoots gave the highest non-reducing sugars percentage (4.58 and 3.88 %) fruits of Sakkoty date palm produced by tissue culture techniques gaves lesser values (4.13 and 3.73 %)) in the first and second seasons, respectively.

4-5- Tannins content (%):

Regarding tannins content, the results indicated that there are significant differences in Sakkoty dates produced by off-shoots and tissue culture techniques in the two seasons. Sakkoty dates produced by off-shoots gave the lowest tannins content (0.56 and 0.45 %) as compared with the Sakkoty date valuse produced by tissue culture techniques (0.71 and 0.62 %)) in the first and second seasons, respectively.

In conclusion, concerning Sakkoty dates produced by tissue culture techniques and grown at Abou-Elreesh, Aswan Governorate gave higher vegetative growth, yield and fruit physical and chemical properties.

5- Vegetative characteristics.

Data in Table (3) show thick tree girth (trunk circumference) of the date palm propagated by tissue culture compared with that propagated by off-shoot. On the other side, the date palm propagated by tissue culture was significantly better than the date palm propagated with off-shoots in the tow seasons in leaf length, leaflet area length, number of leaflet per leaf and numbers of off-shoots per tree. In the both seasons, there was no significant difference regarding the thorn area length and number of thorn per leaf for date palm propagated by tissue culture and date palm propagated by off-shoots.

Table 1. Fruit physical properties of Sakkoty date palm cultivar produced by off-shoots and tissue culture techniques grown at Aswan during 2004 and 2005 seasons.

Sakkoty variety produced by	Yield (kg)	Bunch weight (kg)	Fruit weight (g)	Pulp weight (g)	Seed weight (g)	Fruit volume (cm^3)	Fruit dimension	
							Fruit length (cm)	Fruit diameter (cm)
2004								
Off-shoots	75.40 a	7.54 a	7.84 b	6.63 b	1.21 a	8.90 b	5.20 a	2.70 a
Tissue culture techniques	66.20 b	6.62 b	10.30 a	9.11 a	1.19 a	11.20 a	5.40 a	1.81 b
2005								
Off-shoots	71.20 a	7.12 a	9.04 b	7.84 b	1.20 a	10.00 b	5.10 a	1.94 a
Tissue culture techniques	62.90 b	6.29 b	11.15 a	9.97 a	1.18 a	12.11 a	5.29 a	1.90 a

Table 2. Fruit chemical properties of Sakkoty date palm cultivar produced by off-shoots and tissue culture techniques grown at Aswan during 2004 and 2005 seasons.

Sakkoty variety produced by	Moisture content (%)	Total soluble solids (%)	Total acidity (%)	Sugars (g/100g DW)			Tannins content (%)
				Total Sugars (%)	Reducing sugars (%)	Non-reducing sugars (%)	
2004							
Off-shoots	19.27 a	62.80 a	0.0246 a	70.43 b	65.85 b	4.58 a	0.56 b
Tissue culture techniques	15.01 b	52.21 b	0.0195 b	73.39 a	69.26 a	4.13 a	0.71 a
2005							
Off-shoots	19.94 a	60.41 a	0.0245 a	69.89 b	66.01 b	3.88 a	0.45 b
Tissue culture techniques	18.72 a	51.19 b	0.0220 a	75.11 a	71.38 a	3.73 a	0.62 a

Table 3. Trunk girth and some morphological characteristics of Sakkoty date palm propagated by tissue culture and off-shoots in 2004 and 2005 seasons.

Season	2004		2005	
Parameter tree type	Off-shoot	Tissue culture	Off-shoot	Tissue culture
Trunk girth (cm)	166 a	142 b	168 a	142 b
Leaf length (cm)	206 b	365 a	216 b	370 a
Leaflet area length (cm)	176 b	340 a	186 b	350 a
Thorn area length (cm)	30 a	20 b	30 a	20 b
No. Of leaflet/leaf	90 b	102 a	92 b	102 a
No. Of thorn/leaf	28 a	28 a	28 a	28 a
No. Of off-shoots	10 b	20 a	10 b	22 a

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دراسات مقارنة بين المواصفات الطبيعية والكيميائية لثمار صنف السكوتى المتكاثر بالطريقة العادية (الفسائل) وآخر متكاثر بزراعة الأنسجة

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مركز بحوث الصحراء – القاهرة

تم فى هذه الدراسة تقييم صنف السكوتى المتكاثر بالطريقة العادية وآخر متكاثر بطريقة زراعة الأنسجة والنامى بدراو محافظة أسوان خلال موسمين متتاليين (٢٠٠٤-٢٠٠٥). وقد أوضحت النتائج ما يلى:

– أظهرت النتائج فروقا معنوية فى وزن السوباطة والمحصول الكلى فى صنف السكوتى خلال موسمى الدراسة. حيث أعطت أشجار السكوتى المتكاثر بطريقة زراعة الأنسجة محصولا أقل مقارنة بأشجار السكوتى المتكاثر بالطريقة العادية.

– أعطت أشجار السكوتى المتكاثر بطريقة زراعة الأنسجة زيادة معنوية فى وزن الثمرة ووزن اللحم/ثمرة وطول الثمرة بينما قل قطر الثمرة وذلك خلال الموسم الأول فقط مقارنة بأشجار السكوتى المتكاثر بالطريقة العادية.

– أعطت أشجار السكوتى المتكاثر بطريقة زراعة الأنسجة أقل وزن للبذرة مقارنة بأشجار السكوتى المتكاثر بالطريقة العادية خلال موسمى الدراسة.

– أظهرت النتائج فروقا معنوية فى محتوى ثمار أشجار السكوتى المتكاثر بطريقة زراعة الأنسجة من الرطوبة والحموضة الكلية خلال الموسم الأول فقط مقارنة بأشجار السكوتى المتكاثر بالطريقة العادية.

– أظهرت النتائج أيضا إنخفاضا معنويا فى محتوى الثمار من المواد الصلبة الذائبة وزيادة معنوية فى محتوى الثمار من السكريات الكلية والمختزلة بأشجار السكوتى المتكاثر بطريقة زراعة الأنسجة مقارنة بأشجار السكوتى المتكاثر بالطريقة العادية خلال موسمى الدراسة.

– كما أظهرت النتائج أيضا زيادة معنوية فى محتوى ثمار أشجار السكوتى المتكاثر بطريقة زراعة الأنسجة من التنينات خلال موسمى الدراسة مقارنة بأشجار السكوتى المتكاثر بالطريقة العادية.

– بناء على النتائج المتحصل عليها من هذه الدراسة فأنه يتطلب زيادة أعداد الأصناف الممتازة من النخيل الجاف المتكاثر بطريقة زراعة الأنسجة والعمل على نشر زراعته بجنوب الوادى وتوشكي.