

Evaluation of Some Dry Date Palm Varieties Propagated Through Seed and Tissue Culture Technique under Aswan Region Climatic Conditions

Faissal, F. Ahmed, Moawad A. Mohamed; Ali A. Gobara and Ahmed, A. Abd El- Kafy

Hort. Dept, Fac. of Agric. Minia Univ. Egypt.

a_samman1@yahoo.com

Abstract: This study was conducted during 2011 and 2012 seasons to compare growth, flowering and fruit setting behaviour, yield as well as physical and chemical characteristics of some dry date palm varieties (Melkaby, Gendiala and Sakkoti) propagated through seeds and tissue culture techniques under Aswan region climatic conditions. This study clarified that major differences were observed on vegetative growth characters as well as flowering and fruiting aspects among the two propagation methods namely seeds and tissue culture as well as among the three date palm cvs Melkaby, Gendiala and Sakkoti. All the positive effects on the behaviour of growth and fruiting aspects were attributed to using propagation via seeds. The best date palm cvs successfully grown under Aswan environmental conditions are Gendiala, Melkaby and Sakkoti, in descending order based on their higher yields and fruit quality. We need in the future for evaluation of all date palm cvs produced from tissue culture grown in all environmental conditions under Egypt to survey the different problems and to select the best way for alleviating these problems especially at the older ages.

[Faissal, F. Ahmed, Moawad A. Mohamed; Ali A. Gobara and Ahmed, A. Abd El- Kafy. **Evaluation of Some Dry Date Palm Varieties Propagated Through Seed and Tissue Culture Technique under Aswan Region Climatic Conditions.** *Stem Cell* 2013;4(3):14-24] (ISSN 1545-4570). <http://www.sciencepub.net/stem>. 2

Keywords: Evaluation, growth, fruiting, Melkaby, Gendiala and Sakkoti date palms,

1. Introduction

Like any successful program for improvement of the date palm industry, should begin with a study and evaluation of cvs grown. Recently, most of the standard date palm cvs grown in Egypt are produced from tissue culture method. Accordingly, these date palm cvs need more evaluation studies to select the most suitable of them to be established under the local conditions. Many problems were appeared in tissue cultured date palms such as misformation of flowers and the great decline on fruit retention and number of bunches/ palm (**Djerbi, 2000 and Jain, 2001**). Therefore, it is necessary for made a comparison on the behaviour of dry date palms propagated through tissue culture and those propagated through seeds under Aswan environmental conditions.

A remarkable and great variation was observed on growth, fruit setting and yield behaviour as well as some physical and chemical characteristics of the fruits in different date palm cvs grown under various climatic conditions (**Mostafa- Laila, 2000; Shaker et al., 2000; Al- Obeed and Abdelaal-Rahman, 2002; Azeqour- Mjourhat and Baaziz, 2002; El- Kady, 2004; El- Salhy et al., 2004; Vij et al., 2005; Oraby- Mona, 2006; Alkhateeb, 2008; Zudar et al., 2008; Metwaly et al., 2009 and Hasnaoui et al., 2011**).

The target of this study was elucidating the differences on growth and fruiting aspects between the

three dry date palms namely Melkaby, Gendiala and Sakkoti grown under Aswan region and propagated through seeds or tissue culture techniques.

2. Material and Methods

This investigation was conducted in a private orchard located at El- Bosayila village, Edfo district, Aswan Governorate during consecutive seasons of 2011 and 2012 in which both tissue culture derived and propagated by seeds dry date palm cvs Melkaby, Gendiala and Sakkoti were selected for achieving this study.

The palms of each cv. were at the same age and uniform in vigour. They were 8 years old at the start of this study, good physical conditions, free of insects, damage and diseases. Planting distance was 6×6 meters apart.

Soil is classified as silt; clay in texture with a water table depth not less than two meters deep. The results of orchard soil analysis (according to **Pregel (1945); Chapman and Pratt (1961); Black et al. (1965); Davis and Ferites (1970) and Wilde et al. (1985)**).

This experiment included six treatments from two factors (A & B). The first factor (A) consisted from two propagation methods namely a₁) Through seeds and a₂) Through tissue culture technique. The second factor (B) comprised from three dry date palm cvs grown under Aswan environmental conditions namely b₁) Melkaby, b₂) Gendiala and b₃) Sakkoti.

Each treatment was replicated three times, three palm per each. Therefore, the total palms selected for achieving of this study was 36 palms (12 palms for each date palm cv.).

This experiment was laid out in completely randomized block design in split plot arrangement where the two propagation methods and the three date palm cvs occupied the main and subplots, respectively. Each treatment was replicated three times, two palms per each.

Generally, the following measurements were determined during both seasons:

- 1) Palm height, girth and diameter (cm.).
- 2) Number of offshoots/ palm.
- 3) Number of produced leaves/ palm/ year.
- 4) Leaf morphology (length & width and area of leaflet (**Shabana and Antoun, 1980**) and leaf, number of leaflets/ leaf, number of spines/ leaf, spine length (cm.) and total surface area per palm (m²).
- 5) Date of spathes bursting, length and girth of spathe, number of strands per spathe as well as number of flowers and fruits per strand.
- 6) Percentages of initial fruit setting and fruit retention.
- 7) Yield as well as number of bunches per palm and bunch weight.
- 8) Some physical and chemical characteristics of the fruits namely weight of fruit, percentages of seed and flesh, fruit volume, height and diameter of fruit, seed length, fruit shape volume, T.S.S %, total, reducing and non-reducing sugars (**A.O.A.C., 1995**), total acidity % (as g malic acid/ 100 g pulp) (**A.O.A.C., 1995**), T.S.S/ acid, total soluble tannins % (**Balbaa, 1981**) and Crude fibre % (**A.O.A.C., 1995**).

Thereafter, the obtained data were tabulated and subjected to the proper statistical analysis of variance using New L.S.D. test for recognizing the significance differences among the various treatment means according to the method outlined by **Gomez and Gomez (1984)** and **Steel and Torrie (1980)**.

3. Results and Discussion

1- Vegetative growth characters:

It is quite clear from the data in Tables (1 - 4) that propagation through seeds significantly stimulated the ten vegetative growth characters namely number of offshoots/ palm; palm height, number of leaves/ palm, length, width and area of leaflet and leaf and total surface area and reduced the five growth aspects namely girth and diameter of palm, number of leaflets/ leaf as well as number of spines/ leaf and spine length of the three investigated

date palm cvs in relative to propagation through tissue culture. The maximum values of girth and diameter of palm, number of leaflets/ leaf as well as number of spines/ leaf and spine length were recorded on the palms propagated through tissue culture technique. The maximum values of these growth characters were presented in the date palm cvs Sakkoti, Melkaby and Gendiala, in descending order. In most cases, the maximum values were recorded on Sakkoti date palm propagated through seeds. The minimum values were recorded on the date palm cv. Gendiala propagated from tissue culture technique. These results were true during both seasons.

2- Dates of spathes cracking:

It is clear from the data in Table (4) that carrying out propagated via seeds significantly advanced the dates of spathes cracking rather than propagation with tissue culture. Date of spathes cracking was significantly hastened in Sakkoti date palm in relative to the other two date palm cv. Melkaby and Gendiala. Date palm cv. Melkaby occupied the second position in spathes cracking. Spathes cracking was significantly delayed in the palm cv. Gendiala. Propagation of date palm cv. Sakkoti through seeds greatly advanced the date of spathes cracking (24 Feb. and 28 Feb. during both seasons, respectively). The latest date of spathes cracking (22 Mar. and 25 Mar. during both seasons, respectively) was recorded on the date palm cv. Gendiala propagated through tissue culture method. Similar results were announced during 2011 and 2012 seasons.

3- Length and girth of spathe:

Propagation of the three date palms cvs through seeds significantly was very effective in stimulating length and girth of spathes compared with using tissue culture method (Table 5). The length and girth were significantly maximized in the date palm cvs Melkaby, Gendiala and Sakkoti, in descending order (Table 5). The maximum values were presented in the date palm cv. Melkaby propagated through seeds. Propagation of Sakkoti date palm through tissue culture method gave the lowest values. These results were true during both seasons.

4- Number of strands/ bunch:

It is reveal from the obtained data in Table (5) that number of strands/ bunch was significantly greater in the three date palm cvs propagated through tissue culture method rather than propagation via seeds during the first season of study. In the second season, date palms produced from tissue culture technique failed to give any one of the strands per bunch.

It is clear from the obtained data that number of strands/ bunch did not change among the date palm cvs Gendiala and Sakkoti. Date palm cv. Melkaby significantly had the lowest values compared with the other two date palm cvs Gendiala and Sakkoti. Sakkoti date palm produced the maximum values of number of strands/ bunch. These results were true during the first season. The three date palm cvs produced through tissue culture failed to produce any one of strands/ bunch. Sakkoti date palm cv. produced through tissue culture significantly produced the maximum values followed by date palm cv. Gendiala with the same method of propagation. Melkaby date palm cv. derived from seeds produced the minimum values. These results were true during the first season of study. In the second season, all date palm cvs produced via tissue culture failed to give any strands/ bunch.

5- Number of flowers and fruits per strand in the fruits:

It is worth to mention from the data in Tables (5 & 6) that propagation of these date palm cvs through seeds significantly was responsible for improving number of flowers and fruits/ strand in relative to those date palm cvs derived from tissue culture during the first season of study. In the second season, all date palm cvs produced through tissue culture did not produce any one of both flowers and fruits per strand.

Varying date palm cvs regardless the method of propagation had significant effect on the number of flowers and fruits per strand in the first season of study. In the second season, all date palm cvs produced from tissue culture failed to form any number of flowers and fruits per strand.

The maximum values were recorded on the date palm cv. Sakkoti produced from tissue culture in the first season of study. All date palm cvs produced through tissue culture failed to produce any number of flowers and fruits per strand in the second season of study.

6- Percentages of initial fruit setting and fruit retention:

Carrying out propagation through seeds significantly improved both initial fruit setting and fruit retention % as compared with reproduction by tissue culture method during the first season of study. In the second season, tissue cultured date palm cvs failed to produce any fruits just after fruit setting (Table 6).

It is clear from the obtained data that percentages of initial fruit setting and fruit retention were significantly varied according to date palm cvs. These results were true during the first season. The

maximum values were recorded on date palm cvs Gendiala and Melkaby. Date palm cv. Sakkoti produced the minimum values. However, in the second season of study, all date palm cvs derived from tissue culture did not bear any fruits. The maximum percentage of initial fruit setting was observed in date palm cv. Melkaby. Fruit retention % was maximized in Gendiala date palm cv.

All date palm cvs (Melkaby, Gendiala and Sakkoti) derived from seeds and Melkaby and Gendiala tissue cultured date palms bear the same number of fruits just after fruit setting stage. Sakkoti derived from tissue culture bear the lowest number of initial fruits. In the first and second seasons of study, the maximum percentage of fruit retention was recorded on Gendiala propagated from seeds. Sakkoti tissue cultured date palm bear, the lowest number of retained fruits in 2011 season.

7- Number of bunches and yield per palm of the fruits:

It is clear from the obtained data (Table 7) that propagation of the three date palms (Melkaby, Gendiala and Sakkoti) through seeds was significantly preferable in improving number of bunches/ palm and yield (kg.)/ palm in relative to using tissue culture method in the first season of study. In the second season, all date palm cvs produced from tissue culture failed to bear any bunches while in the third season, all date palm cvs except Sakkoti failed to bear any bunches produced bear any bunches.

The maximum values were recorded on date palm cvs Melkaby and Gendiala. The lowest values were recorded on the date palm cv. Sakkoti. These results were true during the first season of the study. In the second season of this study, all date palm cvs derived from tissue culture failed to bear any bunches and fruit. The maximum number of bunches and yield per palm were recorded in date palm cv. Gendiala produced from seeds. Sakkoti date palm cv. derived from seeds gave the lowest values. In the third season, all date palm cvs except Sakkoti produced from tissue culture failed to bear any bunches.

Date palm cv. Gendiala produced from seeds gave the maximum number of bunches and yield per palm. The lowest values were recorded on Sakkoti date palms produced from tissue culture. These results were true during 2011 season. In the second season, Gendiala date palm produced from seeds gave the maximum values. The minimum values were produced from the date palm cv. Sakkoti derived from seeds. All date palm cvs produced from tissue culture failed to bear any bunches. In the third season, only the date palm cv. Sakkoti derived from tissue culture produced few bunches.

8- Bunch weight:

It is clear from the obtained data in Table (7) that propagation via seeds was significantly very beneficial for improving bunch weight than using tissue culture in the first season of study. In the second season, all date palm cvs propagated through tissue culture failed to bear any bunches. Gendiala date palm cv. produced from seeds produced the heaviest bunches. The lowest bunch weight was recorded on the dater palm cv. Sakkoti produced from seeds.

The maximum weight of bunches was recorded on the date palm cv. Gendiala produced from seeds. Sakkoti date palm cv. produced from tissue culture produced the minimum values in the first season of study. In the second season, date palm cvs produced from tissue culture did not bear any bunches. Gendiala date palm cv. produced from seeds produced the greatest weight of bunches. The lightest bunches were borne on date palm cv. Sakkoti derived from, seeds.

9- Harvesting date:

It is clear from the data in Table (7) that harvesting date was significantly varied among the two methods of propagation.

It was materially advanced in date palm cvs produced via seeds rather than propagation through tissue culture. All date palm cvs produced through seeds were obviously harvested early than using the other method of propagation in the first season of the study. Date of harvesting was clearly harvested in the date palm cvs Melkaby, Gendiala and Sakkoti, in descending order. The earliest in harvesting date palm cv. was Melkaby and the latest one was on the date palm cv. Sakkoti.

The most early harvesting date palm cv. was Melkaby propagated through seeds. Propagation of date palm cv. Sakkoti through tissue culture effectively delayed date of harvesting.

10- Physical properties of the fruits:

It is obvious from the obtained data in Tables (7 & 8 & 9) that propagation of the three date palm cvs through seeds significantly promoted weight, height, width and thickness of fruit, flesh weight % and seed length and had no effect on first shape and flesh seeds in relative to propagation through tissue culture method. In the second season, all date palm cvs produced through tissue culture did not bear any fruits.

The maximum values of weight, height, width and thickness of fruit, flesh % & seed length were recorded in date palm cvs Melkaby, Gendiala and Sakkoti, in descending order. Fruits of Melkaby date palm cv. tended to be elongated while in date palm cvs Gendiala and Sakkoti, the fruits tended to be roundish. The greatest seeds weight was recorded in

date palm cv. Sakkoti. Melkaby date palm cv. produced the lowest values of seed weight.

The greatest weight, height, width and thickness of fruits, flesh weight %, seed length and flesh/ seeds and the lowest seed weight % were recorded on Melkaby date palm cv. produced through seeds. The vice versa was declared on the date palm cv. Sakkoti propagated through tissue culture. These results were true during the first season of study. In the second season, the three date palm cvs produced via tissue culture failed to bear any fruits. The best results with regard to physical characters of the fruits were obtained in the date palm cv. Melkaby propagated through tissue culture.

11- Chemical characteristics of the fruits in date palm cvs:

It is clear from the obtained data in Tables (10 & 11) that propagation through seeds was significantly very effective in improving the total soluble solids, total, reducing and non-reducing sugars, T.S.S/ acid and decreasing total acidity %, total soluble tannins and total crude fibre in the fruits of the three date palms comparing with propagation with tissue culture. These results were true during the first season of study. However, in the second season, date palms cvs produced from tissue culture failed to bear any fruits.

It is evident from the obtained data that all the previous chemical characteristics of the fruits were significantly varied according to date palms cvs. The great promotion on chemical characteristics of the fruits was recorded on date palm cvs Melkaby and Gendiala. Sakkoti date palm fruits recorded the last position in this respect. These results were true during the first season of study. In the second season of the study, the three date palm cvs produced through tissue culture did not give any fruits. The fruits of date palm cvs Melkaby and Gendiala produced from seeds gave the maximum values of fruit quality. Sakkoti date palm fruits exhibited low quality parameters.

The best results with regard to chemical fruits characteristics were obtained in the date palm cv. Gendiala propagation through seeds. Sakkoti date palm cv. Sakkoti propagated through tissue culture produced the worst results on chemical characteristics of the fruits. These results were true during the first season. In the second season of the study, all date palm cvs produced from tissue culture failed to bear any fruits.

4. Discussion

The previous great variation on growth and fruiting characters of the three date palms produced from seeds and tissue culture technique might be attributed to that most somaclonal in tissue culture appear on plants that come from callus tissue (*Zivdar et al.*,

2008 and Alkhateeb et al., 2008). This explanation was supported by the results of **Larkin and Scowcrof (1981) and Karp (1989)** who mentioned that date palm cvs Medjool, Barhee, Sukkary, Toory, Deglat Noor, Khalas and Nabtat- Saif produced from tissue culture had somaclonal variations. Dwarfism, slow growth, morphological abnormality, fruit set failure (shees) and supernumerary carpels were the most common phenomenon. The type and percentage of variations differ among cultivars. The fruit set failure and dwarfism highly occurred and caused an economical loss. Somaclonal variation in date palm plants can be permanent (genetic stable variation) or temporary (epigenetic variation). While, the genetic variations in plants are fixed and different to be changes, epigenetic variations are unstable and mostly results from physical changes. Several factors may contribute to the occurrence of somaclonal variations in tissue cultured date palms namely growth regulators, type of explants use, genotypic, nature of plants, length of duration cultured tissues are kept and

frequency of sub culturing and proliferation rate of cultured tissues (**Alkhateeb et al., 2006**). Propagation by seeds is unsatisfactory because this species is dioeciously and completely heterozygous and hence not true to type. Seeds may produce more than 50 % male or female plants.

Evaluation of dry date palm cvs in the present investigation revealed variations among the different characters. The variations are expected to occur because of different genotypes and environmental factors. The interaction between genetical and environmental conditions is greatly accompanied with great differences in these characters. Some of these date palm cvs bear highly desirable growth and fruiting characteristics and the same are exploited for commercial applications. Similar results regarding variation on growth and fruiting status have earlier been evaluated by **Mostafa- Laila (2000); Djerbi (2000); Shaker et al. (2000); El- Salhy et al. (2004); El- Kady (2004); Metwaly et al. (2009) and Hasnaoui et al. (2011).**

Table (1): Number of offshoots per palm as well as height, girth and diameter of palm of Melkaby, Gendiala and Sakkoti dry date palms propagated through seeds or tissue culture techniques grown under Aswan conditions during 2011 and 2012 seasons.

Dry date palm cv. (B)	Number of offshoots/ palm						Palm height (cm.)					
	2011			2012			2011			2012		
	Methods of propagation (A)											
	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)
b ₁ Melkaby	4.0	3.0	3.5	4.0	3.0	3.5	110.0	100.0	105.0	115.0	110.0	112.5
b ₂ Gendiala	3.0	1.0	2.0	3.0	1.0	2.0	103.0	100.0	109.0	108.0	105.0	106.5
b ₃ Sakkoti	6.0	7.0	6.5	6.0	7.0	6.5	113.0	105.0	101.5	118.0	116.0	117.0
Mean (A)	4.3	3.7		4.30	3.7		108.7	101.7		113.7	110.3	
New L.S.D at 5 %	A 0.5	B 0.8	AB 1.1	A 0.6	B 0.9	AB 1.3	A 2.0	B 2.1	AB 3.0	A 1.7	B 1.9	AB 2.7
Character	Palm girth (cm.)						Palm diameter (cm.)					
	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)
b ₁ Melkaby	139.0	144.0	141.5	144.0	150.0	147.0	71.0	72.0	71.5	72.0	75.0	73.5
b ₂ Gendiala	130.0	135.0	132.5	137.0	140.0	138.5	65.5	67.0	66.3	69.0	70.5	69.8
b ₃ Sakkoti	142.0	148.0	145.0	150.0	153.0	151.5	74.0	75.0	74.5	75.0	77.0	76.0
Mean (A)	137.0	142.3		143.7	147.7		70.2	71.3		72.0	74.2	
New L.S.D at 5 %	A 1.9	B 2.0	AB 2.8	A 2.0	B 2.1	AB 3.0	A 0.9	B 1.0	AB 1.4	A 1.1	B 1.2	AB 1.7

Table (2): Number of leaves/ palm, length and width of leaves and number of leaflets/ leaf of Melkaby, Gendiala and Sakkoti dry date palms propagated through seeds or tissue culture techniques grown under Aswan conditions during 2011 and 2012 seasons.

Dry date palm cv. (B)	Number of leaves/ palm						Leaf length (cm.)					
	2011			2012			2011			2012		
	Methods of propagation (A)											
	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)
b ₁ Melkaby	23.0	21.0	22.0	22.0	20.	21.0	251.0	233.0	242.0	211.0	200.0	205.5
b ₂ Gendiala	21.0	20.0	20.5	19.0	18.0	18.5	245.0	230.0	237.5	200.0	180.0	190.0
b ₃ Sakkoti	30.0	25.0	27.5	28.0	26.0	27.0	260.0	250.0	255.0	220.0	210.0	215.0
Mean (A)	24.7	22.0		23.0	21.3		252.0	237.7		210.3	196.7	
New L.S.D at 5 %	A 1.9	B 2.1	AB 3.0	A 2.0	B 2.1	AB 3.0	A 3.9	B 4.2	AB 5.9	A 4.0	B 4.2	AB 5.9
Character	Leaf width (cm.)						Number of leaflets/ leaf					
	2011			2012			2011			2012		
	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)
	b ₁ Melkaby	22.0	16.0	19.0	24.0	18.5	21.3	28.0	36.0	32.0	32.0	32.0
b ₂ Gendiala	21.0	14.0	17.5	21.0	17.0	19.0	44.0	48.0	46.0	30.0	34.0	32.0
b ₃ Sakkoti	24.0	18.0	21.0	28.0	22.0	25.0	36.0	48.0	43.0	34.0	40.0	37.0
Mean (A)	22.3	16.0		24.0	19.2		36.7	44.0		32.0	35.3	
New L.S.D at 5 %	A 2.2	B 2.5	AB 3.5	A 2.0	B 2.5	AB 3.5	A 1.2	B 1.4	AB 2.0	A 1.1	B 1.4	AB 2.0

Table (3): Length and width of leaflet, leaflet area and leaf area of Melkaby, Gendiala and Sakkoti dry date palms propagated through seeds or tissue culture techniques grown under Aswan conditions during 2011 and 2012 seasons.

Dry date palm cv. (B)	Leaflet length (cm.)						Leaflet width (cm.)					
	2011			2012			2011			2012		
	Methods of propagation (A)											
	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)
b ₁ Melkaby	19.0	13.0	16.0	21.0	16.0	18.5	1.5	1.1	1.3	1.6	1.1	1.4
b ₂ Gendiala	18.0	13.0	15.5	19.0	14.0	16.5	1.4	1.1	1.3	1.4	1.1	1.3
b ₃ Sakkoti	24.0	18.0	21.0	25.0	18.0	21.5	1.7	1.2	1.5	1.9	1.2	1.6
Mean (A)	20.3	14.7		21.7	16.0		1.5	1.1		1.6	1.1	
New L.S.D at 5 %	A 2.1	B 2.0	AB 2.8	A 2.0	B 2.0	AB 2.8	A 0.2	B 0.2	AB 0.3	A 0.2	B 0.2	AB 0.3
Character	Leaflet area (cm ²)						Leaf area (m ²)					
	2011			2012			2011			2012		
	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)
	b ₁ Melkaby	28.5	14.3	21.4	33.6	17.6	25.6	0.08	0.05	0.07	0.11	0.06
b ₂ Gendiala	25.2	14.3	19.8	26.6	15.4	21.0	0.11	0.07	0.09	0.08	0.05	0.07
b ₃ Sakkoti	40.8	21.6	31.2	47.5	21.6	34.6	0.15	0.10	0.13	0.16	0.09	0.13
Mean (A)	31.5	16.7		35.9	18.2		0.11	0.07		0.12	0.07	
New L.S.D at 5 %	A 1.3	B 1.4	AB 2.0	A 1.4	B 1.6	AB 2.3	A 0.02	B 0.02	AB 0.03	A 0.02	B 0.02	AB 0.03

Table (4): Total surface area/ palm, number of spines/ leaf, spine length and date of spathes cracking of Melkaby, Gendiala and Sakkoti dry date palms propagated through seeds or tissue culture techniques grown under Aswan conditions during 2011 and 2012 seasons.

Dry date palm cv. (B)	Total surface area/ palm						Number of spines/ leaf					
	2011			2012			2011			2012		
	Methods of propagation (A)											
	a ₁ Seed s	a ₂ Tissu e	Mea n (B)	a ₁ Seed s	a ₂ Tissu e	Mea n (B)	a ₁ Seed s	a ₂ Tissu e	Mea n (B)	a ₁ Seed s	a ₂ Tissu e	Mea n (B)
b ₁ Melkaby	1.84	1.05	1.45	2.42	1.20	1.81	30.0	36.0	33.0	32.0	37.0	34.5
b ₂ Gendiala	2.31	1.40	1.86	1.52	1.26	1.39	25.0	30.0	28.0	28.0	31.0	29.5
b ₃ Sakkoti	4.50	2.50	3.50	4.48	2.34	3.41	34.0	40.0	37.0	38.0	41.0	39.5
Mean (A)	2.88	1.65		2.81	1.60		29.7	35.3		32.7	36.3	
New L.S.D at 5 %	A 0.09	B 0.12	AB 0.17	A 0.06	B 0.10	AB 0.14	A 4.1	B 4.0	AB 5.6	A 2.9	B 3.0	AB 4.2
Character	Spine length (cm.)						Date of spathes cracking					
b ₁ Melkaby	4.0	6.0	5.0	5.0	6.0	5.5	1 Mar.	15 Mar.	8 Mar.	5 Mar.	--	--
b ₂ Gendiala	3.0	5.0	4.0	4.0	5.0	4.5	6 Mar.	22 Mar.	14 Mar.	10 Mar.	--	--
b ₃ Sakkoti	5.0	6.5	5.8	5.5	6.6	6.1	24 Feb.	9 Mar.	3 Mar.	28 Feb.	--	--
Mean (A)	4.0	5.8		4.8	5.9		28 Feb.	16 Mar.		7 Mar.	--	--
New L.S.D at 5 %	A 0.9	B 1.0	AB 1.4	A 1.0	B 1.0	AB 1.4	A --	B --	AB --	A --	B --	AB --

Table (5): Length and girth of spathe as well as number of strands/ bunch and number of flowers/ strand of Melkaby, Gendiala and Sakkoti dry date palms propagated through seeds or tissue culture techniques grown under Aswan conditions during 2011 and 2012 seasons.

Dry date palm cv. (B)	Spathe length (cm.)						Spathe girth (cm.)					
	2011			2012			2011			2012		
	Methods of propagation (A)											
	a ₁ Seed s	a ₂ Tissu e	Mea n (B)	a ₁ Seed s	a ₂ Tissu e	Mea n (B)	a ₁ Seed s	a ₂ Tissu e	Mea n (B)	a ₁ Seed s	a ₂ Tissu e	Mea n (B)
b ₁ Melkaby	44.0	40.0	42.0	45.3	--	--	21.0	18.0	19.5	22.5	--	--
b ₂ Gendiala	42.0	41.0	41.5	43.2	--	--	20.0	20.5	20.3	21.0	--	--
b ₃ Sakkoti	38.0	36.0	37.0	39.3	--	--	19.0	17.5	18.3	19.5	--	--
Mean (A)	41.3	39.0		42.6	--		20.0	18.7		21.0	--	--
New L.S.D at 5 %	A 0.8	B 1.0	AB 1.4	A --	B --	AB --	A 1.0	B 1.0	AB 1.4	A --	B --	AB --
Character	Number of strands/ bunch						Number of flowers/ strand					
b ₁ Melkaby	10.0	18.0	14.0	17.0	--	--	6.0	6.0	6.0	22.0	--	--
b ₂ Gendiala	20.0	24.0	22.0	14.0	--	--	15.0	12.0	13.5	15.0	--	--
b ₃ Sakkoti	20.0	25.0	22.5	15.0	--	--	18.0	20.0	19.0	15.0	--	--
Mean (A)	16.7	22.3		15.3	--		13.0	12.7		17.3	--	--
New L.S.D at 5 %	A 1.6	B 2.1	AB 2.9	A --	B --	AB --	A 1.0	B 1.2	AB 1.7	A --	B --	AB --

Table (6): Number of fruits/ strand and percentages of initial fruit setting and fruit retention and number of bunches/ palm of Melkaby, Gendiala and Sakkoti dry date palms propagated through seeds or tissue culture techniques grown under Aswan conditions during 2011 and 2012 seasons.

Dry date palm cv. (B)	Number of fruits/ strand						Initial fruit setting %								
	2011			2012			2011			2012					
	Methods of propagation (A)														
	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)			
b ₁ Melkaby	5.0	4.0	4.5	15.0	--	--	66.7	66.7	66.7	68.1	--	--			
b ₂ Gendiala	10.0	8.0	9.0	10.0	--	--	66.7	66.7	66.7	66.7	--	--			
b ₃ Sakkoti	12.0	12.0	12.0	10.0	--	--	66.7	60.0	63.4	66.7	--	--			
Mean (A)	9.0	8.0		11.7	--		66.7	64.5		67.2	--				
New L.S.D at 5 %	A	B	AB	A	B	AB	A	B	AB	A	B	AB			
	0.9	1.0	1.4	--	--	--	1.5	1.6	2.3	--	--	--			
Character	Fruit retention %						Number of bunches/ palm								
	2011			2012			2011			2012			2013		
	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)
b ₁ Melkaby	40.0	22.0	31.0	41.9	--	--	8.0	6.0	7.0	6	--	--	7.0	--	--
b ₂ Gendiala	46.0	28.0	37.0	48.0	--	--	9.0	5.0	7.0	8	--	--	9.0	--	--
b ₃ Sakkoti	32.0	14.0	23.0	34.0	--	--	7.0	4.0	5.5	5	--	--	6.0	--	--
Mean (A)	39.3	21.3		41.0	--		8.0	5.0		6.3	--		6.3	--	
New L.S.D at 5 %	A	B	AB	A	B	AB	A	B	A B	A	B	A B	A	B	A B
	5.0	2.2	--	--	--	--	1.2	1.6	2.2	--	--	--	--	--	--

Table (7): Bunch weight; yield/ palm, harvesting date and fruit weight of Melkaby, Gendiala and Sakkoti dry date palms propagated through seeds or tissue culture techniques grown under Aswan conditions during 2011 and 2012 seasons.

Dry date palm cv. (B)	Bunch weight (kg.)						Yield/ palm (kg.)					
	2011			2012			2011			2012		
	Methods of propagation (A)											
	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)
b ₁ Melkaby	10	8	9	6	--	--	80	48	64.0	36.0	--	--
b ₂ Gendiala	11	6	8.5	8	--	--	99	30	64.5	64.0	--	--
b ₃ Sakkoti	9	4	6.5	5	--	--	63	16	39.5	25.0	--	--
Mean (A)	10	6		--	--		80.7	31.3		--	--	
New L.S.D at 5 %	A	B	AB	A	B	AB	A	B	AB	A	B	AB
	1.8	2.0	2.8	--	--	--	4.0	4.1	5.8	--	--	--
Character	Harvesting date						Fruit weight (g.)					
	2011			2012			2011			2012		
	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)
b ₁ Melkaby	1 Oct.	15 Oct.	13 Oct.	5 Oct.	--	--	10.1	9.7	9.9	9.9	--	--
b ₂ Gendiala	7 Oct.	21 Oct.	14 Oct.	10 Oct.	--	--	6.6	6.0	6.3	7.1	--	--
b ₃ Sakkoti	25 Sep.	9 Oct.	3 Oct.	28 Sep.	--	--	7.3	3.6	5.5	8.3	--	--
Mean (A)	28 Feb.	15 Mar.		--	--		8.1	6.4		8.4	--	
New L.S.D at 5 %	A	B	AB	A	B	AB	A	B	AB	A	B	AB
	--	--	--	--	--	--	1.0	1.1	1.6	--	--	--

Table (8): Height, diameter, thickness and shape of fruits of Melkaby, Gendiala and Sakkoti dry date palms propagated through seeds or tissue culture techniques grown under Aswan conditions during 2011 and 2012 seasons.

Dry date palm cv. (B)	Fruit height (cm.)						Fruit diameter (cm.)					
	2011			2012			2011			2012		
	Methods of propagation (A)											
	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)
b ₁ Melkaby	5.7	5.0	5.4	5.4	--	--	2.7	2.2	2.5	2.5	--	--
b ₂ Gendiala	3.6	3.4	3.5	3.3	--	--	2.2	2.0	2.1	2.0	--	--
b ₃ Sakkoti	5.3	3.0	4.2	5.0	--	--	2.5	1.9	2.2	2.3	--	--
Mean (A)	4.9	3.8		4.6	--		2.5	2.0		2.3	--	
New L.S.D at 5 %	A 0.9	B 1.0	AB 1.4	A --	B --	AB --	A 0.3	B 0.4	AB 0.6	A --	B --	AB --
Character	Fruit thickness (cm.)						Fruit shape					
	2011			2012			2011			2012		
	Methods of propagation (A)											
	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)
b ₁ Melkaby	2.8	2.0	2.4	2.7	--	--	2.1	2.3	2.2	2.2	--	--
b ₂ Gendiala	1.7	1.8	1.8	1.5	--	--	1.6	1.7	1.7	1.7	--	--
b ₃ Sakkoti	2.1	1.7	1.9	2.0	--	--	2.1	1.6	1.9	2.2	--	--
Mean (A)	2.2	1.8		--	--		1.9	1.9		--	--	
New L.S.D at 5 %	A 0.2	B 0.3	AB 0.4	A --	B --	AB --	A NS	B 0.2	AB 0.3	A --	B --	AB --

Table (9): Seed length and percentages of flesh and seeds weight and flesh/ seed in the fruits of Melkaby, Gendiala and Sakkoti dry date palms propagated through seeds or tissue culture techniques grown under Aswan conditions during 2011 and 2012 seasons.

Dry date palm cv. (B)	Seed length (cm.)						Flesh weight %					
	2011			2012			2011			2012		
	Methods of propagation (A)											
	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)
b ₁ Melkaby	2.8	2.0	2.4	2.9	--	--	90.0	87.0	88.5	91.2	--	--
b ₂ Gendiala	2.3	2.0	2.2	2.4	--	--	82.0	91.0	86.5	83.4	--	--
b ₃ Sakkoti	2.7	2.2	2.5	2.8	--	--	86.0	75.0	80.5	88.0	--	--
Mean (A)	2.6	2.1		2.7	--		86.0	84.3		87.5	--	
New L.S.D at 5 %	A 0.2	B 0.2	AB 0.3	A --	B --	AB --	A 1.0	B 1.2	AB 1.7	A --	B --	AB --
Character	Seed weight %						Flesh/ seed					
	2011			2012			2011			2012		
	Methods of propagation (A)											
	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)
b ₁ Melkaby	10.0	13.0	11.5	8.8	--	--	9.0	6.7	7.9	10.4	--	--
b ₂ Gendiala	18.0	9.0	13.5	16.6	--	--	4.6	10.1	7.4	5.0	--	--
b ₃ Sakkoti	14.0	25.0	19.5	12.0	--	--	6.1	3.0	4.6	7.3	--	--
Mean (A)	14.0	15.7		12.5	--		6.6	6.6		7.6	--	
New L.S.D at 5 %	A 0.9	B 1.0	AB 1.4	A --	B --	AB --	A NS	B 0.5	AB 0.7	A --	B --	AB --

Table (10): Percentages of total soluble solids, total sugars, reducing and non-reducing sugars in the fruits of Melkaby, Gendiala and Sakkoti dry date palms propagated through seeds or tissue culture techniques grown under Aswan conditions during 2011 and 2012 seasons.

Dry date palm cv. (B)	T.S.S %						Total sugars %					
	2011			2012			2011			2012		
	Methods of propagation (A)											
	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)
b ₁ Melkaby	72.1	68.5	70.3	74.5	--	--	65.0	62.9	64.0	67.0	--	--
b ₂ Gendiala	74.0	66.0	70.0	76.5	--	--	67.5	60.0	63.8	71.0	--	--
b ₃ Sakkoti	70.2	64.5	67.4	71.0	--	--	63.0	56.0	59.5	63.0	--	--
Mean (A)	72.1	66.3		74.0	--		65.2	59.6		67.0	--	
New L.S.D at 5 %	A	B	AB	A	B	AB	A	B	AB	A	B	AB
	1.2	1.4	2.0	--	--	--	1.9	2.1	2.7	--	--	--
Character	Reducing sugars %						Non-reducing sugars %					
b ₁ Melkaby	15.6	14.1	14.9	15.0	--	--	49.4	48.8	49.1	52.0	--	--
b ₂ Gendiala	16.9	14.0	15.5	16.0	--	--	50.6	46.0	48.0	55.0	--	--
b ₃ Sakkoti	14.4	13.6	14.2	14.0	--	--	48.6	42.4	45.5	49.0	--	--
Mean (A)	15.6	13.9		15.0	--		49.5	45.7		43.0	--	
New L.S.D at 5 %	A	B	AB	A	B	AB	A	B	AB	A	B	AB
	1.1	1.1	1.6	--	--	--	1.5	1.7	2.4	--	--	--

Table (11): Percentages of total acidity, total soluble tannins and total crude fibre as well as T.S.S/ acid in the fruits of Melkaby, Gendiala and Sakkoti dry date palms propagated through seeds or tissue culture techniques grown under Aswan conditions during 2011 and 2012 seasons.

Dry date palm cv. (B)	Total acidity %						T.S.S/ acid					
	2011			2012			2011			2012		
	Methods of propagation (A)											
	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)	a ₁ Seeds	a ₂ Tissue	Mean (B)
b ₁ Melkaby	0.431	0.462	0.447	0.442	--	--	167.3	148.3	157.8	168.6	--	--
b ₂ Gendiala	0.401	0.491	0.446	0.411	--	--	184.5	134.4	159.5	186.1	--	--
b ₃ Sakkoti	0.451	0.515	0.483	0.462	--	--	155.7	125.2	140.5	153.7	--	--
Mean (A)	0.428	0.489		0.438	--		169.2	136.0		169.5	--	
New L.S.D at 5 %	A	B	AB	A	B	AB	A	B	AB	A	B	AB
	0.031	0.032	0.045	--	--	--	2.0	2.2	3.1	--	2.3	--
Character	Total soluble tannins %						Total crude fibre %					
b ₁ Melkaby	0.93	1.19	1.06	1.00	--	--	1.86	2.41	2.14	2.00	--	--
b ₂ Gendiala	0.71	1.60	1.16	0.78	--	--	1.41	3.20	2.31	1.56	--	--
b ₃ Sakkoti	1.11	1.73	1.42	1.19	--	--	2.22	3.59	2.91	2.38	--	--
Mean (A)	0.92	1.51		0.99	--		1.83	3.07		1.98	--	
New L.S.D at 5 %	A	B	AB	A	B	AB	A	B	AB	A	B	AB
	0.13	0.14	0.20	--	--	--	0.14	0.15	0.49	--	--	--

Conclusion

This study clarified that major differences were observed on vegetative growth characters as well as flowering and fruiting aspects among the two propagation methods namely seeds and tissue culture

as well as among the three date palm cvs Melkaby, Gendiala and Sakkoti. All the positive effects on the behaviour of growth and fruiting aspects were attributed to using propagation via seeds. The best date palm cvs successfully grown under Aswan

environmental conditions are Gendiala, Melkaby and Sakkoti, in descending order based on their higher yields and fruit quality. We need in the future for evaluation of all date palm cvs produced from tissue at the older ages and grown in all environmental conditions under Egypt to survey the different problems and to select the best way for alleviating these problems especially at the older ages.

References

1. **Alkhateeb, A. A. (2008):** The problems facing the use of tissue culture technique in date palm (*Phoenix dactylifera* L.). Sci. J. of King Faissal Univ. (Basic and Applied Sciences). Vol. 9 No. 2: 84 – 104.
2. **Al- Obeed, R. S. and Abdelaal- Rahman, A. O. (2002):** Compatibility relationship within and between ten date palm cultivars (*Phoenix dactylifera* L.) 1- Fruit set and yield. J. Adv. Agric. Res. Vol. 7 94): pp 809 – 820.
3. **Association of Official Agricultural Chemists, (1995):** Official Methods of Analysis (A.O.A.C.) 14th Ed. Benjamin Franklin Station, Washington, D.C., (U.S.A.). pp. 496 – 500.
4. **Azeqour, Majourhat, K. and Baaziz, M. (2002):** Morphological variation and isozyme polymorphism of date palm clones from in vitro culture acclimatized and established on soil in South Morocco. Euphytica 123: 57 – 66.
5. **Balbaa, S. I. (1981):** Chemistry of Drugs. (*Laboratory manual*). Cairo Univ. Chapter 6: 127 – 137.
6. **Chapman, H. D. and Protl P. K. (1961):** Methods of Analysis for Soil, Plant and Waters. Univ. of Calif. Division of Agric. Sci. pp. 30 – 45.
7. **Djerbi, M. (2000):** Abnormal fruiting of date palm derived from tissue culture. Proc. of Date Palm. Inter. Sym. Windhoek., Namibia. 22 – 25, Feb. p. 73.
8. **El- Kady, A. M. A. (2004):** Some physiological studies on fruiting of Haiany and Halawy date cultivars under Assiut conditions. M. Sc. Thesis, Fac. Agric., Assiut Univ.
9. **El- Salhy, A. M.; Ahmed- Kamelia, A. and Badawy, E. F. (2004):** Physiological studies on fruit development of some date cultivars under Assiut conditions. Workshop on Agricultural Development in the Arab Nation "Obstacles and solution" Jan., 20 - 22, Assiut Univ., Egypt. pp. 175 – 192.
10. **Gomez, K. A. and Gomez A. A. (1984):** Statistical Procedures for Agricultural Research. 2nd Ed. John Wiley and Sons, New York.
11. **Hasnaoui, A.; Elboumaizi, M. A.; Hakkou, A.; Wathelet, B. and Sindic, M. (2011):** Phisico-chemical characterization classification and quality evaluation of date palm fruits of some Moroccan cultivars. J. Sci. Res. 3 (1): 139 – 149.
12. **Jain, S. M. (2001):** Tissue culture derived. Variation in crop improvement. Euphytica 118: 153 – 166.
13. **Karp, A. (1989):** "Can genetic instability be controlled in plant tissue culture". Inter. Plant Tissue Culture Assoc., Newsletter, 58 – 2 – 11.
14. **Larkin, P. J. and Scowcrof, W. R. (1981):** "Somaclonal variation- a novel source of variability from cell cultures for plant improvement". Theor. Appl. Genet., 60: 197 – 214.
15. **Metwaly, H. A. A.; Abou- Rekab, Z. A. M.; Abd El- Baky, A. A. and El- Bana, A. A. (2009):** Evaluation of some seeded date palm trees grown in Fayoum Governorate B- Chemical characteristics. 4th Conf. on Recent Tech. in Agric. pp. 701 – 715.
16. **Mostafa- Laila, Y. (2000):** Seasonal fluctuation of physical characteristics and chemical constituents in the pinnae, fruits and pits of some Egyptian date palm cultivars. M. Sc. Thesis, Fac. Agric., Alex. Univ. Egypt.
17. **Oraby- Mona, M. M. (2006):** Evaluation of some dry date palm varieties propagated through tissue culture under Aswan climatic conditions. Ph. D. Thesis Fac. of Agric. Minia Univ. Egypt.
18. **Shabana, H. K. and Antoun, P. S. (1980):** The determination of leaf area in date palm Beltraga a zur Tropischen Lund Wirtschaft und Veteriner Medizin 18 (4) 345 – 349 (cited for Hort. Abst., 5th: 9012).
19. **Shaker, M.; Bekheat, S. A.; Taha, H. S.; Fahmy, A. S. and Moursy, H. A. (2000):** Detection of somaclonal variations in tissue culture- derived date palm plants using isozyme analysis RAPD finger prints. Biol. Plant 43: 347 – 351.
20. **Steel, R.G.D. and Torrie, J. H. (1980):** Principles and Procedures of Statistics (A Biometrical Approach). McGraw Hill Book Company, New York, pp. 377 – 400.
21. **Vij, V. K; Thatai, S. K. and Monga, P. K. (2005):** Evaluation of date palm cultivars in arid irrigated region of Punjab. Proc. Inter. Conf. on Mango and Date Palm Culture and Export. 20 – 23 June. Pp. 180 – 195.
22. **Zivdar, S.; Mousawi, M. and Alemzadeh-Ansan, N. (2008):** Genetic stability in date palm micropropagation. Asian J. of Plant Sci. 1: 3.