

EFFECT OF DIFFERENT METHODS OF FRUIT THINNING ON ZAGHLOUL DATE PALM PRODUCTION AND FRUIT QUALITY

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Abstract: The effect of bunch and fruit thinning on yield and fruit quality of Zaghoul date palm grown in Experimental Orchard of Qena, Agriculture Faculty, South Valley University was studied during two successive seasons, 2006 and 2007. Fruit thinning was carried out by removing 20 or 30% of the bunch number/palm as well as cutting back or removing 20 or 30% of the spikelets of each bunch. Results showed that thinning 30% of fruit by cutting back strand tips significantly decreased bunch weight and yield/palm, whereas, other fruit thinning treatments insignificantly decreased the bunch weight and yield/palm compared with unthinned ones. On the other hand, thinning by removing 20 or 30% of bunch number per palm significantly increased the bunch weight but decreased yield/palm than unthinned

ones. A remarkable promotion on fruit quality was observed due to carrying out the studied thinning treatments than unthinning. Either bunch or fruit thinning significantly increased fruit weight, fruit dimensions, flesh percentage and pulp thickness as compared to control. Also, fruit thinning positively enhanced total soluble solids and sugar contents, where total acidity percentage was significantly decreased as compared to unthinning ones.

Fruit thinning by either cutting back 30% of strand tips or removing 30% of total strands from the center of bunch were the best treatments. It could be suggested that, thinning 20 to 30 of strands either by cutting back or removing gave a reasonable yield and best fruit quality of Zaghoul date palm.

Key words: Fruit thinning – Date palm – Fruit quality – Yield

Introduction

Date palm has a great economical importance and agricultural uses throughout humans history. In Egypt, distribution of date palms cover a large area extends from Aswan to north Delta, beside the oasises.

Fruit thinning is one of the major practices that often helps in over come the alternate bearing, enhances fruit quality of dates and reduce compactness of fruit bunches, beside increase adequate flowering in the following season (Nixon and Carpenter, 1978,

Khalifa *et al.*, 1987, Godara *et al.*, 1990 and Diab, 2006).

Such results could be obtained either by reducing the number of bunches per palm or fruits per bunch. The recommended method of thinning was dependent on the date palm cultivar (Nixon and Carpenter, 1978; Abdel-Hamid, 2000 and Mahmoud, 2005).

Zaghloul dates weight and dimension, TSS and sugar contents were increased due to strands shortening or reduced its number. Optimum yield with good dates quality were obtained with 15-20% of Zaghloul dates thinned as early as 2 to 4 weeks after pollination (Khalifa *et al.*, 1987; El-Kassas *et al.*, 1995; Abdel-Hamid, 2000, Hammam *et al.*, 2002 and Mahmoud, 2005). Removing 50% from total bunches number of Zaghloul date palm produced the highest bunch weight. Whereas, thinning of 50% from total stalks in each bunch caused the statistical better fruit weight, dimension, fruit flesh thickness, TSS and total sugars %, while soluble tannins were decreased as compared to unthinned ones (El-Assar, 2005).

Fruit thinning by either removing or cutting back 25% of strands of Zaghloul date significantly increased fruit weight, fruit dimensions and pulp weight percentage compared to unthinned ones. Also, both manual thinning methods significantly increased TSS and total sugars and significantly

decrease acidity and tannin contents than control (Bassal and El-Deeb, 2002).

In Samany dates, fruit weight, TSS and total sugars were significantly increased by increasing the level of fruit thinning. Also, in the same time bunch weight was clearly decreased by increasing the rate of fruit thinning (Hussein *et al.*, 1992).

Removing 20% of entire spikelets from bunch center accompanied with cutting back 20% of spikelets tips was the weightily treatment which gave a reasonable yield with good dates quality of Sewy date palms (Moustafa, 1998, Akl *et al.*, 2004 and Diab, 2006). Removing 30% of entire spikelets from "Shamran" and "Nabetet Ali" bunch center gave a reasonable yield, advancing ripening and best fruit quality (Godara *et al.*, 1990, Al-Ghamdi *et al.*, 1993 and El-Shazly, 1999).

Flower thinning enhanced fruit quality and regulated the yield of Zaghloul, Haiany, Halawy, Sewy and Amry date palm cultivars. Also, removing 20-30% of bunch strands by either thinning out or cutting back before pollination was effective treatments (El-Kady, 2004 and Mahmoud, 2005).

Fruit weight and size, total soluble solids and reducing sugars of Shahani and Khadrawy date cvs. were improved with the thinning practices over control

(Tavakkoli *et al.*, 2006 and Nirmaljit *et al.*, 2006). Reducing of Kabakab dates number by one third (central and strand-tip) thinning increased fruit weight, length and fruit quality, however, this treatment significantly decreased the yield compared with control. Thinning at chimiri stage had significant effects on fruit quality compared with that at pollination stage (Behseresht *et al.*, 2007).

Therefore, this study aimed to find out the effect of different methods of fruit thinning on yield and fruit quality; such practices are essential and of great importance for palm growers.

Materials and Methods

This study was initiated at the Experiment Orchard of Faculty of Agriculture, Qena, South Valley University, Egypt, during two successive growing seasons 2006 and 2007. Twenty one of 11 years old Zaghoul date palm trees of uniform vigour and in good physical condition, free of insect damage and diseases were selected.

The number of inflorescences per palm were adjusted to ten by removing excess earliest, latest and smallest clusters. The retained bunches were thinned to constant number of strands. Artificial pollination was uniformly performed in respect of source, date and method. The involved palm trees received the regular

horticulture practices. The palm trees were classified at random into seven treatments. Each treatment was consisted of three replicates, one palm per each. Thus the treatments were as follows:

1- Fruit thinning by removing 20% of bunch number (T₁).

2- Fruit thinning by removing 30% of bunch number (T₂).

3- Fruit thinning by removing 20% of strands length by cutting back (T₃).

4- Fruit thinning by removing 30% of strands length by cutting back (T₄).

5- Fruit thinning by removing 20% of total strands from the center of bunches (T₅).

6- Fruit thinning by removing 30% of total strands from the center of bunches (T₆).

7- Control (no thinning).

Fruit thinning treatments were done after three weeks from pollination. The experiment was arranged in a complete randomized block design including seven treatments with three replications, one palm each.

All bunches were harvested when they reached to commercially derived color and weighted, then the yield/palm (kg) was recorded. Consequently sample of 100 fruits were taken randomly from each palm to determination of some physical

and chemical fruit properties as outlined in A.O.A.C. method (1985).

All data were subjected to statistical analysis according to the procedure reported by Gomez and Gomez (1984) and Snedecor and Cochran (1990). Treatments means were compared by the least significant difference test (L.S.D.) at the 5% level of probability in the two experimental seasons.

Results and Discussion

This study was carried out to reveal the effect of bunch and fruit thinning on yield and fruit quality of Zaghoul date palm.

1 – Yield index:

Data present in (Table 1) show the effect of bunch and fruit thinning on bunch weight and yield/Zaghoul date palm during 2006 and 2007 seasons. In general, recorded data showed same trend during the two studied seasons. The obtained results declared that thinning 30% of fruit by cutting strand tips significantly decreased the bunch weight as compared to unthinned one (control).

However, other thinning treatments insignificantly decreased the bunch weight. However, thinning by removing 20 or 30% of bunch number per palm significantly increased the bunch weight than unthinned ones during two studied seasons. The heaviest bunches were obtained as response

to thinning 30% of bunch number/palm, whereas the least one was recorded on palm that thinned by cutting back 30% of strand tips. The obtained bunch weights were (16.2, 16.9 & 13.6 kg) and (17.5, 18.3 & 14.5 kg) due to removing 20%, 30% of bunch number (T_1 , T_2) and unthinned ones during two studied seasons, respectively. The increment percentage of bunch weight due to thinning bunch over unthinned ones were (19.12 & 24.26%) and (20.69 & 26.21%) for T_1 and T_2 during the two studied seasons, respectively. These results may be attributed to the increase of fruit retention on bunch and increase in fruit weight as a result increased the supply of food material to individual fruit and consequently heavy bunch weight at harvest.

On the contrary, thinning 30% either by cutting back strands tip or removing of bunch number significantly decreased the yield/palm as comparing with unthinned one. Generally, these reduction in the yield may be attributed to the great reduction in number of fruits per either bunch or palm due to removing some bunches or cutting back of strand tips of each bunch. However, other thinning treatments insignificantly decreased the yield/palm compared to the unthinned ones during the two studied seasons. It can be concluded that all thinning treatments decreased the yield/palm of Zaghoul date palm cultivar. The obtained yield/palm

were 129.6, 118.3, 124.0, 118.0, 130.0 & 128.0 due to thinning as removing 20% , 30% of bunch number (T₁ & T₂), cutting back 20% , 30% strand tips (T₃ & T₄), removing 20%, 30% of entire strands (T₅ & T₆) against 136.0 kg/unthinning palm for the first season respectively. The decrement percentage of yield/palm were (4.70, 13.01, 8.82, 13.23, 4.41 & 5.88%) respectively. During the second season the corresponding values of yield/palm attained 140.0, 128.1, 138.0, 125.0,

135.0 & 128.0 kg/palm against 145.0 Kg/unthinning palm respectively.

These results are in agreement with those of Khalifa *et al.* (1987), Hussein *et al.* (1992), Moustafa (1998), El-Shazly (1999), Abdel-Hamid (2000), Hammam *et al.* (2002), El-Kady (2004), Mahmoud (2005), Diab (2006) and Behseresht *et al.* (2007) who concluded that the fruit thinning by removing one third (central or strand-tip) decreased the yield compared with control.

Table(1): Effect of bunch and fruit thinning on bunch weight and yield/palm of Zaghloul date palm cultivar during 2006 and 2007 seasons.

Treat.	Charac.	Bunch weight (kg)		Yield palm (kg)	
		2006	2007	2006	2007
Removing 20% bunch no (T ₁)		16.2	17.5	129.6	140.0
Removing 30% bunch no (T ₂)		16.9	18.3	118.3	128.1
Cutting back 20% of strand tips of each bunch (T ₃)		12.4	13.8	124.0	138.0
Cutting back 30% of strand tips of each bunch (T ₄)		11.8	12.5	118.0	125.0
Removing 20% of entire strands from bunch (T ₅)		13.0	13.5	130.0	135.0
Removing 30% of entire strands from bunch (T ₆)		12.8	12.8	128.0	128.0
Control (unthinning)		13.6	14.5	136.0	145.0
L.S.D. _{0.05}		1.58	1.96	10.75	12.18

2 – Fruit properties

A – Physical characteristics

Table (2) shows the effect of fruit thinning on some physical fruit properties of Zaghloul dates. General overlook at the data, it was showed that fruit dimension,

flesh percentage and pulp thickness reacted almost similarly and taking the same trend of fruit weight in response to effect of investigated fruit thinning treatments during the two

experimental seasons. It is worth notice from the previously table that the fruit weight was significantly increase as a result of any fruit thinning treatment comparable to unthinned ones (control). The fruit weight were 19.1, 20.8, 23.1, 24.6, 22.8 and 23.9 due to T₁ to T₆ compared to the control, 15.3g respectively, for the first season. While, during the second season the results were 21.8, 22.4, 25.1, 26.7, 24.5 and 25.3 compared to the control, 18.2

g respectively. The increment percentage of fruit weight due to thinning treatments over unthinned ones were attained (24.84, 35.95, 50.98, 60.78, 49.02 & 56.21%) and (19.78, 23.08, 37.91, 46.70, 34.62 & 39.01%) due to T₁, T₂, T₃, T₄, T₅ and T₆ during the two studied seasons, respectively.

Such results could be attributed to reducing either the number of bunches per palm or fruits per bunch consequently increasing in the ratio of leaves to fruits number. This finding might be due to better supply of food material (carbohydrates) that are manufactured in the leaves.

It could be stated that fruit thinning positively improved physical fruit traits. Therefore, fruit thinning either by removing or cutting back 20 or 30% of strands significantly increased physical fruit traits as compared to

either bunch removing or unthinned (control). Moreover, the cutting back 30% of strand tips was more effective comparable to other fruit thinning treatments.

These results are in harmony with those of Khalifa *et al.* (1987), Hussein *et al.* (1992), El-Kassas *et al.* (1995), Abdel-Hamid (2000), Bassal and El-Deeb (2002), Hammam *et al.* (2002) and El-Assar (2005) who concluded that the optimum favorable fruit weight was achieved when 25 to 40% of fruits were removed as early 2 to 4 weeks after pollination of Zaghoul date palm cultivar. Also, the same finding was found by Al-Ghamdi *et al.* (1993), Moustafa (1998), El-Kady (2004), Akl *et al.* (2004), Mahmoud (2005), Diab (2006), Nirmaljit *et al.* (2006) and Behserasht *et al.* (2007) on other date palm cultivars.

Table(2): Effect of bunch and fruit thinning on physical fruit properties of Zaghoul date palm cultivar during 2006 and 2007 seasons.

Charac. Treat.	Fruit weight (g)		Flesh %		Fruit length (cm)		Fruit diameter (cm)		Pulp thickness (cm)	
	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
T ₁	19.1	21.8	90.65	91.04	5.1	5.2	2.6	2.8	0.91	1.02
T ₂	20.8	22.4	91.60	90.80	5.3	5.6	2.7	2.9	0.93	1.12
T ₃	23.1	25.1	91.40	92.14	5.0	5.1	2.7	2.8	0.95	1.22
T ₄	24.6	26.7	92.53	92.10	5.1	5.3	2.8	3.0	1.00	1.28
T ₅	22.8	24.5	91.83	92.38	5.2	5.3	2.7	2.8	0.91	0.98
T ₆	23.9	25.3	92.89	92.31	5.2	5.4	2.7	2.8	0.93	1.08
Control (unthinning)	15.3	18.2	90.08	90.00	4.3	4.6	2.5	2.6	0.83	0.92
L.S.D. _{0.05}	1.58	2.25	0.75	0.86	0.18	0.11	0.08	0.11	0.06	0.07

B – Fruit chemical constituents:

Data present in Table (3) show the effect of fruit thinning on some chemical constituent of Zaghoul dates juice during 2006 and 2007 seasons. It is obvious from the obtained data that sugar contents reacted almost similarly and taking the same total soluble solids in response to the effect of investigated fruit thinning treatments during the two studied seasons. All fruit thinning significantly increased total soluble solids, reducing and total sugar contents as compared to unthinned ones. Contrarily, total acidity percentage significantly decreased as response to fruit thinning. The improvement in fruit chemical quality was associated with either increasing the number of bunch removing or the degree of cutting

back or removing of the spikelets of each bunch from 20 to 30%. The highest values of total soluble solids and sugar contents in dates pulp were obtained as a result of fruit thinning by removing 30% of entire strands. The obtained values of total soluble solids were (50.6, 50.8, 51.0, 51.2, 50.6, 51.6 & 46.4%) and (51.2, 51.6, 51.8, 52.2, 52.4, 52.8 & 48.0%) due to T₁, T₂, T₃, T₄, T₅, T₆ and unthinned ones (control) during the two studied seasons, respectively. The increment percentage of total soluble solids due to fruit thinning over unthinned one (control) were (9.05, 9.48, 9.91, 10.34, 9.05 & 11.21%) and (6.67, 7.50, 7.92, 8.75, 9.17 & 10.0%) due to T₁, T₂, T₃, T₄, T₅ and T₆ during the two studied seasons, respectively.

Table(3): Effect of bunch and fruit thinning on chemical constituents of Zaghoul dates during 2006 and 2007 seasons.

Charac. Treat.	TSS (%)		Acidity (%)		Total sugar (%)		Reducing (%)		Non-reducing (%)	
	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
T ₁	50.6	51.2	0.027	0.034	41.15	40.93	28.50	27.25	12.65	13.68
T ₂	50.8	51.6	0.030	0.034	40.85	41.25	26.90	27.50	13.95	13.75
T ₃	51.0	51.8	0.034	0.038	41.28	40.40	28.18	26.90	13.10	13.50
T ₄	51.2	52.2	0.033	0.034	40.15	40.82	27.05	27.30	13.10	13.52
T ₅	50.6	52.4	0.027	0.038	40.24	41.18	26.95	27.52	13.29	13.66
T ₆	51.6	52.8	0.030	0.034	40.00	41.35	27.20	27.80	12.80	12.20
Control (unthinning)	46.4	48.0	0.040	0.047	36.80	37.18	24.30	24.35	12.50	12.83
L.S.D. 0.05	2.15	1.98	0.011	0.081	1.32	1.86	2.08	2.18	1.15	0.88

Such findings might be attributed to adequate carbohydrates and other essentials food for left fruits to induce increase the fruit weight and size as well as hasten the maturity which improved fruit quality. In

addition, fruit thinning effectively lowered the competition occurred between fruits and consequently raised total soluble solids and sugar contents for each fruit.

The improving effect of fruit thinning on fruit chemical

constituents are harmony with those obtained by Khalifa *et al.* (1987), Godora (1990), El-Kassas *et al.* (1995), El-Shazly (1999), Abdel-Hamid (2000), Bassal and El-Deeb (2002), Hammam *et al.* (2002), El-Kady (2004), El-Assar (2005), Mahmoud (2005), Diab (2006), Nirmaljit *et al.* (2006) and Tavakkoli *et al.* (2006).

In regard of the previously mentioned results, it can be stated that removing either 20 or 30% of total bunches number or bunch strands by either thinning out or cutting back after three weeks from Zaghoul date palm pollination was the most suitable fruit thinning treatment to obtain an economical yield with good fruit quality.

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تأثير طرق خف الثمار المختلفة على إنتاج وخصائص ثمار نخيل البلح الزغلول

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أجريت هذه الدراسة خلال عامي ٢٠٠٦ ، ٢٠٠٧ على نخيل البلح الزغلول بمزرعة كلية الزراعة بقنا - جامعة جنوب الوادي - بهدف دراسة تأثير خف السوباتان والثمار على المحصول وصفات الثمار .

ويمكن تلخيص أهم النتائج كالتالي :

- أدى تقصير الشماريخ بنسبة ٣٠% من أطوالها إلى نقص معنوي في وزن السوباتان والمحصول - بينما أدت معاملات خف الثمار الأخرى (إزالة ٢٠ ، ٣٠% من الشماريخ أو تقصيرها بنسبة ٢٠%) إلى نقص غير معنوي .
- سبب الخف بإزالة ٢٠ أو ٣٠% من السوباتان إلى زيادة مؤكدة في وزن السوباتان مع نقص المحصول / نخلة .

- أدى خف الثمار والسوباتان إلى تحسين واضح في خصائص الثمار الطبيعية من حيث زيادة وزن وأبعاد الثمار ونسبة اللب وسمكه . وبالمثل حدث زيادة مؤكدة في نسبة المواد الصلبة الذائبة الكلية ومحتوى السكريات مع نقص معنوي في نسبة الحموضة مقارنة بثمار السوباتان أو الأشجار الغير معاملة .

- أوضحت النتائج أن إزالة ٣٠% من السوباتان أو ٣٠% من شماريخ السوباتان سواء خفاً أو تقصيراً تعطى أحسن خصائص ثمرية مع نقص المحصول - بينما الخف بنسبة ٢٠% يؤدي إلى تحسين الثمار ونقص قليل بالمحصول كذلك فإن خف الثمار أفضل من خف السوباتان. لذا يمكن التوصية بخف ٢٠-٣٠% من شماريخ السوباتان سواء بالتقصير أو الإزالة حيث يؤدي ذلك إلى إنتاج محصول مناسب ذو خصائص ثمرية جيدة.