

IMPROVEMENTS OF YIELD AND FRUIT QUALITY OF ZAGHLOOL DATE PALM BY USING THE DIFFERENT THINNING TREATMENTS

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ABSTRACT

Different hand thinning treatments were conducted on Zaghloul date palm cultivar to study their effects on bunch yield and fruit quality. Seven thinning treatments; (1) control (no thinning), (2) Thinning by removing 25% the bunches number/ palm in Hababouk stage, (3) Thinning by removing 25% the strands number/ palm in Hababouk stage (4) Thinning by removing 25% of strands length per bunch in Hababouk stage, (5) Thinning by removing 25% the bunches number/ palm in Kemri stage, (6) Thinning by removing 25 the strands number/ palm in kemri stage, (7) Thinning by removing 25% of strands length per bunch in kemri stage, at a private farm under the conditions of the Ismailia Governorate, Egypt. Fruit thinning significantly decreased yield per palm. Fruit thinning by treatments (2,5) significantly increased the bunch/weight, however the other thinning treatments decreased the bunch weight. Fruit thinning significantly increased the average fruit weight, fruit size, flesh weight, flesh thick, fruit dimensions, seed weight and color index as compared to the control in both seasons.

Fruit thinning had significant effect on the total soluble solids, fruit acidity, vitamin C, reducing sugars, non-reducing sugars, total sugars and total soluble tannins in both seasons. Thinning by removing 25% of strands length bunch in Hababouk stage significantly improved fruit quality compared with the other treatments.

Conclusively, it is concerning mentioned that the thinning treatments occurred in Hababouk stage gave good results than in kemri stage.

Key words: Date palm, Thinning, Fruit quality, Bunch weight, Hababouk stage, kemri stage.

INTRODUCTION

Date palm (*Phoenix dactylifera* L.) number have economic importance in Egypt. The total area represented in (2015) reached to (12,827,235) female trees in many restricts all over the Egyptian lands produced (1,465,030) tons according to the last statics of ministry of Agricultural and land reclamation (2015). Zaghloul date palm is acceptable for Egyptian consumers due to its luxurious fruits.

Thinning practice is an important managerial approach in date palm trees *i.e* bunch thinning, bunch strands thinning and on cut of strands length to improve fruit physical quality as fruit weight, size, flesh weight, fruit dimensions. Thinning processes are important processes and for obtaining high quality fruit by thinning bunch, strands, or fruit. AL-Saikan (2008) found that the strands thinning of Ruzeiz date palm by 1/3 removal of central strands significantly decreased yield per palm and bunch weight. Soliman *et al* (2011) found that the strands thinning of Khalas date palm by removing 15 and 30% decreased bunch yield and improved fruit quality. Mostafa and EL-Akkad (2011) found that the fruit thinning by adjusting the strands number/bunch to 30 and 35 strands significantly decreased bunch weight and yield per palm and improved fruit quality of Zaghloul and Haiany date palm. Soliman and Harhash (2012) found that the strands thinning of Sucary date palm by removing 15 and 30% strands significantly decreased bunch yield and increased the physical and chemical characters. Damankeshan and Panahi (2013) found that the bunch thinning improved yield per palm of dates. EL-Asar and Refaat (2013) found that the strands thinning of Sewy date palm by removing 20 and 40% strands from the central strands significantly decreased bunch weight and yield per palm and improved fruit weight, total soluble solids, sugar contents and decreased total acidity. Alam El-Dein and Omar (2014) found that the strands thinning by thinning 15% and 30% of Sultani date palm significantly improved bunch weight, yield per palm and improved fruit quality. Bashir *et al* (2014) found that the strands thinning of kur date palm by removing 10, 25 and 50% strands from the total strands significantly increased the yield per palm, fruit weight, fruit dimensions and total soluble solids. Soliman *et al* (2015) found that the removing 10 cm of strands length per bunch and removing 20 cm of strands length per bunch of Sagae date palm significantly decreased bunch yield and improved fruit quality. Samouni, mona *et al* (2016) found that the strands thinning of Sagae date palm by removing 15,30 and 45% strands /bunch significantly decreased bunch

weight, yield per palm and improved fruit quality. Radwan (2017) found that the thinning of Sewy and Bent Aisha date palm by removing 20 and 30% strands /bunch significantly decreased yield per palm, bunch weight and increased the fruit weight, size, flesh weight, total soluble solids and sugar contents. EL- Badawy *et al* (2018) found that the strands thinning of Sewy date palm by 8 bunches /palm + removing 30% strands /bunch significantly decreased yield per palm, bunch weight and improved fruit quality.

Therefore, the aim of this study to evaluate date palm by using the different thinning Treatments under Ismailia Governorate conditions.

MATERIALS AND METHODS

The present investigation was carried out on Zaghlool date palm at a Private Farm in Ismailia Governorate, Egypt. The experiment was repeated for two successive years (2014 and 2015). 21 trees (15-years-old) grown on sandy loam soil were selected for each treatment. The experimental palms were healthy, uniform in growth, vigor and height.

Pollination was achieved by using pollen grains from the same parent in both seasons. All cultural practices were carried out according to the normal schedule for experimental palms. Only 8 bunches were left on each experimental tree. Thinning treatments were applied in two stage Hababouk stage and kemri stage. Seven fruit thinning treatments were done on the selected palms as follows: (1) control no thinning, (2) Thinning by removing 25% the bunches number/ palm in Hababouk stage, (3) Thinning by removing 25% of strands length per bunch in Hababouk stage, (4) Thinning by removing 25% of strands length per bunch in Hababouk stage, (5) Thinning by removing 25% the bunches number/ palm in (kemri stage), (6) Thinning by removing 25% the strands number/ palm in kemri stage, (7) Thinning by removing 25% of strands length per bunch in kemri stage. The experiment was arranged in a complete randomized block design including seven treatments with three replications, respectively each replicate was represented with one date palm. All bunches were harvested when they reached to the commercially derived color then ultimate fruit retention were estimated. Bunch weight then the yield/palm (kg) were estimated. Samples of 50 fruits were picked at random from each bunch for the determination of some physical and chemical fruit properties, according to A.O.A.C. methods (1985).

Data were subjected to statistical analysis according to the procedure reported by Snedecor and Cochran (1990).

Capital and small letters were used for distinguishing between means of the specific effect of two investigated factors and interaction between them, respectively, according to Duncan (1955).

RESULTS AND DISCUSSION

Yield per palm (kg)

Data presented in Table (1) showed that the thinning treatments of Zaghloom date palm significantly decreased the average yield per palm as compared to the control. As such yield/ tree of control ranged between (168 and 176 kg) in the first and second seasons, respectively. Thinning of 25% strands/ bunch in hababouk stage gave the highest average yield per palm as compared to the other thinning treatments (150,64 and 160.00kg) in both seasons, respectively. It can be concluded that the unthinning treatment (control) gave the highest yield as compared to the other thinning treatments in both stages of fruit growth.

The other thinning treatments were found in descending order the average yield per palm as the following:- thinning 25% strands/ bunch in kemri stage (145,28-156.00 kg), thinning 25% bunch/palm in hababouk stage (140.00-150.00 kg), thinning 25% bunch/palm in kemri stage (135.96-144.00 kg), thinning 25% of strands length per bunch in hababouk stage (92.00-100.00 kg) and thinning 25% strands length per bunch in kemri stage (76.00-88.00kg) in the first and second seasons, respectively. The wide variations between studied seasons in both stage of thinning treatments which that fruit growth of hababouk stage was earlier than kemri stage in fruit thinning of Zaghloom cv date palm, however, thinning in hababouk stage gave the high yield as compared to the second thinning in kemri stage. These results are in agreements with those obtained by Soliman *et al.*, 2011 on khalas date palm; Soliman and Harhash, 2012 on Sucary date palm; El-Assar and Rafaat, 2013 on Sewy date palm; Soliman *et al.*, 2015 on Sagae date palm;

Somouni, Mona *et al.*, 2016 on Sagae date palm and Radwan, 2017 on Sewy and Bent Aisha date palm, El-Badawy *et al.*, 2018 on Sewy date palm.

On the other hand, the thinning bunches or strands treatments gave an increase in the yield by Damankeshan and Panahi, 2013 on dates, Alam El-Dein and Omar 2014 on Sultani date palm and Bashir *et al.*, 2014, on kur date palm.

Table: (1): Effect of fruit thinning treatments on yield and bunch weight of Zaghlool cv. data palm during 2014 and 2015 seasons.

Treatment groups	Yield/ Palm (kg)		Bunch weight (kg)	
	Seasons		Seasons	
	2014	2015	2014	2015
Control	168.00a	176.00a	21.00b	22.00bc
Thinning 25% bunch/palm (Hababouk stage)	141.00bc	150.00b	23.50a	25.00a
Thinning 25% strands/bunch (Hababouk stage)	150.64b	160.00ab	18.83c	20.00c
Thinning 25% strands length per bunch(Hababouk stage)	92.00d	100.00c	11.50d	12.50d
Thinning 25% bunch/palm (Kemri stage)	135.96c	144.00b	22.66a	24.00ab
Thinning 25% strands/bunch (Kemri stage)	145.28bc	156.00b	18.16c	19.50d
Thinning 25% of strands length per bunch (Kemri stage)	76.00e	88.00c	9.50e	11.00d
SEM	5.36	10.04	0.80	1.41
Significant test	**	**	**	**

a,b...f Means with different superscripts in each column differ significantly (P<0.05).

** P<0.01

Bunch weight (kg)

Data presented in Table (1) showed that the bunch thinning treatments of 25% bunch palm in hababouk stage and in kemri stage significantly increased the average bunch weight as compared to the control. While the other treatments of thinning significantly decreased the average bunch weight as compared to the control. Concerning the bunch weight of thinning treatment of Zaghlool date palm recording the descending order of the average bunch weight as (23.50 and 25 kg) in the treatment of thinning 25% bunch/ palm in hababouk stage followed by thinning 25% bunch/ palm in kemri stage (22,66 and 24 kg), the treatment of thinning 25% strands/ bunch (18.83 and 20 kg) in hababouk stage, the treatment of thinning of thinning 25% strands/ bunch (18.16 and 19.50 kg) in kemri stage; the

treatment of thinning 25% of strands length/ bunch (11.50 and 12.50 kg) in hababouk stage and the latest treatment of thinning 25% of strands length/ bunch was (9.5 and 11 kg) in kemri stage in the first and second seasons, respectively.

The present study can mentioned that the time of thinning showed that the average bunch weight of different treatments of thinning in hababouk stage gave more bunch weight than the other treatments of thinning in kemri stage in both seasons of study. It can be concluded that the application of the thinning treatments in early time of fruit growth was better than the late time of thinning. These results are in agreement with those of AL-Saikhan (2008); Mostafa and El-Akkad, 2011 on Zaghlool and Haiany date palm and Radwan, 2017 on Sewy and Bent Aisha, El-Badawy *et al.*, 2018 on Sewy date palm.

Physical characters:

Data presented in Tables (2 and 3) showed that the thinning treatments of bunches or strands in Zaghlool cv. Date palm significantly increased the average fruit weight, fruit size, flesh weight, flesh thick, fruit length, fruit diameter, seed weight and color index as compared to the control treatments (15.73 and 15.96 g), (16.33 and 17.33 cm³), (14.23 and 14.30g), (4.76 and 5.00 mm), (20.60 and 24.41 mm), (1.50 and 1.66 g) and (9.69 and 10.14) in both seasons, respectively.

Thinning 25% of strands length/ bunchs treatment gave highest fruit weight, fruit size, flesh weight, flesh thick, fruit length, fruit diameter, seed weight and color index (32.20 and 35.80g), (32.33 and 36.00 cm³), (30.13 and 33.53g), (9.33 and 10.33 mm) (65.56 and 69.46 mm) (33.92 and 4364 mm), (2.07 and 2.36g) and (16.29 and 15.89), gave the lowest value of fruit weight, fruit size, flesh weight, flesh thick, fruit length, fruit diameter, seed weight and color index (16.56 and 17.10 g), (18.00 and 18.33 cm³), (14.90 and 15.40 g) (6.00 and 5.33 mm), (49.56 and 51.90 mm), (25.35 and 1.70 g) and (10.95 and 10.95) were in the thinning 25% bunch/ palm treatment in the first and second seasons, respectively.

It is interesting to mention that the time of thinning playing an important role in this physical character in the two seasons of study. However, the thinning of bunches or strands in bunch early fruit growth in hababouk stage gave the highest fruit weight, fruit size, flesh weight, flesh thick, fruit length, fruit diameter, seed weight and color index than in the second fruit growth in kemri stage.

Table (2): Effect of fruit thinning on treatments physical characters of Zaghlool cv. data palm (Fruit weight, Fruit Size, Flesh Weight and Flesh thick) during 2014 and 2015 seasons.

Treatment groups	Fruit weight (g)		Fruit Size (cm ³)		Flesh Weight (g)		Flesh thick (mm)	
	Seasons		Seasons		Seasons		Seasons	
	2014	2015	2014	2015	2014	2015	2014	2015
Control	15.73g	15.96e	16.33e	17.33g	14.23g	14.30e	4.76c	5.00c
Thinning 25% bunch/palm (Hababouk stage)	18.00e	19.53d	18.00e	20.33e	16.20e	17.76d	6.00bc	8.00bc
Thinning 25% strands/bunch (Hababouk stage)	22.96c	23.76c	23.76c	25.00c	21.00c	21.86c	8.00ab	9.76abc
Thinning 25% strands length per bunch (Hababouk stage)	32.20a	35.80a	32.33a	36.00a	30.13a	33.53a	9.33a	10.33a
Thinning 25% bunch/palm (Kemri stage)	16.56f	17.10e	18.00e	18.33f	14.90f	15.40e	6.00bc	5.33d
Thinning 25% strands/bunch (Kemri stage)	20.00d	22.23c	20.76d	22.00d	18.26d	20.30c	6.33bc	7.76c
Thinning 25% of strands length per bunch (Kemri stage)	25.43b	27.83b	27.00b	26.76b	23.50b	25.80b	8.33ab	10.00ab
SEM	0.25	1.28	1.35	1.28	0.30	1.26	1.10	1.22
Significant test	**	**	**	**	**	**	**	**

^{a,b,...f} Means with different superscripts in each column differ significantly (P<0.05).

** P<0.01

Table (3): Effect of fruit thinning treatments on physical characters of Zaghlool cv. date palm (Fruit length, Fruit diameter, Seed Weight and Color Index) during 2014 and 2015 seasons.

Treatment groups	Fruit length (g)		Fruit diameter (mm)		Seed weight (g)		Color index	
	Seasons		Seasons		Seasons		Seasons	
	2014	2015	2014	2015	2014	2015	2014	2015
Control	41.93g	45.22f	20.60f	24.41f	1.50c	1.66d	9.69e	10.14f
Thinning 25% bunch/palm (Hababouk stage)	53.33e	54.51d	25.8d	26.26d	1.80b	1.96bc	11.42d	11.46de
Thinning 25% strands/bunch (Hababouk stage)	58.14c	59.09c	27.92c	28.03c	1.96ab	1.90bc	12.77bc	12.99c
Thinning 25% strands length per bunch (Hababouk stage)	65.56a	69.64a	33.92a	43.6a	2.07a	2.36a	15.86a	16.29a
Thinning 25% bunch/palm (Kemri stage)	49.56f	51.9e	25.35e	26.55e	1.66c	1.70cd	10.95de	10.92e
Thinning 25% strands/bunch (Kemri stage)	56.12d	57.17c	27.07c	27.47c	1.83b	1.93bc	11.91cd	12.05cd
Thinning 25% of strands length per bunch (Kemri stage)	59.64b	61.74b	29.45b	30.43b	1.93ab	2.03b	13.82b	13.97b
SEM	0.83	1.16	0.32	0.58	0.11	0.12	0.64	0.50
Significant test	**	**	**	**	**	**	**	**

^{a,b...f} Means with different superscripts in each column differ significantly (P<0.05).

** P<0.01

The obvious results of physical characters had significantly differences in both seasons of study and in agreement with obtained by Soliman *et al.* (2011) on khalas date palm; Mostafa and El-Akkad, 2011 on

Zaghlool and Haiane date palm; Soliman and Harhash, 2012 on Sucary date palm; El-Assar and Rafaat, 2013 on Sewy date palm; Alam EL-Dien and Omar, 2014 on Sultani date palm; Baschir *et al*, 2014 on kur date palm; Soliman *et al*, 2015 on Segae date palm; Samouni, Mona *et al*, 2016 on Segae date palm ; Radwan, 2017 on Sewy and Bent Aisha and El-Badawy *et al*, 2018 on Sewy date palm.

Chemical characters:-

Date presented in Tables (4 and 5) showed that the thinning treatment groups of Zaghlool were significantly improved the average total soluble solids (TSS%), total acidity, TSS/ acid ratio, Vitamin C, total sugar, reducing sugar, non-reducing sugar and total soluble tannins as compared to the control treatments (28.36- 28.46%), (0.272 and 0.263%), (104.26 and 108.21), (9.33 and 10.40 mg), (10.68 and 10.87%), (9.55 and 9.49%), (20.14 and 20.37%) and (105.35 and 104.76%) in both seasons, respectively. Thinning 25% of strands length per bunch in hababouk stage (33.56-33.53%), (0.150 and 0.142%), (222.25 and 236.12), (17.60 and 18.13mg), (16.33 and 16.63%), (10.22 and 10.35%), (26.75 and 26.99%) and (78.78 and 78.28%) gave the maximum frit quality values of total soluble solids (TSS %), total acidity, TSS/acid ratios, vitamin C, total sugar, reducing sugar, non-reducing sugar and total soluble tannins compared to the other thinning treatments, while the lower value of average total soluble solids (TSS %) total acidity, TSS/acidity, vitamin C, total sugar, reducing sugar, non-reducing sugar and total soluble tannins were (29.13 and 29.36%), (0.254 and 0.236%) (114.68 and 124.40), (11.43 and 11.50mg), (9.67 and 9.66%), (21.01 and 21.26%) and (101.79 and 100.03%) were in the thinning 25% of bunch/ palm treatment in the first and second seasons, respectively.

It is clearly mentioned that the time of thinning treatments showed a highest fruit quality in hababouk stage than in the late time of kemri stage in fruit growth Zaghlool cv. Data palm in both seasons of study.

The obvious results of chemical characters were significantly changed in both seasons of study and was in agreement with those obtained by Soliman *et al*,(2011) on Khalas date palm; Mostafa and El-Akkad,(2011) on Zaghlool and Haiane date palm; Soliman and Harhash, 2012 on Sucary date palm; El-Assar and Rafaat, 2013 on Sewy date palm; Alam El- Dein and Omar, 2014 on Sultani date palm; Bschrir *et al*, 2014 on kur date palm; Soliman *et al*, 2015 on Segae date palm; Samouni, Mona *et al*, 2016 on Segae date palm ;Radwan, 2017 on Sewy and Bant Aisha and El-Badawy *et al*, 2018 on Sewy date palm.

Table (4): Effect of fruit thinning treatments on chemical characters of Zaghlool cv. data palm (TSS, Acidity, TSS/ acidity and V.C during 2014 and 2015 seasons.

Treatment groups	TSS%		Acidity %		TSS/acidity		V.C mg/100g	
	Seasons		Seasons		Seasons		Seasons	
	2014	2015	2014	2015	2014	2015	2014	2015
Control	28.36g	28.46g	0.272a	0.263a	104.26e	108.21e	9.33e	10.40c
Thinning 25% bunch/palm (Hababouk stage)	29.97e	30.13e	0.223bc	0.205bc	134.39cd	146.97cd	12.53cd	12.53c
Thinning 25% strands/ bunch (Hababouk stage)	31.80c	31.83c	0.169cc	0.169cc	188.16b	188.34b	15.73ab	17.07ab
Thinning 25% strands length per bunch (Hababouk stage)	33.56a	33.53a	0.151e	0.142d	222.25a	236.12a	17.60a	18.13a
Thinning 25% bunch/palm (Kemri stage)	29.13f	29.36f	0.254ab	0.236ab	114.68de	124.40de	10.93de	10.40c
Thinning 25% strands/ bunch (Kemri stage)	30.90d	31.00d	0.196cc	0.194cc	157.65bc	159.79bc	14.13bc	15.20b
Thinning 25% of strands length per bunch (Kemri stage)	32.50b	32.76b	0.183de	0.142d	177.59b	230.70a	17.07a	17.33ab
SEM	0.08	0.07	0.01	0.02	15.08	18.56	1.12	1.48
Significant test	**	**	**	**	**	**	**	**

^{a,b...f} Means with different superscripts in each column differ significantly (P<0.05).

N.S: Not significant, * P<0.05% ** P<0.01

Table (5): Effect of fruit thinning treatments on chemical characters of Zaghlool cv. data palm (Reducing sugar, Non-reducing sugar, Total sugar and Total soluble Tannins) during 2014 and 2015 seasons.

Treatment groups	Reducing Sugar (%)		Non reducing Sugar (%)		Total Sugar (%)		Total soluble Tannins (%)	
	Seasons		Seasons		Seasons		Seasons	
	2014	2015	2014	2015	2014	2015	2014	2015
Control	10.68g	10.87g	9.55g	9.49g	20.14g	20.37g	105.35a	104.76a
Thinning 25% bunch/palm (Hababouk stage)	12.54e	12.60e	9.70e	9.73e	22.22e	22.3e	97.53c	95.56c
Thinning 25% strands/bunch (Hababouk stage)	14.36c	14.47c	9.96c	10.01c	24.32c	24.58c	88.57d	87.53de
Thinning 25% strands length per bunch (Hababouk stage)	16.53a	16.63a	10.22a	10.35a	26.75a	26.99a	78.87f	78.28f
Thinning 25% bunch/palm (Kemri stage)	11.43f	11.5f	9.67e	9.66f	21.01f	21.26f	101.79b	100.03b
Thinning 25% strands/bunch (Kemri stage)	13.55d	13.61d	9.82d	9.90d	23.38d	23.51d	90.34d	89.73d
Thinning 25% of strands length per bunch (Kemri stage)	15.78b	15.75b	10.02b	10.14b	27.70b	25.89b	84.61e	83.88e
SEM	0.12	0.10	0.02	0.03	0.12	0.10	1.53	2.23
Significant test	**	**	**	**	**	**	**	**

^{a,b,...,f} Means with different superscripts in each column differ significantly (P<0.05).

N.S: Not significant, * P<0.05%, ** P<0.01

Conclusively, it is concerning mentioned that the thinning treatments occurred in hababouk stage gave good results than in kemri stage.

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تحسين المحصول وجودة الثمار لنخيل البلح الزغلول باستخدام عمليات الخف الثمري المختلفة

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الملخص

أجريت هذه الدراسة خلال موسمي ٢٠١٤، ٢٠١٥م على نخيل الزغلول النامي بمزرعة خاصة تحت ظروف محافظة الإسماعيلية – مصر، لدراسة تحسين المحصول وجودة الثمار عن طريق عمليات خف الثمار. أجرى خف الثمار في موعدين الموعد الأول في مرحلة الحبابوك والموعد الثاني في مرحلة الكمري وكانت المعاملات كالتالي؛ الكنترول (بدون خف)، ٢٥% خف سباط/ النخلة في مرحلة

الحبابوك، ٢٥% خف شمرايخ/ السباطة في مرحلة الحبابوك، ٢٥% خف من طول الشمرايخ/ السباطة في مرحلة الحبابوك، ٢٥% خف سباط/ النخلة في مرحلة الكمري، ٢٥% خف شمرايخ/السباطة في مرحلة الكمري، ٢٥% خف من طول الشمرايخ/ السباطة في مرحلة الكمري.

وقد أظهرت النتائج التالية:

- نقص معنوي في المحصول نتيجة عمليات خف الثمار مقارنة بالكنترول.
 - زيادة في وزن السباطة نتيجة معاملات خف السباط/ النخلة في المرحلتين الحبابوك والكمري بينما حدث نقص في وزن السباطة نتيجة عمليات الخف الأخرى.
 - تحسين في الصفات الطبيعية من حيث وزن الثمرة، حجم الثمرة، وزن اللحم، سمك اللحم، طول الثمرة، قطر الثمرة، وزن البذرة ودليل اللون للثمار نتيجة عمليات خف الثمار.
 - تحسين في الصفات الكيميائية من حيث المواد الصلبة الذائبة الكلية، الحموضة، نسبة المواد الصلبة الذائبة الكلية إلى الحموضة، فيتامين سي، السكريات الكلية، السكريات المختزلة، السكريات الغير مختزلة وكذلك التانينات الذائبة الكلية نتيجة عمليات خف الثمار.
 - خف الثمار في مرحلة الحبابوك كان أفضل من الخف في مرحلة الكمري.
- التوصية:** من نتائج الدراسة يمكن التوصية بأهمية القيام بمعاملة ٢٥% خف من طول الشمرايخ/ السباطة في مرحلة الحبابوك وذلك للحصول على جودة عالية للثمرة في الصفات الطبيعية والكيميائية تحت ظروف محافظة الإسماعيلية – مصر.