

Effect of Fruit Thinning Methods on Physical Properties and Yield Qualities of Barhi date Palm in Ripening Stage

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Abstract

This investigation was carried out during the two consecutive seasons, 2023 and 2024 respectively on date palm trees (*Phoenix dactylifera* L.) cv. Barhi grown in a private orchard at Belbis region, Sharkia Governorate, Egypt to evaluate the impact of thinning applications by bunches number and thinning levels using exclusive tools on the yield and fruit quality. In a sandy soil and irrigated with drip irrigation system. Date Palm trees were 10-year-old, planted at 8*8m space. Forty five date palm trees (fifteen treatments with three replicates for each treatment) were selected in both studied seasons. Moreover, the trees were uniform and healthy in vigor and size. The same horticultural practices were applied to all experimental palms .All thinning treatments were at Hababouk stage about forty five days after fruit set.

Thinning methods practical are the most important horticulture parts in date palm trees beginning in Hababouk stage till the ripe fruits. In Barhi cv. experiments were carried out by using tools in this respect as pincers and comb in newly parts as well as the normal methods. Generally methods of thinning increasing markedly in bunch weight per palm especially in 8 bunches/palm treatment and least weight of bunch in 12 one per palm. The more effect of thinning was used by pincers increasing fruit weight significantly as compared to control treatment in least weight of fruits. Also comb thinning treatments came after in pincers ones. Fruits pulp weight increased with used of fruits thinning treatments by pincers and comb practical methods especially in 8 bunches/palm markedly. The interaction was more effects in this respect in fruit weight and pulp weight in loading 8 bunch/palm, in fruit volume was increasing significantly in comb treatments followed by pincers treatment and least in this respect was in control experiments in both seasons of study. While, seed weight didn't markedly effects in this respect of thinning methods in the two seasons respectively. The total yield of palm trees was increased in control treatment as compared to other thinning treatment in comb and pincers in the case of loading 8, 10, and 12 bunches/ palm tree.

Conclusively: from this results of research, improving of fruits physical properties as fruit weight and volume by thinning methods especially pincers and comb tools in Barhi date palm.

Key words: thinning methods- physical properties- yield qualities- Barhi date palm

Introduction:

Date palm trees (*Phoenix dactylifera* L.,) are adapted to drought and desert conditions. Fruits thinning methods are regarded as the key of important orchards management because it gives the retained dates/strands the best chance to improve in quality and develop in size. Moreover, it reduces compactness between fruits set per bunches and provides the best quality which be attractive to the human. In date palm management, fruits thinning treatments are practiced, where 50 to 80% of dates were removed (Morton, 1987). Fruits thinning are

considering one of the most effective horticultural practices that related to dates quality and volume since higher quality with large size fruits. The majority of researches showed that thinning methods resulted in a considerable reducing in yield (Barreveld, 1993; Al Saikhan and Sallam, 2015; Elbadawy *et al.*, 2018; Ahmed *et al.*, 2019; Mukhtar and Ali, 2019 and Ahmed, 2022). There are lots of thinning treatments to remove bunches or inflorescences, removal individual fruits, remove a part of the bunches, central of bunch thinning, shorten of strands or adjust the ratio of bunch: leaves (Ben Salah *et al.*, 1998). The impact of thinning treatments is significantly affected by the the time of thinning application. The fruits physical properties of Barhi cultivar are improved due to strands and bunch thinning. In addition, many studies proved that bunches and strands thinning applications developed the properties of Barhi fruits. Elbadawy *et al.* (2018), Moustafa *et al.* (2019), Mukhtar and Ali, (2019), and Ahmed (2022) illustrated that fruits thinning methods improved fruit dimension, fruit weight, pulp weight, pulp/seed ratio, fruit volume and fruit shape index.

The current study aims to develop, design, and validate an effective, affordable, and farmer adaptable tool for the fruit thinning of cv. Barhi.

The study also includes to assess the effectiveness of comb and pincers thinning tools compared to manual thinning techniques.

MATERIALS AND METHODS:

This investigation was carried out during the two consecutive seasons (2023 and 2024) respectively on date palm trees (*Phoenix dactylifera* L.) cv. Barhi grown in a private orchard at Belbis region ,Sharkia Governorate ,Egypt to evaluate the impact of thinning applications by bunches number and thinning levels using exclusive tools on the yield and fruit quality. In a sandy soil and irrigated with drip irrigation system. Date Palm trees were 10year-old, planted at 8*8m space. Forty five date palm trees (fifteen treatments with three replicates for each treatment) were selected in both study seasons. A factorial experiment was used in a randomized complete block design. Moreover, the trees were uniform and healthy in vigor and size. The first factor was thinning date, which includes three levels ,i.e. 8, 10 and 12 bunches/palm). The second factor was thinning methods: which contain five levels, without thinning, thinning with a comb tool (manufacture by Sallam, 2023), thinning with a pincers (by National Date Palm Center, Ministry of Environment, Water and Agriculture, KSA), removing alternative fruit of the strand, and removing the entire central strands. The same horticultural practices were applied to all experimental palms .The same pollen sources were used for pollination on March till mid of April. The excess early, late and small sized bunches were removed before the trials started. After pollination all bunches were covered with paper bags, its length was 57cm and its width was 33cm. All thinning treatments were at Hababouk stage about forty five days after fruit set. At the end of the ripening stage at harvest time on September about fifteen dates from each replicate were taken randomly to determine fruit quality.

1-Bunch weight and fruits yield per palm (kg):

Average bunch weight (kg) using a digital electronic balance scale and yield/palm were recorded as follow:

Yield per tree (kg) = bunches number x average bunch weight

2-Fruit physical properties:

Fruit weight (g): was estimated by weighting samples from each replicate.

Pulp weight:

Average pulp weight (g) = fruit weight - seed weight Seed weight:

The average seed weight was estimated (g) in each replicate.

Pulp/seed ratio:

Calculated by divided the average of pulp weight/seed weight.

Fruit volume (cm^3) of fruit samples was determined by displaced water directly in measuring cylinder.

Fruit dimensions:

Average fruit length and width (diameter) were measured by digital Caliper (cm).

Fruit shape index: fruit length (cm)/fruit width (cm) according to **Sanaa. (1996)**.

3- Statistical analysis

According to statistical analysis method stated by **Gomez and Gomez (1984)**, the data were subjected to calculate the analysis of variance. According to **Waller and Duncan (1969)**, the least significant differences test (LSD) was used to assess treatment mean differences at 5% probability. Statistics 8.1 was used to conduct all statistical analyses (**Analytical Software, 2005**).

RESULTS AND DISCUSSION:

1-Effect of bunches number/palm, thinning methods and their interaction on bunch weight (kg) and yield/palm (kg) are shown in Table (1) during two consecutive seasons (2023-2024).

1-1 Main effect of bunches number on bunch weight, the highest bunch weight recorded by 8 bunches/palm (18.3 and 19.3 kg) in both seasons respectively. While, treatment of 12 bunches /palm showed the lowest values (14.3 and 14.2 kg) during two studied seasons.

Main effect of thinning methods on bunch weight of control palm gave the greatest results (18.7 and 19.4 kg) in two seasons respectively. Furthermore, the least bunch weights (14.1 and 14.2 kg) revealed by pincers thinning method in two consecutive seasons.

Interaction between bunches number and thinning methods of Control palm +8 bunches gave the maximum results (20.1 and 22.0 kg) during two seasons of study. On the other hand pincers+10 bunches/ palm exhibited the least value (10.9 kg) in the first season of study but in the second season pincers+12 bunches/palm treatment illustrated the lowest result (11.6 kg).

These results are agreement with those reported by **Mostafa and El-Akkad (2011)**, **Soliman et al. (2011)** , **Soliman and Harhash (2012)** and **Al Saikhan and Sallam (2015)** they found that the strands removing by thinning methods had caused decreasing in the weight of bunches by many date palm cultivars.

1-2- Main effect of bunches number on yield/palm, the greatest results (172.0 and 169.9 kg) recorded by 12 bunches/palm treatment in the two seasons. In addition minimum value (146.3 kg) revealed by 8 bunches/palm in the first season of study while 10 bunches/ palm showed the lowest result (146.5 kg) in the second study.

Main effect of thinning methods on yield/palm of control palm showed the highest values (186.7 and 191.2 kg) in two seasons of study respectively. Additionally, pincers treatment gave the least results (137.4 and 137.2 kg) in both seasons respectively.

The interaction between bunches number and thinning methods, control palm +12 bunches gave the maximum yield (228.6 and 219.6 kg) during both seasons, respectively. Moreover, pincers thinning method+10bunches/palm recorded the least yield/palm (109.2 and 119.6 kg) in two consecutive seasons.

The current results are in harmony with **Bashir et al.(2014)** who showed that increasing in the yield / palm with providing intensity of strands thinning to the highest one in approximately 50% thinning of strands because of randomized selected of fruit strands from Kur cultivar bunches, **Samouni et al. (2016)**, **Radwan (2017)**, **El-Badawy et al. (2018)**, **Ghazzawy et al.(2019)**, **Hosny et al. (2022)**, **Radwan et al. (2022)** and **Sallam (2023)**.

The thinning methods reduced the yield/palm which due to treatments of bunches thinning. It caused reducing dates number in comparison to untreated bunches. The obtained results refer to the dates retention increasing by fruits bunch because of providing each fruit with nutrition sources which resulted heavier bunches weight and due to providing the fruits with food materials from the trees (**Leopold, 1964**).

The increasing in fruit weight is regarded as a great aim comparable with palm yield which leads to improvement and increased total dates yield (Samouni *et al.* 2016).

Table 1 : Effect of bunches number /palm, thinning methods and their interaction of Barhi cv. date palm on means of bunch weight (kg) and yield/palm (kg) during 2023 and 2024 seasons.

Characters Season Treatments		Bunch weight (kg)		Yield/palm (kg)	
		2023	2024	2023	2024
A-Bunches no./palm					
8	Control	18.3	14.7	146.3	154.6
10	Comb	14.3	14.2	146.8	146.5
12	Pincers			172.0	169.9
LSD at 5%		0.9	0.8	9.7	7.7
B: Thinning methods					
Control				186.7	191.2
Comb				155.7	151.9
Pincers		18.7	15.6	137.4	137.2
Alternative fruit removal		14.1	15.3	148.2	155.8
Central strands removal		15.1	15.2	147.1	148.8
LSD at 5%		1.2	1.0	12.5	9.9
C: Interaction A X B					
8	Control			160.8	176.0
	Comb			128.5	136.3
	Pincers	20.1	16.1	149.3	153.1
	Alternative	18.7	18.4	146.9	160.5
	Central	18.2	18.4	145.9	147.2
10	Control			170.7	178.1
	Comb			157.4	144.3
	Pincers	17.1	15.7	109.2	119.6
	Alternative	10.9	15.6	155.7	153.3
	Central	14.1	13.7	141.1	137.1
12	Control			228.6	219.6
	Comb	19.1	15.1	181.2	175.2
	Pincers	12.8		153.6	138.8
	Alternative	11.8	12.8	142.0	153.6
	Central	12.9	13.5	154.4	162.0
LSD at 5%		2.0	1.7	21.7	17.2

2- Effect of bunches number/palm, thinning methods and their interaction on fruit weight (g), pulp weight (g) and seed weight (g) at ripening stage are shown in Table (2) during seasons of study (2023 and 2024) respectively.

2-1- Main effect of bunches number on fruit weight at ripening of eight bunches/palm treatment illustrated the maximum values (22.6 and 22.0 g) in both seasons respectively. Moreover, the least results (19.6 and 19.1 g) exhibited by treatment of 12 bunches/palm.

Main effect of thinning methods on fruit weight at ripening, the greatest values (22.9 and 22.5 g) showed by pincers treatment during both seasons of study. Furthermore, the control palm revealed the lowest results (18.0 and 18.5 g) during studied seasons respectively.

Interaction between bunches number and thinning methods of pincers +8 bunches/palm treatment gave the highest values (25.2 and 25.6 g) during two seasons of study but alternative+12 bunches/palm thinning method showed the least values (16.3 and 16.2 g) during both studied seasons.

The reached results are agreement with **Bashir *et al.*(2014)**, **Samouni *et al.*(2016)**, **Radwan (2017)**, **EIBadawy *et al.*(2018)**, **Ghazzawy *et al.*(2019)**, **Atawia *et al.*(2020)** , **Dawoud and Fatima (2021)** and **Hosny *et al.*(2022)** .

Average fruit weight increasing which obtained by levels of thinning might be reduced in the crowded and compactness of dates which had prevented its accumulation by bunches. Such as the dates which took the chance of their growth (**Bashir *et al.* 2014**).

2-2- Main effect of bunches number on pulp weight at ripening, the maximum results (21.4 and 20.7 g) recorded by eight bunches/palm treatment. However, the lowest values (18.3 and 18.0 g) showed by treatment of 12 bunches/ palm.

Main effect of thinning methods on pulp weight at ripening of pincers thinning method illustrated the highest results (21.7 and 21.1 g) in two seasons respectively. Additionally, control palm revealed the maximum values (16.7 and 17.3 g) in studied experiment respectively.

Interaction between bunches number and thinning methods, the highest values (23.9 and 23.9 g) gave the highest values by pincers +8 bunches/palm in both seasons . On the other side alternative+12 bunches/palm treatment exhibited the least results (15.2 and 15.0 g) in both seasons.

All results are in harmony with **Ghazzawy *et al.*(2019)**, **Moustafa *et al.*(2019)**, **Atawia *et al.*(2020)**, **Dawoud and Fatima (2021)**, **Ahmed (2022)**, **Sallam(2023)** and **Abdelaziz *et al.* (2023)**.

These results may be due to retained dates were able to efficiently storage nutrients and also improved its quality by reducing the competition between them according to (**Nixon and Carpenter (1978)**), **Ali-Dinar *et al.* (2002)** and **Hammam *et al.*, (2002)**.

2-3- Seed weight at ripening stage, data recorded non-significant differences during both seasons of study.

Table 2 : Effect of bunches number /palm, thinning methods and their interaction of Barhi cv. date palm on means of fruit weight (g), pulp weight (g) and seed weight (g) at ripening stage during 2023 and 2024 seasons.

Characters Season Treatments		Fruit weight (g) at ripening		Pulp weight (g) at ripening		Seed weight (g) at ripening	
		2023	2024	2023	2024	2023	2024
A-Bunches no./palm							
8		22.6	22.0	21.4	20.7	1.13	1.36
10		21.5	21.6	20.1	20.5	1.40	1.14
12		19.6	19.1	18.3	18.0	1.25	1.13
LSD at 5%		0.8	0.9	0.7	0.8	N.S.	N.S.
B: Thinning methods							
Control		18.0	18.5	16.7	17.3	1.28	1.22
Comb		22.1	21.2	20.7	20.0	1.36	1.21
Pincers		22.9	22.5	21.7	21.1	1.26	1.42
Alternative fruit removal		21.0	20.2	19.8	19.1	1.19	1.06
Central strands removal		22.1	22.1	20.9	21.0	1.23	1.13
LSD at 5%		1.0	1.1	0.9	1.1	N.S.	N.S.
C: Interaction A X B							
8	Control	17.5	17.3	16.3	15.8	1.27	1.50
	Comb	24.5	22.2	23.2	20.5	1.30	1.70
	Pincers	25.2	25.6	23.9	23.9	1.23	1.77
	Alternative	24.5	23.4	23.5	22.5	0.93	0.90
	Central	21.1	21.5	20.2	20.6	0.93	0.93
10	Control	19.1	20.7	18.1	19.8	1.07	0.92
	Comb	19.6	19.9	17.9	19.1	1.63	0.80
	Pincers	22.0	21.3	20.6	19.8	1.40	1.47
	Alternative	22.4	21.0	20.8	19.9	1.57	1.10
	Central	24.5	25.2	23.2	23.8	1.35	1.40
12	Control	17.3	17.4	15.8	16.2	1.52	1.25
	Comb	22.1	21.6	21.0	20.5	1.13	1.13
	Pincers	21.6	20.6	20.5	19.6	1.13	1.03
	Alternative	16.3	16.2	15.2	15.0	1.07	1.17
	Central	20.6	19.7	19.2	18.6	1.40	1.07
LSD at 5%		1.7	1.9	1.6	1.8	N.S.	N.S.

3- Effect of bunches number/palm, thinning methods and their interaction on pulp/seed ratio, fruit volume (cm³), fruit length (cm), fruit width (cm) and fruit shape index at ripening stage are shown in Table (3) during two consecutive seasons (2023-2024).

3-1- Main effect of bunches number on pulp/seed ratio at ripening, the highest value (20.1) exhibited by 8 bunches /palm in first study. While, 10 bunches/palm treatment showed maximum result (20.4) in second study. On the other hand 10 bunches/palm gave the lowest value (15.0) in first season but minimum value (16.7) recorded by 12 bunches/palm in the second study.

Main effect of thinning methods on pulp/seed ratio at ripening of central strands removal illustrated maximum values (18.2 and 20.4) in both studied seasons, respectively. Furthermore the control palm revealed the lowest results (13.6 and 15.5) during two seasons of the study.

Interaction between bunches number and thinning methods of alternative+8 bunches/palm thinning treatment showed the greatest values (25.3 and 25.1) in both studied seasons. In addition control palm +12 bunches recorded the least result (10.9) in first study but control+8 bunches gave the lowest value (10.6) in the second study.

The reached results are agreement with **Mohammad S. Al-Sekhan (2009)**, **Bashir *et al.* (2014)**, **Al Saikhan and Sallam (2015)** , **Ghazzawy *et al.* (2019)** and **Ghazzawy *et al.*(2023)**.

3-2- Main effect of bunches number on fruit volume at ripening, the maximum value (20.3cm³) exhibited by eight bunches/palm in first study but ten bunches/ palm showed the highest value (19.9cm³) in second season. Moreover, minimum values (17.5 and 17.6 cm³) showed by 12 bunches/palm in both seasons.

Main effect of thinning methods on fruit volume at ripening of comb thinning method recorded the highest value (20.3cm³) in first experiment but pincers treatment showed the best result (20.9cm³) in the second study. While, control palm gave the least results (15.5 and 16.7 cm³)in both seasons of study.

Interaction between bunches number and thinning methods of comb+8 bunches/palm thinning method showed the best value of volume (23.5cm³)without any significant differences with pincers+8 treatment in first season. In addition central +10 treatment recorded the highest value (22.3 cm³)in second study. On the other hand control palm+12 exhibited the least value (15.3 cm³) in first season. Moreover the least value (15.8 cm³) revealed by control +8 bunches/palm without any significant differences between control+12 bunches and alternative+12 bunches during the second season.

The obtained results are according to **Kaur *etal.*,(2006)**, **Soliman *et al.*(2011)**, **Mostafa and El-Akkad (2011)**, **Soliman and Harhash (2012)**, **Ahmed *et al.*(2019)**, **El-Dengawy *et al.* (2019)** , **Moustafa *et al.*(2019)**, **Abdelaziz *et al.* (2023)** and **El-Kosary *et al.*(2023)**. The current results obtained are contradictory to the findings of **Marashi and Mousavi (2007)**.

Dates volume rising might be refer to methods of strands and bunches thinning on many date palm cultivars that observed with **Soliman *et al.* 2011** on Khalas date palm cultivar **and Soliman and Harhash 2012** on Succary date palm.

3- Main effect of bunches number on fruit length at ripening, results illustrated a significant differences in first study only.

Main effect of thinning methods on fruit length at ripening, data showed non-significant variances in both seasons of study.

Interaction between bunches number and thinning methods, results recorded significant differences in second season only.

According to **Madani *et al.*(2021)**, **Dawoud and Fatima (2021)**, **Ahmed (2022)**, **Hosny *et al.*(2022)**, **Sallam(2023)** , **Abdelaziz *et al.* (2023)**, **El-Kosary *et al.*(2023)** and **Ghazzawy *et al.*(2023)**.

3-4- Main effect of bunches number on fruit width at ripening, the highest values (3.15 and 3.16 cm) showed by 8 bunches/ palm during both seasons. Furthermore, the lowest results illustrated by 12 bunches/palm (2.94 and 2.92 cm) during studied seasons, respectively.

Main effect of thinning methods on fruit width at ripening of pincers treatment recorded the best results of width (3.14 and 3.16 cm) in both seasons of study. Otherwise control palm revealed the least values (2.84 and 2.86 cm) in two seasons, respectively.

Interaction between bunches number and thinning methods of pincers+8 bunches/palm treatment gave the highest values (3.38 and 3.40 cm) during two consecutive seasons. On the other hand minimum values (2.70 and 2.73 cm) showed by treatment of control +8 bunches during two seasons, respectively.

The reached results are according to **Hosny *et al.*(2022)**, **Sallam (2023)**, **Abdelaziz *et al.* (2023)**, **ElKosary *et al.*(2023)** and **Ghazzawy *et al.*(2023)**.

3-5-Main effect of bunches number on fruit shape index at ripening, maximum results (1.32 and 1.33) recorded by 12 bunches/palm in two seasons of study. Moreover, 10 bunches/palm treatment gave the least value (1.24) in first study but 8 bunches/palm exhibited minimum value (1.27) in second season of study.

Main effect of thinning methods on fruit shape index at ripening, there were significant differences in the second experiment only.

Interaction between bunches number and thinning methods, the highest values of fruit shape index (1.47 and 1.44) revealed by control +8 bunches in both seasons. Additionally, the lowest value (1.17) illustrated by comb+10 bunches in the first season but pincers +8 bunches/palm showed the least (1.20) in the second study.

The current results obtained are contradictory to the findings of **El-Badawy *et al.*(2018)** and **Moustafa *et al.*(2019)** who recorded that there weren't any variances among thinning methods of strands and un-thinned palm (control treatment) during the study.

Table 3 : Effect of bunches number /palm, thinning methods and their interaction of Barhi cv. date palm on means of pulp/seed ratio, fruit volume(cm³), fruit length (cm), fruit width (cm)and fruit shape index at ripening stage during 2023 and 2024 seasons.

Characters Season Treatments		Pulp/seed ratio at ripening		Fruit volume(cm ³) at ripening		Fruit length (cm) at ripening		Fruit width (cm) at ripening		Fruit shape index at ripening	
		2023	2024	2023	2024	2023	2024	2023	2024	2023	2024
A-Bunches no./palm											
8		20.1	17.5	20.3	19.6	4.10	3.99	3.15	3.16	1.31	1.27
10		15.0	20.4	18.9	19.9	3.83	3.99	3.09	3.11	1.24	1.28
12		15.4	16.7	17.5	17.6	3.87	3.87	2.94	2.92	1.32	1.33
LSD at 5%		2.7	N.S.	1.1	1.3	0.18	N.S.	0.08	0.08	0.06	0.05
B: Thinning methods											
Control		13.6	15.5	15.5	16.7	3.82	3.89	2.84	2.86	1.35	1.37
Comb		16.7	18.8	20.3	19.3	3.89	3.94	3.13	3.10	1.25	1.28
Pincers		17.7	17.5	20.2	20.9	3.98	3.98	3.14	3.16	1.27	1.26
Alternative fruit removal		18.0	18.8	19.3	18.7	4.00	3.91	3.09	3.06	1.29	1.28
Central strands removal		18.2	20.4	19.2	19.6	3.98	4.02	3.08	3.14	1.29	1.28
LSD at 5%		N.S.	N.S.	1.4	1.7	N.S.	N.S.	0.10	0.10	N.S.	0.06
C: Interaction A X B											
8	Control	12.9	10.6	15.7	15.8	3.97	3.93	2.70	2.73	1.47	1.44
	Comb	20.4	13.5	23.5	20.3	4.13	3.97	3.33	3.27	1.24	1.22
	Pincers	19.4	14.7	23.5	21.7	4.08	4.07	3.38	3.40	1.21	1.20
	Alternative	25.3	25.1	20.7	21.0	4.30	4.05	3.30	3.30	1.30	1.23
	Central	22.3	23.6	18.3	19.3	4.03	3.93	3.03	3.10	1.33	1.27
10	Control	17.0	22.3	15.5	18.3	3.63	3.90	2.97	3.03	1.23	1.29
	Comb	11.0	24.6	17.8	18.7	3.48	3.77	3.00	3.07	1.17	1.23
	Pincers	14.9	17.5	17.7	20.8	4.00	3.97	3.03	3.03	1.32	1.31
	Alternative	14.4	18.4	21.0	19.3	4.07	4.10	3.17	3.07	1.28	1.34
	Central	17.6	19.3	22.3	22.3	3.97	4.20	3.30	3.37	1.21	1.25
12	Control	10.9	13.7	15.3	15.8	3.87	3.83	2.87	2.80	1.35	1.37
	Comb	18.6	18.3	19.5	19.0	4.05	4.10	3.05	2.97	1.33	1.38
	Pincers	18.7	20.4	19.3	20.3	3.87	3.90	3.00	3.03	1.29	1.28
	Alternative	14.4	12.9	16.3	15.8	3.63	3.57	2.83	2.82	1.29	1.27
	Central	14.7	18.3	17.0	17.0	3.93	3.93	2.93	2.97	1.34	1.33
LSD at 5%		6.1	N.S.	2.4	2.9	N.S.	0.26	0.17	0.17	0.13	0.10

Conclusion:

Under the conditions of this experiment, the current study was planned to improve fruits physical characteristics as (fruit weight, pulp weight, fruit volume, fruit dimensions, fruit shape index and pulp/seed ratio) in Barhi date palm cultivar. This study included to assess effectiveness of comb and pincers thinning tools comparing to techniques of other manual thinning.

The interaction was more effects in this respect in fruit weight and pulp weight in loading 8 bunch/palm, in fruit volume was increasing significantly in comb treatments followed by pincers treatment and least in this respect was in control experiments in both seasons of study.

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