THIS experiment was conducted during 2020 and 2021 on Samany date palms grown in new reclaimed sandy soil at private orchard located at Al Assiuty valley, Assuit, Egypt, to improve yield and some physical and chemical fruit quality by strand thinning (shortening 25% of length of all strands from the terminal tips at pollination and one month after pollination or removing 25% of total strands from the center of the bunch at pollination and one month after pollination. These results indicated that the control gave the highest bunch and total yield than the other treatments but all thinning treatments increased most of physical properties; fruit weight, flesh weight, fruit length, and diameter and thickness. Also improved the chemical properties such as TSS, total sugars, and reducing sugars. Strand thinning by removal 25% of the total number of strands at month after pollination gave the highest physical and chemical properties.

Keywords: Date palms, Samany, Thinning strands, Yield, Fruit quality
thinning to 8 bunches per palm and removing 30% of strands from the bunch center. Imtiaz Hussain et al. (2016) cleared that strand thinning increased the level of total phenols, flavonoids, antioxidants and sugars at rutab stage of Hillawi and Khadrawi date palms compared with un-thinned fruit clusters. The best thinning treatment was removal of 30% central strands alone and in combination with 30% cutting of terminal tips. Mukhtar and Ali (2019) found that fruit thinning significantly increased fruit properties such as fruit weight, fruit length, diameter, Pulp thickness, while total yield was not affected by thinning treatment in the two seasons. This study aimed to evaluate effects of different methods and times of fruit thinning of Samany date cultivar on yield and fruit quality under Assiut conditions.

**Materials and Methods**

This study was conducted during 2020 and 2021 seasons on Samany date palm cultivar grown in newly reclaimed land, on private orchard located at Al Assiuty valley, Assiut Governorate, Egypt. Fifteen mature palms of Samany date cultivar (20 years old) were selected randomly to study the effects of different thinning treatments using different methods and times on yield, some physical and chemical fruit properties. The selected palms were healthy and similar in vigor and received the same culture practice and adjusted to same load of 9 bunches and the leaf/bunch ratio of 9:1 was maintained. Pollination of this investigation was carried out using the same pollen source, same method and timing to avoid metaxinial effect.

The palm trees were divided at random into five treatments each treatment was made of three replicates, each replicate was of one palm.

The five treatments were arranged as follows:-

- (T1) Without thinning (control)
- (T2) Shortening 25% of length of all strands from the terminal tips at pollination
- (T3) Removing 25% of total strands from the center of bunch at pollination
- (T4) Shortening 25% of length of all strands from the terminal tips one month after pollination
- (T5) Removing 25% of total strands from the center of bunch one month after pollination

**Experimental measurements**

All bunches were harvested at commercially color stage at second week of September. Bunches weight were recorded then the yield was estimated as kg per palm. Thirty fruits from each replicate were picked randomly to determine the following physical and chemical properties:

Fruit weight, pulp and seed weight (g) were measured by using electronic balance. Fruit dimension (Length and diameter), size and thickness (cm) measured by Vernier Caliper, TSS% was determined by hand refractometer. Total, reducing, non reducing sugars and total acidity % were determined according to A.O.A.C. (1995).

The complete randomized experimental design was adopted. Analysis of variance was carried out according to Means were separated by L.S.D. (0.05) using Statistix 8.1 software (Analytical Software, 2005).

**Results and Discussion**

**Bunch weight and total yield**

According to results in Table (1) it is noticed that the different methods and times of thinning treatments significantly decreased the bunch weight (kg) and total yield (kg/palm) than the control during the two seasons of the study. The highest bunch weight and total yield were recorded with the control (T1) (23.52, 24.81 kg) and (216.68, 223.29 kg) respectively, followed by Removing 25% of total strands from the center one month after pollination (T5) recorded (22.25, 23.78 kg) and (200.25, 212.02 kg), respectively. Additionally, no significant difference was found between T3 and T5 during the two seasons in these respects.

**Fruit and flesh weight.**

The results presented in Table (1) clear that the all thinning treatments increased significantly fruit and flesh weight as compared with the control in the two seasons of this study. Thinning treatment by removing 25% of total strands from the center of bunch one month after pollination (T5) gave the highest fruit and flesh weights; (24.52, 25.73 g) and (22.91, 24.13g) respectively followed by Removing 25% of total strands from the center of bunch at pollination (T3) (23.75, 24.16 g) and (22.10, 22.39) respectively with insignificant differences between them While the lowest values were recorded with the control (without thinning). Moreover, there were no significant differences between T3, T4 and T5 with respect to flesh weight in the first season only.
These results are in agreement with those obtained by Al-Obeed et al. (2005), Al-Wasfy and Mostafa (2008), Soliman et al. (2011), Moustafa et al. (2011) and Bashir et al. (2014) who reported that thinning fruits by using different methods lead to lowest bunch weight and total yield per palm of many date palm cultivars. On the other hand, these results dissimilar with those obtained by Marashi and Mousavi (2007) who investigated the impact of thinning fruit using different degrees and methods at 6 weeks from pollination on Barhee date cultivar, they observed that no significant difference found on yield/palm between control and cutting 25% or 30% from strand length.

**Seed weight**

Regarding seed weight, result show that no significant differences found between control and all thinning treatments in both seasons.

**Fruit size**

Results in Table (2) revealed that Samany fruit size was significantly increased by thinning treatments; meanwhile where thinning by removing 25% of total strands from the center of bunch one month after pollination (T5) caused a significant increase in fruit size that was highest than other treatments in the first and the second season followed by removing 25% of total strands from the center of bunch at pollination (T3). Thinning treatment T5 gave the largest values (22.44 and 23.29 cm³), while control (without thinning) gave the smallest values (17.83 and 18.08 cm³) during the two seasons. Meanwhile, no differences were found between T3 and T5 during second season.

**Fruit dimension (length and diameter)**

The data presented in Table (2) show that treatment of thinning by removal 25% of total strands from the center of bunch one month after pollination (T5) increased significantly the fruit dimension (length and diameters) than the control and the other treatments, it resulted in significantly the longest fruit length and diameter values (5.39 and 5.55 cm) and (3.25 and 3.27 cm) However, the shortest fruit length and diameter recorded by control (5.00 and 5.10) and (2.80 and 2.85) in both seasons, respectively. Furthermore, no differences were found between T2, T3, and T4 in the two seasons studied. All thinning procedures increased the physical properties of the fruit, such as fruit volume, length, and diameter.

Table 1. Effect of different thinning treatments on bunch weight, total yield fruit and flesh weight of Samany date palm during 2020 and 2021 seasons.

| Treatments | Bunch Weight (kg) | Total Yield (kg) | Fruit weight (g) | Flesh weight (g) |
|------------|-------------------|------------------|------------------|-----------------|
|            | 2020 | 2021 | 2020 | 2021 | 2020 | 2021 | 2020 | 2021 |
| T1         | 23.52<sup>a</sup> | 24.81<sup>a</sup> | 211.68<sup>b</sup> | 223.29<sup>b</sup> | 19.52<sup>c</sup> | 20.15<sup>c</sup> | 17.92<sup>c</sup> | 18.45<sup>c</sup> |
| T2         | 19.40<sup>a</sup> | 20.08<sup>a</sup> | 174.60<sup>a</sup> | 180.72<sup>a</sup> | 21.95<sup>b</sup> | 22.51<sup>b</sup> | 20.51<sup>b</sup> | 20.86<sup>b</sup> |
| T3         | 22.16<sup>a</sup> | 22.90<sup>a</sup> | 199.44<sup>a</sup> | 206.10<sup>a</sup> | 23.75<sup>a</sup> | 24.16<sup>a</sup> | 22.10<sup>a</sup> | 22.39<sup>a</sup> |
| T4         | 21.01<sup>a</sup> | 22.20<sup>a</sup> | 189.09<sup>a</sup> | 199.80<sup>a</sup> | 22.48<sup>a</sup> | 22.51<sup>a</sup> | 20.76<sup>b</sup> | 20.80<sup>b</sup> |
| T5         | 22.25<sup>b</sup> | 23.78<sup>b</sup> | 200.25<sup>b</sup> | 214.02<sup>b</sup> | 24.52<sup>a</sup> | 25.73<sup>a</sup> | 22.91<sup>a</sup> | 24.13<sup>a</sup> |

(T1) Control without thinning; (T2) Shortening 25% of length of all strands from the terminal tips at pollination; (T3) 25 Removing 25% of total strands from the center of bunch at pollination; (T4) Shortening 25% of length of all strands from the terminal tips one month after pollination; (T5) Removing 25% of total strands from the center of bunch one month after pollination. Values having the same letter(s) within a column not significantly different.
TABLE 2. Effect of different thinning treatments on seed weight, fruit size, fruit length, diameter and thickness of Samany date palm during 2020 and 2021 seasons.

| Treatments          | Seed (weight g) | Fruit (size cm³) | Fruit (length cm) | Fruit (diameter cm) | Fruit thickness (cm) |
|---------------------|-----------------|------------------|-------------------|---------------------|---------------------|
|                     | 2020            | 2021             | 2020              | 2021                | 2020                | 2021                |
| T₁ (control)        | 1.60a           | 1.70a            | 17.83b            | 18.08c              | 5.00b               | 5.10c               | 2.80b               | 2.85c               | 0.90b               | 0.91c               |
| T₂                  | 1.44a           | 1.65a            | 19.65b            | 19.90b              | 5.19b               | 5.17c               | 2.90c               | 2.98b               | 0.93b               | 0.94b               |
| T₃                  | 1.65a           | 1.76a            | 21.11b            | 22.78b              | 5.21b               | 5.24b               | 2.86c               | 2.90b               | 0.93b               | 0.93b               |
| T₄                  | 1.65a           | 1.70a            | 20.90b            | 21.16b              | 5.18a               | 5.24b               | 3.01c               | 3.15b               | 0.94b               | 0.94b               |
| T₅                  | 1.70a           | 1.60a            | 22.44a            | 23.29a              | 5.39a               | 5.55a               | 3.25a               | 3.27a               | 0.94c               | 0.96a               |

(T1) Control without thinning; (T2) Shortening 25% of length of all strands from the terminal tips at pollination; (T3) Removing 25% of total strands from the center of bunch at pollination; (T4) Shortening 25% of length of all strands from the terminal tips one month after pollination; (T5) Removing 25% of total strands from the center of bunch one month after pollination. Values having the same letter(s) within a column not significantly different.

These findings are consistent with those of other research reported by Al-Obeed et al., (2005), Marzouk et al., (2007) and Abdel-Galil et al., (2008). Soliman and Harhash (2012) Moustafa et al., (2019) Mukhtar and Ali (2019) who have shown that thinning fruits by different method of many date palm cvs, increased fruit physical properties such as fruit volume, length, diameter and thickness. Bunch thinning by removing 10% to 40% of total strands after pollination enhanced fruit quality than control in Khadrawi date palm cultivar (Nirmaljit et al. 2006).

These results may be attributed to the decrease of fruit number within the bunch to give more space among the fruit and the leaves ratio to fruits number was improved. Thus a better supply of Carbohydrates produced in the leaves which lead to improve fruit quality (Moustafa 1993 and Al-Saikhan 2008).

Acidity
Results in Table (3) illustrate that no significant differences found between control and other thinning treatments in the two studied seasons.

Total soluble solids (TSS %)
Concerning to results presented in Table (3) it’s clear that all thinning treatments increased TSS percentage than control. Strand thinning by removing 25% of total strands from the center one month after pollination(T5) induced the highest TSS percentage (44.62 and 45.36 %) while the control resulted in the lowest TSS percentage (39.77 and 40.48%) in both seasons, respectively.

Reduction sugar
Data presented in Table (3) show that all treatments of strand thinning increased reducing sugars than the control in the two studied seasons, although there are no differences were found between the thinning treatments, the highest reducing sugars (29.75 and 30.72%) were recorded by removing 25% of total strands from the center of bunch one month after pollination(T5).

Non Reducing sugars
Results in Table (3) show that no significant differences were found between control and all thinning treatments in both seasons.

Total sugars
Regarding total sugars, data presented in Table (3) indicate that total sugar increased under all thinning treatments than control during the two studied seasons. Moreover, the highest values (40.25 and 41.18 %) were obtained with thinning treatment T5 compared with control which gave the lowest values (36.42 and 36.91 %) during the two seasons, respectively. The increment in TSS (%), total sugars and reducing sugars could be attributed to the change of the ratio between leaf and fruit and increase the light between fruits.

These results are agreement with those reported by Al-Wasfy and Mostafa (2008), Soliman, et al., (2011), Bashir et al. (2014) Soliman et al. (2015) Moustafa et al. (2019) Mukhtar and Ali (2019).
TABLE 3. Effect of different thinning treatments on fruit acidity, TSS, total sugars, reducing and Non red-sugars of Samany date palm during 2020 and 2021 seasons.

| Treatments | %Acidity 2020 | %Acidity 2021 | %TSS 2020 | %TSS 2021 | Reducing %sugar 2020 | Reducing %sugar 2021 | Non reducing %sugar 2020 | Non reducing %sugar 2021 | %Total sugar 2020 | %Total sugar 2021 |
|------------|---------------|---------------|-----------|-----------|---------------------|---------------------|------------------------|------------------------|---------------------|---------------------|
| T1         | 0.32a         | 0.31a         | 39.77d    | 40.48d    | 25.75b             | 26.26b             | 10.67a                 | 10.65a                 | 36.42c              | 36.91c              |
| T2         | 0.31a         | 0.30a         | 41.97c    | 41.46c    | 27.82b             | 27.54c             | 9.81a                  | 10.28b                 | 37.63b              | 37.82c              |
| T3         | 0.30a         | 0.29a         | 42.30b    | 43.25b    | 28.25b             | 28.04b             | 9.65a                  | 9.78a                  | 37.90b              | 37.82c              |
| T4         | 0.31a         | 0.29a         | 42.80a    | 43.38a    | 27.90a             | 27.90a             | 10.42a                 | 10.57a                 | 38.23b              | 38.32a              |
| T5         | 0.29a         | 0.29a         | 44.62b    | 45.36b    | 29.75c             | 30.72c             | 10.50a                 | 10.46a                 | 40.25a              | 41.18a              |

(T1) Control without thinning; (T2) Shortening 25% of length of all strands from the terminal tips at pollination; (T3) 25% Removing 25% of total strands from the center of bunch at pollination; (T4) Shortening 25% length of all strands from the terminal tips one month after pollination; (T5) Removing 25% of total strands from the center of bunch one month after pollination. Values having the same letter(s) within a column not significantly different.

They found that all thinning treatments increased TSS, total and reducing sugars compared to unthinning (control). These results might due to reduction of fruit compactness between fruits within bunch and increase the light around the fruit to improve fruit quality.

Conclusion

Thinning treatments led to an improvement in the physical and chemical properties of the fruits as a result of increasing the spaces between the fruits inside the bunch and increasing the nutrients for the remaining fruits, which led to an increase in their weight size and chemical properties. Meanwhile, the best treatment in such concern was thinning by removing 25% of total strands from the center of bunch one month after pollination under this study.

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No conflicts

References

Abdel-Galil, H.A., El-Salhy, A.M., El-Akkad, M.M and Diab, Y.M. (2008) Effect of different methods and dates of fruit thinning on “Sewy” date yield and quality under New Valley conditions. The 3rd Int. Conf. on Date Palm, 25-27 April, El-Arish, Egypt.

Al-Obeed, R.S., Harhash, M.A and Fayez, N.S. (2005) Effect of bunch thinning on yield and fruit quality of Succary date palm cultivar grown in the Riyadh region. J. King. Saud. Univ. Agric. Sci., 17(2), 235–249.

Akl, A.M., Ragab, M.A and Mohamed, A.Y. (2004) Yield and fruit quality of Sewy date palms in response to some fruit thinning treatments. The Second Inter. Conf. on Date Palm Faculty of Envir. Agric. Sci., El-Arish, Suez Canal Univ. Egypt.6-8 Oct.

Al-Saikhan, M.S. (2008) Effect of thinning practices on fruit yield and quality of Ruziez date palm (Phoenix dactylifera.L.) in Al-Ahsa Saudi Arabia. Asian. J. Plant. Sci., 7(1), 105-108.

Al-Wasfy, M.M and Mostafa, R.A.A. (2008) Effect of different methods of fruit thinning on Zaghloul date palm production and fruit quality. Assiut J. Agric. Sci., 39 (1), 97-106.

Analytical software, (2005) Statistix8.1 for windows analytical software. Tallahassee, Florida.
A.O.A.C. (1995) Official Methods of Analysis 14th edition. Association of Official Analytical Chemists, Washington, DC (USA).

Bashir, M.A., Ahmad, M., Altaf, F and Shabir, K. (2014) Fruit quality and yield of date palm (Phoenix dactylifera L.) as affected by strand thinning. Journal of Animal and Plant Science 24(3), 951–954.

El-Assar, A.M. (2005) Response of “Zaghloul” date yield and fruit characteristics to various organic and inorganic fertilization types as well as fruit thinning models in a rich carbonate soil. J. Agric. Sci. Mansoura Univ., 30 (5), 2795-2814.

El-Badawy, H.E., EL-Gioushy, S.F and Ahmed, A.M. (2018) Effect of some thinning practices on yield and fruit quality of Sewi date palm grown in farafra region. Asian J. of Agri.and Hort.Research 2 (3), 1-20.

El-Hussein, M.A., EL-Agamy, S.Z., Amen, K.A and Galal, S. (1992) Physiological studies for prolonging harvest date of Samany date under Assiut Governorate conditions. A: Effect of GA₃ and fruit thinning. Assiut J. Agric. Sci., 23(2), 321-334.

Imtiaz, H.S.A., Muhammad, A and Rashid, A. (2016) Execution of strands thinning improves the phytochemicals and sugars profiling in date palm (Phoenix dactylifera L.). Pak. J. Pharm. Sci., Vol.29, No.4, pp.1209-1215.

Lunde. P. (1978) A History of Dates. Saudi Aramco World, 29(2), 176–179.

Marashi, S and Mousavi, A. (2007) Effects of different methods and degrees of fruit thinning on yield and fruit characteristics of Barhee date cultivar. Acta. Hort., 736,187–192.

Marzouk, H.M., El-Salhy, A.M., Abdel-Galil, H.A and Mahmoud, A.E. (2007) Yield and fruit quality of some date palm cultivars in response to some flower thinning rates. The 4th Symposium on date palm in Saudi Arabia. King Faisal Univ., Al-Hassa, 5-7 May, p. 110.

Mostafa, R.A.A and El-Akkad, M.M. (2011) Effect of fruit thinning rate on yield and fruit quality of Zaghloul and Haiany date palms. Australian J. of Basic and Applied Sciences, 5 (12), 3233-3239.

Moustafa, A.A. (1993) Effect of fruit thinning on yield and fruit quality of “Seewy” date palms under El-Fayoum Governorate conditions. Proc. of the Third Symp. On the Date Palm. Al-Hassa, Saudi Arabia, Jan., V. I: 239-246.

Moustafa, A.R., Abdel-Hamid, N., Abd El-Hamid, A., El-Sonbaty, M.R and Abd El-Naby, S.K.M. (2019) Strand thinning of Khadrawi date palm cultivar in relation to yield and fruit quality. Bulletin of the National Research Centre vol. 43, Article N: 204.

Mukhtar, S.A and Ali, A.M. (2019) Bunch and different types of strand thinning effects on yield and fruit characteristics of Barhee date palm cultivar under River Nile State condition, Sudan J. of Applied Science, (1), 14–18.

Shamel, M.A and Alaa, K.O. (2014) Effect of strand thinning on yield and fruit quality on Egyptian dry date palm (Phoenix dactylifera L.), cv. Sultani. J.of American pomology society, 68(3), 135-140.

Nirmaljit, K., Josan, J.S and Monga, P.K. (2006) Fruit thinning of dates in relation to fruit size and quality. II. Abstracts of Poster sessions. Third International Date Palm Conference. Feb, Abu Dhabi, United Arab Emirates, p 56.

Soliman, S.S., Al-Obeed, R.S and Harhash, M.M. (2011) Effects of bunch thinning on yield and fruit quality of khalas date palm cultivar. World J. of Agric. Sci., 7(1), 42–46.

Soliman, S.S and Harhash, M.M. (2012) Effects of strands thinning on yield and fruit quality of Succary date palm. African J. of Biotechnology, 11(11), 2672–2676.

Soliman, S.S., Al-Obeed, R.S and Al-Saif, A.M. (2015) Multivariate analysis as a tool in the assessment of thinning of Segae date palm cultivar (Phoenix dactylifera L.). Pak J. Bot., 47(5), 2023–2029.
RESPONSE OF SAMANY DATE PALM TO DIFFERENT METHODS AND TIMES OF FRUIT …

Ahmed Abdulhameed

The study was conducted on Samany date palm trees cultivated in newly reclaimed lands in Asyut area to study the response of Carissa to different methods and times of fruiting and the following treatments were used:

1. Control (no fruiting)
2. Shortening by 25% of the stalk during pollination
3. Removal of 25% of the stalks from the center of the cluster during pollination
4. Shortening by 25% of the stalks by a month after pollination
5. Removal of 25% of the stalks by a month after pollination

It was found that the control treatment (no fruiting) resulted in the highest weight of the cluster and the total yield compared to the other treatments, which increased statistically in all the natural and chemical characteristics and the other treatments among them were identical, e.g., length and diameter of the fruit, weight of the flesh, and total weight of the solid and soluble carbohydrates.

The fifth treatment, which involved the removal of 25% of the stalks by a month after pollination, was the best among all the treatments, and it exceeded all the other treatments.

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