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## Effect of Thinning Practices on Fruit Yield and Quality of Ruzeiz Date Palm Cultivar (*Phoenix dactylifera* L.) in Al-Ahsa Saudi Arabia

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**Abstract:** A field study was carried out to determine the effect of thinning fruiting bunches on fruit yield and quality of Ruzeiz date palm trees (*Phoenix dactylifera* L.) at Date Palm Research Center, Al-Ahsa, Kingdom of Saudi Arabia. Four thinning treatments included control, no thinning of strands ( $T_1$ ), 1/3 shortening of the total strands from the tips ( $T_2$ ), 1/3 removal of the central strands ( $T_3$ ), 1/3 shortening plus 1/3 removal of central strands ( $T_4$ ). All the thinning treatments improved the fruit quality with respect to fresh fruit weight, fruit flesh weight, reducing sugar and non-reducing sugar contents as compared to the control treatment. Among the various thinning treatments,  $T_4$  (combination of 1/3 shortening and 1/3 removal of central strands) produced the best fruit weight, flesh percentage, reducing and non-reducing sugars contents of date fruit. Whereas the total date palm yield and bunch weight were significantly reduced by the same treatment (combination of the shortening and central removal of strands). However, the date fruit quality was identical for  $T_2$  and  $T_3$  (i.e., 1/3 removal of central strands and 1/3 shortening of total strands) treatments. There was no significant difference of date palm yield and bunch weight obtained in control treatment than that of strands removing and shortening treatments. Overall, the removing and shortening of strands treatments showed promising results for adoption at large scale to improve Ruzeiz fruit yield and quality.

**Key words:** Date palm, *Phoenix dactylifera*, thinning, fruits quality, yield, strands

### INTRODUCTION

Date palm is the major fruit tree in the Kingdom of Saudi Arabia and the annual production is expected to surpass million tons in the coming years (Annual Agricultural Statistics Book, 2004). Presently, the date growers are facing many difficulties to produce high quality date fruit for economical reasons and to compete with the international market. Among the different date growing management practices, thinning practice is an important managerial approach in date palm to improve fruit size, fruit weight, fruit quality and reduce chances of bunch breaking and alternate bearing (Ibrahim and Khalif, 1998; Alkhateeb and Ali-Dinar, 2002; Ali-Dinar *et al.*, 2002). Several methods were used to thin date palm trees, namely: bunch thinning (Ali-Dinar *et al.*, 2002), bunch strands thinning (Nixon and Carpenter, 1978) and individual fruit removal (Osman and Abdulrida, 1989). Combination of removal of individual fruits and strands had substantially improved fruit quality in Majdool date palm (Osman and Abdulrida, 1989). In early studies, Nixon (1940, 1956) found that thinning improved fruit weight and quality, however, severe thinning should be avoided in certain cultivars due to possible occurrence of

physiological and black nose diseases (Nixon, 1956; Nixon and Carpenter, 1978). In Sewi date palm fruit physical and chemical characteristics were substantially improved with thinning by progressive removal of strands while bunch and palm yields were reduced (Mustafa, 1993). Removing 30% of entire spikelets from bunch center was the most promising treatment, which gave a reasonable yield and the best fruit quality of Nabtet Ali cultivar as compared with the other used treatments (El-Shazly, 1999). Recently, Al-Joumayly (2003) concluded that bunch thinning by heading back of strands for Khadrawi cultivar at chemiry stage was useful to produce high quality dates.

In spite of profuse production, most date growers rarely pay any attention to fruit quality and in many cases prices are extremely low and marketing channels are limited. At the same time, certain date growers who adopt management practices to improve fruit physical and chemical characteristics, normally fetch good prices and their produce is highly demanded and easily marketed. The main objective of this study was to evaluate some thinning practices and their possible effects on fruit yield and fruit quality with respect to certain physical and chemical characteristics of Ruzeiz date palm cultivar.

## MATERIALS AND METHODS

The experiment was conducted at the Date Palm Research Center, Al-Ahsa, Kingdom of Saudi Arabia. Ruzeiz date palm trees of approximately uniform size were used for the study. All the date trees received optimum management practices such as irrigation water and fertilizer etc. Thinning practices were applied few days after pollination and proper fruit setting. Thinning treatments were as followed.

- T<sub>1</sub> : Control (no thinning of strands).  
 T<sub>2</sub> : 1/3 shortening of total strands from terminal tips.  
 T<sub>3</sub> : 1/3 removal of the central strands.  
 T<sub>4</sub> : 1/3 shortening and 1/3 removal of total strands.

The experiment was laid out by following A Complete Randomized Block Design with 4 replications according to Gomez and Gomez (1984).

Date fruits were harvested during August 2002 and 2003. Date palm yield and yield components included bunch weight, fruit weight, flesh percentage, reducing and non-reducing sugar contents of date fruit. A sample of randomly selected 25 dates was used to determine different yield components. Reducing and non-reducing sugar contents were determined according to Lane and Eynon (1975).

Data were subjected to statistical analysis according to Gomez and Gomez (1984). The treatment means were compared using Least Significant Difference (LSD) at 5% level of probability according to Waller and Duncan (1969). All statistical analysis was performed using the facility of computer and SAS software package (SAS, 2001).

## RESULTS AND DISCUSSION

**Fruit weight:** Mean fruit weight ranged between 11.25- 16.00 g per fruit in different fruit bunch thinning treatments (Table 1). Mean fruit weight was significantly more in different thinning treatments than the control treatment (LSD<sub>0.05</sub> = 0.998). The fruit weight was significantly higher in T<sub>4</sub> than other thinning treatments but the difference in weight was not significant between T<sub>2</sub> and T<sub>3</sub> treatments. Similar results were reported by

Mustafa (1993) who concluded that in Sewi date palm fruit physical and chemical characteristics were substantially improved with thinning by progressive removal of strands while bunch and palm yields were reduced. Also, El-Shazly (1999) stated that by removing 30% of entire spikelets from bunch center was the most promising treatment which gave a reasonable yield and the best fruit quality of Nabtet Ali cultivar as compared with the other treatments.

**Fruit flesh:** The mean fruit flesh (expressed on percent basis relative to control treatment) ranged between 86-93% in different thinning treatments (Table 1). The fruit flesh percentage was significantly higher in the thinning treatments as compared to the control treatment (LSD<sub>0.05</sub> = 0.005). Although, mean flesh percentage showed increasing trend in T<sub>4</sub> than T<sub>2</sub> and T<sub>3</sub> treatments but the difference was not significant among different thinning treatments. Similar views were stated by Nixon and Carpenter (1978), Ali-Dinar *et al.* (2002) and Hammam *et al.* (2002) who concluded that increase of fruit and flesh weights in treatments of strands removing and tips thinning may be attributed to an internal adjustment mechanism that makes the remaining fruits capable to efficiently use assimilates and improve their chemical and physical qualities in reduced competitive environments. However, in contrast to the study results, many similar studies showed that fruit parameters were not affected by different bunch thinning treatments (Godara *et al.*, 1990).

**Fruit yield:** Mean date fruit yield ranged between 80-89 kg per tree under different thinning treatments (Table 1). Mean fruit yield was significantly affected by different thinning treatments (LSD<sub>0.05</sub> = 2.514). Unexpectedly, the mean fruit yield was significantly less in T<sub>4</sub> (1/3 shortening and 1/3 removing strands) than other treatments. However, the difference in yield was not significant among T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> thinning treatments. The low yield in T<sub>4</sub> could be attributed to the removal of sizable number of fruit bunches that makes up the total fruit yield. The results were identical to those reported by Osman and Abdulrida (1989) and Mustafa (1993) who reported that severe thinning led to great reduction in date palm yield and bunch weight.

Table 1: Effect of different thinning practices on date fruit yield and fruit quality

Treatments	Fresh fruit weight (g)	Fruit flesh (%)	Fruit yield (kg)	Bunch weight (kg)	Reducing sugar contents (%)	Non-reducing sugar contents (%)
T <sub>1</sub>	11.25 <sup>c</sup>	86 <sup>b</sup>	89 <sup>a</sup>	12.00 <sup>a</sup>	46.25 <sup>d</sup>	20.50 <sup>d</sup>
T <sub>2</sub>	14.32 <sup>b</sup>	91 <sup>a</sup>	88 <sup>a</sup>	11.90 <sup>a</sup>	47.32 <sup>b</sup>	21.32 <sup>c</sup>
T <sub>3</sub>	14.25 <sup>b</sup>	90 <sup>ab</sup>	88 <sup>a</sup>	12.50 <sup>a</sup>	47.14 <sup>c</sup>	21.50 <sup>b</sup>
T <sub>4</sub>	16.00 <sup>a</sup>	93 <sup>a</sup>	80 <sup>b</sup>	8.30 <sup>b</sup>	48.65 <sup>d</sup>	22.25 <sup>a</sup>

The values in a column followed by the same letter(s) are not significantly different by LSD<sub>0.05</sub>

**Bunch weight:** Mean date fruit bunch weight ranged between 8.30-12.00 kg per tree under different thinning treatments (Table 1). Mean bunch weight was significantly affected by different thinning treatments ( $LSD_{0.05} = 0.998$ ). The mean fruit bunch weight was significantly less in  $T_4$  (1/3 shortening and 1/3 removing strands) than other treatments. Whereas, the difference in bunch weight was not significant among  $T_1$ ,  $T_2$ ,  $T_3$  and  $T_4$  thinning treatments. These results were identical to those of Tavakkoli *et al.* (2006) on Shahani date cultivar. Because developing fruits normally act as strong sink to tree nutrient sources (Leopold, 1964). Several studies have demonstrated that less date fruits in proper managed trees have always better chances to increase size, weight and other fruit quality variables (El-Hamady *et al.*, 1983; El-Gassas, 1986). This is mainly due to abundance of photosynthates to remaining fruits (Ali-Dinar *et al.*, 2002).

**Reducing and non-reducing sugar contents of fruit:**

Mean sugar contents of date fruit ranged between 46.25-48.65 and 20.50-22.25% for reducing and non-reducing sugar, respectively in different thinning treatments (Table 1). The sugar contents were significantly affected by different thinning treatments ( $LSD_{0.05} = 0.005$  for reducing sugar and  $LSD_{0.05} = 0.007$  for non-reducing sugar). The difference in both the sugar contents (reducing and non-reducing) were significant among different thinning treatments and increased in ascending order from  $T_1$  to  $T_4$  treatments. The higher sugar contents in  $T_4$  could be attributed to overall low total fruit yield in  $T_4$  than other treatments that might have caused concentration factor in total sugar accumulation. The increase of sugar contents in treatments of strands removing and tips thinning may be attributed to an internal adjustment mechanism that makes the remaining fruits capable to efficiently use assimilates and improve their chemical and physical qualities in reduced competitive environments (Nixon and Carpenter, 1978; Ali-Dinar *et al.*, 2002; Hammam *et al.*, 2002). On the other hand, many similar studies showed that fruit parameters were not affected (Godara *et al.*, 1990) by thinning treatments when compared to the study results. It is quite obvious that a balanced removal of bunch strands reduces the inter competition between the remaining fruits for nutrients and assimilates.

**CONCLUSIONS**

Mean date fresh fruit weight, fruit flesh percent, reducing and non-reducing sugars increased with thinning treatments. Besides, total date fruit and individual date fruit bunch yield reduced significantly

with application of various thinning treatments. In conclusion, application of thinning practices in date palm production seems to play a significantly in improving date fruit quality. This practice can be held true only if the date palm trees are properly managed and the leaves are optimally functioning and efficiently providing assimilates. Based on the study results, it was found that thinning 1/3 of bunch strands from tips and 1/3 removal of the central bunch strands are appropriate approaches to improve Ruzeiz date palm fruit quality and ensures reasonable incomes to date growers. The study provided an excellent potential for the application of thinning practices to produce high quality dates in the Kingdom. Further studies are required to study in detail all the physical and chemical characteristics of date fruit under different managing practices.

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