

Full Length Research Paper

Effects of strands thinning on yield and fruit quality of Succary date palm

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Succary date palm cultivar was thinned by removing 15 and 30% of the total number of strands from the center of each bunch, while the control strands were used as reference. Although, thinning caused significant decrease in yield (based on both bunch and palm weight), significant improvement in fruit quality was observed. In conclusion, our results recommended that thinning 30% at four weeks after pollination led to optimum fruit quality.

Key words: Date palm, tinning, bunch yield, fruit quality.

INTRODUCTION

Date palm (*Phoenix dactylifera* L.) is one of the important fruit crops that have been grown in the Kingdom of Saudi Arabia. Succary is one of the best soft type date palm cultivars found to be acceptable by Saudi consumers. Successful orchard management practices include appropriate fruit thinning which gives the remaining fruits a better chance to develop larger size and better quality. Fruit thinning is one of the major practices that often help to overcome this problem. In addition, it gives better quality and reduced compactness among fruits within the bunch. It also helps to have good flowering in the flowering year (Hussein, 1970; Moustafa, 1993; Marzouk et al., 2007). Such results could be attained either by reducing the number of fruits per bunch or by reducing the number of bunches per palm. Hassan et al. (1998) found that there was an inverse relation between the numbers of bunches and each of the volume and weight of both fruit and seed. However, the total yield of the palm showed a non linear relationship with the number of bunches. Thinning treatments improve most physical and chemical properties of fruits (Moustafa, 1998; El-Shazly, 1999). Al-Obeed et al. (2005) found that the 15% shortening of strands at pollination time led to obtain a reasonable yield with fruit quality. Removing 15% of the total number of Haiany and Halawy bunch strands by

either thinning out or cutting back before pollination, was benefice to regulate the yield, with enhancing the maturity and quality of dates (Amen et al., 2007). Behseresht et al. (2007) reported that the thinning in chimiri stage had no significant effects on fruit quality and quantity when compared with that at pollination stage. Although, removal of one third (control and strand-tip) of strands reduced yield; this treatment increased fruits in top grade. Al-Darwish (2010) found that the fruit thinning reduces fruit shrivel. Soliman et al. (2011) found that the thinning treatments improved fruit characteristics, where they significantly increase fruit physical and chemical properties of dates (at Tamer stage).

MATERIALS AND METHODS

The present investigation was carried out at the Research and Agriculture Experimental Station at Dirab, College of Food and Agricultural Sciences, King Saud University, Riyadh. The experiment was repeated for two successive years (2007 and 2008). Five date palms trees (10-years-old) grown on sandy 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 10 bunches were left on each experimental tree. Thinning treatments were applied 30 days after hand pollination in both seasons as follows: control (unthinning), removing 15 and 30% of the total number of strands from the center of each bunch.

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Experimental treatments were arranged in randomized complete block statistical design with five replications (one palm tree for each replication). The total numbers of trees used in the experiment were 15 trees. The yield of experimental trees was harvested through the first half of August. Average bunch weight was recorded as kg/palm. Samples of 10 date fruits were picked at random for the determination of fruit size and dimensions (length and diameter), fruit weight, fruit flesh weight, seed weight and fruit compositions. Average bunch yield was estimated as kg/bunch kg.

Fruit physical characters

Samples of five replicates, 10 fruits each were taken randomly from each bunch to determine fruit size and dimensions (length and diameter, in cm), fruit weight, fruit flesh weight and seed weight (g).

Fruit chemical properties

Chemical properties of fruits (moisture content and total soluble solid (TSS)), fruit acidity percentage was determined according to A.O.A.C. (1995) and the titrable acidity was calculated as citric acid (Mawlood, 1980) and sugar content (reducing, non-reducing and total sugar) were determined according to A.O.A.C. (1995).

Statistical analysis

All collected data were subjected to statistical analysis according to the procedures reported by Snedecor and Cochran (1980). Means were compared by the least significant difference (LSD) test at 5% level of probability in the two seasons of experiment.

RESULTS AND DISCUSSION

Bunch yield (kg)

Data in Table 1 clearly indicate the average bunch weight of Succary date palm cultivar (Tamar stage). Fruit thinning of Succary palm significantly decreased bunch yield than the control treatment in both seasons. Meanwhile, the reduction in bunch yield increases by increasing of the thinning percent. These results are in agreement with those published (Hussein, 1970; Mustafa et al., 1984; Mustafa, 1993; El-Shazly, 1999; Osman and Soliman, 2001; Mahmoud et al., 2003; Amen et al., 2007; Mawlood, 2010; Soliman et al., 2011) on several date cultivars, since removal of part of strands led to a less bunch weight.

Fruit characteristics

Physical properties

Data concerning the physical properties of fruits in two seasons are presented in Table 1.

Fruit weight (g): Data present clearly indicated that fruit weight of Succary date palm cultivar was significantly

affected by different thinning treatments as compared to the control in both seasons. It was found that removing 30% of the total strands from the bunch center significantly increased the average fruit weight than other thinning treatments (Beser and Tamur stages) in both seasons. The increase in average fruit weight was achieved by thinning the reduction in fruits compactness which prevents their accumulation within bunch. Consequently, such fruits take the opportunity of natural growth. The results are in line with those of Mustafa (1993), Osman and Soliman (2001), Bassal (2003), Mahmoud et al. (2003), AL-Obeed et al. (2005), Nirmaljit et al. (2006) and Soliman et al. (2011). They all reported that fruit thinning increased the fruit weight of date palm.

Seed weight (g): Concerning seed weight, the results indicated that no significant differences have been detected between thinning treatments for Succary cultivar (Beser and Tamur stages) in both seasons. These findings are in partial agreement with those achieved by El-Shazly (1999) and Soliman et al. (2011).

Flesh weight (g): Result of flesh weight in the two seasons showed that thinning treatments was significantly affected. All thinning treatments significantly increased fruit flesh weight (Beser and Tamur stages) than the control in both seasons. Meanwhile, trees which were thinned by removing 30% of the total strands from the bunch center showed the highest flesh weight of fruits as compared to removing 15% of the total strands from the bunch center and control. These results are in agreement with those reported by Khalifa et al. (1987), Mustafa (1993), Osman and Soliman (2001), AL-Obeed et al. (2005), Karami and Heidari (2006), Iizadi et al. (2010) and Soliman et al. (2011).

Fruit volume (cm³): The Succary fruit volume was significantly affected by thinning treatments in both seasons. Removing 30% of the total strands from the bunch center gave the highest fruit volume (Beser stage) as compared to the control and other studied treatment in both seasons. The results of these studies (Mustafa, 1993; Osman and Soliman, 2001; Mahmoud et al., 2003; AL-Obeed et al., 2005; Nirmaljit et al., 2006; Soliman et al., 2011) are in agreement with this result.

Fruit dimensions: Result of fruit dimensions (length and diameter) in the two seasons showed that fruit length and diameter were significantly affected by thinning treatments. Fruit length and diameter increased significantly by increasing thinning degree. Data indicate that trees thinned by 30% of the total strands from the bunch center produced significantly maximum increase in average fruit length and diameter in both seasons (Beser stage). Similar effects of fruit thinning on fruit dimensions (length and diameter) were reported by other investigators on several date cultivars (Hussein, 1970;

Table 1. Bunch weight, fruit physical characteristics and fruit composition (Tamur and Beser stages) of Succary date palm.

Parameter	2007			LSD at 0.05	2008			LSD at 0.05
	Control	T-15 (%)	T-30 (%)		Control	T-15 (%)	T-30 (%)	
Tamur stage								
Bunch yield (kg)	14.00	11.66	9.78	0.80	14.70	12.20	10.37	0.65
Fruit weight (g)	9.43	10.23	11.37	0.64	9.50	11.39	11.67	0.47
Seed weight (g)	1.02	1.04	1.08	ns	1.32	1.29	1.33	ns
Flesh weight (g)	8.41	9.19	10.19	0.15	8.18	10.10	10.34	0.41
Acidity (%)	0.200	0.212	0.202	ns	0.192	0.205	0.209	ns
TSS (%)	61.33	65.60	66.67	1.11	62.73	64.53	67.63	1.47
Reducing sugars (%)	10.79	11.04	13.33	1.30	12.77	13.52	14.26	0.58
Non-reducing sugars (%)	40.36	42.98	43.61	1.47	40.03	43.05	44.98	1.80
Total sugars (%)	51.15	54.02	56.94	1.22	52.80	56.57	59.24	1.51
Moisture (%)	18.31	16.55	15.47	1.03	17.28	15.69	14.51	1.11
Beser stage								
Fruit weight (g)	11.74	12.30	13.98	0.61	11.27	12.50	13.22	0.73
Seed weight (g)	1.74	1.72	1.88	ns	1.78	1.85	1.84	ns
Flesh weight (g)	10.00	10.58	12.10	0.34	9.49	10.65	11.38	0.78
Fruit volume (cm)	11.67	13.00	13.90	0.75	11.23	12.20	13.10	0.43
Fruit Length (cm)	3.11	3.23	3.48	0.11	3.15	3.37	3.68	0.09
Fruit diameter (cm)	2.31	2.41	2.61	0.27	2.26	2.50	2.67	0.23
Grade 1%	52.02	69.67	71.26	4.50	48.29	65.55	69.21	3.00
Grade 2%	47.98	30.33	28.74	2.50	51.71	34.45	30.79	1.66
Acidity (%)	0.192	0.205	0.208	ns	0.205	0.193	0.199	ns
TSS (%)	30.60	32.10	33.40	0.85	31.30	32.30	34.83	1.34
Reducing sugars (%)	8.60	8.70	9.20	0.24	9.18	9.40	9.89	0.30
Non-reducing sugars (%)	15.50	17.40	19.10	1.07	16.83	18.34	19.31	0.94
Total sugars (%)	24.10	26.10	28.30	0.99	26.01	27.74	29.20	1.07
Moisture (%)	59.66	56.48	54.74	1.16	60.46	57.15	55.91	1.38

TSS: Total soluble salts.

Khalifa et al., 1987; Mustafa, 1993; Osman and Soliman, 2001; Al-Obeed et al., 2005; Karami and Heidari, 2006; Soliman et al., 2011).

First and second of fruit grade: Regarding the effect of thinning treatments on the first and second grade of fruit, results showed that there was significant effect between thinning treatments. Removing 30% of the total strands from the bunch center gave the highest percentage of first grade fruits as compared to 15% and control treatment (71.3 and 69.2, 69.7 and 65.5 and 52.0 and 48.3%). Meanwhile, more second grade fruits were shown in the control followed by 15 and 30% treatment (48.0 and 51.7, 30.3 and 34.4 and 28.7 and 30.8) in both seasons (Beser stage), respectively. Similar effects of fruit thinning on first and second grade of fruit were reported by Soliman et al. (2011) on Khalas cultivar.

Fruit composition

Data concerning the chemical properties of fruits in two

seasons are presented in Table 1.

Total acidity (%)

Thinning treatments (Beser and Tamur stages) have no significant influence on fruit acidity percentage in both seasons. The results are in agreement with those reported by El-Shazly (1999) on Nabtet Ali cultivar, Osman and Soliman (2001) on Sakkoti, Shamia and Balady dates and Soliman et al. (2011) on Khalas cultivar.

Total soluble solids (%)

Concerning the effect of thinning treatments on total soluble solids percentage, data indicated that by removing 30% of the total strands from the bunch center gave the highest total soluble solids percentage (Beser and Tamur stages) as compared to the control and other

studied treatment in both seasons. These results agreed with those found by El-Shazly (1999), Osman and Soliman (2001), Mahmoud et al. (2003), AL-Obeed et al. (2005), Nirmaljit et al. (2006), Iizadi et al. (2010) and Soliman et al. (2011).

Sugar contents

Reducing sugars (%): Regarding the effect of thinning treatments on reducing sugars percentage, the results indicated that removing 30% of the total strands from the bunch center gave the highest reducing sugars (Beser and Tamur stages) as compared to the control and other studied treatment in both seasons. Thinning was reported to increase reducing sugars in many date cultivars, such as Zaghoul dates (El-Kassas, 1983; Khalifa et al., 1987; Sayed, 1991); Nabtet Ali dates (El-Shazly, 1999), Sakkoti and Shamia as Balady dates (Osman and Soliman, 2001), Succary dates (AL-Obeed et al., 2005), Khadrawy cultivar (Nirmaljit et al., 2006) and Khalas cultivar (Soliman et al., 2011).

Non-reducing sugars (%): Treatment removing 30% of the total strands from the bunch center (Beser and Tamur stages) gave the highest non-reducing sugars than the control and other studied treatment. These results are in agreement with those by Osman and Soliman (2001), Al-Obeed et al. (2005) and Soliman et al. (2011).

Total sugars (%): The obtained results indicated that the total sugars percentage was significantly affected by thinning treatments. Thinning 30% of the total number of strands significantly increased total sugars percentage (Beser and Tamur stages) than the control and thinning 15% treatment. In general, these findings concerning the response of Succary fruit chemical characteristics to the different treatments of fruit thinning goes in line with those found by El-Kassas (1983), Khalifa et al. (1987) and Sayed (1991). They mentioned that fruit thinning increased the total sugars of Zaghoul dates. In addition, Hussein et al. (1992) reported that the fruit sugar contents of Samani dates were significantly increased by fruit thinning. Also, Mustafa (1993) on Siwi and El-Shazly (1999) and Soliman et al. (2011) on Nabtet Ali dates. They found that removing 30% of entire spikelets from bunches center of fruit dates increased the fruit total sugars content. Al-Obeed et al. (2005) on Succary dates found that the shortening of strands by 40% gave the highest value of total sugars.

Moisture content (%)

Significant effect was found on moisture content of Succary fruit due to the thinning treatments in both seasons. Removing 30% of the total strands from the bunch center gave the highest moisture content (Beser

and Tamur stages) as compared to the control and other studied treatment in both seasons. Similar effects of fruit thinning on moisture were reported by Soliman et al. (2011) on Khalas cultivar. On the contrary, Osman and Soliman (2001) and Al-Obeed et al. (2005) reported that the moisture content was not significantly affected by thinning treatments and the control highest values as compared to other thinning treatments.

In conclusion, thinning treatments have improved fruit characteristics, where they increased significantly fruit physical and chemical properties of dates (Beser and Tamur stage) than the control. Meanwhile, the most beneficial treatment in such concern was thinning 30% of the total number of strands from the center of bunches.

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