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Short Communication

FRUIT QUALITY AND YIELD OF DATE PALM (*Phoenix dactylifera* L.) AS AFFECTED BY STRAND THINNING

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ABSTRACT

Kur cultivar of date palm is a high yielder but it has small fruit size. Small fruit size of date palm is not popular among the date growers. An experiment was conducted during 2008-10 on plants of date palms (*Phoenix dactylifera* L.) cv. "Kur" at Horticultural Research Station, Bahawalpur (Pakistan) to improve quality fruit parameters of this cultivar by strand thinning. The plants were of 20-year-old, uniform in size, growth and vigour which were kept under normal schedule of cultural practices. Hand pollination was carried out during the 2nd week of March in three seasons using the same pollen source. Four strand thinning treatments i.e., T1=control (without thinning), removal of strands 10% (T2), 25% (T3) and 50% (T4) were applied by removing the strands randomly from total strands per bunch after 5 weeks from pollination. The experiment was laid out according to RCBD with 3 replications. The leaf bunch ratio was maintained at 5:1. Fruit dimension, fruit weight, TSS% and yield per plant improved by all levels of strand thinning as compared to control. Maximum fruit dimension (length x diameter=3.88 x 2.6 cm), fruit weight (13.7 g), TSS (30.33%) and yield (107 kg/palm) along with minimum stone pulp ratio (10.64%) and fruit drop (17.34%) were recorded by 50% strand thinning, followed by the treatment where 25% strands were removed. Positive correlation existed between fruit yield and fruit weight at 50% strand thinning.

Key words: *Phoenix dactylifera* L., date palm, strand thinning, yield, fruit quality.

INTRODUCTION

Date palm (*Phoenix dactylifera* L.) is the major fruit crop of Pakistan and ranked 5th for production in the world (FAOSTAT, 2012). The total area is 90.1 thousand hectares with annual production of 522.2 thousand tonnes (Anonymous, 2012).

Small fruit size as well as alternate bearing in some date cultivars is considered as a hindrance in their popularity among the farmers. Kur variety of date palm is a high yielder variety but it has small fruit size (Ahmad *et al*., 2004). Fruit thinning/strand thinning is one of the major practices that often helps in overcoming these problem, in addition, it improves fruit quality, reduces bunch compactness, increases adequate flowering for the coming season (Moustafa, 1997; Hassan *et al*., 1998; El-Shazly, 1999; Al-Obeed *et al*.,2005; Marashi and Mousavi, 2007). These fruit characteristics could be achieved either by reducing the number of fruits/strands per bunch or by reducing the number of bunches per palm. The appropriate method of fruit/strand thinning may depend on the date cultivar. Small-fruited date cultivars required strand removing or individual fruit thinning. Strand thinning by removing 10, 20, 30 and 40% strands from the center of each bunch for three different periods i.e. 2, 4 and 6 weeks after pollination in "Seewy" date variety, improved both physical and chemical properties of fruits than those of the control except yield per palm that remained low compared to control. However, removing 30% strands 4 weeks after pollination attained the highest fruit quality as compared with other thinning treatments (Moustafa, 1997; Harhash, 2000). The bunch thinning treatments led to a significant increase in fruit weight, volume, length and diameter, flesh and seed weight in Succary cultivar (Al-Obeed *et al*., 2005). Removal of 1/3 and 1/4 of the entire central strands and removal of 1/4 and 1/2 of bunch 6 weeks after pollination (at the beginning of kimri stage), resulted in significant decrease in palm fruit yield. But, thinning at khalal and rotab stages did not affect different fruit parameters (Marashi and Mousavi, 2007).

MATERIALS AND METHODS

The experiment was conducted during three successive seasons of 2008, 2009 and 2010 on 12 female date palms (*Phoenix dactylifera* L.) of "Kur" cultivar in orchard of Horticultural Research Station, Bahawalpur (Pakistan). The plants were of 20-year-old, uniform in size, growth and vigour which were kept under normal schedule of cultural practices. Seven bunches nearly similar in age and vigour, were selected on each palm in each season. The leaf bunch ratio was maintained at 5:1. Hand pollination was carried out during the 2nd week of March in three seasons using the same pollen source (a vigorous male seedling growing at the same orchard). Four strand thinning treatments viz without thinning (T1), 10% (T2), 25% (T3) and 50% (T4) removal of strands

per spathe respectively, were applied by removing the strands randomly from total strands per spathe after 5 weeks from pollination. Each treatment was replicated thrice by keeping one palm for each replication. The experiment was laid out in accordance with Randomized Complete Block Design (RCBD). The data were collected for fruit drop (%), number of fruits and yield per palm, fruit length and diameter, fruit and stone weight, stone pulp ratio and total soluble solids (Brix %).

All bunches of the palms under investigation were harvested at full colour stage (Khalal). Ten fruits from each spathe of a palm were randomly picked to record physico-chemical characters (fruit size, fruit weight, stone weight, stone pulp ratio and total soluble solids). Individual fruit from each sample was measured with the help of Vernier Caliper for length and diameter and weighed by electronic scale for fruit weight. The stone was taken out and stone and pulp were weighed for stone pulp ratio (%). TSS (Brix %) were determined by a hand refractometer. Three years data were pooled and statistically analyzed using Analysis of Variance technique, followed by comparison of treatment means by LSD test at 5% significance (Steel *et al*., 1997).

RESULTS AND DISCUSSION

Effect of strand thinning on physico-chemical characters of fruit.

Fruit length and diameter: Data given in Table 1 indicated that fruit dimension (length x diameter) was significantly affected by the strand thinning. Maximum fruit dimension (length x diameter = 3.88 x 2.6 cm) was obtained by 50% strand thinning, followed by 25 and 10% strand thinning respectively. All levels of strand thinning significantly enhanced fruit dimension as compared to control. In general, removal of 50% strands at random seems to be the most appropriate thinning level. Similar effects of fruit thinning on fruit dimensions (length and diameter) were reported by other investigators on several date cultivars (Al-Obeed *et al*., 2005). Previously, palms of Seewy date variety thinned by 30% removal of central strands, significantly caused maximum increase in the fruit length and diameter as compared with the control and other thinning treatments (Moustafa, 1997).

Fruit weight, stone weight and stone pulp ratio: Fruit weight, stone weight and stone pulp ratio were significantly affected by the various levels of strand thinning (Table 1). Maximum fruit weight (13.7 g) and stone weight (1.25 g) were obtained from the palms where 50% strands were removed, followed by 25 and 10% strand removal respectively. While, minimum stone pulp ratio (10.64%) was also recorded by the palms under 50% strands removal. Minimum fruit and stone weight with maximum stone pulp ratio was found in the palms under control. The increase in average fruit weight which occurred by thinning may be due to the reduction in fruits compactness which prevents their accumulation within bunch. Consequently, such fruits take the opportunity of natural growth (Moustafa, 1997). The results obtained are supported by the previous findings (Moustafa, 1997; Al-Obeed *et al*., 2005) on various date varieties in which fruit and pulp weight were increased by the fruit/strand thinning.

Total soluble solids: This parameter was affected significantly by different intensities of strand thinning. Removal of 50% strands increased TSS to the maximum (30.33 Brix), followed by 25 and 10% strand removal from the bunch. However, the later two treatments were statistically similar in effect on TSS (Table 1). The fruit from bunches under control has minimum TSS (27.92 Brix). Similar finding has been reported by Moustafa (1997) that thinning treatments has improved fruit TSS than the control in "Seewy" date variety and thinning 30% of the total number of strands from the center of bunches 4 weeks after pollination proved the most beneficial treatment in such concern.

Effect of strand thinning on fruit drop (%), number of fruit and yield per palm: It is apparent from Table 2 that fruit drop (%) of Kur cultivar was not affected significantly by all levels of strand thinning. However, 50% strand thinning reduced fruit drop to the maximum (17%) compared to other levels of thinning and control. Number of fruits per palm was significantly affected by different levels of strand thinning. Maximum reduction in fruit number (7868) was recorded by 50% strand thinning, while maximum number of fruits (12614) was found in the palm under control. Maximum yield per palm (107 kg) was recorded by 50% strand thinning, followed by 25% strand thinning (105 kg). However, both thinning levels were statistically at par. The current results obtained are contradictory to the findings of Moustafa (1997) who reported that central strand thinning reduced yield per palm in Seewy variety when thinning exceeds 40%. In the present study, the increase in yield per palm by the increasing intensity of strand thinning to the maximum one at 50% strand thinning may be due to the random selection of strands from the bunch of Kur cultivar, enhanced fruit dimension, fruit weight, stone weight and minimum fruit drop by 50% strand thinning.

Correlation among different fruit parameters: Coefficients of correlation among different fruit parameters were estimated for various strand thinning levels and presented in Table 3. Negative linear correlation was found between the fruit yield and fruit weight at 0, 10 and 25% strand thinning but positive correlation existed between the same parameters at 50%

strand thinning. However, positive linear correlation was noted between fruit yield and number of fruits per plant for all strand thinning levels. It was obvious from the coefficient of correlation obtained that the fruit weight was negatively correlated with the number of fruits per plant for all levels of strand thinning. It was also observed that the fruit weight was positively correlated with the fruit dimension (length x diameter).

Table 1. Physico-chemical characters of fruit from Kur cultivar affected by various strand thinning levels at Bahawalpur.

Treatments	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (g)	Stone weight (g)	Stone pulp ratio (%)	TSS (Brix %)
T1= Control (without thinning)	3.10 d	2.08 d	6.36 c	0.86 c	15.51 a	27.92 c
T2=10% removal of strands per spathe	3.30 c	2.22 c	8.14 b	1.01 b	14.34 ab	28.60 b
T3=25% removal of strands per spathe	3.55 b	2.37 b	9.81 b	1.17 a	13.83 b	28.71 b
T4=50% removal of strands per spathe	3.88 a	2.60 a	13.70 a	1.25 a	10.64 c	30.33 a
LSD (5%)	0.18	0.11	0.89	0.102	1.53	0.47

Means sharing similar letters in a column under each parameter are non-significant at $\alpha = 0.05$

Table 2. Fruit drop percentage, number of fruits and yield per palm of Kur date cultivar affected by different strand thinning intensity at Bahawalpur.

Treatments	Fruit drop (%)	No. of fruits per palm	Yield per palm (kg)
T1= Control (without thinning)	23.67	12614.44 a	80.21 c
T2=10% removal of strands per spathe	24.60	11890.11 ab	95.09 b
T3=25% removal of strands per spathe	24.11	10838.89 b	104.91 ab
T4=50% removal of strands per spathe	17.34	7868.44 c	107.20 a
LSD (5%)	n.s.	1717	11.19

Means sharing similar letters in a column under each parameter are non-significant at $\alpha = 0.05$

Table 3. Coefficients of correlation for different fruitt parameters studied under different strand thinning levels.

Fruit parameters	Strand thinning levels			
	0	10%	25%	50%
Fruit yield – Fruit weight	-0.454	-0.235	-0.256	+0.469
Fruit yield –No. of fruits/plant	+0.907	+0.880	+0.822	+0.664
Fruit weight–No. of fruits/plant	-0.726	-0.648	-0.741	-0.344
Fruit weight–Fruit dimension	+0.367	+0.532	+0.755	+0.854

Conclusion: Small fruit size in Kur cultivar of date palm is hinderance to popularity among date growers in spite of high yielder. The most effective strand thinning level (random removal of 50% strands after 5 weeks from pollination), has increased fruit yield per palm and improved fruit quality parameters of "Kur" date cultivar under semi arid conditions, to adopt it as a recommended cultural practice.

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