



The effects of date pollinizer variety and pollination time on fruit set and yield of Medjhol date palm

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ABSTRACT: Date palm is unisexual, being either male or female. Male and female flowers grow on buds called Spathe, which opens naturally when fully mature. It is easy to identify the male and female flowers. Under the method of manual pollination, pollen from a male flower is smeared over female flowers. The pollen variety and pollination time have important effects on date palm fruit set, yield and quality. This experiment was carried out to study the effect of date pollinizer variety and pollination time on fruit set, growth and development of Medjhol date palm variety, in date palm garden of date palm and tropical fruit research institute of Iran during three years from 2009 to 2011. The trial was randomized complete block design in factorial manner with three pollen variety as Ghaname, Vardy, and Samesmave, two pollination time as 1-3 days before or after spathe opening and four replication. The results showed that the Vardy pollen had significant effects and increased the fertility percent and fruit yield, rather than two other pollen varieties. The pollen variety had no significant effects on fruit quality as total sugar, acidity, and bricx. The pollination time before spathe opening significantly increased fertility percent, decreased fruit weight and date palm yield. Finally the pollen variety and pollination time interaction effects showed that, application of Vardy pollen from 1-3 days after spathe opening with the most production date palm yield, equal 19.9 kilogram per any date palm trees, so this treatment is the best and are recommended.

Keywords: Pollen variety, Pollination time; Medjhol date palm; Fruit set; Yield.

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INTRODUCTION

Medjool date, the king of date with Moroccan origin is one of the most desirable dates in the world which has an important role in the date global trade. The fruit is so big and delicious with soft texture (soft flesh) that it can be harder easily if it loses some water.

Results show that pollen can change some fruit morphological properties and fruit texture which effect on the endosperm (embryo and albumen). It affects fruit size, shape, weight and time of ripening. Actually, Pollen has Xenia and Metaxenia affection so it has broad efficacy on chemical, quality and quantity characteristics of date fruit. So it is important to choose proper pollen for pollination because this specification affects size of fruit, development rate and time of fruit ripening (Hussein F, Moustafa, S, Mahmud L. 1979; Swingle WT. 1928). In an examination, six types of pollen from Ahmar, Akhzar, Fard, Khnizy, Maghool and Shekar with 10, 20, 30, 40 and 50 density of strands in a male spathe were evaluated on Nabat Sayf female variety. It was reported that pollen could affect fruit set properties (Awad, 2007).

Higazy et al. (1982) used four different pollen on five date cultivars to evaluate some fruit characteristics. They reported that there were significant differences among fruit weight and fruit pulp to seed ratio but no difference among pollen. According to Hussein et al. (1979), there was a significant difference in fruit pulp quality but no difference in seed quality when used four types of pollen to pollinate Nabat safe in Saudi Arabia. In another experiment Osman (1974) compare seven kinds of pollen grain on Degle Nour. He evaluated time of ripening, size of fruit, and dry weight, fruit length and width of fruit weight of seed. He reported that genetic potential has a main role in metaxenia property as same as growth regulators. Dowson (1982) observed that the most fruit set occurred when date pollinated four days after female spathe opened. Zaid (1999) believed that the best time for date pollination is two to four days before female spathe opening and repeated again three to four days after it. Studies conducted by marashi (2011) showed that the best time for pollination in Brhee and Zahedi is one to two days before spathe opening weight of seed and ratio of fruit pulp to seed was affected by pollen grain when shafaat (1980) used seven types of pollen grain.

Ahmad and Ali (1960) believed that the best time for date pollination is three to four days after female spathe opening, in the most date varieties. According to Ream and four (1969), they reported that there was no significant decies in fruit set when pollination done seven days after female spathe opening in Deglet nour.

MATERIAL AND METHODS

This research was carried out in date palm garden of date palm and tropical fruit research institute of Iran, located in Khuzestan province, between 31° , 12" to 31° , 28" north and 48° , 33" to 48° , 55" East, during 3 years 2009 – 2011. Based on climatology statistical the mean annul rain fall was 240.6 mm and mean, maximum, and minimum air temperature were 25.3, 51.2 and –1.0 degree centigrade respectively. The soil physic and chemical characteristic showed in table 1.

Table 1. Soil physic and chemical for experimental site.

Soil Dept (cm)	EC (ds. m ⁻¹)	pH	O.C (%)	P ava. (ppm)	K ava. (ppm)	Cu ava. (ppm)	Mn ava. (ppm)	Fe (ppm)	Zn ava. (ppm)
0-30	4.8	7.8	0.71	27	290	1.3	5.2	7.2	0.43
30 – 60	3.9	7.8	0.45	18	161	1.2	4.3	4.3	0.25
60 – 90	3.9	7.8	0.32	21	154	1.1	5.1	4.1	0.21

The experimental was randomized complete block in factorial method. The factors were type of pollen grain including Verdi, Semesmavi and Ghanmni and two levels of pollination time as one to three days before male spathe opening and at the day of spathe opening to three days after it. Each palm was an experimental unit. After selection of Medjool palms, the main cultural practices such as weed control, leaf pruning, cutting frond stub, plowing, nutrition and irrigation were done properly. In March, male spathes were collected and dried. The pollen grains were kept at cool condition and the female flowers were pollinated by fresh pollen at the time of the pollination. Five weeks after pollination, fruit set percentage of treatments was calculated. At harvest, a sample of fruits at Tamar stage was selected from each palm. Then, quantitative fruit traits such as fruit length, diameter and weight were measured. The fruit yield was calculated and fruits qualitative traits like fruit pulp to seed ratio, fruit total sugar, acidity and total soluble solids of fruit, pH, were measured. Data were analyzed by MSTATC statistical analysis software and comparison trial was performed using Duncan's multiple range tests.



RESULTS

Date palm is unisexual, being either male or female. Male and female flowers grow on buds called Spathe, which opens naturally when fully mature. It is easy to identify the male and female flowers. Under the method of manual pollination, pollen from a male flower is smeared over female flowers. This works very well and also guarantees higher yield. The time of blossoming and pollination time, varied according to the different types of date palms. Two important factors that affecting the quantity and quality of date crop yield are the type of pollens and climatic conditions during pollination (Khalifa A, Hamdy ZM, Azzouz SA, Masry HE, Yousef M. 1980).

Analysis of variance showed that the pollen variety had significant effects on fruit set, fruit diameter, fruit length and yield (table 2). The Vardy pollen variety increased the fertility percent and fruit yield, rather than two other pollen varieties. The highest fruit set and yield equally 53.2% and 18.4 kilogram per each tree were produced in Vardy pollen variety treatment. But this pollen decrease fruit size rather than two other pollens, because of fruit number was more in this treatment. Some of research also showed that the high fertility percent in bunching causes some physiological disorder like size, poor quality of fruit, ripening delay, alternative fruit bearing, wilting or some mechanical effect like bunch breaking (Al-Khateeb et al., 1993). Several investigations studied the effect of fruit thinning to improve quality and size of fruit, these results indicated an interesting yield relationship between thinning and fruit quality. Cultivation of high fruit quality date cultivars coupled to proper cultural and thinning practices were conventionally used to improve fruit quality and maturity of date palm (Ali-Dinar et al., 2002).

The pollination time before spathe opening in cased significant increased in fertility percent and fruit number per strand, decreased fruit weight and date palm yield (table 3). Finally the pollen variety and pollination time interaction effects, showed that used of Vardy pollen from 1-3 days after spathe opening with the most production date palm yield, equal 19.9 kilogram per any date palm tree (table 4). The pollen variety but had no effects on fruit quality as total sugar, acidity, and bricx.

Table 2. Fruit characteristic means squares and significant level

S. O. V	d.f.	Fruit Set	Fruit Weight	Fruit Demeter	Fruit Length	Fruit Yield
Y	1	340.8*	71.8**	4.6 ^{ns}	9.1 ^{ns}	94.5*
Y*R2	6	222.9**	2.8 ^{ns}	2.3 ^{ns}	20.6 ^{ns}	9.2 ^{ns}
P3	2	534.1**	1.0 ^{ns}	9.0*	70.1*	113.8**
Y*P	2	196.6*	11.2**	5.5*	2.5 ^{ns}	1.0 ^{ns}
T4	1	449.6**	32.5**	11.1*	2.5 ^{ns}	90.8**
Y*T	1	345.1*	8.3*	1.7 ^{ns}	54.0*	0.4 ^{ns}
P*T	2	27.5 ^{ns}	0.9 ^{ns}	7.1*	10.9 ^{ns}	0.1 ^{ns}
Y*P*T	2	66.8 ^{ns}	0.4 ^{ns}	0.4 ^{ns}	1.4 ^{ns}	1.7 ^{ns}
Error	30	52.2	2.0	50.7	17.6	6.4 ^{ns}
C.V	-	24.6	7.3	4.8	8.8	16.4

Y, R, P, T are year, Repeat, pollen and time ns, * and ** are non significant and significant at 5 % and 1 % levels respectively

Table 3. Fruit characteristic means squares and significant level

Treatments	Fruit Set (%)	Fruit Weight (g)	Fruit Diameter (cm)	Fruit Length (cm)	Fruit Yield (kg/tree)
G. P. ²	52.4 ^a	19.3 ^a	27.6 ^a	48.3 ^{ab}	14.2 ^b
V.P.	53.2 ^a	18.8 ^a	26.2 ^b	45.3 ^b	18.4 ^a
S.P.	42.9 ^b	19.1 ^a	27.4 ^a	49.4 ^a	13.5 ^b
B.O.S ³	52.6 ^a	18.0 ^b	26.6 ^b	47.4 ^a	14.0 ^{ab}
A.O.S	46.4 ^b	19.8 ^a	27.6 ^a	47.8 ^a	16.8 ^a

- 1- Means. In each Colum, followed by at least one letter in common are not significantly different at the 5% probability level using Duncan's Multiple Range Test
- 2- G.P, V.P. , S.P. are Ghana me , vardy and samesmave pollen respectively
- 3- B.O.S and A.O.S are before and after spat opening respectively.



Table 4 – pollen variety and pollination time interaction means comparison

Treatments	Fruit Set (%)	Fruit Weight (g)	Fruit Diameter (cm)	Fruit Length (cm)	Fruit Yield (kg/tree)
G. P.B ¹	56.7a	18.2b	26.7b	47.9ab	12.9cd
G.P.A	48.2bc	20.4a	28.6a	48.7ab	15.6b
V.P.B ²	56.5a	18.1b	26.5b	46.0b	17.0b
V.P.A	50.0ab	19.4ab	26.0b	44.7b	19.9a
S.P.B ³	44.5bc	18.3b	26.6b	48.4ab	12.2d
S.P.A	41.2c	19.8a	28.2a	50.3a	14.8bc

- 1- G.P.B and G. P.A are Ghaname pollen before and after spat opening
 2- V.P.B. and V.P.A are varyd pollen before and after spat opening
 3- S.P.B and S.P.A are samesmave pollen before and after spat opening

The pollination time had significant effects on fruit set, fruit weight and diameter and yield. The pollination time 1-3 days before spathe opening in cased significant increased in fertility percent, decreased fruit weight and size, This treatment produced 14.0 kilogram date yield and was 16.7% less than the other treatment or pollination 1-3 days after spathe opening whit 16.8 kilogram date yield. Finally the pollen variety and pollination time interaction effects showed that the used of Vardy pollen 1-3 days after spathe opening with the most production date palm yield, equal 19.9 kilogram fruit per any date palm tree, was recommended.

Obeed and Soliman (2011) found that delaying Pollination to three weeks after spathe cracking resulted in a significant reduction in initial fruit set, fruit retention, bunch weight and improving the physical and chemical characteristics of dates. Pollination delay is found to be effective on fruit thinning tool. It is concluded that the three weeks of female spathe cracking is considered the maximum period of cultivar to obtain appropriate yield with good fruit quality of Barhy dates under this study conditions.

Shaheen (1986) reported that pollination is considered the most important factor affecting fruit set yield and quality. Pistils do not receptive for a long time and the period of receptivity differs with different weathering factors and cultivars. These results cleared that the pollination of the female spathe just after cracking gave higher fruit set percentage and earlier pollination either just after spathe cracking or after two days from cracking time increased fruit set percent with low quality of fruits. On the other hand, delaying pollination to 4 days from spathe cracking gave lower fruit set percent and lesser bunch weight, but it was the most beneficial treatment which gave a high quality of fruits. Based on this research the type of pollens and climatic conditions during pollination are important factors that affecting the quantity and quality of date crop. Satisfying pollination results are obtained with used of Vardy pollen 1 or 3 days after the female spathe has opened which the normal pollination period for Medjhoool date palm.

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