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**POLLINATION STUDIES WITH RELATION TO POST SPLITTING TIME  
INTERVALS OF FEMALE SPATHES ON FRUITING OF DATE (*Phoenix  
dactylifera* L.) CULTIVARS**

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**ABSTRACT**

The pollination success, using fresh and dried pollen on the female inflorescence of 4-varieties of date at 0, 2, 4, 6, 8 and 10 days of opening of the spathe, was studied. Moreover, its effect on yield and fruit quality was observed. Maximum fruit setting and yield was recorded in the varieties, pollinated at 0 and after 2 days interval. Both these factors showed decline as the pollination time increased from the day of opening of the spathe. All other parameters remained unchanged except the size and weight of the fruit which slightly increased in case of late pollination due to decrease in the number of available fruits on the spathe of each variety.

**Key words:** Spathe, pollination, spike, spikelet, cultivar, pistilate and staminate flowers, spadix

**INTRODUCTION**

The date-palm is the 4<sup>th</sup> important fruit of the Punjab province and the major foreign-exchange earning fruit of the country. Unlike other fruit trees, its pollination is altogether manual in Pakistan. Moreover, being dioecious specie, male and female flowers are borne on separate palms. The good fruiting and heavy production depends on different factors like pollination time, type of pollen and pistilate flowers' receptivity. To ascertain the pollination time period and its effect on the fruit and yield of 4-varieties, i.e., Shamran, Khadrawi, Hillawii and Zirin, the present study was initiated at the Government Date-palm Research Sub-station, Jhang during the years 2002 and 2003. According to Zaid and De Wet (2002) satisfactory pollination results were obtained within 2-4 days after the female spathe was opened and pollination of 60-80 percent of the female flowers should lead to good fruit set. The study conducted by Nasr *et al.* (1986) revealed that the seedling males are highly variable in their growth vigour, spathe characteristics and the pollen quality. The female flowers' receptivity was further studied by Djerbi (1995) who observed that different varieties required different time to show the best fruit setting. He reported 7 days for Deglet Noor, 8 days for Jihel and Ghars and only 3 days for Mejhool, Boufeggous and Iklane are required to show the maximum fruit setting. Maximal fruit set was also obtained in Khadrawi on the day of spathe splitting and in Zahidi, on 7<sup>th</sup> day of spathe crack as observed by Reuveni (1970). Moreover, the bunch thinning has a maximum effect on the size of the fruit if

applied at the time of pollination (Nixon and Carpenter, 1978). Later, Nasir *et al.* (1997) observed maximum fruit setting (73.75 to 74.4%) and yield (75 to 80 kg/palm) from the female bunches, pollinated just after the opening of the female spathe. Whereas, the pollination at 5, 10 and 15 days interval proved least effective in fruit setting (32.38 to 40.85%) and yield (15 to 43 kg/palm) in Assil dates.

## MATERIAL AND METHODS

The present study was conducted at the Experimental Orchard of Government Date Research Farm, Jhang. Four varieties of dates, i.e., Shamran, Khadrawi, Hillawii and Zirin, were included in the trial. There were six treatments with three replications. Each replication consisted of four equal age palms. Palms were pollinated 0 (T<sub>1</sub>), 2 (T<sub>2</sub>), 4 (T<sub>3</sub>), 6 (T<sub>4</sub>), 8 (T<sub>5</sub>) and 10 (T<sub>6</sub>) days after splitting of the spathe of the pistillate flowers. The data regarding fruit setting (fruit-lets/ 10 spike-lets), yield/ palm in kg, TSS in Brix degree, wt. of fruit and stone in g, size of fruit and stone in cm were to be recorded after the harvest.

## RESULTS AND DISCUSSION

The effect of pollination at 0 and 2 days after splitting of the female spathe was most pronounced and resulted in maximum fruit setting in all the four varieties, i.e., 92.5 to 88.5 fruits/10 spikelets in Hillawii. It was followed by the pollination work at 4 and 6 days interval i.e., 15.6 to 33.5 fruits/10 spikelets, respectively (Table 1). By the passing of time, each day, the fruit setting decreased rapidly due to decline of stigma receptivity for pollen. Therefore, it reached between 6.7 to 8.30 fruits/10 spikelets when pollinated at 10 days after splitting of the female spathe. The findings are almost in accordance with the conclusion obtained by Zaid and De Wet during 2002 who recommended completing pollination within 2 to 4 days after opening of the female spathe. However, a variation in days and time due to varietal characteristics were also reported by different research workers (Djerbi, 1995; Reuveni, 1970) for different varieties such as 7-8 days for Deglet Noor, 8 days for Jihel and Ghar and 3 days for Medjool.

The yield/palm in all the four varieties showed great variation as affected by the pollination time intervals. Maximum yield was observed in palm pollinated at 0 and 2 days intervals i.e. 117 to 125.7 kg/palm in Hillawii, 98.5 to 101 kg/palm in Khadrawi, 81.2 to 84.5 kg/palm in Zirin and 70.5 to 73.8 kg/palm in Shamran (Table 1). It was followed by 4 days interval after spathe opening i.e. 119, 92, 78.5 and 68.5 kg/palm of date in Hillawii, Khadrawi, Zirin and Shamran, respectively. Whereas, the pollination at 10 days interval proved least productive, showing yield from 11.5 to 30.0 kg/palm in all the varieties which was clearly due to less fruit setting.

Similar findings were reported by Nasir *et al.* (1997), who observed low yield i.e., from 32.38 to 40.85 kg/palm, from the trees pollinated at 5, 10 and 15 days after spathe opening but maximum yield was recorded from the palms, pollinated just at the time of spathe opening, i.e., 75 to 80 kg. The slight variation may be attributed due to climatic conditions, general tree health and the type of farm management practices, adopted at that time.

The weight and the size of the fruit had shown slight increase with increase in pollination interval (Table 1). Maximum fruit weight in each variety was recorded when pollination interval was maximum i.e. 10 days. A correlation was found between fruit setting and fruit size. With the decrease in fruit set percentage, fruit size was found to be increasing. Whereas, the late pollination also exerted its influence on the size of the fruit which might be due to low fruit setting in this case. The biggest fruits have been obtained i.e. 4.2 x 2.7cm in Khadrawi, 4.2 x 2.5cm in Hillawii, 4.2 x 2.4cm in Zirin and 3.8 x 2.6cm in Shamran. The present study is in contrary to the findings of Nasir *et al.* (1997) who had concluded non-significant results in these parameters but the increase in size and wt. of date fruit is natural, as the reduction in the number of fruits/spike, positively, affects the size and weight of the fruit in any type of fruit. Though these findings are contrary to the results of Nasir *et al.* (1997) yet in accordance with the

recommendations of Nixon and Carpenter (1978) who have found bunch-thinning effect on the size of the date fruits if this practice is done at the time of pollination. Other factors, like, TSS, size and weight of the stone did not show any variation which is in line with the findings of Nasir *et al.* (1997).

From production point of view, the fruit setting and yield are the major factors for the evaluation of the high productivity of the date orchards. Therefore, the pollination of female spathes from the day of its' opening to after 2 days proved best in all the cases, so it is recommended to the growers that between 0 to 3<sup>rd</sup> day of the spathe splitting the female spathes should have to be pollinated to get maximum yield.

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**TABLES**

**Table 1:** Effect of pollination intervals on fruit setting, yield and quality of date fruit, year 2002

#	Parameters	Varieties	Treatments					
			T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>	T <sub>6</sub>
1	Fruit setting/spikelet	Shamran	91.0	88.2	63.6	40.4	26.7	8.30
		Khadrawi	90.0	75.0	51.2	31.6	20.8	6.7
		Hillawi	92.5	88.5	55.8	38.8	24.3	7.10
		Zerin	72.3	51.9	33.5	15.6	3.80	----
2	Yield/palm (kg)	Shamran	70.5	73.8	68.5	55.0	49.0	15.0
		Khadrawi	101.0	98.5	92.0	67.5	53.0	18.5
		Hillawi	125.7	117	119	86.6	59.1	30.0
		Zerin	84.5	81.2	78.5	61.2	52.0	11.5
3	TSS (°Brix)	Shamran	30.8	32.5	29.0	31.7	30.0	32.2
		Khadrawi	40.5	39.0	1.0	40.5	38.0	40.5
		Hillawi	45.0	45.5	44.5	41.0	44.5	43.4
		Zerin	35.3	37.5	38.4	36.7	38.6	----
4	Weight of fruit (g)	Shamran	8.70	8.40	8.90	9.10	9.30	9.50
		Khadrawi	12.8	12.2	12.9	12.9	13.0	13.4
		Hillawi	13.0	11.8	13.5	13.5	13.7	14.0
		Zerin	9.50	10.5	10.8	10.8	11.0	14.0
5	Size of fruit (cm)	Shamran	3.5x2.1	3.4x2.2	3.50x2.2	3.7x2.3	3.80x2.5	3.8x2.6
		Khadrawi	4.3x2.5	4.2x2.5	4.2x2.4	4.4x2.6	4.5x2.6	4.5x2.7
		Hillawi	4.1x2.2	4.3x2.3	4.0x2.1	4.0x2.3	4.1x2.4	4.2x2.5
		Zerin	4.0x1.42	3.9x2.2	4.1x2.3	2.3x4.0	4.1x2.3	4.2x2.4
6	Weight of seed (g)	Shamran	1.42	1.41	1.46	1.40	1.41	1.40
		Khadrawi	1.32	1.30	1.35	1.34	1.33	1.32
		Hillawi	1.85	1.86	1.83	1.87	1.85	1.84
		Zerin	1.39	1.41	1.42	1.40	1.40	----
7	Size of seed (cm)	Shamran	2.4x0.9	2.3x0.9	2.4x0.9	2.4x0.9	2.3x0.9	2.4x0.9
		Khadrawi	2.7x0.9	2.5x0.9	2.6x0.9	2.7x0.9	2.6x0.9	2.7x0.9
		Hillawi	2.7x0.9	2.7x0.9	2.6x0.9	2.6x0.9	2.7x0.9	2.6x0.9
		Zerin	2.5x1.0	2.6x0.9	2.5x1.0	2.6x1.0	2.6x1.0	--x0.95

T<sub>1</sub> = 0 day, T<sub>2</sub> = 2 days, T<sub>3</sub> = 4 days, T<sub>4</sub> = 6 days, T<sub>5</sub> = 8 days and T<sub>6</sub> = 10 days interval for pollination.