

Receptivity of Pistillate Flowers in Some Date Palm Cultivars in Riyadh Region

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Pistil receptivity was studied in 'Khudari', 'Nebut Seif', 'Seleg' and 'Sakaie' date palm cultivars in 1985 and 1986. Flower clusters were pollinated at 2-day intervals starting on the day of spathe cracking. Pollination was continued for 12 days. Results suggested that delaying pollination for 6-8 days after spathe cracking was usually safe, and that probably satisfactory fruit setting might be obtained for 10 days after the spathe cracking. A delay in pollination for more than 10 days, however, resulted in greatly reduced fruit setting.

The results showed that within the course of pollination during which the per cent fruit setting obtained did not differ significantly in most cases, there was a day on which maximal fruit setting was obtained and that this day differed among the cultivars and the seasons.

The traditional method of pollinating female date palm flowers is by inserting a number of male strands or a ball of cotton containing pollen into the inflorescence. Since this process has to be performed soon after the spathe cracking, all the inflorescences on one tree cannot be pollinated at the same time, i.e., pollination should be carried out at frequent intervals. To ensure maximal fruit setting, the pistils must be pollinated when they are receptive. The term "receptivity" is referred to as the length of time following the spathe cracking during which fertilization would take place. Varieties with a long period of pistil receptivity may be pollinated at less frequent intervals than those with a short period of receptivity.

There is some information in the horticultural literature suggesting that pistils do not remain receptive long, the longer the time of pollination is delayed beyond 2 or 3 days after spathe cracking, the lower the percentage of flowers set-

ting fruit obtained (Chandler 1950). However, there are few rigorous investigations in this aspect. Leding (1928), working mostly with non-uniform seedlings, found that receptivity gradually declined after the spathe cracking and that low percentages of fruit setting were obtained when pollination was delayed more than 10 days. Albert (1930), working on (Mactum) seedling and (Daker Medo-jal), showed that after 6 days, the percentage of fertilized dates decreased quite rapidly until the 13th day, after which no fertilized dates were obtained. With (Deglet Noor) seedling results showed that pistils remained 15-18 days receptive. He also stated that when a maximum set of fruit is desired, pollination should not be delayed longer than 3 or 4 days. Monciero (1950 and 1954) working on some varieties including (Deglet Noor), reported a fall-off in receptivity with time which varied with the variety. Perau-Leroy (1957) reported that pollination was carried out 3-4 days after the spathe cracking and was continued for 8-10 days. Ream and Furr (1969), working with (Deglet Noor), reported that after the spathe was cracked delaying pollination for seven days did not cause a decrease in fruit setting. Further delay to 13 days cause moderate reductions, and delays exceeding 13 days greatly reduced fruit setting. Reuveni (1970) reported a significant decrease in fruit setting when pollination was performed 2 days after cracking in (Khadrawi), 4 days in (Zahidi) and 8 days in (Deglet Noor). Rahim (1975) showed that the highest fruit setting, was obtained when pollination of the varieties (Zahidi, Kustawy, Sayer, Barban and Khadrawi) was performed within 5 days after bunch appearance. They concluded that to assure commercially fruit setting pollination should be performed within 10 days in (Zahidi), 15 days in (Kustawy and Sayer) and could be delayed for 20 days in (Barban and Khadrawi).

Information pertaining to pistil receptivity of various Saudi date palm cultivars are lacking, therefore, the present investigation was carried out to determine the time during which the pistils remain receptive in four widely grown cultivars in the Central Region, namely, 'Khudari', 'Sakaie', 'Nebut Seif' and 'Seleg'.

Materials and Methods

The study was carried out in 1985 and 1986 flowering seasons on trees grown at the College of Agriculture Orchard at Eleisha in Riyadh. The effect of pollinating pistillate flowers at various intervals after spathe cracking on fruit setting was studied. One vigorous tree of four cultivars; 'Khudari', 'Sakaie', 'Nebut Seif' and 'Seleg' was selected for this study. The trees were subjected to the normal cultural practices performed in this orchard.

Pollination was carried out at the same day of spathe cracking, then 2,4,6,8,10 and 12 days after. During both years of the experiment, the spathe

were covered with paper bags when they appeared and prior to spathe opening. The time of spathe opening was recorded. After spathe cracking, the flower strands were thinned to 70, divided into 7 groups, 10 each, then covered with paper bags to prevent contamination with air borne pollen. Cotton was worked around the base of the bags to allow some ventilation. At the time of pollination, the paper bags were removed and treatments were applied with small dusters using 0.5 g. of pollen for each pollination. The cluster groups were recovered after pollination. The treatments were replicated 8 times on different bunches per tree. The cluster groups were uncovered 3-4 weeks after pollination.

Observations on fruit-setting in the different treatments were carried out 50 days after pollination. The strands were removed from the bunch, the numbers of fruit scars and seeded fruits were recorded and the per cent fruit setting was calculated. For statistical analysis each group of standards in a bunch was considered as one sample. Per cent fruit setting was transformed to the arc sine scale before statistical analysis as advised by Steel and Torrie (1980). Data collected for each year were analyzed as split plot design where the main plots were the four cultivars and the dates were the sub plot treatments. Then, the two years data were combined and subjected for analyses (Steel and Torrie 1980).

Results

Summary of analyses of variance for each year and combined over two years is given in Table 1. The interaction between cultivar X year was significant suggesting that the behavior of the four cultivars was not the same for the two

Table 1. Mean squares from the analyses of variance for the percentage of fruit setting in each year and combined over the two years

S.O.V.	d.f.	MS		
		1985	1986	Combined
Year (Y)	1	-----	-----	5059.1**
Cultivar (C)	3	2208	6597	6766 ^{ns}
Cultivar X year	3	-----	-----	2039**
Samples/C/Y	(44)	260	28	176
Dates (D)	6	364**	159**	443
D X Y	6	-----	-----	80
D X C	18	250**	235**	268
D X Y X C	18	-----	-----	217

** Significant at the .01 level of probability, ns: not significant.

years. Also, the date X year X cultivar interaction was highly significant indicating that the effects of date were highly affected by cultivars and years. Therefore, the effects of dates were studied for each cultivar in each year separately. The data are presented in Table 2.

Khudari

In 1985, the percentage of fruit setting was relatively higher on clusters pollinated within 10 days after the spathe was cracked than on the 12th day. The differences in the per cent fruit setting did not differ statistically except between the 12th day and on spathe cracking.

In 1986, the fruit setting increased progressively until the 8th day after spathe cracking. On later pollinations, fruit setting dropped and the differences as compared with the top two pollination treatments were statistically significant.

Comparison between the results of both years, revealed a day on which maximal fruit setting was obtained, i.e., the same day of spathe cracking in 1985 and the 8th day after spathe cracking in 1986. Moreover, the per cent fruit setting in 1986 was generally lower than in 1985, the difference between both being significant.

Nebut Seif

Results of fruit setting counts showed that in both years of investigation no consistent trend was obtained concerning the effect of different pollination dates.

In this cultivar, the maximal fruit setting was noted on the 10th day after cracking in 1985 and on the day of spathe cracking in 1986. The per cent fruit setting, in 1986, was significantly lower than in 1985.

Seleg

In 1985, fruit setting counts dropped sharply past 10 days from spathe cracking and the differences were highly significant. The same trend of results was obtained in 1986 with differences being generally significant. The maximal fruit setting was observed on the 10th day after spathe cracking in 1985 and on the 2nd day after spathe cracking in 1986. It was also observed that the per cent fruit setting was slightly higher in 1986 than in 1985.

Sakaie

In 1985, fruit setting remained almost the same in the pollinations carried out on the day of spathe cracking until the 10th day. On the 12th day after crack-

Table 2. Means of fruit setting on the four cultivars as affected by pollination date

Pollination date (starting on spathe crack)	Fruit setting (%)							
	1985				1986			
	Khudari	Nebut Self	Seleg	Sakale	Khudari	Nebut Self	Seleg	Sakale
0	49.2 a	43.3 b	54.2 a	33.7 a	29.5 d	41.5 a	51.3 a	22.2 a
2	43.2 abc	47.7 ab	53.0 a	32.4 a	33.7 cd	29.0 bcd	53.4 a	27.6 a
4	47.7 ab	43.2 b	48.6 a	32.8 a	38.4 abc	25.4 d	52.2 a	19.2 a
6	43.0 abc	49.7 ab	47.7 a	35.7 a	38.2 abc	27.7 cd	52.8 a	24.2 a
8	42.9 abc	46.4 ab	44.8 a	35.6 a	43.3 a	37.4 ab	51.6 a	24.2 a
10	42.6 bc	52.8 a	46.4 a	34.7 a	41.1 ab	35.5 abc	52.6 a	5.0 b
12	40.6 c	48.7 ab	22.7 b	28.7 a	36.5 bc	38.0 ab	43.9 b	1.7 b
Mean	44.2	47.4	45.3	33.4	37.2	33.5	51.1	17.7

Means with the same letter are not significantly different.

ing, an appreciable drop in fruit setting was noted, but the differences however, were not significant. Again, in 1986, fruit setting dropped sharply on clusters pollinated after 8 days from spathe cracking, but the differences were statistically significant. Fruit setting was markedly higher in 1985 than in 1986. As with other cultivars, maximal fruit setting occurred on the 6th day in 1985, and on the 2nd day in 1986.

Discussion

The results presented above indicated that the period of pistil receptivity not only differ among the four cultivars under investigation, but also between years (or seasons). For all cultivars, delayed pollination for 6-8 days after spathe cracking was usually safe when pollination was done and satisfactory fruit setting may probably be obtained 10 days after spathe cracking. A delay in pollination for more than 10 days, however, may result in a markedly reduced fruit setting. These results are more or less similar to those of Albert (1930), Monciero (1950 and 1954), Perea-Leroy (1957), Ream and Furr (1969) Reuveni (1970). Rahim (1975) indicated that the stigma of different cultivars may vary in their relative time of receptivity and the fall-off in receptivity with time varied with the cultivar.

The foregoing experiments showed that within the course of pollination, the fruit setting obtained did not differ significantly in most cases. Maximal fruit setting was obtained at a certain day which differed among cultivars and seasons. A similar trend of results was obtained by Reuveni (1970) in Zahidi, Deglet Noor and Khadrawi date palm cultivars. He also added that the maximal fruit setting depends mainly on factors within the tree.

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References

- Albert, D.W. (1930). Viability of pollen and receptivity of pistillate flowers. *Date Grower's Inst. Rept.*, 7: 5-7.
- Chandler, W.H. (1950), *The Date, Evergreen Orchards*. Lea and Febiger, Philadelphia, p. 374, U.S.A.
- Leding, A.R. (1928). Determination of length of time during which the flowers of the date palm remain receptive to fertilization. *J. Agric. Res.* 36: 129-134.
- Monciero, A. (1950). Contribution a l'etude du palmier-dattier, 2^e -Fecondation mecanique des palmiers dattiers. *Ann. Inst. Agr. Serv. Rech. Exp. Algerie.* V. 4: 7-12.
- Monciero, A. (1954). Notes sur le palmier dattier, *Ann. Inst. Agr. Serv. Rech. Exp. Algerie.* V. 4: 1-28.
- Pereau-Leroy, P. (1957). La fecondation de palmier-dattier. *Fruits. Mars* 13(3): 101-105.
- Rahim, A.L. (1975). The pollination intervals of dates. *Third International Palm and Dates Conference*. Baghdad. 30 Nov. - 4 Dec., 1975. pp. 9-11.
- Ream, C.L. and J.R. Furr (1969). The period of receptivity of pistillate flowers and other factors affecting set of date fruit. *Date Grower's Inst. Rept.* 46: 28-29.
- Reuveni, O. (1970). Pistil receptivity of 'Khadrawi', 'Zahidi' and 'Deglet Noor' date flowers. *Date Grower's Inst. Rept.* 47: 3-4.
- Steel, R.G.D. and J.H. Torrie (1980). *Principles and Procedures of Statistics*. 2nd ed. McGraw Hill, N. Y., U. S. A.

مدة قابلية الأزهار المؤنثة للتلقيح في بعض أصناف نخيل
البلح في منطقة الرياض
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درست مدة قابلية الأزهار المؤنثة للتلقيح في أصناف نخيل البلح: الخضري،
النبوت سيف، السليج والصقعي عامي ١٩٨٥م، ١٩٨٦م. وقد تم تلقيح
الأزهار المؤنثة على فترات كل يومين ابتداء من بدء تفتح الأغاريض المؤنثة،
واستمر التلقيح لمدة ١٢ يوماً.

وقد أوضحت النتائج أن تأخير التلقيح لمدة ٦ - ٨ أيام بعد تفتح
الأغاريض المؤنثة لا يؤثر على نسبة العقد، ويمكن في بعض الأحيان الحصول
على نسبة عقد مقبولة بعد مرور ١٠ أيام من تفتح الأغاريض المؤنثة.

كما أوضحت النتائج أيضاً أنه على الرغم من عدم وجود فروق إحصائية
مؤكدة بين النسبة المثوية لعقد الثمار خلال وقت معين من فترات التلقيح إلا أن
هناك يوماً معيناً تحدث خلاله أعلى نسبة عقد للأزهار، وهذا اليوم يختلف
باختلاف الصنف وكذلك باختلاف الموسم.