

Pistil Receptivity of Saily Date Palms Grown under New Valley Conditions when Pollinated with Pollen Suspension

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ABSTRACT

This trial was conducted during 2015 and 2016 seasons to find the best time of pollination of Saily date palms grown under New Valley conditions. Pollination was done by spraying pollen grains suspension (5 g pollens/L water). Selecting the optimum period at which the female flowers of such date palm cv. remain receptive for pollination is very essential for date palm growers. Pollination was carried out on zero, two, four, six, eight and ten days from female cracking, besides the traditional pollination (seven strands / spathe). The date reveals that the time of pollination had an obvious impact on fruit retention%, yield and quality of Saily date palms fruits. Traditional pollination with seven strands / spathe surpassed the pollination with improving grain suspension on product fruit retention %, yield and bunch weight. Fruit quality was greatly enhanced with pollination using pollen grain suspension over carrying out traditional pollination. Delaying times of pollination from zero to four days after spathe cracking caused a gradual promotion on fruit retention, yield and bunch weight. A gradual reduction on these parameters was observed with delaying times of pollination from 4-10 days after spathe cracking. Delaying times of pollination from 0-10 days after spathe cracking caused a progressive promotion on all physical and chemical characteristics of the fruits. Carrying out pollination with pollen grain suspension (5 g/ 1 L W) at two to four days after spathe cracking is considered the striking period of pistil receptivity and at the same time was necessary to produce appropriate yield and fair fruit quality of Saily date palms grown under New Valley conditions,

Keywords: Pistil receptivity – Saily date palms – pollen grains suspension - spathe cracking, traditional pollination.

INTRODUCTION

Date palm has a great economical importance and agricultural uses throughout humans history. In Egypt, distribution of date palms cover a large area extends from Aswan to north Data, beside the oasis of Siwa, Bahrya, Farafra, Kharga and Dakhla. It is necessary to understand the horticultural practices that affect tree growth and productivity to ensure good fruit production. Pollination is one of the most important processes in this concern (Shaheen, 1986; Gasim, 1993 and Kotb, 1993).

It is very important to determine length of time during which the female flower of date palm remain receptive to fertilization. In this respect, Reuveni (1970) and Shaheen (1986) reported that pistils do not still receptive long and the period of receptivity differs among the cultivars. Also, Leading (1928), Albert (1930), Al-Delaimy and Ali (1969), El-Kassas & Mahmoud (1986) and Omar (2007) showed that, maximum fruit set was obtained from pollination within three or four days after spathe cracking with most cultivars of dates. El-Salhy *et al.*, (2010) and (2011) on Sewy date palm, reported that initial fruit set, fruit retention and bunch weight were reduced when delaying pollination to the fifth or seventh day of spathe cracking.

The aim of this experiment was to determine the best time of pollination by spraying pollen grains suspension to improve fruit set, yield and fruit quality.

MATERIALS AND METHODS

This investigation was carried out during two successive seasons of 2015 and 2016 on "Saily" date palm of about 10 years old grown in a clay soil at Ber Alslam orchard, El-Kharga Oasis, New Valley Governorate, Egypt. For this study, twenty -one uniform vigorous palms were selected, received the same cultural practices. Ten female spathes of nearly equal

size were selected on each palm tree in both seasons, while the remain spathes were removed. Pollination was done by spraying pollen grains suspension (5 g pollens/L water) from the same male palm tree in the two seasons. Pollen suspension was sprayed on the bunch by hand sprayer (1/2 liter capacity) at 40 ml/bunch to prevent contamination of pollens.

The treatments were as follow :

- 1-Traditional pollination with seven strands/ spathe
- 2-pollination at zero days from spathe cracking
- 3-Pollination at two days after spathe cracking
- 4-Pollination at four days after spathe cracking
- 5-Pollination at six days after spathe cracking
- 6-Pollination at eight days after spathe cracking
- 7-Pollination at ten days after spathe cracking

The experiment was calculated in a complete randomized block design (CRBD). With three times of each treatment. Pollination was uniformed in respect of source and method to avoid residues of metaxenia. Traditional pollination was applied at third day of spathe cracking.

Five female strands were randomly selected from each bunch. On these strands, number of setting fruits was counted total number of fruits was counted just after fruit setting, and then fruit retention percentage was calculated as follows:

Fruit retention percentage was calculated using the following equation :

$$\text{Fruit retention \%} = \frac{\text{No. of fruits on the strand just after harvesting}}{\text{Total number of settled fruits on the strands}}$$

Yield/palm was measured by harvesting and weighting bunches of each palm at tamar stage (last three weeks of August) in both seasons. Bunch weight average (kg) was determined.

Samples of 30 date fruits were randomly taken from each bunch to determine physical and chemical properties of fruits, i.e., fruit weight, fruit height and diameter by using vernier caliper (cm), total soluble solids % (using hand refractometer), percentage of total and reducing

sugars (using volumetric method), total acidity as malic acid/100 g pulp, total fibre and total soluble tannins were determined (A.O.A.C., 1985). The obtained data subjected to the statistical analysis of variance using New L.S.D. test according to Snedecor and Cochran (1980) and Gomez and Gomez (1984).

RESULTS AND DISCUSSION

1-Fruit retention, bunch weight and yield / palm:

It is clear from Table (1) that varying pollination times had significant effect on the percentage of fruit retention, yield and bunch weight. Further more traditional pollination with seven strands per spathe significantly improved fruit retention, yield/ palm and bunch weight over pollination with using pollen grain

suspension. The data also reveal that a significant promotion on these parameters with increasing number of days after spathe cracking for pollination from zero to four day, then with pollination at days over four till ten days after spathe, gradual reduction on these parameters was observed. The maximum fruit set (75.1 & 76.3 , bunch weight (13.9 & 13.3) and yield (139 & 133kg) during both season, respectively were observed on the palms that pollinated with seven strands / spathe (traditional method). Pollination with pollen grain suspension (5 g / one litre water) at four days after spathe cracking since it gave the maximum values comparing with the other pollination treatments conducted at the other times of pollination. Pollination with pollen suspension on ten day after spathe cracking gave lowest results during both seasons.

Table 1. Effect of different times of pollination with pollen suspension on the percentage of fruit retention, yield per palm and bunch weight of Saidu date palms during 2015 and 2016 seasons.

Pollination times (days after spathe cracking)	Fruit retention %		Yield/ palm		Bunch weight (kg)	
	2015	2016	2015	2016	2015	2016
Traditional pollination	75.1	76.3	139.0	133.0	13.9	13.3
Pollination at zero day	56.1	57.0	109.0	103.0	10.9	10.3
Pollination at two days	63.0	64.7	120.0	114.0	12.0	11.4
Pollination at four days	66.1	67.0	131.0	126.0	13.1	12.6
Pollination at six days	52.0	53.9	100.0	91.0	10.0	9.1
Pollination at eight days	32.1	33.0	91.0	82.0	9.1	8.2
Pollination at ten days	21.0	21.7	80.0	74.0	8.0	7.4
New L.S.D. at 5%	2.1	1.9	3.9	4.0	0.7	0.8

Omar (2007) reported that delaying pollination of Saidu date palm within three or four days after female spathe opening caused a reduction in the percentage of fruit set and gave the maximum fruit set with most date cultivars.

2- Physical and chemical characteristics of the fruits

It is evident from Tables (2, 3 and 4) that significant differences were observed on fruit weight and dimensions, T.S.S., total and reducing sugars, total acidity, total fibre and total soluble tannins among the seven pollination treatments. Parameters of fruit quality

were significantly improved in response to pollination with pollen suspension whatever date of pollination (zero to ten days after spathe cracking) over traditional pollination with seven strands / spathe. Delaying times of pollination after spathe cracking from zero to ten days significantly of increased fruit (weight, height & diameter), total soluble solids, total and reducing sugars and reducing total acidity, total fibre and total soluble tannins. The best results were obtained due to carrying out pollination with pollen suspension at ten days after spathe cracking.

Table 2. Effect of different times of pollination with pollen suspension on some physical characteristics of Saidu date palm fruits during 2015 and 2016 seasons.

Pollination times (days after spathe cracking)	Fruit weight (g)		Fruit height (cm)		Fruit diameter (cm)	
	2015	2016	2015	2016	2015	2016
Traditional pollination	9.1	9.0	3.1	3.3	2.0	2.0
Pollination at zero day	10.6	10.5	3.3	3.5	2.2	2.1
Pollination at two days	11.1	10.9	3.5	3.7	2.4	2.3
Pollination at four days	11.6	12.0	3.7	3.9	2.6	2.5
Pollination at six days	12.1	12.4	4.0	4.2	2.8	2.6
Pollination at eight days	12.5	12.7	4.2	4.3	2.9	2.8
Pollination at ten days	12.8	13.0	4.4	4.5	3.0	2.9
New L.S.D. at 5%	0.3	3.0	0.3	0.2	0.2	0.2

The improvement in physical properties of fruit i.e. fruit weight and dimensions might be due to delaying and early pollination after spathe cracking. So,

it could be noticed that there was a negative correlation between fruit weight and fruit set percentage.

Table 3. Effect of different times of pollination with pollen suspension on some physical characteristics of Saidu date palm fruits during 2015 and 2016 seasons.

Pollination times (days after spathe cracking)	T.S.S. %		Total sugars		Reducing sugars	
	2015	2016	2015	2016	2015	2016
Traditional pollination	70.0	69.1	67.0	66.0	47.1	47.5
Pollination at zero day	71.9	71.7	68.9	67.1	48.0	48.5
Pollination at two days	74.0	73.3	70.0	68.8	49.9	50.3
Pollination at four days	75.0	74.4	71.8	70.4	52.0	52.3
Pollination at six days	77.1	75.6	73.0	72.0	53.3	54.0
Pollination at eight days	79.0	77.9	74.7	74.0	54.9	55.5
Pollination at ten days	80.0	79.1	76.0	75.1	55.9	56.0
New L.S.D. at 5%	1.0	0.9	0.8	0.8	0.7	0.7

These findings might be due to delaying and early pollination after spathe crack which causes the reduction of fruit set percentage. Number of fruits per

bunch decreased regarding to the reduction in fruit set % leaving the same number of leaves that may guaranty carbohydrates supply which manufactured in leaves.

Table 4. Effect of different times of pollination with pollen suspension on chemical characteristics of Saidu date palm fruits during 2015 and 2016 seasons.

Pollination times (days after spathe cracking)	Total acidity %		Fibre %		Soluble Tannins %	
	2015	2016	2015	2016	2015	2016
Traditional pollination	0.311	0.320	0.99	1.00	0.95	0.94
Pollination at zero day	0.280	0.289	0.94	0.90	0.89	0.88
Pollination at two days	0.261	0.270	0.88	0.79	0.82	0.81
Pollination at four days	0.240	0.250	0.80	0.69	0.76	0.75
Pollination at six days	0.220	0.230	0.72	0.50	0.69	0.68
Pollination at eight days	0.200	0.210	0.66	0.40	0.61	0.60
Pollination at ten days	0.181	0.191	0.61	0.39	0.56	0.55
New L.S.D. at 5%	0.018	0.16	0.09	0.10	0.05	0.05

Data obtained indicated that the reduction in fruit setting lowered the competition between fruits and caused an adequate carbohydrates and other essential substances for remain ones and consequently improve the fruit maturity and enhance its contents of TSS and sugars. So, it is clear that pollen grain suspension has the similar effect of fruit thinning on improving fruit quality (Brown and Perkins, 1969).

CONCLUSION

The aim of this study was to evaluate the effect of times of pollination by spraying pollen grains suspension (5 g pollens/L water. To selected the optimum period at which the female flowers of such date palm cv. remain receptive for pollination is very essential for date palm growers these treatments as an unordinary methods in date palm pollination by combining mechanical pollination, fruit thinning and reducing the quantity of pollen grain so we recommend that the optimum period pistil pollination at two to four days after spathe cracking is considered the striking period of receptivity and at the same time was necessary to produce appropriate yield and fair fruit quality of Saidu date palms grown under El- kharga oasis conditions.

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قابلية المياسم للتلقيح عند استخدام المعلق المائي لحبوب اللقاح في نخيل البلح الصعيدي النامي تحت ظروف الوادي الجديد

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أجريت هذه الدراسة خلال موسمي ٢٠١٥ ، ٢٠١٦ وذلك لمعرفة أنسب موعد لتلقيح نخيل البلح الصعيدي النامي تحت ظروف الوادي الجديد بالمعلق المائي لحبوب اللقاح (٥٠ جرام لقاح / واحد لتر ماء) مع اختبار الفترة المناسبة التي تكون فيها الأزهار المؤنثة لهذا الصنف من النخيل لها قابلية للتلقيح يكون مهم جدا لمنتجي النخيل وقد تم إجراء التلقيح بعد إنشاقه مباشرة وبعد يومين أربعة – ستة – ثمانية وعشرة أيام من إنشاقه ادى اختلاف مواعيد التلقيح الى حدوث تأثير واضح على النسبة المئوية للثمار المتبقية على النخيل وكمية وخصائص الجودة للثمرة حيث تفوق اجراء التلقيح اليدوى بالطرق التقليدية (سبعة شمرايخ مذكرة / سوباطة مؤنثة عن اجراء التلقيح باستخدام المعلق المائي لحبوب اللقاح فى تحسين النسبة المئوية للثمار المتبقية على النخيل وكمية المحصول ووزن السوباطة عند اجرائه فى جميع المواعيد اما خصائص الجودة للثمار فقد تحسنت كثيرا باجراء التلقيح باستخدام المعلق المائي لحبوب اللقاح بالمقارنة بالتلقيح بالطرق التقليدية، وكان هناك تحسن ملحوظ فى النسبة المئوية للثمار المتبقية على النخيل وكمية المحصول ووزن السوباطة بتأخير اجراء التلقيح من بدء انشاق الاغريض حتى اربعة ايام من انشاقه وكان هناك نقص ملحوظ فى هذه المقاييس عند تأخير اجراء التلقيح من اليوم الرابع الى اليوم العاشر لانشاق الاغريض المؤنث وادى تأخير التلقيح من بدء انشاق الاغريض المؤنث حتى اليوم العاشر لانشاقه الى حدوث تحسن واضح فى خصائص الجودة الطبيعية والكيميائية للثمار. إن إجراء التلقيح بعد يومين أو أربعة أيام بعد إنشاق الإغريض المؤنث باستخدام المعلق المائي لحبوب اللقاح (٥٠ جرام لقاح/ ١ لتر ماء) يعتبر من أفضل المواعيد في قابلية المياسم للتلقيح وفي نفس الوقت يكون ضروريا للحصول علي محصول مناسب وخصائص جودة عالية لنخيل البلح الصعيدي النامي تحت ظروف الوادي الجديد.