

## Evaluation and Improvement of Pollination Efficiently of Saidu Date Palm under New Valley Conditions

Ahmed, E.F.S.; Y.M.S. Diab and M.M. Abd El-Hafez



Date Palm Central Lab. Agric., Res. Center, Giza, Egypt.

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### Abstract

This study was carried out during 2017 and 2018 seasons to find the best time and method of pollination of Saidu date palm grown under New Valley conditions. Determination of period length which the female flowers of date palm remain receptive to fertilization is important for date palm growers. Pollination was done by the traditional pollination or spraying pollen grains suspension (2.5 g pollen grains plus 5 g starch/L water). Pollination was carried out on three days before spathe was cracked as well as within zero, three, six and nine days from cracking.

The obtained results indicated that there is a reduction on the percentage of fruit set and fruit retention as well as bunch weight and yield/palm as pollination was done before spathe cracking or within zero date as well as delaying to nine days.

There were no significant differences in bunch weight and yield/palm and fruit quality due to pollination by pollen grain suspension spraying done at three days before to three days after spathe cracking.

Fruit quality was greatly improved when pollination was done at three days before cracking or zero, six and nine days after spathe cracking compared to the traditional (three days after spathe cracking).

Furthermore, use of advancing pollination (pollen grains suspension spraying) throughout 3 to 3-days before or after spathe cracking, lead to obtain an economical yield with good fruit quality. In addition, reduces pollen grain amount, human effort and production cost.

Therefore, using pollen grain suspension during 3 to 6 days before or after spathe cracking produce high yield with fair fruit quality and improved the efficiency of pollination process and reduce Saidu dates production cost.

These results are important for economic and horticultural point of view.

**Keywords:** Pistil receptivity, Date Palm, Pollen grains, Pollination, Yield, Economy.

### Introduction

Date palm has a great economic importance and agricultural uses throughout human history. In Egypt, distribution of date palms cover a large area extends from Aswan to north Delta, beside the oasis of Siwa, Bahrya, Farafra, Kharga and Dakhla. Saidu date palm is considered the national date palm variety in new Valley Governorate. It is the most impor-

tant cultivar of semi-dry dates that is largely required in the local and foreign markets. Several efforts have been accomplished to improve date palm production through facing production problems and improving agricultural practices as efficiency of pollination process. Therefore, it is required to ensure good fruit production through understanding some horticultural practices that affect tree

growth and productivity. Pollination is one of the major practices in this concern (Ream and Furr, 1970; Shaheen, 1986; Gasim, 1993 and Kotb, 1993). Pollination is an expensive practice due to the pattern of flowering of palm trees and climbing several times to the crown (Hussein *et al.*, 1979 and Hussein, 1982).

The determination of length of time during which the female flower of date palm remain receptive to fertilization is very important (Gupta and Thatai, 1980 and Shaheen, 1986).

Pistils do not remain receptive for a long time and the period of receptivity differs among the cultivars. The receptivity of female flowers reaches its optimum within three to four days after the spathe opening (Marzouk *et al.*, 2002; Abdalla *et al.*, 2002 and Al-Wasfy, 2005). The period is extended from 5 up to 10 days (Ream and Furr, 1970 and Al-Bajallani *et al.*, 1989).

Delaying pollination for many days significantly reduced initial fruit set, fruit retention and consequently bunch weight as compared with the earlier pollination in the first day of female spathe cracking. Contrarily, such delaying significantly improve the fruit quality. From the 4<sup>th</sup> to the 7<sup>th</sup> day of spathe cracking is considered the maximum length of receptivity to give good yield with highest fruit quality of different date cultivars (El-Kassas and Mahmoud, 1986; Moustafa, 1998; Marzouk *et al.*, 2002; Abdalla *et al.*, 2002; Al-Wasfy, 2005; Samih, 2006 and El-Salhy *et al.*, 2011).

The present study aimed to determine the best time and method, as well as the appropriate length of time period which the female flowers of Saidy date palm remain receptive to fertilization that in turn gave the appropriate fruit set, yield and fruit quality.

### **Materials and Methods**

This study was conducted during two successive seasons of 2017 & 2018 on Saidy date palm (*Phoenix dactylifera*, L.) of about 12 years old grown in a clay soil at Bier alsлам orchard, El-Kharga Oasis, New Valley, Egypt, where the monthly weather are shown in Table (1).

In both seasons, ten uniform vigorous palms were selected according to bearing the same number of female spathes. The selected palm trees were planted at 7x7 meters apart and subjected to the same cultural practices. Ten female spathes of nearly equal size were selected on each selected palm tree in both seasons, while the other spathes were removed. Pollination was done either by hand pollination or spraying pollen grains suspension (2.5 g pollens + 5 g starch/L water) from the same male palm in the two seasons. Sprays of pollen suspension are thoroughly applied to the bunch by small hand sprayer (½ liter capacity) at the amount of 40 ml/bunch. To prevent contamination of pollens after pollination every bunch was bagged by paper bag which is removed after fruit set.

**Table 1. Monthly weather, mean of the highest and lowest temperature degree, relative humidity during 2017 and 2018 seasons.**

Year	2017			2018		
	Temperature (°C)		R-humidity (%)	Temperature (°C)		R-humidity (%)
	Max.	Min.		Max.	Min.	
February	28.1	15.0	35.1	27.1	15.0	28.6
March	34.3	18.7	30.4	30.5	13.6	34.8
April	36.1	19.8	29.3	35.3	18.3	31.3
May	38.9	19.1	30.2	34.1	18.3	34.3

Source: El-Dakhla Oasis Meteorological authority station.

The 10 female spathes on each palm were labeled and subjected to the following pollination treatments during both seasons:

- 1- Hand pollination at 3 days before spathe cracking.
- 2- Pollination at 3 days before spathe cracking with spraying
- 3- Hand pollination at zero from spathe cracking.
- 4- Pollination at zero from spathe cracking with spraying
- 5- Hand pollination at 3 days after spathe cracking (check treatment).
- 6- Pollination at 3 days after spathe cracking with spraying
- 7- Hand pollination at 6 days after spathe cracking.
- 8- Pollination at 6 days after spathe cracking with spraying
- 9- Hand pollination at 9 days after spathe cracking.
- 10- Pollination at 9 days after spathe cracking with spraying

These treatments were applied on the same palm. The experiment was set up in a complete randomized block design with ten replications of one bunch each. Pollination was uniformed in respect of source and method to avoid residues of metazenia. Hand pollination was applied at third day of spathe cracking, used as check treatment that is a tradition method.

Five female strands were randomly selected from each bunch. On these strands, number of setting fruits was counted after 28 days from pollination and then fruit set percentage was calculated for each treatment.

The percentage of fruit set was calculated using the following equation:

$$\text{Fruit set \%} = \frac{\text{Number of setting fruits on the strand}}{\text{Total number of flowers per thestrand}} \times 100$$

Bunches were harvested at tamar stage (last week of September), in both seasons. The average fruit weight/bunch (in kg) was determined for each treatment. Samples of 30 date fruits were taken at random from each bunch for the determination of physical and chemical fruit properties, i.e., fruit weight, flesh %, fruit dimensions were measured by vernier caliper (cm), total soluble solids % (using a hand refractometer), fruit moisture content (expressed on the fresh weight basis) and percentage of total sugars and reducing sugars by using volumetric method that outlined in A.O.A.C. (1985) by Lane and Eynon.

The method of pollination was evaluated either by traditional or spraying pollen grains suspension, using mathematical method to calculate the costs and revenues and thus the net yield.

All the obtained data were tabulated and subjected to the proper statistical analysis of variance using New L.S.D. test for recognizing the significance differences among the various treatment means according to the method outlined by Snedecor and Cochran (1980) and Gomez and Gomez (1984).

## Results and Discussion

### Yield index:

Fruits weight/bunch is an indicator for the yield of palm trees since the number of bunches on the palm was constant.

Data illustrated in Table (2) showed the effect of pollination method and time on fruit set percentage and fruit weight/bunch, of "Saidy" date palm cultivar during 2017 and 2018 seasons. It is obvious from data that the results took similar trend during the two studied seasons.

Data showed that there are significant differences in fruit set percentage and fruit weight/bunch due to pollination either for time or method, traditional or by using pollen grains suspension (2.5 g pollen grains plus 5 g starch).

The results showed that the percentage of fruit set and fruit weight/bunch (kg) significantly decreased with delaying or early pollination of spathe cracking compared to hand pollination at the third day of spathe cracking (check treatment).

Also, there was a decrease in fruit set percentage and bunch weight due to pollination with spraying pollen grains suspension at any time compared to the use of hand pollination at same time.

The decrement percentage of fruit set were attained to 49.87, 18.20, 35.97 & 49.13% as well as 55.67, 28.66, 4.63, 38.01 & 51.51% (as an av. of the two studied seasons) due to hand pollination at 3 (T<sub>1</sub>), 0 (T<sub>3</sub>) days before, 6 (T<sub>7</sub>), 9 (T<sub>9</sub>) days after spathe cracking as well as spray pollen grains suspension at 3 (T<sub>2</sub>), 0 (T<sub>4</sub>) days before, 3 (T<sub>6</sub>), 6 (T<sub>8</sub>) & 9 (T<sub>10</sub>) days after spathe cracking compared to use of hand pollination at the third day of spathe cracking (check treatment, T<sub>5</sub>), respectively.

The corresponding decrement of fruit bunch weight attained 45.16, 14.84, 29.50 & 41.81% as well as 48.78, 23.28, 7.42, 31.58 & 42.08% due to T<sub>1</sub>, T<sub>3</sub>, T<sub>7</sub> & T<sub>9</sub> as well as T<sub>2</sub>, T<sub>4</sub>, T<sub>6</sub>, T<sub>8</sub> and T<sub>10</sub> compared to T<sub>5</sub>, respectively.

The increase in the percentage of fruit set occurred by good time pollination may be due to the easily germinating and elongation of the pollen grain tube to penetrate the stigma and style of the female flower resulting in better fertilization and fruit set (Brown *et al.*, 1969). However, Rahim (1975), El-Kassas & Mahmoud (1986), Shaheen (1986), Abdallah *et al.* (2002), Marzouk *et al.* (2002), Al-Wasfy (2005) and El-Salhy *et al.* (2011) found that delaying pollination after female spathes cracking of date palm reduced the percentage of fruit set. They also reported that the maximum set of fruit with most date cultivars was obtained from pollination within three or four days after female spathe opening.

**Table 2. Effect of pollination method and time on fruit set % and fruit weight/bunch (kg) of Saidu date palm during 2017 and 2018 seasons.**

Treatment	Characteristics	Fruit set %			Fruit weight/bunch (kg)		
		2017	2018	M	2017	2018	M
Hand pollination at 3 days before spathe cracking.	T <sub>1</sub>	38.21	37.15	37.68	5.98	6.13	6.06
Pollination at 3 days before spathe cracking with spraying	T <sub>2</sub>	33.65	32.98	33.32	5.54	5.78	5.66
Hand pollination at zero from spathe cracking.	T <sub>3</sub>	62.18	60.65	61.42	8.98	9.83	9.41
Pollination at zero from spathe cracking with spraying	T <sub>4</sub>	54.18	53.08	53.63	8.11	8.85	8.48
Hand pollination at 3 days after spathe cracking (control).	T <sub>5</sub>	76.23	74.11	75.17	10.82	11.28	11.05
Pollination at 3 days after spathe cracking with spraying	T <sub>6</sub>	72.65	70.38	71.69	10.00	10.46	10.23
Hand pollination at 6 days after spathe cracking.	T <sub>7</sub>	48.81	47.45	48.13	7.65	7.92	7.79
Pollination at 6 days after spathe cracking with spraying	T <sub>8</sub>	47.28	45.91	46.60	7.25	7.86	7.56
Hand pollination at 9 days after spathe cracking.	T <sub>9</sub>	38.47	38.00	38.24	6.20	6.65	6.43
Pollination at 9 days after spathe cracking with spraying	T <sub>10</sub>	36.58	36.31	36.45	6.31	6.48	6.40
N- L.S.D. 5%		<b>2.53</b>	<b>2.25</b>		<b>0.74</b>	<b>0.64</b>	

**Fruit quality:****A – Physical characteristics:**

Data in Tables (3 & 4) clearly showed that there was significant differences in fruit weight (g), flesh % and fruit dimensions (cm) due to altered pollination either for time or method, using pollen grains suspension (2.5 g pollen grains plus 5 g

starch/L) compared with hand pollination (check treatment, T<sub>5</sub>).

The results showed that fruit weight (g), flesh % and fruit dimensions (cm) were significantly increased with early or delay pollination before and after spathe cracking compared to check treatment (T<sub>5</sub>). These results could be due to the reduction on the fruit set percentage.

**Table 3. Effect of pollination method and time on fruit weight (g) and fruit length (cm) of Saidu date fruits during 2017 and 2018 seasons.**

Characteristics		Fruit weight (g)			Flesh %		
		2017	2018	M	2017	2018	M
Hand pollination at 3 days before spathe cracking.	T <sub>1</sub>	10.33	10.59	10.46	83.35	84.35	83.85
Pollination at 3 days before spathe cracking with spraying	T <sub>2</sub>	11.20	11.18	11.19	86.10	87.18	86.64
Hand pollination at zero from spathe cracking.	T <sub>3</sub>	9.48	10.30	9.89	82.98	83.85	83.42
Pollination at zero from spathe cracking with spraying	T <sub>4</sub>	9.86	10.52	10.19	83.36	84.58	83.97
Hand pollination at 3 days after spathe cracking (control).	T <sub>5</sub>	9.11	9.53	9.32	80.45	81.76	81.11
Pollination at 3 days after spathe cracking with spraying	T <sub>6</sub>	10.10	10.18	10.14	82.89	84.53	83.71
Hand pollination at 6 days after spathe cracking.	T <sub>7</sub>	10.74	10.96	10.85	83.24	84.78	84.01
Pollination at 6 days after spathe cracking with spraying	T <sub>8</sub>	10.00	10.76	10.38	85.80	87.34	86.57
Hand pollination at 9 days after spathe cracking.	T <sub>9</sub>	11.47	11.28	11.38	86.19	87.43	86.81
Pollination at 9 days after spathe cracking with spraying	T <sub>10</sub>	11.38	11.26	11.32	87.28	88.76	88.02
N- L.S.D. 5%		<b>0.49</b>	<b>0.51</b>		<b>2.11</b>	<b>2.31</b>	

**Table 4. Effect of pollination method and time on fruit dimension of Saidu date fruits during 2017 and 2018 seasons.**

Characteristics		Fruit length (cm)			Fruit diameter (cm)		
		2017	2018	M	2017	2018	M
Hand pollination at 3 days before spathe cracking.	T <sub>1</sub>	3.68	3.78	3.73	2.28	2.26	2.27
Pollination at 3 days before spathe cracking with spraying	T <sub>2</sub>	4.13	4.05	4.09	2.52	2.42	2.47
Hand pollination at zero from spathe cracking.	T <sub>3</sub>	3.47	3.72	3.60	2.14	2.22	2.18
Pollination at zero from spathe cracking with spraying	T <sub>4</sub>	3.60	3.84	3.72	2.13	2.28	2.21
Hand pollination at 3 days after spathe cracking (control).	T <sub>5</sub>	3.30	3.36	3.33	2.07	2.04	2.06
Pollination at 3 days after spathe cracking with spraying	T <sub>6</sub>	3.59	3.62	3.60	2.21	2.16	2.19
Hand pollination at 6 days after spathe cracking.	T <sub>7</sub>	3.73	3.84	3.78	2.31	2.25	2.28
Pollination at 6 days after spathe cracking with spraying	T <sub>8</sub>	3.64	3.86	3.75	2.25	2.29	2.27
Hand pollination at 9 days after spathe cracking.	T <sub>9</sub>	4.10	4.08	4.09	2.48	2.41	2.45
Pollination at 9 days after spathe cracking with spraying	T <sub>10</sub>	4.08	4.02	4.05	2.51	2.38	2.45
N- L.S.D. 5%		<b>0.19</b>	<b>0.22</b>		<b>0.11</b>	<b>0.12</b>	

So, there was a significant increase in fruit physical characteristics due to the early and delay pollination before and after spathe cracking.

The increment percentage of fruit weight attained (12.23, 20.01, 6.12, 9.33, 8.80, 16.42, 11.37, 22.10 & 21.14% as an av. of the two studied seasons) due to use T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, T<sub>6</sub>, T<sub>7</sub>, T<sub>8</sub>, T<sub>9</sub> and T<sub>10</sub> compared to T<sub>5</sub>, respectively.

Such improvement of fruit physical properties i.e. increasing the fruit weight and size might be occurred in response to the early and delay pollination before and after spathe cracking. So, it could be stated that "there is a negative correlation between fruit weight and fruit set percentage".

These results could be due to the reduction in the fruit set percentage when earlying and delaying pollination before and after spathe cracking, whatever by hand pollination or spraying pollen grains suspension. The reduction in fruit set percentage can cause a shortage in the number of fruits per bunch without changing the number of leaves that may induce the better supply of carbohydrates that are manufactured in the leaves. Such effects were similar to the fruit thin-

ning effects in improving the physical fruit properties. So, it could be easily to identify the fruit set percentage which gave the considerable yield characterized by high fruit quality using either different hand pollination or fruit thinning methods (El-Salhy *et al.*, 2010).

#### **B – Chemical characteristics**

Data illustrated in Tables (5 & 6) showed the effect of pollination time or methods on T.S.S.%, fruit moisture % and sugar content of "Saidy" date fruits during 2017 and 2018 seasons. It is quite clear from these tables that fruit chemical constituents took similar trend during the two studied seasons.

Data showed that there are a significant differences in TSS%, sugars and moisture content due to either pollination time or methods using pollen grains suspension compared with hand pollination (check treatment, T<sub>5</sub>).

The results indicated that the altered pollination time or using pollen grains suspension significantly improved the fruit chemical constituents in terms of increasing total soluble solid and sugar contents and decreasing moisture content compared to check treatment.

**Table 5. Effect of pollination method and time on fruit moisture and TSS of Saidy date fruits during 2017 and 2018 seasons.**

Characteristics		Fruit moisture			TSS		
		2017	2018	M	2017	2018	M
Hand pollination at 3 days before spathe cracking.	T <sub>1</sub>	13.08	13.30	13.19	80.67	81.54	81.11
Pollination at 3 days before spathe cracking with spraying	T <sub>2</sub>	12.39	12.81	12.60	82.25	83.00	82.63
Hand pollination at zero from spathe cracking.	T <sub>3</sub>	13.50	13.76	13.63	80.21	81.35	80.78
Pollination at zero from spathe cracking with spraying	T <sub>4</sub>	13.10	13.19	13.15	81.64	82.56	82.10
Hand pollination at 3 days after spathe cracking (control).	T <sub>5</sub>	14.53	14.89	14.71	77.68	78.83	78.26
Pollination at 3 days after spathe cracking with spraying	T <sub>6</sub>	12.64	12.88	12.76	81.33	82.15	81.74
Hand pollination at 6 days after spathe cracking.	T <sub>7</sub>	13.46	13.62	13.54	80.70	81.98	81.34
Pollination at 6 days after spathe cracking with spraying	T <sub>8</sub>	13.08	13.26	13.17	83.20	83.24	83.12
Hand pollination at 9 days after spathe cracking.	T <sub>9</sub>	13.52	13.38	13.45	82.18	83.10	82.64
Pollination at 9 days after spathe cracking with spraying	T <sub>10</sub>	12.83	12.45	12.64	82.53	83.17	82.85
N- L.S.D. 5%		<b>0.88</b>	<b>0.95</b>		<b>2.23</b>	<b>2.56</b>	

**Table 6. Effect of pollination method and time on reducing sugar and total sugar % of Saidy date fruits during 2017 and 2018 seasons.**

Characteristics		Reducing sugar			Total sugar %		
		2017	2018	M	2017	2018	M
Hand pollination at 3 days before spathe cracking.	T <sub>1</sub>	58.36	58.61	58.49	74.18	73.79	73.99
Pollination at 3 days before spathe cracking with spraying	T <sub>2</sub>	59.25	58.66	58.96	74.75	74.08	74.42
Hand pollination at zero from spathe cracking.	T <sub>3</sub>	58.21	58.84	58.52	73.96	73.62	73.79
Pollination at zero from spathe cracking with spraying	T <sub>4</sub>	57.98	58.12	58.05	74.53	74.36	74.45
Hand pollination at 3 days after spathe cracking (control).	T <sub>5</sub>	56.24	56.37	56.31	71.34	70.89	71.12
Pollination at 3 days after spathe cracking with spraying	T <sub>6</sub>	58.60	59.45	59.03	74.58	75.27	74.93
Hand pollination at 6 days after spathe cracking.	T <sub>7</sub>	58.35	59.12	58.74	73.83	74.18	74.01
Pollination at 6 days after spathe cracking with spraying	T <sub>8</sub>	59.35	58.87	59.11	74.95	75.09	75.02
Hand pollination at 9 days after spathe cracking.	T <sub>9</sub>	58.67	59.48	59.08	74.48	75.12	74.80
Pollination at 9 days after spathe cracking with spraying	T <sub>10</sub>	59.58	59.23	59.41	75.24	74.83	75.04
N- L.S.D. 5%		<b>1.82</b>	<b>2.14</b>		<b>2.39</b>	<b>2.48</b>	

So, there was a significant improve in fruit chemical characteristics due to the earlying and delaying pollination before and after spathe cracking.

The increment of total soluble solids percentage were 3.46, 3.22, 3.94 & 5.60% as well as 5.58, 4.91, 4.45, 6.29 & 5.86% (as an av. of the two studied seasons) due to hand pollination before three days (T<sub>1</sub>), zero day (T<sub>3</sub>), after six (T<sub>7</sub>) and nine days (T<sub>9</sub>) of spathe cracking, as well as, spray pollen grains suspension before three days (T<sub>2</sub>), zero (T<sub>4</sub>), after three (T<sub>6</sub>), six (T<sub>8</sub>) and nine days (T<sub>10</sub>), compared to the hand pollination after three days of spathe cracking (T<sub>5</sub>), respectively.

On other hand, the decrement of moisture content attained 10.33, 14.34, 7.34, 10.61, 13.26, 7.95, 10.47, 8.57 & 14.07% (as an av. of the two studied seasons) due to T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, T<sub>6</sub>, T<sub>7</sub>, T<sub>8</sub>, T<sub>9</sub> and T<sub>10</sub> compared to T<sub>5</sub>, respectively.

The reduction of the fruit moisture content is very necessary for improving the quality of such cultivar and resulted in an increase in the packable yield.

These findings might be due to a reduction in the fruit set percentage by using pollen grain suspension. Such reduction in fruit setting was effective on lowering the competition that may be occurred between fruits and induce an adequate carbohydrates and other essential foods for the residual ones which consequently enhance the fruit maturity and improve its contents of total soluble solids and sugar contents. So, it could be said that the use of diluted pollen grain suspension has a similar effect like

the fruit thinning on improving fruit quality.

These results will support the results of Al-Sabahi *et al.* (2006), Alabri *et al.* (2006), El-Salhy *et al.* (2010), Abdalla *et al.* (2011) and El-Salhy *et al.* (2012) who recommended using pollen grain suspension get an economic yield with good fruit quality, as well as improving the efficiency of pollination process.

Similar finding were reported by Moustafa (1998), Abdallah *et al.* (2002), Marzouk *et al.* (2002), Al-Wasfy (2005) and El-Salhy *et al.* (2011) who mentioned that fruit quality was significantly improved when pollination was delayed to 6-9 days from spathe cracking.

In regard of the previously mentioned results, it can be recommended that pollination time of the saidy date palm using pollen grain suspension concentrations (2.5 g plus 5.0 g starch/L) was sufficient to get a high yield with good fruit quality.

#### **Evaluation of the cost of pollination method**

Data in Tables (7 & 8) showed the economic evaluation of pollination either using the traditional method, or by spraying pollen grains suspension.

The data indicated that the cost of traditional pollination for area of feddan (85 palms) about 2025 Egyptian pound (LE), while such cost for spraying pollen grains suspension about quarter (495 LE). Also, the total revenue of the traditional method about 112710 LE, against about 121800 LE for spraying grains suspension. Moreover, the net return attained to 121305 LE due to use spraying grains suspension, against 110685

LE for using traditional method. Then the increment due to use spraying grains suspension attained to 9.91% compared to the traditional method.

These results are important for economic and horticultural point of view. The use of spray method reduces the amount of pollen to 0.09

from the amount used by traditional method. Pollination as pollen grain suspension lead to increase the pollination efficiency, decrease consumption of pollen grains and reduce the human effort and pollination costs. In additional, improve the fruit quality and increase product income.

**Table 7. The costs of the pollination process for 85 palm/faddan by two methods.**

Statement	Traditional (Hand pollination)			Spraying grains suspension		
	No. of male spathe	Price	Total cost	No. of male spathe	Price	Total cost
<b>Pollen</b>	75	15	1125	7	15	105
<b>Employment</b>	6	150	900	1	150	150
<b>Motor spray</b>	-	-	-	1	200	200
<b>Article publisher</b>	-	-	-	1	40	40
<b>Total cost</b>			2025			495

**Table 8. Total revenue and the net return for:**

Statement	Traditional (Hand pollination)	Spraying grains suspension
<b>Average production of palm/kg</b>	110.5	102.3
<b>Price per kilo/pound</b>	12	14
<b>Production of ton/fed.</b>	9.39	8.70
<b>Total revenue (LE)</b>	112710	121800
<b>Total costs (LE)</b>	2025	495
<b>Net return (LE)</b>	110685	121305

### Conclusion

Selecting the optimum period at which the female flowers of date palm cv. remain receptive for pollination, as well as the easily method are very essential for date palm growers. The use of pollen grains suspension as an untraditional method in date palm pollination combines both mechanical pollination, fruit thinning, reduces the quantity of pollen grain and improves the pollination efficiency. The optimum period pollination at three days before to six 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 that grow under El-Kharga oasis conditions.

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## تقييم وتحسين كفاءة تلقيح نخيل البلح الصعيدي تحت ظروف الوادي الجديد

عماد فوده سيد أحمد، يوسف مصطفى سيد دياب ، ماهر محمد عبد الحافظ

المعمل المركزي للنخيل - مركز البحوث الزراعية - الجيزة - مصر

### الملخص

أجريت هذه الدراسة خلال موسمي ٢٠١٧، ٢٠١٨ وذلك لتحديد أنسب طريقة وموعد لتلقيح نخيل البلح الصعيدي تحت الظروف المناخية لمحافظة الوادي الجديد حيث تم التلقيح بالطريقة العادية (٧-١٠ شمراخ) أو الرش بمعلق حبوب اللقاح (٢،٥ جم + ٥ جم نشا/لتر ماء) وتم اختيار مواعيد التلقيح طبقاً لموعد انشقاق الأغريض المؤنث بفترات (٣ يوم قبل الانشقاق - يوم الانشقاق ثم ٣ ، ٦ ، ٩ يوم من الانشقاق). كذلك تم حساب تكاليف الإنتاج وصافي الربح للطريقة العادية وطريقة التلقيح برش المعلق المحسن. وكانت النتائج كالتالي:

- حدوث نقص جوهري في نسبة العقد الأولي والنهائي وكذلك وزن السبابة/ نخلة والمحصول نتيجة التلقيح خلال (قبل الانشقاق - يوم الانشقاق أو التأخر إلي ٩ يوم) مقارنة بالتلقيح العادي. بينما لم تظهر فروق جوهريّة نتيجة استخدام المعلق خلال من ٣ إلي ٣ يوم قبل أو بعد الانشقاق.

- ارتبط نقص % العقد الأولي ووزن السبابة بزيادة معنوية في الصفات الطبيعية والكيميائية للثمار.

- لا توجد فروق معنوية بين نسبة العقد والمحصول وكذلك صفات الثمار نتيجة التلقيح بالمعلق خلال الفترة من ٣ إلي ٣ يوم بعد الانشقاق.

- أظهرت نتائج حساب التكاليف أن طريقة المعلق أقل تكلفة وأعلى إيراداً لذا تؤدي إلي صافي ربح عالٍ وعليه فهي اقتصادية.

- أوضحت النتائج أن استخدام التلقيح بالمعلق خلال من ٣-٣ يوم قبل أو بعد الانشقاق أدى إلي إنتاج محصول عالٍ ذو خصائص ثمرية جيدة - فضلاً عن تقليل تكاليف التلقيح وتوفير الجهد البشري وعليه فإن هذه الطريقة الجديدة تعتبر طريقة جيدة من الناحية الاقتصادية والبستانية.

من نتائج هذه التجربة نوصي بإجراء تلقيح نخيل البلح الصعيدي تحت ظروف الوادي الجديد بالرش بمعلق (٢،٥ جم حبوب لقاح + ٥ جم نشا/لتر) وذلك خلال من ٣ إلي ٣-٦ يوم قبل وبعد انشقاق الاغريض لإنتاج محصول عالٍ جيد الصفات.