

## Evaluation of Some Pollen Grain Sources on Yield and Fruit Quality of Samany Date Palm cv. (*Phoenix dactylifera* L.)

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### ABSTRACT

The present investigation was carried out during two successive seasons of 2012 and 2013 to examine the effect of three pollen grain sources namely Giza, Aswan and El-wady El-Gadid on both fruit set and retention percentage, yield, fruit quality and evaluate which could be recommended to use as best pollinizer for Samany date palm. Data obtained revealed that Giza pollen grains were the most suitable pollinizer for Samany date palm, which significantly increased fruit set percentage, bunch weight, yield and markedly improved fruit physical and chemical properties during the two seasons of study.

**Key words:** Date palm, Samany cv., pollen grain sources, fruit set, yield, fruit quality.

### Introduction

Date palm (*Phoenix dactylifera* L.) is one of the most important fruit crops in Egypt. The Arab countries produce about 5727088 metric tons, which represents about 78% of the total international production. Egypt ranked the first among the date's producers in the Arab countries where it produces about 1352950 metric tons, representing about 18% of the world production of dates (FAOSTAT, 2010)

Keeping forward this position in view, improved yield and fruit quality of date palm became a main target for many researchers in Egypt. This aim could be achieved through improving fruit set and fruit retention, as well as fruit quality. Samany date palm is one of the most important cultivars of soft dates grown in the middle of Egypt. Because of date palm can grow and produce under a wide range of soil and climatic conditions, growers have mistakenly believed that it does not require much attention. While, the successful orchard management practices are directed toward obtaining a suitable yield with good fruit quality. One of the best tools for date palm reproductive potential studies is a good choice of pollen grains which have cross compatibility with female flowers to improve the yield and fruit quality.

Several investigators mentioned that both productivity and quality of date palm were affected by source of pollen grains (Hussein *et al.*, 1999; Aly, 2001; Helail and Hassan, 2001; El-Kosary and Soliman, 2003; Al-Muhtaseb and Ghnain, 2006; Khamis *et al.*, 2010 and Omaima *et al.*, 2014).

The objective of this study was to further evaluate the effect of using different pollen sources namely Giza, Aswan and El- Wadi El-Gadid on yield and fruit quality of Samany date palm.

### Materials and Methods

This study was carried out during 2012 and 2013 growing seasons on 20 years old Samany date Palm grown on sandy soil in a private orchard located at Abo-Rawash region Giza Governorate, Egypt. To study the effect of some pollen grain sources on palm fruiting and quality. The experiment palms were chosen healthy, nearly uniform in vigour as possible and subjected to the some cultural practices commonly adopted in the orchard. The number of bunches per palm was adjusted to 8 bunches nearly equal in size by removing excess number from latest and earliest small ones. The leaf/bunch ratio was adjusted to be 9/1 in both seasons. Three sources of pollen grains were used for this study. Male palms are grown at three different regions as follows: Giza, Aswan and El-wadi El-Gadid.

The male spathes were collected once spath craching and strand were separated individually and dried at room temperature to avoid high moisture. Pollination treatments were done by hand dusting. Pollinated spathes were immediately covered with paper bags to protect them from any foreign pollen grains and were released from the bags after 30 days from pollination time; this period was enough to complete fruit setting. Nine female palms were selected and divided into 3 treatments in three replicates (each of one palm) and arranged in randomized complete block design. Fruit set and fruit retention percentage were calculated after one month of pollination and just before harvest, respectively. The number of fruit set was recorded and then fruit set percentage was calculated according to El-Mkhtoun (1981). All bunches were harvested at the 2<sup>nd</sup> week of

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September at the peak of color development in the two seasons. Fruit retained percentage was calculated using equation:

$$\text{Fruit retained \%} = \frac{\text{Total number of retained fruit per bunch}}{\text{Number of retained fruit} \mid \text{Number of flowers cors}} \times 100$$

Bunch weight was estimated in (Kg).  
Yield (Kg/palm).

Samples of 20 fruit were collected from each replicate to determine both physical and chemical characteristics as following: fruit length (cm), fruit diameter (cm), length/diameter ratio (fruit shape index), fruit weight (g), weight and percentage of both pulp and seed (as percentage to fruit weight) were determined. Total soluble solids % (TSS) was determined using hand refractometer. Total acidity % was calculated as malic acid according to AOAC (2000). Total sugars content was determined according to Smith *et al.* (1956). Reducing sugars were determined according to Nelson and Smoggy (1944). Non-reducing sugars was determined as the difference between total and reducing sugars.

Data were statistical analyses at differences between treatment were compared using the least significant differences LSD test at 5% level according to Snedecor and Cochran (1980).

## Results and Discussion

### Fruit Set Percentage:

Data in (Table 1) indicated that fruit set percentage of Samany date palm varied according to the male sources used. The pollination with "Giza" pollen grains exhibited the highest fruit set percentage (82.67 and 83.0%) in both seasons of the study, respectively, followed by "El-Wadi El- Gadid" (70.67 and 79.67%) in the first and second seasons of study while, "Aswan" pollen grains showed the lowest percentage which gave (65.0 and 68.0%) in both seasons of the study, consecutively. These data could indicate degree of cross incompatibility between "Aswan" pollen grains and "Samany" female parents. While, the degree of cross compatibility between "Giza" pollen grains and Samany female exist. Concerning of El-Wady El-Gadid pollen grains they gave a middle case between both "Giza" and "Aswan". The differences in fruit set percentage among the three sources of pollen grains used mit be due to differences of pollen grains viability or the differences in cross compatibility barriers.

The obtained results are in agreement with those obtained by Bacha *et al.*, 2000; Aly, 2001 and Al-Obeed and Abdul-Rahman, 2002.

**Table 1:** Effect of different pollen grain sources on fruit set, fruit retention, bunch weight and yield of Samany date palm cv. during 2012 and 2013 seasons.

Pollen grain sources	Fruit set %		Fruit retention %		Bunch weight (kg)		Yield / palm (kg)	
	2012	2013	2012	2013	2012	2013	2012	2013
Giza	82.67	83.00	37.00	39.00	16.93	19.30	130.64	154.44
Aswan	65.00	68.00	36.00	38.00	12.77	15.00	102.16	120.00
El-Wady El-Gadid	70.67	79.67	37.00	39.00	14.33	16.00	114.64	128.00
L.S.D. 5%	1.99	1.51	N.S	N.S	0.26	0.86	2.05	6.87

### Fruit Retention Percentage:

Data presented in (Table 1) indicated that pollen grain sources did not affect fruit retention percentage in the two seasons of study. In general, the highest value of fruit retention percentage resulted from "Giza" pollen grains followed by El-Wady El-Gadid pollen grains. While "Aswan" pollen grains showed the lowest value of fruit retention of Samany date palm.

### Bunch Weight:

As for bunch weight, data in (Table 1) revealed that "Giza" pollen grains significantly increased bunch weight in both seasons followed by "El-Wady El-Gadid" pollen grains (16.93 & 19.30 and 14.33 & 16.0 kg) in the first and second seasons of the study, respectively. While, palms pollinated with "Aswan" pollen grains gave the lowest bunch weight (12.77 and 15.0 kg/bunch) during the both seasons consecutively. Similar observations were also found by Shaheen *et al.* (1989); El-Sally *et al.* (1997) and Al- Hamoudi *et al.* (2006) reported that there was a positive correlation between fruit set percentage and bunch weight obtained at harvest.

*Yield (kg/palm):*

Data in (Table 1) cleared that pollen grain sources markedly affected palm productivity, hence, Samany palms pollinated with "Giza" pollen grains produced the highest yield (130.64 and 154.44 kg/palm) in the first and second seasons, respectively. On the contrary palms pollinated with "Aswan" pollen grains gave the lowest yield (102.16 and 120.0 kg/palm) in both seasons of the study. While, palms pollinated with El-Wady El-Gadid pollen grains recorded intermediate value in this respect (114.64 and 128.0 kg/palm) in both seasons consecutively. These results are similar to that achieved by Shaheen *et al.*, (1989) and Khamis *et al.*, (2010).

*Fruit Physical Properties:*

Data in (Table 2) showed those fruit length, diameter and fruit shape indexes were enhanced by pollen grain sources. Any how, the difference was significant in the first season only.

Concerning the effect of pollen grain sources i. e., Giza, Aswan and El-Wady El-Gadid, on fruit weight data in (Table 2) revealed that Giza pollen grains induced significantly positive effect followed by El-Wady El-Gadid pollen grains in the first and second seasons of study, respectively. While, palms pollinated with Aswan pollen grains recorded the lowest value in this respect (20.30 and 28.80 g) during the first and second seasons of the study. As for the pulp and seed percentage data in the same table showed that the difference was significant in the first season only. These results are in harmony with those found by Hussein *et al.* (1999).

**Table 2:** Effect of different pollen grain sources on fruit physical properties of Samany date palm cv. during 2012 and 2013 seasons.

Pollen grain sources	Fruit length (cm)		Fruit diameter (cm)		Fruit shape index		Fruit weight (g)		Pulp %		Seed %	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Giza	5.40	5.70	3.40	3.63	1.73	1.67	28.50	35.67	89.67	94.37	10.33	5.63
Aswan	5.00	5.10	3.00	3.27	1.60	1.47	20.30	28.80	85.07	93.13	13.17	6.87
El-Wady El-Gadid	5.20	5.67	3.00	3.37	1.70	1.57	23.00	32.83	88.00	93.60	12.0	6.38
L.S.D. 5%	0.23	N.S	0.13	N.S	0.08	N.S	1.38	4.61	4.33	N.S	1.13	N.S

*Fruit Chemical Properties:*

Data in (Table 3) showed that total soluble solids percentage was significantly affected by pollen grain sources in the first season only but there were no significant differences between male sources in the second season. Anyhow, palms pollinated with Giza pollen grains recorded the highest value (27.0 and 27.67%) in the first and second seasons of the study as compared with the analogous ones pollinated with Aswan pollen grains (19.30 and 23.80 %). While palms pollinated with El-Wady El-Gadid pollen grains recorded intermediate value in this respect (22.67 and 24.33% during the first and second seasons respectively).

**Table 3:** Effect of different pollen grain sources on fruit chemical properties of Samany date palm cv. during 2012 and 2013 seasons.

Pollen grain sources	TSS %		Acidity %		Non Reducing sugars		Reducing sugars		Total sugars	
	2012	2013	2012	2013	2012	2013	2012	2013	2012	2013
Giza	27.00	27.67	0.28	0.23	8.50	8.83	56.57	56.93	65.07	65.76
Aswan	19.30	23.80	0.32	0.30	7.50	7.77	56.50	55.77	64.00	63.54
El-Wady El-Gadid	22.67	24.33	0.31	0.30	8.00	8.20	56.43	56.30	64.43	64.50
L.S.D. 5%	1.64	N.S	0.03	N.S	0.65	0.61	N.S	0.54	N.S	2.00

Concerning the effect of pollen grains under study on titrable acidity percentage of Samany palm data in (Table 3) showed that acidity was significantly affected by pollen grains sources in the first season only. Moreover, Giza male reduced acidity followed by El-Wady El-Gadid male, while, Aswan pollen grains recorded the highest value in this respect.

As for non reducing sugars data in the same table revealed that non reducing sugars of Samany fruits was significantly affected by pollen grain sources in the two seasons of the study. The best results obtained in this respect from Giza pollen grains followed by El-Wady El-Gadid, but Aswan pollen grains reduced the lowest value.

As for in reducing sugars content data in (Table 3) showed that reducing sugars was not significantly affected by different pollen grain sources in the first season only.

Regarding total sugars content data in the same table revealed that total sugar content takes the same previous trend.

The present results are in agreement with those obtained by Al-Hamoudi *et al.*, 2006 and Omaima *et al.*, 2014.

## Conclusion:

It can be concluded that Giza pollen grains were the best suitable pollinizer for Samany palms cultivar which significantly increased fruit set and improved the yield with good quality of fruits.

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