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EVALUATION OF SOME POLLEN GRAIN SOURCES AND THEIR EFFECTS ON PRODUCTIVITY AND FRUIT QUALITY OF SEWI DATE PALM GROWN IN FARAFRA REGION

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ABSTRACT

The present study was carried out during two successive seasons (2016 and 2017) at El-Farafra Oasis region, New valley governorate, Egypt to study the effect of different pollen grain sources (locations) on productivity and fruit quality of Sewi date palm. Female Sewi date palms of healthy, nearly homogenous in growth as well as fruiting ability were selected. The selected Sewi palms were subjected to all horticultural practices applied to the date palms in this region, except those ones under study. The number of female inflorescences/ palm was adjusted to 8 by removing excess earliest, latest, and small clusters. In addition, male date palms as a pollen sources were selected from five locations (Wahat Bahariya, Farafra, Fayoum, Qaliubiya and Giza). All male date palms were selected and marked to complete investigation in both studied seasons. Pollen grains samples were collected at flowering time (beginning of March) from five locations and prepared for pollination. The prepared pollens of each source were used for pollinating 15 female date palms Sewi cv. by using hand pollination (manual method) during March and April in both seasons of this study to detect the effect of pollen grains source on productivity and fruit quality. The most important results can be summarized as follows: Wahat Bahariya location surpassed significantly other males as it gave the highest weight, length and width of spathe during 2016 and 2017 seasons. In addition, Wahat Bahariya location resulted the heaviest and tallest male inflorescence with the tallest strands with also the greatest number of strands per inflorescence during 2016 and 2017 seasons. Moreover, the greatest values of pollen grains viability were significantly coupled with Fayoum location during 2016 and 2017 seasons. Additionally, Farafra and Wahat Bahariya locations ranked statistically second during the two seasons. The highest fruit weight of female Sewi date palm was recorded when using pollen grains from Fayoum location during both experimental seasons. The highest values of fruit length, diameter, shape index, fruit pulp weight (g) and fruit pulp (%) were contaminant with Giza location pollen source in the two seasons. The highest values of total sugars, reducing sugars and T.S.S. percentages were statistically in concomitant to Farafra and Wahat Bahariya location pollen sources in the two seasons.

Key words: ***Sewi date palms, Pollination, Fruit yield and quality.***

INTRODUCTION

Date palm (*Phoenix dactylifera* L.) belongs to the family *Palmaceae* and is called the tree of life in the desert, because it tolerates high temperatures, drought and salinity more than any other plants (Lunde 1978). Date palm is one of the most successful and commercially important crops in Egypt. The numbers of date palm trees in Egypt are about 12,827,235 palms producing about 1,465,030 tons/year (Ministry of Agriculture and Land Reclamation 2015).

Egypt is considered one of the top ten date palm producers; Zaghloul, Samany, Hayany and Sewi are the most economically important date palm cultivars grown in Egypt. Presently, the date palm growers are

facing many difficulties to produce high quality date fruits for economic reasons and to compete with the international market. Two of the important factors affecting fruit quality and productivity of date palm are pollination and fruit thinning. So, it is needed to find the best pollination sources that may be easiest and most convenient for improving fruiting of date palms. A research done of date palm showed that proper pollination is necessary to increase quantitative, qualitative and economic output of date production in palm growing (El-Salhy *et al* 2010 and Iqbal *et al* 2010).

Date palm is a dioeciously plant in which artificial pollination is vital for economical crop. It is known that pollen grains from different males affect the yield and fruit quality. In most palm growing countries including Egypt, male dates are used for pollination. These male dates are highly variable in the sense that they differ greatly in their growth, vigor, spathe characteristics and pollen quality. Many investigators proved that pollen grains from different males not only influence the size and shape of seed (Xinia), but also has a direct effect on fruit set, yield and fruit physical and chemical characteristics (Metaxinia). Moreover, Shaheen *et al* (1989 a) and El-Salhy *et al* (2010) revealed that pollen sources were found to affect fruit and seed characteristics and exhibited metaxinic effect depending on the female cultivar used.

Farafra oasis lies in the western desert of Egypt. It is characterized by its excellent cultivars of date palm and olive. These two crops represent the main source of income to the farmers.

The decrement of superior cultivars number is a big problem. Most of date palm orchards under Egyptian oases “Farafra Oasis” were planted with seeded palms. For successful improvement program of date palm, it could evaluate the unknown seeded date palm trees already grown in a big population of seeded date palms (Rokba *et al* 1990, Metwaly 1999 and Abou Rekab 2005).

Thus, this study aimed to investigate different the effects of pollen grain sources on productivity and fruit quality of Sewi date palm grown in Farafra region.

MATERIALS AND METHODS

The present study was conducted during two successive seasons of 2016 and 2017 at El-Farafra Oasis region, New valley governorate, Egypt to study the effect of different pollen grain sources (locations) on fruit yield and quality of Sewi date palm. Female Sewi date palms of healthy, nearly homogenous in growth as well as fruiting ability were selected. The selected

Sewi palms were subjected to all horticultural practices applied to the date palms in this region except those ones under study.

Values of the monthly temperatures, relative humidity and wind speed during the two seasons of study are shown in Table (1).

Table 1. The maximum and minimum air temperature, relative humidity and wind speed during 2016 and 2017 seasons at Farafra, New valley, Egypt.

Climate of Farafra - New valley - Egypt / 2016-Monthly								
Latitude: 27.05 | Longitude: 27.96 | Altitude: 78								
Months	**SRAD**	**TMAX**	**TMIN**	**RAIN**	**WIND**	**TDEW**	**TMean**	**RH**
January	**15.36**	**17.42**	**5.30**	**0.00**	**3.83**	**0.99**	**10.65**	**52.90**
February	**18.57**	**22.05**	**7.62**	**0.00**	**3.60**	**0.18**	**14.40**	**41.21**
March	**20.35**	**25.22**	**11.58**	**0.00**	**4.22**	**-0.05**	**17.96**	**32.03**
April	**25.23**	**32.56**	**15.70**	**0.00**	**4.10**	**-0.63**	**23.84**	**21.00**
May	**27.07**	**34.53**	**19.16**	**0.00**	**4.38**	**2.91**	**26.81**	**22.29**
June	**29.61**	**39.01**	**23.42**	**0.00**	**4.34**	**5.00**	**31.23**	**20.17**
July	**29.72**	**32.07**	**18.43**	**0.00**	**4.40**	**4.57**	**25.35**	**22.58**
August	**27.88**	**36.68**	**22.86**	**0.00**	**4.08**	**9.22**	**29.80**	**28.33**
September	**24.62**	**34.12**	**20.70**	**0.00**	**4.44**	**9.55**	**27.14**	**34.28**
October	**20.53**	**29.77**	**16.45**	**0.00**	**4.23**	**9.50**	**22.71**	**44.27**
November	**16.12**	**23.96**	**12.58**	**0.00**	**3.77**	**7.61**	**17.70**	**53.36**
December	**14.18**	**17.19**	**5.95**	**0.00**	**3.73**	**2.82**	**10.81**	**58.14**
Average and Sum	**22.44**	**28.72**	**14.98**	**0.00**	**4.09**	**4.31**	**21.53**	**35.88**
Climate of Egypt -New valley - Farafra / 2017-Monthly								
Months	**SRAD**	**TMAX**	**TMIN**	**RAIN**	**WIND**	**TDEW**	**TMean**	**RH**
January	**14.67**	**16.85**	**4.76**	**0.00**	**3.41**	**-0.34**	**10.01**	**50.00**
February	**18.68**	**18.94**	**5.16**	**0.00**	**3.62**	**0.02**	**11.48**	**46.79**
March	**21.65**	**23.74**	**9.28**	**0.00**	**4.39**	**0.27**	**16.15**	**35.95**
April	**24.65**	**29.68**	**13.68**	**0.00**	**4.03**	**-0.04**	**21.45**	**25.64**
May	**26.75**	**34.02**	**18.49**	**0.00**	**4.20**	**3.65**	**26.33**	**24.05**
June	**29.64**	**37.18**	**21.98**	**0.00**	**4.31**	**5.96**	**29.71**	**23.06**
July	**29.57**	**38.19**	**23.57**	**0.00**	**4.18**	**8.25**	**30.99**	**25.19**
August	**27.90**	**37.26**	**23.22**	**0.00**	**4.13**	**9.81**	**30.26**	**28.57**
September	**24.81**	**29.94**	**15.67**	**0.00**	**3.97**	**4.23**	**22.46**	**27.06**
October	**20.82**	**28.31**	**14.67**	**0.00**	**3.96**	**6.37**	**21.03**	**39.22**
November	**16.87**	**23.10**	**10.08**	**0.00**	**3.19**	**3.47**	**15.86**	**44.91**
December	**13.88**	**19.55**	**8.14**	**0.00**	**3.34**	**4.25**	**13.03**	**56.51**
Average and Sum	**22.49**	**28.06**	**14.06**	**0.00**	**3.89**	**3.83**	**20.73**	**35.58**
Interpretation								
SRAD	**(MJ/m^2/day)**							
TMAX	**Maximum Air Temperature (degrees C)**							
TMIN	**Minimum Air Temperature (degrees C)**							
RAIN	**Average Precipitation (mm)**							
WIND	**Wind Speed (m/s)**							
TDEW	**Dew/Frost Point Temperature (degrees C)**							
TMean	**Average Air Temperature (degrees C)**							
RH	**Average Relative Humidity (%)**							

Central Laboratory for Agricultural climate (CLAC) (2016 and 2017).

Male date palms as pollen sources were selected from five locations (Wahat Bahariya, Farafra, Fayoum, Qaliubiya and Giza). All male date palms were selected and marked to complete investigation in both studied seasons. Pollen grain samples were collected at flowering time (at beginning of March) from the five locations and prepared for pollination. Pollination was done one time in the two seasons of study. The female spathes (bunches) were covered by paper bags before and after pollination to protect the inflorescence from any unwanted pollen and avoid the mixing between different sources and kept covered until fruit set was insured. The prepared pollens of each source were used for pollinating 15 female date palms Sewi cv. by using hand pollination (manual method) during March and April in both seasons of study to detect the effect of pollen source on fruit yield and quality.

Data and measurements

1. Some morphological characteristics of male spathe, inflorescence and strand

At flowering time (beginning of March) four mature spathes were randomly collected of each male from five locations (Wahat Bahariya, Farafra, Fayoum, Qaliubiya and Giza) to measure some morphological characteristics of spathes, inflorescences and strands as follows.

Spathe

The average of spathe weight (kg), spathe length (cm) spathe width (cm), spathe index, spathe thickness and spathe cover weight (kg) of each selected male from five locations were measured and recorded.

Inflorescence

The average of inflorescence weight (kg), length and width of each selected male from five locations were measured and recorded.

Strand

Some strands from each inflorescence that represent each male from five locations were separated and subjected to determine average length (cm) and average number of strands per inflorescence.

2. Pollen grain viability

The total number of pollen grains and viable pollen in the sample were microscopically counted following staining test according to Singh *et al* (1961) and the percentage of pollen grain viability was calculated by using the following equation:

$$\text{Percentage of viability} = \frac{\text{Viable pollen grain}}{\text{Total number of pollen grain (sample)}} \times 100$$

3. Yield

All the fruit bunches from each treatment were weighed and finally mean yield per palm (kg) was calculated.

4. Fruit quality

Samples of 30 date palm fruits were taken randomly from each bunch at picking time for determining the different characteristics after removing their calyxes, wiping, and cleaning from dirties.

4.1. Fruit physical properties

Thirty fruits were randomly taken, at harvest time, as a sample for each palm during both seasons of study. Samples fruits were divided into three groups; each of 10 fruits treated as a replicate to determine the fruit weight (g), flesh weight (g), flesh weight (g), seed weight (g), fruit weight/seed weight ratio, fruit volume (cm^3), and fruit dimensions (fruit length and diameter) were measured by using Vernier Caliper (cm).

4.2. Fruit chemical properties

Thirty fruits were randomly taken at harvest time as a sample for each palm during both seasons of the study. Samples of fruits were divided into three groups (10 fruits of each). Each group was treated as a replicate to determine the following characteristics:

a. Total soluble solids (T.S.S.%)

It was determined in fruit juice using Carl Zeiss Refractmeter as described in **A.O.A.C. (1995)**.

b. Fruit acidity percentage

It was determined as described in A.O.A.C. (1995) and the titratable acidity was calculated as malic acid (Ranganna 1979).

c. Total sugars content

It was determined according to Smith *et al* (1956) in the methanol extract using the phenol sulfuric acid method; and the concentration was calculated as g/100 g fresh weight.

d. Reducing sugars content

It was determined in the methanol extract according to Nelson and Somogy (1944) as described in A.O.A.C. (1995); and the percentage was calculated as g/100 g fresh weight.

e. Non-reducing sugars content

It was determined by differences between total and reducing sugars.

f- Moisture percentage

Fruits were cleaned then seeds were removed, fruit flesh was dried at 60 - 65 °C for 48 hours according to Abd El-Rahman (1974) method and moisture percentage was calculated.

Statistical analysis

All data obtained in both seasons of study were subjected to analysis of variance as a simple experiment in a randomized complete block design according to Snedecor and Cochran (1989). However, means were distinguished by the Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

- Some morphological characteristics of spathe

The investigated morphological characteristics: spathe weight, length, width, shape index, thickness and cover weight of date palm male spathes during 2016 and 2017 seasons are presented in Tables (2, 3 and 4) and Photo (1).

- Spathe weight (kg)

Table (2) shows obviously that M_1 (Wahat Bahariya location) surpassed significantly other males in this concern which gave the highest spathes weight, length and width during 2016 and 2017 seasons. Moreover, M_2 (Farafra location) ranked statistically second during both seasons of study. In addition, M_5 (Giza location) was the inferior one in the two seasons.

- Spathe length (cm)

Table (2) and Photo (1) display obviously that spathes length followed the same trend previously detected with the spathes weight parameter. So, the tallest spathes was significantly coupled with M_1 (Wahat Bahariya location) during 1st and 2nd seasons. Moreover, M_2 ranked statistically 2nd. On the contrary, the shortest spathe was significantly induced by M_5 (Giza location) during both seasons of study.

- Spathe width (cm)

It is quite evident as shown from tabulated data in Table (2) and photo (1) that spathes width of different date palm males under study followed nearly the same trend previously discussed with spathe length, particularly the superiority of M_1 and M_2 during both experimental seasons, descendingly followed by M_5, M_4 and M_3 in the first season, respectively and M_3, M_4 and M_5 in the second season, respectively.

Table 2. Means of morphological characteristics of spathe (weight, length and width) of five date palm males during 2016 and 2017 seasons.

Parameters / Males (Location)		Spathe weight (kg)		Spathe length (cm)		Spathe width (cm)	
		2016	2017	2016	2017	2016	2017
M_1	Wahat Bahariya	2.134a	2.112a	63.07a	57.45a	20.65a	20.62a
M_2	Farafra	1.601b	1.475b	50.67b	49.28b	17.77b	17.27b
M_3	Fayoum	1.294d	1.187c	48.43d	47.68c	15.63e	15.32c
M_4	Qaliubiya	1.396c	1.072d	48.80c	45.48d	16.05c	14.57d
M_5	Giza	1.211e	0.959e	47.95e	45.02e	15.82d	12.92e

Means of each column followed by the same letter/s during every season are not significantly differ at 5% level

Photo 1. Some morphological characteristics of spathe, inflorescence and strand of five date palm males during 2016 and 2017 seasons.

- Spathe shape index

Concerning the spathe shape index (spathe length: spathe width) of different date palm males under study, Table (3) shows clearly that the variances were significant from the statistical point of view. Herein, it could be declared that the spathes shape was ablated in most cases. Anyhow, variations in spathe shape indices due to the different males under study could be logically explained on the unparalleled values of two spathe dimensions (length and width).

-Spathe thickness (cm)

It is quite clear as shown from tabulated data in Table (3) that M_1 (Wahat Bahariya location) was statistically the superior and showed the greatest spathe thickness i.e., 7.77 and 7.57 cm during 2016 and 2017 seasons, respectively. Moreover, both M_2 (Farafra location) and M_3 (Fayoum location) ranked statistically 2nd and 3rd after the aforesaid superior male during both experimental seasons. On the contrary, M_5 Giza location ranked statistically last in this concern during 2016 and 2017 seasons.

- Cover weight (kg)

It is quite evident as shown from tabulated data in Table (3) that cover weight of date palm five males under study followed nearly the same previously discussed with spathe thickness, particularly the superiority of M_1, followed by M_2 during 216 and 2017 experimental seasons.

Table 3. Means of morphological characteristics of spathe (index, thickness and cover weight) of five date palm males during 2016 and 2017 seasons.

Parameters / Males (Location)		Spathe index		Spathe thickness (cm)		Cover weight (kg)	
		2016	2017	2016	2017	2016	2017
M_1	Wahat Bahariya	3.06b	2.79d	7.77a	7.57a	0.966a	0.936a
M_2	Farafra	2.85d	2.85c	6.97b	6.78b	0.784b	0.583b
M_3	Fayoum	3.10a	3.11b	5.77d	6.47c	0.604d	0.514c
M_4	Qaliubiya	3.04bc	3.12b	6.07c	6.17d	0.632c	0.409d
M_5	Giza	3.03c	3.49a	5.53e	5.05e	0.586e	0.335e

Means of each column followed by the same letter/s during every season are not significantly differ at 5% level

- Inflorescence characteristics

In this regard, means of inflorescence weight, length, strands length and No. of strands/inflorescence of five date palm males during 2016 and 2017 seasons are presented in Table (4) and Photo (1).

Table 4. Means of morphological characteristics of inflorescence and strand of five date palm males during 2016 and 2017 seasons.

Parameters / Males (Location)		Inflorescence weight (kg)		Inflorescence length (cm)		Strand length (cm)		No. of strands/inflorescence	
		2016	2017	2016	2017	2016	2017	2016	2017
M_1	Wahat Bahariya	1.168a	1.177a	50.13a	51.17a	27.35a	29.08a	235.7a	216.0a
M_2	Farafra	0.817b	0.893b	44.30b	42.15bc	22.67b	24.03b	223.0b	216.0a
M_3	Fayoum	0.690d	0.672c	41.13cd	41.05d	18.92c	19.37d	192.7d	187.0c
M_4	Qaliubiya	0.765c	0.663c	41.65c	43.17b	18.33d	19.72c	186.0e	166.7d
M_5	Giza	0.625e	0.624d	40.32d	41.37cd	16.33e	17.12e	216.0c	209.0b

Means of each column followed by the same letter/s during every season are not significantly differ at 5% level

It is quite evident as shown from Table (4) that the aforesaid four inflorescence characteristics followed to extent the same trend in most cases. Hence in most cases M_1 (Wahat Bahariya location) resulted the heaviest and tallest inflorescence with the tallest strands with also the greatest number of strands per inflorescence during 2016 and 2017 seasons. Moreover, M_2 (Farafra location) ranked statistically second in this concern during both seasons of study, followed by M_3 (Fayoum location) which ranked statistically 3rd in this concern. On the contrary, the least values of the abovementioned measurements were to great extent coupled with M_5 (Giza location) with some of the exception in case of number of strands per inflorescence M_5 ranked statistically third in this case during 2016 and 2017 seasons.

-Pollen viability stained

With regard to the response of pollen grains viability to the differential investigated date palm males, Table (5) shows obviously some considerable variations in this respect. Herein, the greatest values of pollen grains viability were significantly coupled with M_3 (Fayoum location) during 2016 and 2017 seasons. Moreover, M_2 (Farafra location) and M_1 (Wahat Bahariya location) ranked statistically second as an average of both seasons, respectively. On the contrary, the lowest values of pollen grains viability usually in concomitant to M_4 (Qaliubiya location) which ranked statistically last (88.25 and 87.64) during 2016 and 2017 seasons, respectively. Anyhow, the present results are in general accordance with those previously found by El-Salhy *et al* (1997), Helail and EI-Kholey (2000) and Shaheen (2004).

Table 5. Means of pollen grains viability (%) of five date palm males during 2016 and 2017 seasons.

Parameters / Males (Location)		Pollen Viability stained	
		2016	2017
M_1	Wahat Bahariya	92.26c	94.49b
M_2	Farafra	93.12b	93.55c
M_3	Fayoum	94.38a	95.24a
M_4	Qaliubiya	88.25e	87.64e
M_5	Giza	91.13d	89.32d

Means of each column followed by the same letter/s during every season are not significantly differ at 5% level

- Fruit yield (fruits weight/bunch (kg) and fruits weight/palm (kg))

It is quite clear as shown from tabulated data in Table (6) that M_3 (Fayoum location) was statistically the highest and showed the greatest values in this concern during 2016 and 2017 seasons. However, M_2 (Farafra location) ranked statistically 2nd after the aforesaid superior male during both experimental seasons. The reverse was true with M_5 (Giza location) which ranked statistically lowest in this concern. Such trend was true during 2016 and 2017 seasons. The results of pollen grains source on fruit yield of date palms are in agreement with earlier findings reported by Abdel-Hamid (2000), El-Kosary and soliman (2003), Shafique *et al* (2011), Mustafa *et al* (2014), Merwad *et al* (2015), Omar and El-Ashry (2015) and Ricardo *et al* (2017).

Table 6. Means of Fruits weight/bunch and fruits weight/palm of Sewi date palm as influenced by five date palm males during 2016 and 2017 seasons.

Parameters / Males (Location)		Fruits weight/bunch (kg)		Fruits weight/palm (kg)	
		2016	2017	2016	2017
M_1	Wahat Bahariya	14.37c	13.26c	143.7c	132.6c
M_2	Farafra	14.82b	13.37b	148.2b	133.7b
M_3	Fayoum	16.08a	15.77a	160.8a	157.7a
M_4	Qaliubiya	13.68d	13.41b	136.8e	134.1b
M_5	Giza	13.86d	13.07d	138.6d	130.7d

Means of each column followed by the same letter/s during every season are not significantly differ at 5% level

- Fruit quality

- Fruit physical properties

In this respect, average fruit weight, fruit length, fruit diameter, fruit shape index, fruit pulp weight, fruit weight, fruit pulp (%) and fruit seed (%) of Sewi date palm were evaluated in response to the differential investigated date palm males. Data obtained during both 2016 and 2017 seasons are presented in Tables (7 and 8).

- Fruit weight (g)

As shown in Table (7) that the highest fruit weight of Sewi date palm was exhibited significantly by M_3 (Fayoum location) during both experimental seasons. Moreover, M_5 (Giza location) ranked statistically second, descendingly followed by M_4 (Qaliubiya location) than M_1 (Wahat Bhariya location) which ranked last in this concern, especially in the second season.

- Fruit dimensions (length, diameter and fruit shape index)

It is quite evident as shown in Table (7) that the aforesaid three fruit dimensions followed to extent the same trend in most cases. Hence, in most cases M_1 (Giza location) was statistically the superior in this concern during 2016 and 2017 seasons. Moreover, M_3 (Fayoum location) ranked statistically second in this concern during both seasons of study, followed by M_4 (Qaliubiya location) which ranked statistically 3rd in this concern. On the contrary, the lowest values of the abovementioned measurements were to great extent coupled with M_2 (Farafra location) with some of the exception in few cases during 2016 and 2017 seasons. Such trend was true during both experimental seasons.

Table 7. Means of some fruit physical quality properties (fruit weight, length, diameter and shape index) of Sewi date palm as influenced by five date palm males during 2016 and 2017 seasons.

Parameters / Males (Location)		Fruit weight (g)		Fruit length (cm)		Fruit diameter (cm)		Fruit shape index	
		2016	2017	2016	2017	2016	2017	2016	2017
M_1	Wahat Bahariya	10.25b	10.23d	3.52c	3.50d	2.11d	2.08d	1.67b	1.68a
M_2	Farafra	10.16b	10.31c	3.53c	3.53c	2.14bc	2.12c	1.65c	1.67a
M_3	Fayoum	10.85a	11.15a	3.62a	3.70a	2.15b	2.25a	1.68ab	1.64b
M_4	Qaliubiya	10.31b	10.54b	3.60b	3.59b	2.13c	2.20b	1.69a	1.63b
M_5	Giza	10.36b	11.18a	3.63a	3.71a	2.17a	2.27a	1.68ab	1.63b

Means of each column followed by the same letter/s during every season are not significantly differ at 5% level

- Fruit pulp weight (g) and fruit pulp (%)

The response of fruit pulp weight to various investigated males is shown in Table (8)**.** Herein, it could be noticed the superiority of M_5 (Giza location) during both experimental seasons, followed by M_3 (Fayoum location), particularly in 2nd season. However, the other investigated treatments increased fruit pulp weight and percentage over M_5 (Wahat Bahariya location). Such trend was true during 2016 and 2017 seasons.

Table 8. Means of some fruit physical quality properties (pulp weight, seed weight, pulp % and seed %) of Sewi date palm as influenced by five date palm males during 2016 and 2017 seasons.

Parameters / Males (Location)		Fruit pulp weight (g)		Fruit seed weight (g)		Fruit pulp (%)		Fruit seed (%)	
		2016	2017	2016	2017	2016	2017	2016	2017
M_1	Wahat Bahariya	8.82d	8.78e	1.43a	1.45a	86.04c	85.85c	13.96a	14.15a
M_2	Farafra	8.74e	8.92d	1.42a	1.39b	85.99c	86.54b	14.01a	13.46b
M_3	Fayoum	9.43b	9.76b	1.42a	1.38b	86.92b	87.59a	13.08b	12.41d
M_4	Qaliubiya	8.89c	9.15c	1.42a	1.40b	86.23c	86.75b	13.77a	13.25c
M_5	Giza	9.62a	9.72a	0.74b	1.36c	92.98a	87.83a	7.02c	12.17e

Means of each column followed by the same letter/s during every season are not significantly differ at 5% level

- Fruit seed weight (g) and fruit seed (%)

It is quite clear as shown from tabulated data in Table (8) that the differences in most cases were relatively not so pronounced to be taken into consideration from the statistical standpoint particularly in the first season. Moreover, M_1 (Wahat Bahariya location) was statistically the superior and showed the greatest values in this concern during 2016 and 2017 seasons. However, M_2 (Farafra location) ranked statistically 2nd after the aforesaid superior male during both seasons. On the contrary, M_5 (Giza location) ranked statistically lowest in this concern during 2016 and 2017 seasons.

The tabulated results dealing with the enhancement of fruit physical properties due to pollen grains source go in line with the findings of Shaheen *et al* (1989 a), Al-Makhton and Abd-E1-Kader (1990), Melegy (1993), Abdel-Hamid (2000) and El-Kosary and Soliman (2003).

- Fruit chemical properties

In this regard fruit juice total soluble solids (TSS) %, total acidity %, TSS/acid ratio, total sugars %, reducing sugars %, non-reducing sugars %

and fruit moisture% were the seven investigated fruit juice chemical properties for Sewi date palm regarding their response to differential males type. Data obtained during both 2016and 2017 experimental seasons are presented in Tables (9 and 10).

Table 9. Means of some fruit chemical properties (TSS %, total acidty % and TSS/acidity ratio) of Sewi date palm as influenced by five date palm males during 2016 and 2017 seasons.

Parameters / Males (Location)		Fruit TSS (%)		Total acidity (%)		TSS/acidity ratio	
		2016	2017	2016	2017	2016	2017
M_1	Wahat Bahariya	80.11a	79.92a	0.230c	0.259b	348.9a	308.6b
M_2	Farafra	77.14d	76.95e	0.260b	0.276ab	296.3c	278.5d
M_3	Fayoum	78.78c	78.75d	0.283a	0.281a	278.7d	280.6c
M_4	Qaliubiya	79.50b	79.30c	0.261b	0.283a	304.6b	280.2cd
M_5	Giza	80.03a	79.76b	0.229c	0.230c	349.0a	346.3a

Means of each column followed by the same letter/s during every season are not significantly differ at 5% level

- Fruit juice total soluble solids percentage (TSS) %

TSS % was markedly coupled with M_1 (Wahat Bahariya location)**,** whereas the richest TSS % i.e., 80.11 and 79.92 % was resulted during 1st and 2nd experimental seasons, respectively (Table, 9). Moreover, M_5 (Giza location) ranked statistically second as the influence on fruit juice TSS % was concerned. The reverse was true with M_2 (Farafra location) which induced significantly the poorest fruit in their TSS % content during both seasons. In addition, other males were in between the abovementioned two extremes. Such trend was true during both experimental seasons.

- Fruit juice total acidity percentage

Concerning the fruit juice total acidity% of Sewi date palm as influenced by the differential investigated males, data obtained during both 2016 and 2017 experimental seasons are presented in Table (9). It is quite evident that the highest values in this concern was significantly detected by M_3 (Fayoum location) and M_4 (Qaliubiya location) i.e., 0.283 and 0.282 % during 1st and 2nd experimental seasons, respectively. On the contrary, M_5 (Giza location) ranked statistically lowest in this concern during 2016 and 2017 seasons. Such trend may be attributed to the relative delaying in fruit maturation exhibited by increasing both fruit weight and size induced by these effective males previously discussed with fruit physical properties.

- Fruit juice total soluble solids: total acidity ratio

It is quite clear as shown from tabulated data in Table (10) that the total soluble solids: total acidity ratio (TSS/Acid ratio) was slightly influenced by the differential male types. Anyhow, M_5 (Giza location) was statistically the superior and showed the greatest values in this concern during 2016 and 2017 seasons. However, M_1 (Wahat Bahariya location) ranked statistically 2nd after the aforesaid superior male during both experimental seasons. On the contrary, M_3 (Fayoum location) and M_2 (Farafra locaton) ranked statistically last in this concern during 2016 and 2017 seasons, respectively. Such trend of response (relative lower differences in fruit juice TSS/Acid ratio to various investigated treatments) could be logically explained depending upon the paralleled rates of changes exhibited in both fruit juice TSS and total acidity parameters as influenced by different male types.

Table 10. Means of some fruit chemical properties (Total sugars, reducing sugars, non reducing sugars and moisture percentages) of Sewi date palm as influenced by five date palm males during 2016 and 2017 seasons.

Parameters / Males (Location)		Total sugars (%)		Reducing sugars (%)		Non reducing sugars (%)		Fruit moisture (%)	
		2016	2017	2016	2017	2016	2017	2016	2017
M_1	Wahat Bahariya	71.48b	72.01a	61.38a	61.82a	10.09d	10.20a	13.15c	13.15b
M_2	Farafra	71.71a	70.72c	60.72c	61.27c	10.99a	9.45c	13.19b	13.25ab
M_3	Fayoum	70.73e	70.61d	60.43d	61.23d	10.30c	9.37c	13.22a	13.29a
M_4	Qaliubiya	70.80d	71.13b	60.36e	60.08e	10.44b	10.05b	13.21ab	13.20ab
M_5	Giza	71.34c	71.96a	61.10b	61.69b	10.24c	10.26a	13.14c	13.16b

Means of each column followed by the same letter/s during every season are not significantly differ at 5% level

- Fruit juice total sugars percentage

Table (10) displays clearly that the highest value in total sugars was statistically in concomitant to M_2 (Farafra location) and M_1 (Wahat Bahariya location) during 2016 and 2017 seasons, respectively. The reverse was true with M_3 (Fayoum location) which induced significantly the poorest fruits in their sugars % during both experimental seasons. In addition, other males were in between the abovementioned two extremes. Such trend was true during both experimental seasons.

- Fruit juice reducing sugars percentage

Data obtained during both experimental seasons as shown from Table (10) displayed that M_1 (Wahat Bahariya location) recorded the greatest reducing sugars % i.e., 61.38 and 61.82 % during 2016 and 2017 seasons, respectively. Moreover, M_5 (Giza locatin) and M_2 (Farafra location) ranked statistically 2nd and 3rd respectively, the aforesaid superior treatment during both experimental seasons. The reverse was true with M_4 (Qaliubiya location) which ranked statistically last in this concern during 2016 and 2017 seasons.

- Fruit juice non-reducing sugars percentage:

Table (10) showed that non-reducing sugars % followed to great extent the same trend previously detected with total sugars percentage. Hence, the highest value in non-reducing sugars % was statistically in concomitant to M_2 (Farafra location) and M_5 (Giza location) during 2016 and 2017 seasons, respectively. Moreover, M_4 (Qaliubiya location) and M_5 (Giza location) ranked statistically second during 2016 and 2017 seasons, respectively. The reverse was true with M_3 (Fayoum location) which induced significantly the poorest fruit in their non-reducing sugars % during both experimental seasons.

- Fruit moisture percentage (%):

Table (10) displayed obviously that the highest fruit moisture % was markedly coupled with M_3 (Fayoum location) during 1st and 2nd experimental seasons. Moreover, M_4 (Qaliubiya location) ranked statistically second in this regard. Meanwhile, the reverse was true with M_1 (Wahat Bahariya location) which induced significantly the poorest fruits in their moisture % during both experimental seasons. In addition, other males were in between the abovementioned two extremes. Such trend was true during both experimental seasons.

The obtained results concerning the enhancing affect of pollen grains source on chemical properties of date fruit are in harmony with the findings of Shaheen *et al* (1989 b), Rahemi (1998), Abdel-Hamid (2000), Iqbal *et al* (2009), Omar and El-Ashery (2015), Merwad *et al* (2015), Muhammed *et al* (2017) and Ricardo *et al* (2017).

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تقييم بعض مصادر حبوب اللقاح وتأثيراتها على إنتاجية وجودة ثمار نخيل البلح السيوى النامى فى منطقة الفرافرة

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أجريت هذه التجربة خلال موسمين متعاقبين (٢٠١٦-٢٠١٧) فى منطقة واحة الفرافرة – محافظة الوادى الجديد – مصر، لدراسة تأثير مصادر مختلفة من حبوب اللقاح على إنتاجية وجودة ثمار نخيل البلح السيوى. تم إختيار نخلات صحية متماثلة فى النمو والاثمار. وتم إجراء جميع العمليات البستانية لهذه النخلات والخاصة بتلك المنطقة ما عدا عامل الدراسة (مصدر حبوب اللقاح). تم ترك عدد ٨ نورات زهرية مؤنثة/نخلة مع إزالة النورات الزهرية المبكرة والمتأخرة والصغيرة. بالإضافة إلى ذلك فقد تم إختيار ذكور نخيل بلح كمصدر لحبوب اللقاح من خمس مناطق (الواحات البحرية – الفرافرة – الفيوم – القليوبية – الجيزة). جميع الذكور المختارة تم تحديدها لاستخدامها فى التلقيح فى كلا الموسمين. تم جمع عينات حبوب اللقاح فى بداية شهر مارس من الخمس مناطق وتم تجهيزها للتلقيح. تم إستخدام حبوب لقاح كل منطقة فى تلقيح ١٥ نخلة سيوى عن طريق التلقيح اليدوى خلال شهرى مارس وابريل فى كلا الموسمين. وذلك لتحديد تأثير حبوب اللقاح على انتاجية وجودة ثمار نخيل البلح السيوى. ويمكن تلخيص أهم النتائج المتحصل عليها كالآتى: أعطى ذكر منطقة الواحات البحرية أكبر وزن وطول وعرض للأغريض خلال موسمى الدراسة. بالإضافة إلى ذلك فقد أعطى ذكر منطقة الواحات البحرية أكبر النورات الزهرية طولاً ووزناً وأطول شمراخ زهرى مع أكبر عدد من الشماريخ الزهرية/النورة خلال موسمى الدراسة. وقد تم الحصول على أعلى قيمة لحيوية حبوب اللقاح من منطقة الفيوم يلى ذلك منطقتى الفرافرة والواحات البحرية. فى حين أعطى ذكر منطقة الفيوم أكبر وزن للثمرة خلال موسمى الدراسة، بينما تم الحصول على أعلى قيم لطول وقطر وشكل الثمرة ووزن اللب والنسبة المئوية للب عن طريق التلقيح بحبوب لقاح ذكر منطقة الجيزة. بينما تم الحصول على أعلى محتوى للثمار من السكريات الكلية والمختزلة والمواد الصلبة الذائبة الكلية عن طريق التلقيح بحبوب لقاح منطقتى الفرافرة والواحات البحرية.

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