

COMPARATIVE EVALUATION OF SOME MALE PALMS IN THREE DISTRICTS IN EGYPT

Abdullah, A. S. ; H. A. AbdelKareem and Farida A. Abd rabo

Tropical fruit research division, Horticulture Res. Inst., Agric. Res. Center, Giza, Egypt.

ABSTRACT

This investigation was carried out at three Egyptian Governorates, i.e. New Valley (El-Dakhla oasis), Damietta (Kafr El-Batikh) and Wady El-Natron at private orchard during two successive seasons of 2005 and 2006, to evaluate date palm males used for pollination of female palm in these districts. The obtained results showed that, males differed in their morphological spathe characteristics. Time of flowering also differed between males in each governorate. At the New Valley flowering was earlier than at the other two governorates. Viability of pollen grains ranged from 82.9 to 85.2 %. Males from New Valley produced significantly more amount of pollen grain comparing to other regions. The number of retained flowers on strands differed significantly between the three governorates under investigation but the new valley gave the highest percentage of retained flowers on the strands.

Keywords: Spathe, inflorescence, pollination, male, sheath, strands, pollen grains.

INTRODUCTION

The date palm (*Phoenix dactylifera*) is native to the desert regions of Northern Africa, where moisture is available from springs or underground water. This is truly a palm of desert oases. It has been cultivated for thousands of years and its fruit was an important food in biblical times, providing desert travelers with a nutritious meal. Dates could be dried and carried on long journeys across vast areas of parched land. The date palm is a dioecious species, with male and female flowers produced on separate trees. Dates palms to some extent are naturally wind pollinated, but humans have assisted in this pollen transfer since great antiquity. As early as 2300 B.C., people had learned to hang a male inflorescence in a female tree to enhance pollination. It has become customary to plant one male palm for every 25- 30 females to provide pollen for artificial pollination which is an ancient practice.

Traditionally, a few strands of open male flowers are put upside-down in a female inflorescence while it is still upright, and a cord is bound around the latter to keep the strands in place when the cluster enlarges and bends downward. However, the pollen can be dried and will keep for 6 months at room temperature. Lack of pollination results in small, seedless fruits. The seedling males are highly variable in the sense that they differ greatly in their growth vigor, spathe characteristics and pollen quality (Nixon, 1959, El-Sabrou, 1979 and Bacha *et al.*, 1986). In addition date palm growers use any pollen that is readily available. As a result, yield and fruit quality of the palms differ greatly from one year to another (Chandler, 1958, El-Sabrou, 1979, and Osman *et al.*, 1974). For these reasons, this

investigation was carried to evaluate and select males suitable to various regions in Egypt.

MATERIALS AND METHODS

This investigation was carried out during two successive seasons of 2005 and 2006 at three Egyptian governorates i.e. New Valley (El-Dakhla oasis), Damietta (Kafr El-Batikh) and Wady El-Natron at private orchard.

In 2004 general survey was conducted at each governorate of the three mentioned ones, and 20 to 40 date palm male were observed. Next year, the evaluation involved five vigor male palms and free of disease for each governorate. At blooming time, a number of spathes from each male were collected for further studies of spathe characteristics. In the meantime, classification of the males with respect to time of flowering (early, medium and late) for New Valley, Wady El-Natron and Damietta, respectively. The number of spathes formed each male was determined. The spathes were collected after being mature (shortly after the sheath had opened). The spathes were then cut (three from each male), one spathe as replicate, and taken to the laboratory for determining the morphological characteristics i.e. spathe weight (g), length, width (cm), sheath weight (g), inflorescence weight (g), inflorescence length (cm), number of strands per inflorescence, length of strands (cm), weight of pollen grains per spathe and pollen viability.

For pollen grains extraction, the spathes after collected from male palm, were left at room temperature, then the strands were cut off and spread in a thin layer on paper sheets for 3-4 days till they become dry. Then the pollen grains were separated from the flower parts. The weight of the pollen grains was determined for each spathe.

Pollen viability was determined according to Albert (1930) and Asif *et al.*, (1983). The media used consists of 10% sucrose, 1% agar and 500 ppm boron. A small amount of the pollen grains was added to the media in petri dishes. The dishes were placed in an incubator at 27° C for 24 hours. A square piece of the media of about 1 cm length was taken and placed on a slide for testing under the microscope. An initiation of a pollen tube growth was considered as evidence of germination. Germination counts were taken from 4 fields for each slide.

Also, a retention flower was determined as follow: spathes were left at room temperature for one week, shaking the strand and count the fallen flowers, the retention flower was determined according the following equation:

$$\text{No. Retention flower} = \frac{\text{The fallen flowers}}{\text{Total number of flowers}} \times 100$$

Statistical analysis of the data was thoroughly carried out and the individual comparisons were compared by using the new least significant differences (New LSD) according to Waller & Duncan (1969). The percentage was transferred to arcsine. Interactions studies were carried out as reported by Snedecor & Cochran (1972).

RESULTS AND DISCUSSION

Time of male flowering:

Time of flowering can be classified as follow: early, medium and late according each region. New valley produced the early spathes flowering starting from the 1st of March, while Damietta produced the latest spathes at the end of the same month and Wady el-Natron came in the middle.

Spathes morphological characteristics:

It was observed from Tables (1-5) that spathe number, length,width and weight varied from male to another at the same region but males from Wadi El-Natron produced the longest spathe followed by Damietta then New Valley. This is true for the two seasons. Data also, indicate that New valley palms produced the wider spathes and Damietta gave the narrowest spathes. Same trend was observed about spathe weight since spathes from New valley were the heaviest, while spathes from Damietta were lighter. The differences between spathes weight was significant. Spathe number differed insignificant between the three districts.

Table 1: Number of spathes at three governorates during the two seasons 2005 and 2006

Male No (treatment)	First Season				Second season			
	P1(new valley)	P2 (Wady el-natron)	P3 (Dameitta)	Mean	P1(new valley)	P2 (Wady el-natron)	P3 (Dameitta)	P1(new valley)
1	25	21	24	23.33	27	22	24	24.33
2	20	25	22	22.33	22	23	22	22.33
3	26	22	21	23.0	24	20	21	21.67
4	22	18	23	21.0	23	19	21	23.0
5	26	20	24	23.33	23	22	24	23.0
Mean	23.8	21.2	22.8		23.8	21.2	22.4	

New L.S.D. at .05 for

Places = 1.1687

No = 1.5700

Places x No = 2.6132

1.0136

1.3086

2.2666

Table 2: Spathe weight (g) at three governorates during the two seasons 2005 and 2006

Male No (treatment)	First Season				Second season			
	P1(new valley)	P2 (Wady el-natron)	P3 (Dameitta)	Mean	P1(new valley)	P2 (Wady el-natron)	P3 (Dameitta)	P1(new valley)
1	2978.3	2771.7	2335.0	2695.0	2993.3	2780.0	2333.3	2702.2
2	3116.7	2538.3	2310.0	2655.0	3150.0	2536.7	1610.0	2432.2
3	2526.7	2615.0	2138.3	2426.7	2786.7	2646.7	2140.0	2524.4
4	2443.3	2708.7	2233.3	2461.8	2510.0	2705.0	2225.0	2480.0
5	2700.0	2897.7	2188.3	2595.3	2716.7	2898.3	2161.7	2592.2
Mean	2753.0	2706.3	2241.0		2831.3	2713.3	2094.0	

New L.S.D. at .05 for

Places = 39.311

No = 50.751

Places x No = 87.903

237.28

306.33

530.58

Table 3: Spathe length (cm) at three governorates during the two seasons 2005 and 2006

Male No (treatment)	First Season				Second season			
	P1(new valley)	P2 (Wady el-natron)	P3 (Dameitta)	Mean	P1(new valley)	P2 (Wady el-natron)	P3 (Dameitta)	Mean
1	73.33	117.33	100.00	96.89	75.33	115.67	99.67	96.89
2	74.00	110.33	103.67	96.00	75.00	109.67	101.67	95.44
3	100.00	116.67	100.67	105.78	99.67	115.33	101.33	105.44
4	104.33	98.00	97.33	99.89	107.00	97.33	96.33	100.22
5	101.00	104.67	94.67	100.11	105.00	104.00	94.00	101.00
Mean	90.53	109.40	99.27		92.40	108.40	98.60	

New L.S.D. at .05 for

Places = 2.3031

2.7545

No = 2.9733

3.5561

Places x No = 5.1499

6.1593

Table 4: Spathe width (cm) at three governorates during the two seasons 2005 and 2006

Male No (treatment)	First Season				Second season			
	P1(new valley)	P2 (Wady el-natron)	P3 (Dameitta)	Mean	P1(new valley)	P2 (Wady el-natron)	P3 (Dameitta)	P1(new valley)
1	32.667	24.667	26.667	28.000	34.000	24.000	26.000	28.000
2	34.667	24.000	27.000	28.556	42.333	24.667	25.667	30.889
3	29.000	27.667	24.333	27.000	30.667	27.667	23.667	27.333
4	24.500	27.667	25.333	25.833	25.667	27.333	25.000	26.000
5	25.000	30.000	24.667	26.556	27.333	30.333	23.667	27.111
Mean	29.167	26.800	25.600		32.000	26.800	24.800	

New L.S.D. at .05 for

Places = 1.2162

1.1355

No = 1.5700

1.4660

Places x No = 2.7194

2.5391

Table 5: Sheath weight (g) at three governorates during the two seasons 2005 and 2006

Male No (treatment)	First Season				Second season			
	P1(new valley)	P2 (Wady el-natron)	P3 (Dameitta)	Mean	P1(new valley)	P2 (Wady el-natron)	P3 (Dameitta)	P1(new valley)
1	1231.7	1241.0	1032.0	1168.2	1250.0	1251.7	1003.0	1168.2
2	1268.3	1200.0	1000.3	1156.2	1261.7	1200.0	981.7	1147.8
3	1133.3	1188.3	957.7	1093.1	1223.3	1190.7	973.3	1129.1
4	955.0	1219.7	988.7	1054.4	1046.7	1238.3	1001.0	1095.3
5	1035.0	1261.7	953.3	1083.3	1105.7	1297.3	988.3	1130.4
Mean	1124.7	1222.1	986.4		1177.5	1235.6	989.5	

New L.S.D. at .05 for

Places = 25.155

13.619

No = 32.474

17.583

Places x No =56.247

30.454

Characteristics of the strands:

Data in Tables (5-9) revealed that strand number, weight, and pollen grains per spathe were significantly higher in spathes from New valley followed by Wady el-Natron and the least from Damietta ones. These datum

are in accordance with the finding of Nixon, 1959, El-Sabrou, 1979 and Bacha *et al.*, 1986. They stated that the seedling males are highly variable in the sense that they differ greatly in their growth vigor, spathe characteristics and pollen quality.

Table 6: Inflorescence weight (g) at three governorates during the two seasons 2005 and 2006

Male No (treatment)	First Season				Second season			
	P1(new valley)	P2 (Wady el-natron)	P3 (Dameitta)	Mean	P1(new valley)	P2 (Wady el-natron)	P3 (Dameitta)	P1(new valley)
1	1746.7	1530.7	1303.0	1526.8	1743.3	1528.3	1330.3	1534.0
2	1848.3	1338.3	1309.7	1498.8	1888.3	1336.7	628.3	1284.4
3	1393.3	1426.7	1180.7	1333.6	1563.3	1456.0	1166.7	1395.3
4	1488.3	1489.0	1244.7	1407.3	1463.3	1466.7	1224.0	1384.7
5	1665.0	1636.0	1235.0	1512.0	1611.0	1601.0	1173.3	1461.8
Mean	1628.3	1484.1	1254.6		1653.9	1477.7	1104.5	

New L.S.D. at .05 for

Places =34.704

No =44.803

Places x No = 77.600

236.56

305.39

528.96

Table 7: Pollen grain weight (g) at three governorates during the two seasons 2005 and 2006

Male No (treatment)	First Season				Second season			
	P1(new valley)	P2 (Wady el-natron)	P3 (Dameitta)	Mean	P1(new valley)	P2 (Wady el-natron)	P3 (Dameitta)	P1(new valley)
1	103.00	92.00	82.67	92.556	104.33	92.33	82.33	93.000
2	107.33	90.00	90.33	95.889	105.33	88.33	90.00	94.556
3	105.67	89.00	84.00	92.889	105.67	89.67	83.33	92.889
4	98.33	86.67	84.00	89.667	100.67	86.00	83.67	90.111
5	97.67	82.67	81.33	87.222	99.00	82.33	80.67	87.333
Mean	102.40	88.07	84.47		103.00	87.73	84.00	

New L.S.D. at .05 for

Places =1.8864

No = 2.4353

Places x No = 4.2180

2.0856

2.6925

4.6635

Table 8: Number of strand per spathe at three governorates during the two seasons 2005 and 2006

Male No (treatment)	First Season				Second season			
	P1(new valley)	P2 (Wady el-natron)	P3 (Dameitta)	Mean	P1(new valley)	P2 (Wady el-natron)	P3 (Dameitta)	P1(new valley)
1	357.00	373.33	328.33	352.89	355.67	368.33	328.33	350.78
2	343.00	360.00	326.67	343.22	345.33	352.00	327.33	341.56
3	340.00	327.00	306.67	324.56	338.67	327.33	310.00	325.33
4	321.00	320.33	316.00	319.11	323.67	318.00	319.33	320.33
5	325.33	319.00	319.00	321.11	327.00	320.33	315.00	320.78
Mean	337.27	339.93	319.33		338.07	337.20	320.00	

New L.S.D. at .05 for

Places = 4.5523

No = 5.8770

Places x No = 10.179

5.5381

7.1497

12.384

Table 9: Strand length (cm) at three governorates during the two seasons 2005 and 2006

Male No (treatment)	First Season				Second season			
	P1(new valley)	P2 (Wady el-natron)	P3 (Dameitta)	Mean	P1(new valley)	P2 (Wady el-natron)	P3 (Dameitta)	P1(new valley)
1	25.000	31.333	26.667	27.667	25.333	31.000	25.667	27.333
2	24.000	32.667	26.000	27.556	24.667	33.000	26.667	28.111
3	26.667	26.333	24.667	25.889	27.667	26.000	24.000	25.889
4	25.333	26.000	23.333	24.889	25.000	25.667	24.000	24.889
5	30.333	34.333	26.667	30.444	32.000	32.667	26.000	30.222
Mean	26.267	30.133	25.467		26.933	29.667	25.267	

New L.S.D. at .05 for

Places = 1.1687

No = 1.5700

Places x No = 2.6132

1.0136

1.3086

2.2666

Pollen grains germination (%):

Data concerning pollen grain viability is illustrated at Table (10) and show that viability ranged from 78.5 to 88%. Spathes from New valley produced the more fertile pollen grains followed by Dametta spathes.

These data are in accordance with the findings of Nixon, 1959, El-Sabrou, 1979 and Bacha *et al.*, 1986 who revealed that male seedling differ in the spathe character and pollen viability.

Table 10: Pollen grain germination (%) at three governorates during the two seasons 2005 and 2006

Male No (treatment)	First Season				Second season			
	P1(new valley)	P2 (Wady el-natron)	P3 (Dameitta)	Mean	P1(new valley)	P2 (Wady el-natron)	P3 (Dameitta)	P1(new valley)
1	86.333	81.667	84.667	84.222	86.667	78.667	85.667	83.667
2	85.000	82.000	86.333	84.444	84.667	82.000	85.667	84.111
3	86.000	83.333	84.000	84.444	87.000	83.000	84.333	84.778
4	82.333	83.667	86.333	84.111	82.000	84.333	88.000	84.778
5	86.667	84.000	84.000	84.889	85.000	84.667	83.000	84.222
Mean	85.267	82.933	85.067		85.067	82.533	85.333	

New L.S.D. at .05 for

Places = 1.3760

No = 1.7764

Places x No = 3.0768

1.7713

2.2867

3.9607

Flower retention percentage:

Table (11) show that number of flowers retained attached on strands was the highest for spathes produced in New valley followed by Wady El-Natron while Damietta came at last. The same trend was observed in the two studied seasons concerning pollen grain viability and number of retention flower.

Table 11: Number of retained flower on rachis at three governorates during the two seasons 2005 and 2006

Male No (treatment)	First Season				Second season			
	P1(new valley)	P2 (Wady el-natron)	P3 (Dameitta)	Mean	P1(new valley)	P2 (Wady el-natron)	P3 (Dameitta)	P1(new valley)
1	92.667	83.000	83.333	86.333	92.333	85.000	84.667	87.333
2	87.667	82.667	80.000	83.444	87.667	82.333	79.667	83.222
3	85.000	85.333	83.333	84.556	84.333	84.333	82.667	83.778
4	87.333	82.667	83.333	84.444	87.667	82.000	82.667	84.111
5	84.000	84.667	85.333	84.667	83.333	85.333	86.000	84.889
Mean	87.333	83.667	83.067		87.067	83.800	83.133	

New L.S.D. at .05 for

Places = 1.4894

No = 1.9228

Places x No=3.3304

1.5732

2.0310

3.5178

Conclusion

Males evaluated in this study could be classified according to spathe characteristics (number, weight, width, length, number of strands and pollen grains weight and pollen viability). Spathes produced from New valley were the best ones according to pollen grains viability and also according to the number of flower retained on strands and as such there is rachis or spathes could be stored for late female flower pollination.

REFERENCES

- Albert, D. W. (1930). Viability of pollen and receptivity of pistillate flowers. Date Growers Inst. Report., 9:5-6.
- Asif, M. I., O. A. Al-Tahr and A. F. Farah (1983). The effects of some chemicals and growth substances on pollen germination and tube growth of date palm. Hortscience, 18(3):479-80..
- Bacha, M. A.; T. A. Nase and M. A. Shaheen (1986). Evaluation of seedling male palms used in pollination in the central region, Saudi Arabia. Saudi Arabian Center for Science and Technology (SANCST). Date palm journal, 4(2):163-173.
- Chandler, W. H. (1958). Evergreen orchards. Lea and Febigers Philadelphia, USA.
- El-Sabrou, M. B. I. K. (1979). Some physiological studies on the effect of pollen type on fruit setting and fruit quality in some date palm varieties. M.Sc. Thesis, Fac. Agric. Alex. Univ. Egypt.
- Nixon, R. W. (1959). Growing dates in the United States. Agric. Inform. Bull. No. 207.
- Osman, A. M., W. Reuther and L. C. Erickson (1974). Xenia and metaxenia studies in date palm. Date Growers Inst., Report, 51:6-16.
- Snedecor, G.W. and W.G.Cochran (1972). Statistical methods . 6th ed. Iowa State Univ. Press, Amer , Iowa, U.S.A. pp . 507.
- Waller, P. A. and D. B. Duncan (1969): A bays rule for the symmetric multiple comparison problems. Amer. State Assoc. J. 1485-1503.

دراسة تقييم بعض ذكور نخيل البلح فى ثلاث مناطق من مصر
عباس سعد عبد الله ، حسن على عبد الكريم و فريدة عبد الحميد عبد ربه
قسم بحوث الفاكهة الاستوائية، معهد بحوث البساتين، مركز البحوث الزراعية، الجيزة، مصر.

أجريت هذه الدراسة لتقييم ذكور نخيل البلح فى ثلاث مناطق بمصر وهى محافظة الوادى الجديد (واحة الداخلة) ، محافظة دمياط (مركز كفر البطيخ) و منطقة وادى النطرون. وأوضحت النتائج المتحصل عليها وجود فروق بين اغاريض الذكور فى المناطق موضع الدراسة. أما بالنسبة لميعاد التزهير فكانت النباتات المذكورة فى محافظة الوادى أبكر فى التزهير بحوالى ١٥ يوم عن وادى النطرون وحوالى الشهر عن نباتات محافظة دمياط. بالنسبة لحيوية حبوب اللقاح تراوحت ما بين 78 الى 88% وكمية حبوب اللقاح كانت الأعلى بالنسبة لذكور النخيل من محافظة الوادى الجديد. لوحظ ان الأزهار المتبقية على الشمراخ بعد الجفاف تكون اكبر ما يمكن بالنسبة للنباتات المذكورة المجموعة من محافظة الوادى لذا يمكن تخزين حبوب اللقاح او الاغاريض المذكورة فترة أطول لتلقيح الأشجار المؤنثة المتأخرة التزهير.