

EFFECT OF SOME POLLEN CARRIERS ON YIELD AND FRUIT QUALITY OF SEWY DATE PALMS

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ABSTRACT

Pollination of Sewy date palms with pollen grains carried by sucrose solution, talc powder, wheat flour, bran and starch in three different percentages namely 25, 50 or 75% of pollen grains were compared to ordinary pollination with 100% pollen grains only.

Results showed that using sucrose solution, talc powder, wheat flour, bran and starch as carriers for pollen grains was preferable than pollination with pollens only in improving yield and fruit quality. The promising effect was attributed to using sucrose solution, talc powder, wheat flour, bran, and starch, in descending order. Yield was positively affected by increasing percentages of the five carriers till 50% and at 75% there was a reduction on yield of palms.

From these results, the possibility of using 50% pollen grains in sucrose solution or talc powder as a carrier for Sewy date palm was arised. Such practice gave satisfactory promotion on the yield and gave the best results with regard to fruit quality rather than the conventional method of pollination with pollen grains only. These results were beneficial in early flowering season date varieties when the amount of pollen grains is not sufficient to accomplish pollination efficiency.

INTRODUCTION

Pollination is considered the most important, difficult and expensive practice to ensure good yields in date palms. (Al- Baker, 1972 and Hussein *et al.*, 1979).

The shortage of skilled labourers of pollination and the limited quantity of pollen grains are the basis to justify the use of mechanical pollination by sprayers and dusters (Preston, 1964; Burkner and Perkins , 1976; Brown, 1982., and Shabana and Shafaat, 1982 and El Kassas 1983a and 1983b).

Mixing pollen grains with various carriers was beneficial in establishing mechanical pollination and obtaining an economical yield with good fruit quality. Also, it is responsible for enhancing pollination efficiency. (Furr and Hewitt, 1964; Khalil and Al Shawaan, 1982 and El- Kassas and Mahmoud, 1984).

This study was conducted to find out the fruiting responses of Sewy date cultivar to pollination with diluted pollen grains.

MATERIALS AND METHODS

This study was carried out during 2002 and 2003 seasons in a private orchard situated at Mallawi district, El- Minia Governorate. Eighteen uniform in vigour Sewy female palms, eleven years old and grown on clay

soil were selected. Pruning was performed to maintain bunch/ mature leaves ratio 1:8 (according to Sayed (2002)). The number of female spathes per palm was adjusted to 12 by removing excess latest and small clusters. Freshly pollen grains from the same male palm were used for pollination in both seasons of study . During the last week of February, the cracked male inflorescences were cut early morning , placed in a large white paper bags and were left in the sun for five minutes . In the laboratory, strands were picked up from each bunch and arranged in one layer on clean papers. Daily moving and rotating to the opposite sides were necessary for five days to ensure sufficient dryness without abscission of male flowers by strong shaking. Collection of pollen grains was achieved to prepare the mixtures of 4 % sucrose solution, talc powder, wheat flour, bran and starch as carriers for pollen grains in three various ratios.

The experiment included the following sixteen treatments:

- 1- 100% pollen grains + zero carriers.
- 2- 25 % pollen grains + 75 % sucrose solution.
- 3- 50 % pollen grains + 50 % sucrose solution.
- 4- 75 % pollen grains + 25 % sucrose solution.
- 5- 25 % pollen grains + 75 % talc powder.
- 6- 50 % pollen grains + 50 % talc powder.
- 7- 75 % pollen grains + 25 % talc powder.
- 8- 25 % pollen grains + 75 % wheat flower.
- 9- 50 % pollen grains + 50 % wheat flower.
- 10- 75 % pollen grains + 25 % wheat flower.
- 11-25 % pollen grains + 75 % bran.
- 12-50 % pollen grains + 50 % bran.
- 13-75 % pollen grains + 25 % bran.
- 14-25 % pollen grains + 75 % starch.
- 15-50 % pollen grains + 50 % starch.
- 16-75 % pollen grains + 25 % starch.

The mixtures were prepared just before being applied not a days or more in advance of use. Pollination was achieved in the second day of female inflorescence cracking using simple hand duster and sprayer. The involved palms were subjected to the same horticultural practices.

The experiment was arranged in a complete randomize design including sixteen pollination treatments. All treatments (except control treatment) were replicated four times (four bunches) on the same palm giving 12 replicates on the three palms. Control treatment was replicated four times / palm(four bunches) giving 12 replicates on the three palms. The pollinated inflorescences were bagged before and after pollination by big thin white paper bags to prevent contamination from surrounding treatments. The pollinated bunches were kept covered over ten days to ensure free from crossing. The number of strands on every bunch was reduced to 60 by thinning the excess from each center.

All bunches were harvested on the first week of Sept. Bunch weight of each replicate was recorded . Fifty dates were picked at random from each replicate for the determination of fruit weight (g) and pulp/ seed as well as chemical characteristics. Total and reducing sugars were determined

according to the method of Lane and Eynon outlined in AOAC (1995). Non-reducing sugars were computed by calculating the differences between total sugars and reducing sugars. Total acidity (expressed as g. citric acid / 100g pulp) was determined according to the procedures outlined in AOAC (1995). The total soluble tannins was determined according to Balbaa (1981). The official method as described in AOAC (1995) was used for crude fibers determination.

Data were statistically analyzed and the differences between treatment means were compared using New LSD test at 5 % level (Snedecor and Cochran, 1977).

RESULTS AND DISCUSSION

1- Bunch weight:-

Data in Table 1 clearly show that pollen grains at 50 to 75 % carried by sucrose solution at 4 % ; talc powder, wheat flour, bran and starch significantly improved bunch weight compared to the ordinary pollination of 100% pollen grains as well as using pollen grains at 25% with the studied carriers. Increasing percentages of pollen in the carriers from 25 to 50 led to a significant promotion effect on bunch weight. However, a slight and insignificant promotion effect on the yield was observed due to raising pollen grains percentages in the carriers from 50 to 75 %. The beneficial of carriers on bunch weight was arranged as follows in descending order, sucrose solution, talc powder, wheat flour, bran and starch. Using 25 % of pollen grains in the five carriers significantly reduced bunch weight compared to pollination with 100 % pollen grains.

Table (1) : Effect of some pollen carriers and pollen percentages on bunch weight (kg) and fruit weight (g) of Sewy date palms during 2002 and 2003 seasons.

Treatments	Bunch weight (kg)		Fruit weight (g)	
	2002	2003	2002	2003
100 % P.G. + zero carriers	6.3	6.1	9.1	9.4
25 % P.G. + 75 % sucrose	5.4	9.1	11.7	12.5
50 % P.G. + 50 % sucrose	8.4	9.0	11.6	12.4
75 % P.G. + 25 % sucrose	8.5	9.2	11.5	12.3
25 % P.G. + 75 % talc powder	5.0	5.3	11.2	11.9
50 % P.G. + 50 % talc powder	8.0	8.4	11.1	11.8
75 % P.G. + 25 % talc powder	8.1	8.5	11.0	11.7
25 % P.G. + 75 % wheat flour	4.7	4.9	10.7	11.3
50 % P.G. + 50 % wheat flour	7.6	7.8	10.6	11.1
75 % P.G. + 25 % wheat flour	7.7	7.9	10.5	11.2
25 % P.G. + 75 % bran	4.4	4.5	10.1	10.7
50 % P.G. + 50 % bran	7.2	7.2	10.0	10.6
75 % P.G. + 25 % bran	7.3	7.3	9.9	10.5
25 % P.G. + 75 % starch	4.1	4.1	9.7	10.0
50 % P.G. + 50 % starch	6.8	6.6	9.6	9.9
75 % P.G. + 25 % starch	6.9	6.7	9.5	9.8
New L.S.D. at 5 %	0.3	0.4	0.3	0.3

P.G. = pollen grains

During both seasons of study, mixing 50 % of pollen grains with sucrose solution was sufficient for producing reasonable weight of bunch. The minimum bunch weight was recorded due to pollination with 25% pollen grains carried by starch. Such findings emphasized the possible use of small quantities of pollen to obtain yield comparable to conventional pollination of 100 % . These results were true in both seasons.

These results are in agreement with those obtained by Furr and Hewitt (1964), Khalil and Al-Shawaan (1982) and Brown (1982), who found that using mixture of pollens with wheat flour in a ratio of one part pollens to 6-10 parts flour gave bunch similar to hand pollination without using carriers. The results of Al- Baker (1972) and Hussein et al., (1979) supported these results.

2-Physical and chemical properties:

It is clear from the data in Tables 2 , 3, 4 and 5 that varying pollen grain carriers had an outstanding effect on fruit weight , pulp/ seed ratio, total soluble solids, total, reducing and non reducing sugars %, total acidity %, total soluble tannins and crude fibers %. Using mixtures of pollen grains at 25 to 75 % with the studied carriers significantly improved fruit quality in terms of increasing fruit weight, total soluble solids %, sugars % and in reducing total acidity %, total soluble tannins and crude fibers % compared to using pollen grains at 100 % without employing carriers. The slight promotion was associated with reducing the percentages of pollen grains in the carriers.

Application of sucrose solution, talc powder, wheat flour, bran and starch with pollen grains, in descending order was favourable for enhancing fruit quality.

Table (2) : Effect of Some pollen carriers and pollen percentages on pulp/ seed ratio and TSS of Sewy date palms during 2002 and 2003 seasons.

Treatments	Pulp/ seed ratio		TSS % (F.W. basis)	
	2002	2003	2002	2003
100 % P.G. + zero carriers	6.11	6.55	42.0	41.4
25 % P.G. + 75 % sucrose	7.28	7.61	45.5	46.1
50 % P.G. + 50 % sucrose	7.27	7.60	45.4	46.0
75 % P.G. + 25 % sucrose	7.25	7.59	45.3	45.9
25 % P.G. + 75 % talc powder	7.13	7.44	44.7	44.4
50 % P.G. + 50 % talc powder	7.12	7.42	44.6	44.3
75 % P.G. + 25 % talc powder	7.11	7.41	44.5	44.2
25 % P.G. + 75 % wheat flour	6.83	7.30	44.0	43.5
50 % P.G. + 50 % wheat flour	6.82	7.27	43.9	43.4
75 % P.G. + 25 % wheat flour	6.80	7.25	43.8	43.3
25 % P.G. + 75 % bran	6.57	7.14	34.3	42.6
50 % P.G. + 50 % bran	6.56	7.12	43.2	42.5
75 % P.G. + 25 % bran	6.55	7.11	43.0	42.4
25 % P.G. + 75 % starch	6.23	7.96	42.3	42.0
50 % P.G. + 50 % starch	6.22	7.68	42.2	41.9
75 % P.G. + 25 % starch	6.20	7.67	42.1	41.8
New L.S.D. at 5 %	0.08	0.7	0.3	0.3

P.G. = pollen grains

Table (3) : Effect of Some pollen carriers and pollen percentages on total and reducing sugars % of Sewy date palms during 2002 and 2003 seasons.

Treatments	Total sugars % (F.W. basis)		Reducing sugars % (F.W. basis)	
	2002	2003	2002	2003
100 % P.G. + zero carriers	36.12	36.26	28.91	28.11
25 % P.G. + 75 % sucrose	39.13	39.56	32.31	31.90
50 % P.G. + 50 % sucrose	39.04	39.53	32.30	31.88
75 % P.G. + 25 % sucrose	39.00	39.52	32.27	31.86
25 % P.G. + 75 % talc powder	38.44	37.84	31.80	31.50
50 % P.G. + 50 % talc powder	38.40	37.82	31.78	31.48
75 % P.G. + 25 % talc powder	38.38	37.80	31.75	31.46
25 % P.G. + 75 % wheat flour	37.84	36.91	31.22	31.20
50 % P.G. + 50 % wheat flour	37.80	36.88	31.20	31.19
75 % P.G. + 25 % wheat flour	37.77	36.86	31.18	31.18
25 % P.G. + 75 % bran	36.11	36.00	31.01	30.91
50 % P.G. + 50 % bran	36.07	35.97	30.96	30.88
75 % P.G. + 25 % bran	36.04	35.95	30.95	30.87
25 % P.G. + 75 % starch	36.31	35.80	30.80	30.50
50 % P.G. + 50 % starch	36.28	35.77	30.76	30.47
75 % P.G. + 25 % starch	36.27	35.76	30.75	30.45
New L.S.D. at 5 %	0.11	0.12	0.11	0.12

P.G. = pollen grains

Table (4): Effect of Some pollen carriers and pollen percentages on non-reducing sugars % and total acidity % of Sewy date palms during 2002 and 2003 seasons.

Treatments	Non reducing sugars % (F.W. basis)		Total acidity %	
	2002	2003	2002	2003
100 % P.G. + zero carriers	7.21	8.15	0.223	0.201
25 % P.G. + 75 % sucrose	6.82	7.66	0.128	0.115
50 % P.G. + 50 % sucrose	6.74	7.65	0.129	0.116
75 % P.G. + 25 % sucrose	6.73	7.66	0.130	0.118
25 % P.G. + 75 % talc powder	6.64	6.34	0.146	0.131
50 % P.G. + 50 % talc powder	6.62	6.34	0.147	0.132
75 % P.G. + 25 % talc powder	6.63	6.34	0.149	0.133
25 % P.G. + 75 % wheat flour	6.62	5.71	0.171	0.153
50 % P.G. + 50 % wheat flour	6.60	5.69	0.172	0.155
75 % P.G. + 25 % wheat flour	6.59	5.68	0.172	0.156
25 % P.G. + 75 % bran	5.10	5.09	0.188	0.170
50 % P.G. + 50 % bran	5.11	5.09	0.188	0.171
75 % P.G. + 25 % bran	5.09	5.08	0.190	0.172
25 % P.G. + 75 % starch	5.51	5.30	0.205	0.185
50 % P.G. + 50 % starch	5.52	5.30	0.206	0.186
75 % P.G. + 25 % starch	5.52	5.31	0.207	0.187
New L.S.D. at 5 %	0.06	0.07	0.015	0.011

P.G. = pollen grains

Table (5): Effect of Some pollen carriers and pollen percentages on soluble tannins % and crude fibers % of Sewy date palms during 2002 and 2003 seasons.

Treatments	Soluble tannins %		Crude fibers %	
	2002	2003	2002	2003
100 % P.G. + zero carriers	0.36	0.38	0.69	0.74
25 % P.G. + 75 % sucrose	0.30	0.30	0.54	0.57
50 % P.G. + 50 % sucrose	0.31	0.30	0.55	0.58
75 % P.G. + 25 % sucrose	0.31	0.30	0.56	0.59
25 % P.G. + 75 % talc powder	0.30	0.30	0.55	0.58
50 % P.G. + 50 % talc powder	0.31	0.30	0.55	0.58
75 % P.G. + 25 % talc powder	0.31	0.30	0.56	0.58
25 % P.G. + 75 % wheat flour	0.31	0.30	0.55	0.59
50 % P.G. + 50 % wheat flour	0.31	0.31	0.55	0.60
75 % P.G. + 25 % wheat flour	0.32	0.31	0.56	0.60
25 % P.G. + 75 % bran	0.32	0.32	0.56	0.60
50 % P.G. + 50 % bran	0.33	0.33	0.56	0.60
75 % P.G. + 25 % bran	0.33	0.33	0.56	0.60
25 % P.G. + 75 % starch	0.32	0.32	0.56	0.60
50 % P.G. + 50 % starch	0.32	0.34	0.56	0.60
75 % P.G. + 25 % starch	0.32	0.34	0.57	0.60
New L.S.D. at 5 %	0.03	0.05	0.04	0.04

P.G. = pollen grains

The best results with regard to fruit quality were obtained due to carrying out mechanical pollination using mixture of 25- 50 % pollen grains with 75- 50 % sucrose solution at 4 % . Pollination with 100 % pollen grains had unfavourable effects on fruit quality. These results were true in 2002 and 2003 seasons. The positive action of using pollens with carriers on fruit quality was mainly attributed to their important role in enhancing the efficiency of pollination and fertilization (Hussein *et al.*, 1979).

These results are in harmony with those obtained by Al- Baker (1972), Hussein *et al.*, (1979) and El- Kassas and Mahmoud (1984), who stated that most fruit quality characters were enhanced when pollen grains were mixed with carriers before pollination.

As a conclusion, using 50 % pollen grains with sucrose solution at 4 % or talc powder is suggested for enhancing pollination efficiently of Sewy date palms as well as enhancing productivity.

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تأثير بعض المواد الحاملة لحبوب اللقاح على المحصول وجودة الثمار لنخيل البلح السيوى
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تم مقارنة تلقيح نخيل البلح السيوى بحبوب لقاح محملة بمحلول سكروز وبودرة التلج ودقيق القمح والردة والنشا بثلاث نسب مئوية مختلفة هي ٢٥ ، ٥٠ ، ٧٥ % من حبوب اللقاح وذلك بالطريقة المعتادة بالتلقيح باستخدام حبوب اللقاح فقط (١٠٠ % حبوب لقاح) .
اشارت النتائج المتحصل عليها أن استخدام محلول سكر السكروز ، بودرة التلج ، دقيق القمح ، الردة والنشا كمواد حاملة لحبوب اللقاح كان مفضلا عن التلقيح باستخدام حبوب اللقاح فقط في تحسين المحصول وجودة الثمار ، وكان التأثير المميز يعود الى استخدام محلول سكروز- بودرة التلج - دقيق القمح- الردة والنشا مرتبة ترتيبا تنازليا ولقد نثر المحصول ايجابيا بزيادة النسب المئوية للمواد الحاملة الخمسة حتى ٥٠ % وعند نسبة مئوية ٧٥ % للمواد الحاملة كان هناك نقص في المحصول.
تظهر هذه النتائج إمكانية استخدام ٥٠ % من حبوب اللقاح مع محلول سكروز لو بودرة تلج كحامل لحبوب اللقاح في نخيل البلح السيوى وهذه العملية البستانية الهامة تعطى تحسين في الانتاجية كما تعطى افضل نتائج بخصوص جودة الثمار مقارنة بالطريقة التقليدية باستخدام حبوب اللقاح فقط ، وهذه النتائج مفيدة في اصناف نخيل البلح مبكرة الإزهار ، خصوصا في حالة عدم كفاية حبوب اللقاح لاستكمال عملية التلقيح.