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EFFECT OF DIFFERENT POLLINATION LEVELS ON FRUIT QUALITY OF "HAYANY" DATE PALM FRUITS (*Phoenix dactylifera* L.)

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ABSTRACT

This investigation was carried out during two successive seasons (2006 and 2007) in Balteem district, Kafr El-Sheikh governorate, Egypt, aiming to investigate the influence of different pollination levels on fruit quality of "Hayany" date palm compared to the level pollination used by farmers (9 strands / inflorescence). Five healthy female date palms were selected, 12 spathes (inflorescence) were left on each one. Four levels of pollination were applied; 3,6 and 12 strands/inflorescence and control (9 strands / inflorescence, farmers level pollination). The results showed that fruit set percentage increased by increasing pollination level in both experimental seasons. Bunch weight increased in treatments 3 strands/inflorescence and 6 strands/inflorescence and declined by increasing pollination level to record the lowest values by treatment 12 strands/inflorescence and control. The highest acidity and tannins content were recorded by 12 strands/inflorescence treatment in both seasons. P_2 (6 strands/inflorescence) showed the highest values of bunch weight, fruit weight and flesh weight. Moreover, fruit chemical properties were enhanced under this treatment compared to the other treatments. Based on these results, it is recommend that the optimum pollination level to improve fruit set and quality of "Hayany" date palm is 6 strands/inflorescence, under Kafr El-Sheikh conditions.

Keywords: Fruit quality, Date palm, Pollination level *, Phoenix dactylifera*

INTRODUCTION

Since date palm is a diocious plant, pollen has to be transported from the male to the female palm, this could occur naturally by wind. However, this requires an equal portion of male and female trees in the orchard, which make date farming uneconomical. Therefore, commercial date production necessitates artificial pollination which ensures good fertilization and overcome disadvantage of dichogamy and also reduces the number of male palms.

Hand or manual pollination is considered an ancient practice in date palm cultivation, which usually done by dusting and inserting 2 or 3 dry male strands between the strands of the female inflorescence (spathe) (Sial 1980, Khataab 1985 and Hamood *et al.*, 1986).

Many factors can affect fruit quality (physical and chemicals properties) such as soil moisture (Aldrich *et al*., 1943) and thinning of the fruit clusters or bunches (Nixon and Crawford 1937, 1942). Moreover, Pollination treatments can play similar role in improving fruit quality.

It is believed that different date palm cultivars require different amount of pollen in order to get satisfactory fruit set (Dowson 1982). To the best of our knowledge the information about the optimum pollination level that

improves fruit set and quality of "Hayany" date palm is scarce. Therefore, this research was carried out to study the effect of different pollination levels on fruit quality of "Hayany" date palm in comparison with the farmer's used level to find out the optimum pollination level for this variety.

MATERIALS AND METHODS

Experiment site:

This investigation was carried out during two successive seasons (2006 and 2007) in Balteem district, Kafr El-Sheikh governorate, Egypt. This district is considered one of the intensive date palm growing areas in Egypt. There are about 300,000 female date palms in this district (Ministry of Agriculture, Egypt 2006).

Plant Materials:

Five healthy female "Hayany" date palms 15 years old were selected and 12 spathes were left for each female. Four levels of pollinations were applied as follows:3 strands/inflorescence(P_1),6 strands/inflorescence (P_2), 12 strands/inflorescence (P_3) and control (9 strands/inflorescence, which is the farmer's used level of pollination. Each treatment was represented by 3 bunches / palm. The pollination was done after 2 - 4 days from spathes opening using one male date palm (Meghal) as a source of pollen in both seasons. All female inflorescences were bagged in paper bags directly after pollination and remained covered for approximately two weeks to prevent natural contamination by wind borne pollen, bee pollination and/or unwanted pollen from the surrounding treatments. The palms were grown in loamy soil, planted 8 meters apart and receiving the regular horticultural practices as recommended by the Ministry of Agriculture.

Fruit set:

After one month of pollination , ten female strands per bunch were randomly selected and the number of fruits was recorded, then fruit set percentage was calculated according to El-Makhtoun (1982). All bunches were harvested on the first week of October at the peak of color development in both experimental seasons.

Fruit physical characters:

Samples of 20 fruits were taken randomly from each bunch to determine fruit weight, flesh weight and fruit dimensions (length and diameter).

Fruit chemical characters:

Fruit acidity: Fruit acidity was determined according to Association of Official Agricultural Chemists (1995) and the titrable acidity was calculated as citric acid.Total soluble solids: The percentage of TSS was determined in the fruit juice using Zice refractometer.Tannins content: Tannins content was determined using Indigo carmine indicator after Winton and Winton (1958).

Experimental design and statistical analysis:

The experiment was laid out in a randomized complete block design. The data were statistically analyzed. Analysis of variance technique was implemented to test the overall significance of the data, while the DMRT was used to compare the differences among treatment means (Snedecor and Cochran 1980).

RESULTS AND DISCUSSION

Fruit set:

Fruit set percentage increased with increasing the number of strands that used for pollination (Table.1). The highest level of pollination (12 strands/inflorescence -P_3) recorded the highest fruit set percentage in both seasons followed by the control (9strands/inflorescence),P_2(6 strands/inflorescence) and P_1 (3 strands/inflorescence) respectively.

Bunch weight:

Bunch weight is considered as an index for the yield and reflects the best promising treatments. Table 1, shows that bunch weight increased from P_1 to P_2 and declined by increasing pollination level to record lower values for the control and P3 with no significant differences between these two treatments. P_2 recorded the highest bunch weight in both seasons. Although, P_3 recorded higher fruit set percentage than P_2, bunch weight was lower. This may be attributed to fruit drop as a result of excessive fruit set under this treatment. These results are in agreement with those reported by Mawlood (1980), El-Kassas (1983), Ghalib *et al.* (1987) and Mostafa (1994) on different date palm varieties. They found that there is a positive correlation between fruit set percentage obtained and bunch weight at harvest.

Fruit physical characters:

Table (1) shows that fruit weight was the lowest at P_1 compared with the other treatments. There were no significant differences among P_2, control and P_3. However, P_2 had the highest fruit weight in both seasons.6 strands/inflorescence treatment (P_2) enhanced significantly flesh weight in the first season followed by the control, P_3 and P_1 respectively. In the second season, no significant differences were found between P_2 and control, and the lowest flesh weight was recorded with 3 strands/inflorescence treatment (P_1). Different treatments had no significant effect on fruit length except the control treatment in the second season. In regard to fruit diameter, no significant differences were found among treatments in both seasons.

Fruit chemical properties:

There were no significant differences in fruit total acidity among different pollination levels in the first season (Table 2).

Table (1): Effect of pollinations levels on some physical properties of Hayany date palm fruits during 2005 and 2006 seasons.

Treatments	Fruit set %		Bunch weight (kg)		Fruit weight (gm)		Flesh weight (gm)		Fruit length (cm)		Fruit diameter (cm)	
	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006
3strands/ bunch **(P_1)**	45.13c	55.04d	21.08a	19.03b	28.45b	27.44b	26.16d	24.92c	5.61	5.55b	2.96	2.89
6strands/ bunch **(P_2)**	61.58b	76.59c	22.61a	22.91a	37.03a	32.11a	33.44a	30.64a	5.88	5.78b	3.26	3.16
12strands bunch(**P_3**)	63.87a	87.86a	18.74b	18.25c	36.89a	30.16a	29.11c	27.08b	5.01	5.09b	3.25	3.01
Cont.(9 strands/ bunch)	62.05ab	83.63b	19.08b	18.76c	36.01a	31.02a	31.01b	30.70a	4.85	7.85a	2.89	2.79

Means followed by a common letter are not significantly different at the 5% level by DMRT.

Table (2): Effect of pollinations levels on some chemical properties of Hayany date palm fruits during 2005 and 2006 seasons.

Treatments	Total acidity (%)		TSS (%)		Tannin (%)	
	2005	2006	2005	2006	2005	2006
3strands/bunch (P_1)	0. 13	0.29b	28.36b	28.87b	0.090b	0.190b
6strands/bunch (P_2)	0.031	0.022c	33.51a	33.97a	0.080c	0.120d
12strands/bunch (P_3)	0.34	0.31a	24.55c	26.93c	0.110a	0.22a
Cont. (9 strands/bunch)	0.20	0.028b	29.01b	30.40b	0.090b	0.17c

Means followed by a common letter are not significantly different at the 5% level by DMRT.

However, 6 strands/inflorescence (P_2) showed the lowest acidity percentage in the second season with no significant differences between P_1 and the control, while P_3 recorded the highest acid content. Soluble solids content was the highest with P_2 treatment followed by P_1 and the control with no significant differences between these two levels (Table 2) while, the lowest was found with P_3 treatment in both experimental seasons. Results shows that tannins content had an opposite trend to that of TSS and no significant differences were found in the first season between P_1 and the control, while P_1 was significantly higher than the control in the second season. However, P_2 recorded the lowest significant values and control was the highest in both seasons.

Pollination treatments obviously play a role on enhancing fruit quality, through increasing bunch weight, fruit length, fruit weight and improving TSS and reducing tannins and total acidity contents. These changes in fruit quality are associated with changes in some promotors and enzymes (Mardi 1995 and El Mardi *et al.,* 2007). Mardi (1995) reported that low pollen level can produce the same effect on pectin content as high pollen concentration does, indicating a clue for economizing of pollen application on "Farad" date palm.

The above results indicate that among different pollination levels, P_2 showed the highest bunch weight and fruit quality in both seasons. Thus, it is recommended that 6 strands/inflorescence is the optimum pollination level for "Hayany" date palm under Balteem district conditions. From economic point of view, using this pollination level can reduce the number of male date palms required for each orchard.

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تاثير مستويات التلقيح المختلفة علي جودة ثمار البلح الحياني

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أجريت هذه الدراسة خلال موسمي ٢٠٠٥ ،٢٠٠٦ بمنطقة بلطيم محافظة كفر الشيخ ، بهدف دراسة تاثير مستويات التلقيح المختلفة علي جودة ثمار البلح الحياني مقارنة بمستوي التلقيح لدي المزارعين في المنطقه . اختيرت خمس نخلات وترك علي كل واحده منها ١٢ إغريض ، وذلك لاجراء اربعة مستويات من التلقيح المختلفه هي:٣ شماريخ / إغريض ،٦ شماريخ / إغريض ،١٢ شمراخ / إغريض مقارنة بالكنترول (المستوي المستخدم لدي المزراعين في المنطقة وهو٩ شماريخ/ إغريض) في كلا الموسمين.

أظهرت النتائج ارتفاع نسبه عقد الثمار بزيادة مستويات التلقيح من ٣ الي ١٢ شمراخ / إغريض في كلا الموسمين وأن وزن السباطه قد زاد من المستوي الاول للتلقيح (٣ شماريخ / إغريض) الي المستوي الثاني (٦ شماريخ / إغريض) ولكن انخفض مع زيادة مستويات التلقيح الأخري ، وقد سجلت اقل قيمه لوزن السباطه عند مستوي الكنترول و المستوي الرابع من التلقيح (١٢ شماريخ / إغريض) وأن أعلي محتوي للثمار من الحموضه والتانينات قد سجلت في الثمار بالمعاملة ١٢ شمراخ / إغريض.

قد سجل المستوي ٦ شماريخ/ إغريض احسن النتائج في وزن السباطه ، وزن الثمره، وزن لحم الثمره، علاوه علي تحسين بعض الصفات الكيماويه للثمار تحت هذا المستوي مقارنة بباقي المستويات الاخري وعليه يمكن التوصيه بان المستوي المثالي هو ٦ شماريخ / إغريض للصنف الحياني لتحسين العقد وجودة الثمار تحت ظروف كفر الشيخ.