

NOTE

EFFECTS OF POLLEN SOURCES ON FRUIT CHARACTERISTICS OF 'SHAHANI' DATE

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ABSTRACT

Induction of xenia and metaxenia in fruits and seeds of 'Shahani' date palm was studied by comparing the pollen grains from different male cultivars. Fruit set, pomological fruit characters, fruit quality and date of ripening were markedly affected by pollen parent. 'Piarom' pollen produced the largest seeds while the lowest length/diameter ratio of seed was observed in 'Kabkab' pollen. Pollen source did not significantly affect the total soluble solids. 'Mazafati' cultivar proved to be a good pollen source for pollination of 'Shahani' date palm.

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اثرهای منابع دانه گرده بر ویژگی های میوه خرماي شاهانی

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چکیده

انگیزش ردگذاری و فراردگذاری در میوه ها و بذرهاي خرماي 'شاهانی' به وسیله مقایسه دانه گرده ارقام مختلف نر، مطالعه شد. تشکیل میوه، خصوصیات میوه، کیفیت و زمان

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مقایسه میوه به طور مشخصی تحت تاثیر منابع دانه گرده قرار گرفت. دانه گرده رقم 'پیارم' بزرگترین بذر و دانه گرده رقم 'کبکاب' کوچکترین بذر را در خرماي 'شاهانی' ایجاد نمودند. منابع دانه گرده اثر معنی داری بر مواد جامد محلول نداشت. این آزمایش نشان داد که دانه گرده رقم 'مضافتی' می تواند یک منبع خوب گرده، برای گرده افشانی خرماي 'شاهانی' باشد.

INTRODUCTION

The term xenia was first proposed by Focke (2) who described two forms of xenia, xenoplasm (changes in fruit form) and xenochrome (changes in fruit color). Swingle (8) has suggested the term metaxenia to distinguish this phenomenon from previously reported xenia. Metaxenia, unlike xenia, can not be explained by hereditary elements. He therefore, proposed a hormonal cause for metaxenia in dates, but had no specific technique to test this hypothesis. Swingle's interest seems to be limited to diffusible auxin from fertilized embryo and its associated endosperm. Since the time when xenia and metaxenia were described, many investigators reported the effects of pollen source on sweetness, time of maturity, color and size of dates in different palm cultivars. Osman *et al.* (5) reported that pollen sources had a significant effect on the time of ripening, size and shape of pericarp and seed of 'Deglet Noor' dates. Ream (6) reported that pollen sources resulted in early ripening of 'Deglet Noor' dates. Nixon (4) found that the 'Fard' pollen induced early maturity while the 'Mosque' pollen caused fruit ripening. Shaheen *et al.* (7) observed that pollen grains of male dates had metaxenic effects on fruit set, yield and fruit physical properties in the four female cultivars. The objective of this study was to determine the effect of pollen sources on fruit characteristics of 'Shahani' date.

MATERIALS AND METHODS

Experimental Procedure, 1990

Field experiments were conducted on 'Shahani' date (*Phoenix dactylifera* L.) in a commercial orchard in Jahrom, Fars province (190 km

south of Shiraz.). Male inflorescences were cut as soon as the spaths were cracked and transferred to the laboratory in the Department of Horticulture, Shiraz University. Clusters of male inflorescences were removed from spaths and placed on filter paper in separate rooms to dehisce. After 24 to 48 hr, pollen was collected and stored in glass vials plugged with cotton balls and kept in refrigerator at 2 to 4°C. Pollen viability was determined at the time of collection by a germination assay on MBK culture medium (3). The percentage of pollen germination for all pollen sources was about 85% at the time of collection. Fifteen 15-years old 'Shahani' palm trees with 5 to 8 inflorescences per tree were selected as female parent in this experiment using randomized block design. The following pollens of the male clone were applied to the female inflorescences with three replications and trees as block: 'Shahani', 'Kabkab', 'Piarom', 'Mazafati' and an unknown pollen.

Female inflorescences were covered with brown bags as soon as they emerged and opened after the spaths were cracked. After removal of spaths a mixture of 1:2 ratio of dry pollen and inert material in a cheese-cloth was tapped on the female inflorescences twice at three days interval. Hands were sterilized with 70% ethanol between each pollinations.

Initial and final sets were recorded and number of flowers and fruits per flower and fruit clusters were calculated by the following formulas:

$$\text{No. of FL/FLC} = (\text{No. of FL/ST}) (\text{No. of ST/FLC}).$$

$$\text{No. of FT/FC} = (\text{No. of FT/ST}) (\text{No. of ST/FC}).$$

where:

FL= Flower, FLC = Flower cluster, FT= Fruit, FC = Fruit cluster and ST= Strand.

At harvest time, weight of fruit cluster, weight of 10 fruits, total soluble solids (TSS) and length, diameter and weight of pulp of 10 fruits were recorded.

Experimental Procedure, 1991

The experiment was repeated in 1991 with the exception of using 'Shahdad' pollen instead of 'Piarom'. The rest of the experiment was performed with the same method and design as in 1990.

RESULTS AND DISCUSSION

Fruit Set

There were no differences in the percentage of initial set for different pollen grains in the first experiment in 1990 (Table 1), but there was a significant increase in initial set in 'Mazafati', 'Shahdad' and unknown pollen sources, respectively, in the second experiment in 1991 (Table 2). Pollen sources had also a significant effect on final set. Final set was 71.1, 70.0 and 69.2 per 100 flowers for 'Piarom', 'Kabkab' and 'Mazafati', respectively. Both initial and final set of flower clusters pollinated with 'Mazafati' pollen were more consistent than other pollen sources.

Table 1. Effects of pollen sources on morphology, quality and fruit set of 'Shahani' date, 1990.

Pollen sources	Initial set	Final set	Pericarp weight of 10 fruits (g)	Seed L/D [†] ratio	Fruit L/D ratio	TSS (%)	Weight of 10 fruits (g)	Fruit cluster weight (kg) /tree
Unknown	86.48a [‡]	46.73b	62.23a	3.83a	2.21a	60.75a [§]	69.8a	10.64a
'Kabkab'	86.40a	70.98a	62.89a	3.55b	2.2a	63.63a	71.45a	12.36a
'Piarom'	87.42a	71.06a	58.73a	3.78ab	2.19a	61.22a	66.91a	13.10a
'Shahani'	86.37a	54.25b	62.19a	3.59ab	2.19a	62.75a	70.76a	10.65a
'Mazafati'	86.40a	69.18a	42.36b	3.65ab	2.19a	64.46a	71.67a	13.08a

[†] L/D = length/diameter.

[§] Mean separation within columns, by DMRT, 5% level.

Table 2. Effects of pollen sources on morphology, quality and fruit set of 'Shahani' date, 1991.

Pollen sources	Initial set	Final set	Pericarp weight of 10 fruits (g)	Seed length of 10 fruits (cm)	Length of 10 fruit (cm)	TSS (%)	Weight of 10 fruits (g)	Fruit cluster weight (kg) tree ⁻¹
Unknown	68.14a [†]	57.05a	70.74ab	25.35a	41.86ab	72.41a	79.05a	15.39a
'Kabkab'	59.37ab	48.95a	77.35a	26.21a	42.46ab	71.93a	85.9a	15.79a
'Mazafati'	70.9a	58.88a	64.2b	25.96a	41.11b	71.45a	74.76a	15.67a
'Shahani'	55.56b	45.21a	76.42ab	25.31a	43.57a	70.97a	84.63a	13.23a
'Shahdad'	68.77a	51.27a	69.29ab	26.17a	41.17a	75.99b	77.22a	13.84a

[†] Mean separation within columns, by DMRT, 5% level.

Effects of pollen sources...

The results of this investigation revealed that pollen sources were compatible with 'Shahani' date (Tables 1 and 2). The difference between initial and final sets was probably due to the rate of pollen tube growth and auxin content of pollen sources which induces auxin synthesis in ovary. 'Mazafati' pollen proved to be a good source of pollen for pollination of 'Shahani' date cultivar.

Fruit Yield and Weight

Pollen sources had no significant effect on yield, however, an increase in fruit cluster weight per tree was noticed in 'Piarom', 'Mazafati' and 'Kabkab' (13.1, 13.08 and 12.36 kg), respectively (Table 1). In both years, 'Mazafati' and 'Kabkab' pollens consistently caused an increase in weight of fruit clusters per tree (Tables 1 and 2). There was no significant difference between pollen sources on weight of fruits. Pulp weight of 10 fruits was significantly affected by pollen sources. 'Mazafati' pollen resulted in the lowest pulp weight, but 'Kabkab' had the highest pulp weight in both years (Tables 1 and 2).

Fruit Length and Diameter

The effects of pollen on length of fruits and seeds were significant (Tables 1 and 2). Fruits produced by 'Mazafati' pollen had shorter fruit length and 'Shahani' had the longer length (Table 2). The length/diameter ratio of seeds varied according to the sources of pollen used for pollination. 'Piarom' pollen produced largest seeds while 'Kabkab' pollen produced the lowest length/diameter ratio in seeds (Table 1). The results of this experiment were in agreement with findings in 'Zahedi' (1) and 'Deglet Noor' (5, 6) studies.

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