

NOTE

EFFECTS OF HUMIDITY AND TEMPERATURE ON POLLEN VIABILITY OF SHAHANI DATES¹

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Abstract -- Pollen of mature and immature spathes of date (*Phoenix dactylifera* L.), cv. Shahani, was stored under partial vacuum at 5 and 25°C and 20, 40, 60 and 80% relative humidities in two successive years. Data obtained showed that among the treatments used the best conditions for storage were 5°C and 20-40% relative humidities. Both spathe stages reached the highest percentage of pollen viability in 2-3 weeks of storage and it was concluded that under the conditions of this experiment "Shahani" pollen could be stored for a limited period of time.

INTRODUCTION

The cultivation of date palm (*Phoenix dactylifera* L.) is unique in respect to its artificial pollination. The tree is dioecious and during blooming a few strands of male inflorescences are artificially placed in the female flower cluster to ensure desired pollination.

Peak of flowering period varies for dates growing in different regions of Iran. Moreover, within a region, male and female inflorescences may not emerge or mature simultaneously. Growers may overcome such differentials by storing pollen of desired male plants until female plants of the same or another region are ready for pollination.

Albert [1] reported that the date pollen could be kept viable from one season to another by storing in sealed vials at 1.2°C. Aldrich and Crawford [2] showed that date pollen stored in an ordinary chamber at room temperature could not be expected to cause fruit set whereas that stored at -13°C or 4°C at 0-12% humidity resulted in as good a fruit set as did fresh pollen. Results obtained by Nixon [7] demonstrated that the dry pollen retained its viability two to three months in a moderately dry room and for a year or longer in a desiccator at 4.4°C. Ali and Ahmad [3] reported that *Phoenix* pollen could be stored with advantage at 0% humidity and 10°C up to 30 days, beyond which its viability was greatly reduced.

In Iran, there are about 400 named date cultivars, with "Shahani" being the most common in the Fars region [5]. There is, however, no report available on the pollen storage of Shahani, while reported data are contradictory for other studied cultivars.

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This paper reports the results of a preliminary study in which two temperatures and various humidities were tested for prolonging pollen viability of mature and immature clusters of Shahani cultivar of date palm.

MATERIALS AND METHODS

Spathes of Shahani date cultivar were obtained from staminate plants of commercial orchards in Jahrom, 195 km south of Shiraz, Iran. Immature (intact) and mature (cracked) spathes were cut early in the morning and transferred to the laboratory. The inflorescences were removed and the flowers were separated from the inflorescences. The flowers of several inflorescences obtained from a number of spathes of the same stage were mixed to provide a bulk sample.

The initial viability of bulk sample of each spathe stage was determined and the samples were placed in four open vials representing four replications. The vials were kept in separate desiccators at 20, 40, 60 or 80% relative humidity produced by glycerol under partial vacuum [6].

Two sets of desiccators containing the vials were produced; one set was stored at 5°C and the other at 25°C. Viability of pollen grains was judged on the basis of stained pollen grains. Several chemicals including acetocarmine; benzidine; I₂ KI; 2, 3, 5-triphenyl tetrazolium chloride and diphenyl tetrazolium [4] were tested and among them 0.1% diphenyl tetrazolium was found to be the most suitable stain. The viability test for stored pollen was made weekly until the percentage of stained pollen grains was very low. A random sample of flowers of each vial was taken out by means of a tweezer and the pollen grains were spread on a slide, a drop of stain solution was added and the suspension was covered with a cover slip. Viable pollen grains stained deeply after a few minutes whereas non-viable ones were colorless. At least 100 pollen grains were counted under the microscope for each treatment and replication every week.

Flowers stored at 25°C under different relative humidities were destroyed by fungal attack in the first or second week of storage and were discarded. Statistical analysis was performed only on data obtained for pollen grains stored at 5°C.

The experiment was conducted in a 2³ × 4 (2 years, 2 spathe stages, 2 temperatures and 4 relative humidities) factorial with 4 replications. Since the effect of year and all its interactions with other factors were not significant, the data reported here are averaged over the two years. The data were further analyzed for each spathe stage separately and Duncan's multiple range test was used for comparison of treatment means.

RESULTS AND DISCUSSION

At 25°C, the pollen grains stored at 20% relative humidity survived up to 1 week. However, the percentage of viable pollen was slightly reduced. At this temperature pollen grains stored at higher relative humidities became moist, clumped together and were attacked by bacteria and fungi which rendered the sample unfit for further use. Therefore, it was concluded that 25°C was not a suitable temperature for storing date pollen. Similar observations have been recorded by Vasil [8].

When the data were analyzed for the two spathe stages separately, significant differences were obtained for percentage of viable pollen among different relative humidities, storage periods and their interaction (Table 1). Generally, the immature spathes had lower initial viable pollen than mature spathes and this pattern persisted during subsequent weeks of storage.

Table 1. Effects of different relative humidities on pollen longevity from immature and mature spathes of Shahani dates stored at 5°C (averages of 2 years)

Time (week)	Spathe stage							
	Immature				Mature			
	Relative humidity (%)				Relative humidity (%)			
	20	40	60	80	20	40	60	80
	% Viability							
0	30c*	30c	30c	30c	38c	38c	38c	38d
1	35b	46a	50a	40c	46b	46b	53b	56a
2	40a	43ab	39b	45a	51a	49a	62a	45b
3	40a	40b	23d	22d	33d	48ab	35d	41c
4	33bc	26d	12e	16e	34d	30d	27e	26e
5	17d	16e	9f	8f	18e	25e	14f	13f

*Means in each group, followed by the same letter, are not different at the 1% probability level (Duncan's multiple range test).

At 5°C, pollen grains of both mature and immature spathes reached the highest percentage of viability in the second or third week of storage. The possible explanation for this enhancement is that some pollen grains were not mature at the beginning of the experiment but they matured during the first few weeks of storage and caused an increase in the number of viable pollen.

The effects of relative humidity on pollen viability of mature and immature spathes as averaged over storage periods and years are shown in Fig. 1. Pollen from mature spathes were little influenced (about 2.8%) while that from immature spathes were greatly affected by different relative humidities used. For pollen from immature spathes, relative humidities of 60 and 80% decreased the viability percentage. Either 20 or 40% relative humidity was the optimum for storage of pollen from immature spathes, although even at these humidities, the viability percentage of pollen from mature spathes was greater. These results are in agreement with those obtained by Aldrich and Crawford [2] who emphasized the importance of keeping the date pollen as dry as possible. The results of the present investigation also confirmed those reached by Ali and Ahmad [3] who disagreed with the general conception that it is possible to store date pollen about a year.

The results of both years of the present study indicate that the pollen of "Shahani" date, under the conditions described, can only be stored with advantage for a limited

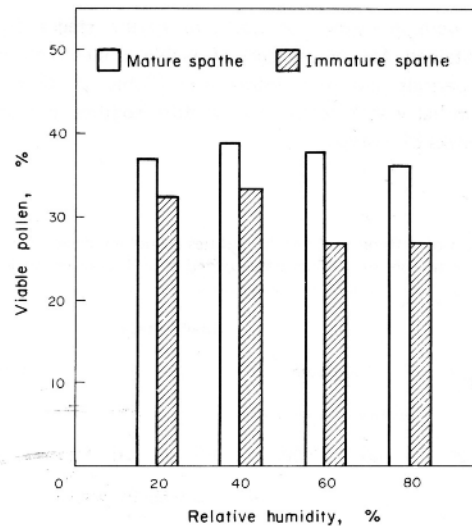


Fig. 1. Mean pollen viability (averaged over storage periods and years) of mature and immature spathes of dates as affected by relative humidity.

period of time. However, experiments to examine lower temperatures and humidities than those used in this experiment may be fruitful to elucidate the possibility of prolonging date pollen storage period.

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