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An investigation on artificial pollination facilities in pistachios by using an atomizer

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SUMMARY – This study was carried out on the Siirt variety of pistachio grown at the Ceylanpınar State Farm. The pollen grains were taken from the early pollen shedding male pistachio trees. The pollen was kept at –4°C for seven to ten days in bottles after drying them by using $CaCl_2$ for absorbing humidity. The pollen grains were taken at full flowering stage and mixed with mixture of 98% wheat flour plus 2% pollen. Application was made by using an atomizer connected to a tractor. The blank nut rate was 47.76% and 55.32% with the artificial and natural pollinated clusters, respectively.

Key words: Pistachio, pollen, pollination, artificial pollination.

RESUME – *"Recherches sur les possibilités de pollinisation artificielle chez les pistachiers en utilisant des atomiseurs". Cette étude a été menée sur la variété de pistachier Siirt cultivée à la ferme d'état de Ceylanpınar. Les grains de pollen ont été prélevés sur des pistachiers mâles lâchant tôt leur pollen. Le pollen a été gardé à -4°C pendant 7 à 10 jours dans des bouteilles après séchage avec $CaCl_2$ pour absorber l'humidité. Les grains de pollen ont été prélevés au stade de pleine floraison et mélangés à raison de 98% de farine de blé et 2% de pollen. L'application a été réalisée en utilisant un atomiseur relié à un tracteur. Le taux de fruits vides était de 47,76% et de 55,32% respectivement pour les groupes pollinisés artificiellement et naturellement.*

Mots-clés : *Pistachier, pollen, pollinisation, pollinisation artificielle.*

Introduction

Pistachio trees are dioecious. Male and female flowers are borne on different trees. For this reason, cross pollination is necessary. In Turkey, there are a lot of different male trees in the orchards. Most of these trees bloom earlier than the female pistachio trees. There are some male selection studies in Turkey, but it is expected to take a time to go into practice.

Unsatisfactory pollination in pistachio (*P. vera*) was attributed to a variable flowering period of female trees as well as to the absence and/or incorrect ratio of male cvs with different flowering times, particularly late flowering cvs (Pontikis, 1975).

There were some experiment on synchronization of staminate and pistillate pistachio trees with chemicals (Procopiou, 1973; Pontikis, 1975, 1989; Porlingis and Voyiatzis, 1986; Ak, 1998).

It has been reported that in some countries, artificial pollination gives good result and noted that it should be used as a temporary solution when natural pollination is insufficient (Tasias i Valls, 1990; Ça_lar and Ka_ka, 1995).

There have been some studies about the artificial and supplemental pollination in Turkey (Kuru and Ayfer, 1984; Ayfer and Kuru, 1990; Ça_lar and Ka_ka, 1995; Kuru, 1995).

In our conditions, artificial pollination appears temporary solution to the problem in orchards that under insufficient pollination conditions.

In this study, we aimed to contribute to artificial pollination facility with a practical way. This method is suitable for the wide pistachio areas on the open pollinated trees for improving pollination.

Material and method

This study has been carried out on Siirt cultivar at pistachio orchards of Ceylanpınar State Farm. Differences between the trees were 10 x 10 m. Pollen grains have been taken from the different male trees which are flowering earlier period. The male flowers were collected at the beginning of blooming. The male branches with inflorescence were cut and then these male inflorescence clusters were kept on a mesh at 20-25°C for pollen shedding for a night. Finally it was sifted by a sieve. And then the pollen is kept at minus 4°C in the freezer for 8-10 days with $CaCl_2$ to keep pollen dry. When the female trees in full bloom, the pollens were taken from the freezer and prepare for application with 98% wheat flour and 2% pollen mixture.

An atomizer which connected a tractor was used to spray pollen mixture to female trees. 80-100 g mixture per tree has been applied. By this application, pistachio orchard was covered with the pollen cloud. The speed of tractor was 8-10 km/h at the orchard during the pollination. Using mixture could be arrived from 1^{st} row to 8^{th}, this range was approximately 80-90 m.

With this application, 15 to 17 thousand trees could be pollinated by one tractor per day.

Application time was 15 April, and then from 22 April to the harvest time; flower, fruitlet and fruit drops were determined, monthly. At the harvest, 3 clusters from each side of trees have been taken. That is 12 clusters have been taken per tree. On these fruits some physical traits were determined.

Results and discussion

Obtained results were discussed in this part. We have used wheat flour for mixture material with pollen grains. It is reported that, corn starch, rice flour, soft and durum wheat flour were convenient for pistachio pollen. But talc and semolina are not suitable for blending material (Kuru, 1995).

The results of artificial pollination can be seen from Tables 1 and 2. According to tables, number of fruit per cluster 11.85 in the pollinated trees, while 9.96 in natural pollination. Filled nut rate was 52.24% and 44.68%; blank nut rate was 47.76% and 55.32% in pollinated trees and natural pollination, respectively.

Table 1. Some physical traits on fruits taken from artificially pollinated trees

Tree number	Number of fruit per cluster	Number of filled nut	Filled nut rate (%)	Number of blank nut	Blank nut rate (%)
1	10.67	5.67	53.14	5.00	46.86
2	12.17	6.42	52.75	5.75	47.25
3	8.75	4.67	53.37	4.08	46.63
4	10.83	5.67	52.35	5.17	47.65
5	12.67	6.58	51.93	6.08	48.07
6	12.58	6.42	51.03	6.17	48.97
7	11.58	6.08	52.50	5.50	47.50
8	14.00	7.17	51.21	6.83	48.79
9	13.58	7.17	52.80	6.41	47.20
10	11.67	6.08	52.10	5.58	47.90
Average	11.85	6.19	52.24	5.66	47.76

The results of fruit set can be seen in the Fig. 1. As it is seen in the figure, fruit set has increased by the artificial pollination. Fruit set was obtained in the pollinated trees and natural pollination as 14.13% and 9.40%, respectively. As it is seen from the figure, flower and fruitlet drops were 84.30% in artificial pollinated trees and 89.22% in natural pollination. According to obtained data, fruit drops were lower after 22 May. Main drops were determined after blooming as fruitlet drops. Ayfer and Kuru (1990) and Kuru (1995) report that, according to fruit set and filled nuts, there was no statistically

differences among various pollination mixtures (1% or 4%) and applications (natural pollination, 1 and 2 pollination) during three years. Bilgen (1973) report that, 10% of flowers turned into filled nuts by artificial pollination, while 7% of flowers turned into by natural pollination.

Table 2. Some physical traits on fruits taken from naturally pollinated trees

Tree number	Number of fruit per cluster	Number of filled nut	Filled nut rate (%)	Number of blank nut	Blank nut rate (%)
1	7.75	3.25	41.94	4.50	58.06
2	9.92	3.92	39.52	6.00	60.48
3	9.75	3.83	39.28	5.92	60.72
4	10.58	6.08	57.47	4.50	42.53
5	10.08	4.00	39.68	6.08	60.32
6	11.08	4.75	42.87	6.33	57.13
7	10.33	4.25	41.14	6.08	58.86
8	11.50	5.08	44.17	6.42	55.83
9	8.08	3.42	42.33	4.67	57.67
10	10.50	5.92	56.38	4.58	43.62
Average	9.96	4.45	44.68	5.51	55.32

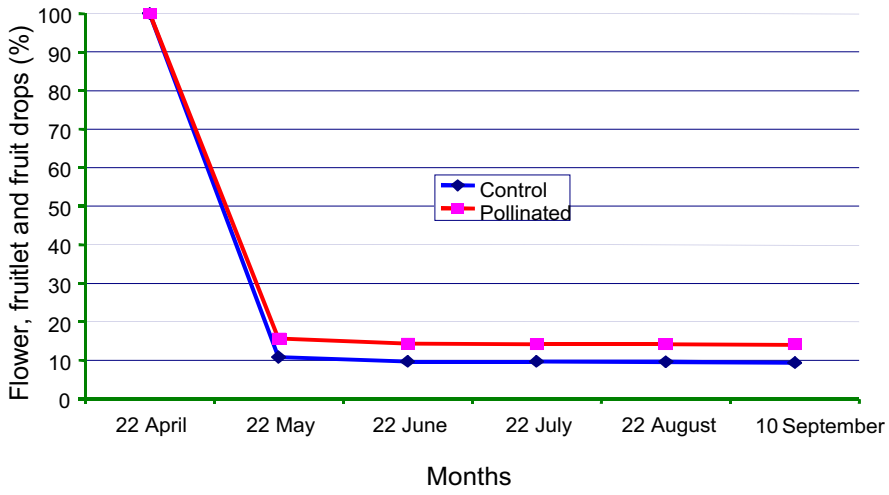

Fig. 1. Flower, fruitlet and fruit drops in artificially and naturally pollinated trees.

As it is known, fruit set is not only depend on pollination and fertilization but it also depend on orchard management practices as nutrition, irrigation, pruning, etc. (Goldhamer *et al.*, 1988; Arpacı *et al.*, 1995; Tekin *et al.*, 1995). The rate of drops were high, and it may be depend on nutrient deficiency. We expect that, fruit set and filled nut rate can be increased with regular soil fertilization, irrigation, pruning, etc.

This application was used to determine effectiveness of atomizer in artificial pollination. Obtained results show that, this method can be used in wide orchard and it can be as effective as artificial pollination by helicopter or aeroplane.

References

Ak, B.E. (1998). The effects of paclobutrazol (pp-333) applications on inflorescence in male pistachio

trees. In. Proceedings of the X GREMPA Seminar, Meknès (Morocco), 14-17 October 1996. *Options Méditerranéennes, Series Cahiers*, 33: 57-61.
Arpacı, S., Tekin, H. and Aksu, Ö. (1995). Improvement of pruning techniques for bearing pistachio nut trees. In: First International Symposium on Pistachio Nut, Adana (Turkey), 20-24 September 1994. *Acta Hort.*, 419: 253-257.
Ayfer, M. and Kuru, C. (1990). Studies on artificial pollination of pistachio flowers. In: Nut Production and Industry in Europe, Near East and North Africa. *Reur Technical Series*, 13: 343-346.
Bilgen, A.M. (1973). Antepfıstı_ı. Gıda Tarım ve Hayvancılık Bakanlı_ı Yayınları, Ankara.
Ça_lar, S. and Ka_ka, N. (1995). A study on the supplemental pollination of pistachios in Mediterranean region. In: First International Symposium on Pistachio Nut, Adana (Turkey), 20-24 September 1994. *Acta Hort.*, 419: 55-60.
Goldhamer, D.A., Phene, B.C., Beede, R., Sherlin, L., Mahan, S. and Rose, D. (1988). Effects of sustained deficit irrigation on pistachio tree performance. In: *California Pistachio Industry, Annual Report-Crop Year 1986-87*, pp. 61-66.
Kuru, C. (1995). Artificial pollination of pistachio trees under unsufficient pollination conditions. In: First International Symposium on Pistachio Nut, Adana (Turkey), 20-24 September 1994. *Acta Hort.*, 419: 121-123.
Kuru, C. and Ayfer, M. (1984). Antepfıstı_ı çiçeklerinin yapay yöntemlerle tozlanması üzerinde ara_tırmalar. Gaziantep Zirai Ara_tırma Enst. Yay. No. 1.
Pontikis, C.A. (1975). Contribution to studies on pistachio pollination problems. The effect of sprays with winter oils (DNOC) on the earliness of flowering in pistachio. *Nea, Agrotiki, Epitheorisis*, 9: 291-298.
Pontikis, C.A. (1989). Effects of hydrogen cyanamide on bloom advancement in female pistachio (*P. vera* L.). *Fruit Var. J.*, 43(3): 125-128.
Porlingis, I.C. and Voyiatzis, D.G. (1986). Flower synchronization of staminate and pistillate pistachio trees (*Pistacia vera* L.) with paclobutrazol. *Acta Hort.*, 179(II): 521-527.
Procopiou, J. (1973). The induction of earlier blooming in female pistachio trees by mineral oil-DNOC winter sprays. *J. Hort. Sci.*, 48: 393-395.
Tasias i Valls, J. (1990). Tree nut production in South Europe, Near East and North Africa – Issues related to production and improvement. In: Nut Production and Industry in Europe, Near East and North Africa. *Reur Technical Series*, 13: 21-46.
Tekin, H., Güzel, N. and Ibrikçi, H. (1995). Influence of manure and inorganic fertilizers on growth, yield and quality of pistachios in southeastern Turkey. In: First International Symposium on Pistachio Nut, Adana (Turkey), 20-24 September 1994. *Acta Hort.*, 419: 129-134.