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PISTACHIO (PISTACIA L.) GENE POOL

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Annotation

The results of the study of the gene pool of the pistachio family (Pistacia L.), the analysis of the collection of handon pistachio varieties in pistachio-growing countries around the world are presented. The current storage of handon pistachio varieties varies from country to country, and significant work has been done on their storage and reproduction. It has been found that storing varietal collections on the basis of research institutes is a more effective method.

Keywords: pistachio, pistacia, pistachio gene pool, varieties and forms of pistachio, selection, collection, Iranian varieties, pistachio export, handon pistachio fruit, handon pistachio blossom, pistachio plantation, introduction.

Introduction

Today, handon pistachio is the main nutty variety grown in many countries around the world. Worldwide, pistachio production is 855,000 tons per year. 415.5 thousand tons in Iran, 233.1 thousand tons in the United States, 76.9 thousand tons in China. and 28.8 thousand tons in Syria. handon pistachio fruit is grown [24]. These countries earn high

incomes by exporting handon pistachios and they are the world leaders in this field. One of the current challenges is to expand the composition of their high-yielding varieties and forms to provide the world's population with quality handon pistachio fruit.

More than 100 varieties and forms of handon pistachio have been propagated around the world. Such varieties and forms are effective when large fruit, fertile, seed and pollinator trees bloom at the same time. In this regard, in Iran, Turkey, Syria, North Africa and the Mediterranean countries, handon pistachio selection and establishment of cultural plantations are widely developed. 10 seeds in Italy, 46 seeds and 29 pollen forms in Spain, more than 70 local varieties in Kerman province of Iran, 45 seeds in Rafsanjan pistachio research institute, 16 seeds in Turkish pistachio research institute collection, 10 seeds in Aleppo University collection of Syria and There are 10 pollen forms, 14 in Greece, and a collection of several varieties and forms at the Palestinian Desert Research Institute. This collection is important in establishing handon pistachio plantations or improving the condition of existing ones.

Research style

The pistachio (Pistacia L.) family includes 18 species:

1) P. aethiopia Kokwaro
2) P. eurycarpa Yalt
3) P. integerrima J. Stewart
4) P. khinjuk Stocks
5) P. ^{x} saportae Burnat
6) P. wenmanifolia J. Poiss
7) P. Chinensis Bunga
8) P. formosana Mats
9) P. philippinensis Merr
10) P. vera L.
11) P. Cabulica Stochs
12) P. mutica Fisch et Mey
13) P. terebinthus L.
14) P. Centiscus L.
15) P. atlantica Desf
16) P. palestina Boiss
17) P. Mexicana Kunth
18) P. texana Swingle

In the last century, the only comprehensive taxonomic study abroad on the pistachio (Pistacia) series was conducted by Michael Zohary, and 10 species of the Pistachio series were divided into 4 sections.

1. Section. Lentiscella Zohary: (P. mexicana HBK., P. texana Swingle)

2. Section. Lenfiscus Zohary (P. lentiscus L., P. weinmannifolia Poisson)

3. Section. Butmela Zohary: (P. atlantica Dest., P. mutica Fischer E.C.A. Mayer)

4. Section. Terebinthus Zohary: (P. terebinthus L., P. palaestina Boiss., P. khinjuk Stocks., P. vera L., P. chinensis Burge).

These sections list 10 types of pistachios, of which only Pistacia vera nuts can be consumed [23]. The number of P. vera chromosomes is 2n = 30.

Research results

The pistachio originated in the West, Central and Asia Minor, and is distributed in areas from Syria to the Caucasus and Afghanistan. Archaeological findings in Turkey show that handon pistachio nuts were consumed as early as 7,000 BC. Handon pistachio was introduced to Italy from Syria in the 1st century AD. As a result, pistachio cultivation has been introduced in the Mediterranean countries. In the U.S., pistachios were originally planted in experimental test plots planted with seeds in California, Texas, and other southern states. In France in 1875, small pistachio trees were planted in Sonoma County, California. The U.S. Department of Agriculture was able to collect representatives of the pistachio family and several of the handon pistachio varieties introduced in 1900 at a station in Chico City, Butte County, California. Commercial cultivation of handon pistachios began in the late 1970s in the San Joaquin Valley, and it developed rapidly. Currently, the main pistachio-growing countries are Iran, the United States, Turkey, and to a lesser extent Syria, India, Greece and Pakistan.

Pistachio, or "green gold," is one of Iran's most important agricultural products. The genetic biodiversity of Handon pistachio in Kermen Province is comparable to that of biodiversity in other regions. More than 70 cultivars of handon pistachio, which have their own distinctive mark, are grown in the province of Kermen.

In Iran, pistachio growing regions are located at 27o and 37o latitudes of the northern latitudes at an altitude of 700-3000 m above sea level. Trees are resistant to a wide range of

temperatures (from -20o C to + 45o C) and do not stop bearing. Pistachios can be grown even in hot summers with long and low relative humidity (<35%).

At present, the pistachio research institute in Rafsajan (Rafsanjan) has 3 collections of pistachios, including pollen and seed varieties and several specimens of the Pista (Ristacia) family. The collection of seed trees is large and includes 45 varieties growing in the provinces of Kerman, Glyazvin, Semnan.

The germoplasm of this collection was built in 1982, welded in 1983 and 1984. In plantations, pistachios are arranged so that the distance between trees is 4 m and the row spacing is 7 m. There were 18 trees in each variety and the Almond variety was used as a graft. Varieties are stored with a separate body center opening.

Between each of the 12 rows of seed trees is placed a row of pollinating trees.

The main and important task of the pistachio research institute in Rafsajan (Rafsanjan) is to identify, collect, store and restore the genetic code of pistachios. The main goal of the eight provinces participating in this project is to isolate new varieties of handon pistachios, prevent genetic degradation and collect and store them on 3 plots of the collection located in Kerman, Gazvin and Semnan. These projects also include the evaluation of each variety, the determination of their quality under different growth conditions, the development of selection potential, reproduction, and the study of disease and pest resistance.

Because the genetic basis of cultivated handon pistachios is very thin [1, 19, 21], their durability is at risk. In addition, less attention to the genetic biodiversity and survival of pistachios (Pistacia) has a negative impact.

Scientific research on pistachios has focused on their selection and, in particular, on improving the condition of pistachios growing in the area, leading to the extinction of some of the forms that grow naturally in the area.

A strategy for the genetic resources of unused species of pistachios (UMS) growing in the Mediterranean countries has been developed, with a step-by-step approach to these species depending on the number of descriptors, ie pistachio species are divided into two groups: group 1 Pistacia vera, group 2 other species Pistacia. included.

In the perspective of other specific issues, it was determined that the biometric and molecular evaluation of cultivated handon pistachio varieties, as well as the study of growing conditions [11].

The International Institute for Plant Genetic Resources (IPGRI) places great emphasis on the assessment of germoplasma and genetic biodiversity under the P. vera L resource research program.

Pollen and seed varieties from Central Asia and the Mediterranean, as well as from Italy, Greece, Morocco, Spain and Turkey are being studied.

In Turkey, 8 local varieties are Uzun (Uzun), Kirmizi (Kirmizi), Halebi (Halebi), Siirt (Siirt), Beyazben (Beyazben), Sultani (Sultani), Dagerni (Dagirnii), Keten Gumlegi (KETEN Gomlegi) and 5 non-local ones. varieties are grown Ohadi (Ohadi), Bilgen (Bilgen), Vahidi (Vahidi), Safedi (Safedi), Mumtaz (Mumtaz).

The collection of Turkish and introduced pistachio varieties, which are kept at the Pistachio Research Institute in Gaziantep, are also grown at the Keylanpinar State Experimental Farm. In order to protect the genetic traits of each species of pistachio, it is necessary to establish field collection plots of regional and global importance and try to collect all their ecotypes [17]. He conducted scientific research on pistachios in Sailyurfa, Gaziantep, Kahramanmaras and Adiyamon provinces. As a result of these studies, 16 varieties of pistachios were identified, and these varieties were distinguished by individual characteristics. They were planted at Gaziantep (Pistachio Research Institute) and Keylanpinar State Farm.

Syrian pistachio has long been a growing country, and wild forms of pistachio are also widespread in the region: P. atlantica, P. palaestina, P. khijuk, and P. lentiscus [9].

According to Hadj-Hassan [6], there are historical pistachio gardens in the village of Am El-Tamnah, Kalamoun District, 60 km north of Damascus, with the oldest pistachio trees (the oldest dating back to 1800). relevant) are available. These trees still bear fruit. If these trees here are not protected from various vandalism attacks, these native varieties may be in danger of extinction.

In Syria, seeded handon pistachios are divided into 18 varieties, which can be divided into 3 groups depending on the quality of the fruit (Table 1).

Table 1. Groups of seeded handon pistachio varieties in Syria

Nav	Fruit quality
1. Ashoury 2. Red Oleimy 3. White Betoury 4. Ajamy 5. Nab Al-Djamal 6. Batoury Ezraa	High
7. Antaby 8. Red Jalab 9. Bondouky 10. White Oleimy 11. White Jalab	Average
12. Marawhy 13. Lazwardy 14. Ein El-Tainah 15. Lesan El-Tair 16. Boyadi 17. White Ashory 18. Zaaroury (Gehashy)	Past

Hadj-Hassan [6] conducted research on 11 seed varieties of pistachios growing in Aleppo between 1978 and 1979. The most cultivated varieties in the Aleppo region are as follows: These species, for which scientific research has been conducted, were widely cultivated in Aleppo. For example, Ashoury Red Oleimy, White Betoury, Ajamy, Red Jalab, Bondouky, Marawhy, Lazwardy, White Oleimy, Nab Al-Djamal, White Jalab. In scientific studies, the growth, flowering, flowering periods, and substances affecting the fruit varieties of Ashoury (Red Aleppo), Red Oleimy, White Betoury, yield indicators, fruit shedding, percentage of empty seeds relative to total yield, percentage of quality yield, nut fruit while complete data such as mass growth, morphological characteristics of the nut fruit were obtained, while for the remaining 8 varieties it was limited to a focus on their main features.

Hadj-Hassan [6] also conducted scientific research on pollen trees suitable for Syrian pistachio varieties in Aleppo province, and as a result, 11 pollen pistachio clones were

selected: Adam's Male, Bazem's Male, Caliphah's Male, Deeb's Male, Elias's Male, Fady's Male, Gaber's Male, Hady's Male, Ibrahim's Male, Jamil's Male, Kamel's Male. These selected clones have the ability to pollinate 2-5 seed varieties.

Selected pistachio and seed varieties of pistachio selected in Syria, some varieties imported from Tunisia, Cyprus, and other countries were grafted to P.vera grafts in a 7x7 meter scheme at the ACSAD collection plot in Gillin (Gillin). In addition, collections of 17 varieties have been set up in each of the handon pistachios in Gillin, Aleppo and Ham, which belong to the Syrian Ministry of Agrarian Reform and Agriculture. In 1984, the Faculty of Horticulture of the Agrarian University in Aleppo established a mother plantation of 10 pollen grains and 10 seed varieties of handon pistachio in a 4x4 meter scheme.

Naturally, 4 species of Pistacia grow in Greece, and 2 species are grown in gardens. Several hybrids have also been cultivated.

The biggest problem in preserving Pistacia's germoplad in Greece is the lack of financial support. Nevertheless, some research institutes, as well as universities, have been contributing to the preservation of this valuable local germoplasm.

A small collection of pistachios has been built at the Faculty of Agriculture of the University of Athens, which is a much older collection.

Two small collections have been built at the Institute of Pomology in Rhodes (ARS) and Naous (Naoussa).

Pistacia vera A collection of two germoplases has also been established to evaluate wild species products, as well as grafts. The ARS collection is the youngest collection, and the first introduction processes began in 1990 (20 varieties, including 5 pollinators, 15 seeders) and all varieties were grafted to the Tsikoudia (Tsikoudia) navigator. (Table 2) resulted in 14 samples (11 seeds and 3 pollen grains) being introduced and grafted to P. integerrima. A. around the collection. 3 specimens (clones) of the genus Egina, some varieties of P. Vera, and eight trees of P. Integerrima were planted [15].

Table 2. Germoplasm collection of seed and pollinator varieties in ARS

Seed	**Changchi**
Samples from the 1990s have grafted T. terebinthus. tsikoudia	
Algina	B-selection C-Selection Chico Macho-502 Peters
Ajamy	
Biance	
Bronte	
Capuccia	
Cerasola	
Joley	
Keeman	
Mateur	
Momtaz	
Ohadi	
Pontikis	
Red Aleppo	
Sefedex	
Sfax	
1994 samples, welded P. integerrima	
Aegina	C-selection Macho-502 Peters
Bianca	
Bianca Regina	
Bronte	
Cerasola	
Joley	
Kerman	
Larnalc	
Matlur	
Red Aleppo	
Safx	

In North Africa, pistachios are widespread, but the number of pistachios in pistachios is very small as a result of anthropogenic adverse events. Pistachios are also declining sharply in the

population as a result of cattle grazing and the use of trees as fuel. Pistachios growing in the Atlas Mountains are a genetically eroded species.

North African countries have done some work to preserve pistachio species, but these efforts have been limited and not sustained.

In Tunisia, which has a relatively large area of pistachios in North Africa, no attention was paid to seed trees until the Mateur variety was isolated. The Sfax and El Guettar varieties are the other varieties in the country, while the Achoury-like Mateur variety, now a Syrian variety, is the main variety of Tunisia. This variety includes 3 genotypes: early maturing pollinator 25A, late maturing pollinator 40A and seed 11. Widespread use of the Mateur variety in Tunisia has weakened attention to other varieties, resulting in a significant increase in the extinction of other varieties. Thus, El Guettar, especially the Sfax varieties, is on the verge of extinction.

The Mediterranean pistachio (Pistacia) germoplasma collection was established by the Jacob Blaustein Institute for Desert Research. The main function of this germoplasm is to study samples at the morphological, molecular, and bio-technical levels [2, 4, 5, 7, 14].

In Mediterranean countries, soil erosion protection is becoming a topical issue as a result of land development. Therefore, it is expedient to study local specimens of this group (Pistacia), collect and select genetic resources, conduct research on grafts and use them to prevent soil erosion [18].

Bianca or Napoletana is the only cultivated variety, the remaining varieties occupy 3% of the area and are mainly distributed in abandoned habitats. Some relict varieties such as Natola, Rappa di Sessa, Minnulina and Agostina may have been lost because these varieties are not found in gardens.

Pistacia vera is believed to have been first introduced to Spain by the Romans from Asia. This species was cultivated in many areas in the Middle Ages but by the end of the Middle Ages the species had completely disappeared from this area. The main reason for this is the cutting of non-yielding pollinating trees, as a result of which the seed trees do not bear fruit even after there is no pollinating tree, and these trees are also completely cut down. At the same time the cultivation of handon pistachio nuts completely stopped. Then, in 1980, the

species was re-introduced to Spain, planted on 1,000 hectares of arable and drip-irrigated land. The pistachios in these areas came into fruition in 1998 (around 400 acres).

The Spanish germoplasma bank for pistacia is in IRTA Mas Hove Pace, Tarragona (Reus, Tarragona) and currently has six species of germoplasma: P. vera., P. atlantica, P. integerrima, P. khinjuk, P. palaestina, P. terebinthus, P. vera has 46 seeded and 29 pollinated varieties. In addition, scientific research on the selection program of more than 200 P. vera seedlings is underway [13, 20].

5 groups of wild trees belonging to the same taxon were planted separately so as not to interfere with each other. The materials were coded and part of the isoenzyme was described. The IRTA gene bank in Spain is the largest among the Mediterranean countries and is used by the institutes of the countries where P. vera is grown wild and cultivated from seed and grafted.

In Spain, there are also two small field pistachio collections, one built in S / A Zaragoza (Zaragoza) and the SMA in Ciudad Real (Table 3).

Table 3. Types of pistachios stored in the gene bank of Mas Bove (Mas Bove) in IRTA (Spain)

Pista type	**Number of trees**	**Origin**
P. atlantica	65	USA and Syria
P. integerrima	35	United States
P. khinjuk	33	Turkey
P. palaestiana	32	Greece, Syria, USA
P. terebinthus	54	Greece and Spain
P. vera навлари	75	13 different countries
P. vera ниҳоллари	>2000	IRTA selection program

95% of Italian pistachios grow in Sicily [10], and currently 10 seed trees are grown [3]. A similar situation is observed in Syria, Turkey and Greece. The main reason for this is the long yield period of varieties, longevity and long waiting for the results of hybridization [9]. However, many genetic erosions (replacement of local varieties, population effects, environmental degradation, grazing, and forest fires) have a major impact on the pistachio variety platform, mainly in natural pistachios [16].

Conclusion

Preservation of handon pistachio varieties today is in a diverse state around the world, and significant work is being done on their storage and reproduction. A more effective way is to store varietal collections on the basis of research institutes. Because the main goal is not to bear fruit, but to further expand research.

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