

ECOLOGY OF POMEGRANATE AND ITS ECONOMICS IN TURKEY

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Abstract

The native land of pomegranate (*Punica granatum* L.) is Iran and Anatolia. Pomegranate is cultivated in Middle Asia, in the relatively drier regions of eastern Asia and especially in Anatolia and Africa along the Mediterranean. The plant was brought to America by Spanish settlers during the 18th century. The plant is grown mainly in California and Arizona. Pomegranate can only be grown in the mid-latitude of various conditions of climate and soil. The plant needs an average of 500 mm rain yearly, and as the plant is considerably temperature tolerant, it can survive in low temperatures down to about -10 °C. The plant is selective of soil type. It can be cultivated in various types of clay soil, sand, and rock. Pomegranate develops in deep, permeable, humid, cool soil, as well as dry and hot climates. Although pomegranate is grown all over the country, the reason why the plant is widely cultivated in the Mediterranean region, the Aegean region, and Southeastern Anatolia is that these are the regions which present the necessary climatic conditions. Pomegranate is a plant with many branches of about 2-5 m in height with multi trunks which sucker from the root. The size of fruit is about the size of an orange with hundreds of pulps and seeds as the edible parts which have sweet, sour or tangy tastes. The seed of the pomegranate is the edible part of the plant. However, the plant has a wide range of uses; the fruit is consumed as food, while the root, stem, and peel are mainly used as raw material in chemistry and the pharmaceutical industry. The increase in economic value of the pomegranate and the increase in the use of the plant, specifically in the food industry, have led to a considerable increase in its production in Turkey. The production of pomegranates amounted to 17,000 tons in 1975 and then increased to 36,000 tons in 1985, to 53,000 tons in 1995, and 80,000 tons in 2005. The plant is widely cultivated in mainly Mersin province and other cities, as well as Antalya, Aydın, Denizli, Gazi Antep, Hatay, and Siirt. Considering the increase in the economic value of pomegranates in recent years, it will have beneficial effects on the country's economy if importance is given to the cultivation of the plant and to the extension of cultivation land by taking the ecological needs of the plant into consideration.

Key word: *Pomegranate, Pomegranate production, Turkey*

Introduction

Pomegranate, which has been grown since early in history, is a fruit widely cultivated in the tropical and subtropical areas, whereas it is only cultivated in limited areas with temperate climates on earth. As well as being used in ancient Egypt and Greek mythology and art, this plant was also mentioned in holy books (Figure: 1). Pomegranate, which can be grown naturally in unfavorable conditions of which many other plants cannot develop, has become a more widely known plant. The production and trade of pomegranates are on the increase, owing to the developments employed in the techniques in plant growing, food technology, storage, and transportation (Onur 1988). The fact that the roots, the stem, and the leaves of the plant are widely used in pharmacy and in the chemical industry has contributed to the importance of the pomegranate. In addition, the fruits are used as raw material in the food industry and the fresh fruits have become exports of pomegranate growing countries.

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Study area

The pomegranate plant, the habitat of which is known to be south and southwest Asia, the Near East and Middle East, Iran, Afghanistan, Southern Caucasia and Anatolia, has been naturally grown over a wide area from Anatolia and Iran to India. It has also been cultivated all over the Mediterranean region, North Africa, and Europe throughout history. The fact that there are wild pomegranate groves in Anatolia, Syria, Iraq, Iran, and Afghanistan makes us believe that the pomegranate was spread across the east and the west through natural means (through the transportation of the seeds by birds) (Onur 1988).



Figure:1

Pomegranate in mythology

narhicz.sitemynet.com

Today pomegranate is cultivated in some Asian countries, such as Pakistan, India, China, Azerbaijan, Uzbekistan, Tajikistan, Turkistan, Crimea, and Georgia, as well as in some Mediterranean countries, such as Lebanon, Israel, Egypt, Algeria, Tunisia, Morocco, Spain, Italy, Yugoslavia, and Greece, and also on the island of Cyprus. Pomegranates, which are believed to have been brought to continental America by Spanish immigrants in the 18th century, are cultivated in the hot southern and middle areas of America. Moreover, it is also cultivated in some American countries, such as the USA, Argentina, Chile, Peru, Honduras, Mexico, and on some islands, such as the Bahamas, the Indies, Bermuda, and Hawaii.

In Turkey, which is one of the leading pomegranate producing countries, pomegranates are cultivated almost everywhere- in gardens and on the edges of fields as a border plant. Besides that, they are cultivated in 53 cities.

The Mediterranean, Aegean, and southern Anatolia regions, which especially present the required ecological conditions for the plant, are the areas where pomegranate gardens are widely located.

Aim and Method

The pomegranate plant, which has a wide variety of species, needs to be widely known in order for its economic value to be recognized and, as a result, the plant could compete with other fruits. Despite the developments in recent years, the current potential of pomegranates in Turkey, which is one of the most important pomegranate producing countries in the world, cannot be fully utilized. That's why, the main aim of the study is to analyse the ecological features of the areas where the plant spreads over, and therefore, to contribute to the expansion of cultivation areas.

With this aim in mind, related data regarding pomegranates has been gathered from TÜİK and evaluated; thus, maps and graphics have been drawn. In addition, personal inquiries have been made and related literature has been examined.

Species of Pomegranate and classification

The pomegranate belongs to the family of Punicaceae in the Myrtiflorae team. This is the only Punica, the most important species of whose is *Punica Granatum* L., which belongs to this family. *Malum punicum*, which is known as the Carthaginian apple, is cultivated for commercial purposes. *P.granatum* v. *striata*, *P.granatum* v. *florae luteo*, *P.granatum* v. *florae plena*, and *P.granatum* v. *florae albo-plena* do not produce fruits; however, these are used mostly in landscape design for ornamental purposes owing to their big and attractive flowers.

Another species of Punica type is *P.nana*. Pomegranates of this species are so small that the plant can be grown in a flower-pot for decoration, and the fruit is the size of a walnut (Figure: 2).

Studies to classify pomegranate, which started as early as the 13th century, were carried out by considering many factors including the colour, flavour, and shape of the fruits, along with the growth of the plant; thus, various groups were formed. In Turkey, in a study on the pomegranate cultivated in the Mediterranean Region, the classification was made according to flavour. Three main groups- namely sweet, tangy and sour- could be distinguished. Besides those, other pomegranate groups, such as sweet-tangy and sour-tangy, were determined. On the other hand, pomegranate classifications, such as early, middle season, and late, were also made according to the harvest period between 20 August and 20 October (Onur 1988).

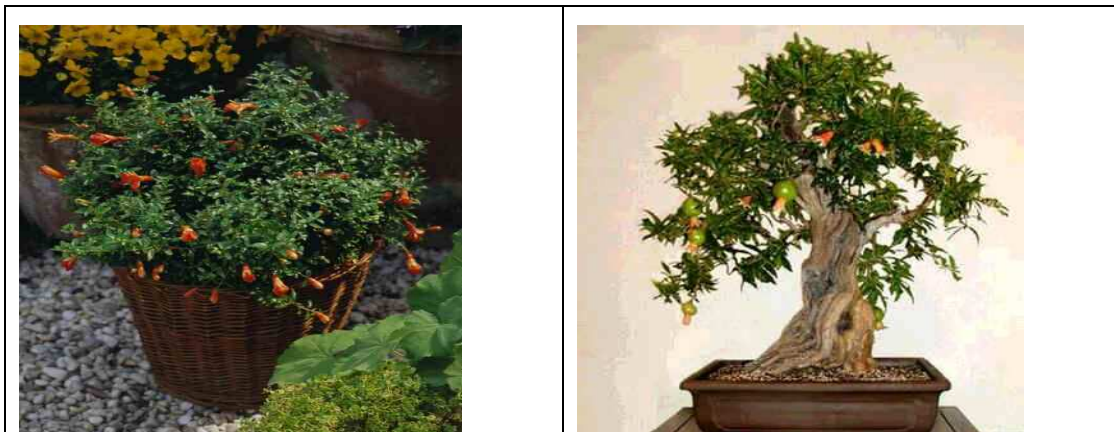


Figure: 2 *P.nana* www.rarexoticseeds.com www.b-and-t-world-seeds.com



Figure: 3 Pomegranate Tree www2.vo.lu

Characteristics of the Pomegranate

The pomegranate, which is one of the most draught-tolerant plants, has strong roots that grow deep into the soil and to all sides. The roots live for a very long time; nevertheless, when the trunk dies back, the roots produce new suckers to prolong the existence of the plant. Pomegranate trees, which have many trunks that stem from the lower parts, are about 3 to 5 meters tall and in the form of a shrub (Figure: 3).

Since the tree continuously produces new suckers from the roots, the tree consists of many trunks of different ages. The color of younger trunks is light brown, whereas older trunks are dark grey. The branches are dense and they usually grow towards all sides. Fruits are mostly on the 2-3 year old branches. The leaves are opposite, in the form of a narrow oblong spindle, 1-8 cm long and 0,5-2 cm wide. The tree is evergreen in the tropical areas; while in subtropical and temperate climate they lose their leaves only in the fall and winter. The flowers are short-stemmed, big, and glossy reddish (Figure: 4-5).

Although the period when the tree starts to blossom varies according to the species and the location of the plant, it covers a long period of time from the beginning of April til the middle of May. The fruit, which is approximately the size of an average orange, is leathery-skinned, and reddish. (Figure: 6).

The edible part consists of red seed pulps with seeds in them. In some varieties of the plant, the seeds in the pulps are soft and hardly noticeable when eaten. These kinds of pomegranate are called seedless, and therefore these are the most preferred ones. The pulps are whitish yellow, pink, and reddish. The pulp in the fruit covers 50-80% of the fruit weight (Figure: 7).



Figure 4: The opposite leaves of pomegranate www.botany.wisc.edu

Ecological Requirements Of Pomegranate

Climate

Generally, the areas where there are hot, dry, and long summers with warm and rainy winters are the suitable areas to cultivate pomegranate. The tree needs to blossom starting from April and May in order to yield fruits of commercial value. The pomegranate tree, which can withstand cold temperatures down to -10° C and completely dies at -20 °C is temperature tolerant.

Pomegranate requires about 500mm of precipitation yearly. The plant favors precipitation during the winter and spring. However, precipitation in the summer might damage the fruit, and it leads to poor quality fruit and cracks on the skin of the fruit. Dry weather conditions during the maturation period of the fruit help to obtain best quality fruits.



Figure 5: Pomegranate flowers

www.floridata.com



www.uni-graz.at



www.kct.ne.jp

Figure 6: Leathery skinned pomegranate fruits.



www.hort.purdue.edu

gorgeoustown.typepad.com

estouest.blog.lemonde.fr

Figure 7: Pomegranate pulps in colours

Soil

The plant, which is not highly selective of soil type, can be cultivated in gravel, siliciferous, and calcerous soil. The plant adapts to alkaline and acidic, moderately salty, very dry, or even very humid soil types.

The most suitable environment for growth of the pomegranate is possible in dry and hot weather conditions, and in deep, humid, permeable, and cool soil on the southwestern, south and southeastern slopes. The plant can be cultivated at high altitudes up to 1000m above sea level. The tree starts to produce fruit in the second or third year after planting and continues to produce good yields for 20-30 years. In Turkey, the approximate yield per tree is about 20 kgs. But, in the gardens where proper planting techniques are applied and the garden is properly kept the yield will be much more (Onur 1988).

Production and Consumption of Pomegranates in Turkey

In Turkey, which is the habitat of pomegranates, the plant grows on its own almost everywhere- by the rivers and on the dry bases of valleys. Moreover, owing to its attractive flowers, the plant is cultivated in home gardens, by the roads, and on the edges of the gardens as a border plant, and in the pomegranate groves.

In Turkey, which is among the most important producers in the world, the production, the consumption, and the trade of pomegranate has gradually increased. That's to say, the production amount was 17,000 tons in 1975, and then increased to 36,000 tons in 1985, to 53000 tons in 1995, and to 80,000 tons in 2005. (Table:1 Figure: 8).

Table: 1 Years of Production of Pomegranate in Turkey (TÜİK)

	Number of trees yielding fruit	Number of trees not yielding fruit	Production (tonnes)
1995	2304000	495000	53000
1996	2350000	520000	56000
1997	2420000	570000	56000
1998	2320000	500000	55000
1999	2410000	730000	58000
2000	2485000	809000	59000
2001	2530000	840000	60000
2002	2670000	855000	60000
2003	3190000	1100000	80000
2004	3200000	1220000	73000
2005	3220000	1409000	80000

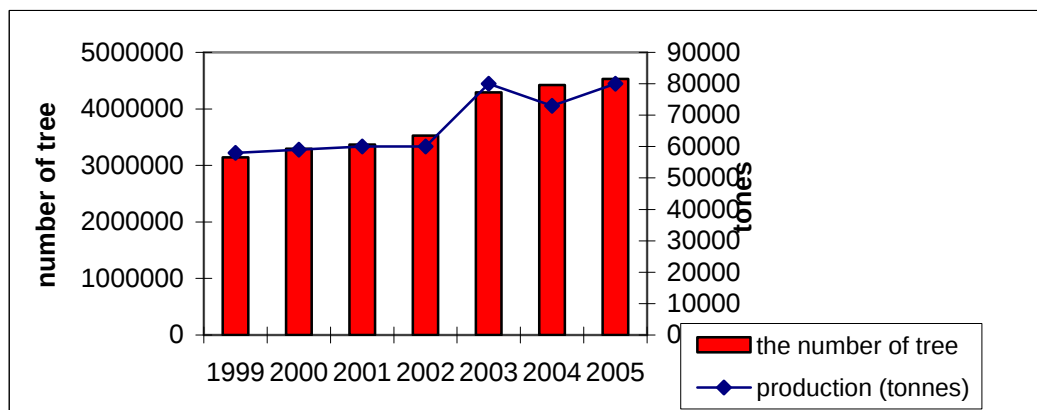


Figure: 8 Number of Trees in Turkey and Amount of Production According to Years

The rapid increase in the production of pomegranates in the recent years is definitely due to the formation of groves of standard pomegranate species, which were determined as a result of the studies carried out, and the developments in the cultivation techniques, in the food technology, in storage, and in transportation conditions. The number of groves and the amount of production has remarkably increased, especially in and around Antalya.

In addition, another factor which enhanced the rapid increase is that the positive effects of pomegranate on human health have been high on the agenda. As a result of an increase in demand, new pomegranate grooves have been planted in many cities in our country, as new grooves were planted in Kocaeli. In 1986, pomegranates were cultivated in 48 cities for commercial purposes; whereas today, the plant is cultivated in 53 cities (Table: 2-Figure:9).

Table: 2 Production of Pomegranate in cities in 2005 (tonnes) (TÜİK)

ADANA	2331	DİYARBAKIR	1032	MUĞLA	2073
ADIYAMAN	698	ELAZIĞ	161	ORDU	16
AFYON	152	ERZİNCAN	2	RİZE	1
AMASYA	11	ERZURUM	1	SAKARYA	239
ANKARA	15	ESKİŞEHİR	465	SAMSUN	219
ANTALYA	26441	GAZİANTEP	6234	SİİRT	3159
ARTVİN	198	HAKKARİ	35	SİNOP	41
AYDIN	6722	HATAY	4793	TEKİRDAĞ	14
BALIKESİR	853	ISPARTA	408	TOKAT	4
BİLECİK	631	MERSİN	8010	TRABZON	38
BİTLİS	28	İSTANBUL	16	ŞANLIURFA	879
BURDUR	951	İZMİR	2252	UŞAK	82
BURSA	129	KÜTAHYA	2	KARAMAN	1398
ÇANAKKALE	238	MALATYA	18	BATMAN	508
ÇORUM	105	MANİSA	783	ŞIRNAK	203
DENİZLİ	6084	K.MARAŞ	124	KİLİS	304
DİYARBAKIR	1032	MARDİN	502	OSMANİYE	397

Likewise, the area for production in 1995 was 4640 hectares; while, in 2000 and 2005 it was 4675 and 6700 hectares respectively (Table:3, Figure:10).

When the graph of yearly distribution of production of pomegranates over the cities is examined, in 2005, when the production in Turkey was 80,000 tons, Antalya and Mersin obtained the highest yields with 26,441 tons and 8,010 tonnes respectively. These cities were followed by Aydın, Gaziantep, Denizli, Hatay, and Siirt with their high yields.

Pomegranates, which can be cultivated in various kinds of climates and in various types of soil, in fact, thrive under the sun. The plant grows almost everywhere on its own in the Mediterranean Region, Aegean Region, and Southeastern Anatolia. However, the fact that the temperature is not high enough in the East Anatolian Region and in the Middle Anatolian Region, and that the amount of precipitation during the summers which destroys the quality of the fruit is large, has a negative effect on pomegranate cultivation (Güngördü 2006).

Pomegranate is consumed mostly in pomegranate producing countries. In our country, pomegranate is consumed as a processed fruit juice, and also consumed as fresh fruit when its in season. According to data in 2005, consumption of pomegranates per person was about 1kg. This amount is considerably small when compared with other kinds of fruits. In some producing countries, pomegranate pulps are canned and dried (Figure: 11)

A new method in order to preserve pomegranate pulps, which has also been applied in our country in the recent years, is to freeze them. Frozen pomegranate pulps are exported especially to Arabic countries (Onur 1988).

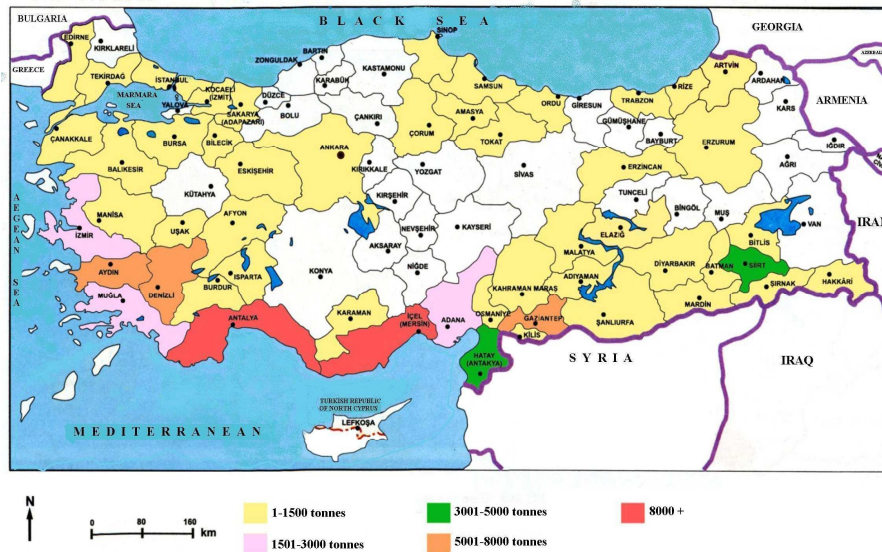


Figure: 9 The Distribution of Pomegranate Production According to Provinces in Turkey (2005)

Table: 3 The Area for Production of Pomegranate in Turkey According to Years (hectares) (TÜİK)

Years	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Hektars	4640	4503	4784	4954	4608	4675	5600	5500	6000	6500	6700

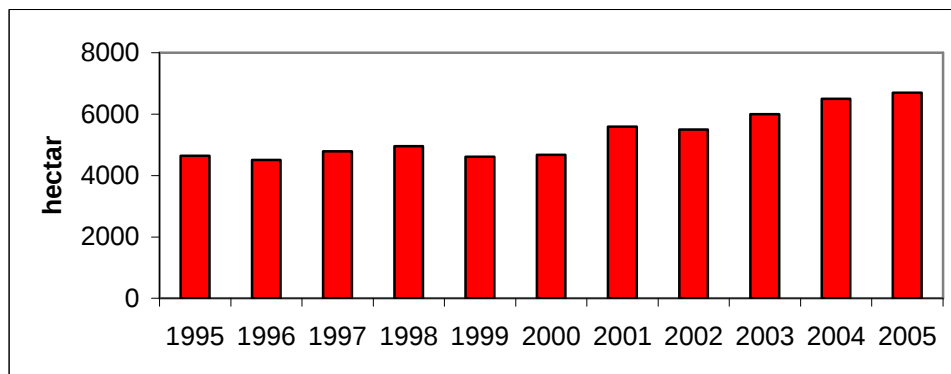


Figure: 10 Production of Pomegranate between 1995-2005

In the food industry pomegranates have been utilized as fruit juice and pomegranate syrup. The effects of pomegranates on human health, which have been known for centuries, such as the effect in reducing fever and blood pressure and the effect of the skin of the fruit on the treatment of intestines, have recently been proven through research; therefore, pomegranate has begun to be used as raw material in the medical industry. The skin of the fruit is indispensable in the leather processing industry owing to the large amount of tannins in the skin. Similarly, the skin and the flowers are essential in plant dyeing since they give out different colors (Kayabaşı, Şanlı, Etikan 2003).



Figure: 11 Dried Pomegranate Pulps (gourmetsleuth.com)

FOREIGN TRADE OF POMEGRANATE

Although foreign trade of pomegranate has not been reflected in the statistics, according to available information, pomegranate exporting countries are generally pomegranate cultivating countries, and pomegranate importing countries are some European and Arabic countries (Onur 1988).

Foreign trade of pomegranate in our country has been realized through the exportation of fresh pomegranates. When we examine the figures of foreign trade (Table:4, Figure: 12). A rise especially in the amount of exportation can be observed. The value of exportation increases in parallel with the increase in production (Table: 5, Figure: 13)

Table: 4 Amount of Foreign Trade of Fresh Pomegranate (TÜİK)

year	Import (kg)	Export (kg)
2000	2500	3193195
2001	14650	6620459
2002	0	7302539
2003	0	9468084
2004	4510	11764335
2005	266809	11296960

In 2005, the value of exportation for 11,296,960 kg of pomegranate was 9,285,254 dollars. Pomegranates were exported to European countries mostly fresh; whereas, frozen pomegranates were exported to Arabic countries. In order to increase the amount of foreign trade, it is essential that the characteristics of pomegranates be introduced into the countries where pomegranates are not cultivated. An increase in exportation will stimulate local markets and increase production.

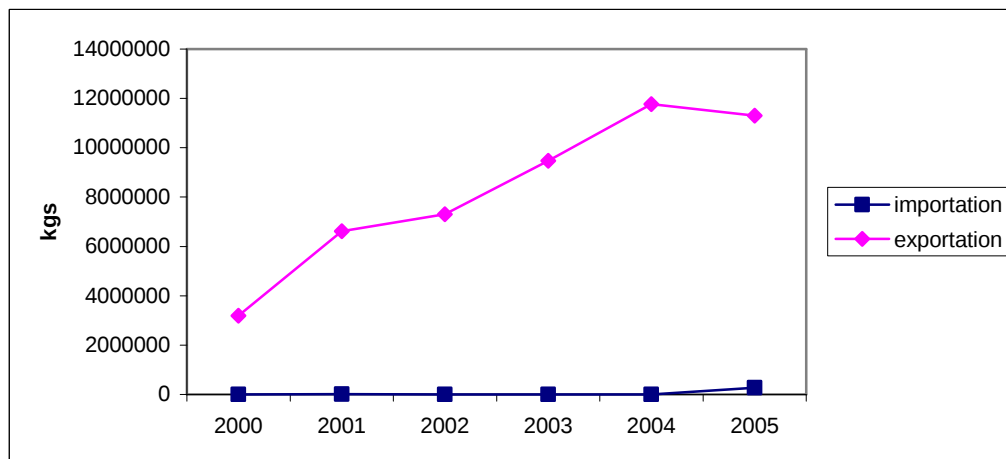


Figure: 12 The amount of Importation and Exportation of Pomegranate (in kgs)

Table: 5 The Value of Foreign Trade of Fresh Pomegranate in Dollars (TULK)

year	Import (dollars)	Export (dollars)
2000	250	1755524
2001	1465	3078818
2002	0	4286394
2003	0	6700051
2004	1684	7917686
2005	80997	9285254

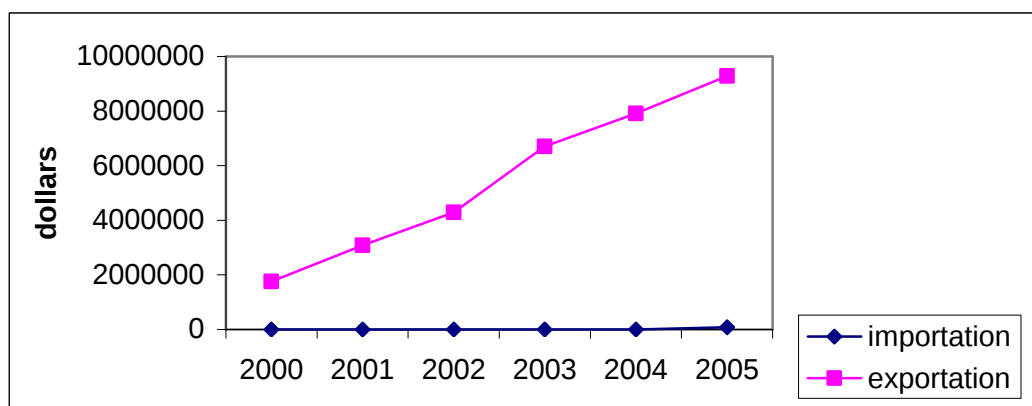


Figure: 13 The Value of Importation and Exportation of Pomegranate in Dollars

Conclusion

Pomegranates, which have been grown for centuries, can adapt to almost any climate and soil. A native to our country, pomegranates can grow at altitudes up to 1000m above sea level. The developments in recent years of the cultivation techniques, food technology, storage, and transportation conditions have enhanced interest in the plant; therefore, proper groves of pomegranates have recently been formed.

Obviously, there has been a rapid increase in the production of pomegranates, the root, the trunk, and the fruit of which have been utilized in various industries. The reason why producers prefer to cultivate pomegranates and why consumers consume pomegranates, especially as pomegranate juice, is that the benefits of the pomegranate on human health have been high on the agenda. However, an increase in the consumption of the fruit is believed to be appropriate only after the effects of the plant on human health have been thoroughly researched.

Regarding the increase in economic value of pomegranates, attaching importance to producing pomegranates, and expanding the cultivation areas while considering its ecological requirements, will have favourable effects on the economy of the country.

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