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Review

Apricot culture in Turkey

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Accepted 2 June, 2009

Turkey is divided into nine agro-ecological regions with mountainous terrain in the periphery, a relatively flat central plateau and a narrow coastal strip. This country has diverse environment with mountains, valleys, plains and numerous rivers and lakes. Over a quarter of the country is covered with forests and woodlands. This results in marked variations in climate and vegetation around the country. Turkey and Iran (Iran Plateau) are centers of origin and diversity of many fruit species, such as apple, pear, cherry, rose, walnut, cornelian cherry, almond and more. Stone fruits comprise 20.0% of the total fruit production in Turkey, and apricot ranks first among stone fruits. Apricot can be grown in all regions of Turkey, except in the Eastern Black Sea Region and in the high plateaus of the East Anatolian Region. Turkey is a leading producer in both in fresh and dried apricots in the world. Although the percentage share of the fresh apricot trade is not significant, Turkey can enlarge this potential in the near future.

Key words: Apricot, Turkey, genetic resources, production.

INTRODUCTION

Apricots were domesticated well over 5,000 years ago in the wide area covering, Iran, Turkistan, Afghanistan, Middle Asia and Western China. *Prunus armeniaca* L. is not a true native to the plains of Armenia, but it has been continuously cultivated there since at least the first century AD. It was brought to Armenia from a more eastern center of origin much earlier as evidenced by archeological excavations at pre-Christian sites. It was brought to Anatolia in Fourth Century BC from Persia during the voyages of Alexander the Great. Thus Anatolia became the second homeland for apricot. During the Roman and Persian wars in 1st century BC, it spread first to Italy, and then to Greece. Eventually it spread to Spain and England in 13th century and to France and America in 17th century (Faust et al., 1998; Buttner, 2001).

Main apricot production areas in Turkey

Although apricots are grown throughout Turkey, about half the crop is produced in the Central Eastern Anatolia Region. Most important apricot producing centers in Turkey are Malatya, Erzincan, Aras valley (Igdir-Kagizman), Icel (Mut), Elazig, Sivas, Kahramanmaras, Kayseri, Nigde, Hatay and Nevsehir provinces (Figure 1). However the first 4 provinces produce 70-75% of Turkey's total apricot production with about 60% of the trees

(Anon, 2008a). The best quality apricots come from Malatya with its unique taste and aroma, because of its unique ecological and soil endowments (Guleryuz et al., 1997; Altindag et al., 2006). This region has also supplies 65-70% of the world dried apricot production.

Altitude

The altitudes of locations of apricot orchards in main apricot growing areas, namely Malatya, Erzincan, Aras valley (Igdir-Kagizman) and Icel (Mut) were between 850-1700 m, 1150-1600 m, 830-870 m and 200-600 m, respectively. Fruits in the Icel (Mut) and Sakit valley (Hatay) mature the earliest and followed by Aras valley (Igdir-Kagizman) provinces, and are sent to markets earlier because of the impact of low altitude compared to the other provinces. Icel (Mut) and Sakit valley are also the earliest apricot producing areas in the Europe.

Climate

In Turkey, apricot is grown in a wide range of climatic conditions. The climate in Igdir, Icel and Sakit valley are rather mild, and Erzincan is a plateau. According to long term data, average temperatures, total annual rainfall and relative humidity in main apricot growing areas, Malatya,

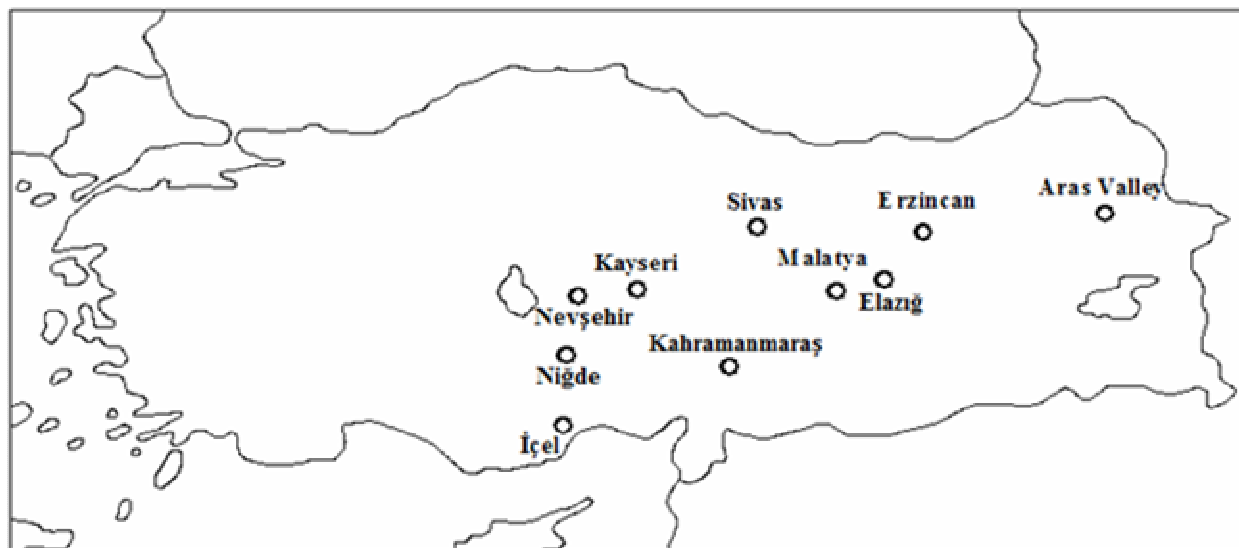


Figure 1. The primary apricot production regions of Turkey.

Erzincan, Aras valley (Iğdir-Kagizman) and Icel (Mut) were 13.7, 10.7, 11.2 and 16.2°C; 382, 374, 251 and 404 mm and 51, 58, 62 and 49% in these provinces (Table 1) (Anon, 2007). Weathers are very cold during winter and very arid during summer in first three provinces. However, the climate of Icel (Mut) is semiarid, having hot summers and cold winters. Having orchards at different altitudes in Malatya, Erzincan, Icel (Mut), Sakit valley and Sivas prevents all apricot orchards from suffering with late spring frosts. Since there are no altitude differences among orchards in Aras valley, especially Iğdir province, all apricot orchards suffer from late spring frosts in some years when it occurred.

Germplasm resources of Turkey

In Turkish the superior, sweet seeded apricot clones are called 'Kayisi' and old, local seedlings with smaller fruit and bitter seeds are called 'Zerdali'. Some Zerdali types have sweet seed. The Turkish word 'Kayisi' is actually 'Ghaysi' meaning the fruit from the land of 'Ghays' in the Old World. The 'gh' is changed to 'k' in Turkish. 'Zardalo' is a Persian word. Zard means yellow and Alo means plum. In Turkish, 'o' is converted to 'i'. So, Zardali is not a Turkish word. In Turkey over 70% of trees are budded onto seedlings. The seed propagated apricots are called in Turkey as 'wild apricots' as well. This terminology is still 'black box' in apricot producing countries. Extensive variability exists among wild apricots and cultivars within and between districts in quality and time of harvest (Akca and Askin, 1995; Ayanoglu and Kaska, 1995; Bolat and Guleryuz, 1995). Although most cultivars mature between the end of May and the beginning of August and wild apricot populations mature from mid-July until the 20-25th August, some wild apricot forms mature in late Septem-

ber (Bolat and Guleryuz, 1995). These forms may be important to extend the harvest period. Late blooming and growth dwarf types have also been reported among the native apricot seedling populations in the Erzincan plain (Ercisli, 2004). The Sakit valley located in Mediterranean coastal region has also important early matured apricot genetic resources. There were numerous local types coming from seeds in this valley and a selection study conducted on these materials and some promising Sakit types has been released as cultivar candidate (Durgac and Kaska, 1997).

Systematics

All apricot varieties and types grown in Turkey belong to *P. armeniaca* L. as do the economically significant varieties used for fresh consumption, canning and drying. Although the apricot varieties grown in Turkey are generally free stone, most of the wild types are clingstone (Guleryuz, 1988). There were four eco-geographical groups in apricots, and Turkish apricots placed within Irano-Caucasian group as defined by Kostina (1969). Apricots from the Irano-Caucasian group are also very diverse, but are generally shorter-lived than those from Central Asia. Extremely late ripening apricot forms are also present in the Irano-Caucasian germplasm. 'Levent' apricot, from the Anatolia region of Turkey, is said to have a fruit development period of 190–200 days (Asma and Ozturk, 2005). Importation and utilization of this germplasm in breeding programs would undoubtedly assist in the extension of the fruit maturation period.

Cultivars

The fruit characteristics demanded by Turkish consumers

Table 1. Long term meteorological data of Malatya, Erzincan, Igdir and Icel (Anon. 2003).

	Months												Average
	1	2	3	4	5	6	7	8	9	10	11	12	
Average temperature (°C)													
Malatya	-0.9	0.7	6.3	13.1	18.5	23.3	27.3	27.5	22.6	15.6	8.3	1.8	13.7
Erzincan	-3.4	-2.0	3.1	10.3	15.6	19.8	23.7	24.1	19.1	12.3	5.9	-0.6	10.7
Igdir	-2.7	-0.7	5.8	12.2	17.4	20.6	24.0	23.3	18.5	11.5	5.8	-1.1	11.2
Icel	3.1	4.1	7.6	14.5	20.0	26.8	29.5	31.2	24.8	18.1	10.3	4.1	16.2
Total rainfall (mm)													
Malatya	47.5	45.6	49.6	50.9	43.7	16.6	1.8	1.9	6.5	33.4	44.6	40.4	382.6
Erzincan	30.1	34.8	40.9	53.0	50.0	31.4	11.3	6.8	15.3	37.0	33.5	30.0	374.1
Igdir	18.5	14.2	17.6	30.1	45.0	34.0	14.9	10.5	12.2	20.7	18.5	15.4	251.6
Icel	88.9	64.2	36.5	28.5	11.2	5.0	3.8	2.0	5.7	18.1	46.2	93.9	404.0
Average relative humidity (%)													
Malatya	71	71	66	58	55	50	44	42	46	58	69	72	59
Erzincan	71	71	66	58	55	50	44	42	46	58	69	72	58
Igdir	71	66	60	59	58	55	53	54	60	68	73	76	62
Icel	60	60	54	46	42	40	46	41	40	45	48	68	49

are symmetry, homogeneity in size, flavor, stone freeness and an attractive surface color (Table 2). Most common cultivated variety in Malatya was Hacı Haliloglu (85-90%) but with the new plantations in recent years cv.

Kabaası is also being used commonly. The reason for this cv. Kabaası has larger fruit than the other cultivars of apricot and it is also more resistant to spring late frosts. Most common cultivated variety in Erzincan is Hasanbey (60-65%) followed by Sekerpare (Shekarpareh) (25-30%). Shekarpareh means 'piece of sugar' in Persian language. In Aras valley province, cv. Shalak (Salak) (90-95%) is dominant and followed by cv. Tabarzeh (Teberze). On the other hand, cv. Y. Tokaloglu, P. de Thyrinthe, Ninfa is dominant in Icel (Mut) province (Ayanoglu and Kaska, 1995; Guleryuz et al., 1997, Bircan et al., 2007). All varieties grown in Icel region, Sakit valley, Kahramanmaras, Kayseri and Aras valley can be used as fresh consumption. In Malatya, Elazığ, Nevşehir, Niğde and Sivas provinces, apricots are generally produced for dry consumption and in Erzincan region both for fresh and dry consumption (Table 2).

Rootstocks

Rootstocks for apricot cultivars in main apricot growing areas in Turkey are generally wild apricot seedlings. It is called 'Zerdali' in Turkish, which is derived from Persian word of 'Zardalo'. Teberze cultivar is also used in addition to wild apricot seedlings in Aras valley province. No problems are faced during seed germination.

Production

Fresh apricot

World fresh apricot production was 2,670,000 metric tons

in the average of the term from 2000 to 2007. The most important apricot production countries are Turkey, Iran, Italy, Pakistan, France, Spain, Morocco, Syria, China, USA, Egypt and Greece. Those countries produce more than half of the world apricot production (Table 3). Turkey is a leading country in apricot production with about 22 percent (Table 3). Other important producing countries include Iran (12.2%), Italy (7.3%) and Pakistan (6.7%), respectively.

Dried apricot

Turkey, Iran, China, U.S.A, Australia, and South Africa are major dried apricot produces countries (Table 4). Turkey produces almost 80% of the dried apricots in the world without any serious competitors. Turkey is also the biggest dried apricot exporters to correspond 70% in the total world export (Anon, 2009). Apricot is dried by using two different methods in Turkey, called 'Gun Kurusu' (natural dry) and 'Kukurtleme' (sulfured dry). Sulfuring is useful to shorten the time of the drying process, to preserve the natural color, to prevent the product from getting infested with bugs, and to increase the storage period. Fruit dried with natural way resulting brown color and different taste. European Union Regulation restricts the amount of sulphur in dry apricot to 2000 ppm; the limit is applied as 2500 ppm in Canada and 3000 ppm in USA.

Utilization

Apricot is one of the most commercially important fruits in Turkey. Besides its fresh consumption, all through the summer it is used in making marmalade, jam or jelly and also canned as slices or processed as fruit juice. Varieties grown mainly in Malatya are used in drying (Ozbek, 1978).

Table 2. Characteristics of apricot cultivars grown in Turkey.

Provinces	Cultivars	F.Weight (g)	Fruit Shape	Skin Color	Freedom of pit	Type of consumption	Flesh Firmness	TSS (%)
Malatya	Cologlu	30	Round	Yellow	Free	Table, Dried	Medium	21
	H.Haliloglu	33	Round	Orange	Free	Dried	Medium	25
	Sekerpere	22	Round	Cream	Free	Table	Soft	20
	Cataloglu	31	Round	Yellow	Free	Dried	Medium	23
	Soganci	46	Round	Yellow	S.cling	Dried, Table	Medium	26
	Kabaasi	38	Round	Orange	Free	Dried	Firm	23
	Hasanbey	36	Cylindric	Yellow	Free	Table	Medium	20
Erzincan	Sekerpere	24	Round	Cream	Free	Dried	Soft	21
	M.Erigi	40	Round	Red	Free	Table	Medium	23
	Hasanbey	39	Cylindric	Yellow	Free	Table	Firm	20
Igdır	Salak	63	Cylindric	Yellow	Free	Table	Soft	14
	Ordubat	25	Cylindric	Orange	S.cling	Dried	Medium	18
	Tebereze	38	Round	Orange	Free	Dried	Medium	17
	Agcanabat	51	Round	Cream	Free	Table	Medium	14
	Agerik	45	Round	White	Free	Dried	Soft	14
İcel (Mut)	Ninfa	30	Round	Red	Free	Table	Medium	13
	P.de Thyrinthe	30	Round	Yellow	S.cling	Table	Firm	13
	Bebeco	46	Cylindric	Yellow	S.cling	Table	Firm	12
	Y.Tokaloglu	48	Round	Yellow	S.cling	Table	Medium	13
	Septik	32	Round	Yellow	S.cling	Table	Soft	11
	Karacabey	57	Cylindric	Yellow	Free	Table	Firm	13
	Sam	59	Cylindric	Yellow	Free	Table	Firm	11
	Sekerpere	36	Round	Cream	Free	Table	Medium	18

Source: (Ayanoglu and Kaska, 1995; Guleryuz et al., 1997 ; Asma and Ozturk, 2005 and Bircan et al., 2007).

Table 3. World fresh apricots production (thousand t)

Countries	2000	2001	2002	2003	2004	2005	2006	2007	Share in world Production (%)
Turkey	579	517	352	499	350	390	461	529	21.9
Iran	262	283	284	285	285	285	280	280	12.2
Italy	201	194	200	108	214	233	222	212	7.3
Pakistan	126	125	130	211	215	220	190	190	6.7
France	139	103	170	124	166	182	179	180	5.6
Spain	143	135	128	144	122	137	141	87	4.5
Morocco	120	104	86	98	85	104	129	100	4.1
Syria	79	66	101	101	100	101	85	87	3.4
China	88	84	72	82	87	90	83	93	3.2
USA	80	75	82	89	84	70	40	80	2.7
Egypt	63	71	103	71	73	73	74	78	2.8
Greece	84	71	70	59	90	84	93	95	3.3

Source: (Anon., 2008b)

Marketing

Local within Turkey

Growers sell their fresh produce mostly through commission agents or in whole sale markets located in their

vicinity. Retailers include public market sellers, green - grocer shops, and supermarkets. Fresh produce is normally not refrigerated. Chain store fruit sales in Turkey are increasing rapidly and buyers of these stores insist on higher quality products in terms of uniformity, flavor, size and color.

Table 4. World dried apricots production (thousand t).

Countries	2001	2002	2003	2004	2005	2006	2007	Share in world Production (%)
Turkey	80	27	50	19	139	90	79	80.3
Iran	4	5	5	5	10	11	11	9.9
China	4	4	3	5	4	5	5	4.3
USA	3	4	5	4	3	3	3	3.0
Australia	4	3	4	3	1	1	1	1.1
South Africa	3	2	3	3	1	1	1	1.4
Total	98	41	67	34	158	111	100	100

Source: (Anon, 2009).

Export

Turkey is expanding fresh apricot export into European and other countries in the world. However, Turkey's exports of fresh apricots have not yet reached the desired levels. The country is third important in terms of export level after France and Spain. Greece and Italy has same amount of export level to Turkey. The export of 15 thousand tons of fresh apricots of Turkey is insignificant compared to its existing potential. Turkey only shares 7-8% of total fresh apricot export in the world. France (63 thousands tons) and Spain (48 thousands tons) has the market share in fresh apricot in European market with 25 and 19% ratio (Anon, 2008b). However, Turkey has great chance to export its fresh apricots because of ecological advantages than France, Spain and Greece. Transportation is one of the biggest problems facing the fresh fruit exporters of Turkey. Overland trucks have been the most common transportation mode to Europe. This is responsible for the difficulty of preservation of the fruit quality after prolonged journeys. Turkish exports of fresh apricots are subjected to the European Community regime on fresh fruit and vegetables. Accordingly, a reference price system is applicable for June-July each year. This system creates difficulties for both exporters and importers and it is a cause for disruption in the smooth flow of trade. The most important fresh apricot importer countries from Turkey are Russia (9.175 tons), Germany (2.548 tons), and Saudi Arabia (917 tons), respectively (Anon, 2008). Turkey is the leading dried apricot exporter country in the world (Anon, 2009) and the country realizes 70% of the total dried apricot trade of the world and price of dried apricot in the world assigned by Turkey.

Conclusion

Turkey has a dominant position in apricot production. Although the percentage share of the fresh apricot trade is not significant, Turkey can enlarge this potential in the near future. The production of apricots in the East Anatolia region is expected to increase parallel with the increases envisaged due to the implementation of the

much acclaimed GAP, the South Anatolia Project.

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