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Persimmon production and market

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SUMMARY – According to FAO (2001), the world-wide persimmon acreage was more than 300,000 ha and production accounted for more than 2,300,000 t. China, Japan and Korea account for 95% of total production; Mediterranean countries account for less than 5% of world-wide production. Italy is the main producer in this area (2650 ha and 42,000 t). However, in recent years, Spain has had the highest and quickest increase in terms of acreage and production (2300 ha and 33,000 t, in 2000). In China, Japan and Korea, production is devoted to local consumption. On the other hand, in those countries where the crop has been introduced recently (Israel, Spain, Australia) production is mostly exported. Brazil and Italy have a mixed consumption: most persimmon production is consumed in local markets but a relevant proportion is exported. Native cultivars from Mediterranean countries give astringent fruits. These cultivars are very well adapted to a wide range of environments, most of them have very good taste and fruit quality, which make them the target of preferences of local growers and consumers. However, cultivars from the astringent type are not suitable to export on a large scale. In order to be exported, fruits from the astringent type need a post-harvest treatment to remove astringency. These treatments are expensive and sometimes not very reliable because they depend on the cultivar. An alternative is to grow cultivars of the non-astringent type.

Key words: *Diospyros kaki*, production, acreage, market, exportation, astringency.

RESUME – *"Production et marché du plaqueminier". Selon la FAO (2001), la surface mondiale consacrée au plaqueminier était de plus de 300 000 ha et la production représentait plus de 2 300 000 t. La Chine, le Japon et la Corée représentent 95% de la production totale, et les pays méditerranéens font moins de 5% de la production mondiale. L'Italie est le principal producteur dans ce domaine (2650 ha et 42 000 t). Cependant, ces dernières années, l'Espagne a connu l'augmentation la plus forte et la plus rapide en termes de surface et de production (2300 ha et 33 000 t en 2000). En Chine, Japon et Corée, la production est destinée à la consommation locale. D'autre part, dans les pays où cette culture a été récemment introduite (Israël, Espagne, Australie), la production est principalement exportée. Le Brésil et l'Italie ont une consommation mixte : la plus grande partie de la production de plaquemines est consommée sur les marchés locaux mais une partie assez importante est exportée. Les cultivars autochtones des pays méditerranéens donnent des fruits astringents. Ces cultivars sont très bien adaptés à une vaste gamme d'environnements, la plupart ayant un très bon goût et une bonne qualité des fruits, ce qui en fait l'objet des préférences des cultivateurs et consommateurs locaux. Cependant, les cultivars du type astringent ne sont pas appropriés pour l'exportation à grande échelle. Pour pouvoir les exporter, les fruits du type astringent nécessitent un traitement post-récolte pour éliminer l'astringence. Ces traitements sont onéreux et pas toujours fiables car ils dépendent du cultivar. Une autre solution consisterait à utiliser des cultivars du type non astringent.*

Mots-clés : Diospyros kaki*, production, surface, marché, exportation, astringence.*

Introduction

Oriental persimmon, Japanese persimmon or kaki (*Diospyros kaki* L.f. or *D. kaki* Thunb., according to different authors) is named the "food of the Gods" (from Greek, *Dios* meaning God and *Spyros* meaning food). The species seems to have originated in China, where its culture started some centuries before Christ and it was introduced to Japan in the 7th century and to Korea in the 14th century. In Europe, it was introduced in the 17th century and later, in the 18th century, it was already known world-wide (Sugiura, 1997).

Tables 1 and 2 and Figs 1 and 2 show the area and production for those countries that according to FAO (2001) have more than 100 ha and/or produce more than 1000 t per year. In 1961, only five countries had such a production: China, Japan, Korea, Italy and Brazil. In 2000, two more countries were added to the list: Israel, beginning in 1980, and New Zealand, starting from 1990. Other

countries, still according to FAO (2001), are close to those numbers: Australia, Iran and Mexico. Some countries like Spain, Portugal, Turkey and others do not appear in the persimmon statistics from FAO, although at present they largely surpass the production of 1000 t, probably because persimmon is included in their statistics together with other minor fruit crops.

Table 1. Evolution of persimmon area (ha) from the main producing countries in the last 40 years (FAO, 2001)

	1961	1965	1970	1975	1980	1985	1990	1995	2000
World	122,381	148,491	188,611	188,062	154,432	239,055	212,057	231,712	312,974
China	76,230	100,240	140,270	145,380	110,684	191,119	162,993	169,568	242,400
Japan	36,700	38,300	35,900	31,900	29,400	29,800	29,500	28,000	30,000
Korea	2346	2661	5192	3724	6590	9838	13,581	25,009	30,821
Italy	4600	4100	3800	3500	3300	3313	3055	2878	2648
Brazil	2500	3185	3444	3551	4051	3692	3960	4819	5500
Israel					400	1200	1300	800	1000
New Zealand							488	428	380

Table 2. Evolution of persimmon production (tons) from the main producing countries in the last 40 years (FAO, 2001)

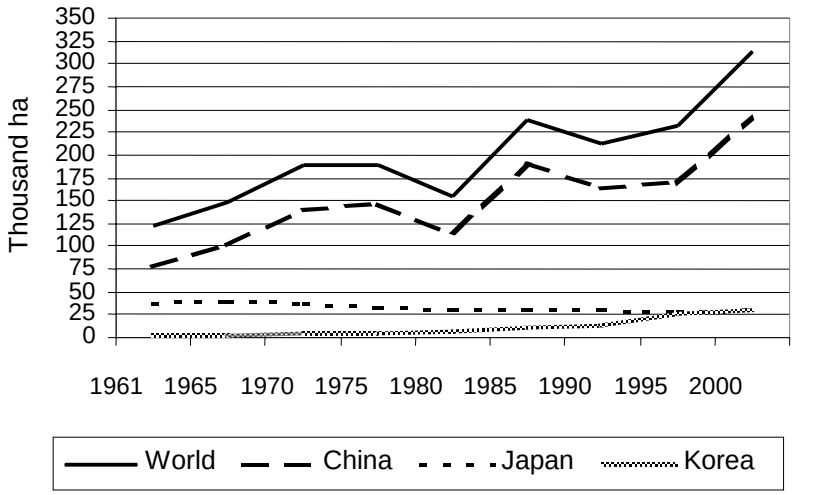
	1961	1965	1970	1975	1980	1985	1990	1995	2000
World	990,079	978,915	911,635	908,607	968,198	1,186,165	1,156,871	1,561,987	2,335,607
China	497,250	516,997	457,341	530,843	566,638	690,945	640,230	985,803	1,655,754
Japan	393,500	346,400	342,700	274,700	265,200	289,700	285,700	254,100	286,000
Korea	13,271	23,510	30,310	20,890	31,837	97,031	95,758	194,585	273,846
Italy	70,740	72,000	59,600	60,000	61,100	56,200	68,770	61,300	41,907
Brazil	15,298	19,988	21,659	22,114	39,958	43,658	46,712	51,685	61,000
Israel					3400	8100	17,200	11,000	13,800
New Zealand							972	1600	1200

In the last 40 years in the world, area and production have been increased almost by 2.5 times (Tables 1 and 2, Figs 1 and 2). Persimmon area and production in 2000 accounted for more than 300,000 ha and 2,300,000 t. This increasing trend is explained by the evolution of the culture in China (Figs 1 and 2). This country always accounts for a substantial percentage of the world production (Figs 3 and 4). Among the main producing countries, beside China, the trend has been different (Figs 1 and 2): an increase in Korea and Brazil and a decrease in Japan and Italy.

Persimmon area and production from Asian countries, where the crop has been established for many years (China, Japan and Korea), have always represented more than 90% of the world totals: 97% of area (Fig. 3) and 95% of production (Fig. 4) in 2000. The contribution to the production by non Asian countries is therefore very small, even if they have a higher productivity, for instance more than 15 t/ha in Italy and Israel and less than 10 t/ha in Asian countries (FAO, 2001).

Finally, the amount of persimmon exported in the world is rather insignificant: less than 8000 t in 1999 (with a value of $11,500,000) of which 82% was from Israel.

The aim of this paper is to review the evolution and the situation of the persimmon crop in the main producer countries and specially in the Mediterranean countries. Evolution in Spain will be pointed out since in recent years this country has had the greatest and fastest crop expansion in the Mediterranean area.



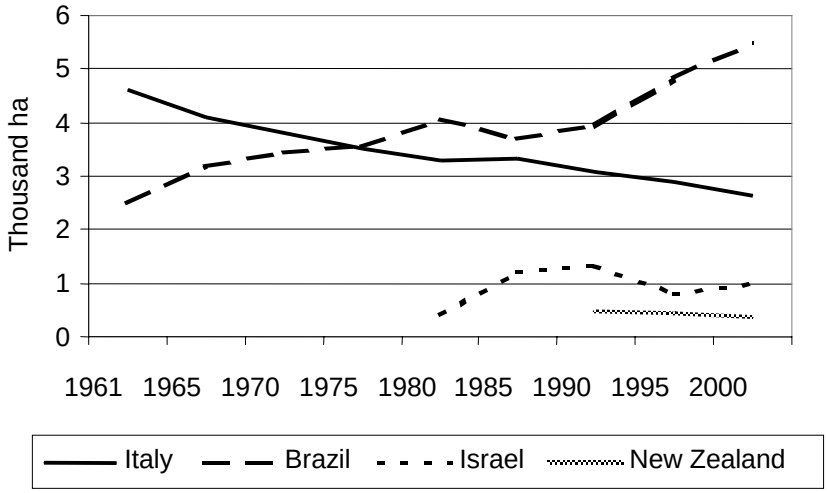


Fig. 1. Evolution of the persimmon area from the main producing countries.

China

The persimmon crop in China has been referenced for more than 3000 years; more than 900 varieties are known, of which 30 or 40 are the most cultivated. All the varieties are astringent except for one ('Luotian Tianshi') (Wang *et al.*, 1997). There is not agreement between area data from Wang *et al.* (1997) for 1992 (68,000 ha), and those referenced by FAO (2001) for the same year (162,000 ha), perhaps because the FAO data include the area from persimmon associated with other fruit trees. However, there is coincidence between production data referenced by Wang and FAO: 730,000 t in 1992 (Wang *et al.*, 1997) and 739,000 t in the same year (FAO, 2001). The total production increased by 3.3 times in the last 40 years, reaching more than 1,600,000 t in 2000. China has always represented a substantial percentage in the persimmon world production. If we accept the FAO data, the area in China increased from 62.3% of the world total in 1961 to 77.5% in 2000 (Fig. 3). The equivalent data for the production in China regarding the whole world are 50.2% in 1961 and 70.9% in 2000 (Fig. 4). Most of the production is consumed in domestic markets.

Japan

Persimmon area in Japan was about 30,000 ha in 2000, which represents 9% of the total fruit trees area in this country. Persimmon is the fourth fruit, after citrus, apple and chestnut. In terms of

production the 286,000 t in 2000 represents 7% of the whole production of fruit trees. It is also in fourth place, after citrus, apple and Japanese pears. The trend of the culture is slightly decreasing (Figs 1 and 2): in 1961 the area was 36,700 ha and the production 393,000 t (FAO, 2001). Persimmon production from Japan has passed from 40% of the world production in 1961 to 12.2% in 2000 (Fig. 4). In 1998, the cultivars from "Pollination Constant Non Astringent" (PCNA) type represented 55% of the total persimmon area, 'Fuyu' being the most important cultivar from this group. 'Fuyu' occupied 31% of the area. Among the astringent varieties, 'Hiratanenashi' and 'Tonewase' are the most important, together they represented 26% of the total (Yonemori, 1997). The astringent varieties, which are more resistant to cold, are the only ones that can be cultivated in the northern regions of the country. A substantial part of the production is consumed in domestic markets.

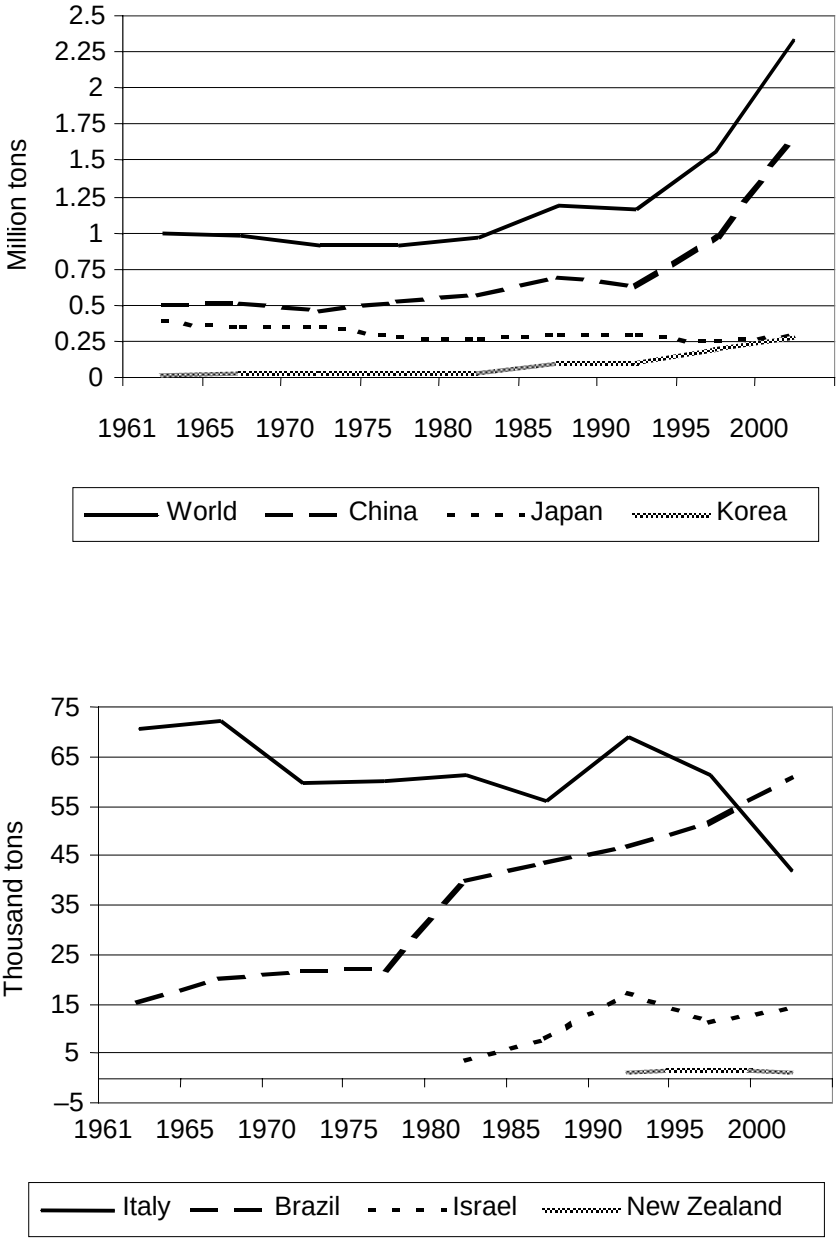


Fig. 2. Evolution of the persimmon production from the main producing countries.

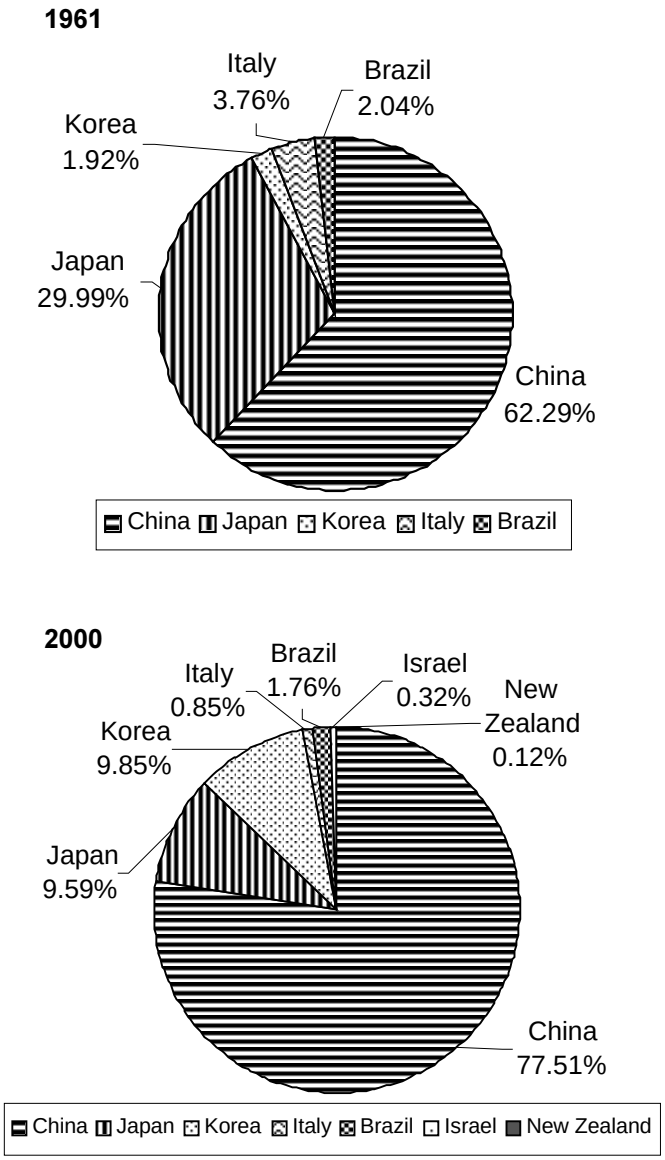


Fig. 3. Percentage of persimmon area in 1961 and 2000.

Korea

Persimmon area and production has increased constantly in Korea in the last 40 years. However, a greater increase has been noticed in the last 10 years (Tables 1 and 2). The area has increased by 13 times and production by 20 times since 1961. According to FAO, area and production from 2000 are similar to those in Japan (30,800 ha and 274,000 t). However, 10 years ago they were less than half. In 1995, persimmon area represented 14.4% of the total area devoted to fruit trees in this country, whereas persimmon production was equivalent to 8.5% from the total production of fruit, after apples, oranges and grapes (Kang and Ko, 1997). The difference between the two percentages is explained by the great amount of young plantings that still had not reached full production. Persimmon production in Korea increased from about 1% of world production in 1961 to near 12% in 2000 (Fig. 4). In this country, more than 100 types or local varieties are known, most of them astringent. However, the recent expansion of the crop is due to the introduction of varieties from the non astringent type, of Japanese origin, that represent 80% of the production. The main variety within this group is 'Fuyu' (85%). As in Japan, the astringent varieties are cultivated in the colder areas of the country. Although the volume of exported persimmon is still very small, this fruit is considered a good alternative for competition in the international markets (Kang and Ko, 1997).

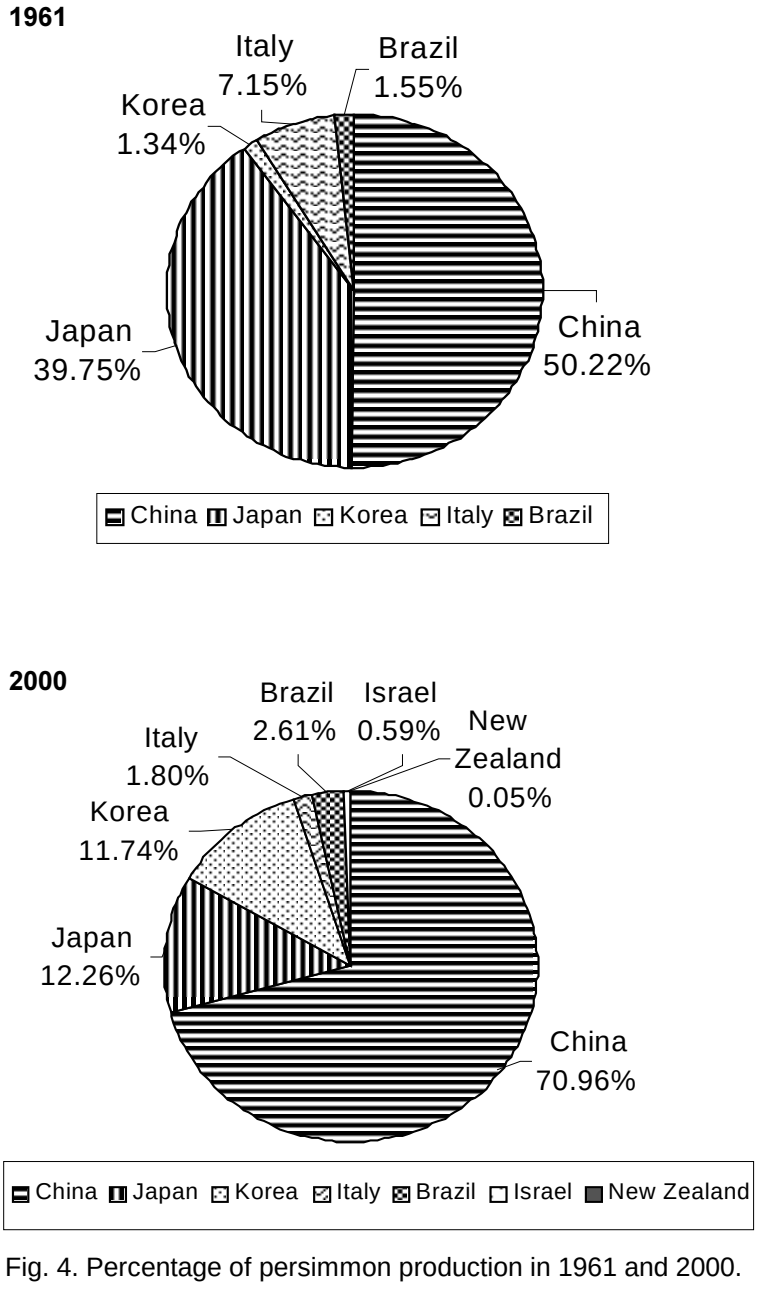


Fig. 4. Percentage of persimmon production in 1961 and 2000.

Australia

Although there is not much data available, it is known that persimmon production of non astringent types passed from almost zero at the beginning of the 1980's, to about 200,000 trees (approximately 500 ha) in 1996. In Australia, the interest for this fruit crop is explained by the great possibilities of exporting the fruit to Asian markets of the northern hemisphere (mainly Singapore, Malaysia, Hong Kong and Thailand). The exports surpassed 500 t in 1996 (Collins, 1997).

Brazil

There are several countries in South America (e.g. Argentina, Chile, etc.) with great interest for developing the culture of persimmon, however, only Brazil has had an important production in that area for a long time. According to FAO (2001), in the last 40 years Brazil has increased the persimmon area by 2.2 times and the production by 4 times (Tables 1 and 2), reaching 5500 ha and

61,000 t in 2000. According to Brazilian experts consulted, the real data would be higher than that of the FAO, being 6700 ha and 110,000 t. The trend is to continue crop expansion in the most important regions (Sao Paulo and Rio Grande do Sul). The reason for such an expansion is the possibility of exports to northern hemisphere markets. At present, Brazil has started sending refrigerated containers that reach good prices in Germany and the Netherlands. The main cultivars grown are 'Fuyu' and its non astringent mutations, 'Taubaté' (astringent) and 'Rama Forte' (variable). There are also local varieties such as 'Chocolate', 'Manteiga', etc. grown in associated orchards with peach, plum and other fruit trees.

Italy

This country is still the main producer in the Mediterranean area. At the end of the 1940's and beginning of the 1950's, the Italian persimmon production largely surpassed 100,000 t. In 1961, the production descended to 70,000 t and the later trend can be seen in Tables 1 and 2 (and Figs 1 and 2): a constant decrease in area (from 4600 ha in 1961 to 2650 ha in 2000) and a substantial decrease in production, although with more oscillations (from 70,700 t in 1961 to 41,900 t in 2000), according to data from the FAO (2001). The increase of competition in the market by other fruits in the same season, such as apples, pears, table grapes and citrus, as well as the always very high cost of marketing due to many hand operations, are the reasons for such a decrease. In the last years another cause has been added: the competition of Spanish exports due to the high quality cultivar 'Rojo Brillante' (to be explained later).

The most important region for persimmon crop in Italy is Campania, which represents now 55% of the total Italian production, although in 1950 it produced by itself more than 80%. The second region in importance at present is Emilia-Romagna, which represents 37% of the total production, with a trend of increase (in 1950 it only produced 1%).

In Campania, almost 90% of production is based on the cultivar 'Kaki Tipo', a "Pollination Variant Non Astringent" (PVNA) type whose fruits are marketed by two ways:

(i) Non pollinated – fruits without seeds and astringent at harvest time, they are sold in northern Italy and some of them are exported.

(ii) Pollinated – fruits with seeds and non astringent at harvest time, they are sold in Campania and in southern Italy.

The rest of the production in Campania is from local pollinators ('Cioccolatino' and 'Zellona') which have seeded fruits and very dark and sweet flesh. There are some attempts at introducing Japanese PCNA varieties, such as 'Hana Fuyu', 'Jiro' and others, which have given good results from the point of view of production, but which have had low commercial acceptance.

Also in Emilia-Romagna, the 'Kaki Tipo' variety represents around 90% of total production and it is marketed non-pollinated to large markets of the north (Milan, Turin, Genoa, Verona, etc.). Exports represent around 10-12% of the production. The exported Italian persimmons are sold in Switzerland (38%), Germany (21%), Belgium (12%) and France (10%) (Pirazzoli, 1998). In Emilia-Romagna the Japanese PCNA varieties have also been tested, their productive behaviour was worse than in Campania because of unfavourable climatic conditions. Additionally, there is also a lack of commercial acceptance.

Only a few years ago, Pirazzoli (1998) studied the profitability of the persimmon culture in Italy, and it can be summarized in the following points:

(i) The average cost of the culture in Emilia-Romagna is about 6310 euros per ha. In Campania, the average cost is lower (4970 euros per ha) as a result of cheaper direct labour.

(ii) The average yield in Emilia-Romagna is 17 t/ha, whereas in Campania it is 26 t/ha. According to these yields, the average cost will be 0.37 euros/kg and 0.19 euros/kg in Emilia-Romagna and Campania respectively.

(iii) The prices obtained by the growers in Italy in the period 1992-97 have oscillated between 0.15 and 0.44 euros/kg; this means that some years do not arrive to cover the costs, mainly in Emilia-Romagna.

The above data points out that the crop in Italy is near the limit between being or not being profitable. Obviously, the study refers to average values and it is evident that a great part of the growers reach productions somewhat higher than those mentioned above (we are speaking of 50 t/ha), with costs of culture which are proportionately not so high, and thus a greater profitability.

Improvement of profitability would require acceptance of the PCNA varieties by the market. These varieties have a marketing cost which is rather less than those of the astringent varieties. Another way to increase profitability would be organic culture. This crop can be easily cultivated without the use of pesticides in some Italian regions and has a high adaptation to many types of soils.

Israel

The spread of persimmon crop in Israel was initiated towards the end of the 1970's (Tables 1 and 2), due to setting up of a post-harvest treatment to remove astringency of the fruits by means of CO_2. This treatment combined with storage in cold chambers extended the shelf life of the fruit. Also the consumers were taught about how to consume this new type of persimmon which favoured the development of the culture even more, so that in 1985 there were already 1200 ha and production surpassed 8000 t, from which half was exported. Production reached a peak towards 1990, then there was a strong fall, and later a recovery (Tables 1 and 2). At present, the area is around 1000 ha in production, with another 400 ha of young plantations (planting of new plots is balanced by removing old orchards). Annual exports are about 10,000 t which are sold mainly in European countries.

The most important cultivar (90% of the total) is 'Triumph', which is sold with the commercial name of 'Sharon fruit'. It is a "Pollination Variant Astringent" (PVA) cultivar, which means its fruits are astringent even if they have been pollinated. Hence, they can be consumed only after removing astringency. Another handicap of this variety is its sensitivity to hot temperatures during the period of fruit set, which some years cause heavy fruit drop. However, in the climatic conditions of Israel, 'Triumph' trees grow and produce very well, in general, and their culture is very easy to maintain. The average yield is 30 t/ha, although some orchards produce much more. Another advantage of this variety is that the fruits can be stored for three months at –1°C. According to these facts, a moderate increase of the persimmon acreage in Israel could be expected, although the main limiting factor for its increase is the 50% reduction of water for agriculture.

Turkey

Persimmon in Turkey has been traditionally considered a minor fruit tree compared with fig and pomegranate. Although the trees are largely spread around the Mediterranean area, its culture was based on seedlings located in home gardens of small towns near the larger cities. Even in the regular orchards, the varieties grown have been of astringent fruits: the more seeds they contain, the darker the flesh (Aksoy, 1995). However, in the last years there has been an increasing interest towards this fruit crop, considering it as a possibility to enlarge the export products. For this purpose, new plantings and commercial orchards of varieties from the PCNA type have been established. The desired cultivars are those with early, coloured, firm pulp fruits, adapted to the environmental conditions of the region. The trend is that the traditional varieties will be replaced by new varieties. At present, an area of 1200 ha and a production of 11,000 t are estimated, and which do not cover the demand of local markets. There are no imports nor exports of persimmon in Turkey.

Greece

The situation of the culture of persimmon in Greece is very similar to that described for Turkey, although on a minor scale: many isolated trees in gardens or mixed with other fruit trees in family orchards; local genotypes of astringent fruits that are consumed mainly by the growers (except for a small amount that is sold in local markets of the cities at very high prices); and a recent interest for

introducing Japanese PCNA varieties (mainly 'Hana Fuyu' and 'O'Gosho') for another type of market. There are about 100 ha of regular plantings with total a production of 6000 t. The average price received by growers is 0.33 euros/kg, similar to that of peach, which would explain the increase of the cultivated area in coming years.

Egypt

This is the only country from northern Africa for which we have information, although it is not updated. Mansour (1995) pointed out that in the period 1989-93 the persimmon area passed from 70 to 238 ha and the production from 625 to 2825 t. The trend was to continue increasing because Egypt had all the required conditions for growing this species on a large scale. The local varieties are all astringent at harvest time, however they are already introducing non astringent Japanese cultivars in order to test them.

Portugal

The species is found scattered all over the country, but is more abundant in the north. The production is based mainly in isolated trees or mixed with other fruit trees. The cultivated area in regular planting is about 224 ha and the total production 5400 t. The most important cultivar grown in Portugal is known as 'Coroa de Rei' (King Crown) (de Sousa and Gomes-Pereira, 1995). Other cultivars grown are 'Triumph', 'Hana Fuyu', 'O'Gosho' and recently 'Rojo Brillante' has been introduced. Persimmon is a much appreciated fruit in Portugal, its consumption is increasing and there are substantial amounts imported from Spain. For this reason, the crop will probably be increased in the future.

Spain

Finally, we will describe in more detail the situation of persimmon in Spain, a country that, as mentioned before, presents the greatest and fastest expansion of the crop among the Mediterranean countries. Persimmon was introduced in Spain by the end of the 19th century, first as an ornamental tree and appreciated for the quality of its wood. As a fruit tree it was grown as isolated trees, in gardens, family orchards or in small plantings destined to local consumption. The species is spread along the Mediterranean coast, coexisting with citrus, fig and olive trees. Although the fruits have always been greatly appreciated in the local markets, the astringency of fruits from all the varieties grown in Spain has limited the culture. The fruits from such varieties cannot be consumed unless they are post-harvest treated for artificial maturation, after which the fruits support badly manipulation and transport.

The Spanish official statistics still consider persimmon crop within the group of "other fleshy fruits", and therefore there are no official data about area and production. Probably, this is the reason why Spain does not appear in the persimmon statistics of the FAO.

Benedicto (1986), 15 years ago, estimated 600 ha cultivated in regular planting, which produced about 3000 t, which represented a low yield (5 t/ha), proper for a culture of low intensity. Nine years later, Llácer *et al.* (1995) estimated that the area in regular orchards reached 1000 ha and its production was around 8000 t, which still included a remarkable proportion of young plantings without cropping. Production was mainly destined to local markets, however the largest Spanish cities (i.e. Barcelona, Madrid, Sevilla and Valencia) had started a substantial consumption and 15% of the production was exported mainly to Portugal and France. Only six years later, the present estimations are 2300 ha and 33,000 t produced in 2000 (Table 3).

The first important expansion of the culture took place in Andalusia (Málaga, Granada, Huelva). At the beginning of the 1990's, several enterprises, some with technicians and/or investments from Israel, started to expand the intensive culture of 'Triumph' variety, which is sold, as in Israel, after removing the astringency of fruits and is marketed as 'Sharon fruit'. Recent data about the persimmon culture in Andalusia show an area of 900 ha and a production of 8500 t (Table 3).

Table 3. Estimation of crop area and persimmon production in Spain in 2000

Province	Area (ha)	Production (tons)
Málaga/Granada	750	7400
Huelva	150	1100
Valencia	1100	20,000
Castellón	200	3500
Barcelona/Tarragona	100	1000
Total	2,300	33,000

Almost simultaneously, there was another important expansion in the province of Valencia, mainly in the Ribera del Xúquer, an area of great tradition in the culture of citrus and stone fruits. In this area, in the last nine years (1992-2000), the persimmon area increased by 106 times and production increased by 140 (Table 4).

Table 4. Persimmon area, production, destination and average price received by growers in the Ribera del Xúquer in the last nine years

	1992	1993	1994	1995	1996	1997	1998	1999	2000
Total ha	6	24	50	73	212	253	330	615	640
Total tons	81	310	640	1098	3185	3800	5000	8000	11,300
% Spanish markets	50.6	66.1	41.9	54.2	45.5	23.5	34.3	22.2	20.8
% Foreign markets	49.4	33.9	58.1	45.8	54.5	76.5	65.7	77.8	79.2
Pesetas/kg	48	48	68	61	40	31	67	33	40
Euros/kg	0.29	0.29	0.41	0.37	0.24	0.19	0.40	0.20	0.24

There are two explanations for this great expansion:

(i) The diffusion of the cultivar 'Rojo Brillante', a budsport from an old native cultivar, 'Cristalino' (Badenes *et al.*, this volume), that has replaced the apricot and Japanese plum trees because of the sharka virus (Climent and Llácer, 2001).

(ii) Techniques for removing the astringency of fruits without loss of firmness were set up (Arnal *et al.*, this volume; Salvador *et al.*, this volume) which represents a substantial improvement of the marketing and transport to long distances.

The variety 'Rojo Brillante' is of outstanding quality: the trees are very productive, they need little or no thinning and produce very large and attractive fruits with nice shape, colour, good flavour, aroma and acceptable storage at maturation. The procedure for removing the astringency has favoured the exportation which is now about 80% of the total persimmon marketed in the Ribera del Xúquer (Table 4). At present, the major receptor countries from the Ribera are: Germany (around 50%), France (20%), The Netherlands (10%) and Brazil (5%).

The Ribera del Xúquer produces more than 70% of total persimmons marketed at Valencia (Table 5). In 1996 the Regulator Council of the Denomination of Origin (CRDO) "Kaki Ribera del Xúquer" was created which is in charge of guaranteeing the quality. Since 1997, this CRDO markets more than 50% of total production from Valencia (Table 5). In the last four years, the proportion of persimmons marketed by one of the brands of the CRDO is increasing (Table 6). The brand "Persimmon" which corresponds to the fruits that are sold hard, after removing the astringency, is increasing their percentage year after year regarding the "Classic" brand, which corresponds to the fruits that are sold soft, after artificial maturation (Table 7). In 2000, this proportion was 83.3% of the brand "Persimmon" and 16.7% of the brand "Classic".

Table 5. Production by areas in Valencia province

	1997		1998		1999		2000	
	Tons	%	Tons	%	Tons	%	Tons	%
Valencia province	6750	100	9900	100	14,000	100	20,100	100
Ribera del Xúquer	4750	70.4	7400	74.7	10,000	71.4	14,100	70.1
CRDO Rib. Xúquer	3800	56.3	5000	50.5	8000	57.1	11,300	56.2

Table 6. Persimmons marketed by "Ribera del Xúquer" with or without a brand from CRDO (Regulation Council of the Denomination of Origin)

	1997		1998		1999		2000	
	Tons	%	Tons	%	Tons	%	Tons	%
CRDO Rib. Xúquer	3800	100	5000	100	8000	100	11,300	100
With CRDO brand	1700	44.7	3500	70.0	4500	56.2	7200	63.7
Without CRDO brand	2100	55.3	1500	30.0	3500	43.8	4100	36.3

Table 7. Persimmons marketed by CRDO "Ribera del Xúquer" as "Classic" or "Persimmon" brands

	1997		1998		1999		2000	
	Tons	%	Tons	%	Tons	%	Tons	%
With CRDO brand	1700	100	3500	100	4500	100	7200	100
Kaki "Classic"	–	–	1600	45.7	1300	28.9	1200	16.7
Kaki "Persimmon"	–	–	1900	54.3	3200	71.1	6000	83.3

Regarding profitability of the culture for the grower from the Ribera del Xúquer, if we compare with the Italian situation, we can point out the following:

(i) The average cost of the culture in Valencia is about 4320 euros/ha, which is lower than that in Campania (4970 euros/ha) and much less than that of Emilia-Romagna (6310 euros/ha).

(ii) The productivity of the 'Rojo Brillante' is higher than that of varieties grown in Italy. Pirazzoli (1998) pointed out an average yield of 17 t/ha and 26 t/ha in Emilia Romagna and Campania respectively. Although most optimists pointed to an average yield of 'Rojo Brillante' in the Ribera del Xúquer of 60 t/ha, we admit that it may be half (i.e. 30 t/ha).

(iii) From the previous numbers, we obtain an average cost of the persimmon grown in the Ribera del Xúquer of 0.14 euros/kg, which is lower than the average cost reported in Italy (0.37 and 0.19 euros/kg in Emilia-Romagna and Campania, respectively) and lower, as well, than the average prices obtained by the Valencian growers in the last years (Table 4). These prices ranged from 0.19 and 0.41 euros/kg.

The present profitability of 'Rojo Brillante' in the Ribera del Xúquer is very interesting. This fact has led to this variety practically replacing all the rest of traditional varieties grown in Valencia. 'Rojo Brillante' is being extended to other Spanish regions such as Andalusia, Catalonia and, within the Valencian community, to the province of Castellón. However, the expansion of persimmon culture in Valencia and Andalusia has been so high in the last years that excesses of production can be expected which would lead to a decrease in prices. Moreover, the procedure for removing the astringency considerably increases the marketing cost. The future trend of this culture in Valencia will need to increase the varietal range (assaying PCNA varieties), to improve the conservation of the fruits and their post-harvest procedure in order to be introduced in new markets.

Conclusions

In those countries where the crop is traditional and it has been established since ancient times, such as China, Japan and Korea, persimmon is consumed in local markets. On the other hand, in those countries where the crop has been established recently, such as Israel, Spain and Australia, persimmon production is mainly exported. Brazil and Italy have both cases: local consumption, which is the greater part of their production, but also the export of important amounts.

In the Mediterranean countries, all the native varieties are of the astringent type and they have certain advantages: adaptability to a wide range of climatic conditions, excellent taste and fruit quality. They are preferred by growers and by the local consumers. However, the astringent varieties are not suitable to export in large amounts. Additionally, production in Italy, Israel and Spain relies on a single variety, which implies sanitary and commercial risks.

To be exported, the astringent fruits need to be treated in order to remove the astringency. The procedure is expensive and is cultivar-dependent. An alternative to overcome this problem is to grow PCNA type cultivars. However, PCNA cultivars have a narrow genetic base, worse adaptability to diverse environmental conditions and the fruits have a lower quality.

The challenge for the persimmon industry in the Mediterranean countries with exporter vocation are mainly two:

(i) To find cultivars from the PCNA type adapted to the Mediterranean environment, with better fruit quality, while new programs of breeding are developed.

(ii) To improve the procedure of astringency removal in order to set up a safer and more economically reliable technique.

International collaboration and exchange of information will be necessary for improvement and progress.

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