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The Mediterranean citriculture: productions and perspectives

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I – The history

Citrus fruits were native to China and other oriental regions like Malaysia, India and Thailand. They have accompanied the history of mankind, from the earliest to the latest times. They conquered all continents and penetrated any society and culture, due to the beauty of the plant and the flower, called Zagara, and also to the precious qualities of the fruit. Historians today believe that the ancestor of the citrus trees in Europe and Middle East was *Citrus medica* L. (citron), which was introduced by Alexander the Great from India into Greece, Turkey, and North Africa in the late 4th century BC (Malcolm, 2006).

The term citrus fruits includes different types of fruits and products. Although oranges are the major fruit in the citrus fruits group, accounting for about 70% of citrus output, the group also includes small citrus fruits (such as tangerines, mandarins, clementines and satsumas), lemons, limes and grapefruits.

It is not known how, where, or when the exceptional present-day varieties of citrus trees developed, but a general consensus of opinions believes that all these citrus developments and improvements were obtained by natural and artificial selection and natural evolution.

II – The world citrus industry

From an economic point of view, citrus fruits rank first in terms of world fruit production and international trade value. Citrus production is estimated at around 100 million tons produced annually. Citrus fruits are cultivated in many countries around the world (140 countries according to FAOSTAT, 2007) although production shows geographical concentration in certain areas, mainly in the Northern Hemisphere, accounting for about 70% of total citrus production. The main citrus fruit-producing countries are Brazil, China, the United States although the whole Mediterranean region (CLAM countries) ranks first worldwide. These countries represent more than two thirds of the global citrus fruit production (CLAM, 2007) (Fig. 1).

Citrus is marketed throughout the world as a beneficial healthy fruit that contains Vitamin C and numerous other vitamins and minerals. Because of their nutritional and organoleptic qualities, citrus fruits contribute to nutritional balance for both Northern and Southern populations.

There are two clearly differentiated markets in the citrus sector: fresh citrus fruits market, with a predominance of oranges, and processed citrus products market, mainly orange juice. Over the last two decades, a major breakthrough was the growth in trade of small citrus fruits (tangerines, clementines, mandarins and satsumas) at the expense of fresh oranges. This is due to the evolution of consumer preferences more oriented to small-sized, easy-peeler and seedless fruits. Consumption of citrus fruit juices has also increased, thanks to product convenience and healthiness, quality improvements, price competitiveness, promotional activity and technological advances in processing, storage and packaging. Among the major citrus varieties, only grapefruit has a level of processed utilization comparable to oranges.

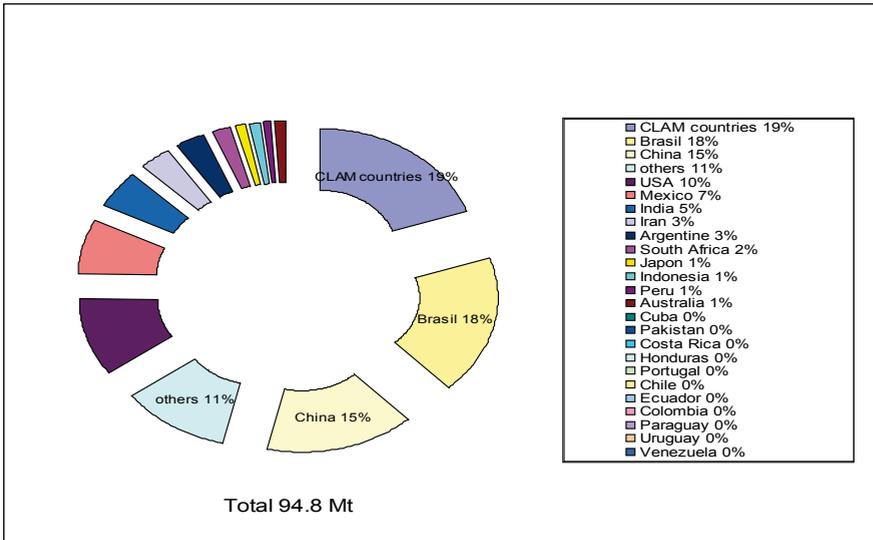


Figure 1. Distribution of worldwide citrus production.
(source data: CLAM, 2007).

III – Citriculture in the Mediterranean Basin

According to CLAM data, the Mediterranean Basin accounts for about 20% of the world citrus production and about 60% of the world fresh citrus trade (Fig. 1, 2). In this region, citrus fruits are produced mainly for fresh fruit consumption. Spain is the leading producing country, whereas Italy and Egypt rank second and third, respectively (Fig. 3).

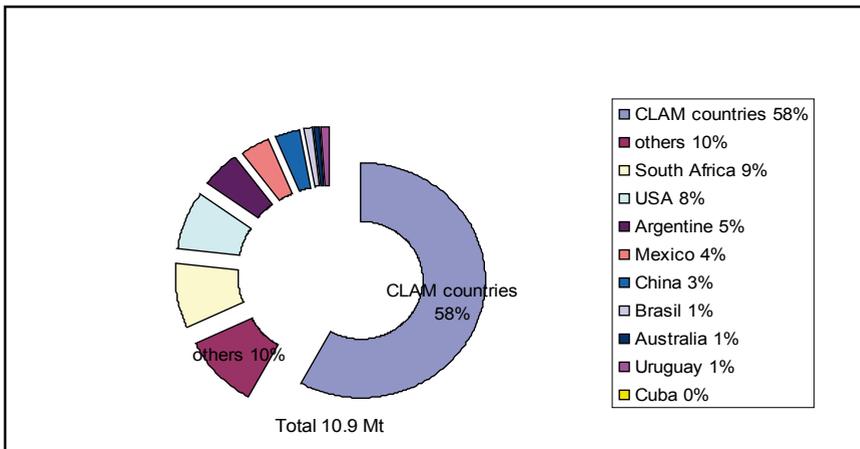


Figure 2. Worldwide citrus exportations.
(source data: CLAM, 2007).

The production is mainly composed of sweet oranges and easy peeler fruits (mandarins and mandarins-like) although other species, such as lemons and limes, are of high interest for specific

areas: lemons are widely cultivated in the Euro-Mediterranean Region, whereas lime in the Near East Region. Grapefruit production is restricted to Israel which is the first exporting country in the Mediterranean and the fourth worldwide. A new entrant to the fresh grapefruit production is Turkey (Imbert, 2007).

The wide range of varieties, with their staggered maturities, allows the fresh fruit market to be supplied throughout most months of the year.

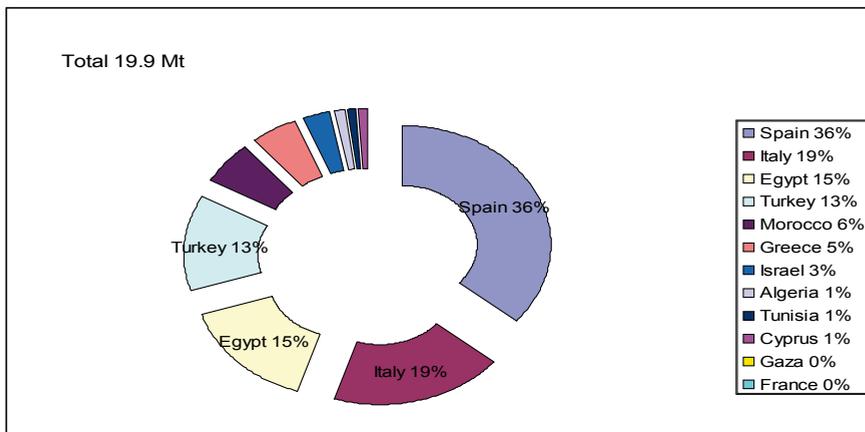


Figure 3. Distribution of citrus production in the Mediterranean basin.
(source data: CLAM, 2007).

On the contrary about the general trend over the last 10 years, production increased in the Mediterranean region exceeding for the first time 20 million tons during the 2006-2007 season. Production records were reached for all species except for grapefruit (Imbert, 2007).

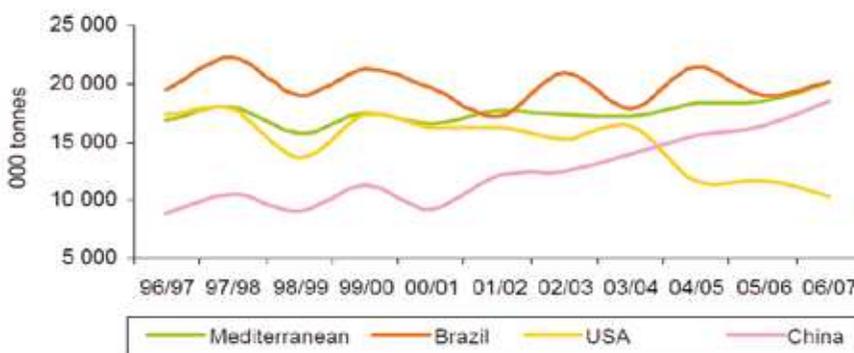


Figure 4. Citrus production trend in the period 1996/1997-2006/2007.
(source data: CLAM, 2007).

Citrus is a major segment in the Mediterranean agricultural industry; developing countries account for almost 40% of the production and citriculture represents a major source of income to a significant number of farmers. According to data provided by the Euro Mediterranean Citrus Network (2007), the Citrus farm size varies from less than 1 ha to a few 100 ha. Farms larger than

10 ha account for 80% of the production and are usually technologically advanced. Most of the fruit is harvested by hand although harvesting machines have been developed. It is a source of employment at various levels of the chain (production, processing trade and farming consumable suppliers). Hence, citrus plays an invaluable role as a driving force to the economy of the entire Mediterranean region.

The Mediterranean has been an important diversification zone for the three most important economic species (oranges, mandarins, lemons); numerous are the germplasm banks in the region, usually under the responsibility of governmental institutions; they represent a valuable reservoir of genetic resources for breeding programmes, but also for commercial purposes. Most of the native genotypes are still widely grown, but their productions are mainly oriented to the local market. The strong replacement of these genotypes with international varieties, highly demanded by the market, is a risk for their possible extinction. Their enhancement through clonal and sanitary selection programmes can surely increase their cultivation and characterize their products for a better economic competition in the market. The market is in fact assisting to a change in consumption patterns, particularly in the form of an increasing focus on the quality and the value-added aspects of the product. European countries are posing particular attention to the quality standards and the traceability of products which have a native origin such as the Italian red orange in Sicily, the Nadorcot/Afourer mandarin in Morocco, the clementine in Corsica and many others.

All together, the Mediterranean countries are the most important exporting regions in the world. Most of the Mediterranean citrus production is used for internal consumption as fresh fruit and for exportation, which represent 42 % and 34%, respectively (Fig. 4).

Based on the species, the Mediterranean basin accounts for 75% of the worldwide exportation of easy peeler fruits (mandarin and mandarin-like fruits) (Tab. 1).

Table 1. The Mediterranean and world trade share per group of varieties in 2006-2007.

(source data: CLAM, 2007).

	World trade	Mediterranean share	Main exporting countries	
Orange	5,370,000	58%	Spain	1,450,000
			South Africa	900,000
			Egypt	760,000
			United States	546,000
			Morocco	264,000
Easy peelers	3,300,000	75%	Spain	1,656,000
			China	367,000
			Morocco	317,000
			Turkey	312,000
			South Africa	100,000
Lemon & lime	2,000,000	45%	Spain	497,000
			Mexico	387,000
			Argentina	355,000
			Turkey	328,000
			United States	384,000
Grapefruit	1,000,000	28%	United States	215,000
			South Africa	215,000
			Turkey	135,000
			Israel	78,000
			Spain	37,000
Total Citrus	11,670,000	58%	Spain	3,640,000
			South Africa	1,215,100
			United States	1,046,021
			Egypt	793,800
			Turkey	775,174

According to CLAM (2007), the current trend in exports of the different Citrus groups of varieties is a leading example of agriculture guided by the market in a constant effort of meeting the consumer's demand, and always aiming at increasing the value added to production. Nevertheless, Mediterranean producers possess a major advantage. Their unique varietal range of easy peelers and orange means that they can generate growth by lengthening the marketing season and facilitating access to the numerous potential markets (e.g. eastern Europe and North America today; Asia and Latin America in the future).

IV – Phytosanitary challenges to the Mediterranean Citrus Industry

The Mediterranean citriculture is characterized by the high prevalence of sour orange (*Citrus aurantium* L.), a rootstock well adapted to the dominant calcareous soils of the region. Sour orange is considered a universal rootstock being also tolerant to Phytophthora gummosis, salinity and drought, which are considered the prevalent biotic and abiotic stresses of citrus in the region. However, sour orange is highly susceptible to citrus Tristeza disease, which is the most severe virus disease affecting these species; it is present in most of the countries in the region and is transmitted by different aphid species. The risk of contamination by tristeza has spurred the use of tolerant rootstocks, Poncirus hybrids (Citrange, Citrumelo) to replace sour orange. The recent introductions in Northern Portugal and Spain of the main virus vector, *Toxoptera citricidus*, is a serious risk to the Mediterranean citriculture, due to its efficiency in spreading the severe virus strains. The situation experienced in other regions of the world after the establishment of this aphid is marked by a massive destruction, irrespective of rootstocks. In the Mediterranean, *Citrus tristeza virus* (CTV) is widely present, but currently, only Spain and Israel have experienced tristeza epidemics and have adapted their citrus to live with the disease, whereas other countries are only recently facing the disease outbreaks. The situation in the region is still lucky, due to the absence of diseases which are even more destructive than tristeza, among which Huanglongbing (HLB) is for sure the most serious disease of sweet orange, mandarin and grapefruit trees.

V – Conclusions

The citrus fruit sector is evolving in a context of highly competitive global markets. Despite the global crisis, the Mediterranean citriculture is at present the leading citrus-producing region in the world, thanks to the production and exportations of easy-peeler fruits; in addition to this, unremitting attention is paid to the quality of citrus fruits as well as to the peculiar characteristics of the native products. This success is in contrast with the stagnation or even with the definitive production slump of the world top juice industries, Brasil and Florida, which are fighting against a broad range of diseases, primarily the citrus hurricane named 'Huanglongbing disease induced by *Candidatus liberibacter* spp'. The crisis in these two countries will profoundly change the world scenario of the citrus sector. It can turn into an opportunity for the Mediterranean citrus industry, if adequate and efficient quarantine measures are jointly adopted by the countries in the region to contrast the entrance and spread of this and other destructive citrus diseases.

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