O L I V E - OLIVE GROWING, OLIVE OIL AND TABLE OLIVES

Written by the Executive Secretariat of the International Olive Oil Council (IOOC)

ORIGIN

Olive leaf fossils found in Pliocene deposits at Mongardino in Italy, fossilised remains discovered in strata from the Upper Paleolithic at the Relilai snail hatchery in North Africa and remnants of wild olive trees and stones uncovered in excavations of Aenolithic and Bronze Age sites in Spain, are cumulative evidence that the olive tree dates back to the twelfth millennium BC. The wild olive tree originated in Asia Minor where it is very abundant. In his treatise on "The Origin of Cultivated Plants" written in 1883, De Candolle identifies Syria as the birthplace of the olive. Other contemporary botanists reported wild olive trees on the slopes of the Atlas mountains and the mountains of Tunisia.

Olive cultivation began 6000 years ago on the Mediterranean coast of Syria and Palestine. From there, it spread to Anatolia (via Cyprus) and to Egypt (via Crete). In the 16th Century BC, the Phoenicians took the olive to the Greek Islands. Later, between the 14th and 12th Centuries BC, they introduced it to the Greek mainland where its cultivation spread. By the 6th Century BC, the olive was cultivated the length and breadth of the Mediterranean region, from Tripoli to Tunisia, from Sicily and Calabria in Southern Italy to Liguria in the North. When the Romans arrived in North Africa, the Berbers knew how to graft wild olives and olive cultivation spread through all the Roman territories. The olive crossed the seas with the discovery of the American continent in 1492.

By 1560, olive trees were being grown in Mexico and then in Peru, California, Chile and Argentina. More recently, it has continued to spread and is now grown in South Africa, Australia, Japan and China. Olive producing areas are found between 30^{o} and 45^{o} latitudes where the temperate, hot climate is characterised by periods of temperatures close to $0^{o}C$, which facilitates vegetative rest, and hot periods. The olive tree can cope with low rainfall, adapting to 220mm per year. It is not demanding soil-wise and it grows well on siliceous and calcareous soils. It is, however, sensitive to excess soil and environmental moisture, which is conducive to the onset of disease. It is also sensitive to wind, which can cause flower and fruit drop. The olive is a member of the family *Oleaceae*, which comprises 30 species such as jasmine, ash, lilac and privet. The only edible species is *Olea europaea* L, which is cultivated for its plump, fleshy, oil-containing fruits. Some 850 million olive trees are cultivated worldwide. There are 1000 inventoried varieties; 139 of which are included in the World Catalogue of Olive Varieties published last year by the International Olive Oil Council. These 139 varieties are from 23 countries and account for 85% of the olives grown (8.7 million hectares).

OLIVE GROWING

The olive is a hardy tree. It adapts well to all kinds of soils (even poor soils that cannot be used for other crops) and to low-rainfall areas. As a result, olive growing is considered essential to soil conservation in numerous Mediterranean regions. The olive is an evergreen tree and generally grows no more than 10 metres high. The leaves are lanceolate and persistent (they stay on the tree for 3 years). They are bright green on the topside and velvety silver on the underside to limit evaporation. The olive grows slowly. When 4-5 years old, it is producing at 50% of its capacity. From 10-12 years onwards, when it has reached maturity, crop production increases until it reaches full performance when the tree is 35-40 years old. According to variety and climatic conditions, olive trees produce 25kg of fruit per year on average. Crop production does alternate, however, between a good harvest one year and a poor harvest the next.

When intensively farmed, the olive tree responds generously to cultural care. Orchard density varies according to soil and climatic conditions and variety. Most frequently, 70-150 olives are planted to the hectare. Olives need to be pruned - firstly, to train them to the right shape so that they can adapt to the available rainfall and sunlight and, secondly, so that they can adapt to crop health treatments and harvesting. Annual production pruning helps light to penetrate to all the branches and facilitates harvest mechanisation. When crop production starts to drop, olives undergo rejuvenation pruning, which is how trees that are hundreds of years old are able to return to normal crop levels.

Olive orchards are not very demanding in terms of fertilisation and soil management requirements. The olive does not like damp soils and it is important to ensure good drainage. It lends itself well to organic farming. Although it is sensitive to certain pests in specific climatic and humidity conditions, biological pest control is widely implemented, especially using bait traps. Irrigation during very dry periods helps to raise olive yields. Olives are harvested by hand or by mechanical shakers. Nets are spread underneath the trees to collect any fruit that falls to the ground. When they are for oil production, the olives are picked when their oil content is at its height. When intended for table production, they are harvested when they are at the right stage of ripening, depending on whether they are to be prepared as green olives or black olives.

THE OLIVE FRUIT

The olive fruit is ovoid and weighs from 2-12g; although some varieties may weigh as much as 20g. It is a drupe or stone fruit. The epicarp (or skin) is covered with wax and turns from light green to black as the fruit ripens. The mesocarp (or flesh) contains a bitter substance known as oleuropein. It has a low sugar content (2.6-6%) and a high oil content (12-30%) that varies according to the variety and ripeness of the fruit. The endocarp (or stone) of the olive is hard and made of fibrous lignin. Its ovoid shape and the extent to which it is furrowed are varietal characteristics. The stone encloses a seed (olive kernel) that accounts for 3% of fruit weight and contains 2-4% oil. When the olives are going to be used for oil, they are picked when the oil content is at its maximum; at which point, they may vary in colour from straw yellow to violet or deep black, depending on the variety. If they are going to be made into table olives, they are picked at the appropriate stage of ripening for each trade preparation. Green olives are picked when the fruit is leafy green to straw yellow; olives turning colour are picked when they are rose, winey-rose or brown and black olives are harvested when their colour ranges from reddish-black to deep chestnut. The average composition of an olive is water (50.0%), oil (22.0%), sugars (19.1%), cellulose (5.8%), proteins (1.6%), ash (1.5%).

OLIVE OIL - PROCESSING AND COMMERCIAL GRADES

On average, 5kg of olives are needed to make one litre of olive oil. Virgin olive oil is defined as the oil obtained from the fruit of the olive tree solely by mechanical or other physical means under conditions (particularly thermal conditions) that do not lead to the alteration of the oil. It undergoes no treatment other than washing, decanting, centrifuging and filtering. Healthy, freshly-picked fruit is used to make the oil. The clean olives are crushed into a uniform mash or paste that is then mixed slowly and continuously in a mixer at a temperature of not more than 30ºC. This process helps to form bigger oil droplets and breaks up the oil-water emulsion. The oil is then extracted. The traditional method is to spread the olive mash in layers 2-3cm thick on pressing mats (made of synthetic or natural fibre) or on steel discs. It is more common, however, for the oil to be extracted by centrifuging the mash. The mash left over after extracting virgin olive oil is called olive-pomace. This pomace is taken to special facilities where the residual oil is solvent-extracted. The resultant product is known as crude olive-pomace oil. The edible olive oils and olive-pomace oils that enter international trade are classified into various commercial grades.

Extra Virgin Olive Oil has a maximum free acidity of 1g per 100g (expressed as oleic acid). It has no organoleptic defects (taste and smell) and has a median fruitiness >0 (assessed according to the IOOC organoleptic assessment method COI/T 20/Doc No 15). Virgin Olive Oil has a maximum free acidity of 2g per 100g. The median defect of its organoleptic characteristics is not more than 2.5 and it has a median fruitiness >0. Ordinary Virgin Olive Oil has a maximum free acidity of 3.3g per 100g. The median defect of its organoleptic characteristics is between 2.5 and 6.0 and it has a median fruitiness =0. Refined Olive Oil is obtained by refining virgin olive oils without modifying the initial glyderidic structure. It has a maximum acidity of 0.3g per 100g. Olive Oil is a blend of refined olive oil and virgin olive oil. It has a maximum acidity of 1.5g per 100g. Refined Olive-Pomace Oil is obtained by refining crude olive-pomace oil without modifying the initial glyceridic structure of the oil. It has a maximum free acidity of 0.3g per 100g. Olive-Pomace Oil is a blend of refined olive-pomace oil and virgin olive oil. It has a maximum acidity of 1. 5g per 100g.

The International Olive Oil Council trade standard for olive oil and olive-pomace oil lays down the physico-chemical characteristics of each of these grades. This standard is updated regularly and the characteristics it fixes are also specified in the Codex Alimentarius standard for olive oil and olive-pomace oil.

PRODUCTION, CONSUMPTION AND INTERNATIONAL TRADE

The Olive Oil Market

During the last 3 years (1997/98-1999/00), world olive oil production averaged around 2.3 million tonnes; with the European Union accounting for 78.2% of this volume. Along with the European Union, other important world olive oil producers are Tunisia (7.2%), Turkey (3.7%) and Syria (3.7%). Together they produced, on average, 92.8% of the world's olive oil during the previously mentioned 3 year period. Most of the comparatively smaller producing countries (such as Algeria, Cyprus, Israel, Jordan, Morocco and Palestine) are also located in the Mediterranean area. Olive oil production outside the Mediterranean Basin accounts for less than 2% of world production.

Olive Oil Consumption And World Trade

As for production, olive oil consumption is largely concentrated in the Mediterranean Basin, particularly within the European Union and, more specifically, in its producing countries (Italy, Spain, Greece, Portugal and France). Between 1997/98 and 1999/00, the European Union accounted for 71.3% of average world consumption, which amounted to 2.4 million tonnes. In the non-Mediterranean group, the United States was by far the most important consumer country, with an average consumption figure of 151,100 tonnes, the equivalent of 6.2% of average world consumption and well above the consumption levels of important producer countries like Syria (3.7%), Tunisia (2.2%) and Turkey (3.1%). Other important consumer countries outside the Mediterranean are Australia, Brazil, Canada and Japan. Together with the United States, consumption in these countries has increased at an average annual rate of 10% since the International Olive Oil Council started to run promotional campaigns in these markets. The IOOC promotion started in 1983/84 in the United States, 1989/90 in Australia, 1991/92 in Japan, 1993/94 in Canada and 1997/98 in Brazil.

OLIVE OILS
Provisional 1999/00 Balance (1,000 tonnes)

	Carry-over 1.11.99	Production	Imports	Available Supplies	Consumption	Exports	Carry-ove 31.10.00
Algeria	12.0	52.5	0.0	64.5	42.0	0.0	22.5
Argentina	0.5	11.0	3.0	14.5	8.0	6.0	0.5
Cyprus	0.0	2.0	0.5	2.5	2.0	0.0	0.5
EC/15	563.5	1,744.0 **a**	112.5 **b**	2,420.0	1,731.0	336.5 **b**	352.5
USA	1.0	1.0	165.0	167.0	160.0	6.0	1.0
Israel	0.0	2.0	12.5	14.5	14.5	0.0	0.0
Jordan	1.5	6.5	6.5	14.5	14.5	0.0	0.0
Lebanon	0.0	5.0	3.0	8.0	8.0	0.0	0.0
Libya	3.0	7.0	1.0	11.0	11.0	0.0	0.0
Morocco	28.0	40.0	0.0	68.0	50.0	15.0	3.0
Palestine	2.0	2.0	0.0	4.0	4.0	0.0	0.0
Syria	40.0	81.0	0.0	121.0	90.0	4.0	27.0
Tunisia	0.0	210.0	0.0	210.0	60.0	120.0	30.0
Turkey	19.0	54.0	2.0	75.0	58.0	15.0	2.0
Yugoslavia (FR)	0.0	1.0	0.0	1.0	1.0	0.0	0.0
Others	0.5	29.0	146.0	175.5	168.0	3.0	4.5
TOTAL	**671.0**	**2,248.0**	**452.0**		**2,422.0**	**505.5**	**443.5**

0 = Nil or under 300 t
a = Share(1999/00) - Spain (652.3), France (2.7), Greece (398.0), Italy (648.0), Portugal (42.9)
b = Extra-community trade only, including inward processing traffic

Olive Oil Prices in the European Union

Italy, Greece and Spain account for around 75% of world production. Their market performance therefore has an important impact on prices in the other regions of the European Union, as well as in other producing countries. It also affects the prices of the oils that these last countries export to foreign markets. During the 1999/00 crop year, producer prices for extra virgin olive oil on the three most representative markets of Italy, Greece and Spain were on a downward trend, lying on average 15.2% lower than the comparable prices of the previous crop year.

This trend is the result of a combination of different factors, such as the level of world stocks (671,000 t) at the beginning of the crop year, which was above the normal bridging requirements and heavily concentrated in the EU (84%); the forecasts of an average/low harvest, which meant that EU and world bridging stocks could be expected to be absorbed to a certain extent over the season; final EU production in 1999/00, which was higher than expected and did not match forecasts, coupled with the fact that consumption did not react as expected. Average prices for refined olive oil on the markets of Bari and Córdoba/Sevilla kept to a similar trend to the prices of extra virgin olive oil during the 1999/00 crop year.

Nutritional Properties of Olive Oil

The bulk of olive oil (98-99%) is made up of triacylglycerols. The remaining 1-2% comprises minor constituents, such as squalene, triterpene diols, sterols, tocopherols (alpha-tocopherol in particular) and phenols (natural antioxidants). It also includes one hundred or so aromatic compounds whose chemical composition varies according to the olive variety, the producing area and the organoleptic quality of the oil. Olive oil is chiefly monounsaturated. Its average fatty acid composition is saturated fatty acids (14%), monounsaturated fatty acids (72%), polyunsaturated fatty acids (14%). Extensive scientific research and supporting epidemiological studies have been carried out over the last 20 years and have provided evidence of the health benefits of olive oil. It helps to prevent cardiovascular disease by raising high-density lipoproteins levels, regulates hepatic function and gallbladder emptying, regulates the endocrine system (so helping to prevent and control diabetes) and helps calcium absorption and bone mineralisation.

Future prospects

New orchards are being planted, production is rising, product image is improving and people are learning more and more about the nutritional and gastronomic properties of olive oil and table olives. In short, the future looks promising for olive growing.