

Olive Trees
Olives, Olive Oil
(Olea Europaea)

Olive History and Importance

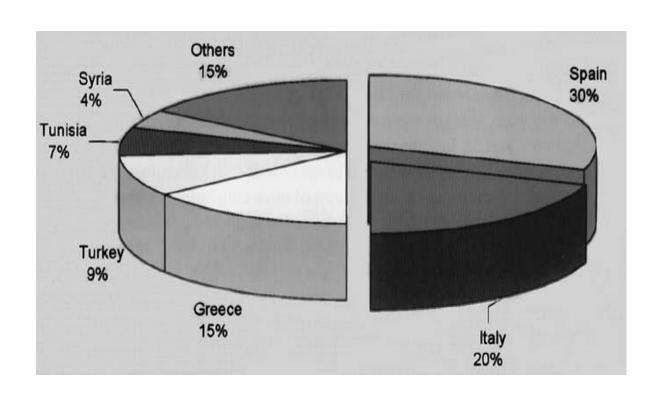
The olive is native to the Mediterranean region, tropical and central Asia and to various parts of Africa. The genus Olea includes at least 30-35 species belonging to the family Oleaceae and subfamily Oleoideae (x = 23).

The cultivated olive (Olea europaea L.) is an evergreen tree derived from tropical and subtropical species. Fossils Oceania: Australia, New Zealand

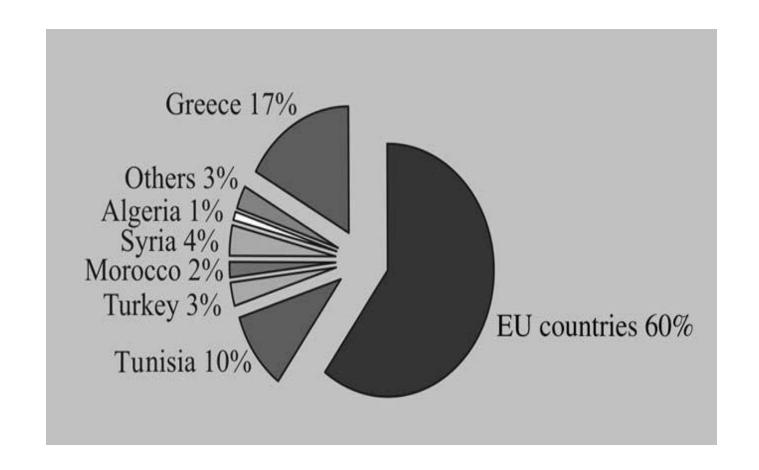
- from olive species have been found in Italy, France and in other countries.

Countries with olive cultivation and the botanical species

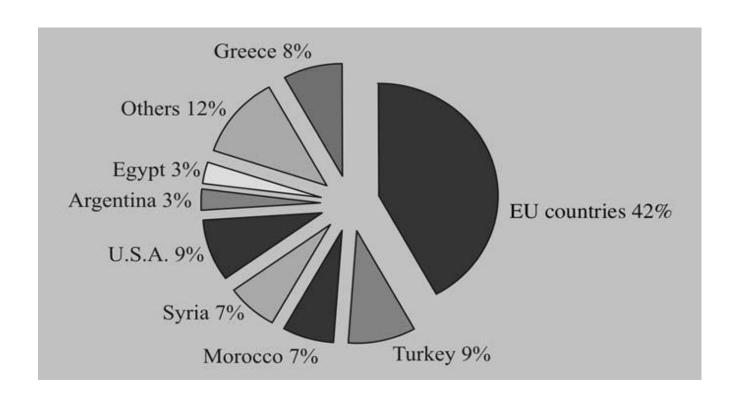
- Olive trees are cultivated in the following countries:
- Europe: Spain, Italy, Portugal, France,
 Albania, Montenegro, Greece, Cyprus
- Asia: Turkey, Syria, Lebanon, Jordan, Palestine, Iran, Iraq, Japan, China
- Africa: Tunisia, Algeria, Morocco, Egypt, South Africa
- America: USA, Mexico, Peru, Chile, Argentina, Uruguay



The average annual total world production of olives during the period 1998–2001



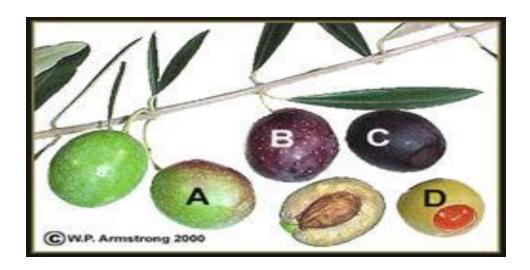
. World production of olive oil (1999–2000)



World production of table olives (1999-2000)

- Habit: naturally bushy, it becomes a tree with the growt, the bark is light grey.
- Leaf: Elliptic, lanceolate, simple and opposite, coriaceus, with entire margin; up dark-green and bright, withe-silverdown.
- Flowers: collected in sparse and short axillary panicles; funnel-shaped corolla white-ivory.
- Fruit: ovoid fleshy drupe (oil) at first green, then black and inside there is an elliptical stone.

Olive Fruit Types and Nutrional Value



- **A.** Fresh olive at the picking stage. [To the lower right is a sectioned olive showing the stony endocarp (pit) surrounding the seed.
- **B.** Fresh olive that is turning black on tree.
- **C.** Pitted, canned olive treated with ferrous gluconate.
- **D.** Pitted, canned green olive stuffed with pimento, a bright red Capsicum pepper cultivar.

NUTRITIONAL IMPORTANCE OF OLIVE

- -The Vitamin E contained in Olives is the body's primary fat-soluble antioxidant
- -Olives contain compounds called polyphenols that appear to have significant anti-inflammatory properties.
- -The juice of the olive, otherwise known as olive oil (Zayt), is a delicious source of antioxidants.
- Olives are also very light foods (ie contain low calories), but at the same time very filling; being able to quickly satisfy hunger.

- The Zaytun oil can also be used on hands, hair and as a base for massage oil.
- Used as a balm, it fortifies and moisturizes the skin, combating dry skin and softening it.
- Massaged onto the body, Olives fortify the limbs, combat against inflammation, and sooth away aches and pains from tired muscles and so on.
- Help against wrinkles and delaying the effects of old age.
- Help combat against strokes, heart-disease, High blood pressure, diabetes.

- It aids digestion and strengthens the bowels, as well as the stomach. Soothes Pain.
- Drunk, the tea from Olive leaves help against High blood pressure.
- The decoction of olive leaves in water is effective against mouth and lip ulcers and allergic dermatitis also.
- The concentrated aqueous extract of olive leaves and fruits is very effective against dental cavities and application of this solution shows very good effects on Leukoplaquea in mouth.

- This solution is applied with vinegar on Alopecia, grows the hair and removes the Alopecia.
- It is also stated that the local application of this extract removes the scars of small pox and boils.
- The powder of seeds mixed with butter is effective in brittle nails.
- The pickles prepared from olive fruits is a good appetizer and removes constipation.
- The smashed leaves are applied locally to check excessive perspiration.

Anatomy of The Olive Tree

Root system

The root system has the following functions:

- Anchorage of the tree.
- Water and nutrient absorption.
- Synthesis of various organic materials.
- Storage of nutrients.

The functions of the root system depend upon the rootstock, variety, soil conditions and cultivation practices .

Anchorage

The root is the most efficient anchorage mechanism for the tree when it is very deep and branched.

Such a root system is found most commonly when the scion is vigourous and when the rootstock is a seedling and not originated from rooted cuttings.

A very deep and branched root system does not grow in shallow soils or in soils having claypan, hardpan or a sand layer.

Absorption

Trees with a deep and well-branched root system are better adapted to water and nutrient absorption.

Water absorption is a function of soil properties and the plant itself.

The active absorption of nutrient elements requires utilization of metabolic energy in the form of adenosine triphosphate (ATP).

Synthesis

In the root, gibberellic acids (GAs) and cytokinins are produced in the root tip.

Furthermore, in the root ethylene is synthesized, which at very low concentration induces root growth and branching.

When stress due to root damage is exerted a significant amount of ethylene is produced which, after its transport to the tree top, causes senescence and leaf abscission.

Another growth regulator, abscisic acid (ABA), is produced in the root cap and, following its transport to leaves, is responsible for stomatal closure.

Storage

In the root system carbon and nitrogen compounds are stored.

Carbon is stored in the form of starch and soluble carbohydrates, while nitrogen is stored as amino acids and proteins.

The accumulation of certain compounds at the end of summer and early in autumn exerts a significant influence on both the induction of flowering buds and shoot growth the following spring.



The olive trunk is cylindrical, with an uneven surface, bearing a lot of swellings.

The wood is yellowish and darker towards the centre of the trunk.

The graceful, billowing appearance of the olive tree can be rather attractive.

In an all-green garden its greyish foliage serves as an interesting counterpoint.

The attractive gnarled branching pattern is also quite distinctive. The trees are tenacious, easily sprouting back even when cut to the ground.

Main branches

The branches originate at a height of 1.2 m in the classical olive grove and at 20–40 cm in the modern dense olive plantings.

The number of branches is three or more. The main branches give secondary and tertiary branching bearing the leaves, flowers and fruits.

The small shoots are classified into four categories:

I- Vegetative shoots bearing only vegetative buds and producing new shoots and leaves.

2- Fruit-bearing shoots bearing flowering buds; their number is greater in the low-vigour trees.

3- Mixed shoots bearing vegetative and flowering buds concurrently; theflowers and fruits are borne at the base of the mixed shoots.

4- Water sprouts originating from the trunk, branches and the thick shoots; these are very vigourous, grow vertically and they should be removed, unless they are going to substitute for a low-vigour branch or stem.

Leaves

The leaves of olive trees are grey—green and are replaced at 2–3 year intervals during the spring after new growth appears.

The olive's feather-shaped leaves grow opposite one another.

Their skin is rich in tannins, giving the mature leaf its grey—green appearance. Leaves have stomata on their lower surface only.

The leaves are covered by a layer of wax and cutin (cuticle).

The deposition of cutin in the leaves takes place during leaf growth and stops when leaf growth terminates

Buds

These are classed as either vegetative or flowering. The former are small and conical, while the latter are spherical and of greater size.

Furthermore, latent buds grow following severe pruning or after frost damage.

A proportion of the buds of the fruit-bearing shoot remains inactive.

Inflorescences and flowers

Inflorescences are born in the axil of each leaf.

Each inflorescence contains 15–30 flowers, depending on both the prevailing conditions and the cultivar. Inflorescences originate from buds of the current season's growth.

These buds are induced to become flowering ones after the winter's chilling effects.

They then begin to grow, producing inflorescences. The olive flowers are small, creamy white and hidden within the thick leaves.

Each flower consists of a four-segmented calyx, a tubular corolla with four lobes, two stamens and an ovary with two carpels and a short style.

The blossoms usually begin to appear in May. A wild seedling olive tree normally begins to flower and produce fruit at the age of 8 years.

The olive tree produces both perfect and staminate flowers.

The perfect flowers contain two stamens and a well-developed ovary (green in colour), while staminate flowers contain an aborted ovary (very small in size) and normal stamens.

The percentage of perfect flowers depends on many factors such as the cultivar, the number of inflorescences per plant, the soil moisture and the leaf nitrogen content during the period of flowering differentiation.

Flower bud induction takes place in winter and 8 weeks before full-bloom flower formation can be seen under a microscope.

During the following 8 weeks flower development proceeds rapidly and flowering occurs at the end of May, or I-2 weeks earlier in more southerly areas

The pistil of perfect flowers contains two ovules from which only one is fertilized, giving one seed.



Fruit

The olive fruit is a drupe, spherical or elliptic in shape and consists of the exocarp (skin), which contains stomata, the mesocarp (flesh), which is the edible portion of the fruit, and the endocarp (pit), including the seed.

The fruit of the olive tree is purplish black when completely ripe, but a few cultivars aregreen when ripe and some olives develop the colour of coppery brown. The size of the olive fruit is variable, even on the same tree, and depends on cultivar.

Olive Oil Quality and Grades

Definition

- * Olive oil obtained solely from olives
- * Excludes oil extracted by solvents or reesterification processes, or any mixtures with other oils
- * Pure olive oil cannot be any olive residue oils
- * Virgin Oil
- * Mechanically pressed from olive fruit without using heat cold pressing
- * Only washed, decantation, and centrifugation (natural product)
- * May have vintage years on label

Grades of Virgin Oil

- * Virgin Olive Oil Extra
 - -Extra Vergine (Italian)
 - -Vierge Extra (French)
- * Pure unadulterated oil from top quality olives
- * Perfect taste and odor
- * Max of 1% acid and strong odors

Other Olive Oils

- * Virgin Olive Oil Fine or Fino
 - Almost perfect taste but 1.5% acid
- * Semi-fine or Ordinary Olive Oil
 - Good taste maximum acidity 3.3%
- * Virgin Olive Oil Lampante>3.3%
 - Not for human consumption

Poorer Grades

- * Refined oils
- -Caustic soda used to purify virgin oil from cull fruits
- * Blended oil
- -Blend of refined and virgin oil Most imported olive oil in USA

Residue Oil

* Olive-residue oil obtained by treating pomace with solvents

Total Polyphenols content •

Phenolic compounds is minor components of olive oil. Four groups of polyphenols are present in VOO: simple phenolic acids, cinnamic acids, oleuropein derivatives, and flavonoids, oleuropein is The most abundant in VOO. These substances stop VOO autooxidation and give its remarkable thermal stability, as well as donate its preferred flavor and taste⁽²⁵⁾. Olive oil polar phenol part, known as "polyphenols" differ in phenolic compounds content ranges (50-1000 mg/kg) but values are usually between 100 and 300 mg/kg in many studies, hammer crushers are advised to obtain a higher content of phenols during olive oil extraction⁽²²⁾. Studies (human, animal, in vivo and in vitro) have confirmed that olive oil phenolic compounds have positive effects on certain physiological parameters, such as plasma lipoproteins, oxidative damage, inflammatory markers, antimicrobial activity and bone health (26). Many studies have shown that the content of phenols increased during maturation until it reached a maximum and then appeared to decrease with advancing maturity(14)(16)(18)(20), Other studies have shown a decrease of olive oil polyphenols content during maturation process(15)(1A9). Chimlali cv oo in Tunisia were a few polyphenols content⁽¹⁷⁾, while it was a high polyphenols content of Gemlik more than Adana cv's during progressing maturity⁽¹⁶⁾.kalmata cv oo in Egypt, contains polyphenols higher than manzanillo cv⁽¹⁹⁾.Memecik and Edremit cv's oo have a high content of polyphenols and there was a clear correlation between polyphenols and antioxidant activity of the oil $r = 0.98^{(18)}$, A study showed Polyphenols synthesis continued in Gordal Sevillana olive cv fruits during maturation⁽²³⁾.

Phenols

Olive flesh contains I-I4% (d.w.) phenolic compounds, depending on the variety (Amiot et al., 1986). The phenolic compounds are important in many aspects, such as protection of plants from bacteria, fungi and viruses (Hanbury, 1954) and fruit browning as maturation proceeds. Furthermore, phenolic compounds play significant roles in human nutrition (Bravo, 1999) and health (Christakis et al., 1982; Manna et al., 1999). The bitter taste of raw olives is due to phenols and, especially, oleuropein, which is water soluble (Gutiérrez et al., 1992). Other phenols include ligstroside, verbascoside, 4hydroxytyrosol, tyrosol and glucosides or aglycones, 3,4dihydroxyphenyl glycol and flavonoids (Manna et al., 1999). The concentration of phenols is a function of fruit maturity and can be as high as 14% (d.w.) in young fruits, though it may be close to zero in black-type fruits.



Among the phenolic compounds found in extra virgin oils, gallic, caffeic, vanillic, p-coumaric, syringic, ferulic, homovanillic, hydroxybenzoic, protocatechuic acids, tyrosol and hydroxytyrosol are the most important. During cooking under domestic conditions the oil is heated to temperatures of up to 190°C. Polyphenols of extra virgin oil are stabilizers of _-tocopherol during heating (Andrikopoulos, 1989). Therefore, they contribute to the nutritional value of cooked foods, and polyphenols prevent the decrease in antioxidant activity in olive oil during heating. Olea europaea extracts containing oleuropein and hydroxytyrosol were found to be much more effective than vitamin E in their antioxidative activities.

These extracts owe their antioxidative properties both to their high oleuropein content (19% w/w) and to a lower amount of flavonoids (1.8% w/w). Tyrosol showed neither antioxidant nor pro-oxidant activity (Lerutour and Gue

Climatic Conditions : Temperature Requirements

The olive tree is cultivated under various climatic and soil conditions and its cultivation is feasible throughout the entire temperate and subtropical zone, i.e. between 30° and 45° (Bongi and Palliotti, 1995). The olive tree could also grow under tropical conditions without producing fruits, unless it is cultivated either:

- I- at adequate elevation in order to fulfil its needs of low temperatures .
- 2- if the cultivars have low chilling requirements.
- 3- by supplemental pollination.

The areas of olive culture have a mean annual temperature 15-20°C, with a minimum of 4°C and a maximum of 40°C. The minimum temperature should not drop below -7°C, otherwise damage to trees occurs. However, this limit is only an estimation, since the tolerance of olive trees depends on various factors such as the duration of very low temperatures, atmospheric humidity, cultivar, etc. Damage also varies from one tree to another. If the drop in temperature is gradual the olive tree can stand temperatures down to -12°C

Due to the late blooming of olives, spring frosts are not a determining factor in olive culture. Olive trees require low temperatures for flowering bud differentiation and the requirement of vernalization explains why the tree does not produce in tropical regions. Some varieties such as 'Sevillano' and 'Ascolano' require about 2000 h below 7°C. Not only low but also high temperatures play a significant role, especially during the summer, since these instigate fruit drop. Concerning soils, olive trees can grow well even in poor, dry, calcareous and gravelly soils

The available soil volume/tree is significant. Clay soils that have high

moisture content and immobilize K and P are not suitable for olives. Also, soils

with a hardpan close to the soil surface are not appropriate for olives. Another

factor is that the sodium chloride (NaCl) content of soils should be less than Ig/I.

Olive trees grow and produce in soils with both medium acid and medium

alkaline pH; however, pH values greater than 8.5 reduce growth significantly.

Furthermore, olives grow with no toxicity problems in soils with a relatively high boron content (Chatzissavvidis, 2002).

Flowering in Olives

The flowers are small, yellowish white and inconspicuous and contain a four-segmented calyx and a tubed corolla with four petals (lobes). The flower also has two stamens and a short style with a two-loculed ovary. The flowers are divided between two categories: perfect, having stamen and pistil, and staminate (male) flowers, where the pistil is aborted while the two stamens are functional. In the perfect flower the pistil is large, green in colour and fills the space in the floral tube. Staminate flowers are very small and do not fill the floral tube; the style is greenish white and small.

Flower initiation takes place very early in November and the flower parts develop during March–April, as has been shown by histochemistry.

Induction in the olive may occur about 6 weeks after full bloom, while the initiation is not visible until 8 months later (February).

Stages Of Flowering Bud Induction and Differentiation

- **I.** The stage of flowering bud induction, which starts in October and lasts up to the end of February .
- 2. The stage of morphological changes, which leads to the development of a central axis and side branches of the inflorescence and the meristems destined to develop into flowers.
- 3. The stage of differentiation of flowers, Initially the induction of sepals takes place and is followed by petals, stamens and carpels.
- 4. The stage of completion of growth of the various parts of flowers, The full bloom happens from the end of May to the first days of June.

Chilling Requirement For Cultivation of Olive

- * Optimum Flowering if chilling temps
- Maximum 60 to 65oF
- Minimum 35 to 40oF
- * Poor flowering if
 - Constant 55oF

- * No flowering if
- No temp > 45oF or < 60oF

Pollination Requirements:

- * Monoecious.
- * Flowers borne axially along shoot in panicles.
- * Self and cross pollination occurs.

Alternate Bearing

The productivity of each cultivar is a function of alternate-bearing habit and fruit abscission before ripening.

In olive trees we observe two growth flushes, the first one in spring and the second in autumn (October), under adequate soil moisture and temperature.

Alternate bearing is directed by various factors such as water stress, warm soil, climatic factors and the cultivar.

The main causal factor of alternate bearing is the inhibition of flower bud induction by the seed of growing fruits, and this is due to competition for nutrients.

The Effect of Fruit Load

The inhibition of floral induction by seeded developing fruits is the major factor in the olive's biennial behaviour.

the control of biennial bearing should be achieved By:

I-selection for breeding cultivars that produce every year.

2- cultural practices to stabilize the floral induction percentage.

Protein Content

Chlorogenic acid (CHA) is associated with alternate bearing and levels are high in the alternate years and low in the off years. Injection of exogenous CHA reduces flower bud differentiation when applied during the secondary induction period in the autumn and early winter.

Fruit Growth, ripening and harvesting:

The fruit generally follows three growth phases in most varieties:

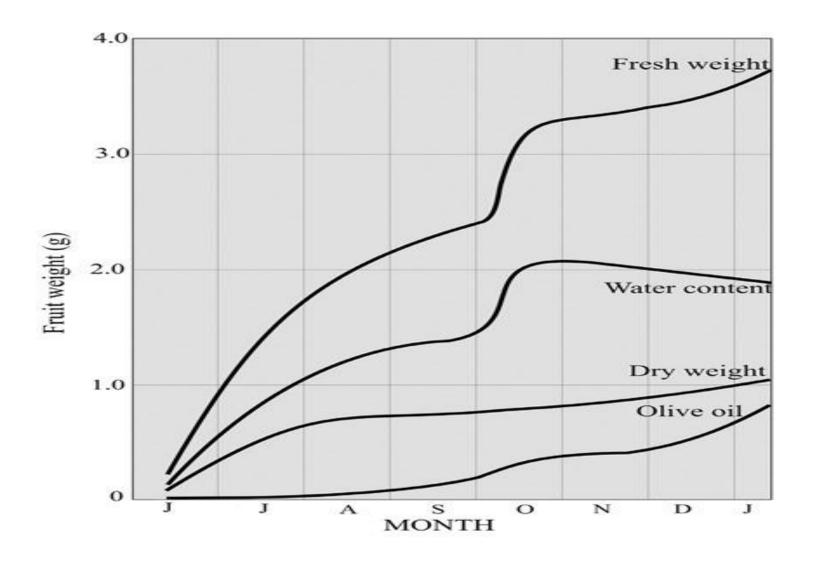
1. First Phase. Initially, fruit growth is rapid during the first 2 months (June–July).

During this period the weight of the fruit increases, mostly due to endocarp growth rather than to flesh.

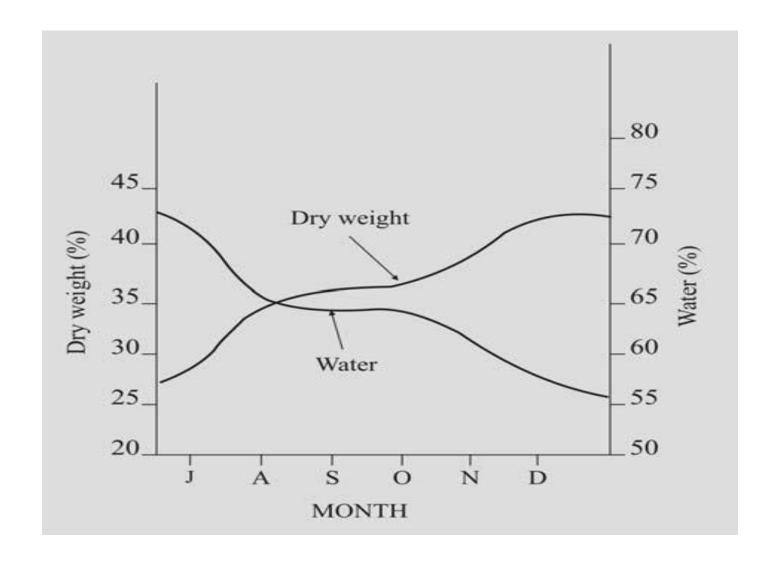
Polyphenols increase and later decrease while hydroxytyrosol decreases with ripening.

2. Second Phase. During the period August—September fruit growth is faster, the flesh grows and pit hardening occurs.

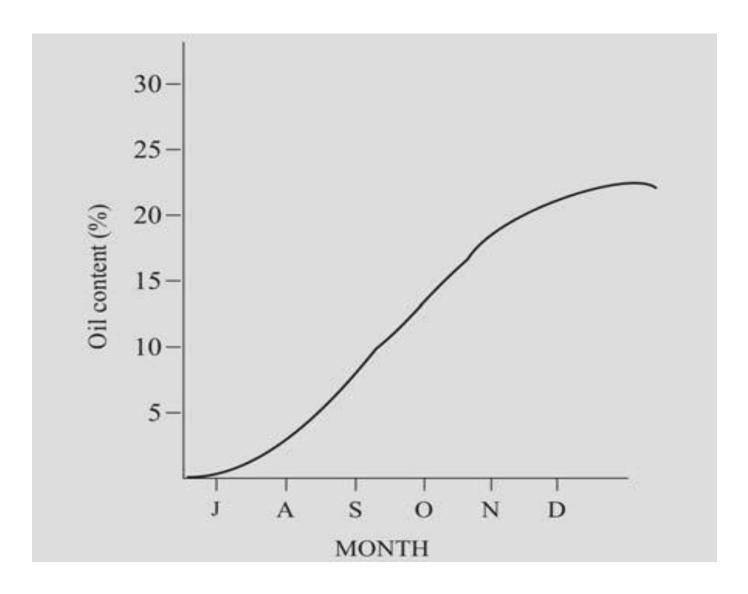
3. Third Phase. The growth of fruits is rapid (October) and the fruit starts to change colour from green to bluish, and finally to black. The changes in fresh weight and percentages of water.



The seasonal changes in fresh weight, water content, oil content and dry weight of olive fruits



. The seasonal changes in percentage dry weight and water content in olive fruits.



The seasonal changes in oil content (%) of the olive cv. 'Koroneiki' during fruit growth and ripening

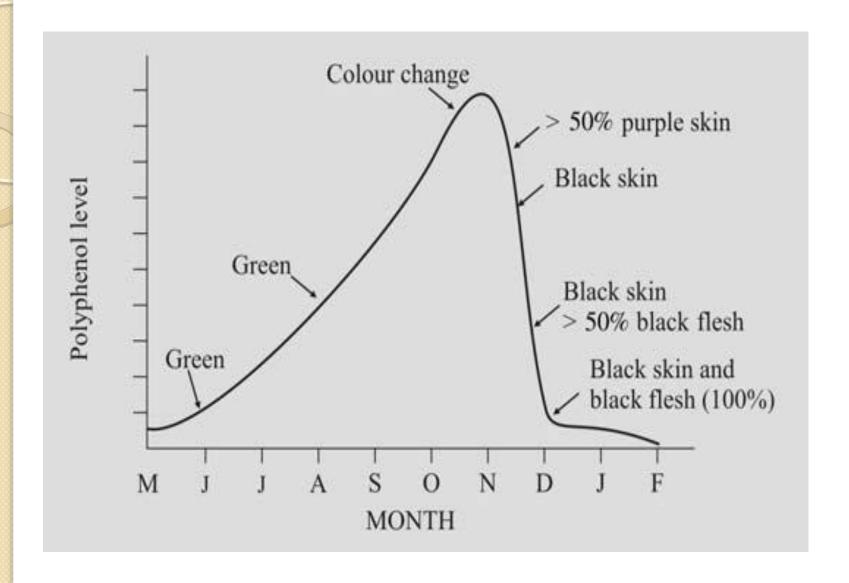
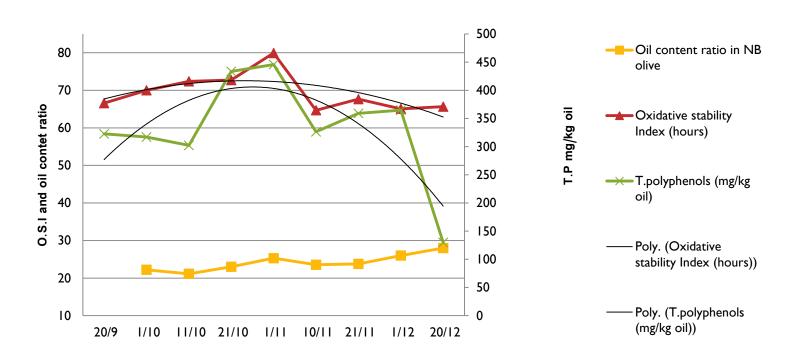


Diagram showing the time course of olive fruit polyphenol levels and colour changes

2016 Nihad Salahat and Hassan Abu-Qaoud

oxidative stability index relationship with total polyphenols and oil content ratio for NB CV olive oil during harvesting dates



2016 Nihad Salahat and Hassan Abu-Qaoud



FACTORS AFFECTING OLIVE FRUIT SIZE AND PRECOCITY OF RIPENING:

I. Genotype.

2. Tree age and vigour.

3. Soil moisture and mineral nutrition.

4. Olive orchard orientation.

LAND PREPARATION:

Soil should be well ploughed before plantation of olive.

Pits of size 2.5×2.5 feet should be dug a month before plantation. It should be filled with Matti : Bhal : FYM at ratio of 1:1:1.

A. PLANTING TIME:

Trees can be planted during spring and fall. However fall is best if there is no likelihood of frost during winter.

B. PLANTING GEOMETRY:

Trees are planted in square with equal line to line and plant to plant distance. 6x6, 7x7 or 8x8 meter distance yields best results. There may be 80 to 110 trees in an acre.

Irrigation Requirement:

Although Olive is a hardy tree, yet it requires timely irrigation during the early two years. In Barani reas annual rainfall shoud be between 400-500 mm. If it does not rain, trees should be irrigated twice or thrice in ayear.

- I- Before Flowering
- 2-After Flowering
- 3-30-45 dayes before fruit maturing

Fertilizer requirement

For an orchard of 1000 m2 the nutrients absorbed by olives per annum amount to 1.5–3.5 kg N, 0.8 kg P, 1–5 kg K and 2–5 kg Ca. The nutrients (N, P, K and Ca) required for 100 kg of fruits, 50 kg of leaves and 50 kg of wood.

Phosphorous + Potash at rate of 300 + 200/ Hectare at time of land preparation, repeated after 3-4 Years.

Harvesting of fruit

Olive fruit matures during August to September. Harvesting is accomplished by following methods.

- -Picking singly. Good quality oil/pickle, Expensive mode
- -Shaking branches and collecting of dropped fruit
- -Mechanically: Machine grips trunk and shakes branches. 80% harvesting

التأبير (التلقيح) والاخصاب ونمو الثمار.

الزيتون ذاتي التلقيح وخلطي التلقيح فقد دلت الدراسات على زيادة العقد في حالة وجود اكثر من صنف من الزيتون في البستان .

حبوب اللقاح تظهر حيوية عالية يمكن الحصول على نسبة انبات 20-70%.

•يمكن تخزين حبوب اللقاح في او عية محكمة الاغلاق لمدة تصل الى 3 سنوات .

•درجات الحرارة المنخفضة تعيق انبات حبوب اللقاح بعد سقوطها على الميسم وخصوصاً في التلقيح الذاتي .

•ارتفاع درجة الحرارة في اثناء التلقيح يقلل من نسبة العقد .

•التلقيح الخلطي لن يؤثر على صفات الثمرة Xenia

عدم التوافق بالزيتون

تظهر بعض اصناف الزيتون مثل السيفيلانو والمانزانيلو انخفاضاً في نسبة عقد الثمار والسبب عدم مقدرة حبوب اللقاح على اخصاب مبايضها.

- •عدم الانبات .
- •عدم القدرة على اختراق الكيس الجيني من قبل الانبوبة اللقاحية للحد من هذه الظاهرة ورفع نسبة العقد في الصنفين لا بد من الترتيب في البستان لاتمام عملية التلقيح الخلطي بزراعة صنف اخر من االزيتون مع هذين الصنفين كالنبالي والرصعي .

Insect Pests and diseases of Olive

INSECTS:

I- Olive fruit fly, Diptera: Tephritidae (Bactrocera oleae)

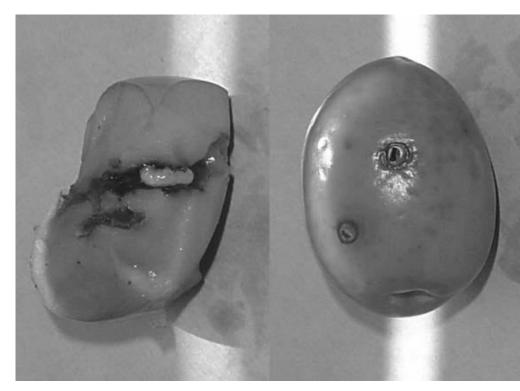
Control:

I - ray male sterilization.

2- mass trapping.

3-use of chemical repellents of females.

4- biological methods



- Direct damage:

reduction of olive production due to precocious downfall.

- Indirect damage:

bad olive oil quality, with high acidity and in cases of serious damage showing bad taste (worm) in panel test.

Olive fly - Bractocera Oleae



Adult



Fecundation



Wound



Egg's deposition



Larva

For the olives for oil:

•preventive to kill the adults with the method "Attract and Kill" using traps with pheromon and deltametrina or lambda-cialotrina.

•curative at the moment of exceeding of the threshold with dimetoate, in the first phases of life of the fly (egg and larva – 1° age)

Temperature more than 32 °C give a high mortality of larvas and an interruption of the reproductive activities for the adults and development of the eggs.

In case of late infestations, it's better to anticipate the harvesting.

Other dangerous insects



Prays oleae



Zeuzera pyrina



Saissetia oleae



Otiorrhynchus cribricollis

2-Wooly Aphid





3- Scales







4- Olive caterpillar







DISEASES

I- Bacterial knot





2- Sooty mildew







3- PEACOCK'S EYE (Spilocaea oleagina)





This disease is causing serious problems along the coastline where the humidity is relatively high and the weather warm.

Damage

Symptoms generally appear from September to April. The fungus attacks the leaves causing a dysfunction of photosynthesis.

In case of high infestation, it causes the defoliation of branches.

CONTROL

Between July and August, an early diagnosis should be carried out on the leaves for the presence of the disease even if symptoms are not apparently visible on the tree.

Check the new leaves and sprouts, in particular when the humidity is high during spring and summer. Another control during autumn and after harvest is desirable

Diagnostic technique: dip a sample made of 100 leaves, picked from 4 trees/ha, in 5% sodium hydroxide (NaOH) solution for 2-3 minutes at room temperature for young leaves. For old leaves 50-60°C is applied. In case of infection, dark spots on the upper blade of the attacked leaves will appear.



Economic threshold: More than 20% of leaves present black spots (it depends on the susceptibility of the olive variety to the disease).

Chemical control

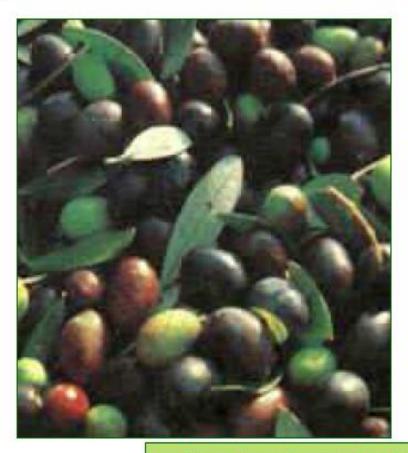
Preventive use of copper compounds 20 days before harvest or after harvest in area with high humidity and curative treatment in spring after pruning (cupper

hydroxide). Doses of copper compounds use are in function of the percentage of cupper in the product and are written on the label.

Cultural practices

An intervention of pruning with multiannual cycles is recommended, depending on the area or local uses, to improve the ventilation canopy and the sunshine, in order to reduce the conditions of development of the fungus. Balanced fertilizations are recommended. For the new plantations, it's important the use of varieties less susceptible, but suitable to pedo-climatic condition of growing area, and the adoption of planting distance appropriate to the vigor of the plant.





Harvesting is the last phase of the productive process on the field.

It must be done, when the color of the olives is changed in an good average.

The determination of the best period to harvest olives to produce oil has to be established through studies that allow, for the **different cultivars** in the considered **environment**, to characterise **fruit ripening** and oil quantity and quality evolution.

In this stadium the olive has:

- the best contents of olive oil,
- a good contents of antioxidants,
- a good organoleptic sensation of fruitty.



Manual harvesting is a wide spread harvesting system. It is normally done by using nets under the trees, ladders and manual combs in the case of cultivars for the production of oil.

It is the best way to get high quality olive oil because it does not cause any damage to the fruit or tree.

It is done using suitable containers or baskets for table olives.

It is tiring and dangerous for the use of ladders

The productivity of workers is relatively low: 7-15 kg/h

The use of plastic combs and dropping the fruit on underlying plastic nets increase the rate of harvest (15-25 kg / hour).

Dropped olives have not to be harvested, because the quality of the oil obtained from them is very bad becouse the presence of fungi and bacteria, that start fermentation processes.



The importance of mechanical harvesting results in:

- Reduction of the cost production and maintenance of the quality at the same time.
- Reduction of the cost of labor and shorten the period of harvesting.

Note: You must train the olive tree in a manner facilitating the mechanical harvest.

For the same motive the transportation has to be rapid and in bean or in plastic boxes in order to facilitate the circulation of the air and to avoid worm.



To avoid:

Use the stick because it will lead to:
Decrease in production in the
next season
fruit injuries and consequently a
higher acidity in the oil

Use nylon bags for the storage of olives because the heat increases the oil acidity.

Mix the ground fruit with the freshly picked fruit because they cause a negative fermentation process.

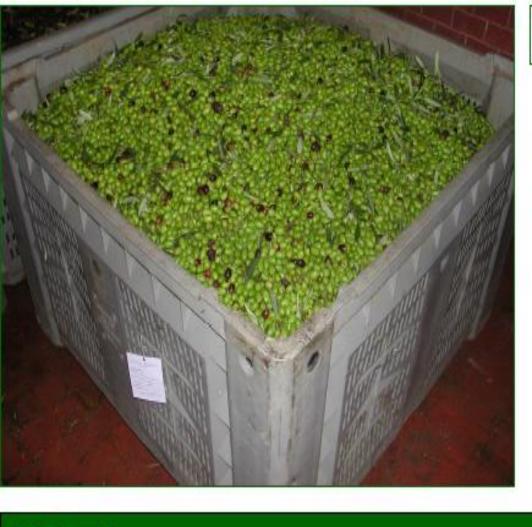
To do:

Use the net under the trees to avoid fruit contact with the ground.

Use ventilated plastic boxes.

Separate the fruit from the leaves.





Storage:

The storage has to be:

- fresh
- ventilated
- protected by the light

Objectives:

To prevent problems of fermentation, warming, mould

MAXIMUM TIME OF STORAGE: 48 h



Defogliation

An excessive presence of leaves give to the oil flavors of Bitter and Leaves not appreciated by the consumers and variable in the time.

Washing

Before the processing, the olives (harvested with nets) have to be washed to avoid a taste of soil.



Milling

It's important to obtain a omogeneity of the paste.

Timing of processing: between 20'

Machinery: Muller or

Crushing

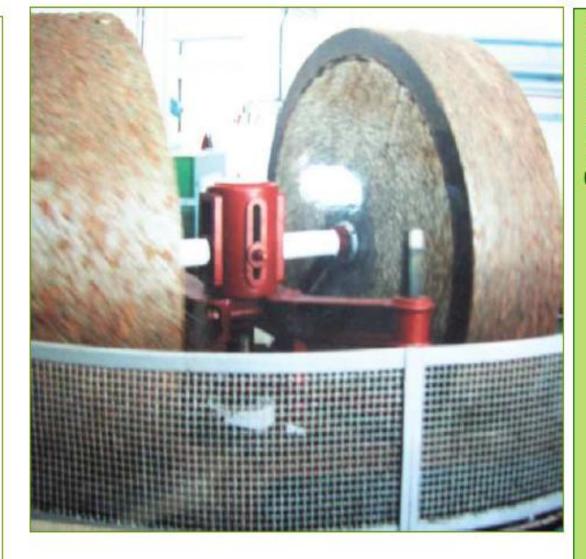
- The degree of crushing impacts the yields and the characteristics of the oil; crushing is responsible for the transfer of phenols (bitterness, a positive attribute) from olives to oil.
- If the olives are not well crushed, the yield is lower than expected.
- It is recommended not to add water while crushing the olives with a hammer/disk crusher or a stone crusher.



Stone Press

 It is advisable to have stone presses and a stainless steel platform;

 Stone pressing shall not exceed 30- 40 minutes according to the ripening rate of olives (shorter with ripe olives, longer with less ripe olives).



Crushers

Main charcateristics:

Hammer crusher:

- good paste emulsion,
- more phenols are extracted,
- higher number of rounds (2900 rpm),
- cheaper than the disk.

· Disk crusher:

- softer grinding,
- lower number of rounds (1450 rpm),
- more phenols are extracted than the hammer mill,
- the paste is less heated.

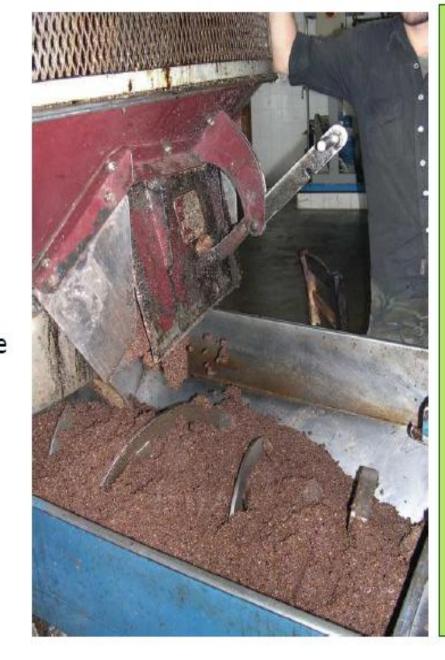


With the disk crusher, some left-over stones may break the metal parts of the grinder thereby damaging the other machines in the mill.



Malaxing

- The purpose of malaxing is to extract the oil from the cell structure.
- In general, malaxing is over when some oil droplets are observed in the paste.
- The temperature of the paste should be around 28- 30°C. Water temperature in the external cavity of the tank can vary from 32°C to 35°C.
- If the malaxer is not equipped with a thermometer, use portable electronic thermometers so as to check the paste temperature.
- If the malaxing temperature exceeds 28- 30°C, the degradation of polyphenols occurs. The oil will be less fruity, of lower quality and shorter shelf life.



Malaxing

- Malaxing time shall not exceed 30-60 minutes according to the ripening rate of olives (longer for less ripe olives and shorter for ripe olives).
- The oil cannot be extracted at a temperature below 25°C, since the enzymes start working from this temperature.
- Do not add water in this step. Should the paste be too dry, water can be added in the decanter to facilitate the oil extraction.



Estraction

Pressing technique

- To avoid the transfer of defects from one lot of olives to another, the mats should be cleaned after each lot.
- Nylon mats are advisable. They are readily washed and do not absorb bad odours.
- · Change mats every year.
- If the mats are not clean, the oil will be fermented and musty. If the contact is long, the oil will have a muddy taste.
- It is advisable to have a machine for spreading the paste on the mats. It reduces exposure of the paste to the air.
- A stainless steel disk is placed every 5 mats.



- Do not use iron disks.
- The press shall impart a slow and continuous pressure up to 350- 400 Kg/cm2 for about 30 minutes.
- This system has a low capacity; the olives will stay for a longer time in the mill before they are processed into oil.
- If the machines are made of iron, the oil will taste metallic and rancid.



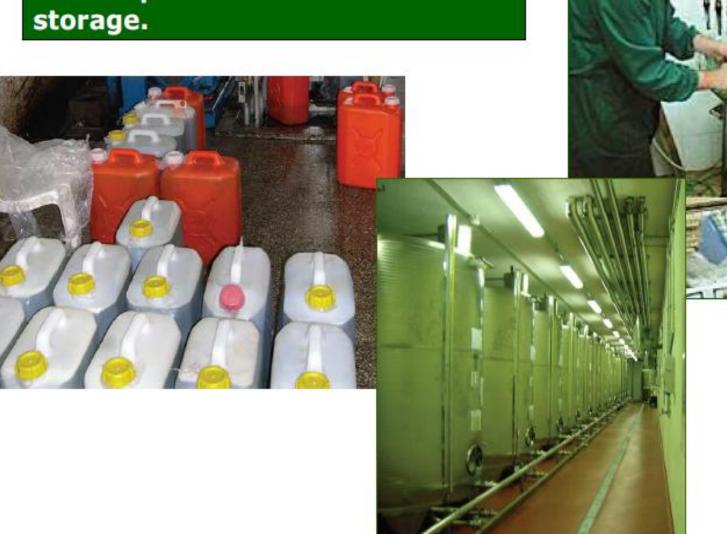
Oil Centrifugation: vertical separation

- It is used to separate the oil from the residues and the water.
- It is very important to add the appropriate amount of water (it should be a thin flow of water).
- The separator should be cleaned every
 10 days, or more if the oil is dirty.
- If hot water (not more than 28 degrees) is used then the quality of the oil will be affected.



Storage and bottling

Extravirgin olive oil behaves like a sponge and absorbes all the odour present in the room of storage.



What is the quality

Quality system is a way of production representing obligations:

- 1. Food protection forwards to the customers
- 2. Environmental protection forwards to the territories and of the biological systems
- 3. Health protection forwards to operators
- 4. Ethic forwards to the people

The Quality System has to be clear and accepted by the farmer, in order to be build and applied in function of every particular situations.