

OLIVE GOOD PRACTICES FROM THE FIELD TO THE TABLE

You can't make good olive oil out of bad fruit: don't spoil the oil quality in the fruit by poor harvesting, transport, fruit storage, processing and oil storage techniques.

MUST CONSIDER FOLLOWINGS:

1. IN THE FIELD



| Varieties



| Field management



| Pests and diseases affecting olive trees



| Olive picking time (Maturity index)



| Olive post-harvest handling prior to milling

1. IN THE MILL



| Type of mill and processing methods



| Management of the mill



| Olive oil storage



IN THE FIELD

a. VARIETIES

Oil quantity and quality are highly dependent on the variety. Some varieties have a higher antioxidant content and other quality parameters than others. Quality and quantity also depend on the climatic conditions of the particular area. In Punjab and other monsoon area, the early bearing varieties have less oil contents due to high temperature and the monsoon affecting the yield and quality by making favorable conditions for anthracnose infestation and fruit dropping. The mid to late varieties are comparatively more suitable as compared to early varieties because the mid and late varieties are skipping the monsoon to some extent and mature in late season which is less favorable to anthracnose, and reduction in the temperature favor the oil accumulation. The oil content of most olive cultivars ranges from 10 to 25 percent of fresh weight at full maturity.

The most important exotic olive varieties grown in Pakistan are: Arbequina, Arbosana, Koroneiki, Gemlik, Manzanilla, Pendolino, Picual, Leccino, Frantoio, Coratina, Ottobratica and Chetoui.

Most of the total olive-growing area is intended for olive oil production and also intended for the production of table olives.

b. FIELD MANAGEMENT

IRRIGATION

- Olive trees are generally grown under rain-fed conditions. As the early half summer in Pakistan is hot and dry, supplementary irrigation is increasingly introduced in the existing orchards and yield response is considerable.
- Before March/flowering, the irrigation is necessary to avoid poor pollination and drying of flowering.

- Summer monsoon season starts from 15 July to 15 September; during the monsoon (if sufficient rain) there is no need to irrigate the olive orchard.
- Although the olive tree is hardy, it requires timely irrigation during the first two years of plantation. In Barani areas, annual rainfall ranges between 150–500 mm. but not timely useful for olives crop. If it does not rain tree should be irrigated twice or thrice in a year in which case the irrigation schedule will be, in principle: (1) Before Flowering, (2) After Flowering, and (3) 30–45 days before fruit maturing. In more frequent cases, irrigation is also needed during flowering.
- For a drought-tolerant plant, supplementary irrigation is needed through the high-efficiency system at critical poly phenological stage to obtain optimum fruit yield. High efficiency irrigation not only saves water but also contributes towards better quality and less frequency of disease and insect pests.
- Shriveled fruits may gain turgidity after irrigation; for this reason, it is recommended to irrigate table olive varieties, especially during the last period of fruit development, to improve their size and quality.
- The precautionary and control measures must be adopted if there are more monsoon rains, humidity and fungal infestation.



PRUNING

Olive plants require proper training and pruning like all other fruit plants. These operations are intended to enforce trees to give a good regular yield and at the same time to maintain a good balance of fruit /leaves/wood ratio. The pruning intensity shall be optimized according to the different climatic zones to maintain vegetative and reproductive growth balance. Climate has its influence on pruning because olive is cultivated in different climatic zones and they have to be pruned differently. It may be done severely in tropical and subtropical climates because the growing conditions favor an excessive amount of growth. The Polyconic Vase and the Open Center System, according to the areas, are the recommended pruning systems.

TYPES OF PRUNING

- Pruning of young plants
- Pruning of productive plants
- Rejuvenation/Reform Pruning

ADVANTAGES OF PRUNING

- Giving the best shape for production.
- Improvement of fruit characteristics.
- Regularity in production throughout the years.
- Improved plant health and reduce pest attacks.
- Adequate supply of light and ventilation.
- Adequate and uniform application of chemical treatments.
- Strengthen branches.
- Reduced stress and increase the potential for good yield.



c. PESTS AND DISEASES ATTACK ON OLIVE TREES

- The olive tree is affected by some pests and diseases to a lower extent compared with most other fruit trees. The major pests are the Olive Psyllids (*Euphyllura olivina*), olive fruit fly (*Bactrocera oleae*), the olive moth (*Prays oleae*) and the leopard moth (*Zeuzera pyrina*). The Olive Anthracnose (*Colletotrichum lindmuthianum*), Peacock eye (*Spilocaea oleaginea*), and Verticillium wilt are the most common fungal diseases and they cause a decrease in yield if no treatment is made. A bacterial disease known as an olive knot *Pseudomonas syringae* pv. *Savastano* is spread by pruning infected tools during rainy months.
- In Pakistan the most damaging pest/disease Olive Psyllids/Anthracnose/Peacock Leafspots have a serious effect on the quantity and quality of the fruit and oil. The infested olive fruits become more acidic and the organoleptic characteristics of olive oil are also altered.
- It can cause heavy pre-mature fruit drops and damage the fruit intended for canning and oil processing.

OLIVE PSYLLIDS



OLIVE FRUIT FLY



OLIVE ANTHRACNOSE



OLIVE PEACOCK LEAFSPOT



PEST MANAGEMENT

Olive pest control is very important; however, the excessive use of pesticides increases the level of chemical residues in olive fruit and oil. Integrated pest management can help to minimize the possible environmental hazards and it shall be based on the following:

- Monitoring the insects in the field with chromo tropic traps, food attractants and pheromone traps.

Good and preventive cultural practices: pruning plays an important role in pest control and it opens the tree canopy and destroys infected branches.

- After pruning, a wound dressing shall be applied with copper-based products, disinfection of tools (with bleach), soil tillage, weed management, well-balanced fertilization and timely harvesting, etc.

Chemical control: insecticides (ex: Wetcit to control olive psyllids and dimethoate for fruit fly) and fungicides (e.g. copper-based products to control peacock eye and Olive Anthracnose).

d. OLIVE PICKING TIME

- The picking time is still under discussion among olive growers and it can make a real difference in yield, oil flavor, oil-keeping ability and color.
- The best time for picking olives is the period when we get the highest yield with the best oil quality; it is when the skin starts to turn from green to black. Like any tree fruit, more mature olives will become sweeter and fruitier as alcohols, esters, and aldehydes increase.
- Generally, the oil content in olives increases as the fruit grows and then it remains stable when the fruit has reached its maximum size. Oil yield may increase per ton as the fruit ripens, due to the olive dehydration.

e. OLIVE HARVESTING

- When the olives are on the tree, the oil inside the fruit is in perfect condition. Some changes that affect the quality occur during and after harvest.
- There are many ways to harvest olives: the traditional/manual and the mechanical methods.



MANUAL HARVESTING

Hand harvest is the best but it is very expensive and it takes more time.



MECHANICAL HARVESTING

It can reduce labor and save time.

To get the best quality fruit and oil at harvest we should follow:

- Use plastic nets to avoid any contact between the fruit and the ground.
- Never beat the trees because this can damage the branches and fruits.
- Never mix the fruits dropped on the ground with the freshly picked fruits; they can cause a negative fermentation process.
- Before harvesting, shake the trees slightly to drop the infected fruits to avoid it mixing with healthy fruit.



f. OLIVE POST-HARVEST HANDLING PRIOR TO MILLING

- Store fruit in baskets or ventilated plastic crates and avoid using bags, especially the big nylon ones.
- Make an appointment with the mill before transporting the olives to avoid waiting.
- It is preferable to store the olives in ventilated plastic containers for a period not exceeding 48 hours.
- Remove the field heat through fans.
- Store in a clean well-ventilated area, not exposed to sun and rain.



HANDLING AT THE MILL

a. TYPE OF MILL AND PROCESSING METHODS

There are two processing methods (for olive oil extraction):

TRADITIONAL (BATCH PRESSING).

Advantages: uses less energy, produces relatively dry pomace, no water addition is required.

Disadvantages: batch operation with high labor costs and low workers productivity; long contact time among oil, cell-water, and air oxygen (risk of oil oxidation); difficulty to maintain the cleanliness of filtration disks (mats).



MODERN (CONTINUOUS OLIVE OIL EXTRACTION BY CENTRIFUGATION)

Advantages: continuous operation with low labor costs and high worker productivity; lower space required for plant installation; low extraction time that reduces the risk of oil oxidation; easy sanitation of contact materials (only stainless steel) no filters are required.

Disadvantages: wastewater production; need of continuous power.

3-PHASE DECANTER (OIL, POMACE, WASTEWATER)

Advantages: produces unique quality oil and relatively dry pomace; High extraction rate of oil and extraction plant flexibility (in terms of use) with different olives quality.

Disadvantages: wastewater production.

2-PHASE DECANTER (OIL, POMACE + WASTEWATER)

Advantages: low or null water addition produces an oil with high polyphenol content.

Disadvantages: produces wet pomace; low plant flexibility with different olives quality; lower oil extraction rate.



b. MANAGEMENT OF THE MILL

A mill **MUST** have:

- Drainage channels in the floor to remove wastewater;
- Flooring coated with a special material that prevents oil from accumulating and going rancid; easy to clean.
- Good visibility and noise reduction.

The different steps for processing the olives into oil are the following:

- Separation of the fruit from the leaves or dirt and wash with clean water (if required).
- Grinding of the fruit into a paste, mixing slowly the fruit, not exceeding 27°C and not less than 20 °C. The time required ranges between 30 and 120 min depending on olive characteristics.
- Oil separation from water and husk: the cleaned oil should contain less than 0.1% of water or solids and the wastewater effluent should contain less than 0.1% oil. Olive oil residues (husk) from the milling process could be used for oil solvent extraction, and then used for heating. Bad-quality olive is transformed into soap (around 15% of the total olive oil production).

c. OLIVE OIL STORAGE

AVOID PLASTIC CONTAINERS;

- For long-term storage stainless steel containers should be used or opaque glass, well cleaned, with airtight closure, and completely filled.
- For olive oil marketing, colored glass bottles should be used;
- Keep at 12-15°C, in dark, odorless, and well-ventilated conditions.
- Oil should be decanted 1-3 times, then filtered directly prior to bottling.

CLASSIFICATION OF OLIVE OILS

- Olive oil is defined as oil obtained solely from the olive tree fruit.
- Olive oil cannot be mixed with any other type of oil, must pass a sensory analysis by a certified panel of tasters, and meet the analytical criteria.
- One of the most important aspects of olive oil classification and value determination is sensory analysis.
- Sensory values come from a rating of the oil by a qualified taste panel that has been officially recognized by the International Olive Council (IOC).
- Virgin oil is obtained solely by mechanical or physical means that do not lead to alterations in the oil.

OLIVE OIL QUALITY CRITERIA AND STANDARDIZATION (IOC & EU 2009)



| | Extra Virgin | Virgin | Lamp Virgin |
|------------------------------------|--------------|---------|-------------|
| Sensory Characteristics | | | |
| Median of Defects | =0 | 0 < 2.5 | >6.0 |
| Median of Fruitiness | >0 | >0 | --- |
| Chemical Characteristics | | | |
| Free Acidity Level % | <0.8 | <2 | < 3.3 |
| Peroxide Value (meq. 02/kg) | <20 | <20 | No limit |

- The sensory characteristics are defined based on the aroma and flavor of the oil.
- Defects are caused by errors during harvest and storage.
- Fruitiness is related to the quality of the olive that is defined by the maturity and variety.
- Free acidity is measured as percent oleic acid within the oil. A high value indicates poor fruit quality or improper handling before milling.
- Peroxide value is an indicator of the amount of primary oxidation within the oil.

DEFINITION OF EXTRA VIRGIN OLIVE OIL

- It is a natural juice derived from pressing the olives and it has the most delicate flavor and the most anti-oxidizing benefits.
- With positive attributes: fruity, bitter, green, citrus, spicy, fragrant, tropical, soft, over-ripe, and pungent, determined by the quality of the fruit.
- With no negative attributes (sensory defects): fusty, musty, muddy, winey-vinegary, rancid, metallic, and burnt.
- Free acidity level less than 0.8%.
- Peroxide value not higher than 20 milliequivalents of oxygen/kg of oil.
- Extracted by mechanical means without solvents or heating.
- Not mixed with any other oils or chemicals.



TABLE OLIVES

DEFINITION OF TABLE OLIVES

- Table olives are the sound fruits of suitable varieties of the cultivated olive tree (*Olea europaea* L.) harvested at an appropriate stage whose volume, shape, flesh-to-stone ratio, fine flesh, taste, firmness and ease of detachment from the stone make them particularly suitable for processing.
- Treated to remove their bitterness and preserved by natural fermentation, or by heat treatment, with or without the addition of preservatives.
- Packed with or without covering liquid.

TYPES OF OLIVES

The International Olive Council (IOC) classifies the table olive into three categories according to the degree of ripeness of the fresh fruits.

Green olives: Fruits harvested during the ripening period, prior to coloring, and with normal size.

Olives turning color: Fruits harvested before the stage of complete ripeness are attained, at the color change.

Black olives (ripe olives): Fruits harvested when fully ripe or slightly before full ripeness is reached.

PROCESSING METHOD

Table Olives should be processed under Good Hygienic and Manufacturing Practices.

SORTING

- Table olives are sorted manually to remove the damaged, misshapen and infected fruits. The sorting machine divides the olives for size.
- The leaves are also removed during this phase. This step is very important in the classification of the final product.

PROCESSING

- In the Mediterranean region, generally, table olives are put in brine with 8-10 % of salt, where a natural and spontaneous fermentation occurs. During this phase, the enzymes, produced by bacteria, and the salt get into the fruits and neutralize the bitter compound.
- Green table olives can be treated with a chemical method before putting them in brine: the Sevillian method treats the olives with a lye solution (1.5 – 2.4 % NaOH) for 8 – 12 h to remove the bitter taste, then the olives are washed to remove the lye from flesh and then the olives are put into salt solution (8-10% NaCl). After 8-10-30 days of fermentation.



The natural fermentation passes by the following steps:

Fruit Washing: The olives are washed to remove the dirt.

Crushing: The olives could be crushed or split deeply with a small knife. This phase of the process helps the brine to penetrate inside the fruits and allows the leak of the bitter compound.

Brining and anaerobic fermentation: Olives are fully immersed in brine (10 % of salt) at room temperature (20–25°C). The tanks should be filled before with olives and then with brine. The salt solution must cover the olives. During the processing the salt concentration should be maintained between 8 to 10%.

Sorting, Stoning, and stuffing: Olives are sorted for the second time to remove the non-standard fruits. If required stoning and stuffing should be done before packaging.

Packaging: The mainly used packages are glass jars and tin containers.

- They can be used in different sizes from 250 g to 5 kg according to the final market target.
- Olives are covered with fresh brine (0.3–0.5% lactic acid + 3–6 % NaCl).





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