The Oklahoma Cooperative Extension Service

WE ARE OKLAHOMA

The Cooperative Extension Service is the largest, most successful informal educational organization in the world. It is a nationwide system funded and guided by a partnership of federal, state, and local governments that delivers information to help people help themselves through the land-grant university system.

Extension carries out programs in the broad categories of agriculture, natural resources and environment; family and consumer sciences; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

Some characteristics of the Cooperative Extension system are:

- The federal, state, and local governments cooperatively share in its financial support and program direction.
- It is administered by the land-grant university as designated by the state legislature through an Extension director.
- Extension programs are nonpolitical, objective, and research-based information.
- It provides practical, problem-oriented education for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.
- It utilizes research from university, government, and other sources to help people make their own decisions.
- More than a million volunteers help multiply the impact of the Extension professional staff.
- It dispenses no funds to the public.
- It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.
- Local programs are developed and carried out in full recognition of national problems and goals.
- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
- Extension has the built-in flexibility to adjust its programs and subject matter to meet new needs. Activities shift from year to year as citizen groups and Extension workers close to the problems advise changes.

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Director of Oklahoma Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma. This publication is issued by Oklahoma State University as authorized by the Vice President for Agricultural Programs. 01/20 MHG

EXTENSION

How to Purchase Olive Oil

January 2020

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facts.okstate.edu

The Olive tree, *Olea europea* L., has been part of Mediterranean landscape even before recorded history. European explorers and colonists brought olives to the Americas. Olive trees were first grown in Baja, California, in settlements established by Jesuit missioners in the early 1700s. But, it was not until a century later that a commercial olive industry was established in California.

Olive trees grow best in a climate with a long, hot, dry growing season and relative cool winter. Temperatures below 10 degrees Fahrenheit (-12 degrees Celsius) are deadly to the trees. Most cultivars are injured around 15 degrees Fahrenheit (-9 degrees Celsius).

There are many cultivars of olives that produce table olives, fruits used for oil extraction or dual purpose fruits. High quality oil is usually formulated from varietal blends to ensure good flavor and acceptable shelf life. Manzanillo, Sevillano, Ascolano, Mission and Barouni are the varieties commonly grown in California.

Oil content of olive fruits vary between 10 and 35% by weight depending on the variety and level of maturity. Oil production is relatively simple as compared to the other vegetable oils. Olive fruits are washed, crushed and mixed to promote formation of large oil droplets. Then, pomace is pressed or centrifuged to separate solids and olive oil plus water mixture (olive juice). Oil is separated from water either by decanting the oil floating on top of water or centrifugation. Oil is filtered and bottled for marketing and consumption. Residual pomace can be extracted using organic solvents to obtain crude oil, which requires further refining before it can be consumed by humans.

Types of Olive Oils

The International Olive Council (IOC) (https://www.internationaloliveoil.org/) is the world's only international intergovernmental organization in the field of olive oil and table olives and has a United Nations charter to develop quality and purity criteria for olive oil (http://cesonoma.ucanr.edu/files/27262.pdf). The council lists nine grades of olive oil in two main categories: 1) olive oil and 2) olive pomace oil.

IOC defines olive oil as the "oil extracted from the olive fruit (*Olea europea* L.)," which excludes the oils produced using solvents (see OSU Fact Sheet FAPC-159 Oil and Oilseed Processing II) and mixing with other oils. The oils described below have to meet certain purity criteria for inclusion into specific categories. The olive oils must not be adulterated with any other type of oil, pass a sensory analysis by a certified panel of tasters and meet the analytical criteria. Some of the important sensory characteristics of the olive oil determined by IOC are as follows: a) oil should have a fruity olive flavor that is characteristic of the variety or blend of varieties making up the oil, b) there should be no vinegary or fermented odor or flavor, c) oil should not be rancid or possess any other off flavor that is essentially not of the olive, and d) bitterness and pungency are often present in olive oils, especially when newly made. They are not defects and will mellow as the oils age. The following sensory attributes are defined as positive: 1) fruity, 2) bitter, and 3) pungent. Negative attributes (defects) include: 1) fusty, 2) musty, 3) muddy sediment, 4) winey-vinegary, 5) rancid, and 6) heated or burnt.

Virgin olive oils are extracted solely by mechanical or other physical means under conditions, particularly thermal conditions, that do not lead to alterations in the oil and have not undergone any treatment other than washing, decantation, centrifugation and filtration.

- ***Extra virgin olive oil:*** This is the highest quality rating for an olive oil. Extra virgin olive oil should have clear flavor characteristics that reflect the fruit from which it was made and a free acidity (see OSU Fact Sheet FAPC-196 Lipid Glossary), expressed as oleic acid, of not more than 0.8 grams per 100 grams. This oil, as evaluated by a certified taste panel, contains zero defects and greater than zero positive attributes. In other words, more than half of the tasters should indicate this oil has no defect and has some fruitiness.
- ***Virgin olive oil:*** Analytical and sensory analyses for this oil reflect slightly lower quality than extra virgin olive oil. This is a virgin olive oil with a free acidity of not more than 2 grams per 100 grams and sensory defects from 0 to less than 2.5.
- ***Ordinary virgin olive oil:*** This is a low-grade oil with notable defects. It has a free acidity of not more than 3.3 grams per 100 grams with organoleptic defects of 2.5 to less than 6.0. This product may only be sold direct to the consumer if permitted in the country of retail sale. If not permitted, the designation of this product has to comply with the legal provisions of the country concerned. European Union (EU) laws do not permit bottling of this grade oil, so it is sent for refining. The EU has eliminated this category and other regulating agencies are likely to follow by simply including it into the lampante category.

Lampante virgin olive oil products may have a free acidity of more than 3.3 grams per 100 grams with severe defects, greater than 6. This product is intended for refining or for technical use.

Refined olive oil is the olive oil obtained from virgin olive oils by refining methods (see OSU Fact Sheet FAPC-160 Oil and Oil Processing III), which do not lead to alterations in the initial glyceridic structure of the oil. It has a free acidity of not more than 0.3 grams per 100 grams. Refined olive oil must not come from the solvent extraction of pomace. The refining process usually consists of treating virgin oil/lampante with sodium hydroxide to neutralize the free acidity, washing, drying, odor removal, color removal and filtration (OSU Fact Sheet FAPC-160 Oil and Oilseed Processing III). In the process, the oil can be heated to as high as 430 degrees Fahrenheit (220 degrees Celsius) under a vacuum to remove all of the volatile components. Refined olive oil is usually odorless, tasteless and colorless. It is designated as not fit for human consumption. This designation may only be sold direct to the consumer if permitted in the country of retail sale.

Olive oil is the oil consisting of a blend of refined olive oil and virgin olive oils fit for consumption as they are. It has a free acidity of no more than 1 gram per 100 grams. The country of retail sale may require a more specific designation. Oils labeled as "Extra Light" in the U.S. would likely contain mostly refined olive oil. Blends with more color and flavor would contain more virgin or extra virgin olive oil.

Olive pomace oil is the oil obtained by treating olive pomace with solvents or other physical treatments. Oils obtained by re-esterification processes (see OSU Fact Sheet FAPC-196 Lipid Glossary) and of any mixture with other types of oils (i.e. seed or nut oils) are not included in this category. Pomace oil is marketed under the following designations and definitions:

- ***Crude olive pomace oil.*** This is the solvent extracted crude olive oil product that comes out of the pomace extractor after separation and recovery of most of the solvent. EU law defines any oil containing 300-350 mg/kg of waxes and aliphatic alcohols above 350 mg/kg as crude pomace oil. This oil is intended for refining before use for human consumption or technical use.
- ***Refined olive pomace oil.*** This is the oil obtained from crude olive pomace oil by refining methods, which do not lead to alterations in the initial glyceridic structure. It has a free acidity of not more than 0.3 grams per 100 grams. This product may only be sold directly to the consumer if permitted in the country of retail sale.
- ***Olive pomace oil.*** This is the oil comprising the blend of refined olive pomace oil and virgin olive oils fit for human consumption as they are. It has a free acidity of not more than 1 gram per 100 grams. This oil shall not be called "olive oil." The country of retail sale may require a more specific designation.

Nutritional Properties of Olive Oil

Just like any other oil, olive oil is composed of mainly triacylglycerides and small quantities of free fatty acids, glycerol, phosphatides, pigments, flavor compounds and phytosterols. It is characterized by a high unsaturated, about 85%, and low saturated fatty acid content, about 15% (Table 1).

Table 1. Popular filler types for liquid food products.

Fatty Acid Name	*Content (%)*
Myristic (14:0)	*0.1-0.1*
Palmitic (16:0)	*7.0 - 20*
Palmitoleic (16:1)	*0.3 - 3.5*
Stearic (18:0)	*0.5 – 5.0*
Oleic (18:1)	*55 - 83*
Linoleic (18:2)	*3.5 - 21*
Linolenic (18:3)	*0.0 - 1.5*
Arachidic (20:0)	*0.0 - 0.8*
Behenic (22:0)	*0.0 - 0.2*
Lignoceric (24:0)	*0.0 - 1.0*

Olive oil is rich in oleic acid, which gets its name from Latin word "oleum" meaning oil. Oleic acid is a monounsaturated oil that has higher oxidative stability than other unsaturated fatty acids. There are a number of scientific studies indicating health benefits of oleic acid rich oils. The potential health benefits of olive oil consumption mostly attributed within the context of a Mediterranean diet. In general, associations between single nutrients and chronic diseases are difficult to prove. However, aggregate epidemiological data supports the beneficial human health effects of olive oil consumption, particularly for the prevention of cardiovascular diseases, several cancers and diabetes mellitus. Some of the health benefits of olive oil are ascribed to its high concentrations of monounsaturated fatty acids, phytosterols and lipid soluble antioxidants. It is also important to note olives contain several simple and complex compounds including phenolics like vanillic, gallic, coumaric and caffeic acids, hydroxytyrosol and tyrosol, and more complex compounds such as oleuropein and lignans in small quantities. These compounds are reported to have human health benefits. Extra virgin olive oil contains more of the latter compounds than refined oil. Hence, extra virgin olive oil often has been associated with human health benefits.

Tips for Purchasing Olive Oil

1. Read product labels carefully keeping in mind the specifications of the oil types described in this article.
2. Note the distinction between "olive oil" and "pomace olive oil."
3. Olive harvest, milling and best use dates are important information to look at on the label. Considering that virgin oils are not refined for extended shelf life, it is best to consume them within the 18 months of harvest/milling. Some bottles might be labeled as a 2-3 year expiration date, so, it is good to know the harvest date to access its quality at the time.
4. Keep in mind that the U.S. Department of Agriculture (https://www.ams.usda.gov/grades-standards/olive-oil-and-olive-pomace-oil-grades-and-standards) olive oil standards are not mandatory, and IOC standards apply to its members. Hence, it might be a good idea to purchase products that are certified by one of these organizations. A list of the producers participating in the California Olive Oil Council certification program can be found at https://www.cooc.com/2018-harvest-seal-certified-oils/.
5. Look for oils marketed in a dark glass or tin bottles. Exposure to light dramatically shortens the shelf life of oil. The bottles on the top shelves of the grocery stores would expose oil to direct light.
6. Make sure oil is stored away from light and heat in a cool environment to extend its shelf life and maintain quality. However, storing virgin oil in a refrigerator is not recommended. Refrigerated storage may cause condensation in the bottle and could produce off-flavors.
7. Think about the application in which the olive oil will be used. Refined olive oil is more stable at cooking and frying temperatures. Choose extra virgin oil for cold applications such as bread dipping, salad dressing and various cold sauces, and refined oil for cooking and frying.