

VARIETY AND MATURITY THE TWO LARGEST INFLUENCES ON OLIVE OIL QUALITY

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There are several olive variety comparison trials around the world. Professor John Metzidakis, one of the primary researchers working with olive improvement on the island of Crete in Greece, has been conducting variety evaluation trials on several European olive cultivars for 15 years. In Italy, Professor Piero Fiorino at the University of Firenze has been evaluating oil varieties and Dr. Giuseppe Fontanazza at the Olive Oil Research Institute in Perugia has been developing new compact varieties and dwarfing rootstocks for more efficient mechanical harvest. He has released three varieties to date, FS-17, I-77, and Don Carlo.

In Catalonia Spain, Dr. Joan Tous, of the Institute of Food Research and Technology (IRTA), has been evaluating the yield, bloom dates, harvest maturity dates, pollination, and oil quality for about 10 years. Prior to that he made collections of the primary local variety, Arbequina, and categorized several genotypes that he feels are different clones. His evaluation of these clones brought about the release of I-18, a very productive type of Arbequina. He is also evaluating varieties for the super-high-density plantings and has found to date, that Arbequina I-18, Arbosana, and Koroneiki work very well and produce very high quality oils. The Leccino variety was also found to perform very well in Catalonia for production, precocity, ease of harvest, and oil quality, but not for the super-high-density plantings.

The world germplasm repository in Córdoba Spain has a whole team of researchers working on variety identification, pollination, bloom dates, fruit size, cold hardiness, disease resistance, and oil quality profile. Dr. Diego Barranco, Dr. Juan Caballero, and Dr. Marino Uceda are three of the main people involved, but there are many others. They have a new book that is due out soon, covering 10 years of research evaluating these varieties. Much work is being done on developing DNA profiles for each known variety and checking those against synonym varieties. Right now most varieties can be reliably identified using pit characteristics, but not with 100% accuracy.

Dr. Barranco is also leading a team of researchers in the development of new varieties. They make several crosses each year with the goal of producing a very productive, precocious, self fruitful, disease resistant tree that produces fruit that is easy to harvest and has excellent fruity aromatic oil characteristics with good stability. To date, they have released two varieties: UCO-2/36 and UCO- 1/68.

There are undoubtedly many other variety evaluation trials around the world including the one in Adelaide Australia led by Susan Sweeney. In California we planted 14 varieties in six different locations around the northern part of the state in 1996 – 1998. We will be evaluating oil quality on those varieties for the first time this season. Trial varieties include:

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|-----------|-----------|------------|
| Arbequina | Frantoio | Aglandau |
| Picual | Pendolino | Bouteillan |
| Mission | Maurino | Cayon |
| Leccino | Moraiolo | Picholine |
| Lucca | Coratina | |

In order to adequately evaluate olive oil varieties, the varieties of choice need to be planted in the climatic region where they will be grown. Without comparison data, the best that can be done is to try and compare climates in the Mediterranean with climates in the new world and guess what might fit. Surprisingly, little is known worldwide regarding performance of different varieties outside their traditional growing regions. What many California growers have done is to try and match their variety choices with similar Mediterranean climatic regions, market popularity, and the flavor appeal of their favorite oils. Until specific data is collected on variety performance within California, this is the best that can be done.

Varietal choices in the new world have primarily been influenced by regional consultants with their favorites and the strong influence of Italian marketers that are promoting a style of crisp, green, fruity, aromatic, pungent, and slightly bitter olive oil. That style of oil is only one type of oil and there is likely room for many oil styles in the marketplace. Look what has happened with the wine industry over the last 20 to 30 years.

Because of the strong influence of name recognition and market presence of some varieties, those should be at the top of the list of choices to try. There are other varieties to look at for their horticultural characteristics and or resistance to pest problems, including diseases. We are probably overlooking several good potential varieties from North Africa and the Middle East that nobody really knows much about. Several thousand varieties exist.

PRIMARY WORLD OLIVE OIL CULTIVARS -

| <i>CULTIVAR</i> | <i>~% OIL</i> | <i>COLD HARDINESS</i> | <i>FRUIT SIZE</i> | <i>POLYPHENOL CONTENT</i> | <i>POLLENIZER VARIETIES</i> |
|-----------------|---------------|-----------------------|-------------------|---------------------------|-------------------------------|
| Aglandau | 23-27 | Hardy | Medium | Medium | Self compatible |
| Arbequina | 22-27 | Hardy | Small | Low | Self compatible |
| Arbosana | 22-27 | Hardy | Small | Medium | Self compatible |
| Barnea | 16-26 | - | Medium | Medium | Self - Manzanillo - Picholine |
| Bosana | 18-28 | - | Medium | High | T de Cagliari - Pizzé Carroga |
| Chemlali | 26-28 | - | V Small | High | Self compatible |
| Coratina | 23-27 | Hardy | Medium | Very High | Self - Ogliarola |
| Cornicabra | 23-27 | Hardy | Medium | Very High | Self compatible |
| Empeltre | 18-25 | Sensitive | Medium | Medium | Self - Arbequina |
| Frantoio | 23-26 | Sensitive | Medium | Medium-High | Pendolino - Leccino |
| Hojiblanca | 18-26 | Hardy | Large | Medium | Self compatible |
| Koroneiki | 24-28 | Sensitive | V Small | Very High | Mastoides |
| Lechin Sevilla | 22-23 | - | Medium | Medium | Hojiblanca - Picual |
| Leccino | 22-27 | Hardy | Medium | Medium | Frantoio - Pendolino |
| Manzanillo | 15-26 | Sensitive | Large | High | Sevillano - Ascolano |
| Moraiolo | 18-28 | Sensitive | Small | Very High | Pendolino - Maurino |
| Picudo | 22-24 | Hardy | Large | Low | Hojiblanca - Picual |
| Picual | 24-27 | Hardy | Medium | Very High | Self - Picudo |
| Picholine | 22-25 | Moderate | Medium | High | Self - Aglandau |
| P. Marocaine | 22-25 | Hardy | Medium | High | Self - P. Languedoc |
| Taggiasca | 22-27 | Sensitive | Medium | Low | Self compatible |
| Verdial Huevar | 24-26 | Hardy | Medium | High | Manzanilla - Gordal |

Some varieties are thought to be the same or very similar to other varieties with different names. For example: Frantoio and Oblonga were recently determined to be the same variety. The varieties Haouzia and Menara are really clonal selections of Picholine Marocaine that are better producers, come into bearing sooner, and are easier to propagate from cuttings.

Oil Characteristics by Variety

The varietal character of an oil is just like the varietal character of any fruit. It changes with the genetics of the variety. One of the most prominent components of the variety is the fatty acid composition. The fatty acids, sterols, methyl-sterols, and some alcohols are nonvolatile compounds that do not add to the flavor of olive oil, but can influence the fluidity of the oil or mouth feel, as well as the stability of the oil and health aspects related to the amount of saturated versus mono and poly unsaturated fatty acids it contains. These components are also used to determine the authenticity or genuineness of an oil.

Another very important aspect of variety as it relates to oil flavor is the specific composition and quantity of the polyphenols and aromatic compounds it contains. The watery portion of the cell surrounding the globules of oil contains all the water-soluble and semi-water-soluble compounds, such as the polyphenols, tocopherols, glucosides, aldehydes, ketones, esters, organic acids, aromatic hydrocarbons, and pigments like chlorophyll and the carotenoids. The polyphenols and glucosides give the oil most of its bitterness, pungency, and together with the tocopherols, its antioxidant capacity.

The volatile aromatic compounds such as the aldehydes, ketones, esters, and organic acids, plus some alcohols are responsible for much of the ultimate flavor of the oil. These are different than the polyphenols; they are not usually bitter or pungent, but give the oil certain characteristics sometimes described as flowery, ripe fruity, perfumey, etc. The pigment, chlorophyll, has some flavor, but mostly just gives olive oil a green color.

The variety essentially determines the quality of the fruit and oil. It has been well established that with distinct varieties distinct oil types are produced. The quantity of polyphenols, aromatic compounds, and many of these other compounds varies by variety, fruit maturity, and processing technique, which is why there are so many different kinds of olive oil, each with its unique inherent flavor characteristics and stability.

- **Arbequina**: Recognized for its aromatic ripe fruitiness, low bitterness, pungency, and stability
- **Aglandau**: Highly fruity, bitter, pungent, and stable
- **Barnea**: Fruity with mild bitterness, pungency, and stability
- **Bosana**: Highly fruity, herbaceous, medium pungency, bitterness, and stability
- **Chemlali**: Strongly aromatic fruitiness with notable varietal character
- **Coratina**: Strongly green herbaceous, bitter, pungent, and stable
- **Cornicabra**: Very fruity and aromatic with medium bitterness, pungency, and stability
- **Empeltre**: Mildly fruity with low bitterness, pungency, and stability
- **Frantoio**: Very fruity, aromatic, and herbaceous; medium bitterness and stability; strongly pungent
- **Hojiblanca**: Fruity, aromatic, mildly pungent, low bitterness and stability
- **Koroneiki**: Strongly fruity, herbaceous, and very stable; mild bitterness and pungency
- **Lechin de Sevilla**: Very fruity, mildly bitter, pungent, and stable
- **Leccino**: Medium fruitiness, and stability; low bitterness and pungency
- **Manzanillo**: Fruity, aromatic and herbaceous; medium bitterness and stability; strongly pungent
- **Moraiolo**: Very strongly fruity, herbaceous, and stable; medium bitterness and pungency
- **Picudo**: Very aromatic ripe fruitiness; medium pungency and stability; mildly bitter
- **Picual**: Controversial variety that when harvested early produces a nicely aromatic fruity oil that has medium bitterness and very high stability. Poor reputation is due to poor fruit handling.
- **Picholine**: Very fruity and aromatic; medium fruitiness, bitterness, and pungency
- **Picholine Marocaine**: Very fruity and aromatic; medium fruitiness, bitterness, and pungency
- **Taggiasca**: Mildly fruity; low bitterness, pungency, and stability
- **Verdial de Huevar**: Mildly fruity, bitter, and pungent; very green in color

Harvest Date – Fruit Maturity

The ultimate flavor of any variety can be completely changed by either harvesting the fruit green (unripe) or mature (ripe). The subtleties in between those two extremes still can have a big influence on the style of oil produced. Some producers believe that maturity can even have a greater influence on quality than the variety itself.

Green oils have the green herbaceous characteristic and riper fruit has more of an olive fruity flavor, while the oil from very ripe fruit is often buttery, less fruity to flat, and does not keep as well. The greener the fruit the more bitter and pungent the ultimate product and the longer its shelf life. Maturity is often a compromise, but is a key factor in determining the style of oil produced. For any given variety there is probably no more than about two to three weeks of ideal harvest period to capture its best qualities.

Oil synthesis and accumulation in the olive fruit occurs over about 34 weeks, begins about 10 weeks into the season, increases fairly rapidly up until fruit maturity (color change and softening) then the rate of accumulation tapers off, but still continues. It seems like there is a much larger increase than there really is late in the fruit-ripening season due to the loss of moisture in the fruit. When the fruit becomes very over-ripe, oil synthesis stops completely.

Polyphenols: As olive fruits on the tree grow during the season, the content of polyphenols gradually increases and reaches a maximum level just as the fruit skin begins to change color (veraison). As the fruit matures and colors fully all the way to the pit, the content of polyphenols and most of the other flavor components of the fruit decline very rapidly (over about 2-5 weeks). Oil quality, therefore, is very strongly tied to fruit maturity.

Terroir is the influence of the “land” on the quality of the oil. This is the romantic part that nobody can quite put their finger on. When the oil is good people often say it is because of the land - the ideal soil, wonderful climate, or because the olives were dry farmed. Of course when it tastes bad, that is blamed on something or somebody else, usually the processor – never the land. There is undoubtedly an influence of climate, elevation, irrigation, soil water holding capacity, soil mineral content, sunlight intensity, rainfall, etc. on ultimate quality of the oil, but these things are very difficult to pin down. In my opinion and the opinion of most scientists, the influence of terroir is minimal compared to variety and fruit maturity.

