

Making Sense of Olive Oil Testing

by Liliana Scarafia
Durham, CA

On July 15th 2010, the UC Davis Olive Oil Chemistry Laboratory in collaboration with the Australian Oils Research Laboratory published a study of extra virgin olive oils (EVOO) sold in retail stores in California. Many people were surprised to learn that 69% of imported oils and 10% of California oils analyzed in the study failed to meet the extra virgin grade. Quite a few olive oil merchants became anxious about their olive oil inventories.

Our laboratory analyzes domestic and imported olive oil samples to determine oil grade. We routinely perform the standard International Olive Council's (IOC) chemical grading tests (free acidity, peroxides and UV absorption) used in the UC Davis study. Our experience allows us to see the analytical profile of quite a few olive oils, from the very fresh to pretty old.

We received inquiries from merchants concerned about ensuring quality for their customers and managing the risk of mislabeled olive oil. Our goal in this paper is to provide a practical perspective, drawn from the study results, that may be useful for retailers and buyers interested in minimizing their risk at an affordable cost.

First, an overview of the availability and costs of the tests performed in the Davis study:

- **Sensory test by an IOC-certified tasting panel** is not available in the US. Starting in October, the USDA laboratory in Blakely, GA will provide USDA Organoleptic tests. Cost is expected to be about \$300 per sample.
- **USDA Quality Criteria's analytical tests to determine grade** (free acidity, peroxides and UV) cost less than \$100 per sample, and are available at a dozen US laboratories.
- **USDA Purity Criteria** (authenticity or genuineness) **tests** to detect adulteration with refined oil or non-olive oils may cost up to \$2,000 per sample. These are available from a couple of US laboratories, including USDA's.
- **German/Australian tests** (DAGs and PPP) are provided by the Australian Oils Research laboratory. Note that these tests are currently not part of the USDA standard.

Summarizing the study results: 52 oils were tested, only 5 brands from California; 30 were found defective by sensory evaluation; 11 of those 30 oils also failed USDA/IOC chemical tests. The German DAGs test failed 23 of those 30 oils and the PPP test failed 15 of them. For clarity, grading works like this: if a single criterion of the sensory or chemical criteria is not met, the oil will fail to meet the stated grade and would be assigned a lower one.

The UC Davis report provides evidence as to:

The sensorial panel provided a very stringent detection of non-extra virgin oil

Oils that passed all chemical tests (IOC/USDA standards, plus DAGs and PPP) failed to meet the EVOO

standards by an IOC-recognized tasting panel. Trained tasters can find defects that go undetected by chemical means, such as 'musty', or 'rancidity' in old oils .

German/Australian method appear more stringent than current standards

Though neither endorsed by IOC nor adopted by USDA, the German DAGs test appear to be very adept at discriminating virgin grade among the oils tested. Let's stay tuned to its adoption in the US.

Among USDA/IOC quality tests, UV Absorption was the most discriminatory

UV absorption at 232 nanometers (K232) was the most discriminatory (10 out of 30) of non-extra virgin oils in this study. UV absorption is an inexpensive test that is most informative and cost effective to evaluate older oils, especially when age, storage or provenance is in question.

Among USDA/IOC quality tests, most oils passed Free Fatty Acids(FFA) and Peroxide Value (PV)

FFA and PV are essential to evaluate fresh oils because those showing high values will deteriorate more quickly in storage. But for oils of unknown age and origin, these values are dicier, and refining can also remove high acidity and peroxides.

Going beyond the study: if you decide to have olive oils tested, how could you choose what tests to select? What should you test for?

- **Standard quality tests are a good start.** They provide a snapshot of oil quality at any stage. There is a chronological progression of deterioration happening in oil from the time of harvest till a bottle reaches the retail shelf and then the consumer. Free Fatty Acids resulting from enzymatic breakdown of oils are a good indicator of early oil deterioration. Peroxides are early signs of oxidation: PV will rise and then taper down while oil is in storage. Free acidity and peroxides are not discernible by human senses, but both are a prelude to rancidity, which a sensorial test will detect later on in old oil. In older oils UV Absorbance values will rise with secondary oxidation, becoming the best test target.
- **Buyers should set their own acceptable cut-off values for PV, FFA and UV absorbance.** If empirically and scientifically it is known that oil with a lower FFA and PV at milling will have a better shelf life, then when sourcing new olive oils, buyers could set their own FFA threshold down to 0.5% or lower, PV well below 20, and K232 significantly lower than 2.5. Values approaching the IOC/USDA thresholds, as several oils in this study, are indicative of lower quality.
- **Consider performing sensory tests.** Even if a tasting panel is not available (or affordable), there are quite a few industry experts who can taste for a fee, train a buyer's staff to recognize obvious defects, and advise on the best characteristics of any oil. Their advice may not be meant to "certify" the oil, but to emphasize care and quality offered to consumers.
- **Choose analytical tests to fit the purpose.** If you have reason to be concerned about possible adulteration, then your choices are to test for a comprehensive set of tests from the Purity Criteria section of the USDA standards, or to pursue the German/Australian tests. The former are meant to detect blending with refined, and with non-olive oils, while the latter reflect an ongoing effort to detect sophisticated low-temperature refining methods of adulteration. Which one is more likely, based on your oil source?
- **Demand both the harvest date and bottling date.** Since olive oil is perishable and has, at most, a 24 month lifespan, harvest date is essential. But so is bottling date because oil may sit in tanks for a long while before bottling.

- **Analytical tests are pass-fail, but deterioration is gradual.** Next time you read an olive oil laboratory report or bottle label, keep in mind that values approaching the IOC/USDA thresholds are indicative of lower quality. The FDA advises against the listing of a single test on the oil label. Rightly so, it may be misleading since evaluating extra-virgin oil requires several parameters and those values change with time.

Agbiolab, Inc.