Understanding the Chemical Analysis Panel of Extra Virgin Olive Oil

To assess the quality of olive oil, producers submit samples from their most recent harvest to a third party, accredited lab for certification. Using various set parameters of quality, the lab will run a chemical analysis panel. Results are then evaluated against strict industry standards for the purpose of certifying to the highest quality designation – extra virgin.

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Partridge Family Olive Oil
Report #114274

BAKER WINE & GRAPE ANALYSIS

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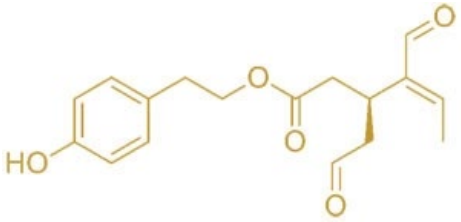
Sample ID	Free Fatty Acids % as oleic acid	Peroxide Value meq/kg	Absorbance at 232nm	Absorbance at 270nm	Delta K_{270}
pfo-Tusci	0.06	5	1.58	0.16	-0.005
COOC Standards for Extra Virgin Olive Oil	***<= 0.50***	***<= 15***	***<= 2.40***	***<= 0.22***	***<= +0.010***
USDA Standards for Extra Virgin Olive Oil	***< 0.80***	***< 20***	***< 2.50***	***< 0.22***	***< +0.010***

What does all this mean to the average buyer? Well, we hope the information provided below provides a little bit of insight into the world of extra virgin certification and what it means for you the consumer.

THE BASIC COMPOSITION OF OLIVE OIL

Let's first start with the fundamentals of olive oil. Olive oil is composed mainly of fatty acids which are simple structures made up of long chains of carbon atoms. The major fatty acid components are as follows:



- Oleic Acid – monounsaturated Omega-9
- Linoleic Acid – polyunsaturated Omega-6
- Linolenic Acid – polyunsaturated Omega-3

The fatty acids are assembled in groups of three with a unit of glycerol. These units are called Triacylglycerol molecules. Only when the fatty acids are bound in these small units are they considered to be good quality oil.

Minor components of olive oil include antioxidant compounds such as Phenolics, Sterols & Tocopherols. *These are the polyphenols (antioxidants) that many buyers ask about*. Yet is this the only aspect one should consider when choosing a quality EVOO? We will attempt to answer this question by explaining the chemical analyses in hopes you will appreciate that there is a direct relationship between polyphenols and other important oxidative stability values.

Free Fatty Acids (FFA)

The bond between the fatty acids is extremely delicate and can break by oxidization (heat, exposure to air, and time). When this degradation happens, a triacylglycerol molecule loses one or two fatty acids. A fatty acid that is lost is called a 'free fatty acid'. On this test, acidity is measuring the quantity of free fatty acids present in the oil at the time the oil is made.

Factors that lead to high free fatty acidity include damaging the fruit during harvest, fruit fly infestation, delays between harvest and extraction, or incorrect milling methods such as the use of excessive heat.

Therefore, the lower the FFA number the higher the quality of oil. Standards for extra virgin need to be <.08% USDA (<=.05% COOC). For buyers, this indicates care taken from grove-to-mill using sound, healthy olives. Low acidity will also make the oil less greasy and more fluid on your palate, whereas high acidity will give an oily and heavier mouthfeel.

Peroxide Value (PV)

The primary by-product of olive oil oxidation is peroxide. Essentially, fatty acids such as linoleic and linolenic are destroyed when exposed to oxygen and/or natural and artificial light sources. The PV starting point is determined by the extraction process, and then storage conditions. Elevated levels of peroxide indicate an oil has been damaged by free radicals and is already beginning its march towards rancidity.

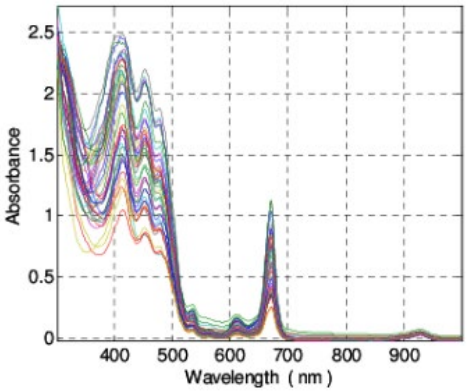
Therefore, the more peroxides present the more rancid or oxidized the oil. Higher PV means more of those "free radicals" that are damaging to your body. Thus buyers, look for high quality extra virgin olive oils with a low starting peroxide value of < 20meq/kg USDA (<=15meq/kg COOC). As good practice, producers typically use dark glass bottles and purge the headspace with Argon gas when sealing. This minimizes deterioration, keeping the oil in its freshest state possible. Regardless, always store your oil in a cool, dark location as well.

Ultra-violet Absorbance (UV)

Unfortunately, olive oil fraud is not uncommon. This involves mixing extra virgin olive oil with lower-quality edible oils or adding color. One of the most reliable techniques to assess the integrity of extra virgin olive oil is UV-visible spectrophotometry. This offers a precise way of quantifying various compounds of olive oil (i.e. chlorophyll & carotenoids pigments) by measuring the absorbance of specific wavelengths of light against the established trade standards.

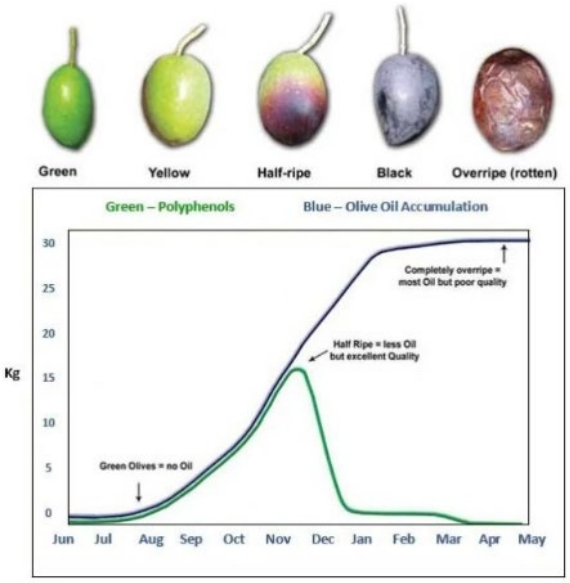
Therefore, since there are many grades of olive oils, a buyer can trust that they are purchasing unrefined, unadulterated extra virgin olive oil if the following regulatory criteria is met:

- *< 250 USDA (<=240 COOC) at Absorbance 232nm*
- *<.22 USDA (<=.22 COOC) at Absorbance 270nm*
- *< +0.01 USDA (<= +0.01 COOC) Delta K270 value*



Polyphenols

In short, polyphenol compounds are powerful antioxidants which, as the name implies, means that they protect from oxidation. In the case of olive oil, high polyphenol content protects against rancidity. It also contributes to the bitter taste (sharpness), pungency (often described as pepperiness) and astringency (dry, rough, or puckery) descriptors of olive oil.



As noted at the opening, polyphenol numbers are what most buyers focus on since studies have shown consuming olive oil fights oxidative stress (free radicals), age-related diseases like heart disease, high blood pressure, high cholesterol, inflammation, and certain types of cancer. While some olive oils are naturally higher in polyphenols than others, the timing of harvest contributes greatly to polyphenol content. The bell curve shows polyphenol concentration increases until olives begin to turn purple. Over time, levels decrease which results in what many describe as “softening” of an oil’s flavor.

A polyphenol test is an auxiliary analysis (and a little expensive), but it measures the maximum levels of the new oil on a scale of 200 (low) to 600 (high) mg tyrosol/kg. Since it is not required to be considered extra virgin, many micro-producers decline this analysis. But again, consider the relationship of polyphenols to the other required chemical values. If FFA & peroxides are high, it's safe to conclude that polyphenols will be low - and sensory defects will be evident. And given the inevitable decline in polyphenols over its shelf life, it would seem reasonable that a consumer would need to sample and assess an oil style, and then decide whether that oil was appropriate for the use they had in mind.

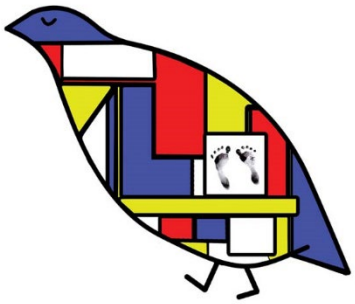
IN CONCLUSION

We all love the taste of EVOO. Now armed with understanding of its chemistry, you will truly appreciate the composition of great oils and how it contributes to your overall good health! *So, when looking to purchase olive oil, simply consider these factors in combination with all the knowledge above:*

- ✓ *Pick the freshest oils (the closer to harvest date the better)*
- ✓ *Harvesttime produced (early season olives would be the highest polyphenol content)*
- ✓ *How it was processed (if possible, ask about timing to the mill & master miller's skill)*
- ✓ *Consider certain varietals (i.e. Frantoio & Coratina are medium to higher polyphenol olives)*

Enjoy!

The Partridge Family Olive Oil Co.



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