

Chemistry

Objective, verifiable chemical standards form the foundation of the UP grade. Chemical analysis of EVOO has proven to be a fundamental indicator of sensory quality, predictor of perishability, and authenticity of olive oils. UP is the highest quality standard in the world because it utilizes the broadest array of available tests and enforces the strictest limits on all chemical standards.

Chemical Parameters	Determination	Indicators	Extra Virgin Standard	UP Standard
6.1 Free Fatty Acids (FFA)	Free Fatty Acids are formed due to breakdown of the triacylglycerols in oils during extraction. Fatty acids are "free" when they are no longer bound to any other molecules.	An elevated level of FFA can indicate poor quality or mishandled fruit, too much time between harvesting and extraction, poor storage and/or high temperature during extraction.	Units: % as oleic acid IOC limit ≤ 0.8	Units: % as oleic acid UP limit ≤ 0.3
6.2 Oleic Acid	The major fatty acid in olive oil triacylglycerols is Oleic acid making up 55 to 85% of olive oil	The higher the oleic acid monounsaturated fat content translates to increased durability and shelf-life.	Units: % as oleic acid IOC limit ≥ 55	Units: % as oleic acid UP limit ≥ 65
6.3 Peroxide Value	Peroxides are primary oxidation products that are formed when oils are exposed to oxygen causing defective flavors and odors	Primary measurement of rancidity in oil. Higher peroxide levels indicate oxidized and/or poor quality oil & give an idea of the freshness & storage conditions.	Units: mEQ O ₂ /kg oil IOC limit ≤ 20	Units: mEQ O ₂ /kg oil UP limit ≤ 9
6.4 UV Absorption	UV spectrophotometric determination Secondary measurement of rancidity in oil. Elevated levels of UV absorption indicate oxidized and/or poor quality oil, possible refining and/or	Secondary measurement of rancidity in oil. Elevated levels of UV absorption indicate oxidized and/or poor quality oil, possible refining and/or adulteration with refined oil.	Units: K1%/1cm IOC limits K232 ≤ 2.5, K270 ≤ 0.22, DeltaK ≤ 0.01	Units: K1%/1cm UP limits K232 ≤ 2.0 K270 ≤ 0.20, DeltaK ≤ 0.01 (immediately after production)

	adulteration with refined oil.			
6.5 Phenolic Content (Polyphenols)	Phenols are healthful anti-oxidant substances in olive oil which aid in slowing down the natural oxidative processes.	Phenolic content decreases over time and is an indicator of freshness, with higher amounts improving shelf-life and oxidative stability.	N/A	Units: (as ppm caffeic acid) UP minimum limit ≥ 130
6.6 DAGs	Fresh olive oil has a much higher proportion of 1,2-diacylglycerols to Total diacylglycerols while olive oil extracted from poor quality fruits and refined oils have a higher level of 1,3-diacylglycerols	The ratio of 1,2-diacylglycerols to the Total diacylglycerols are a useful indicator of fruit quality and acts as a snapshot of olive oil freshness. Low values can also indicate oxidized oil & sensory defects.	Units: %Total 1,2-diacylglycerols AOA limit ≥ 35	Units: %Total 1,2-diacylglycerols UP limit ≥ *90 (immediately after production)
6.7 PPP	Upon thermal degradation of olive oil, chlorophyll pigments break down to pheophytins and then to pyropheophytins	The ratio of pyropheophytins to the total pheophytins is useful for distinguishing fresh olive oil from soft column refined, deodorized, or backblended oils.	Units: %Total Pheophytins AOA limit ≤ 17	Units: %Total Pheophytins UP limit ≤ 5 (immediately after production)
*IOC= International Olive Council, AOA= Australian Olive Association				