Summary of Chemical Analysis

Analysis	IOOC limit for EV	Average	Effect	Comments
Common Analysis				
Free fatty acidity	0.8%	0.19% [a] 0.28% [b]	Quality Culinary	• A general measure of oil quality. Oils expeditiously processed after harvesting from sound fruit will have low FFA. • The higher the FFA (particularly when > 0.5%), the higher the probability that the oil will have a taste defect. • Oils with low FFA smoke at a higher temperature. • FFA remains stable as the oil ages
Polyphenol level	not applicable	268 ppm [a#] 190 ppm[a#] (median) 195 ppm [b#]	Style Culinary Shelf life Health	• In general, the higher the polyphenol level the more bitter and/or pungent (robust) the oil. • Bitterness and pungency are primary determinants of the appropriateness of the oil in cooking. • High polyphenol levels improve shelf life of the oil. • Polyphenols are antioxidants, which are considered to be healthful. • Declines with oil age.
Peroxide Value	20 mEq /Kg	8.8 [b]	Shelf life	• Measurement of the active oxygen in the oil, that is, in the primary stage of oxidation. • A high peroxide level in young oils suggests a short shelf life. • PV is difficult to interpret in older oils as its value reduces as the active oxygen is used up and the oil starts to become rancid. • Declines with oil age.

Analysis	IOOC limit for EV	Average	Effect	Comments
Fatty Acid Profile				
Major Monounsaturated Fatty Acids				
Oleic acid (C18:1)	55-83%	74% [c]	Health Shelf life	• The major fatty acid in olive oil • A high level of this monounsaturated fat considered healthful^ • A high level of this fat favours a good shelf life
Major Saturated fatty acids				
Stearic acid (C18:0)	0.5-5.0%		Health Shelf life	• The lower the level the better as this saturated fat is considered to be poor for health. • A very high level suggestive of adulteration with tallow and other animal fats. • A stable oil which positively contributes to shelf life of the oil. • A high level will reduce the melting point of the oil making it solidify in the refrigerator.
Palmitic acid (C16:0)	7.5-20%	12% [c]	Health Shelf life Other	• The lower the level the better as this saturated fat is considered to be poor for health. • A very high level suggestive of adulteration with palm oil. • A stable fatty acid which positively contributes to shelf life of the oil. • A high level will reduce the melting point of the oil assisting it to solidify in the refrigerator.
Major Polyunsaturated Fatty Acids				
Linoleic acid (C18:2)	3.5-21%	9% [c]	Health Shelf life Adulteration*	• Polyunsaturated fat considered good for health. • Rather unstable fatty acid. High levels contribute to short shelf life. • High levels suggestive of* adulteration with sunflower oil.
Linolenic acid (C18:3)	<1.0%	0.74% [b]	Shelf life Health Adulteration*	• Polyunsaturated fat considered good for health. • Very unstable fatty acid. High levels strongly contribute to short shelf life. • High levels is suggestive of* adulteration with linseed oil.

Analysis	IOOC limit for EV	Average	Effect	Comments
Other Analysis				
Iodine Value		Typical value 80 [b]	Health Shelf life	• High iodine value means that the individual fatty acids that comprise the oil contain a higher average number of double bonds (and therefore a higher proportion of unsaturated fats). • Therefore a high iodine value suggests better healthfulness. • However a very high iodine value suggests a shorter shelf life.
Saponification value		Typical value 190 [b]	Health Shelf life	• Measures the number of ester bonds in the fatty acid. • A high number of ester bonds suggest that the fat molecule is intact, which suggests that the oil has been properly processed from sound fruit.
Induction Time	None	5.3 hours [b]	Shelf life	• The longer the induction time, the longer the expected shelf life of the oil. • However, as the actual shelf life is dependent on storage conditions no specific relationship between induction time and actual shelf life is possible. However in relative terms all else being equal, oils with longer induction times will have a longer shelf life.
Moisture content			Shelf life	• Oils with high moisture contents are more prone to rancidity as one of the chemical pathways to oil oxidation relies on the presence of water.
UV absorption at 232nm and 270nm			Quality Shelf life	• A high absorption is indicative of oils containing high levels of primary and secondary oxidation products. Typified by old or poorly stored oils.

Analysis	IOOC limit for EV	Average	Effect	Comments
Adulteration Analysis				High Levels are **suggestive of*** adulteration with:
Waxes			Adulteration*	Olive pomace oil or other solvent extracted oils.
UV-absorption 270nm	<0.25		Adulteration*	Refined oil (specifically due to the decolorisation step of the refining process)
Trans fatty acids			Adulteration* Health	Suggestive of adulteration with refined oils. Tran- fats raise LDL (that create bad cholesterol) while cis-fats that are naturally found in virgin olive oils lower it in favour of HDL (that create good cholesterol)
2-position palmitic acid			Adulteration*	Esterified oils or palm oil. In olive oil, the 2 position on the triacylglyceride is preferentially occupied by unsaturated fats.
Delta K			Adulteration*	Refined oil
R1 value			Adulteration*	The ratio of campestadiene to stigmastadiene. A high level is indicative of* adulteration with refined seed oils.
Eicosenoic acid (C20:0)	<0.6%			A minor fatty acid naturally found in olive oil. However a high level is suggestive of* adulteration with vegetable oils.
ECN42			Adulteration*	A high equivalent carbon number (ECN42) is indicative of oils with a high proportion of triacylglycerides containing three linoleic fatty acids. A high level suggests* adulteration with seed oils particularly sunflower oil.
Total aliphatic alcohols			Adulteration*	Pomace oil
Stigmastadiene			Adulteration*	Refined vegetable and olive oils
Sterols	(% of total sterols)			
Cholesterol	<0.5%		Adulteration*	Animal based fats
Brassicasterol	<0.1%		Adulteration*	Canola oil
Campesterol	<4.0%		Adulteration*	High oleic sunflower oil or other seed oils

Stigmasterol	<campesterol level		Adulteration*	
δ-7-stigmasterol	<0.5%		Adulteration*	
β-sitosterol	0%			Major sterol of vegetable based oils
δ-5-avenasterol	0%		Adulteration*	
δ-5-23-stigmastadienol	0%		Adulteration*	Suggests adulteration with refined vegetable oil
Clerosterol	0%		Adulteration*	
Sitostanol	0%		Adulteration*	
δ-5-24- stigmastadienol	>93%		Adulteration*	A low level suggests adulteration with other oils

a- Source 2005 Australian Olive Association Extra Virgin Olive Oil Show – unpublished.
b- Source New South Wales Department of Agriculture – unpublished.
c- Source Australian Olive Oil Association National Olive Oil Survey – unpublished.
#- Measured as caffeic acid equivalents
^- 'unsaturated' refers to fats that contain more than one double bond somewhere in their chemical structure. Monounsaturated fats have health benefits over saturated fats (ones with no double bonds). However polyunsaturated fats (i.e. those with two or three double bonds) such as linoleic and linolenic acid are more prone to oxidation and therefore degrade (go rancid) more quickly.
*- olive oil is a complex natural product. As such the amount of individual components in olive oil varies. As a result, unadulterated oils may be high in one or more components associated with adulteration practices.
This table should be used only as a guide. While every care was taken in the compilation of this table, the author takes no responsibility for any inaccuracies.