UV SPECTROPHOTOMETRIC ANALYSIS OF OLIVE OILS

The absorption in the U.V. is related to the presence of conjugate double bonds. In the oils, due to oxygen fixation in linolenic and linoleic acids' double bond position, hydroperoxides arise. The double bond moving that we'll obtain provoke the formation of conjugate diene systems between carbon atoms:

-CH-CH=CH-CH=CH-
  |
 O-OH

This kind of conjugate systems presents a maximum absorption at 232 nm wavelength. Instead, during more advanced oxidation states, products are generated with conjugate diene systems carbon-oxygen like:

CH_2—C—C--CH_2 CH_2—CH==CH-C-CH_2
// \\ //
O O O

The maximum absorption in this case ranges between wavelength of 260/280 nm. A conjugate triene system presents a triple band with a maximum absorption at 268 nm and another at 232 nm. The absorption curve in the U.V. of an oil is very much influenced by the oxidation products, some of which provoke an increase of the absorption at 232 nm and others at 270 nm. This curve is called Delta k and is part of the fundamental analysis that we conducted to establish the purity and degree of degradation of an oil.

MATERIALS

U.V. absorption spectrophotometer
Quartz cuvette
100 ml. volumetric flask
Isooctane solvent for spectrophotometer analysis
Analytical balance

PROCEDURE

1. The oil sample must be clear. If not, filter it at room temperature with filter paper.
2. Weigh 0.5 gr. of oil in a volumetric flask at 50 ml.
3. Bring up to the same volume with isooctane.
4. Read the absorption value at 232-262-268-274 nm wavelengths.
5. Use the isooctane as a blank.
6. Indicate with D the absorption value read on the spectrophotometer and with K the specific absorption value.

The K value is obtained from this expression:

$$\mathbf{K} = \frac{D}{C \times S}$$

C = solution concentration in gr./L (10 gr./L) **S =** cuvette thickness in cm (cm.1)

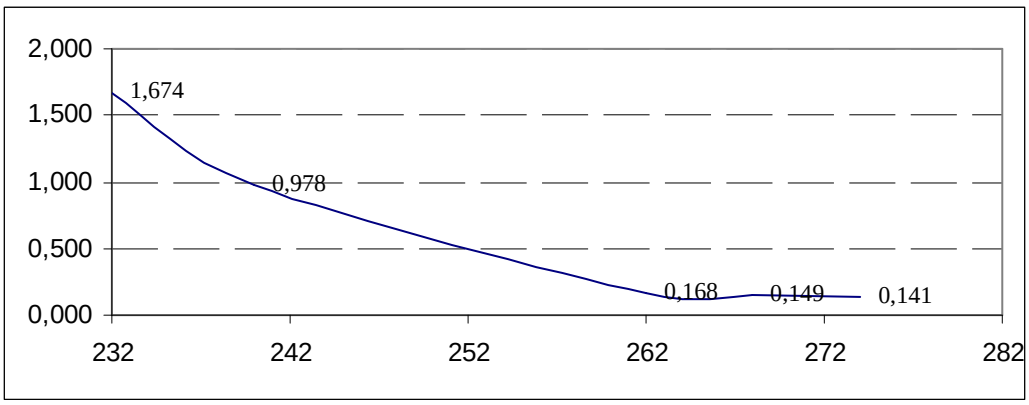
The ΔK value was determined as follows: $\mathbf{\Delta K} = K\,268 - [(K\,262 + K\,274) / 2]$

RESULTS

Maximum UV absorption of commercial oils

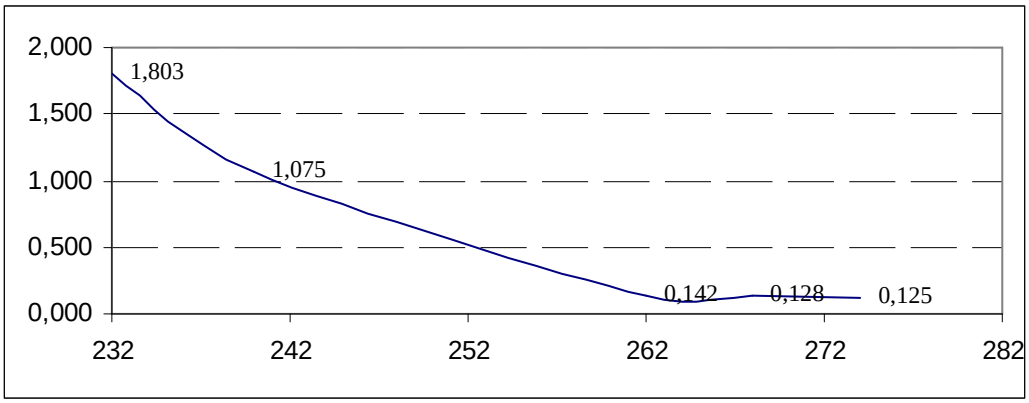
Oil type	K232	K268	ΔK
Extra-Virgin Olive Oil	3.0	0.18/0.20	0.01/0.010
Superfine-Virgin Olive Oil	3.0	0.18/0.20	0.01/0.010
Fine-Virgin Olive Oil	3.0	0.18/0.25	0.01/0.010
Virgin Olive Oil	3.0	0.18/0.25	0.01/0.010
Rectified Olive Oil	3.0/3.5	1.0/1.10	0.15/0.16
Rectified Olive Oil and Residue Olive Oil Mix	5.50/6.0	1.8/1.90	0.20
Olive Oil cut with Rectified Olive Oil or Virgin oil	2.80/3.30	0.90	0.100/0.130
Olive Oil and Residue Olive Oil Mix	5.0/5.50	1.70	0.180

Extra Vergin Olive Oil



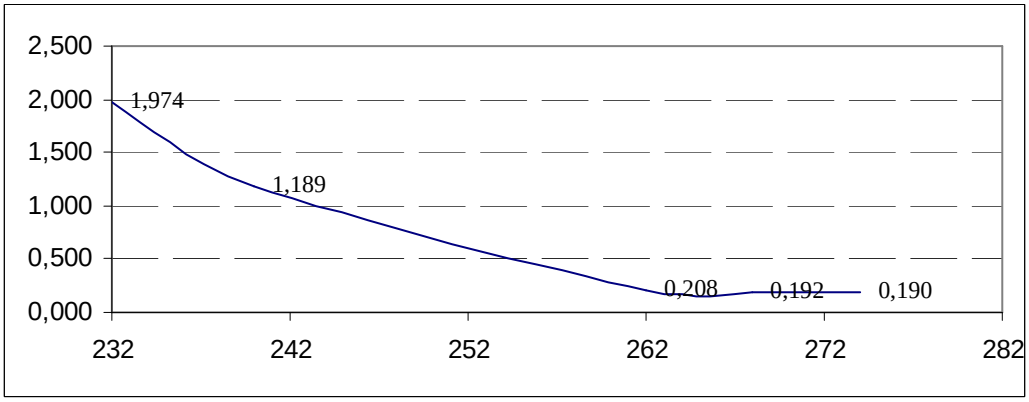
ΔK = 0,005

Sample II – Extra-Vergin Olive Oil



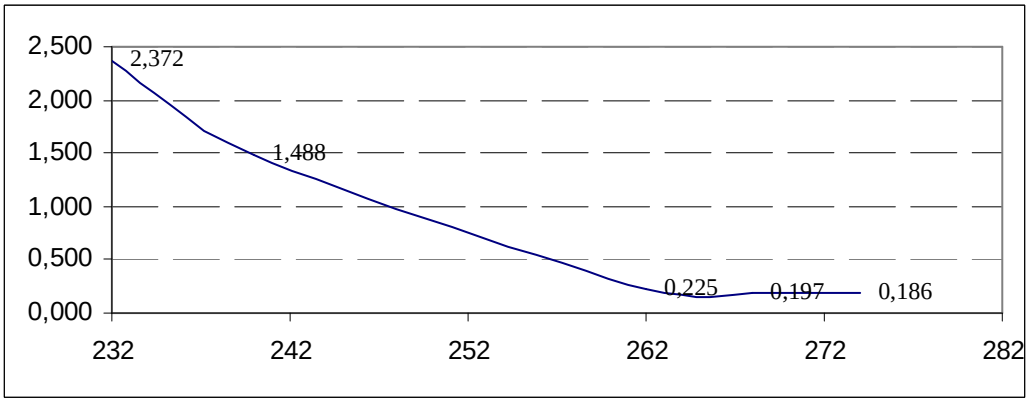
ΔK = –0,005

Sample III – Extra-Vergin Olive Oil



ΔK = -0,007

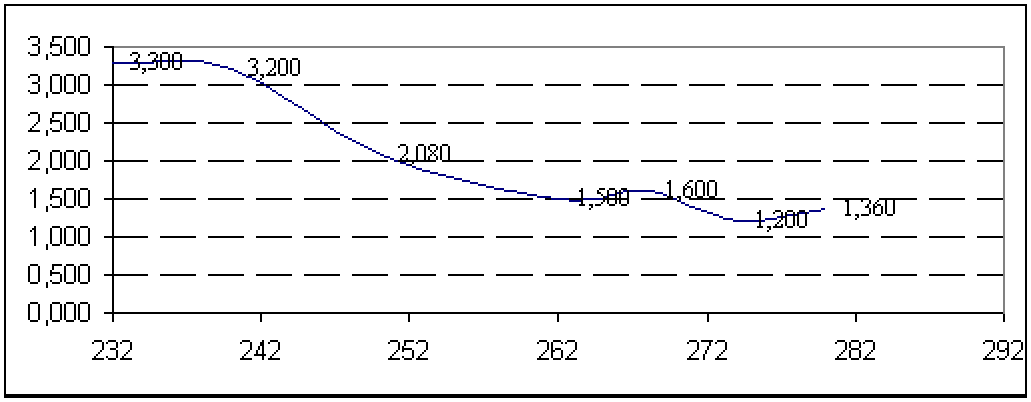
Sample IV – Extra-Vergin Olive Oil



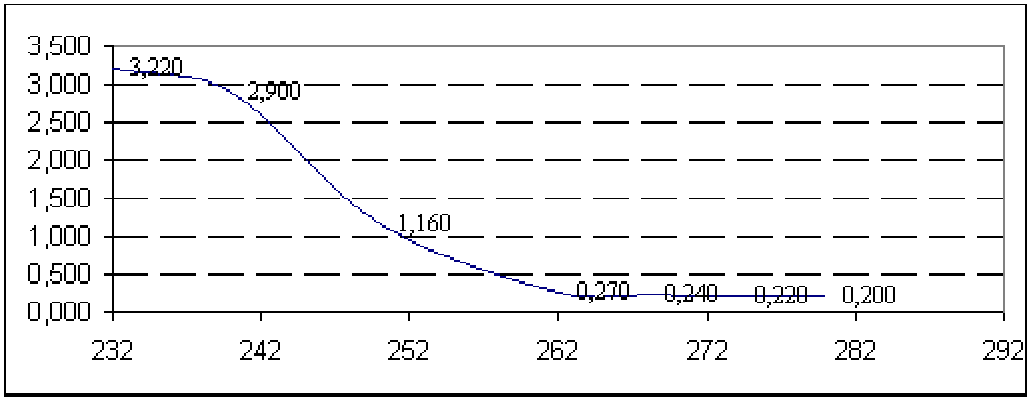
ΔK = -0,008

DISCUSSION

Oil Derived from Olives and Residue



Olive Oil



REFERENCES

Biffoli Roberto - *"Chimica degli alimenti"* – Ed.USES Firenze
Tateo Fernando VOL.II - *"Analisi dei prodotti alimentari"* – Ed. Chiriotti, Pinerolo

CLASSIFICATION OF OLIVE OILS USED IN EXPERIMENT

Extra-Virgin Olive Oil: Olive oil of perfec taste obtained mechanically whose acidity expressed in terms of lineoic acid does not exceed 1.0% w/w.
Superfine-Virgin Olive Oil: As above whose acidity does not exceed 1.5% w/w.
Fine-Virgin Olive Oil: As above whose acidity does not exceed 3.0% w/w.
Virgin Olive Oil: As above whose acidity does not exceed 4.0% w/w.
Rectified Olive Oil: Obtained from second quality (damaged from inappropriate storage, bacterial attack, etc.) olives whose acidity was adjusted with an alkali to provide a maximum of acidity expressed in terms of lineoic acid of 0.5% w/w.
Olive Oil: Mixtures of virgin olive oil with rectfied oil (final acidity not above 2.0% w/w) or with residue oil (final acidity not above 2.0% w/w). The acidity can be reduced via mechanical methods as long as they do not chemical affect the oil more than a chemical treatment.
Residue Olive Oil: Oil extracted with solvents from residue pulp and neutralized with alkali or mechanical manipulations resulting in a maximu acidity of 0.5% w/w.

Production Schematic for Various Olive Oil Types