

Determination of Olive Oil Purity

According to EEC

Summary

The olive oil purity and degree of oxidation can be verified by using UV/VIS spectroscopy. Olive oil is known for monounsaturated fats. Studies show that consuming monounsaturated fatty acids helps to lower the risk of heart disease. The quality check of olive oil can be made by measuring the absorbance between 200 nm and 300 nm, since absorption in this spectral region are due to the presence of conjugated dienes and trienes. A low absorption in this area is a sign of a high-quality extra virgin olive oil, whereas low quality oil shows a greater level of absorptions in these areas. This application note examines the quality of oil and helps to differentiate between extra virgin, virgin and regular olive oil as defined by the International Olive Council (IOC).

Samples and reagents

- Cyclohexane spectrophotometric grade
- Olive oil regular
- Olive oil extra virgin
- Native olive oil extra



Instrument and accessories

- UV5 (ME-30254725) with single cell holder
- Rectangular quartz cuvette with path length of 10 mm
- Analytical balance XP 205 (ME-11106027)
- Disposable plastic pipettes
- Volumetric flask 25 mL



Sample preparation

Weigh accurately 0.250 g olive oil into a 25 mL volumetric flask fill up to the mark with cyclohexane. The resulting solution must be clear. If opalescence or turbidity is present, filter through Whatman no.4 filter paper. Fill the sample solution into cuvettes and seal with PTFE lids to prevent evaporation.

As blank for the baseline correction a covered cuvette with cyclohexane is used.

The official method of EEC regulation (European Commission Regulation, No 2568/91) involves determination of specific extinction in cyclohexane at wavelength 232, 266, 270 and 274 nm and determination of the variation of the specific extinction (ΔK) as defined in the following equation 1 and 2;

1. $K_{\lambda} = \text{Abs}_{\lambda} / (c \times L)$
2. $\Delta K = K_{270} - [(K_{266} + K_{274}) / 2]$

c = concentration of olive oil [g / 100mL]

L = path length [cm]

K = Extinction coefficient [100mL/(g*cm)]

Acceptance Criteria			
Category	Extra Virgin Olive oil	Virgin Olive oil	Refined Olive oil
K ₂₃₂	≤ 2.40	≤ 2.50	3.4
K ₂₇₀	≤ 0.20	≤ 0.25	≤ 1.20
ΔK	≤ 0.01	≤ 0.01	≤ 0.16

Table 1: Summary of the acceptance criteria defined by the EEC standard

Method parameters

Method: Fixed wavelength
 Pathlength: 1 cm
 No of Wavelengths: 4
 Wavelengths selection: 232, 266, 270, 274 nm
 Background correction: None
 Calculations:

Extinction coefficients (100mL/(g*cm))

- $K_{232} = A_{232} / (c * \text{Path})$
- $K_{266} = A_{266} / (c * \text{Path})$
- $K_{270} = A_{270} / (c * \text{Path})$
- $K_{274} = A_{274} / (c * \text{Path})$

Variation of the extinction coefficient

- $\Delta K = K_{270} - ((K_{266} + K_{274}) / 2)$

Note: this method is available as a template on the UV7, UV5Nano and UV5Bio spectrophotometer.

Results

The instrument does calculate all the required data using the above calculations. The mean values of the three measurements are reported in the following table:

Sample	K ₂₃₂	K ₂₇₀	ΔK
Olive oil extra virgin	2.02	0.18	0.00
Native olive oil extra	1.85	0.13	0.00
Olive oil	1.89	0.32	0.02

Table 2: Specific extinction mean values for different olive oil samples.

Literature:

- International Olive Council. IOC/T20/Doc. no. 19/Rev3 2010. Method of Analysis: Spectrophotometric Investigation in the Ultraviolet. 2010.
- EEC/2568/91 (1991) and EEC/2472/97 (1997) regulations.

Conclusion

The olive oil quality in accordance with EEC guidelines can easily be checked on the UV5 spectrophotometer.

According this regulation, the olive oil samples can be distinguished between Extra Virgin Olive Oil and Olive Oil.

Further information

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