Rapid Determination of the Oxidation Level in Olive Oil based on Front-face Fluorescence Spectroscopy

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The oxidation level is a parameter of routine analysis in the olive oil quality control laboratory. This parameter is determined by chemical (Peroxide Value) and spectroscopic (UV Absorbance) procedures.

In this work, a new methodology for the determination of the oxidation level in olive oil is proposed. The method is based on fluorescence spectroscopy. Fluorescence spectra of virgin olive oil are very simple. In extra virgin olive oil, the only significant signals in the emission spectrum are the corresponding to tocopherols (a weak band) and to chlorophyll pigments, pheophytins and chlorophylls (a strong band, depending on the pigment concentration). On the contrary, in “lampante” virgin olive oils and olive oils (a blend of virgin and refined ones) a third signal appears. This band is due to oxidation products coming from autoxidation or resulting from thermal refining processes. The intensity of this band is directly related to the oxidation level of olive oil.

From a practical point of view, front-face fluorescence spectroscopy allows direct measurement in the oil sample without none previous preparation. As a result, the measurement procedure is extremely simple, giving an excellent sensitivity.

This procedure was applied to a series of virgin olive oils and olive oils, and the corresponding fluorescence responses were correlated to “classical” oxidation parameters. The proposed methodology allows a direct, rapid and simple analyte measurement, easy to automate. For these reasons, its implementation as on-line methodology is very simple.