

Detection of Adulterated Olive Oil by Near Infrared Spectroscopy Coupled to Multivariate Statistics

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The detection of adulterated extra virgin olive oil (EVOO) is still a challenge and requires the development of innovative approaches. The methods in regulation (EEC) 2568/91 have been considered for a long time as a good tool for the detection of unpermitted thermal treatment of extra virgin olive oil such as deodorization to remove off-flavors or the addition of cheaper refined vegetable oil. More and more it is evident that most of these manipulations remain undetected because counterfeiters can adjust their process and finally the product in the way it meets the official criteria.

In a new approach the structural and oxidative changes of fats and oils during storage at ambient temperature and heating processes up to 220 °C, as applied during refining, were monitored. Near infrared spectroscopy (NIRS) was used to determine the primary and secondary degradation products such as peroxides, aldehydes and ketones, free fatty acids, di- and oligomerized triacylglycerols, monomeric oxidized triacylglycerols and total polar compounds. These parameters were used to characterize differences between heat-treated and non-heat-treated virgin olive oils. Statistical analysis of the data by linear discriminant analysis (LDA) based on the analytical parameters revealed that chemical changes up to 50 °C differed from those above 70 °C. Moreover, the latter class could be differentiated from those samples heated above 130 °C. This observation allowed a differentiation between different treatments of olive oils such as storage (T < 70 °C), soft deodorization (80-120 °C) and thermal treatment above 150 °C such as refining. Consequently, the addition of conventionally refined vegetable oil or olive oil and pomace oil might be distinguished from a mild deodorized olive oil.

The present work continues the investigations published in 2020 by Gertz et al. (1). The previously obtained results have been verified and substantially expanded by further investigations. Even adulterations of virgin olive oil with only 10% refined or soft-deodorized vegetable oil or olive oil can now be detected with high statistical confidence.

(1) Ch.Gertz, B.Matthäus, I. Willenberg (2020) Detection of Soft-Deodorized Olive oil and Refined Vegetable oils in Virgin Olive Oil Using Near Infrared Spectroscopy and Traditional Analytical Parameters *Eur. J. Lipid Sci. Technol.* 2020, 1900355 (1-11)