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CHARACTERIZATION AND AUTHENTICATION OF OLIVE OILS BY PORTABLE INFRARED SPECTROMETER COMBINED WITH PATTERN RECOGNITION ANALYSIS

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Olive oil is an economically important product and commonly adulterated with less expensive oils to increase the profit. Additionally, oxidative stability is an important characteristic in olive oil because of its high oleic acid content. Currently using methods for the olive oil authenticity and to determine the stability to oxidation requires laborious sample preparation process and time consuming chromatographic analysis. Our main objective was to develop a rapid and accurate method for the characterization and authentication of extra virgin olive oils. Olive oil samples (n=49) were obtained from a local market in Turkey and their fatty acid profile was determined by using GC-FAME procedure. Peroxide value (PV) and free fatty acids (FFA) were also evaluated to determine quality characteristics of the olive oils. A portable FT-IR with a temperature controlled (65°C) crystal was used to collect the IR spectra. Soft independent model of class analogy (SIMCA) and partial least squares regression (PLSR) was used to analyze the spectral data. PLSR models showed good correlation coefficients ($R^2 \square 0.9$) between reference tests and spectra from FT-IR, allowing for rapid determination of fatty acid composition and predicting oxidative stability. Oils formed distinct clusters allowing the evaluation of extra virgin olive oils from lower quality or adulterated oils. Determining oil adulteration and quality characteristics using portable FT-IR unit enables portability and ease-of-use, making it a great alternative to traditional testing methods.

Keywords**:** FT-IR, Chemometrics, olive oil, adulteration

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