

Detection of Hazelnut Oil in Extra Virgin Olive Oil by DSC

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Detection of admixtures of extra virgin olive oil (EVOO) with hazelnut oil (HaO) is a difficult task, due to their similar chemical composition (i.e. triacylglycerol and fatty acid composition). Differential Scanning Calorimetry (DSC) has been applied to detect oil or fat adulteration with animal fat and it can be potentially applied to detect oil – in – oil adulteration. The objective of this work was to evaluate the potential use of DSC to detect adulteration of EVOO with HaO.

EVOO was mixed with HaO at different ratios (60:40, 70:30, 80:20 and 90:10, w/w). Thermograms were obtained by means of DSC (TA Instruments, New Castle, DE) by cooling from 30 to -80°C at 2°C/min, holding 3 min at -80°C and heating from -80 to 30°C at 2°C/min. Crystallization and melting profiles were obtained for of each oil and their mixtures and the thermograms were deconvoluted into the individual constituent peaks using PeakFit™ software (Jandel Scientific, CA). Chemical composition of oils and their admixtures were evaluated by means of triacylglycerol and total fatty acid composition.

Addition of HaO to EVOO affected the mixed oil crystallization process by significantly lowering the onset temperature and increasing the transition enthalpy. Moreover, crystallization occurred over a narrower temperature range. The crystallization exothermic peak was deconvoluted into three distinct components, which may correspond to the three major triacylglycerol groups (disaturated, monosaturated and triunsaturated) present in the oils and their mixtures. Addition of HaO modified the area percentages of the deconvoluted peaks and, in particular, the area of the major unsaturated fractions increased, according to compositional data. The lineshape of the melting curves of the crystallized admixture was largely influenced by HaO addition, especially at higher concentration (30-40%). In particular, melting enthalpy was significantly increased; the transition occurred over a narrower temperature range, as T_{off} was shifted towards lower temperatures. DSC was proven to be a potential analytical tool to detect adulteration of EVOO with HaO.