



Fast and cheap evaluation of the adulteration of non-conventional seed oils by classical vegetable oils using FTIR-PCA technique

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Abstract: The goal of the study was the evaluation of the adulteration of hazelnut (*Corylus avellana* L., code "Ca"), walnut (*Juglans regia* L., code "Jr") or black sesame seed (*Sesamum indicum* L., code "Si") oils by sunflower or palm oils (*Helianthus annuus* L. and *Elaeis guineensis* Jacq., codes "Ha" and "Eg", respectively) using the fast and cheap FTIR-PCA (principal component analysis) technique.

• Introduction

Fourier-transform infrared spectroscopy (FTIR) is a fast, cheap and non-destructive method useful for analysis of food samples, including edible oils. Edible non-conventional seed oils generally contain high amounts of valuable fatty acids (as glycerides) such as omega-3 α -linolenic acid (ALA) or oleic acid. These non-conventional oils are sometimes subjected to adulteration with cheaper classical vegetable oils.

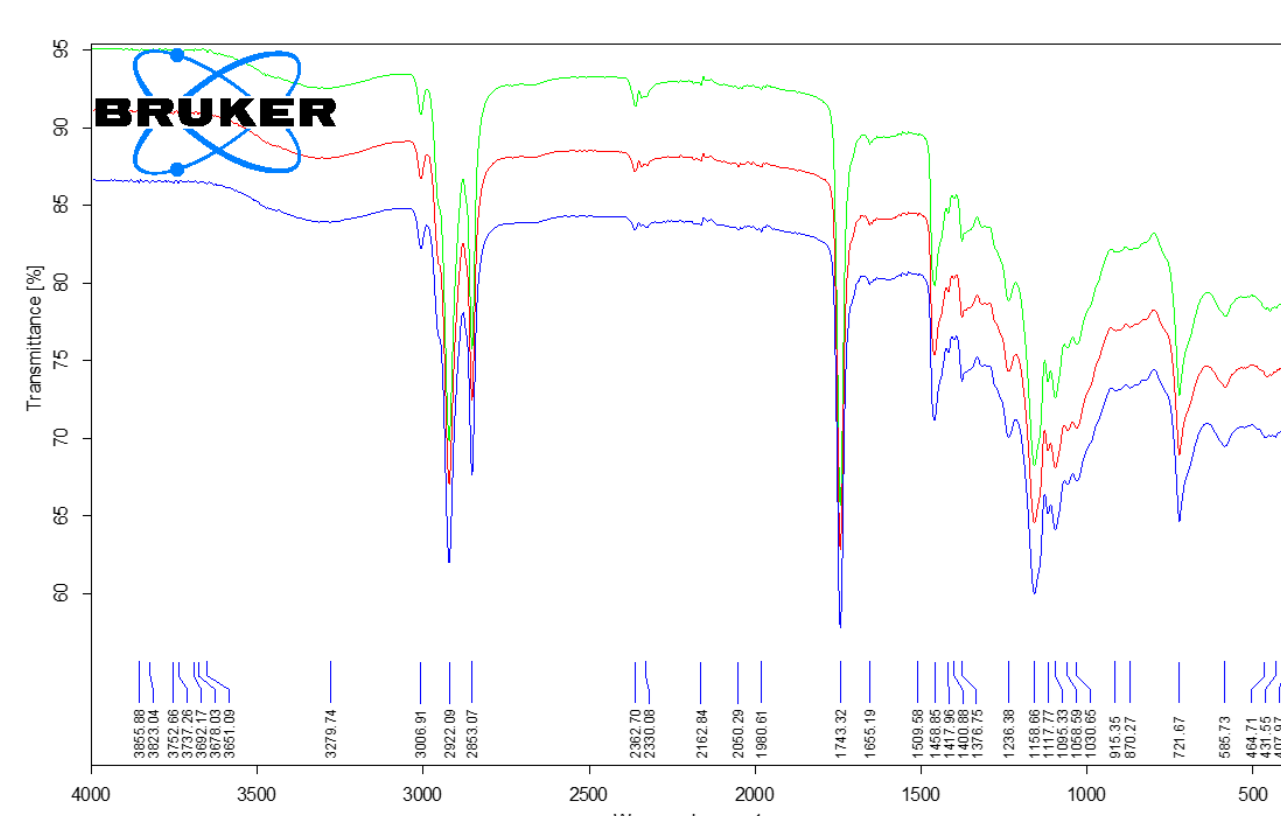


Figure 1. Representative FTIR spectra for the adulterated non-conventional seed oils with 40% sunflower oil

• Materials and Method

The raw non-conventional and classical edible oils, as well as their mixtures at 60:40 volume ratio were analyzed by FTIR and subjected to PCA using both wavenumber and intensity of the FTIR characteristic bands.

• Results and Conclusion

The adulterated oils (generally coded as "F") were especially located at the upper half of the PC2 vs. PC1 scores plot if the FTIR band intensities were used for discrimination (Figure 1; "C" – hazelnut oil, "J" – walnut oil, "S" – black sesame seed oil, and "H" – sunflower oil). The intensities of the bands corresponding to the asymmetric and symmetric stretching vibrations of the CH bonds in the hydrocarbon chain of the FA moiety (2922 and 2852 cm⁻¹), as well as the intensity of the stretching vibration of the ester C=O bond in glycerides (at 1742 cm⁻¹) were the most important variables for the discrimination of the adulterated oils along the PC2 axis.

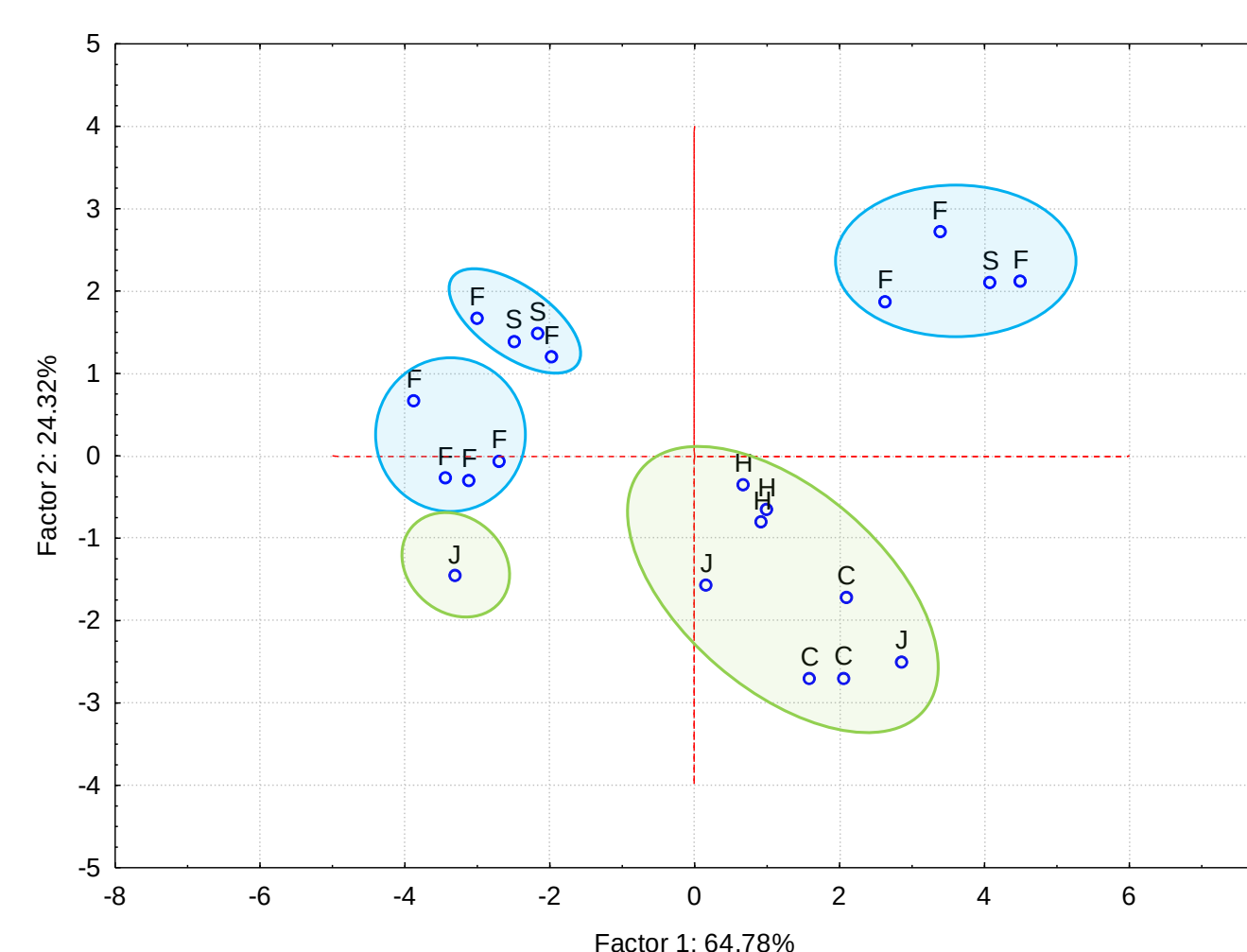


Figure 2. PC2 vs. PC1 scores plot for the adulterated non-conventional seed oils ("F"), as well as non-conventional ("C", "J" and "S") and classical oil, "H" (right)

This approach can be useful for the detection of the adulterated seed oils, which are obtained from non-conventional vegetable sources and are more expensive.