

Discrimination of Saffron from different producing countries by Mid- Infrared Spectroscopy

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Saffron, the dried red stigmata of *Crocus sativus* L. flower, is one of the most expensive of spices. Its price is strongly depending on its country of production. But in view of the high price, there is an increasing interest by producers and consumers for high quality product with clear geographical origin. Thus, there is a significant interest in accurate methods for classifying saffron from different geographical origins or countries.

Near- Infrared (NIR) spectroscopy has already found application in quality control and classification in saffron [1]. However, due to the fact that NIR consists of overtones and combination bands of fundamental transitions, NIR spectra is more difficult to be determined. Mid- infrared (MIR) absorptions bands are well resolved and the spectra can be easier interpreted. MIR methods have recently been applied to the authentication of fruit purees [2], coffee [3], honey [4], and wines [5].

The objective of the present work was to examine the possibility to discriminate saffron from different countries, especially from Greece, Iran, Italy, and Spain using mid-infrared spectroscopy and multivariate analysis.

250 saffron samples were used from the four main saffron producing counties. 4 g of each sample was extracted twice by 40 mL of diethyl ether using ultrasound for 15 min. The extracts were combined and evaporated until 4 mL under vacuum.

Spectra were obtained using ZnSe crystal windows on a Nicolet 6700 FT-IR spectrometer. 20 μ L of sample was placed on a ZnSe disk, air-dried and its spectrum was collected. All spectra were smoothed, their baseline was corrected and their second derivative was calculated by the use of the OMNIC software (ver. 7.3).

Factorial principal component analysis was applied to different spectral regions of the spectra and their second derivative, as well. Then the PC scores with eigenvalue- one criterion were used for discriminant analysis. The best discriminatory approach was achieved in the spectral region 2000- 700 cm^{-1} using the second derivatives of the spectra where 93.6% of original grouped cases were correctly classified. The correct classification rates for saffron sample from Greece, Iran, Italy, and Spain were 90.0%, 89.5%, 96.7% and 98.4%, respectively.

References

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