

عنوان مقاله:

Vibrational spectroscopy and chemometrics: a perfect combination for saffron authenticity and adulteration

محل انتشار:

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خلاصه مقاله:

Introduction: Quality control and confirmation of the authenticity of foodstuffs is considered as an important and challenging task for the food industry that seek to ensure the protection of both consumers health and export economies [1]. Among different foods, saffron (*Crocus sativus* L.) ranked the fourth highest in number of adulteration records with 5% of total records [2]. Thus, dealing with saffron adulteration is very important from different aspects. Among the available analytical tools for food analysis, the combination of FT-IR spectroscopy with chemometrics is one of the fastest and reliable methods for food certification [3]. This study presents an application of potassium bromide (KBr)-pellet FT-IR spectroscopy with special preprocessing and pattern recognition techniques for evaluating saffron adulteration with four characteristic adulterants of plant origin (i.e. *C. sativus* style, calendula, safflower and rubia). **Methods** Different saffron samples (i.e., 100 samples) from main regions of Iran were provided. Then, KBr-pellet FT-IR spectra of the samples were recorded. Samples were grounded and passed through a sieve according to ISO/TS 3632-2. Datasets were analyzed using principal component analysis (PCA), partial least squares-discriminant analysis (PLS-DA) and support vector machine (SVM) with quadratic kernel function (QSVM). **Results:** PCA was performed for preliminary exploration of possible differentiation according to the purity of saffron and the type of adulterant used. Different preprocessing and filtering methods were applied, but differentiation of most of the samples was not possible, except for the case of external parameter orthogonalization (EPO). Thus, pre-processed data was modeled in the next step. Firstly, classification of pure samples was performed and secondly, adulterated saffron samples were examined. In all cases, discrimination between saffron and adulterated samples was better in EPO-QSVM than EPO-PLS-DA and good classification figure of merit including sensitivity (93.5%), specificity (95.5%) and accuracy (94%) were achieved. **Conclusion:** The obtained results illustrated that the proposed strategy based on combining EPO-QSVM with rapid spectroscopy analysis can be considered as a rapid test for food quality control.

کلمات کلیدی:

Saffron adulteration, Spectroscopy, Chemometrics, Support vector machine

