O4 CHEM2

CHEMOMETRICS COMBINED WITH UNTARGETED MASS SPECTROMETRY FOR THE STUDY OF SAFFRON ADULTERATIONS

A. Zappi[1], D. Melucci[1], F. Gottardi[2], C.M. Tavilla[3], A. Tartaglia[3], M. Locatelli[3]

[1]*Dipartimento di Chimica "G. Ciamician", Università di Bologna, Bologna, Italy*
[2]*Coop Italia, Soc. Cooperativa, Casalecchio di Reno, Bologna, Italy*
[3]*Dipartimento di Farmacia, Università degli Studi "G. D'Annunzio", Chieti, Italy*

Saffron (*Crocus Sativus L.*) is one of the most expensive spices in the world, due to its particular flavor, its limited areas of production and the laborious process required to obtain the final product. Therefore, it can be subject to fraud, as for example the undeclared addition of a cheaper spice, with the aim of illegally increase the seller's gain.
The aim of the present work is to develop an analytical method able to detect an addition of turmeric, safflower, marigold, or garlic in a saffron sample. These spices are, generally, the most used for saffron adulteration.
We analyzed several samples of spices by mass spectrometry. However, instead of looking at specific compounds, perhaps separating them by chromatography, we injected the samples (properly prepared) directly into the mass spectrometer. A single quadrupole spectrometer was used and the whole mass spectra of the samples were used for the following chemometric procedure. By a Principal Component Analysis, the most discriminative mass peaks for each adulterant spice were identified. In this way, the untargeted method can also support the targeted analysis, by confirming the presence of known discriminant molecules and adding new interesting analytes. Then, some saffron samples were manually adulterated with a known amount of each spice, and the mass spectra were used to quantify the added spice. This task was carried out by a multivariate standard addition method combined with the Net Analyte Signal (NAS) procedure [1].
Good results were obtained, thus encouraging the possibility to apply it to routine analyses in food authenticity control, also for other food matrices. Moreover, the untargeted single-quadrupole mass spectrometry was used to identify the presence of adulterants in saffron both qualitatively and quantitatively.

References

[1] Zappi A., Maini L., Galimberti G., Caliandro R., Melucci D., European Journal of Pharmaceutical Sciences 2019, 130, 36–43