

Determination of safranal percentage content in saffron (*Crocus sativus L.*) extracts using FT-IR spectroscopy

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Safranal is the major component of saffron (*Crocus sativus L.*) and is correlated with saffron quality. Usually is determined quantitatively with gas chromatography. This method is time-consuming and destructive for the samples.

FT-IR spectroscopy can be used to the determination of safranal percentage content. The method is based on the differences that present samples with different content safranal, in the FT-IR spectra. The most interesting spectral region is from 1692 to 900 cm^{-1} . In this region the carbonyl of safranal absorbs and there are the ‘fingerprint’ bands. The method is simple, rapid and accurate.

Sixty saffron samples were used from different countries. 4 g of each sample was extracted twice by 40 mL diethylether using ultrasound bath for 15 min. The extracts were combined and evaporated until 4 mL under vacuum. The safranal percentage content of each sample was measured using gas chromatography – mass spectrometry (GC-MS) and the value was characterized as ‘actual’. Fifty extracts were used as ‘standards’ and ten as ‘unknown’.

FT-IR spectra were obtained using ZnSe crystal windows. 20 μL of sample was placed on a ZnSe disk, air-dried and its FT-IR spectrum was collected. A partial least square (PLS) method was made using the FT-IR ‘standards’ samples and the TQ Analyst software (ver. 7.2.0.161, Thermo Electron Corporation). The 1692-900 cm^{-1} spectral region and ‘actual’ contents were used for the calibration. The software calculated the safranal percentage content of each ‘standard’ sample and the value was characterized as ‘calculated’. A linear relationship between ‘actual’ and ‘calculated’ values was found ($r=0.96$, $\text{RMSEC}=2.47$). The safranal percentage contents of ‘unknown’ samples were calculated. Their safranal percentage contents, as were measured with GC-MS, fluctuated between 25.3 and 48.2 %. The corresponding values, as calculated using FT-IR method, fluctuated between 26.4 and 48.1 %. The relative standard deviation (RSDV) oscillated between 0.3 and 11.0 %.

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