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Use of Fourier Transform Infrared Spectroscopy (FT-IR) for the botanical origin characterisation of commercial tannins

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Many efforts have been spent in the last years in order to propose effective methods to control the botanical authenticity of commercial tannins. To date, the suggested approaches involved the analysis of different classes of analytes (e.g. polyphenols, sugars, mineral elements, $^{13}\text{C}/^{12}\text{C}$ isotopic ratio, simple phenols), but also some preliminary studies on tannins IR spectra investigation have been presented (Laghi et al., 2010; Ricci et al., 2015). FT-IR technique is already widely used in many fields of the food industry, due to its capability to allow easy, cheap and rapid analytical controls, both in terms of sample preparation and instrumental analysis.

One hundred and fourteen powder tannins were collected on the Italian market and their declared botanical sources (oak, N=19; chestnut, 15; gall, 15; quebracho, 15; tea, 15; grape skin, 18; and grape seed, 17) were first confirmed by applying the reference method recommended by the International Organisation of Vine and Wine (COEI-1-TANINS: 2009), based on the monosaccharides and polyalcohols profiling.

FT-IR spectra of tannin samples (3 g/L in 10% ethanol solution) were acquired in the region $926\text{--}5011\text{ cm}^{-1}$. Forward Stepwise Discriminant Analysis on FT-IR spectra was then performed in order to investigate the possibility to differentiate the 7 botanical origins of the considered tannins. The results were satisfactory, with 95% of correct re-classification. Only 1 chestnut tannin was misclassified as oak, 1 oak as chestnut, 2 grape seed as grape skin and 2 grape skin as grape seed, the last 4 misclassified samples belonging however to the same plant species.

References

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