

MicroNIR spectrometer and multivariate classification in coffee fraud: towards a portable and agile method to legitimize Brazilian Conilon with indication of origin

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Resumo: Portable analysis methods are at the pinnacle of next generation measurement tools and are seen as a functional issue for the beverage and food industry. In this work, a portable spectrometer takes measurements of solid coffee samples in the near-infrared region, from 906 to 1650 nanometers. The miniaturized spectrometer is powered by the notebook and allows each sample to be evaluated instantaneously, providing a unique chemical fingerprint in seconds. These spectral fingerprints are analyzed and interpreted by chemometrics methods. This method development was motivated by the rise of Conilon coffee in the specialty coffee scenario in the face of a new industry perception and by the need that coffee producers and associations have to legitimize their coffee, that in this case, is their own responsibility. Conilon from Espírito Santo was registered under geographical indication (GI) in Brazil, with the production located predominantly in the northern region of state. Other regions in the south of the state also produce Conilon, which makes its sensory profile diverse. In a real case study with Brazilian Conilon coffee with indication of origin, the spectrometer showed promising results. A set of 124 Conilon samples from Espírito Santo State with indication of origin and another of 75 Conilon coffees from different regions and named in the study as “samples without geographical indication” were analyzed. The chemometric method named Partial Least Squares-Discriminant Analysis (PLS-DA) was used to build a multivariate classification model. The result of the final predictive model showed 100% sensitivity and specificity, which means that no sample was misclassified. To conclude the work, the spectral variables that most influence of differentiation between GI Conilon and non-GI Conilon were interpreted, allowing say that they differ in terms of carbohydrates, chlorogenic acids, lipids, caffeine, and trigonelline contents. The method could be a quality control tool for the inspection of fraud with respect to the certification of origin of Conilon coffee with this specification.

Palavras-chave: Coffee fraud. Portable analysis. Indication of origin.