

Influence of spectral pre-processing on the evaluation of coffee roast degree by HSI-NIR

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ABSTRACT

Coffee is a globally appreciated beverage, renowned for its sensory characteristics. In 2023, approximately 1.1 million tons of roasted and ground coffee were consumed in Brazil (ABIC, 2023). One of the key factors influencing its flavor is the degree of roasting of the coffee beans. Therefore, evaluating the degree of coffee roasting is crucial, as an uneven roasting process can result in undesirable qualities (Franca, et al., 2009). The objective of this study was to utilize near-infrared hyperspectral imaging (HSI-NIR) in combination with multivariate analysis methods to assess the spatial homogeneity of coffee roasting. It is important to emphasize that in chemometrics, data preprocessing is a critical step, as this is when irrelevant information that could interfere with result interpretation is removed. Thus, different preprocessing algorithms (derivative, Savitzky-Golay filter, vector normalization and standard normal variation) were tested and their impacts on the principal component analysis of spectral data from Arabica coffee samples at different roasting degrees were analyzed. The results indicated that the differences in moisture content among the samples affected the exploratory data analysis. The combination of the Savitzky-Golay filter pre-processing with vector normalization provided the best visualization of the different roast levels between the samples in the first principal component.

Keywords: Chemometrics, Near-infrared spectroscopy, Coffee.

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