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Detection of wine adulteration using NIR spectroscopy and diffuse reflectance

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Food adulteration is in the focus of research due to its negative effect on safety, nutritional value and because of the demand of protection of brand, regional origin. Wine is one of the most sensitive food products since the quality primarily depends on the plant cultivar, the geographic origin and the production year, as well. Addition of water and sugar is not allowed at all for wine products. Presented study investigated the feasibility of non-destructive methods to detect such adulteration. Wines of Portugieser (2009, Szekszárd, Hungary) and Sauvignon Blanc (2009, Etyek-Buda, Hungary) were selected for experiments. The instrument of DLP® NIRscan™ Nano (Texas Instrument) was used to collect near infrared spectra in the range of 900-1700 nm. Spectra were preprocessed using standard normal variate (SNV). Partial least squares regression (PLSR) was performed on NIR spectra to predict adulteration level, if any. Low power laser modules (3 mW) were used to collect diffuse reflectance signals at wavelengths of 532, 635, 780, 808, 850, 1064 nm. Digital images were collected using a 12 bit camera (Photonfocus MV1-D1312) with 0.113 mm/pixel resolution. Intensity signal collected around the incident point of the laser beam was processed and compared to detect changes. The presented preliminary study obtained promising results. Introduced techniques might be suitable for rapid non-destructive detection of wine adulteration. Findings must be confirmed with large sample set and wide range of products before industrial deployment.