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AUTHENTICATION OF POTATO CHIP OIL USING A PORTABLE INFRARED SPECTROMETER COMBINED WITH PATTERN RECOGNITION ANALYSIS

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Potato chips represent huge sales in the global snack market, and potential for oil adulteration or miss-labeling is an economic concern. Current oil testing methods requires chromatographic separation which is time-consuming, expensive, and labor-intensive, demands complex procedures of sample pre-treatment and well-trained technicians. Our objective was to develop a rapid and reliable authentication program for frying oils using portable FT-IR spectroscopy enabling oil characterization and detection of potential adulteration for real-time and field-based applications. Oil from commercial potato chips (n=86) were expelled mechanically. Fatty acid profile was determined by GC-FAME to identify the type of oil or mixture used for chip manufacturing. A temperature controlled portable FTIR were used to collect IR spectra and spectra analyzed by pattern recognition (Soft Independent Modeling of Class Analogy Algorithm-SIMCA and Partial least squares regression-PLSR). A validation set included commercial potato chips specifying either a sole type of oil or contained one or more oils. PLSR models, correlating the spectra and reference values, showed excellent correlation (Rval>0.93) for the prediction of fatty acid profile (GC-FAME) and low standard error of cross-validation (SECV) (~1.0%) for major fatty acids. 1800-1000cm^{-1} range spectral bands resulted from –C-O groups stretching vibrations are responsible for the oil types separation. Different oils formed distinct clusters which allow the detection of mislabeled frying oils. The potential profits and trading advantages from mislabeling prejudice the interests of both consumers and honest manufacturers, and our data strongly supports that IR portable instruments present great potential for efficient in-situ surveillance of food ingredients.

Keywords: FT-IR, Chemometrics, oils, potato chips

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