

Application of Infrared Spectroscopy for Screening Acrylamide Content in Commercial Potato Chips

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Acrylamide (2-propenamide, CAS Registry No. 79-06-1) is a chemical compound naturally formed during high temperature processes such as frying, roasting and baking in a wide variety of foods including french fries, potato chips, cereal, bread and coffee.¹ It has been reported to be a human neurotoxin, a rodent carcinogen and classified as a “probable carcinogen to humans”.² Commonly used techniques for acrylamide analysis in foods require the use of LC-MS/MS or GC-MS that require extensive sample preparation, highly specialized instrumentation, and are time consuming. In this study, attenuated total reflectance (ATR) mid-infrared microspectroscopy (IRMS) and portable and handheld infrared (IR) spectrometers were evaluated as rapid alternative methods for acrylamide detection and quantification in commercial potato chips. The acrylamide content of 64 commercial potato chips (169-2453 µg/kg) was determined using LC-MS/MS as reference method. Partial Least Squares Regression (PLSR) calibration models were developed to predict acrylamide levels and validated in independent sample sets. Potato chips were grouped into three categories; regular potato chips, seasoned potato chips and sweet potato chips, based on ingredients listed on their labels and individual PLSR models were developed for each group. Overall, good linear correlation was found between the predicted acrylamide levels of independent sample sets and acrylamide concentrations measured by LC-MS/MS ($r_{Pred} > 0.90$ and $SEP < 100$ µg/kg). ATR-IRMS allowed the determination of acrylamide in aqueous extracts without the need of SPE cleaning steps making IRMS a simple, rapid and high-throughput screening tool for acrylamide detection and quantification in potato chips.³ Additionally, portable and handheld systems allowed screening of acrylamide levels by direct contact on potato chips providing food producers with increased flexibility and great potential for in-field applications compared to bench-top systems that can only be used in a laboratory setting.

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