

Investigation of Butter Adulteration With Margarine Using FTIR

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Milk product butter includes saturated animal fat, however margarines are hydrogenated vegetable oils. Adulteration of butter with varying amounts of margarine tempting since butter is more expensive than margarine. Investigation of butter adulteration with margarine with gas chromatograph (GC) is applied, but the GC measurements necessitate sample preparation step, and technique is time-consuming and expensive. The objective of this study is to test the potential of FTIR spectroscopy for development of a protocol which could later be used as a rapid and inexpensive screening tool for butter adulteration detection.

FTIR spectroscopy provides fruitful information on the molecular structure of fats and oils. We prepared 15 different samples of butter and 15 each of 0-5%, 6-20%, 23-50%, 55-100% margarine adulterated butter samples. Total of sixty FTIR spectra with three replications were collected and the data was treated with a chemometrics tool to develop a classification rule to discriminate samples based on the extent of adulteration. Complete separation of adulterated samples, even for the lowest adulteration level, from the control (butter with no adulteration) was attained applying canonical discriminate analysis (CDA) along with a proper data reduction algorithm, which was partial least squares to FTIR data. We allotted the C-H, C=O and C=C stretch regions of IR spectra in the discrimination model to take the compositional and saturation differences between butter and margarine into account.

Finally, we developed a new methodology to detect adulteration of butter with cheap hydrogenated vegetable oils using FTIR spectroscopy in connection with a multivariate discrimination tool, CDA. The proposed methodology can be used in rapid and inexpensive detection of adulterated fats & oils or high fat containing food products, such as chocolate.