

# Determination of Butter Adulteration with Palm Oil by Synchronous Fluorescence Spectroscopy

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Adulteration of butter with vegetable oils undermines the confidence of consumers and decreases the profit of scrupulous producers. The most common adulterants of butter are palm coconut oils.

The aim of the study was to examine the synchronous fluorescence technique to detect adulteration of butter with palm oil. Synchronous fluorescence spectra were collected in the region of 280 – 700 nm with wavelength intervals ( $\Delta\lambda$ ) of 10, 30, 60 and 80 nm. Successive Projections Algorithm was used to select five most important wavelengths from the spectra collected for each wavelength interval.

Further, regression analysis of synchronous spectra intensities was used to calculate the limits of adulteration of butter with palm oil. Detection limits were calculated as three times the standard deviation of the intercept, divided by the calibration curve slope. According to the data acquired at 10, 30, 60 and 80 nm wavelength intervals, the lowest detection limits of adulteration equaled 4.2%, 7.7% , 5,3% and 7,4%, respectively.

Moreover, the Multiple Linear Regression models were built to enable the prediction of percentage of soybean oil added to extra virgin olive oil. The lowest root mean square errors of calibration and the root mean square errors of cross validation were acquired for the wavelength intervals 10 and 80 nm. The results obtained for both parameters were comparable and equaled 0.9 ; 1.0. and 1.0; 1.1, respectively. Synchronous fluorescence spectroscopy together with multiple linear regression analysis can be successfully applied for the quantitative determination of adulteration of butter with palm oil.

Additionally, synchronous fluorescence spectroscopy is a rapid technique which avoids any sample preparation steps, except for dilution in hexane, resulting in simple and easy to use method.