Determination of free fatty acids in palm oil by near-infrared reflectance spectroscopy

ABSTRACT

A near-infrared (NIR) spectroscopy calibration was developed for the determination of free fatty acids (FFA) in crude palm oil and its fractions based on the NIR reflectance approach. A range of FFA concentrations was prepared by hydrolyzing oil with 0.15% (w/w) lipase in an incubator at 60°C (200 rpm). Sample preparation was performed in Dutch cup, and the spectra were measured in duplicate for each sample. The optimized calibration models were constructed with multiple linear regression analysis based on C=O overtone regions from 1850ï 2050 nm. The best wavelength combinations were 1882, 2010, and 2040 nm. Multiple correlation coefficients squared (R2) were: 0.994 for crude palm oil, 0.961 for refined-bleached-deodorized (RBD) palm olein, and 0.971 for RBD palm oil. Calibrations were validated with an independent set of 8ï 10 samples. R2 of validation were 0.997, 0.943, and 0.945, respectively. The developed method was rapid, with a total analysis time of 5 min, and environmentally friendly, and its accuracy was generally good for raw-material quality control.

Keyword: Free fatty acids; MLR; NIR; Palm oil; Spectroscopy