

Reunreudee Kaewcheenchai 2010: Determination of Total Oil Content in Corn Seeds Using Near Infrared Spectroscopy. Master of Science (Agronomy), Major Field: Agronomy, Department of Agronomy. Thesis Advisor: Assistant Professor Vichien Keeratinijakal, Ph.D. 133 pages.

The objective of this research is to develop the calibration model for prediction of total oil content in corn seeds using near infrared (NIR) spectroscopy, which will be used as a criterion to evaluate high oil corn in breeding program. NIR spectroscopy is a rapid and non-destructive method. Thus, it preserves the seed for propagation in next cycle. Pre-calibration model was developed from 102 corn samples. The NIR absorptions were collected in the region of 1200-2400 nm (X values) and the total oil content was determined by soxhlet extraction with petroleum ether (Y values). Calibration equations were calculated using partial least squares regression (PLSR). The pre-calibration model built using first derivative pretreated NIR spectra provided the lowest root mean square error of cross-validation (RMSECV) of 0.6810% w/w. Subsequently, this pre-calibration model was employed to predict the total oil content in corn seeds from 4 breeding programs, in which SW04L-336 and SW04L-337 were used as base populations. From the NIR prediction results of total oil content, 20 corn samples of each breeding program were selected for re-calculation of the model. The pre-calibration model was re-calibrated by adding NIR spectral and total oil content data of 20 corn samples of each program, in which the pre-calibration model was updated following 1st, 2nd and 3rd re-calibration models, respectively. The RMSECV and correlation of calibration (R_c) of 1st, 2nd and 3rd re-calibration models were 0.6052, 0.5785 and 0.5667 % w/w and 0.8936, 0.9011 and 0.9045, respectively. Moving window partial least squares regression (MWPLSR) is the wavelength interval selection method applied to optimize predictive performance of calibration model. The best MWPLS calibration model was developed from first derivative pretreated NIR spectra in the region of 1200-1440 nm which was tested using a validation sample set from four breeding programs. The root mean square error of prediction (RMSEP) and bias of MWPLS calibration model were 0.3610 % w/w and -0.0162, respectively, which were lower than those obtained from the 3rd re-calibration model. However, when applied this MWPLSR calibration model to predict total oil content in another samples, the results showed that the RMSEP and bias values became higher which were 0.9147 % w/w and 0.3220, respectively.

Student's signature

Thesis Advisor's signature