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A RAPID METHOD OF ANALYSIS OF CORN GRAIN FOR DAIRY CATTLE

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Summary

Calibration equations for near infrared reflectance spectroscopy (NIRS) have been either purchased from the manufacturer or developed in the laboratory. Comparative analysis with standard laboratory procedures indicate that NIRS may be used for analyzing dairy feedstuffs, when proper calibration is made with local feedstuffs.

Introduction

NIRS is a new, rapid method of analyzing feedstuffs that reduces the time from several days to one minute or more after grinding and subsampling. The instrument needs to be calibrated from nutrient analyses made in the laboratory. Many calibrations may be purchased from the manufacturer of the instrument; however, we have found that many Kansas feedstuffs do not lend themselves well to purchased equations. Purchased equations that do appear to give acceptable results include those for alfalfa hay, mixed hay, grass hay, and corn silage. Sorghum silage equations are inadequate for the many cultivars in this state, and those for corn and milo were too expensive to purchase.

This is a report on progress with the development of an equation for corn grain.

Procedures

Three hundred corn grain samples were collected from Peterson's Laboratory, Manhattan Milling Co., and the Farmers' Cooperative. Samples were ground in an impact mill and scanned by NIRS in duplicate. Samples different from each other were chosen by using a subset routine in the computer and analyzed by wet chemistry for moisture, crude protein, crude fiber, and crude fat (ether extract). The laboratory data were matched with spectra of the samples, a procedure called calibration. From this we obtained information on means, standard error of calibration, and correlation coefficients. Multiple linear equations were developed for each nutrient, then validation tests with other samples were conducted to determine correlations and standard errors of validation.

Results and Discussion

Variation among the corn samples was low, so only 17 samples were picked by the computer to be different from each other. It is usually necessary to use at least 50-55 samples for calibration. The current equation developed for corn does appear acceptable (Table 1); however, additional samples for the calibration equation would increase the correlation coefficient (r^2) and decrease the standard errors of calibration. Collection of samples over several harvests will improve both calibration and validation.

Table 1. Calibration Results from Corn Grain

Variable	Mean	Standard error of calibration	r^2
Dry matter	89.69	.424	.899
Crude protein	9.43	.309	.837
Crude fiber	1.05	.171	.656
Ether extract	4.57	.196	.860