Evaluation of On-Farm Forage Dry Matter Determined by Near Infrared Spectroscopy

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The objective of this study was to evaluate the use of near infrared spectroscopy (NIRS; Dinamica Generale, Mantova, Italy) for on-farm measurement of forage dry matter (DM) content. To calibrate the NIRS to forages at the University of Wisconsin-Madison Emmons Blaine Dairy Center (Arlington, WI), ten samples each of corn silage (CS) and alfalfa silage (AS) were analyzed using the NIRS to obtain a spectral analysis, then sent to a commercial laboratory (Dairyland Laboratories, Inc., Arcadia, WI) for DM analysis using the two step method (microwave drying to 90-95% DM, then use NIRS to measure total DM content). Spectral and DM analysis data were used to update the calibration equations on the NIRS. The CS and AS samples were obtained twice weekly on Monday and Thursday for 11 weeks. A total of 94 CS samples from 6 silo bags and 2 bunker silos, and 20 AS samples from one bunker were analyzed for DM content on-farm using the NIRS. Samples (60-100 g) were put in the scanning tray, compressed, and scanned by moving the tray in the scanning chamber for 10 seconds. After NIRS analysis, the sample was removed and the entire sample was dried at 60º C for 48 hr in a forced-air oven to measure DM content. Bias was calculated for each sample as the difference between oven and NIRS DM . The DM contents using the oven and NIRS were 38.1±4.2% and 37.2±3.9% for CS and 43.4±3.8% and 41.8±4.4% for AS, respectively. The minimum and maximum DM contents of CS were 27.3% and 47.1% DM using the oven, and 26.5% and 46.7% using the NIRS, respectively. The minimum and maximum DM contents of AS were 31.6% and 47.7% DM using the oven, and 27.7% and 45.8% DM using the NIRS, respectively. For CS, the regression equation developed was NIRS DM%=(0.867×Oven DM%)+4.23;R^2=0.85, and the AS regression equation was NIRS DM%= (1.1395×Oven DM%)-7.7; R^2=0.95. The NIRS accurately (bias=0.8% units) but less precisely (standard deviation of bias=1.6% units) measured DM content of CS and consistently measured lower DM content of AS (bias of 1.6±1.1% units). Overall, NIRS measured DM content comparable to the oven method and was a useful tool for measuring forage DM content.
Keywords: forage dry matter, NIRS