

## Prediction of the feed values of maize silage by Near Infrared Reflectance Spectroscopy

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**Introduction** Until recently, feed evaluation of silages in official laboratories and feed factories was based on cutting date, chemical composition and the ammonia fraction. However, *in vitro* techniques have been developed based on rumen fluid or commercial enzymes to replace laborious, time-consuming and expensive digestibility experiments with animals. In this study the possibility of using near infrared reflectance spectroscopy (NIRS) to predict the chemical composition and digestibility of maize silage was examined.

**Materials and methods** Maize silage samples (n=112) were collected from dairy farms in Korea. Samples were dried in a forced-air drier at 60°C for 48h. All samples were analysed in duplicate. Ash content was determined by ashing at 550°C for 6h; CP, NDF, ADF and ADL were carried out according to AOAC methods. *In vitro* dry matter digestibility (IVDMD) was determined following the classical two-stage technique of Tilley & Terry (1963). Cellulase digestibility (COMD) was determined following the procedure of De Boever *et al.* (1986). Predictive equations were developed using modified partial least squares (MPLS) regression with internal cross-validation after scatter correction using SNV and Detrend.

**Results** The calibration and validation statistics for the prediction of feed values of corn silages were as shown in Table 1. The R<sup>2</sup> coefficients and standard errors of cross-validation were 0.93 (SECV 2.14), 0.96 (SECV 1.05), 0.90 (SECV 0.45), 0.88 (SECV 0.29), 0.92 (SECV 1.73), and 0.93 (SECV 0.29) for NDF, ADF, Ash, CP, IVDMD and COMD, respectively. Calibration statistics were good for all parameters. The results obtained on the independent validation set for the squared simple correlation coefficients (RSQ) are 0.83, 0.92, 0.91, 0.72 and 0.79 for NDF, ADF, CP, IVDMD and COMD, respectively.

**Table 1** The calibration and validation statistics for the prediction of feeding values of maize silages

Parameters (%, DM)	Calibration				Validation	
	R <sup>2</sup>	SEC	SECV	1-VR	SEP	R <sup>2</sup>
Chemical composition						
NDF	0.93	1.73	2.14	0.89	1.98	0.83
ADF	0.96	0.79	1.05	0.94	1.10	0.92
ADL	0.80	0.46	0.54	0.70	0.51	0.73
Ash	0.90	0.34	0.45	0.83	0.41	0.86
CP	0.88	0.24	0.29	0.84	0.29	0.91
Digestibility						
IVDMD	0.92	1.22	1.73	0.83	1.57	0.72
COMD	0.93	1.20	1.74	0.91	1.48	0.79
IVTD	0.91	0.97	1.13	0.88	1.07	0.76

R<sup>2</sup>, coefficient of determination; SEC, standard error of calibration; SECV, standard error of cross-validation; 1-VR, coefficient of determination for cross-validation; SEP, standard error of prediction.

IVDMD, *in vitro* dry matter digestibility; COMD, Cellulase digestibility; IVTD, *in vitro* true digestibility

**Conclusions** It was concluded that good prediction of quality parameters was obtained. The results showed that IVDMD as well as COMD, ADF and CP could be accurately predicted in maize silage using NIRS. Because of the higher costs and labour involved in the laboratory analysis of IVDMD and fibre analysis, NIRS will become the main analytical technique in feeding programmes and for farmer advice.

### References

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