

Prediction of digestible organic matter of grass silage by near infrared reflectance spectroscopy

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Grass silage is the most economical alternative in dairy cow feeding in Finland. Therefore it is important to estimate the nutritive value of grass silage as accurately as possible and with low cost. Annually more than 36 000 grass silage samples have been analyzed using near infrared reflectance (NIR). The parameters predicted by NIR are crude protein, crude fibre and digestible organic matter in the dry matter (DOMD). The NIR instruments were calibrated against *in vivo* DOMD in 1989 (M Hellämäki in Making light work, ed by I Murray and IA Cowe VCH Weinheim ; New York, 1992, 264-268) and since 1990 the energy value of silages has been calculated from the NIR DOMD value. The purpose of this work was to develop a new NIR DOMD calibration based on *in vitro* cellulase according to Friedel (1990, Wiss Z Uni Rostock, N-Reihe, 39, 78-86). *In vitro* analysis as a control is easier and cheaper to use than *in vivo* analysis. It is also possible to extend the calibration material to include some of the variation in farm samples.

Three hundred and twelve grass silages were analysed with the cellulase method. All samples were pretreated as described previously (Hellämäki 1992). One hundred and two grass silages had also DOMD values measured *in vivo*. Two hundred and ten

samples were from commercial farms collected during 1992-1994. The Technicon Infra Analyzer 400 R with the APC software (Multiple Linear Regression) was used for developing the DOMD *in vitro* calibration.

The regression equation proposed by Friedel (1990) to estimate the digestible organic matter content (DOM) of different kinds of roughages is as follows : $DOM_{\text{Friedel}} = 0,93 \text{ OM} - 0,89 \text{ OM}_{\text{ns}}$, where OM = organic matter and OM_{ns} = organic matter non soluble in cellulase. Fifty one randomly selected *in vivo* silages were used to calculate a new regression equation for grass silages : $DOM_{\text{New}} = 0,93 \text{ OM} - 0,79 \text{ OM}_{\text{ns}}$, which was tested with the other part of the *in vivo* silages ($R^2 = 0,61$; RSD = 2,1 %). Two hundred and twenty two randomly selected silages were used for NIR DOMD *in vitro* calibration and eighty nine silages were left for validation.

In conclusion, the new regression equation for calculating *in vitro* DOMD and a NIR calibration using seven wavelengths gave the best results and will be used for estimating the feeding value of silage. This combination estimated the DOMD of silages at different growth stages better than the former NIR calibration based on *in vivo* data.

	N	DOMD _{Friedel} (%)		DOMD _{New} (%)		Calibration _{Friedel}			Calibration _{New}		
		Mean	SD	Mean	SD	R	RSD/ SEP	SKEW	R	RSD/ SEP	SKEW
Calibration	222	67.5	3.11	68.7	3.03	0.826	1.76	-	0.840	1.65	-
Validation	89	66.8	3.65	68.2	3.56	0.857	1.89	1.027	0.867	1.78	1.038