Can prediction equations based on fibre and nitrogen assays accurately predict the *in vivo* digestibility of silages?

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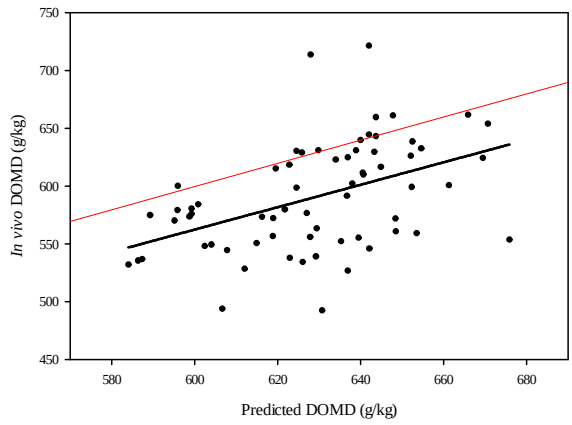
The calculation of digestibility, particularly digestible organic matter in the dry matter (DOMD) is a standard measure by Australian feed testing laboratories, and these values are also used to predict the metabolisable energy (ME) content of feeds. However, this practice can be problematic particularly when testing silages (Kaiser and Piltz, 2003).

Some laboratory tests used to predict silage DOMD may give inaccurate results for some silages or silage types resulting in significant under or over estimation of silage nutritive value (Rinne *et al* 2006). These chemical analyses, which may poorly predict the nutritional value of silages, are also used to develop near infrared spectroscopy (NIR) calibration equations.

Fibre assays and associated prediction equations used alone or in combination with other proximate analysis are one method used in many laboratories around the world to predict silage DOMD. This has shown potential, reported results explaining up to 85% of the variation (Nousianinen *et al*, 2003). However, these prediction equations have generally been developed on very limited data sets, using specific forages that may not cover the diversity of forages used in Australian farming systems (Restaino *et al.* 2009; Davies *et al.* 2012).

Digestibility (DOMD) was measured in sheep and cattle at 16.5 g/kg liveweight for a diverse range of silages (n=30) at the Wagga Wagga Agricultural Institute. Neutral detergent fibre (aNDF), acid detergent fibre (ADF), lignin (ADL) and nitrogen (N) was determined on all silage samples using the following methods: N by macro-Kjeldahl digestion using a Tecator® Kjeltec (Tecator AB, Hoganäs, Sweden); aNDF and ADF were determined sequentially using the filter bag method (Ankom® 200/220 fiber analyzer, Ankom Technology, Macedon NY, USA); lignin was determined on the residue from ADF analysis.

Results determined by chemical analyses were compared against actual *in vivo* DMD using generalised linear regression (Genstat®). The best prediction equation based on single fibre fractions accounted for 43% of the variation in digestibility (ADF). Multiple regression analyses examining combinations of fibre analyses with and without total N content resulted in little improvement in predictive capacity. An equation utilised by some feed testing laboratories based on ADF and N accounted for only 43% of the variation in *in vivo* DOMD. An equation based on NDF, ADL and N showed the most precision, accounting for a little under half of the variation in digestibility (Figure 1).



Based on the results of this study prediction equations based on fibre analyses are unlikely to be of value for predicting silage digestibility *in vivo* and their use should be discouraged, as also supported by Rinne *et al* (2006) and Kitessa *et al* (1999). Laboratories who use prediction equations or NIR calibrations based on these parameters run a significant risk of over or under estimating silage digestibility and/or ME.

Figure 1. Relationship between DOMD predicted from a regression based on silage ADF, ADL and N and actual (in vivo) DOMD. All data expressed as g/kg oven DM basis.
In vivo DOMD = 731.8 – (0.371 ×ADF) – (0.565 ×ADL) + (0.654 ×N), $r^2 = 0.48$; s.e. = 34.2

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