# Ruminal degradability of neutral detergent fibre and neutral detergent insoluble nitrogen of feed supplements

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**Introduction** In ruminant feeding, the prediction of metabolizable protein requires accurate estimates of feed protein degradation in the rumen. Some common feed protein sources have a high concentration of neutral detergent insoluble nitrogen (N-NDF) whose degradation may be dependent on neutral detergent fibre (NDF) degradation and, consequently, on rumen cellulolytic activity. This may lead to an underestimation of the undegraded protein that reaches the small intestine, particularly when animals are fed high starch diets. The objective of this study was to verify if there is a relationship between the ruminal degradability of the NDF and N-NDF of eight feed supplements currently used in ruminant feeding with the *in sacco* technique.

**Materials and methods** Twelve samples of eight feed supplements (dried distillers' maize, corn gluten feed, coconut meal, palm kernel meals, sunflower meal, groundnut meal, cottonseed meal and dehydrated lucerne) were used in this study. Samples (1 mm) were analysed for dry matter (DM) and crude protein (CP) according to AOAC (1990) and NDF and N-NDF according to Van Soest *et al.* (1991). Samples (4 mm) were incubated *in sacco* (46 µm pore size; Ørskov *et al*., 1980) for 2, 4, 8, 16, 24, 48, 72 and 96 h. The daily ration of the 3 cannulated rams consisted of meadow hay, beet pulp and soya bean meal making 50:35:15 on DM basis. Residues from individual animals were analysed for N-NDF and NDF. Degradation data were analysed using the exponential model: p=a+b(1-exp(-ct)) where p is the degradation, t is the time of incubation**,** a is the soluble and/or rapidly degradable fraction, b is the potential degradable fraction and c is the constant rate of degradation. One-way ANOVA analysis was used to compare degradation constants between feeds.

**Results** Chemical composition of feed supplements (Table1) is in good agreement with current tabulated values. The N-NDF fraction represents a large proportion of the CP (higher than 50%) in palm kernel meals and coconut meals. Differences in the degradation constants between feed supplements for NDF and N-NDF were found (Table 1). As expected, the soluble and/or rapidly degradable fraction was low for both NDF and N-NDF, representing the losses of small particles from the bags. Higher (P<0.05) degradation rates were observed for sunflower meal for both NDF and N-NDF. The correlation between degradation rate for NDF and N-NDF was significant (r=0.814; n=12; P<0.001). These data show that the N-NDF degradation rate is lower than the degradation rate of NDF for all the feeds studied, confirming that the degradation of N-NDF depends on the NDF degradation. This probably indicates that a large amount of feed protein may be affected by the lower ruminal cellulolytic activity when animals are fed high starch diets.

**Table 1** Chemical composition and degradation constants of NDF and N-NDF

| | Chemical composition | | | Degradation constants | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | NDF | | | N-NDF | | |
| | CP | NDF | N-NDF | a | b | c | a | b | c |
| Feed supplements | (%DM) | | | (%) | | (%/h) | (%) | | (%/h) |
| Coconut meal 1 | 22.5 | 58.7 | 2.72 | 2.7$^{b}$ | 58.0$^{b}$ | 3.52$^{ab}$ | 4.5$^{cd}$ | 48.7$^{cd}$ | 2.00$^{a}$ |
| Coconut meal 2 | 21.3 | 62.5 | 2.51 | 2.3$^{b}$ | 61.7$^{b}$ | 3.88$^{b}$ | 3.3$^{bc}$ | 45.2$^{c}$ | 2.15$^{a}$ |
| Palm kernel meal 1 | 16.3 | 72.2 | 1.71 | 1.1$^{a}$ | 57.4$^{b}$ | 3.11$^{a}$ | 6.2$^{e}$ | 31.1$^{a}$ | 2.63$^{b}$ |
| Palm kernel meal 2 | 17.5 | 73.2 | 1.81 | 0.8$^{a}$ | 59.6$^{b}$ | 4.02$^{b}$ | 2.0$^{a}$ | 30.2$^{a}$ | 2.91$^{bc}$ |
| Sunflower meal | 30.0 | 45.6 | 0.91 | 2.5$^{b}$ | 57.7$^{b}$ | 6.77$^{d}$ | 5.2$^{d}$ | 60.2$^{e}$ | 4.65$^{e}$ |
| Groundnut meal 1 | 52.8 | 24.2 | 1.38 | 2.2$^{b}$ | 62.4$^{b}$ | 5.86$^{c}$ | 5.5$^{d}$ | 58.5$^{e}$ | 3.61$^{d}$ |
| Groundnut meal 2 | 43.9 | 31.6 | 0.99 | 2.2$^{b}$ | 68.0$^{cd}$ | 5.71$^{c}$ | 3.0$^{ab}$ | 57.6$^{e}$ | 3.58$^{d}$ |
| Cottonseed meal | 43.1 | 26.8 | 0.65 | 3.0$^{b}$ | 65.3$^{bc}$ | 5.65$^{c}$ | 2.8$^{ab}$ | 50.9$^{cd}$ | 3.17$^{c}$ |
| Dehydrated lucerne | 13.7 | 46.9 | 0.33 | 3.6$^{c}$ | 59.3$^{b}$ | 4.97$^{c}$ | 2.0$^{a}$ | 43.3$^{bc}$ | 2.81$^{bc}$ |
| Dried distillered maize 1 | 26.9 | 47.2 | 2.14 | 3.3$^{c}$ | 71.7$^{d}$ | 3.18$^{a}$ | 9.7$^{g}$ | 39.3$^{b}$ | 2.91$^{bc}$ |
| Dried distillered maize 2 | 28.8 | 48.2 | 2.21 | 3.7$^{c}$ | 67.8$^{c}$ | 3.21$^{a}$ | 7.8$^{f}$ | 29.0$^{a}$ | 2.76$^{b}$ |
| Corn gluten feed | 21.9 | 36.7 | 0.86 | 4.1$^{c}$ | 45.9$^{a}$ | 4.17$^{b}$ | 9.7$^{g}$ | 35.1$^{a}$ | 3.12$^{c}$ |
| Probability | | | | 0.007 | <0.001 | 0.002 | 0.033 | <0.001 | 0.005 |

Values in the same column with different letter are significant different (P<0.05).

**Conclusions** These results show that the N-NDF degradation constants varied greatly between feed supplements. Our data also indicates that the degradation of the N-NDF fraction seems to be dependent of on the NDF degradation.

**References**

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