

Value of ADIN as a measure of unavailable nitrogen in treated rapeseed meal

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Introduction Acid detergent insoluble nitrogen (ADIN) is used in the UK Metabolisable Protein system (AFRC, 1992) to estimate the amount of indigestible nitrogen (N) in a feedstuff. A novel process has been developed which is intended to increase the proportion of undegradable protein in rapeseed meal. *In situ* work on this treated rapeseed product (TRSM) has shown a reduced rate of rumen degradation compared with the untreated product (UTRSM). However when these data were used in combination with ADIN content to calculate digestible undegraded protein (DUP), there was a minimal increase in DUP due to the high content of ADIN in the TRSM. There have been other cases where products have high ADIN content (e.g. distillery by-products; Webster, 1992) but when whole tract determinations of indigestible N were made, this was considerably lower than estimated from ADIN content. This raises some concerns about the use of ADIN to estimate indigestible protein for by- and treated- products. The objective of this study was to investigate whether the ADIN content of the untreated and treated rapeseed products was representative of the indigestible N.

Materials and methods One sample each of UTRSM and TRSM product were used. The samples were analysed for oven dry matter (DM), N and ADIN. The untreated sample required no further sample preparation and the treated sample was broken down to provide a similar particle size to the UTRSM sample with a pestle and mortar. Each feed was incubated for 10h in duplicate polyester fibre bags (PSF, 43 µm pore size) in the rumen of three non-lactating cows maintained on a grass silage/rolled barley based diet (80:20 on a DM basis), all bags (six replicates per sample) were encased in a larger bag (195 µm pore size). Upon removal from the rumen the bags received a cold water machine wash, each were placed inside a 10 µm pore size bag and then received a pepsin-HCl digest for 3h. The resulting residue was placed in the duodenum and collected from the faeces of each cow 4 to 36 h later and immediately machine washed in cold water. The residue was analysed for N. Separately, ADIN water solubility and disappearance after 10h rumen incubation plus pepsin/pancreatin digestion were determined in triplicate for each sample. The results were statistically analysed for treatment effect by t-test.

Results The chemical composition, indigestible N and sites of digestion of ADIN for the UTRSM and TRSM are shown in Table 1. ADIN content was higher in the TRSM while indigestible N determined in mobile nylon bags (MNB) was similar. Indigestible N calculated from ADIN was similar to the MNB value for the UTRSM but was nearly three times as high for the TRSM. It was seen that the ADIN was apparently water soluble in both feeds, but as the solubility reduced with decreasing filter pore size, then it is likely that the ADIN was not water soluble but was lost with the fine particle loss. ADIN disappearance after rumen and enzyme digestion was significantly lower for the TRSM but the resulting indigestible N was 7.6 and 66.5 g kg⁻¹ N for untreated and treated respectively.

Table 1. Chemical analysis, indigestible nitrogen and ADIN disappearance of the untreated and treated rapeseed.

	UTRSM	TRSM	t	P
Chemical analysis				
Oven dry matter (g kg ⁻¹)	906	883		
Nitrogen (g kg ⁻¹ DM)	60.0	57.7		
ADIN (g kg ⁻¹ DM)	5	14		
Indigestible nitrogen MNB (g kg⁻¹ N)	108	122	-3.0	0.009
Indigestible nitrogen calculated from ADIN (g kg⁻¹ N)	83	243		
ADIN disappearance				
Water solubility (PSF bags, 43 µm, %)	4.3	13.1	-42.5	0.0006
Water solubility (glass sintered crucibles, 100-160 µm, %)	14.0	36.1	-16.3	0.0005
Rumen 10h/pepsin-pancreatin digestion residue (%)	90.9	72.6	32.9	0.0009

Conclusion The results clearly prove the hypothesis that ADIN content of the TRSM product is not a good estimator of indigestible N. The use of ADIN to estimate indigestible N for heat treated products is therefore not advisable and would significantly reduce the apparent benefit of heat treatment on increasing the digestible undegradable fraction of the product.

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