

## Nitrogen fractionations, *in situ* ruminal degradation and post-ruminal crude protein disappearance of overheated and overheated-xylose processed guar meal

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**Introduction** The by-product of guar gum industry consisting of the guar germ and hull materials is called guar meal (GM), valuable to include in both ruminant and mono-gastric diets (Rahman and Leighton, 1968). The aim of the present study was to evaluate the effect of overheated and overheated-xylose processing on nitrogen fractionations, *in situ* ruminal CP degradation, and *in situ/in vitro* ruminal and post-ruminal protein disappearance of guar meal.

**Material and methods** Samples were raw GM (GM<sub>r</sub>), overheated processed GM (GM<sub>hp</sub>, 100 °C for 45 min using air-forced oven) and overheated-xylose processed GM (GM<sub>xp</sub>, xylose was included to give a final concentration of 10 g/kg DM, then heated as described for GM<sub>hp</sub>). Nitrogen fractions including non-protein nitrogen (NPN), buffer insoluble nitrogen (BISN), neutral detergent insoluble nitrogen (NDIN) and acid detergent insoluble nitrogen (ADIN) were determined as proposed by Licitra *et al.* (1996). *In situ* rumen degradation of CP of the samples was determined using four ruminal fistulated sheep (49.6±2 kg body weight). The animals fed 1.5 kg DM lucerne hay and 0.4 kg DM concentrate (165 g CP/ kg of DM) per head per day. Approximately, 6 g DM of each sample were placed in a polyester bag (9 × 17 cm; pore size of 52 µm, n=10) and incubated in the rumen for 0.0 (bags were washed with cold tap water), 2, 4, 8, 12, 16, 24 and 48 h. Ruminal disappearance of CP was determined using the 16 h incubation samples (n=8). Post-ruminal disappearance of ruminal undegradable residue was determined using 3-step procedure (Calsamiglia and Stern, 1995). Ruminal degradation parameters were determined using an exponential equation of  $P=a+b(1-e^{-ct})$ ; where P= potential of degradability, a= quickly degradable fraction, b= slowly degradable fraction, c= constant rate of degradation and t= time (Ørskov and McDonald, 1979). Data of ruminal and post-ruminal CP disappearances were analyzed using the GLM procedure of SAS (SAS Institute, 1990). Tukey test was used to compare the means at P< 0.05.

**Results** Data of nitrogen fractionations, *in situ* CP ruminal degradation parameters, and *in situ/in vitro* CP disappearance of ruminal and post-ruminal of rumen undegradable of raw, overheated and overheated-xylose processed guar meals are presented in Table 1. The NPN values of GM<sub>xp</sub> was significantly (P< 0.01) lower than GM<sub>r</sub> and GM<sub>hp</sub>. In addition, overheated-xylose processing caused to significantly (P< 0.05) increase the BISN, NDIN and ADIN content of GM<sub>xp</sub> compared with GM<sub>r</sub>. The degradation rate (c) was significantly (P< 0.05) decreased as a result of overheated-xylose processing. Overheated-xylose processing decreased ruminal CP disappearance and increased Post-ruminal CP disappearance of ruminal undegradable residue of GM (P< 0.01).

**Table 1** Nitrogen fractionations, *in situ* CP ruminal degradation parameters, and *in situ/in vitro* CP disappearance of ruminal and post-ruminal of rumen undegradable of raw, overheated and overheated-xylose processed guar meal

Items	Feed samples			s.e.m	P
	GM <sub>r</sub>	GM <sub>hp</sub>	GM <sub>xp</sub>		
Crude protein (g/kg of DM)	566	580	594	-	-
Nonprotein nitrogen (g/kg N)	320 <sup>a</sup>	298	217 <sup>b</sup>	8.76	< 0.01
Buffer insoluble nitrogen (g/kg N)	666 <sup>a</sup>	731 <sup>b</sup>	774 <sup>c</sup>	9.00	< 0.05
Neutral detergent insoluble nitrogen (g/kg N)	56 <sup>a</sup>	104 <sup>b</sup>	118 <sup>b</sup>	1.88	< 0.05
Acid detergent insoluble nitrogen (g/kg N) <sup>2</sup>	10 <sup>a</sup>	11 <sup>ab</sup>	18 <sup>c</sup>	0.66	< 0.05
Quickly degradable fraction (a)	0.10	0.09	0.08	0.03	> 0.05
Slowly degradable fraction (b)	0.94	0.95	0.9	0.06	> 0.05
Fractional constant rate of degradation (c)	0.10 <sup>a</sup>	0.08 <sup>a</sup>	0.06 <sup>b</sup>	0.01	< 0.05
Ruminal disappearance (g/g)	0.996 <sup>a</sup>	0.997 <sup>a</sup>	0.989 <sup>b</sup>	0.004	< 0.05
Post-ruminal disappearance of rumen undegradable (g/g)	0.918 <sup>a</sup>	0.906 <sup>a</sup>	0.965 <sup>b</sup>	0.008	< 0.05

<sup>a, b, c</sup> Means with a different letters in each row are significantly different at P< 0.05.

**Conclusions** It was demonstrated that overheated-xylose processing might increase the intermediate (BISN) and slowly degradable fractions (NDIN) of GM. In addition, these are effective methods of altering the CP rumen degradation characteristics of GM. Therefore, both methods could be used to increase the proportion of the rumen non-degradable protein fraction in GM sources which would then reach the small intestines unaffected by ruminal fermentation. It was concluded that overheated and overheated-xylose processing has a benefit effect on GM protein as reducing the ruminal disappearance and enhancing the post-ruminal value.

### References

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