

Proceedings

of the British Society of Animal Science
and the Agricultural Research Forum

2010

Advances in Animal Biosciences

This book is part of a series which is a companion to the journal ANIMAL



- 257 The effect of offering grass silage alone or in combination with legume:cereal wholecrop silage on methane emissions of Holstein steers
P C Kennedy, L E Dawson, D J Kilpatrick
- 258 The effect of electromagnetic water treatment on *in vitro* methane production
M O'Brien, P O'Kiely
- 259 Effect of legume and perennial ryegrass herbage on *in vitro* methane output using the total gas production technique
A Navarro-Villa, M O'Brien, S Lopez, T M Boland, P O'Kiely
- 260 *In vitro* methane output of perennial ryegrass produced under four grazing management regimes and sampled throughout the growing season
P Purcell, M O'Brien, T M Boland, M O'Donovan, P O'Kiely
- 261 The effect of sward maturity on the *in vitro* digestibility and methane production of sward components
C J Quinlan, M B Lynch, M O'Brien, A Navarro, T M Boland
- 262 Effect of sward maturity on the dry matter intake, enteric methane emission and milk solids production of pasture grazed dairy cows
M H Deighton, C M Wims, B M O'Loughin, E Lewis, M O'Donovan

FEED EVALUATIONS/TECHNIQUES

- 263 Effect of adding different levels of probiotic on *in vitro* gas production of noodle waste
M Besharati, A Taghizadeh, A Ansari
- 264 Effect of peppermint (*Mentha piperita*) essential oil on *in vitro* gas production parameters of lucerne hay and cottonseed hulls
E Jani, M Danesh Mesgaran, A R Vakili, A Soleimani, H Jahani-Azizabadi
- 265 *In vitro* gas production parameters of chickpea (*Cicer arietinum* L.) by-product
E Abdi Ghezeljeh, M Danesh Mesgaran
- 266 Use of *in situ* technique to evaluate three weed forages
M Kazemi, A M Tahmasbi, R Valizadeh, A R Vakili, M M Moheghi
- 267 Kinetic of *in vitro* gas production of high fat sunflower meal treated with sodium hydroxide and or formal dehyde by rumen bacteria+protozoa
M Bojarpour, T Mohammadabadi, M Danesh Mesgaran, M Chaji
- 268 The kinetic of *in vitro* gas production of tannic acid treated sunflower meal with or without polyethylene glycol
T Mohammadabadi, M Chaji, S Tabatabaei
- 269 Nitrogen fractionations, *in situ* ruminal degradation and post-ruminal crude protein disappearance of over heat and overheat-xylose processed guar meal
H Jahani-Azizabadi, M Danesh Mesgaran, A R Vakili, M Vatandoost, M Mojtahedi, E Abdi Ghezeljeh, A Hojjat Panah, A Fanaie-Nokar
- 270 *In vitro* first order dry matter disappearance kinetics of chemically and physically treated cottonseed hulls
A Famarzi Garmroodi, M Danesh Mesgaran, A R Vakili, A R Heravi Moussavi, A Tahmasbi, H Jahani-Azizabadi
- 271 Use of white rot fungi to improve the feed value of rice straw
J W Cone, J J P Baars, A S M Sonnenberg
- 272 Cultivation of oyster mushrooms (*Pleurotus* species) to improve the *in vitro* dry matter digestibility of wheat straw for feeding to ruminants
H Omed, A Avagyan, M Hale, J Gibbons
- 273 Evaluation of condensed tannin content of some native tanniferous plants from semi-arid regions in Brazil
R C Lucas, A L Abdalla, M E Q Vieira, J D F Gomes, M R R S Peçanha, M T Lima, R Moura, B Berenchein, A S Morsy, Y A Soltan
- 274 Chemical composition and dry matter degradability coefficients of Fennel seed
M Kazemi, A M Tahmasbi, R Valizadeh, M Danesh Mesgaran, A A Naserian

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

H. Jahani-Azizabadi, M. Danesh Mesgaran, A. R. Vakili, M. Vatandoost, M. Mojtahedi, E. Abdi Ghezalje, A. Hojjat Panah, A. Fanaie-Nokar

Department of Animal Science, Excellence Center for Animal Science, Faculty of Agriculture, Ferdowsi University of Mashhad, Mashhad, Khorasan Razavi, Islamic Republic of Iran

Email: jahani_hossein@yahoo.com

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_r), overheated processed GM (GM_{hp}, 100 °C for 45 min using air-forced oven) and overheated-xylose processed GM (GM_{xp}, xylose was included to give a final concentration of 10 g/kg DM, then heated as described for GM_{hp}). 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_{xp} was significantly (P< 0.01) lower than GM_r and GM_{hp}. In addition, overheated-xylose processing caused to significantly (P< 0.05) increase the BISN, NDIN and ADIN content of GM_{xp} compared with GM_r. 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 _r	GM _{hp}	GM _{xp}		
Crude protein (g/kg of DM)	566	580	594	-	-
Nonprotein nitrogen (g/kg N)	320 ^a	298	217 ^b	8.76	< 0.01
Buffer insoluble nitrogen (g/kg N)	666 ^a	731 ^b	774 ^c	9.00	< 0.05
Neutral detergent insoluble nitrogen (g/kg N)	56 ^a	104 ^b	118 ^b	1.88	< 0.05
Acid detergent insoluble nitrogen (g/kg N) ²	10 ^a	11 ^{ab}	18 ^c	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 ^a	0.08 ^a	0.06 ^b	0.01	< 0.05
Ruminal disappearance (g/g)	0.996 ^a	0.997 ^a	0.989 ^b	0.004	< 0.05
Post-ruminal disappearance of rumen undegradable (g/g)	0.918 ^a	0.906 ^a	0.965 ^b	0.008	< 0.05

^{a, b, c} 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

- Calsamiglia, S. and Stern, M. D. 1995. Journal of Animal Science. 73, 1459-1465.
 Licitra, G., Hernandez, T. M. and Van Soest, P. J. 1996. Animal Feed Science and Technology. 57, 347-358.
 Ørskov, E. R. and McDonald, I. 1979. The Journal of Agriculture Science. 92, 499-503.
 Rahman, M. S. and Leighton, R. E. 1968. Journal of Dairy Science. 51, 1667-1671.