

# 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



- 15 Effect of omitting one milking weekly on milk production and quality characteristics  
B O'Brien, D Gleeson, J Humphreys
- 16 Effect of rumen protected choline supplementation on milk production and composition of lactating Friesian cows  
M Mohsen, H Gaafar, M Khalafallah, A Shitta, A Elsheikh
- 17 Effect of calving difficulty on the saleable milk yield of UK Holstein Friesian dairy cattle at different stages of lactation  
A C Barrier, M P Coffey, M J Haskell
- 18 The effect of adding stinging nettle (*Urtica dioica*) haylage to a total mixed ration on performance and rumen function of lactating dairy cows  
D J Humphries, C K Reynolds
- 19 The fatty acid composition of milk available at retail over the course of one year  
K E Kliem, D I Givens
- 20 Effect of low energy high fibre and grass silage feeding strategies on metabolic status of dairy cows in the *peri-partum* period  
M Butler, J Patton, J J Murphy, F J Mulligan
- 21 Differential transport of trans fatty acids by bovine plasma lipoprotein fractions: 1. Soya oil and partially hydrogenated vegetable oil  
E Vargas-Bello-Pérez, P C Garnsworthy
- 22 Differential transport of trans fatty acids by bovine plasma lipoprotein fractions: 2. Fish oil and partially hydrogenated vegetable oil  
E Vargas-Bello-Pérez, P C Garnsworthy
- 23 The association between herd size, herd expansion and breeding policy, reproduction and production performance of spring calving Irish dairy herds  
J Jago, D P Berry

## **RUMEN DEGRADATION AND FERMENTATION**

- 24 Nutrient composition and *in vitro* degradability of some tropical shrubs from Pakistan  
M R Virk, A S Chaudhry
- 25 Effect of incubation time on chemical compositions and *in vitro* digestibility of treated extracted gambir leaf waste (*Uncaria gambir roxb*) with mix *Rhizopus sp* and *Aspergillus niger* as animal feed  
N Gusmanizar, Y Marlida, M Dasya
- 26 Development of an intra-ruminal nylon bag technique for feed evaluation which does not require the use of fistulated animals  
R W Mayes, J H Pagella, E R Ørskov
- 27 The effect of dietary proportions of kale (*brassica oleracea*) and grass silage on rumen pH and volatile fatty acid concentrations in dry dairy cows  
B Keogh, P French, F J Mulligan
- 28 The effects of individual or blended essential oils on rumen gas production and ammonia accumulation *in vitro*  
K Mitchell, S Chikunya
- 29 Effect of phenotypic residual feed intake and diet type on ruminal microbial population in beef heifers  
C A Carberry, D A Kenny, M S McCabe, S M Waters
- 30 Effect of feeding level on dry matter degradation characteristics of canola meal and soybean meal  
M Pourabedin, A Afzalzadeh, A A Khadem
- 31 *In situ* dry matter digestion of different fodder tree leaves in Pakistan  
A S Chaudhry, M R Virk, U B Cheema
- 32 Comparison of ruminal degradability models using the number of runs of sign of residuals  
M H Fathi Nasri, M Danesh Mesgaran, J France, E Kebreab, H Farhangfar

## Comparison of ruminal degradability models using the number of runs of sign of residuals

M Hassan Fathi Nasri<sup>1</sup>, M Danesh Mesgaran<sup>2</sup>, J France<sup>3</sup>, E Kebreab<sup>4</sup>, H Farhangfar<sup>1</sup>

<sup>1</sup>The University of Birjand, Birjand, Islamic Republic of Iran, <sup>2</sup>Ferdowsi University of Mashhad, Mashhad, Islamic Republic of Iran, <sup>3</sup>University of Guelph, Guelph, Canada, <sup>4</sup>University of California, Davis, United States

Email: mhfathi@gmail.com

**Introduction** Various models are used to describe the degradation of feeds in the rumen. The use of a particular model in fitting a degradability data set and estimating the degradability parameters implies the model goodness-of-fit has been examined holistically, otherwise the validity of estimated parameters may be controvertible. There are different statistical tests for ranking and evaluating models and sometimes results from these different tests seem contradictory, so an overall assessment is needed in this situation. In this study, the goodness-of-fit of three models were evaluated using a single test, the number of runs of sign of residuals, when fitting whole soybean ruminal degradability data.

**Materials and methods** DM and CP degradability data of two Iranian soybean cultivars (Sahar and Williams) as raw, roasted and steep-roasted (6 feeds in total), which was recorded at fixed incubation periods (1, 2, 3, 4, 8, 16, 24, 36 and 48 h) for each feed and yielded a total of 6 disappearance curves, were used in this study. The evaluated models were: a segmented model with three spline-lines delimited by two nodes or break points, constraining splines 1 and 3 to be horizontal asymptotes, and follows zero-order degradation kinetics (model I); a simple negative exponential curve with first order kinetics and assuming a constant fractional rate of degradation (model II); and a rational function or inverse polynomial which assumes a variable fractional rate of degradation that declines with time (model III). The models were fitted to the DM and CP ruminal disappearance data by nonlinear regression using the PROC NLIN of the SAS (SAS, 1999) to estimate ruminal degradation parameters. The number of runs of sign of the residuals was calculated as Motulsky and Ransnas (1987). A run is a sequence of residuals with the same sign (positive or negative). For this test, the average residual of replicate observations was used for each incubation period.

**Results** All models could be fitted to the data using PROC NLIN of SAS, as convergence to a solution occurred in all cases and the degradability parameters could be estimated. The number of runs of sign of residuals was different (Table 1) for the three models. Model III gave a high percentage of curves with three or fewer runs (for both DM and CP components) indicating the residuals were not randomly distributed over the incubation times and this model was not as good as the other two for fitting these particular data.

**Table 1** Percentage of curves (both DM and CP) for each number of runs of sign of the residuals observed when fitting each model

Number of runs of sign	Model I		Model II		Model III	
	DM	CP	DM	CP	DM	CP
≤ 3	0.0	0.0	0.0	0.0	66.7	66.7
4	0.0	0.0	0.0	0.0	16.7	33.3
5	16.7	16.7	16.7	33.3	16.6	0.0
6	66.7	16.7	16.7	16.7	0.0	0.0
≥ 7	16.6	66.6	66.6	50.0	0.0	0.0

**Conclusion** The results of this study showed that all three models could to describe the degradability data without systematically over- or underestimating any section of the DM and CP degradability curves and the number of runs of sign of residuals test could be a useful statistical test as other statistical criteria (R-square, Bayesian information criteria and lack-of-fit test, data are not shown) for assessing and ranking models.

### References

- Motulsky, H.J., and L.A. Ransnas. 1987. Fitting curves to data using nonlinear regression: A practical and nonmathematical review. *FASEB J.* 1, 365–374.
- SAS, 1999. User's Guide: Statistics, 1999. Version 8.2. SAS Institute Inc., Cary, NC, USA.