Ruminal disappearance and passage rates in fresh Nezasa dwarf bamboo growing in Japanese native pasture

M. Yayota, J. Karashima, T. Kokestu, M. Nakano and S. Ohtani
Faculty of Applied Biological Science, Gifu University, 1-1 Yanagido, Gifu 501-1193, Japan, Email: yayo@cc.gifu-u.ac.jp

Keywords: native forage, disappearance rate, passage rate, rumen

Introduction Nezasa dwarf bamboo (*Pleioblastus chino* makino) is one of major native forages for grazing in Japan. However its nutritional utilisation in the rumen has been little studied. The object of this research was to measure ruminal disappearance and passage rates in fresh Nezasa dwarf bamboo compared with improved grass.

Materials and methods Six Suffolk ewes surgically fitted with ruminal cannulae were used in this study. Three ewes were assigned to receive fresh Nezasa dwarf bamboo (*Pleioblastus chino* makino) as native forage and the remaining three received fresh bahiagrass (*Paspalum notatum* Flluge) as improved forage. The diets were fed twice daily at 09.00 and 16.00 in maintenance quantities. The experiment was conducted in June, July - Aug. and Oct. in 2003. Each experimental period consisted of 17 d. The first 7 d of each period were used for adjustment to the diet. The following 5 d were used for measurement of ruminal disappearance rate using the *in sacco* technique. The diet samples were incubated in the rumen of ewes for 0, 4, 8, 16, 24, 48, 96 and 120 h. The last 5 d were used for measurement of ruminal passage rate using the forage labelling technique. At 09.00 of the first day (d 13), the ewes were fed a 15g single dose of each forage that had been labelled with ytterbium (Yb) by immersing fresh forages in a 0.5% w/v aqueous solution of $YbCl_3 \times H_2O$ for 24 h, rinsing in running water for 1h and drying for 48 h at 60°C. The faecal samples were collected every 4 h for 48 h and every 8 h for the next 72 h. The passage rate constant of digesta was calculated as described by Grovum & Williams (1973); $Y = Ae^{-K1(t-TT)} - Ae^{-K2(t-TT)}$ where Y = marker concentration in the faeces, K1 = ruminal passage rate, K2 = post-ruminal passage rate, t = time of sampling, TT = time of first appearance of marker in faeces. Total mean retention time (TMRT) in the whole tract was calculated as 1/K1 + 1/K2 +TT. Data were analysed using ANOVA for a two-way factorial design with forage and season as the factor.

Results Extent of disappearance in the rumen at 120 h of Nezasa bamboo was significantly lower than that of bahiagrass for all seasons (Table 1). Also the extent of disappearance in the rumen of Nezasa bamboo decreased with the progress of season. Ruminal passage rate was slower and TMRT was longer in Nezasa bamboo than in bahiagrass during July - Aug. and Oct., but the differences were not significant (Table 1).

Table 1 Chemical composition, ruminal disappearance and passage rates in Nezasa bamboo and bahiagrass

	June		July - Aug.		Oct.		Significance		
	Nezsa	Bahiagrass	Nezsa	Bahiagrass	Nezsa	Bahiagrass [1)]	F	S	F×S
Chemical composition (% of dry matter)									
CP	12.7	16.1	14.3	13.4	17.0	11.5			
NDF	72.5	53.6	70.4	64.0	62.4	66.6			
Extent of disappearance in the rumen at 120 h (%)									
DM	52.3	89.6	47.3	81.9	40.0	70.6	***	***	n.s.
	72.5	96.1	67.5	94.6	65.9	86.8	***	*	n.s.
NDF	58.9	83.7	52.9	81.6	45.0	68.9	***	*	n.s.
Ruminal passage rate (%/hr)									
	2.1	1.9	2.1	3.0	2.0	3.8	n.s.	n.s.	n.s.
TMRT (h)	90.1	97.9	108.5	61.3	87.0	65.9	n.s.	n.s.	n.s.

1) Because of health disorder, one ewe was removed from the treatment (n=2)
F = effect of forage, S = effect of season, F×S = interaction between F and S, * = $P < 0.05$, *** = $P < 0.001$

Conclusions This study suggests that Nezasa dwarf bamboo was nutritionally poorer than the improved grass. Therefore note must be taken of the chemical composition and digestion characteristics of native forages such as dwarf bamboo when considering the role that they can play in feeding grazing cattle.

Reference

Grovum, W.L. & V J.Williams (1973). Rate of passage of digesta in sheep. 4. Passage of marker through the alimentary tract and the biological relevance of rate constants derived from the changes in concentration of marker in faeces. *British Journal of Nutrition*, 30, 313-329.