

High floral tannin white clover reduces rumen ammonia concentrations in dairy cows

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Keywords: ammonia, condensed tannins, flower, rumen, white clover

Introduction White clover produces high quality forage for ruminant production, but it results in high rumen ammonia concentrations, indicating extensive protein degradation. The excess ammonia is absorbed through the rumen and excreted as urea in urine, at a cost to the animal and the environment. Condensed tannins (CT) contained in some forages reduce proteolysis in the rumen, which can lead to increased amino acid absorption and therefore improved animal performance. White clover produces CT in its flower heads, but concentrations are normally too low to benefit animals. This paper reports on comparisons of rumen ammonia concentrations in dairy cows grazing HT (high tannin) white clover (an experimental line of white clover with increased flowering) or Grasslands Huia white clover.

Materials and methods Ten rumen-fistulated lactating Friesian dairy cows grazed either Huia or HT white clover for 18 days on an unrestricted allowance. Treatments were balanced for cow age and milk production, and experiments were repeated in December 2001, February 2002, April 2002 and December 2002. Herbage CT (butanol-HCl method; Terrill *et al.*, 1992) and crude protein concentrations (near infra-red spectroscopy; NIRS) were measured on samples cut to grazing height. Rumen fluid was collected from each cow three times per day on three of the last 6 days of each experimental period and was analysed for rumen ammonia concentrations. Treatment differences were determined by analysis of variance using Genstat 5.

Results Pre-grazing herbage mass was 3.8 to 3.9 t DM/ha for Huia and HT in both Decembers, 3.5 in February, and 2.5 for Huia and 2.4 for HT in April. Post-grazing herbage masses were 2.8 to 3.0 t DM/ha in December experiments, 2.2 for Huia and 2.1 for HT in February, and 1.2 for Huia and 1.0 for HT in April. Average rumen ammonia concentrations were 6 to 22% lower in cows grazing HT white clover than those grazing Huia. This was most likely due to the 0.3 to 3 times higher CT concentrations in HT, as the clovers had similar crude protein concentrations (Table 1). Rumen ammonia was consistently lower in cows fed HT than Huia 6.5 hours after the start of morning grazing, and was lower at other sampling times on some occasions (Table 1).

Table 1 Condensed tannin (CT) and crude protein (CP) concentrations as a % of herbage DM and average rumen ammonia concentrations (mM/L) of cows before the morning grazing and at 2 and 6.5 hours after the start of grazing Huia or HT white clover

	CT		CP		Rumen ammonia								
	Huia	HT	Huia	HT	Pre-grazing			2 hours			6.5 hours		
					Huia	HT	se	Huia	HT	se	Huia	HT	se
Dec 2001	0.18***	0.74	28*	27	29.5*	22.1	2.8	30.6***	22.0	1.6	45.1**	37.7	1.7
Feb 2002	0.48*	0.74	26	26	16.1*	11.6	2.3	23.1	21.8	2.5	32.1 [†]	30.2	1.9
Apr 2002	0.42*	0.70	28*	26	11.7	12.3	1.3	22.8	24.9	1.3	35.7*	28.7	2.3
Dec 2002	0.50***	1.20	27	24	21.7	18.9	1.4	26.3**	22.8	1.0	28.0**	22.3	1.3

[†] = p<0.1, * = p<0.05, *** = p<0.001, se = standard error of the difference for differences between treatments within experiments and sampling times

Conclusions The CT in HT white clover appeared to reduce protein degradation in the rumen, resulting in lower rumen ammonia concentrations than in cows grazing Huia white clover. This may lower urinary N excretion, providing minor benefits to the environment and the animal. However, the herbage CT concentrations and reduction in rumen ammonia concentrations were low compared to reports from other legumes where animal production has been improved by CT (Waghorn *et al.*, 1999).

References

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