Effects of feeding legume silage with differing tannin levels on lactating dairy cattle

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Introduction Condensed tannins (CT) bind to plant proteins in the rumen, reducing protein degradation to ammonia and increasing milk production and milk protein (e.g. Waghorn, 1987). Previous research showed that the reduced soluble non-protein nitrogen (NPN) content of red clover (*Trifolium pratense*) silage (RCS) was related to its greater N efficiency relative to lucerne (*Medicago sativa*) silage (LS) (Broderick *et al*., 2001). Commercial cultivars of birdsfoot trefoil (*Lotus corniculatus*; BFT) contain modest levels of CT which reduce NPN formation in silage (Albrecht & Muck, 1991). The objective was to compare silages made from BFT with RCS and LS for milk production and N efficiency in lactating dairy cows.

Materials and methods Twenty-five lactating Holstein cows (5 fitted with ruminal cannulae) were randomly assigned to incomplete 5x5 Latin squares to assess effects on milk production and N utilisation. Diets contained (DM basis) 50% of LS, RCS or one 3 BFT lines that contained low (LTBFT), normal (NTBFT) or high (HTBFT) concentrations of CT. The HTBFT and LTBFT lines were developed from the NTBFT by selecting for high and low CT by Dr Nancy Ehlke (University of Minnesota, USA). The remainder of the ration consisted of maize silage, high moisture maize and soybean meal 48% CP.

Results Characteristics of the silages and animal performance on the silages are shown in Table 1. There were differences in CP among silages: LS and LTBFT were highest, NTBFT and HTBFT intermediate, and RCS lowest ($P<0.01$). The levels of NDF were higher in RCS and LS than in the BFT silages ($P<0.01$). There were no differences in DM intake or in milk composition due to silage source ($P>0.01$). However, yield of milk and FCM was higher on NTBFT and HTBFT than LTBFT, which was higher than that on LS or RCS ($P<0.01$). Fat yield was 0.19 kg/d higher on NTBFT than on LS, with the other 3 diets being intermediate ($P<0.01$). Protein yield on all 3 BFT diets, regardless of CT level, was higher than on LS and RCS, despite the fact that the BFT diets contained about 1% less CP ($P<0.01$). Milk urea nitrogen (MUN) was lower on NTBFT and HTBFT than on LTBFT, LS and RCS ($P<0.01$). Differences in milk yield may have been confounded by the BFT diets being lower in fibre (27% NDF) than the LS and RCS diets (29% NDF) ($P<0.01$). However, these results suggest CT concentration was directly related to improved utilisation of CP in BFT silages.

Table 1 Silage characteristics, intake, milk production and milk constituents

Item	LS	RCS	LTBFT	NTBFT	HTBFT	SE	P Value
Silage NDF (% DM)	35.3^{b}	42.7^{a}	32.4^{c}	32.4^{c}	32.2^{c}	0.4	<0.01
Silage CP (% DM %)	22.0^{a}	18.1^{c}	21.7^{a}	20.4^{b}	20.1^{b}	0.3	<0.01
DMI (kg/d)	24.4	25.6	25.2	23.3	24.5	0.7	0.41
Milk (kg/d)	30.2^{c}	31.1^{c}	32.9^{b}	34.6^{a}	34.3^{a}	0.5	<0.01
3.5% FCM (kg/d)	31.4^{d}	32.6^{cd}	33.8^{bc}	36.3^{a}	35.3^{ab}	0.6	<0.01
Fat (kg/d)	1.13^{c}	1.17^{bc}	1.20^{bc}	1.32^{a}	1.24^{ab}	0.03	<0.01
Protein (kg/d)	0.94^{b}	0.96^{b}	1.04^{a}	1.09^{a}	1.07^{a}	0.02	<0.01
MUN (mg/dl)	10.8^{a}	11.0^{a}	10.8^{a}	9.3^{b}	9.2^{b}	0.3	<0.01

^{a,b,c} Means within a row with unlike superscripts differ ($P<0.05$)

Conclusions The results indicate that the condensed tannins in BFT improved N utilisation in the dairy cow with no ill effects on milk production.

References

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