

Maceration of Alfalfa Hay and Silage Improves Milk Production

D.R. Mertens and R.G. Koegel

Introduction

Previous experiments have shown that maceration of alfalfa improved digestibility in sheep, increased weight gain in late lactation dairy cows, and altered fermentation in the rumen. Maceration of forage increases the proportion of propionic acid produced during ruminal digestion which is similar to the result when additional grain is added to ruminant diets. This suggests that maceration of forage would provide the greatest benefit to animals with high energy demands such as cows in early lactation. The objective of this study was to obtain quantities of macerated and control alfalfa hay and silage that could be evaluated using high producing, peak lactation cows in a trial with adequate length and numbers of animals to detect differences due to maceration.

Methods

Third cutting alfalfa was harvested over a 28-day period to obtain 10 tons of dry matter as non rain-damaged hay and silage. Alternate rows were macerated or cut and conditioned, then harvested as hay or silage. Hay was harvested as small rectangular bales, and silage was stored in small plastic bags containing about 1000 kg wilted forage. To obtain consistent forage quality during the feeding trial, the least and most mature lots of forage were blended. Average forage composition was between 18 to 20% crude protein and 43 to 46% aNDF, and silages were 37 to 40% dry matter. Forages were mixed with high moisture corn, soybean meal, roasted soybeans (5% of ration dry matter) and minerals to obtain rations that contained 30% amylase-treated NDF and a minimum of 16% crude protein. Hays were chopped, and both hays and silages were fed as total mixed rations.

Forty-eight cows that averaged 80 days in lactation were divided into 12 groups based on parity and milk production within parity during a covariate period (covariate ration contained both

hay and silage). One cow of each group was assigned to a ration containing control alfalfa hay, macerated alfalfa hay, control alfalfa silage, or macerated alfalfa silage. Cows were fed the rations for seven weeks.

Discussion

Statistical analysis of the data indicated that treatment differences were significant by the third week the cows were on their respective diets; thus, data for the last five weeks were averaged and used to determine the effects of maceration on animal response (Table 1). There were no differences in dry matter or NDF intake of cows fed macerated or control alfalfa forage. However, these early lactation cows responded to maceration of alfalfa with a significant increase in milk production. Although the cows fed macerated silage had lower milk fat percentages than control cows during the covariate period, there was a significant decrease in milk fat percentage for the macerated forage when least-squared means were compared. This has been a consistent response to maceration of alfalfa and may reflect the shift to lower acetate to propionate ratios in ruminal volatile fatty acids that was observed in previous experiments.

Although treatment differences were not significant, there was a trend toward greater positive body weight and condition score change for cows fed macerated forage compared to controls. This result agrees with previous studies. The combination of slightly lower dry matter intake with increased milk production and body weight change suggests that the energy utilization of macerated forages is greater than that of controls.

Conclusion

Maceration of alfalfa can result in greater milk production with slightly decreased milk fat percentages and a more positive energy balance. Not only does maceration appear to improve

energy utilization of alfalfa, but it also changes fermentation in the rumen in a way that results in greater propionate production similar to that

which occurs when grains are fed. Thus, maceration may allow the substitution of some forage for grain in dairy rations.

Table 1. Least-squared means for animal responses during the last five weeks of the experiment when fed control and macerated alfalfa (averaged across hay and silage preservation methods (n = 24).

Variable	Control Treatment	Macerated Treatment
Chemical composition of total mixed rations (% of DM):		
Crude protein	16.9	17.7
amylase-treated NDF	30.8	29.7
Animal responses:		
Dry matter intake (kg/d)	23.4	23.2
aNDF intake (%BW/d)	1.18	1.19
Milk (kg/d)	34.5 ^a	37.1 ^b
4%FCM (kg/d)	32.6	33.5
Milk fat (%)	3.66 ^a	3.37 ^b
Milk protein (%)	3.12	3.05
Milk lactose (%)	4.85	4.83
Somatic cell count (1000)	161	181
Body weight (kg)	597	578
Body weight gain (kg/d)	-0.06	0.09
Condition score change (/mo)	0.12	0.15

^{a,b}Values with different superscripts are different at $P < .05$.