

INTAKE, DIGESTION AND PERFORMANCE COMPARISONS FOR CATTLE FED MACERATED VS. ROLLER-CONDITIONED ALFALFA (*Medicago sativa L.*) FORAGE

Suwarno¹, K.M. Wittenberg¹ and W.P. McCaughey²

¹Department of Animal Science, University of Manitoba, Winnipeg, MB, R3T 2N2

²Agricultural Research Station, Brandon, MB.

ABSTRACT

The objective of this study was to determine whether maceration of alfalfa forage at the time of harvest will have a positive impact on intake, digestibility and performance in beef cattle. A performance trial conducted with 24 growing beef calves resulted in a 7% and 10% increase ($P < 0.05$) in dry matter intake (kg/d) and daily gain (kg), respectively, when animals were fed alfalfa silage harvested with a macerator vs. a mower conditioner. Feed efficiency was not affected by treatment. Four steers assigned to alfalfa hay harvested with a macerator vs. mower conditioner showed no differences in dry matter intake, however, dry matter digestibility for the macerated hay was higher.

KEYWORDS

Maceration, alfalfa, cattle, intake, digestion, animal performance

INTRODUCTION

Forage grown for silage, hay and other dried forage products is usually wilted in the field prior to further processing or storage. Although forage may have high nutritional value at the time of cutting, high humidity or precipitation during field wilting stage can reduce forage quality by extending the period of cell respiration, by fungal or bacterial growth on the plant material and by leaching. Therefore, increased drying rate may have some beneficial effect in preventing further deterioration of forage quality at the time of wilting.

Maceration is achieved by grinding freshly cut forage through a series of serrated rollers, causing cross sections of stems to be crimped and longitudinally split. Hong et al. (1988) revealed that dry matter intake (DMI) and digestions of neutral detergent fibre (NDF) and acid detergent fibre (ADF) were increased in macerated alfalfa forage relative to the respective conventionally harvested forage fed to sheep and goats, although digestibilities of DM and crude protein were similar between treatments. Production of milk and milk protein concentration were increased in goats fed the macerated forage. Petit et al. (1994) found an increase in DMI when either macerated timothy or alfalfa forage were fed to lambs.

These studies will compare performance criteria for growing beef calves fed conditioned vs. macerated alfalfa silage and intake and digestion when fed conditioned vs. macerated alfalfa hay.

MATERIALS AND METHODS

Twenty four weaned beef calves, 12 males and 12 females, 274.5 ± 1.8 kg, were assigned to one of two silage treatments for a 75-day feeding period. Two dietary treatments included Consil- produced with a John Deere mower-conditioner and Maccsil-produced with a prototype mower-macerator manufactured by Prairie Agricultural Machinery Institute (PAMI). Forage was ensiled as round bale silage. Animals were assigned to pens (1 male and 1 female) on the basis of body weight with 6 pens assigned to each forage treatment. Animals were fed at 9:00 AM, the amount offered based on a 5 to 10% weighback. Fresh water and mineral were available at all times. Animals were weighed on two consecutive days at the start and end of the study, and on days 21 and 42. A completely randomized design, using initial body weight as the covariate was used. The general linear model procedure of SAS (Statistical Analysis System Inc., Cary, NC, 1985) was used.

Intake and digestibility of hay was conducted using 4 steers (353 ± 10.9 kg). Two dietary treatments, severely macerated hay (Machay) and conditioned hay (Conhay) were used. Two animals were assigned to each dietary treatment in each of the two periods, comprised of a 7-day adjustment, 7-day intake and a 9-day digestibility phase. Grab samples of feed and weighbacks were taken daily and composited on a weekly basis for nutrient analysis. Feces were collected daily during the digestibility study. The data was analysed as two 2 X 2 latin squares using SAS.

RESULTS AND DISCUSSIONS

Macerated silage dried faster and contained approximately 13 percentage units more DM compared to that of conditioned silage (56.9 vs. 43.7% respectively, $P < 0.01$). Crude protein concentrations were greater in conditioned silage relative to macerated silage (18.1% vs. 16.8% respectively, $P < 0.01$). Greater leaf loss in macerated forage during handling might be responsible.

Similar results were found by Hong et al. (1988) and Petit et al. (1994). Savoie et al. (1994) found no differences in crude protein due to maceration. Neutral detergent fiber tended to be greater in macerated silage relative to that of conditioned silage (49.83% vs. 48.18%, $P < 0.11$). No differences were found in terms of ADF (38.4% vs. 39.3%) and acid detergent insoluble nitrogen (ADIN: 7.1% vs. 7.6% total N) between Consil and Maccsil, respectively. Animal response to forage treatment in the first 21 days showed a greater DMI and a tendency ($P < 0.10$) for higher rates of gain in cattle fed the macerated vs. conditioned silage (Table 1). No differences were found for feed efficiency. For the 75-day feeding period, DMI and daily gain were greater for the macerated silage relative to the conditioned silage, although no differences were observed for feed efficiency between the two treatments.

Although cattle fed macerated hay tended ($P < 0.07$) to eat less DM relative to those fed the conditioned hay, the macerated hay DM was more digestible (Table 2).

Maceration of alfalfa forage at the time of cutting can improve the value of the forage when fed to animals as either hay or silage.

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Table 1

Effect of alfalfa forage maceration on dry matter intake, body weight gain and feed efficiency when fed to growing beef calves in the form of silage.

	Silage Treatments		Standard error
	Roller Conditioned	Macerated	
Number of animals	12	12	
Initial weight, kg	273	276	1.8
Final weight, kg	340 ^b	353 ^a	4.0
Initial 21 days			
DMI, kg d ⁻¹	7.0 ^b	7.9 ^a	0.08
DMI, % body weight	2.55 ^b	2.87 ^a	0.03
ADG, kg d ⁻¹	0.9	1.1	0.07
Feed conversion,	8.07	7.64	0.49
Overall			
DMI, kg d ⁻¹	8.5 ^b	9.1 ^a	0.13
DMI, % body weight	2.77 ^b	2.91 ^a	0.04
ADG, kg d ⁻¹	0.9 ^b	1.0 ^a	0.04
Feed conversion,	9.63	9.12	0.36

^{a, b} Least square means in the same row with different superscripts are different (P<0.05).

Table 2

Effect of maceration of alfalfa forage on dry matter intake and digestibility when fed to beef steers as hay.

	Hay Treatments		Standard error
	Roller conditioned	Macerated	
No.	4	4	
Initial weight, kg	352	354	3.6
DMI, kg d ⁻¹	10.7	10.0	0.15
DMI, % BW	3.04	2.82	0.05
DM digestibility, % ^Z	55.53 ^b	59.18 ^a	0.82

^{a, b} Least square means in the same row with different superscripts are different (P<0.05).

^Z Preliminary data