PERFORMANCE OF LACTATING DAIRY COWS FED ALFALFA HAYLAGE TREATED WITH BACTERIAL INOCULANTS AT THE TIME OF ENSILATION

J. E. Shirley, M. V. Scheffel, and R. K. Scoby

Summary

Sixty Holstein cows averaging 65 days in milk at the initiation of a 13-week study were used to evaluate three alfalfa haylages. Haylages were treated at the time of ensilation with either a Pioneer experimental inoculant (Treatment A), no inoculant (Treatment B), or Pioneer brand 1174® inoculant (Treatment C). Cows fed A had greater peak yields and tended to produce more milk than cows fed B and C. Milk fat percentages were 3.7, 3.66, and 3.59 for A, B, and C, respectively. Greater milk yield and butterfat percentage translated into higher ($P<.05$) daily fat production by cows fed A compared to C but not B.

(Key Words: Lactating Cows, Alfalfa Haylage, Inoculant.)

Introduction

Alfalfa haylage is used commonly as a high protein forage on dairies throughout the U.S. and Canada. Lactating dairy cows fed alfalfa hay or haylage and corn silage in a 75:25 ratio outperformed cows fed other combinations of the two forages in a Wisconsin study. Harvesting alfalfa as haylage reduces field losses and drying time compared to hay. Conversely, alfalfa does not survive the fermentation process as well as corn silage unless well managed because it is lower in readily fermentable carbohydrates. Therefore, fermentation aids that improve nutrient availability and(or) reduce fermentation and feedout losses, should improve the nutritive value of the forage for livestock. The objective of this study was to determine the nutritive value of alfalfa haylage ensiled with bacterial inoculants.

Procedures

Sixty Holstein cows averaging 65 days in milk at the initiation of the 13-week study were used to evaluate three alfalfa haylages. Cows were blocked according to parity, days in milk, and average milk production during the 7 days immediately prior to treatment. Cows within blocks were assigned randomly to either haylage A (a Pioneer experimental inoculant), B (no inoculant), or C (Pioneer brand 1174® inoculant) to provide 20 cows per treatment. All cows were fed a similar total mixed ration (TMR) during a 14-day pretreatment period. Data collected during the 7 days immediately before treatment were used for covariate analysis. Diets were formulated to meet or exceed NRC requirements for 636-kg cows producing 44 kg of energy-corrected milk (Tables 1 and 2).

Experimental haylage, hay, grain mix, and whole cottonseed were mixed in a Roto-mix wagon and fed *ad libitum* as a TMR twice daily. Bunks were cleaned daily prior to the AM feeding. Milk production was recorded daily, and milk samples were collected weekly for analysis of milk components (AM and PM samples composited).

Body weights and condition scores were determined weekly. The average body weights during the first 2 wk and the last 2 wk on treatment were averaged and used to determine body weight change during treatment. All cows were observed daily to assess their health status. Forage samples were collected weekly and composited monthly for analysis (Table 3). Samples of each batch of grain mix were obtained and composited monthly for analysis (Table 3).

Haylage dry matter was determined weekly, and diets were adjusted accordingly. Dry matter feed refusals were determined weekly. Calculations of dry matter intake were determined weekly utilizing the corresponding dry matter of haylage and feed refusals and the monthly dry matter obtained for the dry feedstuffs.

Results and Discussion

Cows fed diet A (Pioneer experimental inoculant) tended to consume more dry matter, produce more milk, and gain more weight than cows fed B (control, no additive) or C (Pioneer brand 1174® inoculant) diets (Table 4). Persistency of lactation from week 2 to week 13 was similar across diets. Cows fed A had greater peak milk yields and consistently produced more milk throughout the study. Extension of the data over a 305-day lactation using the Dairy Herd Improvement formula (each pound of peak milk translates into 250 lb of total lactation yield) indicate that cows fed diets A, B, and C would produce 19,250, 18,646, and 18,315 lb of milk per lactation, respectively. Thus, the net return per cow receiving diet A would be $126 more than the returns for cows fed C, and $81 more than the return for those fed B ($13.50/cwt milk).

Milk fat percentages tended to be greatest in milk from cows fed A, intermediate from cows receiving B, and lowest for cows fed the C diet (3.7, 3.66, and 3.59, respectively). Greater milk yield and butterfat percentage translated into more ($P<.05$) daily fat production by cows fed A compared to C but not B (P = .30). Milk protein percentage was similar across diets, but yield was slightly higher from cows fed A compared to C (P = .11). Milk protein yield was consistently greater throughout the 13-wk study by cows on diet A, suggesting that alfalfa haylage treated with the experimental inoculant supplied more available protein or energy or both than the control and B-treated haylage. Interestingly, feed efficiency for milk production was similar across treatments, but cows fed A gained slightly more weight. This also supports the premise that the A diet improved the cow's protein status. Evaluation of protein status via total blood amino acid measurements is needed in future studies.

Dry matter intake decreased during weeks 3 and 4 in cows fed A, because the silo contained some inferior haylage resulting from 4-day lag period during the filling process. This depression in intake caused a decrease in milk production from which cows never fully recovered. This did not occur in the B and C haylages, because most of the deteriorated haylage was discarded. Another interesting aspect regarding dry matter intake during the 13-week study was the trend for differences in feed intake. We normally expect dry matter intake to remain relatively constant or decrease slightly during this stage of the lactation cycle. Cows fed diets A and B tended to fit the expected pattern, whereas those that received diet C had increased dry matter intake throughout the study. A plausible explanation for this observation was that the quality of C haylage improved as it was fed out of the silo. In other words, the haylage farthest from the top of the silo was of higher quality because of enhanced oxygen exclusion.

Table 1. Diet Composition (% of Dry Matter)

		Diet		
Ingredient	lb DM	A	B	C
Alfalfa hay	2.7	4.46	4.46	4.46
Alfalfa haylage	22.4	36.96	36.96	36.96
Whole cottonseed	5.4	8.91	8.91	8.91
Soybean meal (48% CP)	2.53	4.18	4.18	4.18
Distilled grain	1.08	1.78	1.78	1.78
Shelled corn	18.45	30.44	30.44	30.44
Meat and bone meal	1.246	2.06	2.06	2.06
Soyhulls	4.49	7.40	7.40	7.40
Wet molasses	.745	1.24	1.24	1.24
Dicalcium phosphate	.136	.22	.22	.22
Ground limestone	.476	.78	.78	.78
Buffer	.527	.87	.87	.87
Magnesium oxide	.136	.22	.22	.22
Trace mineral salt	.187	.32	.32	.32
Vitamins A, D, E	.0765	.13	.13	.13
Vitamin E	.0085	.014	.014	.014
Selenium	.0085	.014	.014	.014
Total dry matter	60.60	100.0	100.0	100.0

Table 2. Composition of Feed Ingredients

	Alfalfa silages				
Item	A	B	C	Alfalfa hay	Grain mix
Dry matter	39.8	40.1	41.0	87.8	87.0
Crude protein	17.65	17.70	17.45	18.6	14.8
Crude fat	1.95	1.95	2.05	1.28	3.56
Crude fiber	30.20	30.33	29.07	30.0	8.14
ADF	36.35	35.70	35.70	35.46	11.70
NDF	44.10	43.60	43.20	47.90	17.0
TDN	59.8	60.5	60.48	60.78	75.82
NE_L	.61	.62	.62	.62	.79
Ca	1.24	1.23	1.18	1.32	1.40
P	.33	.32	.31	.27	.62
Mg	.20	.20	.19	.16	.39
K	2.63	2.58	2.57	2.84	.85
S	.18	.18	.18	.25	.18
NaCl	.80	.76	.78	.45	.98

Table 3. Chemical Composition of Experimental Diets

Item	Diets		
	A	B	C
	---------- % of dry matter ----------		
Crude protein	16.66	16.67	16.58
Crude fat	4.32	4.32	4.36
ADF	23.8	23.6	23.6
NDF	30.8	30.6	30.5
NEL	.74	.74	.76
Ca	1.23	1.23	1.20
P	.50	.50	.49
Mg	.32	.32	.31
K	1.61	1.60	1.60

Table 4. Dairy Cow Performance with Three Alfalfa Haylage Diets

Item[1]	Alfalfa silages		
	A	B	C
No. of cows	20	20	20
Weeks on test	13	13	13
Initial wt., lb[2]	1201	1228	1246
Final wt., lb[3]	1287	1296	1316
Body wt. change, lb	86	68	70
Body condition score			
Initial	2.18	2.28	2.34
Final	2.16	2.27	2.38
DMI, lb/d	55.8	53.1	53.8
Milk yield, lb/day	74.5	71.9	70.8
Milk fat %	3.70	3.66	3.59
Milk fat, lb/day	2.8[a]	2.6[ab]	2.5[b]
Milk protein %	3.09	3.06	3.08
Milk protein, lb/day	2.3	2.2	2.2
FCM, 3.5%, lb/day	77.4	74.3	71.9
ECM[4], lb/day	77.2	74.1	71.7
SCC (× 1000)	139	147	60

[1]Values expressed as least square means.
[2]Average of weeks 1 and 2 of treatment period.
[3]Average of weeks 12 and 13 of treatment period.
[4]Energy-corrected milk.
[a,b,c]Values with different superscripts differ $P<.05$.