Direct-Fed Microbials Decreases Dry Matter Intake and Increases Feed Efficiency When Fed to Lactating Holstein Dairy Cows

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Summary and Implications

Dry matter intake, milk production, and milk production efficiency were evaluated in 84 Holstein dairy cows fed either a control diet or a control diet plus the direct-fed microbial Bovamine. Neither milk nor ECM production were affected by feeding Bovamine. Feeding Bovamine, however, decreased DMI by 3.59%, resulting in an improvement in milk production efficiency and ECM production efficiency of 6.1% and 5.3%, respectively. Inclusion of Bovamine in dairy cattle diets should be considered to increase milk production efficiency.

Introduction

Direct-fed microbials (DFM) are sources of live bacterial and fungal microorganisms that are used as feed supplements in the livestock industry. Bovamine is a commercially available DFM consisting of cultures of *Lactobacillus acidophilus* and *Propionibacterium freudenreichii*. Objective of this study was to determine the effect of feeding Bovamine on milk production and feed efficiency of lactating dairy cows. Previous research indicates that DFM variably affect production efficiency. Additionally, in animals in which DFM improve production efficiency, this improvement is obtained through increased production, decreased dry matter intake, or a combination of increased production and decreased dry matter intake.

Our hypothesis is that daily feeding of Bovamine to lactating dairy cows will improve milk production performance. Specific objectives were to investigate the effects of feeding Bovamine on daily feed intake, daily milk production, and milk production efficiency.

Materials and Methods

Eighty-four multiparous (parity 1 to 5) Holstein cows at differing stages of lactation (42 to 121 DIM) were enrolled in the study. Cows had *ad libitum* access to TMR and were acclimated to individual feeding with a Calan gate system for 14 d followed by a treatment period of 85 days. On d 0, cows were assigned randomly to one of two treatment groups: TMR plus lactose (Control; 1 g of lactose per cow per day) and TMR plus Bovamine (Bovamine; 1 g Bovamine per cow per day). Each gram of Bovamine contains a total of 3×10^9 cfu of *Propionibacterium freudenreichii* and *Lactobacillus acidophilus* in addition to a lactose carrier. Lactose and Bovamine was offered to cows once daily by topdressing the TMR with 115 g of ground corn mixed well with 1 g of lactose or Bovamine, respectively. Feed refusals were collected, weighed, and recorded daily to determine daily intake.

Cows were milked three times daily, and daily individual milk production was recorded. Fat, protein, lactose, total solids, milk urea nitrogen, and somatic cell counts were measured in milk samples weekly. The following equation was used to calculate ECM:

$$\text{ECM} = (0.327 \times \text{kg of milk}) + (12.95 \times \text{kg of fat}) + (7.65 \times \text{kg of protein})$$

Statistical analysis of dry matter intake, milk production, ECM production, and milk production efficiency measured daily and milk components measured weekly were analyzed by the mixed procedures of SAS as a randomized complete block experiment with repeated measures. The model included fixed effects of block, treatment, time, and the interaction of treatment and time. Covariates included parity, block, and initial DIM. Cow ID was included as a random variable. Differences were considered significant at $P \leq 0.05$. LSMeans were separated by Tukey-Kramer multiple comparison test.

Results and Discussion

Dry matter intake decreased 3.59% in cows in the Bovamine group compared with that of cows in the Control group ($P < 0.0001$; Table 1). Both daily milk production and daily ECM production, however remained unchanged ($P = 0.3006$ and $P = 0.7376$, respectively) in response to treatment. The decrease in DMI without a change in milk production caused milk production efficiency and ECM production efficiency to increase ($P < 0.0001$ and $P = 0.0296$, respectively) by 6.1% and 5.3%, respectively. Milk fat, lactose, other solids, total solids, MUN, and SCC were not altered in the Bovamine group ($P > 0.05$; Table 2). Milk protein was decreased ($P = 0.0103$) in the Bovamine group compared with that in the Control group.

Although the mechanism for improvement in milk production and ECM production efficiency is not known, these data indicate that feeding Bovamine to lactating dairy cattle may have economic benefits within the dairy industry by improving milk production efficiency in dairy cattle.

Acknowledgments

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Table 1. Effect of Bovamine on dry matter intake (DMI), milk production, energy corrected milk (ECM) production, milk production efficiency, and ECM production efficiency.

				P-Values		
Item	Control[1]	Bovamine[2]	SE	Trt	Time	Trt x Time
DMI, kg/d	25.36	24.45	0.21	< 0.0001	< 0.0001	0.7889
Milk, kg/d	40.5	41.07	0.59	0.3006	< 0.0001	0.9884
ECM, kg/d	41.27	40.94	1.03	0.7374	< 0.0001	0.2483
Feed efficiency, kg milk/kg DM	1.625	1.724	0.023	< 0.0001	< 0.0001	0.7445
Feed efficiency, kg ECM/kg DM	1.632	1.718	0.042	0.0296	< 0.0001	0.7218

[1]1 g/cow per day of lactose.
[2]1 g/cow per day of Bovamine.

Table 2. Effect of treatment on milk composition.

				P-Values		
Item	Control[1]	Bovamine[2]	SE	Trt	Time	Trt x Time
Protein, %	2.832	2.757	0.030	0.0103	< 0.0001	0.8653
Fat, %	3.735	3.681	0.083	0.4910	< 0.0001	0.8778
Lactose%	4.875	4.855	0.022	0.3317	0.1911	0.9895
Other solids, %	5.771	5.747	0.023	0.2478	0.2737	0.9897
Total solids	12.33	12.18	0.11	0.1305	0.0001	0.9844
MUN[3]	12.73	12.61	0.22	0.5751	< 0.0001	0.9474
SCC[4]	408.99	349.79	46.51	0.1712	0.7031	0.6475

[1]1 g/cow per day of lactose.
[2]1 g/cow per day of Bovamine.
[3]Milk urea nitrogen.
[4]Somatic cell count.