1-1-2000

Sugar Beet Pulp and Corn Silage for Growing Yearling Steers

Jessica Park
University of Nebraska-Lincoln

Ivan G. Rush
University of Nebraska-Lincoln, irush1@unl.edu

Burt Weichenthal
University of Nebraska-Lincoln, bweich@comcast.net

Sugar Beet Pulp and Corn Silage for Growing Yearling Steers

Jessica Park
Ivan Rush
Burt Weichenthal[1]

Feeding pressed beet pulp reduced dry matter intake but feed conversion improved compared to corn silage in growing diets fed to yearling steers.

Summary

British crossbred steers with an average weight of 735 lb were fed in a 92-day growing trial. Silo Guard II®, an additive containing an amylase enzyme and sulfur salts, was used to treat corn silage and beet pulp. Cattle received either untreated corn silage, treated corn silage, or treated corn silage and treated beet pulp (35% of ration DM). Average daily gains were not significantly different between treatments. Dry matter intake was lower with the diet containing beet pulp, resulting in a better feed conversion compared to the treated and untreated corn silage diets.

Introduction

Sugar beet pulp is a byproduct of the sugar beet industry and it has a highly digestible fiber fraction, making it a good energy source for cattle. The pulp is mechanically pressed at the factory to increase the dry matter content to about 24%. Replacing corn silage dry matter with increasing levels of pressed beet pulp increased daily gain and improved feed efficiency in growing steer calves (1992 Nebraska Beef Report, pp. 24-25). Replacing all of the corn silage in a finishing diet (10% of diet DM) with beet pulp resulted in similar daily gains and a trend toward improved feed efficiency in steer calves during finishing (1993 Nebraska Beef Report, pp. 48-49).

Several types of products have been used to treat corn silage at ensiling time in attempts to reduce storage losses and improve cattle performance. One of those products is Silo Guard II®, a registered trademark from International Stock Food Corporation, Marietta, GA. Silo Guard II® contains an amylase enzyme and sulfur salts as the active ingredients. Amylase is involved in the breakdown of starch to produce organic acids which are needed for preservation of ensiled feeds like corn silage. Pressed sugar beet pulp has about 76% moisture and ferments during storage, but data from treating beet pulp at ensiling with products to enhance fermentation are not available. Objectives of this trial were to evaluate performance of yearling steers fed growing rations that included corn silage treated or untreated with Silo Guard II® or a mixture of corn silage and sugar beet pulp when both were treated with Silo Guard II®, and to measure dry matter storage losses in corn silage.

Procedure

One hundred and twenty British crossbred yearling steers with an average weight of 735 lb were used in a 92-day growing trial. The steers were weighed individually on two consecutive days at initiation and conclusion of the trial. Weights were taken approximately every 28 days. The steers were randomly assigned to one of 12 pens. Three diet treatments then were randomly assigned to the 12 pens, which resulted in four replications per treatment with 10 steers per pen. The three diet treatments were: untreated corn silage (CON), treated corn silage (TCS), and treated corn silage with treated beet pulp (TCS/BP) where beet pulp replaced 35% of the corn silage dry matter. The remainder of the diet was made up of alfalfa hay and a protein supplement. The diets were formulated to be isonitrogenous with a crude protein level of 13.9%. This level is more than adequate in metabolizable protein according to the 1996 NRC Nutrient Requirements of Beef Cattle. This level was set so the energy differences in the beet pulp and corn silage could be evaluated without concern for protein level. The diet compositions are shown in Table 1. At the beginning of the trial, the steers were implanted with Synovex-S. Two steers were removed from the trial. Reasons for removal were not related to the treatments.

Three concrete bunker silos were used to store the untreated corn silage, treated corn silage and treated beet pulp. The corn silages were harvested on Sept. 9 and 10, 1998. The corn silage was treated with liquid Silo Guard II® in the field on the forage harvester at 1 lb/ton of corn silage. The beet pulp was hauled fresh from the factory and treated with Silo Guard II® at 2.5 lb/ton by scattering dry product on top of the pulp before and after dumping at the bunker. The corn silage was pushed into each bunker and packed with a tractor while the beet pulp was pushed into the bunker with a loader,

Table 1. Composition of diets and calculated nutrient analyses.

	Treatment[a]		
	CON	TCS	TCS/BP
Diet composition, dry matter basis			
Corn silage, %	69.6	69.6	37.1
Beet pulp, %	0	0	35.0
Alfalfa hay, %	22.4	22.4	22.4
Protein supplement 58, %[b]	5.5	5.5	5.5
Protein supplement 40, %[c]	2.4	2.4	0
Calculated nutrient analysis, dry matter basis			
Dry matter, %	45.6	45.6	36.7
Crude protein, %	13.9	13.9	13.9
NEm, Mcal/cwt	68.4	68.4	71.0
NEg, Mcal/cwt	44.7	44.7	45.2
Rumensin, g/ton	25.0	25.0	25.0

[a]CON = control untreated corn silage, TCS = treated corn silage, TCS/BP = treated corn silage and treated beet pulp.
[b]Supplement contains 58 percent crude protein, air dry basis, with Rumensin at 420 g/ton.
[c]Supplement contains 40 percent crude protein, air dry basis.

Table 2.Performance of yearling steers fed corn silage or beet pulp rations.

	Treatment[a]		
	CON	TCS	TCS/BP
No. of steers	40	40	38
Initial wt, lb	740	734	735
Final wt, lb	1031	1018	1041
Daily gain, lb[b]	3.17	3.09	3.31
Feed intake (DM), lb	23.27[c]	22.51[d]	20.93[e]
Feed/Gain[f]	7.34[c]	7.28[c]	6.32[d]

[a]CON = control, untreated corn silage, TCS = treated corn silage, TCS/BP = treated corn silage and treated beet pulp.
[b]P = .11 for the treatment effect.
[c,d,e]Means with different superscripts on the row are significantly different (P<.05).
[f]Feed efficiency was analyzed gain/feed.

then all three silos were covered with black plastic and tires.

Results

Steer performance by treatment is shown in Table 2. Average daily gain tended to be higher in the TCS/BP treatment (P=.11). The steers consuming the treated and untreated corn silage gained at the same rate. Dry matter intake was considerably lower for the cattle consuming the beet pulp ration with smaller differences between the treated and untreated corn silage rations (P<.05). Cattle consuming untreated silage had the highest dry matter consumption (P<.05). The dry matter content of the corn silage diets was drier than the beet pulp containing diet (45.6% versus 36.7%, respectively). The differences in dry matter content of the diets may have influenced the daily intake. The feed to gain conversions for the treated and untreated corn silage were similar throughout the trial. However, there was a reduction in feed required per unit of gain for TCS/BP (P<.05), and the reduction was consistent throughout the trial. Even though the cattle were eating less dry matter with the TCS/BP diet, the gains were comparable to those for the treated and untreated silage diets.

The improved gain and feed utilization of the cattle consuming beet pulp likely were due to the higher levels of energy in beet pulp compared to corn silage plus the complementary effect of beet pulp in the growing rations. Previous research and chemical analysis indicate that beet pulp has slightly higher energy values. Calculations to determine the comparative value of net energy for gain in corn silage versus beet pulp were made and it was found that the beet pulp was 51% greater. This increase in energy is due to two factors. First, the energy in the fiber of the beet pulp is greater than the combined fiber and starch in corn silage. Second, the fiber in pulp has a complementary effect on energy digestion in the total diet. This is due to the slower rate of digestion of the fiber in pulp, in contrast to the faster breakdown of starch in corn silage, which increases rumen acidity that adversely affects fiber digestion.

The corn silage used in this trial was characterized as well-eared which contains relatively high levels of energy and consequently, the overall gains of all steers in this trial were higher than predicted by the 1996 NRC model. Well-eared corn provides large quantities of nutrients for excellent fermentation when harvested at optimal dry matter levels (33 to 37% DM). The dry matter losses for both the treated and untreated corn silages were 14%. Dry matter storage loss for the treated sugar beet pulp was 13%.

[1]Jessica Park, graduate student; Ivan Rush and Burt Weichenthal, professors, Animal Science, Panhandle Research and Extension Center, Scottsbluff, NE.