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EFFECTS OF PROCESSING WHOLE-PLANT CORN SILAGE ON GROWTH PERFORMANCE AND NUTRIENT DIGESTIBILITY IN FEEDLOT CATTLE

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Summary

Sixty crossbred heifers and 12 crossbred steers were used to evaluate the effects of mechanically processing (crushing the kernels of) whole-plant corn silage on feedlot performance and nutrient digestibility. The three treatments were: preensiled processed, postensiled processed, and nonprocessed corn silages. Heifers fed the processed corn silages grew faster and were more efficient than those fed nonprocessed silage. Steers consuming the two processed silage rations had numerically higher DM, OM, NDF, and ADF digestibilities and significantly higher starch digestibilities than those fed the nonprocessed silage ration. These data suggest that processing whole-plant corn silage before or after ensiling has a positive effect on both rate and efficiency of gain and nutrient utilization, particularly when the kernels approach the black layer stage of maturity.

(Key Words: Mechanically Processed, Corn Silage, Growing Cattle, Feedlot.)

Introduction

Corn silage is important in growing cattle rations throughout the High Plains. It has been suggested recently that processing the whole-plant corn through a forage harvester equipped with a kernel processor could improve growth performance and nutrient digestibility in feedlot cattle. The objective of this study was to evaluate the effect of corn silage processed either at the time of harvest or when removed from the silo in high-silage rations for backgrounding cattle.

Experimental Procedures

Trial 1. Sixty mixed breed, crossbred heifers (avg wt, 591 lb) were used in a completely randomized designed, 80-day growth trial. Three whole-plant corn silage treatments were compared: preensiled processed (PRE), postensiled processed (POST), and nonprocessed (control). The heifers were allocated randomly to one of 15 pens (four head per pen), and the treatments were assigned randomly to blocks of three pens. Dry matter intake, ADG, and feed efficiency were measured. The heifers were weighed individually on 2 consecutive days (February 19 and 20, 1997), and the average was used as the initial weight. Final weights were obtained in the same manner on May 9 and 10, 1997. Each ration contained 90% of the appropriate corn silage and 10% supplement (DM basis). Rations were formulated to provide 13.5% crude protein.

The corn hybrid was Pioneer 3394, which was grown under irrigation during the summer of 1996. A six-row, self-propelled forage harvester (CLAAS Jaguar 880, provided by Taylor Implement, Hoxie, KS) was equipped with an in-line kernel processor, and the corn was harvested in 18-row blocks to remove field variation among the three silage treatments. The whole-plant corn was in the 90% milkline to black layer stage of kernel maturity and contained about 36%

DM. The forage was chopped to a 3/8-inch particle length. Three, 10 × 50 ft concrete stave silos were filled on August 17. One was filled with chopped forage that was put through the kernel processor. Two silos were filled with chopped forage without further processing. Silage from one of them was put through a Roskamp roller mill before feeding (postensiled, processed silage).

Trial 2. Nutrient digestibilities of the three corn silage rations from Trial 1 were determined using 12 ruminally cannulated, yearling steers in a 21-day metabolism study. The steers were tethered via a collar in individual tie stalls in a climate-controlled, metabolism barn. The trial consisted of a 10-day ration adaptation phase and an 8-day total fecal collection phase (two 4-day periods). Each ration was fed once daily ad libitum to four steers.

Results and Discussion

Trial 1. The effect of processing whole-plant corn silage on growth performance of the feedlot heifers is shown in Table 1. DM intake was numerically highest for heifers fed the PRE processed silage and lowest for those fed the POST processed silage. These differences were significant at P<.10 but not at P<.05. Heifers fed either the PRE or POST processed silages had higher (P<.05) ADGs than those fed the control silage. Feed efficiency (F/G) also was significantly improved by processing the corn silage, either PRE or POST ensiling, with a slight advantage to PRE processing.

Trial 2. The effect of processing whole-plant corn silage on nutrient digestibility in the feedlot steers is shown in Table 2. Steers fed either PRE or POST corn silage rations had numerical improvements in DM, OM, NDF, and ADF disappearance versus those fed the control silage ration. Starch disappearance was significantly higher for the POST silage ration (96.7%) compared to the PRE (94.9%) and control (93.1%) silage rations.

The slight improvement in feed efficiency (Trial 1) and greater starch disappearance (Trial 2) observed for the POST processed versus PRE processed silage were likely due to an increased surface area of the kernel and more starch granules exposed to ruminal degradation in the POST corn silage. Although all kernels were disrupted in both processed corn silages, those in the POST silage had a more "flake-like" appearance.

Table 1. Effect of Processing Whole-Plant Corn Silage on Growth Performance of Feedlot Heifers

Corn Silage Treatment	No. of Heifers	Initial Wt, lb	Daily DM Intake, lb	ADG, lb	Feed/lb of Gain, lb[1]
Pre	20	591	21.2[x]	3.21[a]	6.6[a]
Post	20	591	20.0[y]	3.12[a]	6.4[a]
Control	20	590	20.6[x,y]	2.93[b]	7.0[b]

[1]100% DM basis.
[a,b]Means within a column with different superscripts differ (P<.05).
[x,y]Means within a column with different superscripts differ (P<.10).

Table 2. Effect of Processing Whole-Plant Corn Silage on Nutrient Digestibility in Feedlot Steers

	Digestibility[1]					
Corn Silage Treatment	DM	OM	NDF	ADF	CP	Starch
Pre	75.7	77.5	59.4	54.4	78.8	94.9[b]
Post	75.5	76.7	57.6	54.6	76.5	96.7[a]
Control	74.7	76.3	55.7	54.2	77.4	93.1[b]

[1]DM = dry matter, OM = organic matter, NDF = neutral detergent fiber, ADF = acid detergent fiber, and CP = crude protein.
[a,b]Means within a column with different superscripts differ (P<.05).