Evaluation of Brown Midrib Corn Silage for Growing and Backgrounding Beef Steers

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Summary with Implications

A growing study evaluated three corn silage hybrids for growing crossbred steers. The three hybrids were: a standard corn silage hybrid which served as the control, a brown midrib hybrid, and an experimental brown mid rib hybrid with a softer endosperm. Intake, ADG, and ending BW were greater for steers fed either brown mid rib silage compared to control, but not different between the brown mid rib or experimental brown mid rib silage. While brown mid rib hybrids had greater DMI and ADG, there was no difference in F:G between all three treatments. Feeding brown mid rib hybrids as corn silage at 80% of the diet DM likely improved ruminal digestion, which allowed for greater DMI and ADG but without improving F:G.

Introduction

Feeding corn silage allows cattle feeders to take advantage of the entire corn plant at a time of maximum quality and tonnage as well as secure substantial quantities of roughage/grain inventory (*2013 Nebraska Beef Cattle Report,* pp. 74–75). Incorporating corn silage based growing diets containing 80% corn silage in combination with distillers grains has been shown as a potentially economical and efficient way to grow steers prior to the finishing phase (*2011 Nebraska Beef Cattle Report, pp*. 16–17). However, in corn silage growing diets, gut fill and fiber digestion limit DMI and thus ADG. The brown mid rib (*bm3*) mutation has been shown in previous research to lower lignin concentrations and improve fiber digestibility. Unfortunately, little research has been done in beef growing diets for corn silage incorporating the *bm3* trait. Research is needed on growth performance as a result of increased fiber digestion due to *bm3* within corn silage.

Table 1. Diet (DM basis) fed to growing steers.

	Treatment[1]		
Ingredient	CON	BM3	BM3-EXP
Control corn silage	80.0	-	-
BM3 corn silage	-	80.0	-
BM3-EXP corn silage	-	-	80.0
Modified distillers grains plus solubles	15.0	15.0	15.0
Supplement[2]	5.0	5.0	5.0

[1.] Treatments were control (CON; hybrid-TMR2R720), a bm3 hybrid (BM3; hybrid-F15579S2), and an experimental bm3 hybrid (BM3-EXP; hybrid-F15578XT) with a softer endosperm

[2.] Supplement consisted of 3.0% Fine ground corn, 0.916% limestone,, 0.574% urea, 0.125% tallow, 0.30 % salt, 0.05% trace mineral package (10% Mg, 6% Zn, 4.5% Fe, 2% Mn, 0.05% Cu, 0.3% I, and 0.05 Co), 0.015% Vitamin A-D-E package (1,500 IU of vit A, 3,000 IU of vit D, 3.7 IU of vit E) as percentages of the final diet (DM basis). Supplement was formulated to provide 200 mg/steer of Rumension® daily.

Therefore, the objective of this experiment was to determine the effect of feeding two *bm3* corn silage hybrids on growing steer performance.

Procedure

Three hybrids of corn silage were grown and harvested at the Eastern Nebraska Research and Extension Center (ENREC) near Mead, NE. The three hybrids were a standard corn silage hybrid which served as the control (CON; hybrid-TMR2R720), a *bm3* hybrid with the brown midrib trait (BM3; hybrid-F15579S2), and an experimental *bm3* hybrid (BM3-EXP; hybrid-F15578XT) with a greater proportion of softer endosperm. Silage was harvested from 9/11/15 through 9/16/15 and stored in concrete wall bunkers until the initiation of the trial. Bunker samples were sampled for DM and fermentation analysis 28 d after harvesting to ensure proper ensiling. All feeds were sampled weekly for DM, and monthly composites analyzed for nutrients.

A 76-day growing study was conducted utilizing 216 yearling crossbred steers (initial BW = 714 ± 22 lb). All steers were limit-fed a common diet consisting of 50% alfalfa hay and 50% SweetBran® at 2% of BW for five days prior to trial initiation to minimize gut fill. Following five days of limit feeding, steers were weighed for two consecutive days. Initial BW was calculated by averaging the two-day weights. Cattle were implanted with Ralgro® during initial processing. Cattle were stratified by BW and assigned randomly to pens with 12 head per pen. Pens were assigned randomly to one of three treatments, with 6 replications per treatment.

The three treatments (Table 1) were set up in a generalized randomized block design. All diets included 15% modified distillers grains plus solubles (MDGS) and 5% supplement. Rumensin was added in the supplement to supply 200 mg / steer daily. The remainder of the diet consisted of 80% corn silage of 1 of the three hybrids (CON, BM3 or BM3-EXP). Ending BW was collected similar to initial BW with steers limit-fed at 2% of BW for five days and weighed for two consecutive days.

Performance data (BW, DMI, ADG, and G:F) were analyzed using the MIXED procedure of SAS (SAS Institute, Inc., Cary, N.C.) with pen serving as the experimental unit. Block was included in the model as a fixed effect. One steer died during the study on the BM3 treatment due to pneumonia and was removed from the data.

Results

Corn silage was targeted to be harvested at 35% DM. However, after fermentation, DM declined slightly (Table 2). The fermentation analysis of the three

corn silage hybrids indicated that proper fermentation did occur as pH was below 3.9, as well as having total acids greater than 7.3%. The starch percentage and the sugar (water soluble carbohydrates) percentage remained consistent across all three silage hybrids. The ADF and lignin concentrations were numerically lower in both the BM3 and BM3-EXP compared to the CON, as expected.

Ending BW was greater ($P < 0.01$) for steers fed the BM3 and BM3-EXP compared to the CON, but not different between the two *bm3* varieties (Table 3). Steers fed both BM3 and BM3-EXP had greater ($P < 0.01$) DMI and ADG compared to the steers on the CON treatment, but DMI and ADG were not different between steers in the BM3 or BM3-EXP treatments. While BM3 and BM3-EXP had greater DMI and ADG, there were no differences ($P = 0.26$) in F:G between the three silage treatments.

Conclusions

Feeding corn silage hybrids with the *bm3* trait at 80% of the diet DM resulted in greater ending BW, DMI and ADG when compared to a control corn silage without the *bm3* trait. Increased gain when feeding corn silage with the *bm3* trait lead to heavier BW out of the growing program or entering the feedlot, which could be advantageous in reducing total feed costs.

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Table 2. Nutrient and fermentation analysis of silage hybrids[1]

	CON		BM3		BM3-EXP	
Nutrient[2]	Mean	CV[3]	Mean	CV[3]	Mean	CV[3]
DM[2]	31.9	6.4	32.4	5.3	33.0	6.9
CP	8.6	3.4	9.6	7.8	9.1	3.9
NDF, %	40.9	4.3	41.0	4.4	39.0	3.6
ADF, %	27.1	2.5	26.7	2.2	23.6	3.0
Lignin, %	4.3	27.5	3.7	24.2	2.81	34.6
Starch, %	31.0	8.8	32.0	8.9	30.8	6.7
Sugar, %	2.3	28.1	2.4	37.8	2.8	22.4
pH	3.89	2.5	3.86	1.9	3.81	6.3
Lactic Acid, %	5.6	17.1	6.2	16.6	6.0	15.6
Acetic acid, %	1.4	31.2	1.6	30.9	1.5	34.4
Propionic acid, %	0.34	40.5	0.43	48.7	0.46	0.54
Butyric acid, %	< 0.01	0.0	< 0.01	0.0	< 0.01	0.0
Total acids, %	7.3	10.4	8.2	11.0	7.9	10.8

[1.] Hybrids were control (CON; hybrid-TMR2R720), a bm3 hybrid (BM3; hybrid-F15579S2), and an experimental bm3 hybrid (BM3-EXP; hybrid-F15578XT) with a softer endosperm

[2.] DM was calculated using weekly samples and oven dried for 48 h at 600 C. All other nutrient assays are based on monthly composites of weekly samples taken during the finishing trial, and analyzed at Dairy One Labs (Ithaca, NY).

[3.] C.V. = coefficient of variation and is calculated by dividing the standard deviation by the mean and is expressed as a percentage.

Table 3. Effects of feeding two different *bm3* corn silage hybrids on growing steer performance.

	Treatments				
Variable	CON	BM3	BM3-EXP	SEM	P-value
Initial BW, lb	714	713	714	0.7	0.80
Ending BW, lb	989[b]	1035[a]	1032[a]	4.9	< 0.01
DMI, lb/d	21.2[b]	24.0[a]	24.1[a]	0.2	< 0.01
ADG, lb	3.62[b]	4.23[a]	4.19[a]	0.06	< 0.01
Feed:Gain[2]	5.86	5.67	5.74	-	0.26

[a,b,c] Means with different superscripts differ ($P < 0.05$).

[1] Treatments were control (CON; hybrid-TMR2R720), a *bm3* hybrid (BM3; hybrid-F15579S2), and an experimental *bm3* hybrid (BM3-EXP; hybrid-F15578XT) with a softer endosperm.

[2.] Feed:Gain was analyzed as gain to feed, the reciprocal of feed:gain.