Effect of Corn Residue Composition on Digestibility by Lambs

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Summary

A lamb digestion trial was conducted to determine the effect of harvest method on total tract digestibility of corn residues. Two residues were harvested using a corn head which gathered 4-rows or 8-rows of stalks with the tailings dropped on the top of the windrow. Corn husks were fed as a control. Diets contained 64.18% corn residue and 35.82% DM of Sweet Bran®, brome grass hay, and sheep mineral. There were no differences in OM, DM, or NDF digestibility between 4-row and 8-row residues. Corn husks had the greatest digestibility.

Introduction

Several harvest technologies have been developed to increase the feeding value of corn residue. One of those new technologies is the New Holland Cornrower, which pulls the recently harvested corn plant through a chute and into a series of rotating blades. After being cut the corn plant travels on a conveyor belt to the center of the combine. The residue is then funneled into a windrow and gathered into a baler. The rows of the Cornrower can be turned on and off so that as little as 2 rows of residue and as much as 8-rows of residue are gathered into the windrow. Previous *in vitro* DM digestibility experiments (*2015 Nebraska Beef Cattle Report*, pp. 62–63) found that IVOMD of 4-row residue (54.3%) was greater than 8-row residue (47.0%). In that study, 8-row residue was four percentage points higher in IVOMD than conventionally harvested corn residue (43.0%). This same IVOMD trial determined that corn husk was 72.4% digestible. The resulting hypothesis is that 4-row residue will have higher total tract DM, OM, and NDF digestibility than 8-row and that husk will have the greatest total tract digestibility. Therefore, the objective of this study was to compare the *in vivo* digestibilities of corn husk with residues harvested using a corn head that collected 4-rows, and 8-rows of stalk.

Procedure

A New Holland Cornrower was used to gather residue from 4 of the 8 rows of the corn head, or all 8-rows. Husks were obtained from seed corn harvest (Hoegemyer Hybrids). Nutrient profiles of the residues are provided in Table 1. The residues were fed to 18 crossbred wether lambs (BW 57.5 lb; SD = 9.8 lb) over three, 16 d periods. Lambs were divided into 3 blocks in a 6 × 3 row-column transformation with 6 treatments, 3 periods, and 3 independent squares (n = 9). A concentrate mixture consisting of 86.4% Sweet Bran®, 9.6% brome grass hay, and 4.0% sheep trace mineral supplement was used in all diets to supplement protein and increase palatability. Diets contained 64.18% corn residue and 35.82% DM of the concentrate mix. Residue was fed *ad libitum*; lambs consumed 1.39% BW of the residue and 0.78% BW of the concentrate mix. Lambs were fed treatment diets in a 9 d adjustment period, and total fecal collections were completed over 7 d. Feces was collected every day at 0700 and at 1600 and lambs were fed once at 0800. Each day's feed intake was recorded and refused feed was weighed and fed back to the same lamb on the following day. Feces were composited from each day of the collection period. An additional 4th period was added during which only the concentrate mix was fed. Lambs were assigned randomly to two treatments during the last period. Half of the lambs were fed 1.5% of BW while the other half were fed 2.5% of BW. Diet compositions are summarized in Table 2.

Each fecal composite was sampled and dried for 48 h in a 60oC oven to determine DM excreted. Each sample was ground through a 1-mm screen using a Wiley mill and analyzed for OM and NDF. Additionally, samples for each ingredient were taken for every period of every block and analyzed for DM, OM, and NDF. Total tract DM, OM, and NDF digestibility of the

Table 1. Nutrient composition of residue samples

	Husk	4-Row	8-Row
DM, %	92.24	90.70	91.11
OM, %	96.40	94.18	92.13
NDF, %	83.99	82.68	87.02

Table 2. Diet Composition (% of DM) fed to crossbred wether lambs

Ingredient	4-Row	8-Row	Husk	Sweet Bran/ Brome
4 Row Residue	64.18	—	—	—
8 Row Residue	—	64.18	—	—
Husk	—	—	64.18	—
Sweet Bran	29.76	29.76	29.76	86.4
Brome	3.31	3.31	3.31	9.6
Sheep Trace Mineral	2.00	2.00	2.00	2.00
Limestone	0.75	0.75	0.75	2.00

Table 3. Effects of dietary treatment on intake and total tract digestibility of DM, OM, and NDF[a]

	Husk	4-Row	8-Row	SEM	*P*-Value
DM					
Intake, %BW	1.37	1.31	1.49	0.06	0.14
Total tract digestibility, %	66.76[b]	49.89[c]	48.51[c]	2.53	< 0.01
OM					
Intake, %BW	1.36	1.29	1.47	0.06	0.14
Total tract digestibility, %	67.92[b]	52.80[c]	56.42[c]	2.37	0.03
NDF					
Intake, %BW	1.04	1.04	1.15	0.09	0.61
Total tract digestibility, %	73.89[b]	56.89[c]	57.58[c]	2.00	0.01

[a]Diets contained 64.18% residue, 29.76% Sweetbran, 3.31% bromegrass hay, and 2.75% supplement. Reported intakes and digestibities are for the residue portion only

concentrate mix fed during period 4 was determined. With these results, amount of DM, OM, and NDF of the feces in periods 1–3 from the concentrate mix was calculated. The remaining feces was from corn residue, and thus the digestibility of only the residue could be calculated. The concentrate mix had digestibility estimates of 74.8, 76.2, and 63.0% for DM, OM, and NDF, respectively.

All data were analyzed using the MIXED procedures of SAS (SAS Inst., Inc., Cary, N.C.). Lamb was the experimental unit, and the model included period as a fixed effect. Lamb and lamb*residue type were included in the random statement. Probabilities less than or equal to alpha ($P \leq 0.05$) were considered significant.

Results

All intakes and total tract digestibilities are reported for only the residue, with the concentrate mix removed (Table 3). Husks were 16.9 percentage units more digestible than 4-row and 18.25 percentage points more digestible than 8-row samples ($P < 0.01$). This demonstrates that the harvest method that increases the amount of husk should increase the digestibility. Husk had greater DM digestibility (DMD) than 4-row or 8-row residues, however there was no statistical difference in DMD between 4 and 8-row samples ($P = 0.36$).

There was a similar result for OM digestibility (OMD). Husk was the greatest OM digestibility (67.9%; $P < 0.01$), while 4-row and 8-row did not differ (52.8% and 56.42% for 4-row and 8-row, respectively; $P = 0.69$). For neutral detergent fiber, husk was 73.9% digestible while 4-row was 56.9%. The, 8-row was 57.6% digestible which is not statistically different from 4-row ($P = 0.94$). Lastly, there was no difference in intake of DM, OM, or NDF among treatments ($P > 0.14$).

The lack of difference in residue digestibility between 4-row and 8-row residues may suggest those samples did not differ in the proportion of corn plant components that were collected. However, the improved digestibility of the husk supports the hypothesis that increasing the proportion of husk in baled residues may increase digestibility.

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