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Effect of Corn Hybrid on Amount of Residue Available for Grazing

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Summary

Twelve corn hybrids were evaluated to determine differences in corn grain yield and crop residue DM. Hybrids did not differ in corn grain yield but differed in amount of stems, leaves, husks, and cobs. Differences also existed in the ratio of corn grain to total residue production and corn grain to leaf and husk, indicating potential differences in plant efficiency independent of the amount of grain produced.

Introduction

Many variables should be considered in the effective management of corn residue as a source of grazed forage. Cattle will select the highest quality parts of corn residue first. Wilson et. al. (*2004 Nebraska Beef Cattle Report*, pp. 13-15) reported that husk (3.6% CP and 67% IVDMD) and leaf (7.8% CP and 47% IVDMD) were more palatable than stem (4.5% CP and 45% IVDMD) and cob (2.2% CP and 35% IVDMD). Fernandez-Rivera and Klopfenstein (1989, *Journal of Animal Science*, 67:597) observed that 65 to 72% of DM utilized was represented by leaf and husk. Therefore, relative amount of plant parts, as well as their quality, could affect performance by grazing animals. The objectives of our research were to determine 1) whether differences exist among hybrids in the amount of residue available for grazing and in the ratio of corn grain to total residue produced, and 2) whether residue from different corn hybrids differs in quality.

Procedure

Hybrids that represented a wide range of production traits were selected from test plots near Paxton and Scottsbluff, Neb. The following hybrids were evaluated at Paxton: Pioneer P0541XR, P1173HR, P1395XR, Dekalb 59-35, 61-04, NK N68B-GT, N74C-3000GT, Croplan Genetic 5757 VT3, Golden Harvest 8211 3000GT, and Midwest Genetics 76482R. Plots received center pivot irrigation and had a silt loam soil type. Dekalb 42-91 and Mycogen 2R416 were produced at Scottsbluff.

The plot contained four rows per hybrid and rows were 30 inches apart. Plants were selected randomly for each hybrid by measuring 100 ft then sampling the 10th plant down, alternating between the four rows for each sample. Each plant was cut at ground level, and the entire plant was collected. Plant density was measured by counting the number of plants present in a 15 ft length of row.

Each plant was sorted into the following parts: stems, leaves (including leaf sheath), husks, cobs, and corn grain. Plant parts were dried in a forced air oven at 140°F to determine DM yield per plant. Plant part samples were composited into five samples per hybrid and analyzed for *in-vitro* organic matter disappearance (IVOMD). IVOMD was determined using a 48-hour incubation of 0.5 g of sample in a 1:1 mixture of McDougall's buffer (1 g/L urea) and rumen fluid collected from ruminally fistulated steers. Samples were incubated in a water bath at 39°C and swirled every 12 hours. After incubation, samples were filtered, dried for 24 hours, and burned in an ash oven to determine the DM and OM content for the calculation of IVOMD.

Results

Corn grain yield among hybrids (251 bu/ac at 15.5% moisture; 11,813 lb/ac ± 319, DM basis) at Paxton were not different. Differences were present between hybrids in the amount of stems, leaves, husks, and cobs (Table 1). Total residue production (sum of stems, leaves, husks, and cobs) was different among hybrids. However, differences also existed in the ratio of corn grain to total residue production and corn grain to leaf and husk, indicating potential differences in plant efficiency. Wilson, et al. (*2004 Nebraska Beef Cattle Report,* pp. 13-15) reported an average of 16 lb leaf and husk produced per bushel grain

Table 1. Composition of corn residue components of 10 corn hybrids (dry matter).

Hybrid[1]	5	8	10	21	25	29	35	38	46	48	SE	*P*-value
Grain[2], bu/ac	257	251	249	266	254	239	246	247	214	231	11	0.23
Stem, lb/ac	4411	4022	3896	3946	3760	3321	4521	4719	5384	4524	199	<0.01
Husk, lb/ac	808	993	828	811	882	984	1009	784	864	610	73	0.01
Leaf, lb/ac	2551	3173	2817	3133	2917	3010	3323	2991	3255	2603	184	0.05
Cob, lb/ac	1386	1628	1305	1396	1471	1387	1702	1412	1297	1123	79	<0.01
Total, lb/ac	9157[a]	9816[ab]	8846[a]	9286[a]	9030[a]	8702[a]	10555[b]	9905[ab]	10782[b]	8860[a]	477	0.02

[1]Hybrids are as follows: 5, Golden Harvest 8211 3000GT; 8, Pioneer P0541XR; 10, Croplan Genetic 5757 VT3; 21, Dekalb 59-35; 25, Midwest Genetics 76482R; 29, NK N68B-GT; 35, Dekalb 61-04; 38, Pioneer P1173HR; 46, Pioneer P1395XR; and 48, NK N74C-3000GT.
[2]15.5% moisture.

Table 2. *In vitro* **organic matter disappearance (%) of 10 corn hybrids from Paxton, Neb.**

Hybrid[1]	5	8	10	21	25	29	35	38	46	48	SE	*P*-value
Husk	60.5	56.8	56.0	56.1	54.5	55.7	56.0	57.0	58.0	58.5	1.1	<0.01
Leaf	51.5	52.1	52.1	50.7	50.8	52.0	49.9	51.8	50.9	51.9	0.6	<0.01
Stem	48.3	47.8	46.4	47.9	46.0	46.7	46.0	47.9	50.4	49.0	1.0	<0.01
Cob	47.1	48.2	46.6	46.9	47.0	45.2	46.8	51.0	49.1	52.6	1.0	<0.01

[1]Hybrids are as follows: 5, Golden Harvest 8211 3000GT; 8, Pioneer P0541XR; 10, Croplan Genetic 5757 VT3; 21, Dekalb 59-35; 25, Midwest Genetics 76482R; 29, NK N68B-GT; 35, Dekalb 61-04; 38, Pioneer P1173HR; 46, Pioneer P1395XR; and 48, NK N74C-3000GT.

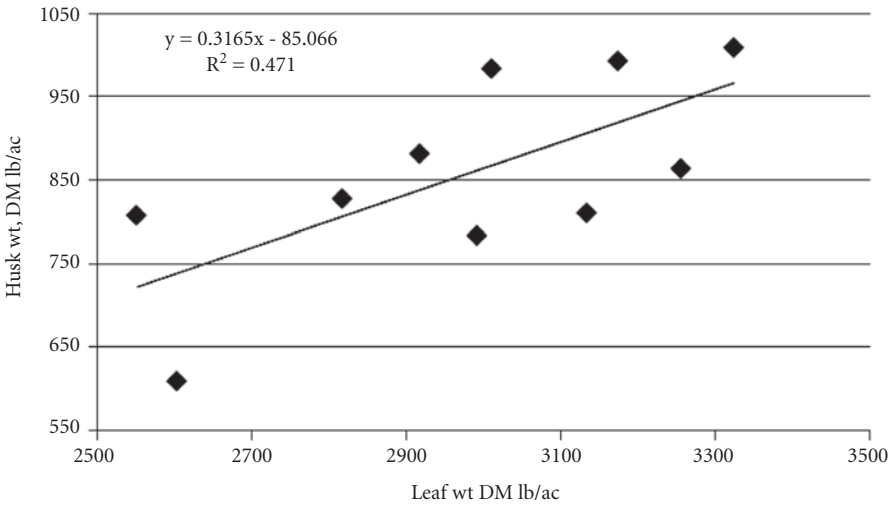

Figure 1. Relationship between leaf and husk weight.

Table 3. *In vitro* **organic matter disappearance of two corn hybrids from Scottsbluff, Neb.**

	Hybrid	
	1[1]	2[1]
Husks[2], lb/ac	806	724
Leaves[2], lb/ac	1296	1475
Stems[2], lb/ac	2073	1820
Cobs[2], lb/ac	984	957
Grain[3], bu/ac	152.2	143.6
***In vitro* Digestibility**		
Husk, %	60.4	61.0
Leaf, %	56.4	57.3
Stem, %	54.5	53.2
Cob, %	46.4	50.8

[1]Hybrids are as follows: 1, Dekalb 42-91; 2, Mycogen 2R416.
[2]Values reported on a dry matter basis.
[3]15.5% moisture.

yield for corn producing 43 to 183 bu/ac. Leaf and husk produced per bushel grain in the current study ranged from 14 to 19 lb. Corn hybrids differed in the amount of residue produced independent of the amount of grain. The correlation was very low (Figure 1).

Since corn hybrids differed in the amount of residue they produced, possible differences exist in the amount of residue available for cattle to graze. The production of leaf and husk ranged from 3,267 to 4,407 lb/ac. A 1,200 lb cow will consume about 785 lb/month in a corn residue grazing situation (DM basis; NRC, 1996). Assuming a 50% utilization of the leaf and husk (*2004 Nebraska Beef Cattle Report,* pp. 13-15) the high and low husk and leaf producing hybrids could support 2.8 and 2.0 cows/ac for one month. If corn residue cost $6.00/ac, this would equate to $2.15 and $2.90/cow monthly for the high and low leaf and husk producing hybrids, respectively. The findings of this study indicate differences in total residue, as well as the ratio of grain yield to total residue, do exist among hybrids. These differences can equate to potential economic differences among hybrids in the grazing value of the corn residue.

There was variation in digestibility among hybrids for the respective plant parts (Table 2). However, the digestibility among hybrids was not consistent across plant parts. Greater digestibility was observed for leaf and husk material compared to stem and cob material, but varied among hybrids. Digestibility of leaf or husk material was not highly correlated with leaf or husk residue weight ($P = 0.45$, $R^2 = 0.07$ for leaf, and $P = 0.23$, $R^2 = 0.17$ for husk). Wilson reported a high correlation between total leaf and husk material (DM lb/ac) and grain yield (bu/acre; *2004 Nebraska Beef Cattle Report,* pp. 13-15), across a wide range of growing conditions and hybrids. However, a relationship among hybrids was not observed in this trial ($P = 0.87$, $R^2 = 0.004$). Husk and leaf weight (DM lb/ac) were correlated (Figure 1; $P = 0.03$, $R^2 = 0.47$); weight of husk material increased as weight of leaf material increased.

The two hybrids at Scottsbluff had lower grain yields (Table 3). The amount of residue was roughly proportional to the grain yield. The amount of leaf plus husk was 14 and 15 lb/bu. The *in vitro* digestibility of the leaves and husks was generally greater than the values for the leaves and husks from Paxton.

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