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Summary

Five commercially available corn hybrids were evaluated for finishing cattle performance and carcass characteristics when fed as high-moisture (HMC) or dry-rolled corn (DRC). No significant interactions were observed between hybrid and processing method. Corn hybrid had no significant impact on ADG or DMI, but did have a minor influence on F:G. However, these data suggested that processing as HMC-method had a greater effect on cattle performance than hybrid.

Introduction

Limited research has evaluated corn hybrid differences across different processing methods. In a study conducted by Macken et al., (*2003 Nebraska Beef Report*, pp. 32-34) two corn endosperm types, floury and flinty, were fed as high-moisture or dry-rolled corn. Their results indicated hybrids fed as high-moisture corn were more efficiently used than those fed as dry-rolled corn, and that the flintier hybrids were improved more by processing than the floury type. Our objectives were to evaluate the influence of corn hybrid, processing method, and any interaction between hybrid and processing method on finishing cattle performance and carcass characteristics.

Procedure

Grain Production

Five commercially available corn hybrids were selected based on prior research (*2005 Nebraska Beef Report*, pp. 45-47) to be grown for a finishing trial. The trial was designed as a 2×5 factorial, with five corn hybrids fed as either high-moisture (HMC) or dry-rolled corn (DRC). Hybrids were selected to represent a wide variety of kernel characteristics, including kernel weight and hardness. The selected hybrids were H-8562, H-8803Bt, H-9230Bt, H-9485Bt (Golden Harvest Seeds Co., Waterloo, Neb.), and 33P67 (Pioneer Hybrids, Johnston, Iowa). Grain was grown at the University of Nebraska's Agricultural Research and Development Center in two similar irrigated fields with identity preservation maintained throughout the growing season, storage, and feeding. Corn being used for DRC was harvested in early October and was targeted to be 85% DM. HMC was harvested in early September and was targeted to be 73% to 74% DM. After the high-moisture corn was harvested, DM was analyzed. H-9230Bt contained the most moisture at harvest (69.5% DM), 33P67 contained the least moisture (74.6% DM), with H-9485Bt, H-8562, and H-8803Bt being intermediate (73.9%, 72.4%, and 72.4% DM respectively). Whole grain for the dry-rolled treatments was stored in individual bins throughout the trial, and corn was trucked to the feed mill to be rolled as necessary. High-moisture corn was rolled at harvest and ensiled in separate ensiling bags and removed as necessary for feeding.

Kernel Characteristics

Upon dry corn harvest, grain samples were collected for kernel characteristic analysis. Grain was cleaned to remove cracked kernels and other debris, so a whole kernel sample could be analyzed. One thousand kernels were counted using an automated seed counter and weighed to obtain an air dry kernel weight measurement. This measurement was then adjusted based on DM to determine a dry 1,000 kernel weight. Also a Stenvert Hardness Test was conducted on each sample (procedure detailed in *2006 Nebraska Beef Report*, pp. 43-44). All hybrids were replicated twice for each kernel measurement.

Feedlot Procedure

Crossbred yearling steers (n = 475, 837 lb BW) were used in a 2×5 factorial design, with factors of processing method and corn hybrid. Cattle were limit fed 2% of BW for 5 days, prior to being weighed two consecutive days, at trial initiation, in order to obtain initial BW. Cattle were stratified by BW into two blocks, and then randomly assigned to 1 of 60 pens (eight steers/pen). Treatments (n = 10) were assigned randomly to pens, with a total of 6 pens/treatment. Diets consisted of 67.5% corn, 20% wet corn gluten feed (Sweet Bran®, Cargill Inc. Blair, Neb.), 7.5% alfalfa hay, and 5% supplement (all DM basis). Corn gluten feed was added to the diet in order to limit digestive upsets, considering the HMC treatments contained high levels of rapidly fermentable starch. Diets were formulated using the lowest protein value of any corn, 8.88% CP, in order to eliminate any differences in performance being attributed to protein differences. The supplement, which was identical across treatments, included 0.44% urea and was formulated to provide 90 mg/head/day Tylan® and 320 mg/head/day Rumensin®. Cattle were fed once daily and were allowed ad libitum access to feed and water throughout the trial. On day 22, cattle were implanted with Revalor S® and fed either 127 days (heavy block) or 134 days (light block). Cattle were weighed off trial on the morning of shipping, and loaded out in the early evening. All cattle were harvested at a commercial abattoir (Greater Omaha, Omaha, Neb.) with the sequence, liver scores and HCW collected on the day of harvest. Following a 48 h chill, 12th rib fat thickness, ribeye area, kidney pelvic and heart fat, and USDA marbling

Table 1. Kernel characteristics for all corn hybrids.

Variable	H-9485Bt	H-8562	33P67	H-9230Bt	H-8803Bt	*P*-value[d]
Kernel wt., g	369.32[a]	364.46[a]	327.13[b]	320.68[bc]	299.07[c]	<0.01
Yield, bu/ac	210.9	197.4	218.6	190.32	207.1	
Stenvert Hardness						
Grind Time, s	6.5	6.0	7.5	7.2	6.7	0.68
RPM	2698	2703	2640	2621	2662	0.99
Soft height, cm	7.7	8.6	6.9	7.8	7.7	0.21
Total height, cm	10.8	11.6	10.4	11.2	10.5	0.25
Soft height, %	70.77	74.43	66.17	69.81	73.08	0.21
Hard, %	75.83	74.09	77.88	77.42	75.83	0.65

[a,b,c]Means within a row with unlike superscripts differ ($P < 0.05$).
[d]*P* - value for the effect of hybrid.

Table 2. Effect of processing method on finishing performance and carcass characteristics.

Variable	HMC	DRC	*P*-value	hybrid * processing
Performance				
Initial BW, lb	837	837	0.88	0.79
Final BW, lb	1362	1351	0.17	0.90
DMI, lb/d	24.9	25.7	<0.01	0.51
ADG, lb	4.02	3.95	0.18	0.74
F:G	6.17	6.49	<0.01	0.49
Carcass Characteristics				
HCW, lb	858	851	0.17	0.68
Marbling score[a]	517	507	0.21	0.71
12th rib fat, in	0.54	0.51	<0.01	0.71
KPH %[b]	2.02	2.01	0.54	0.26
Ribeye area, in^2	13.41	13.19	0.05	0.74
Yield grade[c]	3.23	3.17	0.27	0.85

[a]Marbling score: 450 = Slight50, 500 = Small00 etc.
[b]KPH % = kidney, pelvic, and heart fat %
[c]Calculated yield grade = Calculated as: yield grade = 2.5 + (2.5*12th rib fat) + (0.2*KPH%) + (0.0038*HCW) - (0.32*ribeye area).

Table 3. Effect of corn hybrid on finishing performance and carcass characteristics.

Variable	H-9485Bt	H-8562	33P67	H-9230Bt	H-8803Bt	*P*-value
Performance						
Initial BW, lb	836	838	836	839	834	0.45
Final BW, lb	1364	1362	1353	1354	1349	0.66
DMI, lb/d	25.2	25.2	25.3	25.2	25.5	0.92
ADG, lb	4.05	4.01	3.97	3.95	3.95	0.70
F:G	6.20	6.27	6.39	6.39	6.44	0.12
Carcass Characteristics						
HCW, lb	860	858	852	853	850	0.66
Marbling score[a]	506	514	512	512	514	0.95
12th rib fat, in	0.52	0.54	0.53	0.53	0.52	0.82
KPH %[b]	2.01	2.00	2.03	2.01	2.02	0.89
Ribeye area, in^2	13.45	13.21	13.42	13.29	13.15	0.36
Yield grade[c]	3.17	3.24	3.18	3.20	3.22	0.88

[a]Marbling score: 450 = Slight^{50}, 500 = Small^{00} etc.
[b]KPH % = kidney, pelvic, and heart fat %.
[c]Calculated yield grade = Calculated as: yield grade = 2.5 + (2.5*12th rib fat) + (0.2*KPH%) + (0.0038*HCW) - (0.32*ribeye area).

scores were collected. Using HCW, ribeye area, 12th rib fat thickness, and kidney, pelvic and heart fat, the yield grade was calculated.

Statistical Analysis

All data were analyzed using the MIXED procedure of SAS (SAS 9.1, SAS Inst., Cary, N.C.). Kernel traits were evaluated as dependent variables upon hybrid. Correlations between kernel traits and feed efficiency were also analyzed. Pen was used as the experimental unit, with block, hybrid, processing, and hybrid*processing interactions run as fixed effects. If a significant interaction between hybrid and processing method was observed, then only the simple effects were reported. However, if the interaction was not significant, the main effects of hybrid and processing method were presented separately.

Results

Kernel Characteristics

Kernel characteristics among hybrids are summarized in Table 1. Kernel weight was the only trait significantly affected by hybrid, with hybrids H-9485Bt and H-8562 being the heaviest (369 and 364 g, respectively). H-8803Bt was the lightest (299 g) and H-9230Bt and 33P67 were intermediate (320 and 327 g, respectively). Hybrids showed numeric differences in grain yield; however, these differences could not be analyzed because this trial was not designed to evaluate yield differences. Hybrid 33P67 had the highest yield (218.6 bu/ac), hybrid H-9230Bt had the lowest yield (190.3 bu/ac), and hybrids H-9485Bt, H-8803Bt, and H-8562 being intermediate (210.9 bu/ac, 207.1 bu/ac, and 197.4 bu/ac, respectively).

Finishing Performance

No significant hybrid*processing interactions were observed for any finishing performance or carcass characteristics; therefore, the main effects of hybrid and processing method will be presented. Processing method affected finishing performance and carcass characteristics (Table 2). Cattle fed DRC had greater ($P < 0.01$) DMI compared to HMC fed cattle. Also, F:G was improved ($P < 0.01$) by 5.2% for cattle fed HMC compared to those fed DRC. The HMC fed cattle had greater 12th rib fat thickness ($P = 0.02$) compared to cattle fed DRC. Cattle fed HMC also had a larger ribeye area ($P = 0.05$); however, this increase in ribeye area did not affect calculated yield grade.

Table 3 summarizes the hybrid effects on finishing performance and carcass characteristics. No significant hybrid effects were observed for DMI or ADG. There was a trend

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(P = 0.12) for a hybrid effect on F:G, with H-9485Bt being the most efficiently used, and H-8803Bt being the least efficiently used hybrid, with H-8562, H-9230Bt, 33P67 being intermediate.

Based on previous research (*2006 Nebraska Beef Report,* pp. 38-39) we expected an interaction between hybrid and processing method, however this did not occur, and we are not sure why no interaction was observed. We did however observe better feeding values for all hybrids when processed as HMC compared to DRC. The greatest improvement in conversion was found for H-8803Bt (8.53%), with the least improvement for 33P67 (2.26%), with H-9230Bt, H-8562, and H-9485Bt intermediate (5.65%, 4.82%, 4.25%, respectively) when processed as HMC compared to DRC.

Kernel weight was the only significant ($P < 0.02$) kernel characteristic, with a strong relationship to efficiency (r = 0.94). This relationship indicates that as kernel weight increases, efficiency improves as well. This finding was similar to the results found by Jaeger (*2004 Nebraska Beef Report,* pp. 54-57).

The results of this study suggest hybrid and processing method do not interact in finishing diets. This observation suggests that if one hybrid is better than another when fed as DRC, it should also be better when fed as HMC. There were also few significant effects of corn hybrid on finishing performance. These results agree with numerous studies that HMC is an effective way to improve feed conversion compared to DRC. The results also suggest that kernel characteristics, especially kernel weight, may predict feeding value for feedlot cattle.

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