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Performance of Growing Cattle Fed Corn Silage or Grazing Corn Residue from Second Generation Insect-Protected (MON 89034), Parental, or Reference Corn Hybrids

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Summary

Effects of feeding second generation insect-protected transgenic corn (MON 89034) on growing steer performance was evaluated in two experiments. In Experiment 1, a corn silage-based diet was fed to growing steers in pens, and the transgenic test hybrid was compared to a non-transgenic parental hybrid and two commercially available reference hybrids. In Experiment 2, steers grazing corn residue of the transgenic test hybrid were compared to steers grazing a non-transgenic parental hybrid. In both experiments, growing performance was not affected by source of corn silage or residue.

Introduction

Given that the majority of domestic corn production is used for livestock feed and the highest percentage is fed to feedlot cattle, it is important for producers to know if cattle perform similarly when fed transgenic corn compared to non-transgenic corn. Furthermore, it is also essential to see comparable results when grazing transgenic crop residue or feeding transgenic silage in growing situations.

The objective of Experiment 1 was to compare the performance of growing steers fed second generation insect-protected corn silage (MON 89034) with the non-transgenic parental hybrid (DKC 63-78) and two non-transgenic reference hybrids (DKC 61-42 and DKC 62-30). The objective of Experiment 2 was to compare the performance of steers grazing the insect-protected (MON 89034) corn residue with that of steers grazing the non-transgenic parental hybrid (DKC 63-78).

Procedure

Experiment 1

Animals. Crossbred British x Continental steers (n = 240; initial BW = 614 ± 44 lb) were used in a randomized complete block design experiment. Steers were received at the University of Nebraska Agricultural Development and Research Center (Ithaca, Neb.) during the fall of 2009. Steers were weighed and vaccinated (Bovishield Gold 5, Somubac, Dectomax) and treated with Micotil (Elanco Animal Health) on arrival. Following a 14- to 21-day receiving period, steers were limit fed five days to minimize variation in rumen fill. The limit fed ration contained a 1:1 ratio of wet corn gluten feed and alfalfa hay fed at 2% BW. Steers were weighed individually on two consecutive days in the morning before feeding to obtain an accurate initial BW. Steers were blocked by BW, stratified within block, and assigned randomly to 1 of 20 pens based on day 0 BW. Pens were then assigned randomly to one of four treatments. Diets for each treatment are shown in Table 1.

Treatments. Treatments consisted of two reference hybrids, a non-transgenic parental hybrid, and the second-generation Bt hybrid (MON 89034). All corn was grown at the Agricultural Research and Development Center near Ithaca, Neb., under identity preserved methods. All hybrids were cut for silage at similar moisture levels (34.2% DM ± 2.1%) and stored in silo bags by hybrid. Samples of all hybrids were collected and sent to Monsanto Company, where the presence or absence of the genes was verified.

Table 1. Growing Diet Composition (%DM).[1]

Ingredient	MON	PAR	REF1	REF2
Corn silage W				80.0
Corn silage X	80.0			
Corn silage Y		80.0		
Corn silage Z			80.0	
WDGS	15.0	15.0	15.0	15.0
Supplement[2]				
Fine ground milo	3.006	3.006	3.006	3.006
Limestone	0.916	0.916	0.916	0.916
Salt	0.300	0.300	0.300	0.300
Urea	0.574	0.574	0.574	0.574
Tallow	0.125	0.125	0.125	0.125
Trace mineral	0.050	0.050	0.050	0.050
Vitamin A-D-E	0.015	0.015	0.015	0.015
Rumensin-80	0.014	0.014	0.014	0.014
Nutrient composition				
CP	13.3	12.6	12.7	13.4
NDF	39.4	35.7	33.0	36.3
Ca	0.67	0.53	0.54	0.70
P	0.28	0.27	0.27	0.36
K	0.78	0.78	0.89	0.82

[1]REF1 = reference hybrid DKC 61-42, REF2 = reference hybrid DKC 62-30, PAR = non-transgenic parental hybrid, MON = corn silage containing Cry1A.105 and Cry2Ab2 proteins (MON 89034).
[2]Formulated to provide 200mg/head/day.

Table 2. Growing Performance on Corn Silage-based Diet for 86 days.[1]

Variable	MON	PAR	REF1	REF2	*P*-value
Initial BW, lb	613	616	612	614	.01
Ending BW, lb	925	927	925	919	.53
DMI, lb/day	20.4	20.8	20.9	20.8	.40
ADG, lb	3.63	3.62	3.64	3.54	.56
F:G[2]	5.62	5.74	5.75	5.89	.25

[1]REF1 = reference hybrid DKC 61-42, REF2 = reference hybrid DKC 62-30, PAR = non-transgenic parental hybrid, MON = corn silage containing Cry 1A.105 and Cry2Ab2 proteins (MON 89034).
[2]Analyzed as gain:feed, reported as feed:gain.

Table 3. Grazing Performance.

	MON	PAR	SEM	*P*-value
Initial BW, lb	547	550	1	.07
Ending BW, lb	567	566	4	.89
ADG, lb	0.52	0.39	.06	.20

MON = corn containing Cry1A.105 and Cry2Ab2 proteins (MON 89034), PAR = non-transgenic parental hybrid.

Prior to experiment initiation, corn silage samples were collected and sent to a commercial laboratory (Romer Labs, Union, Mo.) to test for the presence of mycotoxins. Small amounts of Deoxynivalenol (Vomitoxin) and Zearalenone were found in the test hybrid (MON) and the non-transgenic parental hybrid (PAR) silage. In all samples, the amount of mycotoxins present was well below the level for concern. Ingredient and diet samples were collected weekly, composited by month, and sent to a commercial laboratory (Dairy One, Ithaca, N.Y.) for nutrient analysis.

Data were analyzed using the MIXED procedures of SAS (SAS Institute, Cary, N.C.). Pens were the experimental unit (5/treatment). Block was treated as a fixed effect in the model. Only one replication was included in the heavy block, with four replications in the other weight block. Data were analyzed and statistics are based on this analysis. However, least square means are not presented due to adjustment for unequal replication of blocks. Arithmetic means are presented by treatment (Table 2).

The study was blind to feedlot personnel. Each hybrid was assigned a letter before beginning the trial. All treatments, silage bags, pen assignments, feed sheets, and observation documents were designated by letter to limit possible partiality to treatment.

Experiment 2

Animals. Crossbred British x Continental steers (n = 64; initial BW = 549 ± 17 lb) were used in a completely randomized design experiment. Prior to initiation of the trial, steers were limit fed five days to minimize variation in rumen fill (1:1 blend of wet corn gluten feed and alfalfa hay at 2% BW). Individual weights were taken on two consecutive days in the morning before feeding to obtain an accurate initial BW. Steers were stratified by BW recorded on day 0 and assigned randomly to a paddock (8 steers/paddock) and treatment. Steers were fed a supplement (2.5 lb/steer daily) formulated to meet protein requirements. The supplement was dry distillers grain-based (93.8%) and included limestone, tallow, Rumensin-80, trace minerals, selenium, and vitamin A-D-E.

Treatments. Treatments consisted of two 30.7-acre fields separated into four 7.7-acre paddocks per field. The fields consisted of corn crop residue from either the second generation insect-protected corn (MON 89034) or the non-transgenic parental hybrid (DKC 63-78).

Residual corn from each paddock was estimated by sampling three random 300 x 2.5 ft strips. Whole and partial ears were collected and shelled to determine bushels of acre residual corn for each paddock and hybrid. Shelled corn was dried in a 60°C oven for 48 hours to determine DM/acre of residual corn. Downed corn in MON 89034 paddocks was estimated at 101.0 lb DM/ac or 2.41 bu/ac. Estimates of downed corn in the PAR paddocks were 103.3 lb DM/ac or 2.48 bu/ac.

Data were analyzed using the MIXED procedures of SAS (SAS Institute, Cary, N.C.). Paddocks were the experimental unit (4/treatment).

Due to adverse winter weather conditions, the experiment ended on day 40, earlier than originally planned. One steer from MON treatment died due to weather related stress on day 39 and was removed from experiment analysis.

Results

Growing performance is shown in Table 2. No significant differences were observed. Because initial BW was statistically different, it was used as a covariate of analysis. Across-treatment averages were 20.7, 3.61, and 5.75 for DMI, ADG, and F:G, respectively. Steers fed MON were numerically the most efficient at 5.62 F:G. Cattle fed silage-based growing rations had very good DMI, ADG, and F:G due to good feeding conditions from February to May. No statistical differences were observed in grazing experiment performance (Table 3).

Cattle in this trial were not affected by source of corn, whether grazing residue or fed silage from transgenic or non-transgenic hybrids. Intake and ADG were numerically similar and certainly suggest no performance problems in the feeding value of transgenic corn when compared to non-transgenic corn. Mon 89034 is nutritionally equivalent to non-transgenic corn.

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