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The feeding value of corn residue or silage is similar between Bt and nonBt corn hybrids.

Summary

Two trials were completed to evaluate the efficacy of Bt corn hybrids for growing steers. After grain harvest, trial 1 used two fields of N7333 Bt and nonBt corn to evaluate grazing performance and preference of growing steers. Trial 2 compared early and late maturing varieties (N4242 and N7333, respectively) of Bt and nonBt corn hybrids in corn silage-based growing diets. No differences in performance or grazing preference were observed between N7333 Bt or nonBt residue. Steers fed corn silage from hybrids N4242 gained 11% faster (P>.01) and were 7% more efficient (P>.01) than those fed N7333 hybrids. Effects of the Bt trait in the corn silage growing study were inconsistent between hybrids.

Introduction

Bt corn hybrids have been genetically engineered to control European corn borer without pesticide use. Corn residue and corn silage are commonly used as feedstuffs for growing cattle. The objectives of this research were to 1) compare corn residue from a Bt and near-isogenic nonBt corn hybrid on performance and grazing preference, and 2) compare corn silage from two Bt corn hybrids and their near-isogenic counterparts on performance of growing beef steers.

Materials and Methods

Experiment 1

Sixty-seven large framed steer calves (625 lb) were used in a two-part 70-day grazing trial. Thirty acres of later maturing Novartis N7333 Bt and 28 acres of nonBt corn residue were divided into six pastures (3 Bt and 3 nonBt) and then stocked with 51 steers. To achieve equal stocking rates (.69 AUM/acre), the three nonBt pastures were each assigned eight steers and the three Bt pastures were each assigned nine steers. Prior to grazing, residual corn (bushels/acre) was estimated by counting full and partial ears in each of the six pastures. Steer weights were taken for two consecutive days at the start and finish of the trial after a three-day period of limit-feeding to equalize gut fill. The second component of experiment one evaluated grazing preference for Bt and nonBt corn residue. Sixteen steers grazed one pasture containing equal acres of Bt and nonBt corn residue for 70 days. Animals were observed once daily between 6 and 9 a.m., and numbers of animals grazing Bt and nonBt residue were recorded. All steers (performance and preference experiments) received an equal amount of protein supplement (1 lb as fed/hd/d) to ensure protein did not limit performance.

Experiment 2

One hundred twenty-eight medium-framed steer calves (620 lb) were used in a completely randomized design with a 2x2 factorial arrangement of treatments. Early vs late maturing varieties of Bt and non-Bt corn hybrids (N4242 and N7333, respectively) were grown under similar agronomic conditions. Silages were harvested at 3/4 milk line in the grain, and stored separately in large plastic Agbags®. Silages were ensiled approximately 100 days prior to initiation of the experiment.

Sixteen pens were used with eight steers per pen and four replications per treatment. Corn silage growing diets contained 90% corn silage and 10% supplement (DM basis, Table 2). The supplements were formulated for adequate degradable intake protein (DIP), undegradable intake protein (UIP), vitamins, and minerals based on the 1996 NRC Nutrient Requirements of Beef Cattle. All diets contained 20 g/t Rumensin®. Steers were implanted with Ralgo Magnum®, and fed for 101 days. Weights were taken on two consecutive days at the initiation and end of the experiment with interim weights taken approximately every 35 days. Initial and final weights were obtained following a three-day period of equalized intake (2% of BW; DM basis) to minimize differences in gut fill.

Results and Discussion

Experiment 1

Grain yield for N7333 Bt was 184 bu/acre and was 182 bu/ac for the N7333 nonBt. These two corn fields were approximately 75% pivot irrigated and 25% dryland. Results of the grazing trial indicated no difference in steer performance due to incorporation of the Bt trait (Table 1). Previous Nebraska research has demonstrated a high correlation (r=.79)between residual corn and daily gain of steers grazing corn residue (Jordan et al., 1997). Low European corn borer pressure and

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good harvesting conditions contributed to the low amount of residual corn (1.0 and 1.5 bu/acre, Bt and nonBt respectively), which is typically 2-4% of the corn yield . These conditions also contributed to lower than expected daily gains. Previous research and experience at the University of Nebraska would predict the average daily gain to be .9 to 1.2 lbs/day.

There was no preference (F-test; P=.51) in grazing distribution between Bt and nonBt varieties. During the grazing period, 47.5% of the steers were observed grazing Bt residue, and 52.5% of the steers were observed grazing nonBt residue (Table 1).

Experiment 2

Corn grain and silage yield data are summarized in Table 3. These dryland fields showed a greater difference in grain yield between the Bt and nonBt varieties. Corn borer infestation data are also summarized in Table 3. These measurements were taken from Aug. 28 through Sept. 1, 1998. The nonBt corn fields did incur some degree of European corn borer infestation. Results from six strip trials in various locations across the state showed an average of an 11% infestation rate (B. Siegfried, University of Nebraska Entomology Department, personal communication).

Results for the silage growing study are summarized in Table 4. Dry matter intake was higher (P=.02) for steers fed the Bt hybrids compared with nonBt hybrids. Additionally, N4242 tended (P=.09) to have a higher dry matter intake compared to N7333. An interaction (P< .05) was observed for daily gain and feed efficiency between corn hybrid and incorporation of the Bt trait. Daily gain was increased 7% (P <.05) when N4242 Bt was fed compared to its near-isogenic nonBt counterpart. In contrast, incorporation of the Bt trait into N7333 depressed daily gain by 4% (P =.09) when compared with its near-isogenic nonBt counterpart. Feed efficiency was improved 4% (P =.11) in steers fed N4242 Bt, compared with N4242 nonBt. Steers fed N7333 nonBt were 8% (P <.05) more efficient than those fed the N7333 Bt. Although the

Table 1. Performance and grazing preference of growing steers grazing Bt and nonBt corn residue in Experiment 1.

Item	Bt	nonBt	SEM	P-Value
Performance				
Initial wt, lb	626	626	.77	.89
End wt, lb	664	675	4.5	.15
ADG lb/day	.54	.70	.06	.12
IVDMD[a], %	33	36	.7	.04
Residual corn bu/acre	1.0	1.5	—	—
Grazing Preference				
Distribution[b], %	47.5	52.5	5.2	.51

[a]*In vitro* dry matter digestibility measured using modified procedures of Tilley and Terry (1963).
[b]Percentage of steers observed grazing Bt or non Bt corn residue.

Table 2. Composition of corn silage diets fed to growing steers in Experiment 2.

Ingredients (DM%)	N4242 Bt and nonBt		N7333 Bt and nonBt	
Corn Silage	90.0		90.0	
Supplement	10.0		10.0	
Supplement Composition (%)				
Soybean Meal	65.00		75.00	
Sorghum Dry Roll	11.58		0.00	
Urea	8.50		10.00	
Limestone	8.23		8.47	
Salt	3.00		3.00	
Tallow	2.20		2.20	
Dicalcium Phosphate	1.02		0.86	
Vit. Min. Premix	0.47		0.47	
Nutrient Composition (DM%)	**N4242Bt**	**N4242 nonBt**	**N7333 Bt**	**N7333nonBt**
DM	37.30	37.30	37.30	37.30
CP	12.37	12.37	12.37	12.37
NDF	34.99	33.05	36.99	38.19
ADF	22.21	19.93	23.74	21.44
Ca	0.600	0.600	0.609	0.609
P	0.250	0.250	0.250	0.250

Table 3. Yield of corn grain and silage used in Experiment 2.

Item	N4242 Bt	N4242 nonBt	N7333 Bt	N7333 nonBt
% Infested[a]	33	0	56	0
Grain Yield bu/acre	132.6	122.0	151.5	142.7
Silage Yield t/acre	14.1	12.1	16.2	17.6
DM t/acre[b]	5.7	4.7	6.1	6.7

[a]Indicates percentage of plants infested with live larvae.
[b]Silage yield multiplied by actual silage dry matter content.

Table 4. Performance (101 days) of growing steers in experiment 2 fed Bt and nonBt silage.

Item	N4242 Bt	N4242	N7333 Bt	N7333	SEM	Gene[a]	Hybrid[a]	Gne* Hyb.[a]
Initial wt, lb	619	621	619	621	1.0	0.08	0.88	0.93
End wt, lb	944[b]	923[bc]	898[d]	910[cd]	7.3	0.56	0.002	0.04
DMI lb/d	19.2	18.6	18.8	18.1	0.24	0.02	0.09	0.96
ADG, lb	3.22[b]	2.99[c]	2.76[d]	2.86[cd]	0.07	0.39	<0.01	0.03
Feed / Gain	5.98[b]	6.22[bc]	6.81[d]	6.33[c]	0.11	0.32	<0.01	<0.01

[a]Gene = main effect of Bt genetics; Hyb = main effect of hybrid ; Gne*Hyb = interaction of Bt gene and hybrid.
[bcd]Means in the same row not bearing a common superscript differ (P< .05).

Table 5. Chemical analysis of silages used in Experiment 2.

Item (% of DM)	N4242 Bt	N4242 nonBt	N7333 Bt	N7333 nonBt	SEM
DM %	40.2	39.0	37.6	37.8	—
Ash	4.1	4.5	6.1	4.7	.07
CP	7.0	7.2	6.1	6.3	.11
NDF	38.9	36.7	41.1	42.4	.60
ADF	24.7	22.1	26.4	23.8	.20
PL[a]	5.2	4.4	5.6	5.1	.15
ADL[b]	3.3	2.7	3.6	3.4	.04
Starch	37.6	38.6	37.3	37.1	.21
30-h NDF Dig.[c]	32.4	30.8	34.4	31.6	.07
IVDMD[d]	74.3	65.6	69.1	65.6	1.41

[a]Permanganate lignin measured according to Goering and Van Soest (1971).
[b]Acid detergent lignin measured according to Goering and Van Soest (1971).
[c]30-hour neutral detergent digestibility measured in vitro.
[d]In vitro dry matter digestibility measured using modified procedures of Tilley and Terry (1963).

interaction was observed for daily gain and efficiency, steers fed the N4242 gained 11% faster (P<.01) and were 7% more efficient (P<.01) than those fed corn silage produced from N7333.

The data from these experiments suggest incorporation of the Bt trait has no effect on corn residue value or preference in grazing beef steers. Producers can take advantage of increased yields and reduced pesticide use with Bt corn hybrids without adverse effects on corn residue grazing performance. Stocking rates may need to be adjusted for Bt hybrids because of the potential reduction in residual corn, or more supplemental feed may be needed to maintain daily gain compared with nonBt hybrids. The interaction of hybrid genetics and incorporation of the Bt trait observed with corn silage growing diets is difficult to explain, and may be related to slight changes in the chemical composition of the silages (Table 5). Most importantly, hybrid genetics have a larger influence on daily gain and feed efficiency of growing steers fed corn silage-based diets compared with changes associated with incorporation the Bt trait in these hybrids.

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