Effect of Corn Density on Finishing-steer Intake, Performance, and Carcass Characteristics

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Introduction

Corn production in the northern Great Plains is subject to cool growing seasons, which result in a reduction of growing degree days and subsequent decrease in the density and starch content of corn grown under these conditions. The objective of this study was to evaluate the effect of low corn density (low test weight) resulting from insufficient growing degree days on the intake, performance, and carcass characteristics of finishing steers.

Ground and packed wet corn stored over winter.

Materials and Methods

One-hundred forty-four crossbred steers were housed at the NDSU animal research center in concrete-floored pens (six head/pen). The steers were blocked by initial weight (985 ± 44 lbs.) and assigned randomly to one of three dietary treatments. Treatments were 1) high-density corn, 53.7 lbs./bu., 9.4 % crude protein (CP), 21.6% neutral detergent fiber (NDF), 5.9% acid detergent fiber (ADF); 2) medium-density corn, 46.9 lbs./bu., 10.5% CP, 22.5% NDF, 5.7 ADF; and 3) low-density corn, 39.1 lbs./bu., 11.35% CP, 26.7% NDF, 6.9% ADF, fed in a total-mixed ration. Diet dry matter (DM) was composed of dry-rolled corn (81%), beet pulp (5%), mixed grass/legume hay (5%), concentrated separator byproduct (5%) and a supplement that provided 25 gallons/ton Rumensin and 10 g/ton Tylan (4%). The diets were formulated to provide a minimum of 0.70% calcium (Ca) and 0.28% phosphorus (P), and provide 13.5% CP.

Initial weight was an average of weight on three consecutive days. Subsequently, weight was measured every 28 days. Final weight was computed from hot carcass weight using a common dressing percentage of 62.5% and a common shrink of 4%. Feed offered was recorded daily and feed refusal was recorded weekly. Weekly feedstuff samples were collected to determine diet DM and to analyze nutrient composition. Calves were implanted with Revalor S at the start of the study. Carcass data was collected at slaughter.

Data were analyzed with the Mixed model of SAS with linear and quadratic contrasts ($P \leq 0.05$).

Results and Discussion

The effects of corn density on intake, performance and net energy are shown in Table 1. Final weight (1,347 ± 26 lbs.; *P* = 0.93) and ADG (4.73 ± 0.11 lbs./day; *P* = 0.86) were not affected by treatment. Decreasing corn density linearly increased DMI (*P* = 0.02) and F:G (*P* = 0.04). Dietary NE_g decreased with decreasing corn density (*P* = 0.04).

Table 1.Effect of corn density on intake, performance and net energy.

	High Density	Medium Denisty	Low Density	SEM[a]	Lin *P-value*
Pens	9	9	6		
Steers	54	54	36		
Final BW, lbs.	1344	1351	1345	26	0.93
ADG, lbs./d	4.74	4.74	4.72	0.11	0.86
DMI, lbs.	25.3	26.3	27.4	0.75	0.02
Dietary NE_g, Mcal/cwt	71.2	68.5	65.3	2.27	0.04
F:G	5.35	5.55	5.83	0.17	0.04

[a] Standard error of the mean, n = 6.

The effects of corn density on carcass characteristics are presented in Table 2. Hot carcass weight (808.3 ± 15.7 lbs.; *P* = 0.93); 12th-rib fat (0.45 ± 0.03 inch; *P* = 0.47); kidney, pelvic, heart fat (KPH) (1.96 ± 0.13 percent; *P* = 0.16); and marbling score (407 ± 17; *P* = 0.61) were not different between treatments. However decreasing corn density resulted in a linear decrease in longissimus area (*P* = 0.05) and a linear increase in yield grade with decreasing corn density (*P* = 0.03).

Table 2. Effect of corn density on carcass characteristics.

	High Density	Medium Density	Low Density	SEM[a]	Lin *P-value*
Hot carcass weight, lbs.	807	811	807	16	0.93
Marbling[b]	403	424	395	17	0.61
Ribeye area, in^2	13.45	13.49	12.75	0.27	0.05
12th-rib fat, in	0.43	0.46	0.45	0.03	0.47
KPH, %	1.90	1.90	2.07	0.13	0.16
Yield grade	2.73	2.80	3.04	0.14	0.03

[a] Standard error of the mean, n = 6.

[b] $300 = slight^0$, $400 = small^0$

These data indicate decreasing corn density increases DMI and F:G. ADG did not decrease, however. Yield grade was greater with decreasing corn density and this is due to a reduction of longissimus muscle area (LMA) in those calves fed the medium-density and low-density diets.

Medium- and low-density corn may not appear to be suitable substitutes for high-density corn. However, low-density corn typically is less costly than high-density corn; therefore,

beef cattle feedlot operators should evaluate the cost of corn of varying bushel weights in light of potential negative impacts on feed efficiency. They must take care to evaluate the cost reduction of low-density corn versus the increase in DMI and F:G. Low-density corn may be a suitable alternative for high-density corn in a finishing diet when low-density corn is available at a discount to high-density corn.

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