View metadata, citation and similar papers at core.ac.uk

brought to you by CORE

provided by DigitalCommons@University of Nebraska

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

Nebraska Beef Cattle Reports | Animal Science Department

2012

Effect of Corn Processing on Feedlot Steers Fed Sugarbeet Pulp

Cody A. Nichols
University of Nebraska-Lincoln

Matt K. Luebbe
University of Nebraska-Lincoln, mluebbe2@unl.edu

Karla H. Jenkins Jenkins
University of Nebraska-Lincoln, kjenkins2@unl.edu

Galen E. Erickson
University of Nebraska-Lincoln, gerickson4@unl.edu

Stephanie A. Furman
University of Nebraska-Lincoln, sfurman2@unl.edu

See next page for additional authors

Follow this and additional works at: https://digitalcommons.unl.edu/animalscinbcr

Part of the Animal Sciences Commons

Nichols, Cody A.; Luebbe, Matt K.; Jenkins, Karla H. Jenkins; Erickson, Galen E.; Furman, Stephanie A.; and Klopfenstein, Terry J., "Effect of Corn Processing on Feedlot Steers Fed Sugarbeet Pulp" (2012). *Nebraska Beef Cattle Reports*. 676.
https://digitalcommons.unl.edu/animalscinbcr/676

This Article is brought to you for free and open access by the Animal Science Department at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Nebraska Beef Cattle Reports by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

Authors
Cody A. Nichols, Matt K. Luebbe, Karla H. Jenkins Jenkins, Galen E. Erickson, Stephanie A. Furman, and Terry J. Klopfenstein

This article is available at DigitalCommons@University of Nebraska - Lincoln: https://digitalcommons.unl.edu/animalscinbcr/676

Effect of Corn Processing on Feedlot Steers Fed Sugarbeet Pulp

Cody A. Nichols
Matthew K. Luebbe
Karla H. Jenkins
Galen E. Erickson
Stephanie A. Furman
Terry J. Klopfenstein[1]

Summary

Impact of feeding three levels of beet pulp (0, 10, 20%, DM basis) with either dry-rolled corn (DRC) or steam-flaked corn (SFC) in feedlot rations was evaluated. Final BW, DMI, and ADG decreased linearly as beet pulp replaced corn in the diet. Beet pulp linearly decreased HCW, 12th rib fat, and yield grade. Corn processing had no impact on carcass characteristics. Feeding SFC improved F:G, compared to feeding DRC. The inclusion of beet pulp in the diet did not impact F:G, however, because of the decrease of both DMI and ADG.

Introduction

Pressed beet pulp (24% DM, 9.5% CP, DM basis), has a relatively high level of fiber (44% NDF, DM basis) remaining after extraction of sugars from beets (*Journal of Animal Science*, 85:2290-2297). The fiber fraction of sugarbeet pulp is highly digestible and has been shown to be a very effective corn silage substitute in growing diets (1992 *Nebraska Beef Cattle Report*, p. 24; 1993 *Nebraska Beef Cattle Report*, p. 48; 2000 *Nebraska Cattle Beef Report*, p. 36). However, results from finishing studies where beet pulp replaced corn (dry rolled or high moisture) indicate beet pulp may be a better corn silage substitute than a corn replacement (*1993 Nebraska Beef Cattle Report,* pp. 48-49; *2001 Nebraska Beef Cattle Report,* pp. 67-68; *Journal of Animal Science*, 2007, 85:2290-2297). Data are limited on how corn processing method interacts with the feeding of beet pulp. The objectives of this experiment were to determine the effects of feeding different levels of beet pulp in combination with dry-rolled corn (DRC) or steam-flaked corn (SFC) on finishing performance and carcass characteristics.

Procedure

In the current study, 432 yearling British x Continental steers (initial BW = 690 ± 54 lb) were used in an experiment conducted at the University of Nebraska–Lincoln (UNL) Panhandle Research and Extension Center Panhandle Research Feedlot. Prior to the start of the experiment, cattle were given Bovi-Shield® Gold, Vision® 7, Ivomec, electronic and visual ID, and branded. Cattle were limit fed (2% of BW) a 50% forage, 50% distillers grains diet for five days before the initiation of the trial in an effort to reduce variation in gut fill at time of weighing. Steers were individually weighed two consecutive days (day 0 and day 1) after the limit feeding period to obtain an initial BW. On day 0 (11/30/10) cattle were implanted with Component® TE-IS and were vaccinated with Somubac®. Cattle were stratified by BW within respective weight block (three blocks: Light, Medium, and Heavy) and assigned randomly to 36 pens (12 steers/pen). Steers were reimplanted with Component® TE-S 72 days after initial implant. Six dietary treatments (n = 6; six replications) were assigned randomly to pens within weight blocks. A randomized complete block design was used with a 2x3 factorial treatment structure. The first factor was corn source which consisted of either SFC or DRC, and the second factor was level of beet pulp inclusion (0, 10, 20% DM).

A 21-day grain adaptation period was used, in which incremental percentages of corn (SFC or DRC, dependent upon treatment) replaced alfalfa hay to allow cattle to become acclimated to the final finishing diet. Beet pulp inclusion levels remained constant from day 1 of the adaptation period until the end of the finishing trial. The SFC was processed off-site at a local commercial feedlot (Panhandle Feeders, Morrill, Neb.; target flake density of 27-28 lb/bu) and was shipped to the Panhandle Research Feedlot three times weekly (Monday, Wednesday, and Friday). The experimental diets (Table 1) consisted of 15% corn silage, 20% wet distillers grains with solubles, 6% liquid supplement (DM basis), and varying proportions of SFC or DRC. Beet pulp was included in both the DRC and SFC based diets at 0, 10, or 20% (DM) respectively, replacing corn. Urea was supplemented to both DRC (0.30% DM) and SFC (0.40% DM) diets to meet degradable intake protein requirements. The liquid supplement was formulated to provide 360 mg/steer/day Rumensin and 90 mg/steer/day Tylan.

Cattle were individually weighed at the end of the trial. Carcass adjusted performance was calculated using carcass weights adjusted to a common dressing percentage of 63%.

Cattle were split up into two

(Continued on next page)

Table 1. Experimental diets (DM).

	DRC			SFC		
Ingredients	0	10	20	0	10	20
DRC[1]	59.0	49.0	39.0	—	—	—
SFC[2]	—	—	—	59.0	49.0	39.0
Beet Pulp	—	10.0	20.0	—	10.0	20.0
WDGS[3]	20.0	20.0	20.0	20.0	20.0	20.0
Corn Silage	15.0	15.0	15.0	15.0	15.0	15.0
Supp.[4]	5.7	5.7	5.7	5.6	5.6	5.6
Urea	0.3	0.3	0.3	0.4	0.4	0.4
Nutrient Composition						
CP%	12.5	12.7	12.9	12.7	12.9	13.1
Fat%	4.5	4.2	3.9	4.2	4.0	3.8
Ca%	0.57	0.64	0.70	0.57	0.64	0.71
P%	0.35	0.34	0.32	0.34	0.33	0.31
S%	0.14	0.15	0.15	0.14	0.15	0.15

[1]DRC = dry-rolled corn.
[2]SFC = steam-flaked corn.
[3]WDGS = wet distillers grains with solubles.
[4]Formulated to provide 360 mg/steer/day Rumensin and 90 mg/steer/day Tylan.

© The Board of Regents of the University of Nebraska. All rights reserved.

Table 2. Effect of corn processing method and sugarbeet pulp level on finishing performance.

	DRC			SFC				*P*-value[1]		
Item	0	10	20	0	10	20	SEM	Corn Type	Level	CxL
Carcass Adjusted Data										
Initial BW, lb	690	689	690	692	692	689	4.8	0.74	0.89	0.83
Final BW, lb[2]	1314	1296	1259	1306	1305	1279	15.2	0.42	<0.01	0.46
DMI, lb/day[2]	23.5	22.7	21.4	22.6	22.0	21.6	0.3	0.03	<0.01	0.07
ADG, lb/day[2]	3.72	3.63	3.41	3.68	3.67	3.53	0.08	0.42	<0.01	0.35
F:G[3]	6.30	6.24	6.29	6.15	6.01	6.11	0.117	<0.01	0.49	0.86

[1]Corn type = main effect of corn processing method, Level = main effect of beet pulp level, CxL = simple effect of the corn processing method x beet pulp level interaction.
[2]Linear effect of beet pulp concentration ($P < 0.01$).
[3]Statistically analyzed as G:F, the reciprocal of F:G.

Table 3. Effect of corn processing method and sugarbeet pulp level on carcass characteristics.

	DRC			SFC				*P*-value[1]		
Item	0	10	20	0	10	20	SEM	Corn Type	Level	CxL
Carcass Data										
HCW, lb[1]	828	817	793	823	822	806	9.6	0.44	<0.01	0.47
Marbling[2]	572	591	578	586	570	563	12.2	0.34	0.52	0.13
12th rib fat, in1	0.61	0.57	0.55	0.60	0.59	0.56	0.02	0.44	<0.01	0.63
LM area, in^2	12.3	12.5	12.3	12.5	12.6	12.3	0.17	0.36	0.20	0.82
Yield Grade[1,3]	3.60	3.43	3.33	3.55	3.47	3.42	0.10	0.68	0.02	0.61

[1]Linear effect of beet pulp concentration ($P < 0.01$).
[2]Marbling score: 400 = Slight, 450 = Slight50, 500 = Small.
[3]Calculated as 2.50 + (2.5*fat depth, in) - (0.32*LM Area, in^2) + (0.2*2.5 KPH) + (0.0038*HCW, lb).

separate groups (group 1, heavy; group 2, medium and light) and slaughtered at a commercial abattoir on day 154 and d 174. Hot carcass weight (HCW) data were collected on the day of slaughter. Carcass 12th rib fat, calculated yield grade (YG), preliminary YG, marbling score and longissimus (LM) area were recorded following a 48-hour carcass chill. Yield grade was calculated using the USDA YG equation (YG = 2.5 + 2.5 (Fat thickness, in) – 0.32 (LM area, in^2) + 0.2 (KPH fat, %) + 0.0038 (HCW, lb).

Animal performance and carcass data were analyzed using the Glimmix procedure of SAS (SAS Inst., Inc., Cary, N.C.) as a randomized complete block design with pen serving as the experimental unit. Factors included in the model were corn processing, beet pulp level, corn processing x beet pulp level, with BW block as a random variable. If the corn processing x beet pulp level interaction was significant ($P < 0.05$), simple effect *P*-values were reported, and if a significant interaction was not detected, only main effect *P*-values were reported. Orthogonal contrasts were used to detect linear and quadratic effects of beet pulp level across both corn processing types when no significant interaction existed and within corn processing when a significant interaction was present.

Results

No significant corn processing x beet pulp interaction was detected for the carcass adjusted finishing performance data (Table 2). Final BW decreased linearly ($P < 0.01$) as level of beet pulp increased in the diet. Dry matter intake decreased linearly ($P < 0.01$) as beet pulp inclusion level increased in both DRC and SFC based diets. Gain decreased linearly ($P < 0.01$) with increasing levels of beet pulp in both DRC and SFC finishing diets. However, F:G was not different ($P = 0.49$) among levels of beet pulp in the finishing diet. The inclusion of 20% beet pulp in DRC based diets decreased ADG by 9.1% compared to diets without beet pulp. In SFC diets the inclusion of 20% beet pulp decreased ADG 4.2%. The lack of difference in F:G is likely due to the fact that the change in magnitude for DMI (9.8 and 4.6%, for DRC and SFC, respectively) was similar to the change noted for ADG (9.1 and 4.2%, for DRC and SFC).

Cattle fed DRC based diets had greater DMI ($P = 0.03$) compared to cattle fed diets containing SFC. Also, feed conversion was improved ($P < 0.01$) for cattle consuming diets containing SFC compared to diets with DRC as the grain source.

Similar to finishing performance, no corn processing x beet pulp interaction was detected for carcass data (Table 3). Since carcass adjusted final BW decreased with increasing levels of beet pulp supplementation, HCW also decreased ($P < 0.01$) linearly. Marbling and LM area were not impacted ($P = 0.13$) by corn processing method or by the inclusion of beet pulp in the finishing diet. Yield grade, and 12th rib fat thickness decreased linearly ($P < 0.01$) as beet pulp increased in the diet. Corn processing did not impact ($P > 0.17$) carcass characteristics.

In summary, the inclusion of beet pulp in the finishing diet decreased DMI and ADG in both DRC and SFC diets. Since there was a concomitant decrease in DMI and ADG, feed conversions were not different, which resulted in estimates for the calculated dietary energy content to be similar among beet pulp levels (data not shown). As beet pulp level increased in the diet, fat deposition (YG and fat thickness) decreased. Feed conversion was improved when DRC was replaced with SFC, which is a common response when comparing the two corn processing methods.

[1]Cody A. Nichols, graduate student; Galen E. Erickson, professor; Terry J. Klopfenstein, professor; University of Nebraska (UNL) Department of Animal Science, Lincoln, Neb.; Matthew K. Luebbe, assistant professor; Karla H. Jenkins, assistant professor; Stephanie A. Furman, research manager; UNL Panhandle Research and Extension Center, Scottsbluff, Neb.

 © The Board of Regents of the University of Nebraska. All rights reserved.