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Using Beet Pulp to Adapt Cattle to Finishing Diets

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Summary

Cattle were adapted to a common finishing diet over 21 days by traditional adaption, reducing alfalfa hay inclusion (46 to 6%) or beet pulp (BP) adaption programs. A low beet pulp treatment (BP decreased from 18 to 6% and alfalfa hay from 34 to 6%) and a high BP treatment in which both BP and alfalfa hay were decreased from 26 to 6% were compared. Adapting cattle with high BP tended to decrease DMI during the adaption period. Both BP adaption programs increased ADG over the entire feeding period. Replacing up to 50% of alfalfa hay with BP during grain adaption had no impact on F:G or carcass traits and increased ADG.

Introduction

Replacing all of the corn silage in the diet (10 %DM) with beet pulp (BP) resulted in similar ADG and a trend toward improved feed efficiency in a feedlot finishing diet (1993 *Nebraska Beef Cattle Report*, pp. 48-49). Another study included BP at 8.5 and 12.5% of diet DM as the only source of roughage in a finishing diet and showed decreased ADG and DMI with no difference in F:G (2001 *Nebraska Beef Cattle Report*, pp. 67-69). Although BP is commonly used as a fiber source, little research has evaluated the use of BP in grain adaption programs. The objective of this study was to compare grain adaption programs using BP to traditional grain adaption with alfalfa hay.

Procedure

Yearling crossbred steers (n=232; BW=718 ± 32 lb) were separated into three weight blocks, stratified by BW, and assigned randomly within strata to 18 feedlot pens, with 12 or 13 steers per pen. Treatments were imposed during grain adaption (21 days) using three grain adaptation programs (Table 1). Within each program, four grain adaption diets were fed for 3, 4, 7, and 7 days. Each program increased dry-rolled corn (DRC) inclusion while roughage inclusion decreased. In the control treatment, alfalfa hay inclusion decreased from 46 to 6% and pressed BP (24% DM) was held constant at 6% in all step diets. Beet pulp adaption programs included a low BP treatment (LOBP) where BP was decreased from 18 to 6% and alfalfa hay from 34 to 6%, or a high BP treatment (HIBP) in which both BP and alfalfa hay were decreased from 26 to 6%. Subsequent to grain adaption, all steers were fed a common finishing diet for the remainder of the feeding period. All step diets and the finishing diet contained 20% wet distillers grains with solubles (WDGS), 0.25% urea, and 5.75% liquid supplement that was formulated to provide 33 g/ton Rumensin® and 90 mg/steer daily Tylan® (DM basis). All cattle were offered *ad libitum* access to feed and water for the duration of the study.

Prior to trial initiation, steers were limit fed a 55% alfalfa hay, 40% WDGS, 5% supplement diet for five days at 1.8% of BW to minimize variation in gut fill. Upon initiation of the study, cattle were vaccinated with Bovi-Shield® Gold 5 and Vision® 7, poured with Ivomec®, branded, tagged, and weighed. Weights were measured over two consecutive days (days 0 and 1) to determine initial BW. Feed ingredient samples were collected weekly throughout the trial, dried in a forced-air oven at 60°C for 48 hours, and analyzed for nutrient content. On day 28, following grain adaptation, and after being on a common finishing diet for seven days, BW were collected and cattle were implanted with Component® TE-S. A 4% pencil shrink was subtracted from this BW to obtain 28-day BW.

After 148 or 181 days on feed, cattle were weighed and transported to a commercial abattoir (Cargill Meats

Table 1. Dietary composition (%) and DOF of control (CON), low beet pulp (LOBP) and high beet pulp (HIBP) adaptation methods (DM).

Days fed	1-3	4-7	8-14	15-21	
Adaptation	1	2	3	4	Finisher
CON					
Alfalfa	46	36	26	16	6
Beet Pulp	6	6	6	6	6
DRC[1]	22	32	42	52	62
WDGS[2]	20	20	20	20	20
Supplement[3]	5.75	5.75	5.75	5.75	5.75
Urea	0.25	0.25	0.25	0.25	0.25
LOBP					
Alfalfa	34	27	20	13	6
Beet Pulp	18	15	12	9	6
DRC[1]	22	32	42	52	62
WDGS[2]	20	20	20	20	20
Supplement[3]	5.75	5.75	5.75	5.75	5.75
Urea	0.25	0.25	0.25	0.25	0.25
HIBP					
Alfalfa	26	21	16	11	6
Beet Pulp	26	21	16	11	6
DRC	22	32	42	52	62
WDGS	20	20	20	20	20
Supplement[3]	5.75	5.75	5.75	5.75	5.75
Urea	0.25	0.25	0.25	0.25	0.25

[1]Dry-rolled corn.
[2]Wet distillers grains with solubles.
[3]Supplement formulated to provide 33 g/ton Ruminsin and 90 mg/head/day Tylan (DM).

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Table 2. Feedlot performance and carcass characteristics of cattle adapted to grain using control (CON), low beet pulp (LOBP), or high beet pulp (HIBP) adaptation methods.

	Treatment				
Item	CON	LOBP	HIBP	SEM	*P*-value
Performance					
Initial BW, lb	718	718	718	0.8	0.30
Final BW, lb[1]	1312	1342	1343	21.7	0.32
DMI, lb/day					
28 day	21.8[a]	21.4[ab]	20.9[b]	0.34	0.07
Final	23.8	24.2	24.0	0.40	0.58
ADG, lb					
28 day	4.19	4.10	4.23	0.20	0.80
Final[1]	3.63[a]	3.80[b]	3.81[b]	0.08	0.07
F:G,[2]					
28 day	5.20	5.22	4.94	0.14	0.20
Final[1]	6.56	6.36	6.30	0.08	0.11
Final live BW, lb	1317	1348	1341	17.4	0.20
Carcass characteristics					
HCW, lb	827	845	846	13.7	0.32
Dressed yield, %	62.8	62.7	63.0	0.4	0.78
LM area, in^2	12.4	12.4	12.4	0.20	0.99
12th rib fat, in	0.59	0.60	0.59	0.02	0.80
Yield Grade[3]	3.67	3.75	3.72	0.08	0.61
Marbling[4]	629	635	636	18.5	0.90
Liver abscess, %	19.5	16.9	12.9	—	0.63

[1]Final BW was calculated from HCW using a common dressed yield of 63%.
[2]Statistics performed on carcass adjusted G:F.
[3]Calculated as 2.5+ (2.5 x 12th rib fat) + (0.2 x 2.5[KPH]) + (0.0038 x HCW)-(0.32 x LM area).
[4]400 = Slight, 500 = Small, 600 = Modest.
[a,b]Within a row, means without a common superscript are different, $P < 0.05$.

Solutions, Fort Morgan, Colo.). A 4% pencil shrink was subtracted from this BW to obtain final live weight. Hot carcass weights (HCW) and liver abscesses scores were obtained on the day of slaughter. Following a 48-hour chill, USDA marbling score, 12th rib fat thickness, and Longissimus muscle area (LM) were recorded. Yield grade was calculated using HCW, 12th rib fat thickness, LM, and an assumed percentage (2.5%) of kidney, pelvic, and heart fat (KPH) using the following formula: 2.5+ (2.5 x 12th rib fat) + (0.2 x 2.5[KPH]) + (0.0038 x HCW)-(0.32 x LM). Carcass adjusted performance was calculated using a common dressing percentage (63%) to determine carcass adjusted final BW, ADG and F:G.

Animal performance data and carcass characteristics were analyzed using the MIXED procedure of SAS (SAS Inst., Inc., Cary, N.C.). Pen was the experimental unit, fixed effect was treatment, and block was treated as a random effect. Treatment comparisons were made using pair-wise comparisons when the F-test statistic was significant. Prevalence of liver abscesses was analyzed using the GLIMMIX procedure of SAS.

Results

Feedlot performance data and carcass characteristics are summarized in Table 2. Cattle adapted to grain using HIBP tended to have lower DMI ($P = 0.02$) during the adaption period. Another study found similar reductions in DMI when BP was compared to corn silage as a roughage source in a finishing diet (*2001 Nebraska Beef Cattle Report,* pp. 67-69). These reductions in DMI are likely due to differences in fiber digestibility between the roughage sources. BP contains highly digestible fiber that is a rich source of energy and could decrease DMI compared to corn silage or low quality alfalfa hay. Average daily gain and F:G were similar among treatments during the grain adaptation period. However, based off of carcass adjusted final BW steers adapted using HIBP and LOBP had greater ADG ($P = 0.04$) compared with cattle adapted with the control treatment. Increases in ADG could have occurred during the grain adaption period and were not realized until the end of the feeding period when carcass adjusted values were available. This could be due to the difficulty associated with accurately measuring change in BW over short durations of time due to variation in gut fill and differences observed in DMI at day 28 may lead to differences in gut fill. If gain responses were primarily during the adaption period, these differences may be attributed to an increase in digestibility or higher energy content of BP compared to low quality alfalfa hay. Several studies have noted improvements in ADG when BP replaced a portion of the corn silage in growing diets (*1992 Nebraska Beef Cattle Report*, pp. 24-25; *1993 Nebraska Beef Cattle Report*, pp. 48-49; *2000 Nebraska Beef Cattle Report*, pp. 36-37). Another study observed increased ADG when BP replaced corn silage at 8.5 and 12.5% of diet DM (2001 *Nebraska Beef Cattle Report*, pp. 67-69). Overall F:G was not different ($P = 0.11$) among treatments, although approaching significance with cattle adapted using BP having numerically lower F:G compared with cattle adapted with the control treatment. Dry matter intakes were not affected by adaption method.

Carcass characteristics were not affected by adaptation method. Hot carcass weights were similar ($P = 0.31$) among treatments, and dressing percentage was not different. No differences were observed in LM area or calculated YG and USDA marbling scores were similar among treatments, as well as 12th rib fat thickness ($P = 0.80$), indicating steers were finished to similar endpoints. Increases in ADG for HIBP and LOBP were likely due to the 21-day adaptation period, as the finishing diets were the same for the remainder of the study. Replacing up to 50% of alfalfa hay with BP during grain adaption increased ADG.

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