

Effects of Soybean Hulls, Wet Brewer's Grain or a Combination Supplement on the Performance of Forage-fed Steers during Backgrounding

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Steers backgrounded with a mix of soybean hulls and wet brewers grains had superior bodyweight gains compared to individual ingredient supplements. However, steers supplemented with soybeans hulls were most profitable.

Summary

The objective of this study was to compare the use two co-products, soybean hulls (SBH), wet brewers grains (WBG), or a combination of both co-products, on the performance of backgrounding steers. Steers were backgrounded on bahiagrass-bermudagrass pastures and supplied with Coastal bermudagrass hay. Supplement treatments were formulated to offer 3.0 lbs of total digestible nutrients. Supplement treatments consisted of 1) SBH (4.2 lb as fed); 2) WBG (20 lb as fed); 3) WBG/SBH (10.0 lb WBG and 2.09 lb SBH as fed). From d 0 to 34 average daily gain (ADG) was greater ($P < 0.05$) for steers supplemented with WBG/SBH or WBG compared to SBH. However, across the 51-d backgrounding period steers supplemented with the combination of WBG/SBH had ADG that was nearly 0.30 lb/d greater than SBH steers (1.82 vs. 1.54 lb/d), WBG were intermediate (1.66 lb/d). Final steer value was not different among treatments. However, because of the increased cost of supplementation associated with the use of WBG a greater production economic loss was observed for WBG and WBG/SBH supplemented steers compared to SBH steers alone. Including a \$6.64/100 lb BW backgrounding premium resulted in less \$/steer loss for SBH compared to WBG/SBH, which had less loss than WBG. Application of a premium associated with the backgrounding process and market timing differences resulted in a net profit for all three supplementation scenarios.

Introduction

Backgrounding of cattle is generally utilized to prepare the calf for subsequent segments of the beef cattle industry. Cravey (1996) suggested that backgrounded calves may demonstrate greater feedlot profitability as a result of greater feedlot ADG, gain:feed, decreased medicinal cost and mortality compared to non-backgrounded cattle. Step et al. (2008) indicated that calves from a single source that were retained after weaning for 45 d had less feedlot morbidity and health cost during the initial feedlot receiving period compared to commingled or direct-transported calves after weaning. The profitability of backgrounding calves is complicated by many factors including calf purchase/sale price, feed cost, and medicine costs (Peel, 2003). In order for backgrounding to be a feasible practice, consistent profits must be expected.

Subtropical and tropical grasses are often deficient in nutrients required by growing cattle and therefore additional supplementation is necessary in the diets of growing cattle on a high-forage diet. Supplementation is also beneficial in terms of improved animal performance, improved forage utilization, and greater overall economic return. With the increasing cost of corn, many cow-calf and stocker cattle operations are looking to take advantage of alternative co-products. By evaluating the nutritional value of soybean hulls (SBH) or wet brewer's grain (WBG) in a supplementation program and their impact on cattle performance, backgrounding operations in Florida will be better able to match these

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available co-products to the dietary requirements of growing cattle.

Wet brewers grains contain approximately 20% dry matter (DM) and should not be fed above a recommended rate of feeding of approximately 0.5% of body weight (BW). Feeding greater amounts of this supplement can negatively impact DM intake as a result of the excess amount of water in the diet. Studies have shown that DM intake is reduced when DM of the whole diet falls below 50%. This is an important consideration regarding cattle gains during the backgrounding period.

The overall objective of the study was to investigate the nutritional impact of a co-product supplementation strategy available to producers in Florida on backgrounding performance of steers.

Materials and Methods

Animals and Management

This study was conducted at the Santa Fe Beef Unit located near Alachua, FL in northern Alachua County. The experiment was initiated on September 29, 2008 and ended on November 20, 2008 for a total duration of 51 d. Ninety-nine Angus and Brangus steers were blocked by BW and randomly allotted to 1 of 3 treatments with 3 pens per treatment. Prior to the initiation of the study, 2 lb (as fed) of a 50:50 mix of WBG and SBH was fed daily beginning 7 d prior to the initiation of the experiment to all calves managed as a large group. At the initiation of the study 7 Angus and 4 Brangus steer calves were allotted to a pen. Supplement treatments were formulated to offer 3.0 lbs of total digestible nutrients (TDN). Treatments included: 1) SBH (3.75 lbs. of DM, 4.2 lbs. as fed); 2) WBG (4.0 lbs. of DM, 20 lbs. as fed); 3) WBG/SBH (1.5 lbs. DM from WBG, 1.88 lbs. of DM from SBH; 10.0 and 2.09 lbs. as fed, respectively). Steers were placed in 2-acre bahiagrass-bermudagrass pastures that were not fertilized, and had similar amount of available forage. In each pen steers were offered Coastal bermudagrass hay as large round bales. Supplements were offered daily in the morning, no supplement refusal was noted. Hay was offered for ad libitum consumption, 5 to 7 bales per pen were utilized during the study. Bale weights were recorded for each bale offered in

each pen. Water and a complete mineral supplement were offered ad libitum in each pen throughout the duration of the study. Chemical composition of pasture, hay, and supplements are presented in Table 1.

Steers were fed for a total of 51 d, unshrunk BW were taken on 2 consecutive days at the initiation and (d 0 and 1) and termination of the trial (d 50, 51). Interim BWs were obtained on d 17 and 34. The 2-d mean of BW was utilized to determine initial and final BW and ADG. An economic analysis was conducted using estimated costs for pasture, hay, supplements, health, and calves. Calves were valued for the study using the mean value from the AMS Florida Cattle Auctions Weekly Summary report (AMS, USDA; 2008) for a 550 lb calf (initial value, \$71.10, market value at end of experiment \$77.81/100 lb BW) with a \$0.10/100 lb BW price slide.

Statistical Analysis

The experiment was designed as a completely randomized design with supplement treatment as the fixed effect, pen within treatment as the random effect, and pen as the experimental unit. Data were analyzed using the Mixed procedure of SAS v9.2 (2002, SAS Inst. Inc., Cary, NC). Means were calculated using least squares means and means separated using the P-diff option when the overall F-value was <0.10.

Results

At the initiation of the study, steer BW (mean = 554 lb, Table 2) did not differ ($P = 0.99$) among treatments. From d 0 to 34, BW gains were not different ($P = 0.15$) among treatments, but steers supplemented with WBG/SBH had ADG that were 0.30 lb/d greater than SBH or WBG. At the end of the study, final BW was similar (mean = 639 lb; $P = 0.96$) among treatments. However, 51-d ADG was greater ($P < 0.05$) for steers supplemented with a combination of supplements (WBG/SBH) compared to steers supplemented with SBH alone, steers supplemented with WBG were intermediate. Treatments were formulated to deliver equal amounts of TDN among treatments. However, several variables could have affected steer ADG during the study. Variability of SBH TDN and crude protein can be quite significant from published values and could be one cause of the

decreased performance observed in SBH supplemented steers. Additionally, pasture, hay, and SBH crude protein contents likely would not have supported greater steer BW gain based upon estimated nutrient requirements (NRC, 2002). Similarly, the slightly decreased gain response observed in WBG steers compared to WBG/SBH steers could be attributed to the increased water content of the supplement. Wet brewers grains contain approximately 20 to 30% DM, feeding greater amounts of this supplement could have negatively impacted total intake as a result of the excess amount of water in the diet. This is particularly important point to consider when backgrounding growing cattle with roughages or pasture forage with significant water content. Several studies have shown that DM intake is reduced when DM of the whole diet falls below 50%. However, estimated hay offer did not differ among the treatments (11.4, 10.2, and 10.2 lb/steer/d; SBH, WBG/SBH, WBG, respectively).

Economic evaluation indicated that supplement costs were nearly three-times greater for WBG supplemented steers compared to SBH supplemented steers, WBG/SBH steer supplement cost were two-times greater than SBH steers. The increased cost associated with WBG supplementation is attributable to the increased amount of supplement provided on an as fed basis to supply 3.0 lbs of TDN compared to SBH. Total feed cost and total production costs followed a similar pattern, SBH steers had the lowest ($P < 0.05$) associated costs, followed by WBG/SBH, and greatest costs were experienced by the WBG steers. Profit/loss was directly related to supplement costs. Steers supplemented with WBG loss the greatest ($P < 0.05$) amount of money during the backgrounding period (-\$83.08/steer) compared to WBG/SBH steers (-\$63.00/steer). Likewise, steers supplemented with WBG/SBH indicated a net loss greater ($P < 0.05$) than SBH steers (-\$50.10/steer). Calves that are backgrounded often are able to garner a premium associated

with the backgrounding process. King et al. (2006) indicated that calves that underwent a value added calf 45-d program could realistically expect to receive a \$6.64/100 lb BW premium. If that premium is applied to the final value of the calves a backgrounding loss is still demonstrated by all treatments. The largest loss is exhibited by WBG steers, which was \$20.19 greater ($P < 0.05$) than WBG/SBH which had a \$32.24 greater ($P < 0.05$) loss than SBH steers. During this experiment the calf value for 550 lb steers calves increased. Coupling the backgrounding premium and the increase in steer value resulted in a net profit for all treatments. Steers from the SBH treatment had the greatest ($P < 0.05$) profit compared to WBG/SBH steers. Steers in the WBG treatment had the lowest profit margin compared to the other 2 treatments. The concept of backgrounding cattle is predicated on profitability associated calf sale price and input feed costs. In this study a premium associated with backgrounding and an increase in calf sale price was necessary to generate a profitable return to the cost of the calf and other management inputs.

Table 1. Chemical composition of pasture, hay, and supplements offered to backgrounding beef steers.

	Pasture	Hay	SBH	WBG
Mean DM yield, lbs/acre	1,759	---	---	---
Dry matter, %	57.4	92.4	92.9	35.7
Total digestible nutrients, % of DM ¹	56.3	54.8	80.0	75.0
Crude protein, % of DM	9.83	9.73	9.09	27.14

¹Estimated from chemical analysis for pasture and hay samples, estimated from NRC (1996) values for SBH and WBG.

Table 2. Effect of soybean hulls and/or wet brewers grains on bodyweight (BW), gain, and economic value of backgrounded steers.

Item	Treatment ¹			SEM ²	P-value
	SBH	WBG/SBH	WBG		
Initial BW, lb	552	551	558	33.5	0.99
Final BW, lb	631 ^a	644 ^b	642 ^b	34.2	0.02
34-d gain, lb/d	1.97 ^a	2.33 ^b	2.04 ^b	0.12	0.05
51-d gain, lb/d	1.54 ^b	1.82 ^a	1.66 ^{ab}	0.07	0.08
Initial steer value, \$ ³	392.16	391.12	395.71	21.99	0.16
Final steer value, \$ ³	393.70	393.36	393.58	0.96	0.84
Total supplement cost, \$/steer ⁴	16.76	32.61	48.36	---	---
Total feed cost, \$/steer ⁵	38.28 ^b	51.86 ^a	67.58 ^c	1.57	< 0.001
Total production cost, \$/steer ⁶	51.65 ^b	65.23 ^a	80.95 ^c	1.57	< 0.001
Profit/(Loss), \$/steer	(50.10) ^a	(63.00) ^b	(83.08) ^c	22.91	0.002
Backgrounding premium, steer value, \$ ⁷	435.59	436.09	436.21	2.30	0.53
Backgrounding profit/(loss), \$/steer	(8.22) ^a	(20.26) ^b	(40.45) ^c	20.65	0.002
Background premium + market change, steer value, \$ ⁸	477.91	479.27	479.29	4.49	0.12
Background premium + market change profit/(loss), \$/steer	34.11 ^a	22.92 ^b	2.63 ^c	18.37	0.002

¹Least squares means, treatment: SBH 3.75 lbs of soybean hulls; WBG/SBH 1.5 lbs wet brewers grains, 1.88 lbs soybean hulls; WBG 4.0 lbs of wet brewers grains.

²Standard error of the mean, n = 3.

³Initial and final value: \$71.10/100 lb BW; calculated with a \$0.10/100 lb BW price slide.

⁴Soybean hulls: \$170/ton as fed, wet brewers grains: \$78/ton (estimated 20% dry matter delivery).

⁵Includes hay consumption with a value of \$74/ton.

⁶Includes feed cost, pasture charge of \$6.12, and health processing charge of \$7.25.

⁷Backgrounding premium: \$6.44/100 lb BW and a \$0.10/100 lb BW price slide.

⁸Backgrounding premium plus market value increase to \$77.81/100 lb BW and a \$0.10/100 lb BW price slide.

^{a, b, c}Means with different superscripts differ P < 0.05.