Effects of Feeding Soybean Hulls on Calf Performance During Preconditioning

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Supplementing calves on mixed bahiagrass and bermudagrass pasture with soybean hulls yielded higher preconditioning weight gains than supplementing with soybean meal. Economic analysis showed greater returns for soybean hulls.

Summary

Soybean hulls (SBH) and soybean meal (SBM) were evaluated as potential supplements for preconditioning beef calves in Florida. Weaned calves were fed 4.76 lb/hd/d as fed of SBH or 1.40 lb/hd/d as fed of SBM for a 42-d preconditioning period. Calves fed SBH yielded higher preconditioning weight gains than calves supplemented with SBM (34.8 lb/hd vs 22.3 lb/hd). An economic evaluation of preconditioning with SBH or SBM was included. Preconditioning with SBH generated a $7.21 profit, while preconditioning with SBM generated a loss of $(-0.41) when compared to selling calves at weaning.

Introduction

Preconditioning is a process that prepares the calf's immune system against future challenges. Preconditioning involves weaning, vaccinating, and training calves to eat from feed bunks. Other factors including socialization and environmental adaptation are also very important. It is well documented by Cole (1985) that preconditioned calves are healthier than non-preconditioned calves resulting in improved performance in the feedlot. The improvement in animal health in the feedlot has also been expressed by improved carcass quality (McNeill et al, 2002). The improvement in subsequent feedlot performance associated with preconditioned calves has led to market driven premiums for these calves. However, the actual amount of the premium, gain during the preconditioning period, cost of preconditioning, and other market factors will affect the ultimate profitability of the preconditioning program. Sound preconditioning programs are particularly important when establishing a reputation for quality calves or when considering retained ownership.

The cost of feed during the preconditioning period is usually the greatest expense. Therefore, selecting the proper supplement has a great impact on the profitability of the preconditioning program. Feedstuffs utilized in a preconditioning program should be highly palatable in order to encourage consumption and limit weight losses immediately following weaning. Calves should be supplemented with a highly digestible feedstuff that compliments the nutrient profile of the existing forage. Storage and feeding of these commodities should be taken into consideration. Many different feedstuff options exist for preconditioning calves in Florida. Some of these feedstuffs can be very expensive which may limit their usefulness from an economic standpoint. However, the use of cheaper byproduct feedstuffs, that are available locally, may make it possible to increase profits for producers while optimizing animal performance.

Soybean hulls are a byproduct of the soybean oil industry that are readily available to producers. SBH contain a high level of digestible fiber (66.3% neutral detergent fiber (NDF)) which makes them very useful for supplementing cattle on pasture. SBH are also a safe feedstuff with a low incidence of founder, bloat, and ruminal acidosis. The availability and safety of SBH suggests consideration as a byproduct feedstuff for economically preconditioning calves. SBH are a good source of energy (80% total digestible nutrients (TDN)) and contain an adequate level of protein (12.2% crude protein (CP)) for growing calves (NRC, 1996). The palatability of SBH is generally good. The objective of this study was to evaluate SBH on the basis of calf performance and economics as a supplement for preconditioning calves.

Procedure

This study was conducted at the UF/IFAS Beef Research Unit in Alachua County, Florida. The trial began on September 10, 2003, and ended on October 22, 2003. The study utilized 144 crossbred calves of varying percentages of Brahman and Angus genetics (mean body weight 486 ± 6lb) in a 42-d performance trial. The trial utilized 82 heifers and 62 steers. Calves were categorized into five breed types based on the amount of Brahman influence; 0-20%, 21-40%, 41-60%, 61-80%, and 81-100%. True Brangus calves that were exactly 3/8 Brahman and 5/8 Angus were evaluated as a separate breed type. Weights were taken on d 1, d 21, and d 42. Supplemental treatments were 4.76 lb/hd/d as fed of SBH or 1.40 lb/hd/d as fed of SBM. Treatments were isonitrogenous with a target consumption of 0.6 lb/hd/d CP. A complete summary of supplement composition and the amount of supplement offered is available in Table 1. The mean age for both treatment groups was 232 ± 3 d. Calves were stratified to treatment based on sex, weight, breed, and age. Initial weight was not different between treatments (P=0.98).

At weaning (d-1), cow/calf pairs were penned in the morning and calves were separated for weaning. The calves were weighed, ear tagged, vaccinated with a modified live 4-way viral respiratory vaccine, boostered with a 7-way clostridial vaccine, dewormed with an injectable avermectin dewormer, and sorted into treatment groups. The vaccinations were boostered with the same products three wk later. The calves were weaned in drylot pens with adequate shade, water, and hay for five d. Free choice Coastal bermudagrass hay was provided for each treatment during the drylot period. Calves were fed their respective supplements twice daily in 10 ft portable plastic feed bunks with 14 in of bunk space per animal for the first 5-d. On d 2, 50% of target supplement intake was offered on top of Coastal bermudagrass hay. From d 3 to d 5, 50%

of target supplement intake was offered without hay in the bunks. On the morning of d 6, calves were turned out onto mixed bahiagrass and bermudagrass pastures. The desired level of supplementation was achieved on d 7. There was no refusal of feed during the entire trial.

Animals were housed in two adjacent 15-ac pastures of mixed Argentine bahiagrass and Common bermudagrass for the duration of the trial. The pastures were created by crossfencing a 30-ac pasture with temporary electric fence. The pastures were six wk regrowth following hay harvest. Fertilizer was applied in the form of liquid nitrogen at a rate of 50 lb of nitrogen/ac two wk prior to the beginning of the trial. The treatment groups were rotated between pastures every 7 d in an attempt to eliminate pasture effect on calf performance. Forage availability was measured at the beginning of the trial and every other week until completion. Forage availability was not different between treatments (P>0.10) and was never less than 1,100 lb of dry matter (DM)/ac. Water and a complete mineral supplement were offered ad libitum during the entire trial.

All statistical analyses were conducted using the General Linear Models procedure of SAS. The statistical model included treatment, breed, sex, treatment x breed, treatment x sex, breed x sex, and treatment x breed x sex. The random variable was calf within treatment and calf age was used as a covariant. Least squares means were calculated. Results were considered significant if P<0.05.

An economical analysis was conducted using actual costs for vaccines, anthelmintic, fertilizer, pesticide, mineral, and supplement. The opportunity costs of hay, pasture, and labor were calculated. Details of the economic analysis are presented in Table 2. The costs and returns associated with preconditioning were compared to a theoretical group of non-preconditioned calves.

Results

Calves fed SBH gained more (P<0.0001) than calves fed SBM (34.8 lb vs 22.3 lb) during the 42-d preconditioning period (Figure 1). There was a significant treatment effect (P<0.001) on gain for the first 21-d period of preconditioning as well as the second 21-d period of preconditioning (P<0.05). During the first 21-d period, calves fed SBM gained 11.1 lbs while calves fed SBH gained 19.3 lb. During the second 21-d period, gains were 11.2 lb and 15.5 lb for SBM and SBH, respectively (Figure 2). The differences in gain appear to be due to increased energy intake from the SBH. There was a breed effect (P<0.001) for initial and ending weights (Figure 3). As expected, calves with greater heterosis were heavier initially and maintained their weight advantage throughout the trial. Forty-two day weight gains were similar for all breed types (P>0.10, Figure 4). The mean initial weights for heifers and steers were 474 and 499 ± 6 lb, respectively. No significant differences in gain were observed between heifers and steers.

A summary of the costs associated with preconditioning are listed in Table 2. The total costs of preconditioning for SBM and SBH were $36.54/hd and $34.68/hd, respectively. The value added to calves that were preconditioned with SBM was $36.13/hd, while calves fed SBH showed an increase in value of $41.89/hd. When compared to selling the calves at weaning, the amount of profit derived from preconditioning was $(-0.41)/hd for SBM and $7.21/hd for SBH. If the difference in the amount of shrink between preconditioned and non-preconditioned calves is taken into consideration, the true profit potential of preconditioning can be estimated. Assuming that the preconditioned calves shrink 1% and the non-preconditioned calves shrink 5%, the amount of profit derived from preconditioning would be $9.38/hd for SBM and $21.51/hd for SBH.

The economic evaluation was made on the basis of research conducted by Dhuyvetter et al (2005) that suggests that preconditioned calves are worth $0.05/lb more than non-preconditioned calves. Without adjusting for differences in shrink between preconditioned and non-preconditioned calves, the SBM treatment actually lost money. If preconditioned calves could not have been sold for more $/lb, then this analysis would have yielded a negative returns for both treatments.

SBH yielded greater economic gains than SBM. However, both supplements appear to have value as preconditioning supplements. While the SBH treatment yielded greater performance economically and in terms of gain, both supplements produced acceptable weight gains. More importantly, there was no incidence of mortality on either supplement. The only incidence of morbidity was with one calf on the SBM treatment that was treated with antibiotic for foot rot on d 30 of the trial. The health status of these calves can be attributed to proper immunization, adequate nutrition, and weaning on the ranch which both reduces stress and eliminates commingling.

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Table 1. Feeding rate and nutrient composition of soybean meal (SBM) and soybean hull (SBH) supplements.

	SBM preconditioned	SBH preconditioned
Target, lb/hd/d		
Feeding rate	1.40	4.76
DMI[a]	1.26	4.34
CP[b]	0.63	0.61
TDN[c]	1.05	3.47
Actual, lb/hd/d		
Feeding rate	1.26	4.39
DMI	1.13	4.00
CP	0.56	0.56
TDN	0.98	3.20

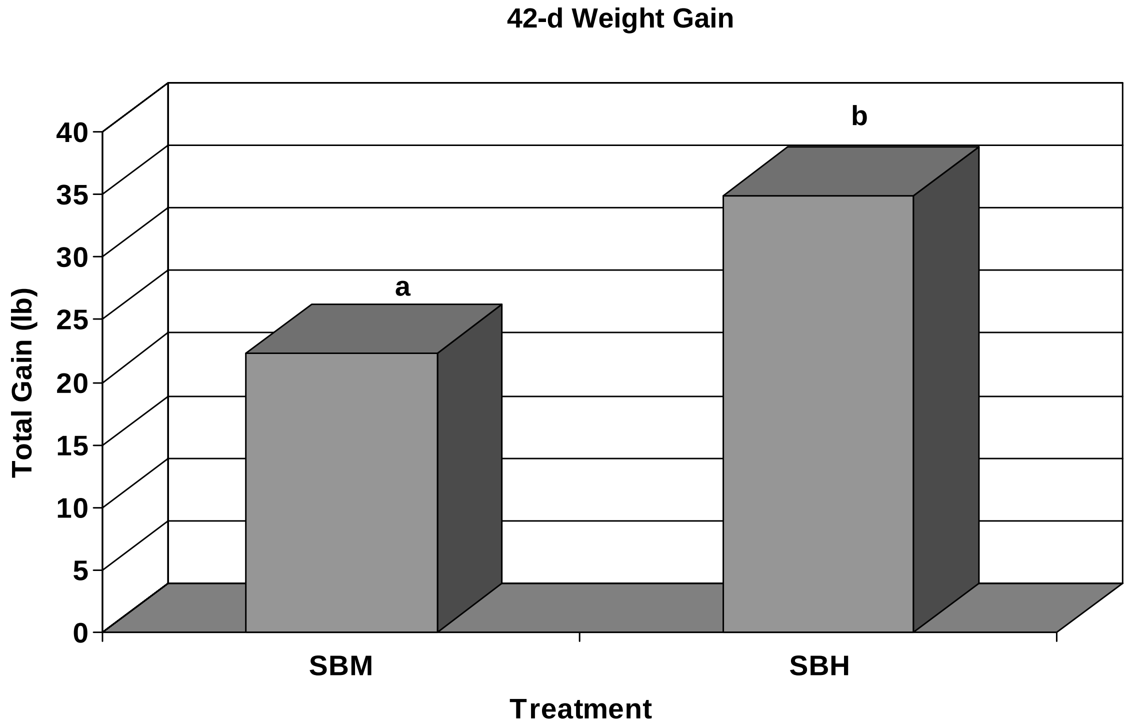
[a]Dry matter intake.
[b]Crude protein.
[c]Total digestible nutrients.

Table 2. Economic evaluation of preconditioning with soybean meal (SBM) and soybean hulls (SBH).

	Cost/hd ($)		
	Non-preconditioned	SBM preconditioned	SBH preconditioned
Vaccines[a]		5.47	5.47
Anthelmintic[b]		1.73	1.73
Fertilizer[c]		4.30	4.30
Pesticide[d]		1.55	1.55
Mineral[e]		1.75	1.75
Supplement[f]		8.82	12.45
Hay[g]		2.25	2.25
Pasture[h]		0.72	0.72
Labor[i]		3.44	3.44
Interest[j]		2.26	2.26
Total cost[k]		36.54	34.68
Calf weight, lb[l]	486	509	521
Calf price, $/cwt[m]	97.34	95.04	93.84
Adj. calf price, $/cwt[n]		100.04	98.84
Calf value[o]	473.07	509.20	514.96
Value added[p]		36.13	41.89
Profit[q]		(0.41)	7.21
Shrunk calf weight, lb[r]	462	504	516
Shrunk calf price, $/cwt[s]	99.74	95.54	94.34
Shrunk adj. calf price, $/cwt[t]		100.54	99.34
Shrunk calf value[u]	460.80	506.72	516.99
Shrunk value added[v]		45.92	56.19
Shrunk profit[w]		9.38	21.51

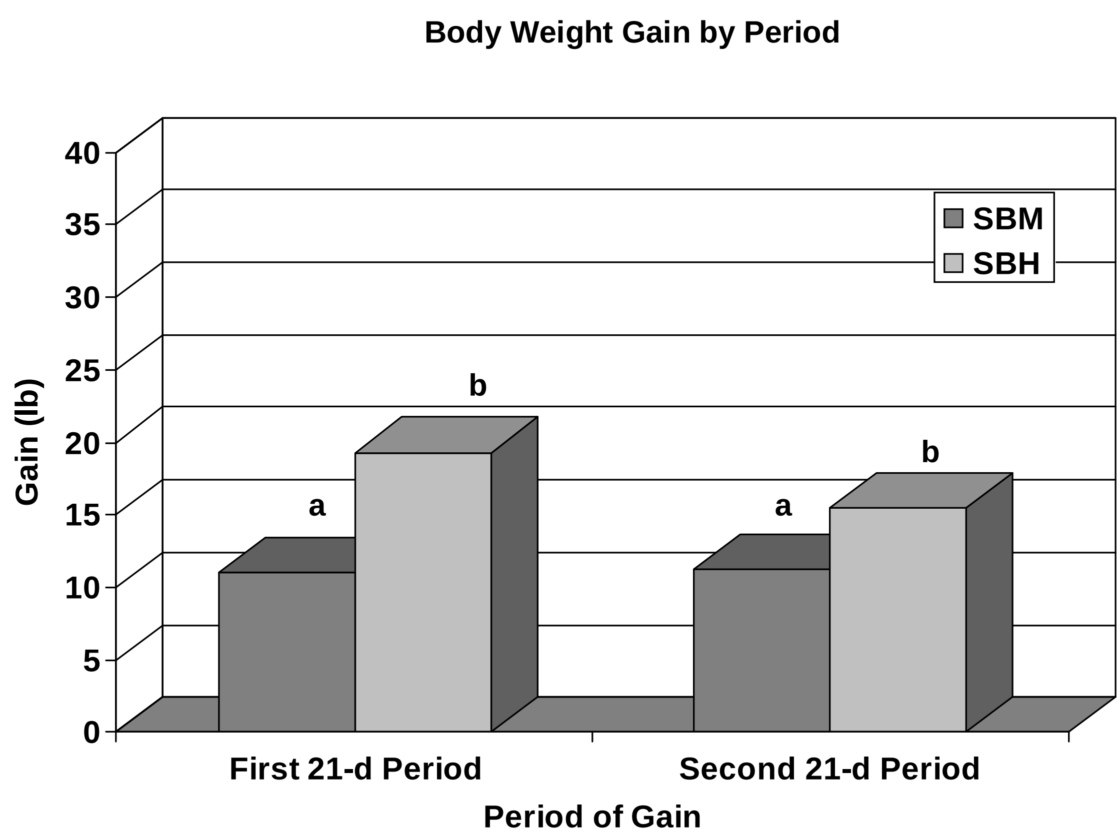
[a]Preconditioned calves were vaccinated twice before weaning and again at weaning with a MLV.
[b]5 ml dose (550 lb) of injectable avermectin dewormer per calf.
[c]Liquid nitrogen application @ 50 lb of N/ac.
[d]1qt/acre of Sevin XLR @ $29.80/gal.
[e]12 bags per treatment @ $10.50/bag.
[f]3,800 lb of SBM @ $334.20/ton, 13,280 lb of WCS @ $125.00/ton.
[g]54 square bales of Coastal bermudagrass hay (average weight 44 lb) per treatment @ $3.00/bale.
[h]15 ac/treatment @ $30.00/ac/yr.
[i]31 h of labor per treatment @ $8.00/h.
[j]4% interest for 42 d on the value of the calves at weaning ($473.07).
[k]Total cost of preconditioning.
[l]Actual weight without accounting for shrink.
[m]Calf price $97.34/cwt @ 486 lb (USDA, 2003). Preconditioned price determined by a $0.10/lb slide.
[n]Calf price adjusted for premiums associated with preconditioning $0.05/lb (Dhuyvetter et al, 2005).
[o]Total calf value using adjusted calf price and actual weight without accounting for shrink.
[p]Value added due to preconditioning. (Preconditioned calf value – Non-Preconditioned calf value).
[q]Profit over the value of Non-Preconditioned calves (Value Added – Total Cost).
[r]Calf weight adjusted for shrink differences (Assuming Preconditioned 1%, Non-Preconditioned 5%).
[s]Calf price $97.34/cwt @ 486 lb adjusted for shrink differences with a $0.10/lb slide.
[t] Calf price adjusted for shrink and premiums associated with preconditioning $0.05/lb.
[u] Total calf value using adjusted calf price and shrunk weight.
[v]Value added due to preconditioning and shrink differences.
[w] Profit over the value of Non-Preconditioned calves including shrink differences.

Figure 1. Forty-two day weight gain of calves supplemented with soybean meal (SBM) or soybean hulls (SBH).



[a,b]Means with different superscripts are different P<0.0001.

Figure 2. Body weight gain of calves preconditioned with soybean meal (SBM) or soybean hulls (SBH) by period.



[a,b]Means with different superscripts are different P<0.05.

Figure 3. Mean initial and ending weights of preconditioned calves by breed type.

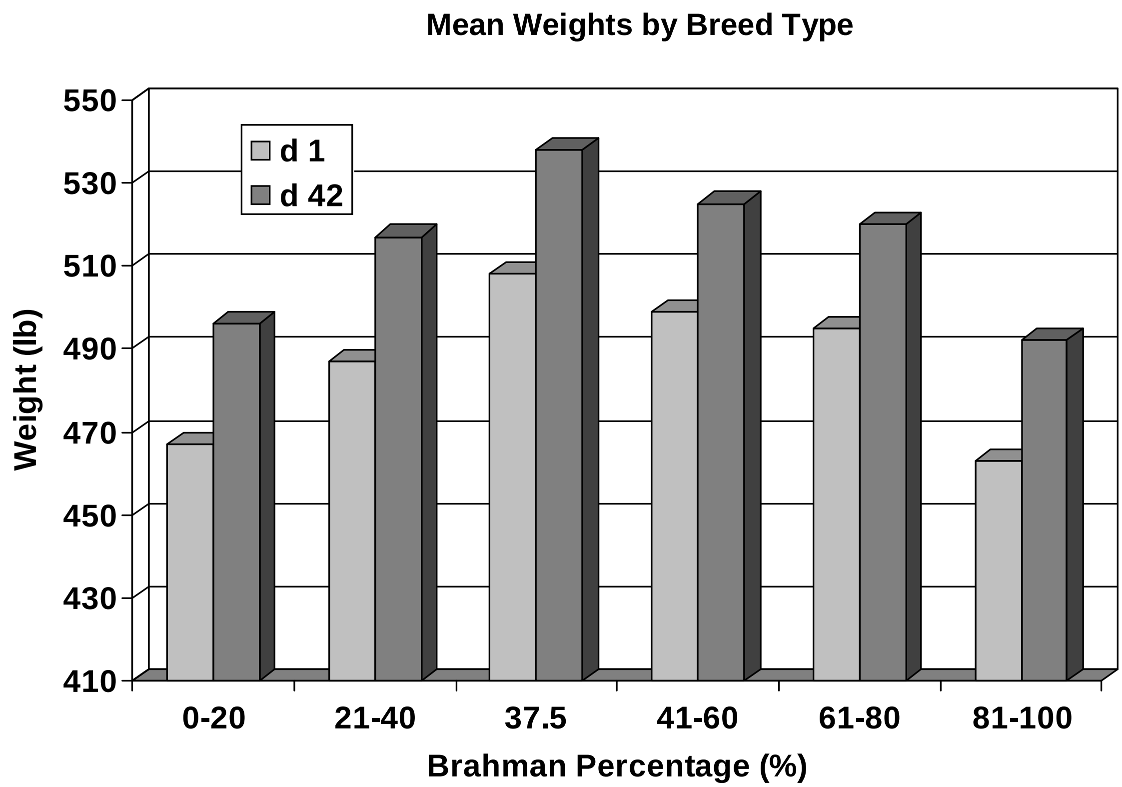


Figure 4. Forty-two d weight gain of supplemented calves by breed type. No significant differences were found P>0.10).