Effects of Feeding Whole Cottonseed on Calf Performance During Preconditioning

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Supplementing steers on bahiagrass pasture with whole cottonseed yielded lower preconditioning weight gains than supplementing with soybean meal. Economic analysis was similar for both supplements.

Summary

Whole cottonseed (WCS) and soybean meal (SBM) were evaluated as potential supplements for preconditioning beef calves in Florida. Weaned calves were fed 2.78 lb/hd/d as fed of WCS or 1.40 lb/hd/d as fed of SBM for a 42-d preconditioning period. Steer calves fed WCS had lower preconditioning weight gains than steers supplemented with SBM (30.7 lb/hd vs 40.1lb/hd). An economic evaluation of preconditioning with WCS or SBM was included. Preconditioning with WCS generated a $5.25 profit, while preconditioning with SBM generated $5.72 profit 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.

Whole cottonseed is a byproduct of the cotton industry that is readily available to southeastern producers. Due to the seasonal harvest of cotton there is an increase in WCS production during the months of September, October, and November (NCPA, 2005). Historical data from USDA (2005) has shown that 72.5% of the cotton produced in the US is produced during these three months. This coincides with the period of time when many Florida cattle producers are weaning their calves. This relationship between cotton harvest and weaning suggests consideration of WCS as a byproduct feedstuff for economically preconditioning calves. Whole cottonseed is a good source of energy (90% total digestible nutrients (TDN), 17.5% fat) and contains 24.4% crude protein (CP) (NRC, 1996). The palatability of WCS is good in mature cows, but relatively unknown in young stressed calves. The objective of this study was to evaluate WCS on the basis of calf performance and economics as a supplement for preconditioning calves.

Procedure

This study was conducted at the UF/IFAS Boston Farm - Santa Fe River Ranch Beef Unit in Alachua County, Florida. The trial began on September 17, 2003, and ended on October 29, 2003. The study utilized 42 Angus steers and 30 Brangus steers (mean body weight 525 $\pm$ 8 lb) in a 42-d performance trial. Weights were taken on d 1, d 21, and d 42. Supplemental treatments were 2.78 lb/hd/d as fed of WCS 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 237 $\pm$ 3 d. Calves were stratified to treatment based on weight, breed, and age. Initial weight was not different between treatments (P=0.71).

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, boostrered 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 wks later. The calves were weaned in drylot pens with adequate shade, water, and hay for 5 d. Free choice Coastal bermudagrass hay was provided for each treatment during the drylot period. Calves were fed their respective supplements each morning in 10 ft portable plastic feed bunks with 14 in of bunk space per animal. On d 2 and d 3, supplement was offered on top of Coastal bermudagrass hay at 50% and 60% of target intake respectively. The amount of supplement was increased by 10%/d until the desired level of supplementation was achieved on d 7. On the morning of d 6, calves were turned out onto bahiagrass pastures. There was

no refusal of feed during the drylot period.

Animals were housed in two adjacent 15-ac pastures of Argentine bahiagrass for the duration of the trial. The pastures were 6-wk regrowth following hay harvest. Fertilizer was applied in the form of granular ammonium nitrate at a rate of 150 lb/ac (50 lb of nitrogen/ac) 2 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 ($P>0.10$) for both treatments and was never less than 1,400 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 supplement treatment with calf age 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 preconditioned calves were compared to a theoretical group of non-preconditioned calves.

Results

There was a treatment effect on 42-d gain ($P<0.05$). Calves fed SBM gained 40.1 lb during the preconditioning period, while calves fed WCS gained 30.7 lb (Figure 1). During the first 21-d feeding period, there was no difference ($P<0.05$) in gain between SBM and WCS. However, there was a treatment effect on gain for the second 21-d period of preconditioning ($P<0.01$). During the second 21-d period, calves fed SBM gained 17.1 lb while calves fed WCS gained 6.2 lb (Figure 2). The difference in weight gain between treatments appears to be the result of decreased dry matter intake (DMI) of WCS during the second 21-d period (Figure 3). The calves in the SBM treatment reached the target intake by d 7, and there was no refusal of feed for the duration of the trial. The calves on the WCS treatment exhibited periodic refusal that increased in frequency and amount as the trial continued. One possible explanation for the decrease in DMI could be insult to the WCS by pests or weather while in the commodity bay. The decrease in DMI could also be a function on increased lipid in the diet.

A summary of the costs associated with preconditioning are listed in Table 2. The total costs of preconditioning for SBM and WCS were \$36.54/hd and \$34.68/hd, respectively. The value added to calves that were preconditioned with SBM was \$42.26/hd, while calves fed WCS showed an increase in value of \$39.93/hd compared to non-preconditioned calves. When compared to selling the calves at weaning, the amount of profit derived from preconditioning was \$5.72/hd for SBM and \$5.25/hd for WCS. 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 \$14.71/hd for SBM and \$14.16/hd for WCS.

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. If preconditioned calves could not have been sold for more \$/lb, then this analysis would have yielded a negative return.

Both SBM and WCS yielded similar economic results, and both supplements appear to have value as preconditioning supplements. Both supplements produced acceptable weight gains. However, the palatability and handling characteristics of WCS appear to be the greatest limiting factors to its widespread use as a preconditioning supplement. More importantly, there was no incidence of morbidity or mortality on either supplement. 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 whole cottonseed (WCS) supplements.

	SBM preconditioned	WCS preconditioned
Target, lb/hd/d		
Feeding rate	1.40	2.78
DMI[a]	1.26	2.56
CP[b]	0.63	0.62
TDN[c]	1.10	2.30
Actual,lb/hd/d		
Feeding rate	1.29	2.10
DMI	1.16	1.94
CP	0.58	0.47
TDN	1.01	1.74

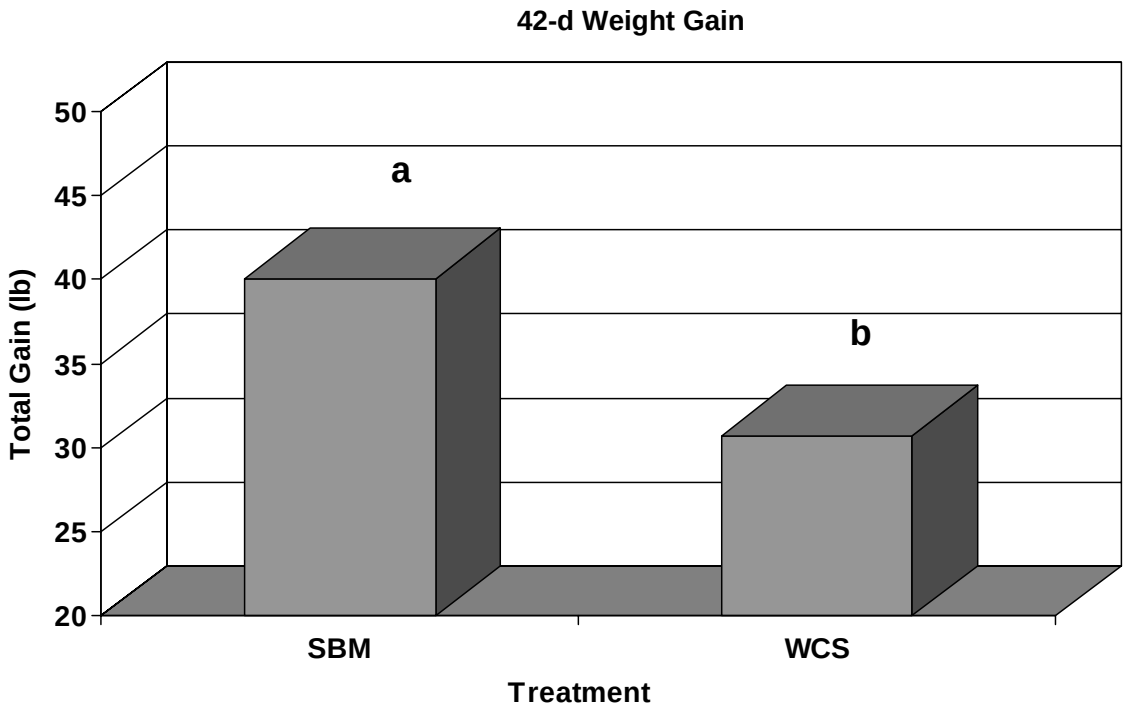
[a]Dry matter intake.
[b]Crude protein.
[c]Total digestible nutrients.

Table 2. Economic evaluation of preconditioning with soybean meal (SBM) or whole cottonseed (WCS).

	Cost/hd ($)		
	Non-preconditioned	SBM preconditioned	WCS preconditioned
Vaccines[a]		5.47	5.47
Anthelmintic[b]		1.73	1.73
Fertilizer[c]		8.59	8.59
Pesticide[d]		3.10	3.10
Mineral[e]		0.88	0.58
Supplement[f]		9.07	6.56
Hay[g]		1.67	1.67
Pasture[h]		1.44	1.44
Labor[i]		2.33	3.28
Interest[j]		2.26	2.26
Total cost[k]		36.54	34.68
Calf weight, lb[l]	525	563	557
Calf price, $/cwt[m]	93.44	89.64	90.24
Adj. calf price, $/cwt[n]		94.64	95.24
Calf value[o]	490.56	532.82	530.49
Value added[p]		42.26	39.93
Profit[q]		5.72	5.25
Shrunk calf weight, lb[r]	499	557	551
Shrunk calf price, $/cwt[s]	96.04	90.24	90.84
Shrunk adj. calf price, $/cwt[t]		95.24	95.84
Shrunk calf value[u]	479.24	530.49	528.08
Shrunk value added[v]		51.25	48.84
Shrunk profit[w]		14.71	14.16

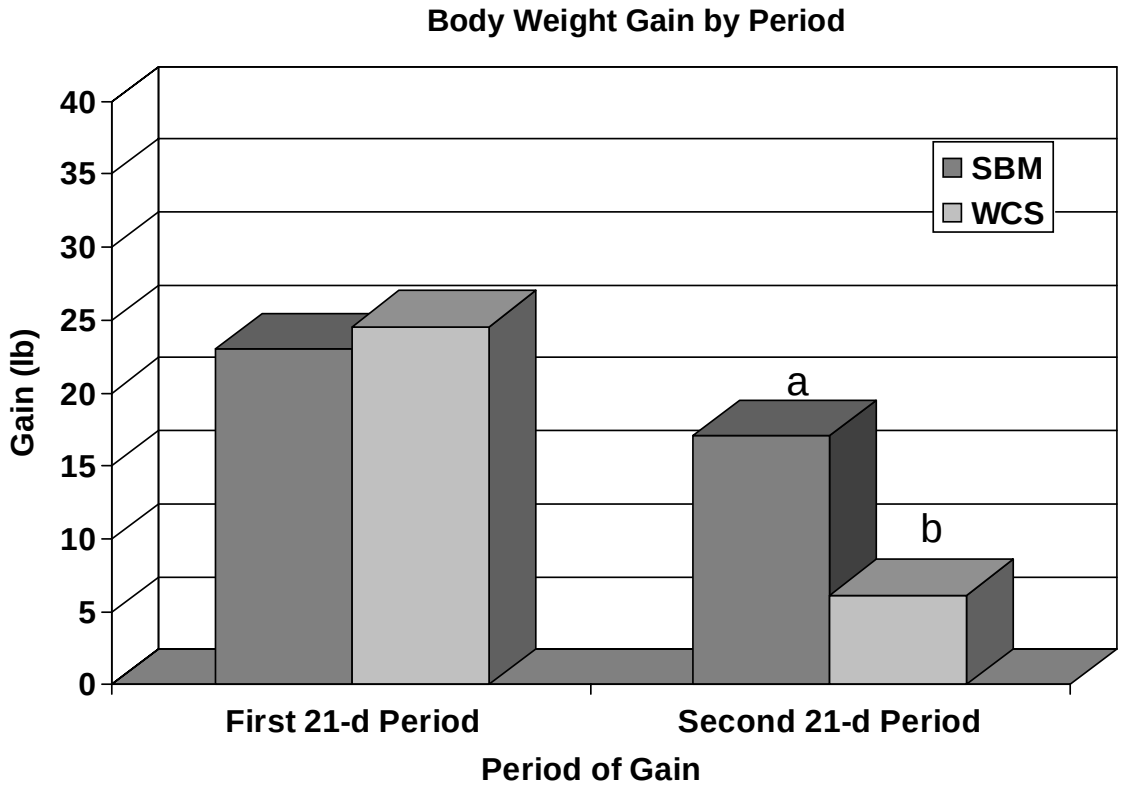
[a]Preconditioned calves were vaccinated twice before weaning and again at weaning with a MLV.
[b]5 ml dose (550 lb) of injectable avermectin dewormer per calf.
[c]150 lb/ac of 34-0-0 (50 lb of N/ac).
[d]1qt/ac of Sevin XLR @ $29.80/gal.
[e]150 lb for SBM, 100 lb for WCS @ $10.50/bag.
[f]1,955 lb of SBM @ $334.20/ton, 3,776 lb of WCS @ $125.00/ton.
[g]2 rolls of Coastal bermudagrass hay (average weight 830 lb) per treatment @ $30.00/roll.
[h]15 ac/treatment @ $30.00/ac/yr.
[i]10.5 h for SBM @ $8.00/h, 14.75 h for WCS @ $8.00/h.
[j]4% interest for 42 d on the value of the calves at weaning ($490.56).
[k]Total cost of preconditioning.
[l]Actual weight without accounting for shrink.
[m]Calf price $93.44/cwt @ 525 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 $93.44/cwt @ 525 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 whole cottonseed (WCS).



[a,b]Means with different superscripts are different P=0.02.

Figure 2. Body weight gain of calves preconditioned with soybean meal (SBM) or whole cottonseed (WCS) by period.



[a,b]Means with different superscripts are different P=0.02.

Figure 3. Supplement intake of soybean meal (SBM) or whole cottonseed (WCS) as a percentage of target intake by week.