Use of Soybean Hulls as a Complementary Feedstuff to Winter Rye Pasture

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Story in Brief

A study was conducted to evaluate five different winter rye pasture based production programs for growing beef cattle and effects on subsequent feedlot performance. Three hundred and ninety-seven steers were grazed on 15 rye pastures. The experiment was initiated on December 6, 2004 and completed on April 11, 2005 near Burneyville, Oklahoma. Upon turnout, steers were randomly assigned to five treatments as follows: (1) conventional; steers grazed rye pasture (2.7steers/ha); 2, 3, 4; steers grazed rye pasture at stocking rates of 4.7, 6.2, and 7.4 steers/ha, respectively, and had ad libitum access to soybean hulls; (5) optimum; steers grazed rye pasture at stocking rates to result in forage mass of 840 kg/ha throughout the study. From these data we conclude that providing free choice soybean hulls allowed stocking rates to be markedly increased without decreasing cattle performance. Additionally, there was a pronounced advantage in returns ($/ha) to land, labor, and management by feeding supplemental soybean hulls to increase initial stocking rates on winter rye pasture. Feedlot performance and carcass characteristics were similar irrespective of type of production program on rye pasture.

Key Words: Beef Cattle, Production Programs, Rye Pasture

Introduction

Winter small grains pasture is a major forage resource for growing cattle in the southeastern United States. Rate of weight gain (ADG) is a key factor that affects the economic outcome of stocker cattle enterprises. The development of sound energy supplementation programs has the potential to add stability to the enterprise and decrease cattle production risk (Vogel et al., 1987). Soybean hulls (SBH) are a by-product of soybean processing for oil and meal production. Additionally, SBH are abundant in readily digestible fiber. High-fiber by-product feedstuffs, such as SBH, do not have a negative effect on forage digestibility as compared with starch-based supplements (Fieser et al., 2003). Forage production and availability vary tremendously over the grazing period and often becomes first-limiting with respect to forage intake and ADG. The use of SBH can extend the traditional forage grazing season in drought or when availability is low. Furthermore, purchase cost of stocker cattle accounts for about 75% of the total dollars needed to breakeven in a stocker/feeder cattle operation. Due to the seasonality of cattle prices, producers have the opportunity to purchase cattle in early fall on seasonally low markets; thereby, decreasing purchase price.

Materials and Methods

Study Site. Fifteen rye pastures were assigned to one of five treatments, with three replicates per treatment. The pastures were managed using a no-till production system that included two applications of Roundup (2.34 kg/ha) pre-planting to control weed growth. Additionally, 67 kg/ha of phosphorus was applied pre-planting, and 179 kg/ha of nitrogen was applied at the time of planting. Maton rye was seeded at 134 kg/ha in early September.

Experimental Treatments. Fall-weaned steer calves were used. Cattle were from one source and consisted primarily of Continental x British crossbred steers. Upon turnout, steers were randomly assigned to five treatments as follows: (1) conventional; steers grazed rye pasture (2.7 steers/ha); 2, 3, 4; steers grazed rye pasture at stocking rates of 4.7, 6.2, and 7.4 steers/ha, respectively, and had ad libitum access to soybean hulls through the use of self-feeders; (5) optimum; steers grazed rye pasture at stocking rates to result in forage mass of 840 kg/ha. All treatments were allowed access to rye hay when forage mass was below 1120 kg DM/ha or during times of inclement weather. SBH intake was determined by difference, periodically weighing the self-feeders and adding additional hulls. Hay intake was estimated from bale weights and rate of disappearance. Shrunk body weight measurements were taken on December 6, March 13, and April 12.

Economic Analyses. An economic analysis was done to assess the profitability of the different production programs. Pasture cost included the cost of chemical, seed, fertilizer, no-till planting cost, and interest at 7%. The cost of the SBH was included at $103.40/ton and rye hay at $60.00/ton. The total pasture cost were $248.37/ha. In addition to determining total pasture cost, a cost per kg of gain on pasture was calculated first, by dividing the total pasture cost by the kg gained per pasture, and then averaged by treatment. Feedlot cost of gain was calculated by summing the cost of processing, alliance fees and insurance, medical cost, yardage, feed cost, and interest at 7% then dividing by total kg gained in the feedlot. The total feedlot cost of gain was $1.24/kg. A return to land, labor, and management was calculated three ways-gross return, $/steer, and $/ha. Return to land, labor, and management was calculated by multiplying the market value of gain (1.65/kg) by the weight gained then subtracting the total cost. Return to land, labor, and management on a $/steer basis, was calculated by dividing the gross return to land, labor, and management by the average head days per pasture. The return to land, labor, and management ($/ha) was figured by multiplying the return ($/steer) by stocking rate.

Statistical Analyses. The experimental design was completely randomized and statistical analyses were performed using PROC MIXED (SAS Institute, Cary, NC). Experimental units were pastures and sampling units were steers. The data were analyzed on a pasture basis using generalized least squares. Non-orthogonal contrasts were conducted for treatments SR1120, SR1400, and SR1680 that included the effect of stocking rate which was divided into linear and quadratic effects. A direct comparison of stocking rate compared CONV to the OPT treatment and the average of treatments SR1120, SR1400, SR1680 to the CONV treatment.

Results and Discussion

Soybean Hull and Hay Intake. Figure 1 shows mean daily soybean hull intake (as-fed basis) across treatments 2, 3, and 4 ranged from 5.2 to 6.2 kg/steer (SEM=.20), and intake of soybean hulls increased linearly ($P<.01$) as stocking rate increased and forage availability decreased. Hay intake increased quadratically ($P<.01$) across treatments 2, 3, and 4 as a result of increased stocking rate.

Weight Gains. Average daily gains and gain/steer were not different ($P=.76$), whereas gain/ha increased in a linear manner ($P<.01$) as stocking rate increased. Additionally, there was a difference ($P<.01$) in the average of treatments 2, 3, and 4 and CONV.

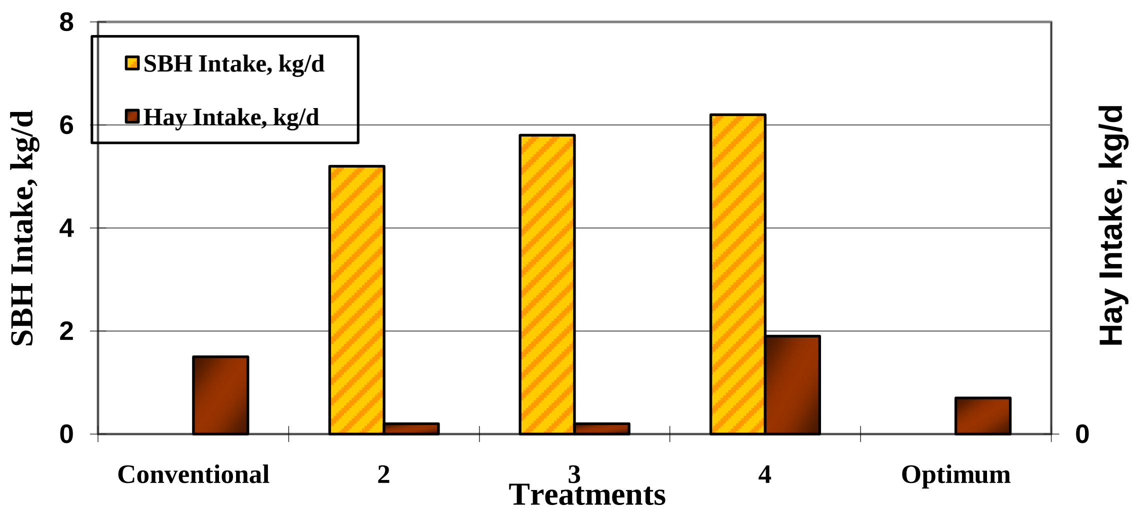

Figure 1. Soybean hull and hay intake on pasture.

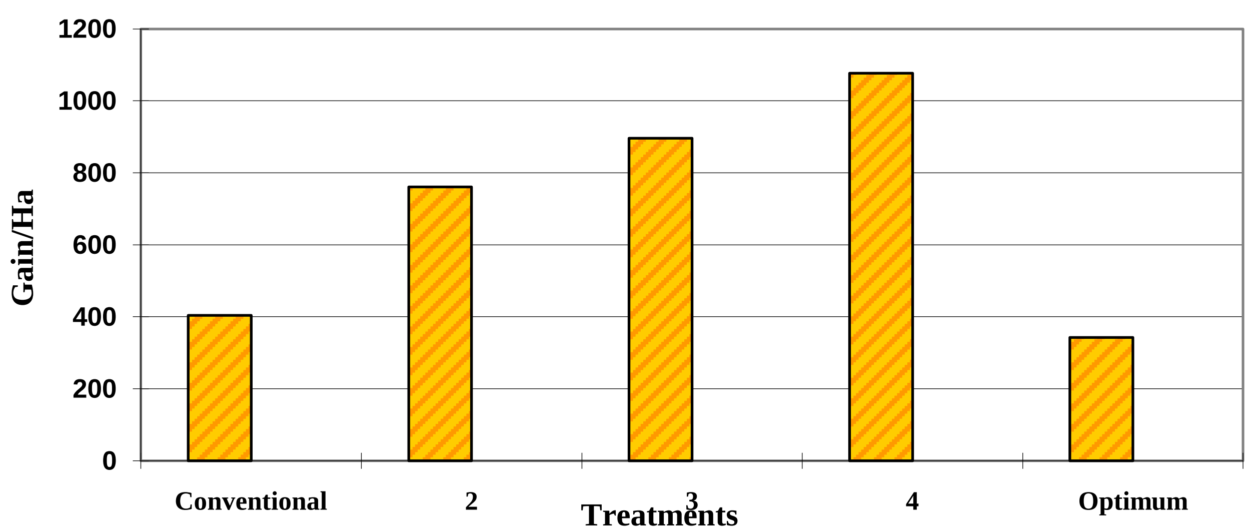

Figure 2. Gain per hectare on pasture.

Pasture Economics. Cost of gain ($100/kg) and supplement cost ($/ha) increased linearly (P<.05)across treatments 2, 3, and 4 as stocking rate increased, and the average of 2, 3, and 4, was greater (P<.01) than conventional as shown in figure 3. Figure 4 illustrates that return to land, labor, and management ($/steer) decreased linearly as stocking rate increased, and conventional was greater (P=.003) than 2, 3, and 4. Furthermore, return to land, labor, and management ($/ha) was greater (P<.01) for 2, 3, and 4, than conventional.

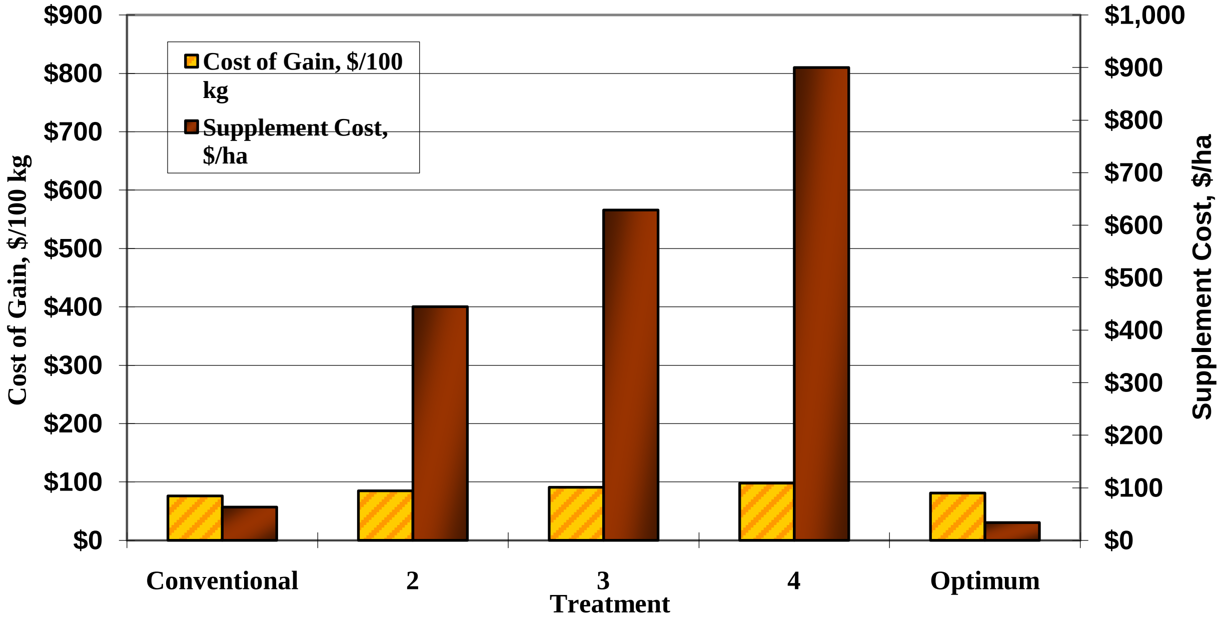

Figure 3. Supplement cost and cost of gain.

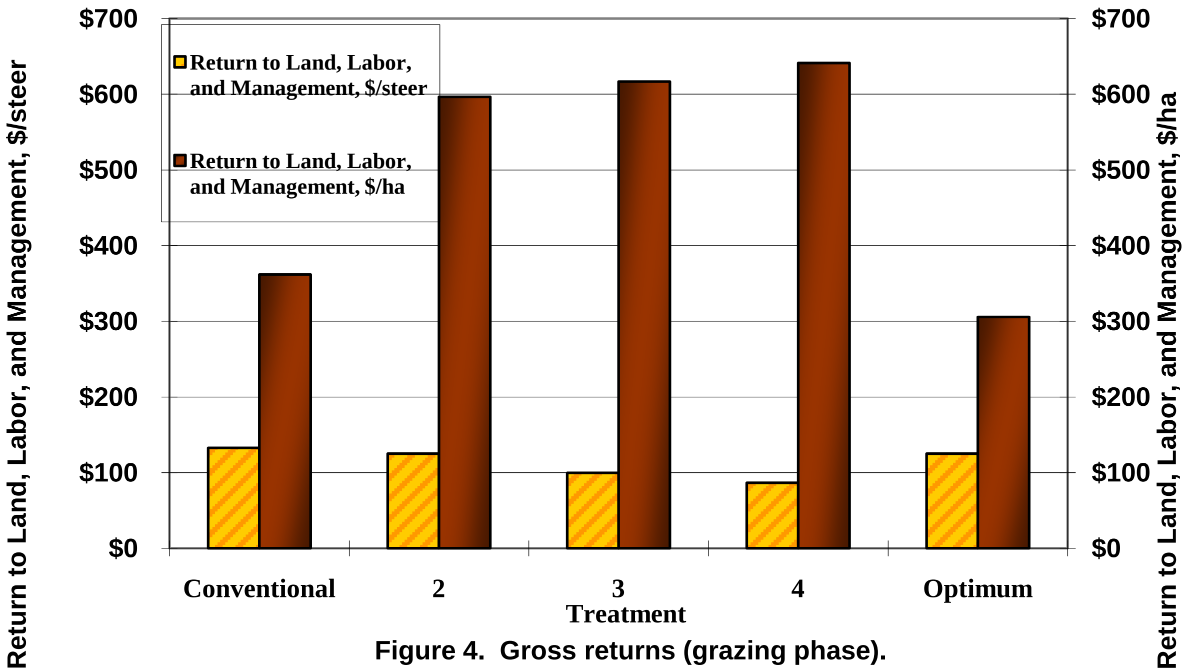

Figure 4. Gross returns (grazing phase).

Feedlot Phase. The cattle were finished at Decatur County Feed Yard in Oberlin, Kansas. Steers entered the feedlot weighing an average of 362 kg (SEM=7.19) at a common backfat of 1.35 cm (SEM=.135) and were on feed for an average of 132 d. During this phase there were no differences in cattle performance or feedlot cost of gain and all carcass characteristics were similar with the exception of dressing percentage. There was a linear decrease (P=.004) in dressing percentage as the stocking rate on pasture was increased. USDA quality grade was unavailable at the time this report was written.

Table 1. Pasture treatment least-squares means for feedlot phase.

	Conventional	2	3	4	Optimum	SEM
Number of Steers	38	78	77	78	24	-
Initial wt, kg	365	367	357	358	364	7.19
Final wt, kg	583	568	573	565	584	6.66
Initial Backfat, cm	1.30	1.49	1.30	1.45	1.23	0.135
Days on Feed	131	132	133	129	134	-
ADG, kg	1.67	1.53	1.62	1.61	1.65	0.05
Total Feed Cost, $/hd	$234.63	$228.39	$240.32	$223.88	$236.30	4.84
Cost of Gain, $/kg	$1.24	$1.27	$1.24	$1.22	$1.21	0.02
Hot Carcass Wt, kg	372	371	369	365	378	4.4
Dressing Percentage	63.6	65.3	64.7	63.7	63.6	0.004
Ribeye Area, cm2	91.40	92.87	90.53	90.73	95.47	2.97
USDA Yield Grade	2.20	2.30	2.20	2.30	2.10	0.12

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