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Effects of Feeding Increasing Levels of Soyhulls in Finishing Diets with WDGS

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Summary

The effects of including 0, 12.5, 25, or 37.5% soyhulls fed in combination with 40% wet distillers grains solubles (WDGS) were evaluated. Gain was greatest at the 12.5% inclusion level, but similar ADG was observed between 0 and 25% inclusion levels. Feed conversion (F:G) decreased by 2.4% and HCW increased 13 lb when including 12.5% soyhulls in the diet compared to steers fed 0% soyhulls. Therefore, results from this study suggest that 12.5% soyhulls can replace a portion of corn in finishing diets that contain WDGS and achieve greater performance when fed to calf-feds.

Introduction

The use of co-products, such as soybean hulls, is rarely included in the finishing ration at elevated levels. Previous research, (*2013 Nebraska Beef Cattle Report,* pp. 86-87) has demonstrated that with increasing dietary inclusion of pelleted soyhulls, performance of steers decreased linearly, along with the feeding value relative to corn. However, this research was performed with yearling steers along with the use modified distillers grains plus solubles (MDGS) in the diet. Therefore, our objective was to determine the optimum level of ground soyhulls, replacing corn, when fed with wet distillers grains plus solubles (WDGS) in finishing diets for calf-feds.

Procedure

Crossbred steer calves (n = 160, BW = 801 ± 36 lb) were utilized in a randomized block design. Prior to initiation, steers were backgrounded for approximately 45 days. Dietary treatments (Table 1) consisted of ground soyhulls (ADM, Lincoln, Neb.) at 0, 12.5, 25, and 37.5% diet DM while replacing a 1:1 blend of dry rolled corn (DRC) and high moisture corn (HMC). Wet distillers grains plus solubles (40%), sorghum silage (8%), and supplement (4%) were included in all diets. The supplement was formulated for 30 g/ton of Rumensin® and to provide 90 mg/steer daily of Tylan®. Cattle were adapted over a 17-day period by increasing the inclusion of corn blend and soyhulls, while decreasing the level of sorghum silage from 35 to 8% (DM). The nutrient composition of soyhulls was 57% NDF, 12.9% CP, and 3.7% ether extract.

Prior to initiation of trial, steers were limit fed (a common diet) at 2% BW for five days to minimize variation in gut fill. Steers were weighed two consecutive days (days 0 and 1) to establish initial BW. Calves were blocked by day 0 BW, stratified by BW within blocks (light, medium, heavy), and assigned randomly to pen. Pens were assigned randomly to one of four treatments with eight steers per pen and five pens per treatment. The energy values and feeding values of soyhulls were calculated the same way as a previous study (*2013 Nebraska Beef Cattle Report,* pp. 89-90). Total digestible nutrients were assumed to be 90% for DRC, 93% for HMC, 60% for sorghum silage, and 117% for WDGS in all diets. The net energy (NE) adjusters for the 0% diet were adjusted to equal observed ADG for that treatment. The NE adjusters were set at 83.4% based on performance of the 0% diet. Pens were then evaluated where TDN of soyhulls was modified to equal observed ADG after setting observed DMI.

Steers were implanted on day 1 with Revalor®-IS, re-implanted with Revalor®-S on day 47, and harvested at Greater Omaha Pack, Omaha, Neb., on day 139. On day of slaughter, hot carcass weights (HCW) and liver scores were collected. After a 48-hour chill, USDA marbling score, 12^{th} rib fat depth, and LM area were collected. Yield grade was calculated from the following formula: 2.5 + (2.5 x 12^{th} rib fat) – (0.32 x LM area) + (0.2 x 2.5 [KPH]) + (0.0038 x HCW). Final BW, ADG, and F:G were calculated from HCW adjusted to a common dressing percentage (63%).

Table 1. Diet composition for diets containing 0% to 37.5% soyhulls (DM basis).

	Soyhulls, % Diet DM			
Ingredient[1], %	0	12.5	25	37.5
DRC	24.0	17.75	11.5	5.25
HMC	24.0	17.75	11.5	5.25
WDGS	40.0	40.0	40.0	40.0
Soyhulls	—	12.5	25.0	37.5
Sorghum Silage	8.0	8.0	8.0	8.0
Supplement[2]	4.0	4.0	4.0	4.0

[1]DRC = dry rolled corn; HMC = high moisture corn; WDGS = wet distillers grains solubles.
[2]Supplement formulated to provide 375 mg/daily Rumensin and 90 mg/daily of Tylan.

Table 2. Effect of soyhulls inclusion on cattle performance and carcass characteristics.

Item	Soyhulls, % Diet DM				SEM	*P*-value	
	0	12.5	25	37.5		Lin.[1]	Quad.[2]
Performance							
Initial BW, lb	791	792	793	793	1	0.20	0.64
DMI, lb/day	22.7	23.1	22.1	22.0	0.5	0.18	0.57
ADG, lb[3]	3.88	4.03	3.85	3.69	0.09	0.09	0.12
Feed:Gain[4]	5.85	5.71	5.75	5.95		0.45	0.12
Energy Value[5], %		86	98	94	7	0.84	0.46
Feeding Value[6], %		119	107	95			
Carcass Characteristics							
HCW, lb	836	849	834	821	8	0.13	0.13
Marbling[7]	580	573	573	565	18	0.57	0.99
LM area, in^2	12.84	12.92	12.98	13.16	0.24	0.35	0.83
12^{th} rib fat, in	0.60	0.53	0.52	0.49	0.04	0.04	0.61
Calculated YG	3.58	3.43	3.33	3.19	0.13	0.06	0.98

[1]Lin. = P-value for the linear response to Soyhulls inclusion.
[2]Quad. = P-value for the quadratic response to Soyhulls inclusion.
[3]Calculated from carcass weight, adjusted to 63% common dressing percent.
[4]Analyzed as G:F, the reciprocal of F:G.
[5]Calculated from percent TDN of soyhulls, divided by percent TDN of corn (90%).
[6]Percent of corn feeding value calculated as percent different in G:F from control divided by inclusion.
[7]Marbling Score: 400 = Slight, 500 = Small, 600 = Modest, etc.

Performance and carcass characteristics were analyzed using the MIXED procedure of SAS (SAS Inst. Inc., Cary, N.C) with animals removed from analysis. Pen was the experimental unit and block was treated as a fixed effect. Orthogonal contrasts were constructed to determine the response curve (linear, quadratic, and cubic) for soyhulls level in the diet.

Results

Two steers died due to bloat, one fed 0% and one 37.5% soyhulls; two steers were removed from the study (one each on 25 and 37.5% soyhulls) due to bloat and not included in the analysis. As inclusion level of soyhulls in the diet increased, a tendency for a linear decrease in ADG ($P = 0.09$) was observed (Table 2). Numerically, response in ADG appeared quadratic with greatest ADG being observed at the 12.5% inclusion level resulting in 3.8 and 9.2% greater gains compared to inclusion levels 0 and 37.5%, respectively. No statistical differences in DMI across inclusion levels were observed ($P > 0.17$). Feed conversion (F:G) tended to respond quadratically ($P = 0.12$) with feed efficiency improving by 2.4% (0 vs 12.5%) and then slightly increasing at the 25% inclusion level, but numerically steers fed 25% soyhulls were still 1.7% more efficient than those fed 0% soyhulls. There were no differences in HCW, marbling score, or LM area ($P > 0.12$); however, numerically steers fed 12.5% soyhulls resulted in 13 lb heavier HCW (0 vs 12.5%) and also 28 lb greater than 37.5%. As inclusion level increased, 12^{th} rib fat decreased linearly ($P = 0.04$), as did calculated yield grade ($P = 0.06$).

The energy values relative to corn were 86, 98, and 94% at soyhull inclusion levels of 12.5, 25, and 37.5%, respectively. Based on animal performance, the energy value at 12.5% does not support the response in performance that we observed and appears to be underestimating the energy value of soyhulls. With the use of G:F (the inverse of F:G), the feeding value of soyhulls was calculated for 12.5, 25, and 37.5% inclusion. Feeding values were 119, 107, and 95% of corn, respectively. These values reflect the performance responses that were observed resulting in a more accurate assessment for producers when comparing the feeding value of soyhulls to corn in diets that contain WDGS.

Feeding up to 25% soyhulls may effectively reduce the inclusion level of corn in the diet and achieve similar gains with lower feed conversions. Gain was numerically greatest at the 12.5% level where feed conversions were lowest. This study would suggest that the optimum inclusion level of soyhulls in the finishing diet is 12.5%, resulting in increased ADG, decreased F:G, and increased HCW when fed to calf-feds. This response is different than a similarly designed study conducted with yearlings where we observed poorer ADG and F:G with increasing levels of Soyhulls (*2013 Nebraska Beef Cattle Report,* p. 86-87).

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