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The Effect of Corn or Soybean Hull Diets Supplemented with Dried Distillers Grain with Solubles (DDGS) on Finishing Lamb Performance and Carcass Merit[1]

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Summary

Eighty 78.1 ± 1.6 lb white-faced and brockle-faced wether and ewe lambs were used in an experiment to test the effects of soybean hulls and dried distillers grains with solubles (DDGS) on growth, feed efficiency and carcass merit. Lambs were placed on test between 79 to 105 days of age (average 92 days) and fed the experimental diets for 60 days. Each pen consisted of 10 lambs. Diets were formulated to meet or exceed NRC requirements. The diets were corn or soybean hull based and DDGS served as the protein supplement in both diets. No treatment differences were observed in lamb growth at monthly intervals or for the entire period (0.77 vs. 0.79 lb/d, corn vs. soybean hull, respectively). Feed intake (DI) and feed efficiency (F/G) was greater for the soybean hull versus corn based diets (DI: 4.9 vs. 4.1 lb; F/G: 6.7 vs. 5.1 lb, respectively). Self-feeders were cleaned as needed and feed refusals were recorded. Additionally, for a 3-week period during the feeding trial, weekly feed refusals were recorded. The soybean hull diet had significantly less feed refusal per pen than the corn diet (13.9 vs. 29.1 lb/wk). Carcass measurements for back fat, loin eye area, body wall thickness, hot carcass weight, and USDA Quality and Yield Grades did not differ between treatments. No death loss occurred during the trial. These data suggest that soybean hulls are a suitable replacement for corn in finishing lamb diets.

Introduction

With the growth of ethanol production from corn and increasing volume of soybeans processed in the Upper Midwest, livestock producers have greater access to nutrient dense co-product feed resources. Dried distillers grain with solubles (DDGS) derived from ethanol production and soybean hulls from soybean processing have attracted the interest of sheep producers. Research at SDSU demonstrated DDGS can be utilized as the primary protein source in lamb diets with no effect on growth or carcass traits compared to traditional soybean meal diets (Huls et al., 2006). However, the mix in advantageous to these feeds are cost, animal performance and reducing labor. Both DDGS and soybean hulls are energy dense feeds that can safely replace a portion of traditional forage or grain in diets since the high fiber-low starch physical characteristics have low rumen acidodic potential.

In beef and dairy cattle studies recommendations are to limit soybean hulls to 40% of dry matter intake due to concern for bloat. However, we previously fed ewes slightly above maintenance requirement by offering 4 pounds of pelleted soybean hulls and 1 pound of long-stemmed alfalfa hay daily. Ewes were fed this diet for 60 days with no ill health and ewe body weight change was a positive 0.1 lb per day. Additionally, researchers at Cornell University fed a diet containing 70% soybean hulls to lambs with no negative effect on lamb growth rate (Thonney and Hogue 1999). Thus, soybean hulls may be added to lamb diets at high levels.

Until recently, the industry use of DDGS in lamb growing and finishing diet formulation has been limited. Lamb diets are generally offered feed ad-libitum in self-feeders with maximum expected dry matter intake and growth performance. Most lamb diets contain a feed grain source for energy and a pelleted lamb supplement containing protein, minerals, vitamins and feed additives. The pelleted supplements are used to improve overall diet palatability and reduce feed refusal. However, the high cost of commercially manufactured lamb protein supplements has created lamb feeder interest in using DDGS in mixed lamb

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diet formulations. Therefore, this study was designed to evaluate DDGS and soybean hulls in ad-libitum fed mixed diets.

Materials and Methods

Diets were formulated to contain 14 % crude protein, DDGS was included at 17.3 % and either cracked corn or pelleted soybean hulls at 76.4 % (Table 1). Diets were formulated to meet or exceed NRC (1985) requirements. Eighty 78.1 ± 1.6 lb white-faced and brockle-faced wether and ewe lambs were allotted to one of eight pens to test the effects of diet on growth, feed efficiency and carcass merit. Animal allotment to treatment pen was stratified by weight, sex and breed type. The age of lambs were placed on test was 92 d (range 79 to 105 d). Each replicate pen housed 10 lambs. After a 7 day adaptation period, lambs were weighed, and the study was initiated. Lambs were weighed at 28 and 56 d (final weight), and feed disappearance was recorded to calculate feed to gain ratios. Self-feeders were cleaned as needed and feed refusals were recorded. After observing the soybean hull diet did not require as frequent cleaning, feed refusal was recorded weekly for a 21 day period. Lambs were maintained on their respective diets, and slaughtered at a commercial packing plant 14 days after completion of the test period. Carcass data were collected. Data were tested for effect of diet, period, and the interaction on average daily gain, pen intake, and feed to gain ratio using PROC GLM procedures for SAS. Data were tested for effect of diet, week and the interaction on feed refusal using PROC GLM procedures for SAS. Data were tested for effect of pen diet on back fat, loin eye area, body wall thickness, hot carcass weight, and USDA Yield Grade using PROC GLM procedures for SAS. Data were tested for effect of pen diet on USDA Quality Grade using chi square comparisons.

Table 1: Ingredient composition of diet

Ingredient[a]	Corn Diet	Soybean Hull Diet
DDGS	17	17
Cracked Corn	76	--
Pelleted soybean hulls	--	76
Limestone	2	2
Liquid molasses	2	2
White salt	1	1
Commercial micro mineral and vitamin mix[b]	0.25	0.25
Deccox	0.1	0.1
Ammonium chloride	0.5	0.5

[a]%, DM basis

[b]Calcium 18%, iron 2%, manganese 1.6%, zinc 1.32%, iodine 0.032%, colbalt 0.008%, selenium 0.012%, vitamin A 400,000 IU/lb, vitamin D-3 80,000 IU/lb, vitamin E 24,000 IU/lb

Results and Discussion

No treatment differences ($P > 0.33$) were observed in lamb growth at 28 d intervals or for the entire period (Table 2). Carcass measurements for back fat, loin eye area, body wall thickness, hot carcass weight, and USDA Quality and Yield Grades did not differ ($P > 0.23$) between treatments (Table 3). Thus, both growth and carcass traits are comparable in lambs feed either the corn or soybean hull diet.

Diet intake ($P = 0.0021$) and feed to gain ratios (F/G) were greater ($P = 0.0039$) for the soybean hull versus corn based diets (Table 2). Thonney and Hogue also observed increased intake of lambs fed diets contain high levels of soybean hulls (1999). Soybean hulls appear to have an intrinsic property (perhaps fiber characteristics) that enhances intake for sheep.

Feed refusals, or fines, are a common problem associated with self feeding mixed diets to lambs. Initially self-feeders in this study were cleaned as needed and feed refusals were recorded. After observing the soybean hull diet did not require as frequent cleaning, feed refusal was recorded weekly for a 21 day period (days 29 through 50). The soybean hull diet had significantly less feed refusal per pen than the corn diet (Table 2; $P = 0.0056$). The lower amount of fines for the soybean hull mixed diet is advantageous to producers by reducing labor management requirements.

Table 2: Growth performance of lambs[a]

	Corn diet	Soybean hull diet	*P*-value
ADG (lb per day)	0.77 ± 0.02	0.79 ± 0.02	0.3316
Daily intake (lb)	4.1 ± 0.2	4.9 ± 0.3	0.0276
Feed to gain (lb)	5.1 ± 0.2	6.7 ± 0.6	0.0039
Residual[b] (lb per pen)	29.1 ± 1.4	13.9 ± 2.1	0.0056

[a]Values are means ± std error

[b]After observing the soybean hull diet self-feeders did not require frequent cleaning, feed refusal was recorded weekly for a 21 day period.

Table 3: Carcass characteristics of lambs[a]

	Corn diet	Soybean hull diet	*P*-value
Back Fat	0.28 ± 0.01	0.26 ± 0.01	P = 0.2346
Bodywall thickness	1.08 ± 0.03	1.08 ± 0.03	P = 0.9097
Ribeye area	2.76 ± 0.05	2.74 ± 0.08	P = 0.5997
Hot carcass weight	69.0 ± 1.2	68.7 ± 1.2	P = 0.9203
USDA Yield Grade	3.2 ± 0.1	3.0 ± 0.1	P = 0.5028
USDA Quality Grade	Choice	Choice	P = 0.9355

[a]Values are means ± std error

Both DDGS and pelleted soybean hulls offer a palatable feed ingredient for lamb diets. Yet, the level of the phosphorous contributed from DDGS is a formulation challenge. In this trial the limestone inclusion was 2% in both diets to maintain a 2:1 calcium to phosphorus ratio in the corn based diet. The level of limestone inclusion was twice the level traditionally added to maintain a 2:1 ratio of calcium to phosphorus. Although higher levels of limestone could potentially adversely affect diet palatability and result in lower diet consumption and subsequently growth performance; reducing the incidence of urinary calculi in male lambs is dependent on maintaining this ratio. However, formulating DDGS into a soybean hull based diet appears to have a complimentary effect regarding the concern for urinary calculi. Soybean hulls are naturally high in calcium (.5 %) and low in phosphorus (.12%), and thus the soybean hull diet did not require the high level of limestone inclusion to maintain 2:1 calcium to phosphorus ratio.

In summary, although lambs on the soybean hull diet had greater levels of intake, lamb growth rates and carcass traits did not differ between treatment diets. No lamb death loss or off-feed observations were observed during the trial. These data suggest that soybean hulls are a suitable replacement for corn in finishing lamb diets.

Implications

In this lamb finishing trial, soybean hulls and DDGS were combined to serve as the sole energy, protein and fiber sources. To our knowledge this is the first such work reported in sheep. Before utilizing such diets producers need to consider both the cost of gain resulting both from the cost of the ingredients and the decreased feed efficiency of the soybean hulls and DDGS diet.

Literature Cited

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