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USE OF SUNFLOWER HULLS AS THE ROUGHAGE COMPONENT OF FINISHING DIETS FOR YEARLING STEERS

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Summary

Sunflower hulls were substituted for grass-alfalfa hay as the roughage component of finishing diets for yearling steers. Feed intake was lower when sunflower hulls were fed, resulting in reduced rate of gain and increased feed conversion. When diets were formulated to contain 12% NDF rather than 10% roughage, performance of steers fed either roughage source was similar. Sunflower hulls because of low cost can be used in finishing diets at 5% of dry matter intake without affecting production costs. Feeding higher levels of unprocessed sunflower hulls is discouraged.

(Key Words: Steers, Sunflower Hulls, Roughage, NDF.)

Introduction

The roughage source used in feedlot finishing diets represents a significant contribution to total diet costs. Roughage purchase cost/T is high during drought years. Cost per unit of energy or protein, storage losses and processing-handling costs of roughages are high relative to grains. Sunflower hulls (SFH) represent a low cost alternative roughage source. The raw product has a small enough particle size to accommodate mixing and feeding without further processing. Since the roughage component of high grain diets is poorly utilized as a nutrient source, the low nutritive value of SFH is of little concern. This experiment was designed to evaluate SFH as an alternative to mixed grass-alfalfa hay as the roughage for finishing steer diets.

Materials and Methods

Yearling crossbred steers, 128 head, initial weight 824 lb, were allotted to 16 pens of 8 head. Steers were fed a common receiving diet and were vaccinated for IBR, BVD, PI₃, RSV and 7-way clostridia a week before initiating this study. Initial and final weights were obtained following a 12-hour feed and water restriction. Final weights reported and gain

calculations include a 4% pencil shrink. The steers were on test for 72 days. Test diets (Table 1) were offered at a maintenance intake level on day 1. Feed delivery was increased 10% every other day until feed refusals were evident. From that point, feed was offered to appetite.

Diets were formulated to contain either 10% roughage or 12% NDF for each roughage source (Table 1). Roughage composition values were mixed hay, 14.6% crude protein, 57% NDF, 37% ADF and 13.7% ash; SFH 7.6% crude protein, 75% NDF, 60% ADF and 4.0% ash. The supplement was pelleted. Feed samples were obtained weekly to determine dry matter and NDF content.

Statistical analysis of data was completed using procedures appropriate for a 2 x 2 factorially arranged experiment. All data were analyzed on a pen mean basis using the general linear model procedure of SAS.

Results and Discussion

Roughage source affected average daily gains (3.31 vs 2.76 lb; $P < .0001$) daily dry matter intake (18.53 vs 16.89 lb per head; $P < .001$) and feed/gain (5.61 vs 6.16; $P < .01$) for hay and SFH diets, respectively. An interaction between roughage source and level existed for performance variables. This interaction could be attributed to the performance depression that occurred when diets contained 10% SFH (Table 2).

Lower feed intake can explain virtually all of the reduction in performance observed. It is beyond the scope of this experiment to determine if the lower intake of SFH diets was in response to poor palatability or other factors. The SFH used were not further processed. The hulls were brittle and had sharp edges that may have caused problems with prehension and mastication. The SFH were not sorted by steers, suggesting other factors may be involved. SFH are refractory and may have created a large ruminal indigestible fill component that might suppress feed intake.

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TABLE 1. DIET FORMULATIONS^{ab}

Roughage source Formulation	Mixed hay		Sunflower hulls	
	12% NDF	10% roughage	12% NDF	10% roughage
Whole shelled corn	26.65	25.72	27.43	25.60
High moisture corn	58.98	57.12	59.86	56.54
Hay	7.00	10.00		
Sunflower hulls			5.04	10.00
Molasses	2.00	2.00	2.00	2.00
Supplement				
Ground corn ^c	3.00	3.00	3.00	3.00
SBM, 44% ^c	.40	.40	.40	.40
Urea ^c	.46	.43	.62	.68
Calcium carbonate ^c	1.01	.93	1.15	1.16
Potassium chloride ^c	.25	.15	.25	.54
Trace mineralized salt ^c	.25	.25	.25	.25

^a Percentage, dry matter basis.

^b Diets provide 30 g/T lasalocid and 1,000 IU/lb vitamin A.

^c Included as supplement.

TABLE 2. PERFORMANCE OF STEERS FED FINISHING DIETS THAT INCLUDED MIXED HAY OR SUNFLOWER HULLS

Roughage source Formulation	Mixed hay		Sunflower hulls		SEM
	12% NDF	10% roughage	12% NDF	10% roughage	
Initial weight, lb	826	826	820	823	1.9
Final weight, lb ^{abc}	1058	1071	1034	1006	3.8
ADG, lb ^{bc}	3.22	3.40	2.97	2.54	.05
DMI, lb/d ^{bc}	18.07	18.99	17.33	16.44	.20
F/G ^{bde}	5.62	5.59	5.83	6.50	.09
Feed cost/gain, cents/lb ^f	24.6	24.7	24.2	26.2	.37
Total cost/gain, cents/lb ^f	37.8	37.2	38.4	42.9	

^a Includes a 4% pencil shrink.

^b Roughage source effect ($P < .01$).

^c Roughage source x level effect ($P < .05$).

^d Roughage level effect ($P < .10$).

^e Roughage source x level effect ($P < .10$).

^f Includes feed, interest and yardage. Projected to constant final weight of 1071 lb.

Previous studies conducted in this feedlot indicated that 11 to 12% NDF may be optimum in finishing diets. There were no ($P > .15$) roughage level responses in this trial when considering main effects. Formulating for NDF would have restricted the use of SFH to 5% of the diet, avoiding the typical substitution of 10% roughage which resulted in unacceptable performance.

Optimum feedlot performance is a function of lowest production costs. Because of the lower cost of SFH feed cost per pound of gain was not higher when 5% SFH were fed. Feed cost/lb gain tended ($P < .20$) to be lower with diets formulated for 12% NDF than diets with 10% roughage.

Total feedlot cost of gain was calculated projecting a 1071-lb final weight for each group. Cattle purchase price accrued a 12% interest charge and daily yardage was set at 20 cents per head. Total cost of gain tended to be higher for the 10% SFH diets. The other three diets provided for similar production costs and therefore profit potential.

These data indicate SFH may be an acceptable roughage substitute. In our situation, hay cost \$85/T to feed while SFH cost \$35/T to feed. If substitution of alternative feeds for typical roughages is being considered, diet formulations and production costs must be included in the evaluation process.