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Effect of physical form and level of alfalfa in corn-based diets for finishing steers

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EFFECT OF PHYSICAL FORM AND LEVEL OF ALFALFA IN CORN-BASED DIETS FOR FINISHING STEERS'

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Summary

One hundred-eighty British crossbred steers (760 lb) were used in a 3x2 factorially arranged experiment to evaluate the main effects of alfalfa form (chopped hay, dehydrated pellets, or a 50:50 mixture of hay:dehy) and level (5 or 10% of diet DM) on finishing steer performance. Alfalfa (third-cutting, 23.9% CP) was harvested in alternate rows from a common field. No interactions between alfalfa form and level were detected. Steers fed chopped hay or the 50:50 mixture gained faster ($P < .05$), consumed more feed ($P < .05$), and had heavier final and carcass weights ($P < .05$) than steers fed dehy pellets. Steers fed 10% alfalfa gained faster ($P < .05$), consumed more feed ($P < .0003$), and had heavier carcass weights ($P < .02$) vs those fed 5% alfalfa. Feed efficiency was unaffected by alfalfa form or level. Lower feed intakes and numerically higher incidences of liver abscesses indicated less ruminal tactile stimulation and more subacute acidosis for dehy pellets vs hay or the 50:50 mixture and for 5 vs 10% alfalfa, respectively. Positive associative responses of 5.1% ($P = .07$) on daily gain and 2.9% ($P = .11$) on dry matter intake suggested that the 50:50 mixture provided enough long particles for adequate rumen function at the alfalfa levels studied.

Our results suggests more dehy pellets than chopped hay must be fed to provide similar roughage value.

(Key Words: Alfalfa, Hay, Dehydrated Pellets, Finishing Diets.)

Introduction

Chopped alfalfa hay has a relatively long average particle length. This probably aids rumen function in cattle fed high grain diets, which, in turn, maximizes consumption and lessens the incidence of acidosis and related health problems. However, wind losses during processing, storage, and ration mixing and in the feed bunk can be substantial. Other problems include increased ration and processing dust and storage difficulty. Use of dehydrated alfalfa pellets (dehy) instead of chopped hay would minimize wind losses and dust at the feedlot, increase bulk density to lessen shipping costs, and aid in ease of storage. Reduction in leaf loss from harvesting, processing, and feeding might also result in higher nutritional value for dehy. However, because particle size is smaller, dehy may not provide ruminal tactile stimulation and may result in depression in performance relative to chopped hay. Whether combining chopped hay and dehy, enhances the feeding benefits of each is also unknown. Therefore, our objective was to evaluate the main effects and interaction of alfalfa form (chopped hay, dehy, or 50:50 mixture) and level (5 or 10% of diet DM) on finishing steer performance and carcass traits.

[1]The cooperation of Ray Bert, Sedgwick, KS, who supplied alfalfa used in this study, is gratefully acknowledged.

Experimental Procedures

Third-cutting alfalfa from a common field was harvested in July, 1991, in alternate rows as either hay or dehy. Hay was sun-cured, baled, and stored immediately in a barn. It was then chopped through a tub grinder equipped with a 2 x 3 in rectangular screen, shipped to the Beef Research Unit, Manhattan, and stored in a covered hayshed until fed. Dehydrated alfalfa was wilted to 30-40 % moisture, chopped, ground through a 5/32 in. screen, made into 1/4 in. pellets, shipped, and stored at the Beef Research Unit in a grain bin until fed.

One hundred eighty British crossbred steers (760 lb), selected from a larger group of 247 based on uniformity in weight and breed type, were allotted to one of five weight replicates. Within each replicate, steers were allotted to one of six pens for a 3 **X** 2 factorially arranged experiment. Main effect factors were alfalfa form (chopped hay, dehy, or a 50:50 mixture of chopped hay:dehy) and level (5 or 10% of diet DM). Steers had been processed using standard procedures and adapated to full feed before the trial started. Initial and final weights were the average of two consecutive, early morning weights. Steers were slaughtered at a commercial plant, and carcass data obtained following a 24-h chill. Carcass data were collected on four replicates, because the fifth (light) replicate did not have desired weight or finish when the trial was terminated. The trial was conducted from August 1 - December 9, 1991.

Results and Discussion

There was no interaction between alfalfa form and level for any variables in this study. Therefore, data were pooled across main effects. Steers fed alfalfa as chopped hay or the mixture gained faster ($P < .05$) and consumed more feed ($P < .05$) than steers fed dehy (Table l), suggesting that the roughage value (ability to elicit tactile stimulation) was lower for dehy than for chopped hay. The fact that performance between steers fed chopped hay or the mixture did not differ may indicate some minimal requirement for long or coarse particles. Improvement in liveweight gain resulted in heavier ($P < .05$) carcasses for steers fed chopped hay or the mixture vs dehy. No differences were observed in other carcass or slaughter characteristics, although steers fed dehy or the mixture tended to have a higher incidence of liver abscesses, despite the feeding of tylosin for liver abscess control.

Pooled across alfalfa level, steers fed 10% alfalfa gained 4.8% faster ($P < .05$) and consumed 7% more dry matter ($P < .0003$) than those fed 5% alfalfa. Feed efficiency did not differ, which may indicate that the lower energy content of the 10% alfalfa diet was offset by its higher consumption. Feeding 10% alfalfa resulted in heavier ($P < .02$) carcasses at slaughter. Although not statistically significant, there was a numerical reduction in the incidence of liver abscesses for 10 vs 5% alfalfa.

Associative effects of chopped hay and dehy were evaluated using orthogonal contrasts. An associative effect is one where the observed response for a mixture of components differs from that predicted from the response of the individual components fed separately. Daily gain, feed consumption, and feed efficiency were 5.1, 2.9, and 2.7% higher, respectively, for the 50:50 alfalfa mixture than was predicted from chopped hay and dehy fed separately. The most practical explanation for this result seems to be that the 50:50 mixture provided enough longer particles for rumen function at the alfalfa levels we evaluated. The quality of alfalfa used in this study was extremely high (third cutting; 23.9% crude protein). It is possible that pelleting the lower quality alfalfa typically used in feedlots and(or) increasing pellet size would alter animals' response to pelleted alfalfa in finishing diets.

Table 1. Effect of Alfalfa Physical Form on Performance and Carcass Traits of Steers

Item	Alfalfa form		
	Chopped hay	Dehy	Mixture'
No. pens	10	10	10
No. steers	60	60	60
Initial wt, lb	761	759	761
Final wt, lb[b]	1137	1107	1141
Daily gain, lb	3.07[d]	2.85[e]	3.11[d]
Daily feed, lb DM	21.1[d]	19.9[e]	21.1[d]
Feed/gain"	6.90	6.99	6.76
Carcass traits			
Hot weight, lb	732[d]	720[e]	73a[d]
Dressing pct.	64.0	63.8	64.3
Backfat, in	.52	.51	.53
Marbling	Sm56[de]	Sm32[d]	Sm61[e]
Pct. choice	80	77	79
Liver abscesses, %	14	20	25

[a]50:50 mixture of chopped hay and dehydrated pellets.
[b]Pencil shrunk 4%.
[c]Calculated and analyzed statistically as gain/feed.
[de]Means in a row with different superscripts differ (P < .05).

Table 2. Effect of Alfalfa Level on Performance and Carcass Traits of Steers

Item	Alfalfa level, % of DM		SE	P value*
	5	10		
No. pens	15	15		
No. steers	90	90		
Initial wt, lb	760	760	.5	
Final wt, lb[b]	1119	1137	6	
Daily gain, lb	2.94	3.08	.05	.05
Daily feed, lb DM	20.0	21.4	.23	.0003
Feed/gain'	6.80	6.94	.09	.29
Carcass traits				
Hot weight, lb	723	737	4	.02
Dressing pct.	64.1	64.0	.2	.81
Backfat, in	.50	.54	.02	.29
Marbling	Sm49	Sm50	08	.87
Pct. choice	76	82		.72
Liver abscesses, %	22	16		44

[a]Probability of a treatment difference. Probability values for pct. choice and liver abscesses were generated from Chi-square analyses.
[b]Pencil shrunk 4%.
[c]Calculated and analyzed statistically as gain/feed.