Biomass Energy Production Co-Products

Beef Feeding Trials

MINNESOTA AGRIPOWER PROJECT
TASK I RESEARCH REPORT

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ALFALFA LEAF MEAL IN FINISHING STEER DIETS

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Summary

Ninety-six medium frame, Angus and Angus cross steer calves (average initial weight 540 lb.) were allotted to a heavy or light weight block and then randomly assigned to one of four dietary treatments for a 167 or 189-day finishing phase, respectively. Treatments were control (supplemental soybean meal), alfalfa leaf meal (ALM) providing 33%, 66%, 100% of supplemental protein. Finishing diets were formulated to contain .61 Mcal NE_g /lb dry matter, 12.5% crude protein, .6 % Ca and .3 % P. There were no significant (P >.05) effects of dietary treatments on daily gain or dry matter required /lb of gain. Steers fed 100 % ALM consumed more (P <.05) dry matter than steers fed either of the other three treatments. Dry matter consumption increased linearly (P >.05) with increasing ALM. There was no significant (P >.05) dietary treatment effect on marbling, KPH %, yield grade, quality grade, or liver abscesses. There was an apparent trend in reduced liver abscess incidence in steers fed 100 % ALM. Steers fed 66 % ALM had significantly (P <.05) greater backfat measurements, backfat also had a cubic effect (P <.05). Hot carcass weight had a quadratic relation (P <.05) with level of ALM. Substituting alfalfa leaf meal for soybean meal in diets of finishing steers increased DM intake, but this increase was accompanied by an increase in gain which resulted in similar feed efficiency. There may be an advantage in blending ALM and soybean meal as feed efficiency was improved when cattle were fed the blend. Also, feeding ALM may result in lower incidence of liver abscess.

Introduction

Alfalfa leaf meal is a byproduct of processing alfalfa hay to separate stems for power generation. The leaves are high in protein, calcium and other minerals. In addition, the energy content of leaves should approximate that of high quality hays and small grains silage. Because of its relatively high fiber content, ALM may effect rumen function in some as yet unknown way. These characteristics make ALM a likely alternative source of protein in the diets of finishing steers.

Therefore, the objectives of this study were twofold:

a) to determine the feeding value of ALM in the diets of finishing steers, and
b) to determine the effect of ALM on carcass characteristics.

Materials and Methods

Ninety six medium framed Angus and Angus cross steers (average initial weight 540 lb) were allotted to a light or heavy block and then randomly assigned to one of four treatments (12 steers per treatment). Treatments consisted of ALM fed at 100 % of supplemental protein (ALM-100), ALM fed at 66 % of supplemental protein (ALM-66), ALM fed at 33 % of supplemental protein (ALM-33) and a control diet containing soybean meal as 100 % of the supplemental protein (ALM-00). Diets were formulated to contain .61 Mcal NE_g /lb dry matter (DM), 12.5% crude protein (CP), .6 % Ca and .3 % P. Corn silage and a grain mix consisting of 50 % ground corn and 50 % ground barley were fed adlibitum. Supplements were fed at the rate of 3 lb/head/day and formulated to provide supplemental CP, and balance vitamins and minerals. Nutrient analysis of feedstuffs and composition of supplements are provided in Table 1 and 2, respectively.

Table 1. Nutrient composition of feeds.

		DM basis, %		
Feeds	DM, %	CP	NDF	ADF
Corn silage	35.3	6.92	41.37	20.30
Cracked corn	93.6	8.86	9.07	1.19
Cracked barley	92.5	14.10	18.31	4.10
Supplements[a]				
ALM00	90.6	24.02	15.10	4.07
ALM33	91.9	21.2	20.00	7.50
ALM66	93.2	20.19	23.92	11.95
ALM100	94.6	19.00	28.89	15.87
Alfalfa leaf meal	96.8	22.88	32.73	19.20

[a] ALM00, ALM33, ALM66 or ALM100: Alfalfa leaf meal-based supplement with 0, 33, 66 or 100% of the supplemental protein derived from alfalfa leaf meal; the balance protein was derived from soybean meal.

Table 2. Composition of supplements[a,b].

	ALM00	ALM33	ALM66	ALM100
Grain mix[c]	44.29	32.89	20.39	6.12
Alfalfa leaf meal	0	22.50	47.07	74.33
Soybean meal	32.70	22.83	12.03	0
Molasses	9.43	9.43	9.43	9.43
CATTLYST-50	.07	.07	.07	.07
$CaCo_3$	8.83	8.03	7.17	6.20
TM salt	3.37	3.37	3.37	3.37
Vitamin premix	.43	.43	.43	.43
Zn sulfate	.03	.03	.03	.03
Mn sulfate	.01	.01	.01	.01
DYNA-K	.83	.40	0	0

[a] Supplements were fed at the rate of 3 lb/head/day.

[b] ALM00, ALM33, ALM66 or ALM100: Alfalfa leaf meal-based supplement with 0, 33, 66 or 100% of the supplemental protein derived from alfalfa leaf meal; the balance protein was derived from soybean meal.

[c] A 50:50 mixture of barley and corn.

Steers were implanted with Revalor-S on day 8 and on day 91 (heavy) and 112 (light). Cattle were processed at a commercial abattoir (IBP Luverne, MN) after 167 (heavy) or 189 (light). Ribeye area and fat depth were measured after a 24-hour chill and marbling, KPH, yield and quality grade were assessed by a USDA grader. Data were analyzed for effects of supplemental protein source on average daily gain (ADG), DM intake, DM required/lb gain, and carcass characteristics as a randomized block design using pen as the experimental unit. Least square means procedures were used to separate mean differences when the effect was significant at $P < 05$. Orthogonal contrasts were used to test trends resulting from substituting soybean meal with ALM.

Results and Discussion

Data are presented (Table 3) for effects of supplemental protein source on ADG, DM intake, DM required/1 lb gain, and carcass data. Dry matter intake was 2.1 lb/day higher ($P < .05$) for steers fed ALM-100 when compared to other treatments. As percent of ALM increased in the supplement, DM intake increased linearly ($P <.05$). Neither ADG nor DM required/lb gain were affected ($P >.05$) by treatment. However, contrast tests suggested an improvement in feed efficiency (lower DM required/lb gain) when ALM and soybean meal were blended to provide 33 or 66 % of the supplemental protein. Steers fed ALM-66 had more ($P < .05$) backfat than steers fed ALM-00, ALM-33 and ALM-100. There were no other significant effects on carcass traits. However, hot carcass weight was numerically higher for steers fed ALM-100.

Table 3. Performance of steers fed diets supplemented with alfalfa leaf meal during the finishing period.

Item	Alfalfa leaf meal, % supplemental protein[a]				SE
	ALM00	ALM33	ALM66	ALM100	
No. pens	2	2	2	2	
Initial BW, lb	554	541	523	541	9.31
Final BW, lb	1230	1210	1200	1246	7.15
ADG, lb	3.66	3.76	3.76	3.98	.10
DMI, lb/day					
Grain	15.84	15.98	17.18	19.68	.28
Corn silage	4.00	3.36	2.72	2.02	.06
Supplement	2.67	2.7	2.72	2.80	.05
Total	22.50[c]	22.04[c]	22.63[c]	24.50[b]	.39
DM/lb gain, lb	6.16	5.85	6.02	6.17	.11
Alfalfa leaf meal, lb/day	0	.66	1.38	2.20	.01
Carcass characteristics					
Weight, lb	762	750	744	773	4.44
Ribeye area, in^2	12.49	12.32	12.33	12.77	.19
Fat depth, in.	.50[c]	.51[c]	.57[b]	.51[c]	.01
Marbling score	592	610	610	609	18.12
KPH, %	1.92	2.02	2.02	2.10	.15
Yield grade	2.38	2.54	2.53	2.42	.12
Choice, %	79.5	82.5	79.5	87.0	
Liver abscess incidence, %	20.5	25.0	22.0	12.5	

[a] ALM100: alfalfa leaf meal-based supplement; Hi: formulated to provide 112.5% of NRC recommendation; ALM00: soybean meal-based supplement; NRC: formulated to provide 100% of NRC recommendations.

[b,c] Means differ ($P < .05$).