

Effect of field pea (*Pisum sativum*) replacement of corn on lamb performance in finishing diets.

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Introduction

Field peas have been shown to effectively replace corn and soybean meal in growing and finishing diets for calves (Poland and Landblom, 1996; Birkelo, 1998) and lambs (Poland and Landblom, 1998). NDSU research reported in the 1999 Western Dakota Sheep Day Report showed that field peas were greater in net energy compared with corn in lamb finishing diets.

64,000 acres of field peas were planted in North Dakota in 1999, down from a high of 102,849 in 1998. Crude protein content of field peas range from 14 to 28.5%. Published energy values for field peas are 87% TDN, 98 Mcal NE_m/cwt (net energy for maintenance/cwt), and 67 Mcal NE_g/cwt (net energy for gain/cwt).

Summary

Five diets (Table 1) were fed to Hampshire cross ram lambs to determine the energy value of field peas in lamb finishing diets. In diets one through four, peas replaced 0, 15, 30, and 45% of the corn, and in the fifth diet (45-no-SBM) peas replaced 39% of the corn and all of the soybean meal (SBM). Inclusion of peas did not affect ($P > .15$) dry matter intake (DMI), average daily gain (ADG), or feed efficiency (Table 2). Lambs were more efficient ($P = .10$) when fed 45-no-SBM compared with lambs eating 45% peas. Leg conformation and carcass conformation changed quadratically ($P = .05$) with addition of peas. There were no other carcass characteristics (Table 3) affected by treatment ($P > .10$). The calculated net energy for maintenance (NE_m) and net energy for gain (NE_g) for field peas were 100 and 69 Mcal/cwt, respectively which is 3% greater than corn.

Materials and Methods

One hundred ram lambs ($86.0 \pm .4$ lb initial weight) fed for 63 days were blocked by weight and allotted to one of five dietary treatments (5 pens/treatment). Lambs were housed at the NDSU Animal Research Center barns. Treatments one through four were designed to have peas replace 0, 15, 30, and 45% of the corn and contained 75% dry-rolled corn (DRC) or dry-rolled peas and 6% SBM. In the fifth treatment (45-no-SBM) peas replaced corn and all SBM. Treatment five contained 45% dry-rolled peas and 36% DRC.

All diets contained 10% alfalfa, 5% CSB, .8% feather meal, .2% blood meal, and 3% supplement. Feathermeal and bloodmeal were included as dietary sources of by-pass protein. Diets were formulated to contain a minimum 14.8% CP, .7% Ca, .43% P, 1.22% K, 1.51 Ca:P, and 25 g lasalocid/Ton.

Feed offered was adjusted daily prior to feeding. Each pen had access to an indoor and outdoor run and fresh water. Initial and final weights were an average of two consecutive day weights. Average daily gain, dry matter intake, and feed efficiency were measured. Carcass characteristics of all lambs were taken at slaughter, however, hot carcass weights were not gathered due to a mix up at the slaughter facility.

Results and Discussion

Inclusion level of field peas did not affect ($P > .15$) any measure of performance (Table 1), however, lambs fed 45-no-SBM were more efficient than lambs fed the 45% pea diet ($P = .10$). Leg conformation and carcass conformation changed quadratically ($P = .05$) with addition of peas. There were no other carcass characteristics affected by treatment ($P > .10$).

Calculated dietary NE_m and NE_g (Table 4) were greater for 45-no-SBM compared to 45% peas ($P = .05$). No other dietary effects ($P > .24$) on NE_m or NE_g occurred. Based on lamb performance, field peas have a calculated NE_g that is 3% greater than corn (69 vs 67 Mcal/cwt) when fed to feedlot lambs.

Field peas are higher in ruminally degraded intake protein (DIP) than corn (78 vs 45% DIP as a percent of CP, respectively). Calculated DIP for the 0, 15, 30, 45, and 45-no-SBM treatments were 8.9, 10.7, 12.5, 14.3, and 12.6%, respectively. None of the treatments should have been limited by ruminal protein.

Cost per hundredweight of gain (Table 5) was analyzed. Prices for corn, field peas, and SBM were \$2.00/bu, \$3.00/bu and \$130/ton, respectively. Cost of gain was calculated by dividing price per hundredweight of feed by gain:feed (feed efficiency). There was a linear increase ($P > .01$) in cost of gain as inclusion level of field peas increased. Compared with 45% peas lambs eating the 45-no-SBM diet had a lower cost of gain ($P = .02$). Decrease in cost of gain is explained by the increase in lamb efficiency and replacement of SBM (\$.065/lb) with field peas.

Conclusions

Field peas and corn are similar in net energy content. Field peas can effectively replace corn and SBM in lamb finishing diets based on the improved feed efficiency. Using the prices reported in this report,

however, there is an increase in cost per hundredweight of gain with the inclusion of field peas. The NRC under values the energy content of field peas when used in high-grain diets.

Table 1. Diet composition (% Dry matter basis)

Ingredient	Unit	<u>Dietary Treatment (% Field Peas)</u>				
		0	15	30	45	45noSBM
DRC	%	75	60	45	30	36
Field Pea	%	0	15	30	45	45
Alfalfa	%	10	10	10	10	10
CSB	%	5	5	5	5	5
SBM	%	6	6	6	6	0
FM	%	.8	.8	.8	.8	.8
BM	%	.2	.2	.2	.2	.2
Supp.	%	3	3	3	3	3
Calculated composition						
CP	%	14.8	16.5	18.2	19.9	17.5
DIP ^a	%	5.9	5.8	5.7	5.6	4.9
UIP ^b	%	8.9	10.7	12.5	14.3	12.6
MP:ME		22.2	23.61	24.09	27.06	23.10

^a Rumen degradable intake protein

^b Remen undegradable intake protein

Table 2. Effect of treatment on feedlot performance (dry matter basis)

		<u>Dietary Treatment (%Field Peas)</u>				
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Item	Unit	0	15	30	45	45noSBM	Error
Initial wt	lb	85.9	86.3	86.0	86.0	85.9	.4
Final wt	lb	134.8	137.1	136.7	132.9	136.9	2.0
DMI	lb/day	3.49	3.65	3.45	3.47	3.44	.11
ADG	lb/day	.78	.81	.81	.74	.81	.03
Feed/Gai		4.48	4.49	4.29	4.61	4.22	---

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a Feed/Grain calculated as Gain/Feed. Feed/Gain is a reciprocal of Gain/Feed.

Table 3. Effect of treatment on carcass characteristics

<u>Dietary Treatment (%Field Peas)</u>							
Item	Unit	0	15	30	45	45noSBM	Error
REA	in ²	2.31	2.44	2.47	2.48	2.53	.09
Backfat	in	.16	.15	.16	.13	.14	.02
Bodywall	in	.85	.77	.77	.82	.86	.04
YG		4.38	4.17	4.35	3.70	4.08	.43
<i>Lega</i>		11.1	11.5	11.2	11.0	11.1	.1
<i>Carcass^b</i>		11.0	11.4	11.0	10.8	11.0	.1

a Leg conformation

b Carcass conformation

Table 4. Effect of treatment on calculated dietary net energy

Item	Unit	<u>Dietary Treatment (% Field Peas)</u>					Error
		0	15	30	45	45noSBM	
NE _{ma}	Mcal/cwt	105	105	109	101	110	3
NE _{ga}	Mcal/cwt	73	73	77	70	78	3

a NE_m and NE_g were calculated from lamb performance

Table 5. Effect of treatment on cost of gain

Item	Unit	<u>Dietary Treatment (% Field Peas)</u>					Error
		0	15	30	45	45noSBM	
Diet cost	\$/cwt	4.83	5.06	5.30	5.54	5.36	
Cost of gain	\$/cwt	21.81	22.85	22.87	25.84	22.92	.81

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