

SOYBEAN MEAL OR RAW SOYBEANS WITH COMMODITY GRADE OR SEA-LAC FISH MEAL FOR RAPIDLY GROWING LAMBS

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Introduction

Previous research at Cornell has shown that lambs grow faster and more efficiently if 2 to 3% fish meal is included in the diet to replace an equivalent amount of protein from soybean meal. Recent soybean meal prices have been low, however, so that more information is needed on the substitution value of fish meal for soybean meal. In addition to commodity grade fish meal, Omega Protein makes a high quality fish meal, Sea-Lac, designed specifically for the dairy industry. One objective of the experiment was to determine if the characteristics of Sea-Lac fish meal result in better lamb growth and feed efficiency than commodity grade fish meal.

With soybean meal prices so low, some lamb growers have expressed interest in using their own raw soybeans as a source of supplemental protein. Thus, the value of diets with raw soybeans compared to soybean meal and diets with part of the protein supplied by commodity-grade or Sea-Lac fish meal were compared.

Procedures

Seventy-two purebred Dorset lambs (36 rams and 36 ewes) born in January and February 1999 in the Cornell Dorset flock were used in this experiment. Lambs were assigned two to each elevated, expanded metal floor pen so that there were 36 pens of lambs (18 pens of rams and 18 pens of ewes) as experimental units. The experiment was a 2 x 3 factorial arrangement of the following treatments: 1) soybean meal or 2) raw soybeans, each with 1) no fish meal, 2) 3% commodity grade fish meal replacing an equivalent amount of protein from soybean meal or whole soybeans, and 3) 3% Sea-Lac fish meal replacing an equivalent amount of protein from soybean meal or raw soybeans.

The lambs were placed in experimental pens on 17 March 1999 and the experiment was started on 19 March 1999. The experiment ended on 30 April 1999. Feed offered each day was recorded and lambs were weighed once weekly.

Ingredient composition of the experimental diets is shown in Table 1.

Table 1. Composition of experimental diets

Ingredient	Raw soybeans			Soybean meal		
	No fish meal	Commodity fish meal	Sea-Lac fish meal	No fish meal	Commodity fish meal	Sea-Lac fish meal
	% of DM					
Agway sheep salt	0.7	0.7	0.7	0.7	0.7	0.7
Ammonium chloride	0.25	0.25	0.25	0.25	0.25	0.25
Barley 25 Feb 99	66.8	70.2	69.8	70.6	72.1	72.0
Bovatec 68 (68 g/lb)	0.0221	0.0221	0.0221	0.0221	0.0221	0.0221
Sea-Lac fish meal			3			3
Commodity fish meal		3			3	
Limestone	1.88	1.7	1.6	1.91	1.7	1.63
CoPhos	0.33	0.1		0.45	0.15	0.07
Sheep unit vitamin premix	0.125	0.125	0.125	0.125	0.125	0.125
Soybeans	12.7	6.75	7.3			
Soybean meal 25 Feb 99				8.8	4.75	5
Soy hulls	15	15	15	15	15	15
Vegetable oil	2.2	2.2	2.2	2.2	2.21	2.2
Total	100.0	100.0	100.0	100.0	100.0	100.0

Chemical composition is shown in Table 2. All diets were designed to contain 15% crude protein. The analyzed concentration of crude protein was slightly higher than anticipated.

Table 2. Chemical analysis of experimental diets

Nutrient	Raw soybeans			Soybean meal		
	No fish meal	Commodity fish meal	Sea-Lac fish meal	No fish meal	Commodity fish meal	Sea-Lac fish meal
	% of DM					
Crude protein	15.9	16.5	15.9	15.3	15.5	15.9
NDF	23.7	19.8	26.8	27.4	25.2	26.4
Ca	1.31	1.45	1.25	1.06	1.10	1.38
P	0.45	0.48	0.50	0.47	0.41	0.47
K	0.95	0.88	0.93	1.00	0.82	0.88

Results

Two pens of ram lambs – one fed the diet containing raw soybeans and Sea-Lac fish meal and one fed the diet containing soybean meal and Sea-Lac fish meal – went off feed and had to be removed from the experiment. Thus, the experimental data consisted of observations on 34 pens of lambs.

Lambs fed the soybean meal diets gained faster ($P < 0.05$) than lambs fed the raw soybean diet but feed intake was lower ($P < 0.03$) for lambs fed the raw soybean diet so source of soy protein had no effect on feed efficiency.

Table 3. Effect of soybeans or soybean meal on growth and feed intakes of lambs.

Item	Raw soybeans	Soybean meal	SE	P-value
Initial weight, lb	36	36	0.7	ns
Final weight, lb	62	64	0.9	ns
Average daily gain, lb	0.61	0.66	0.012	0.05
Daily dry matter intake, lb	3.51	3.75	0.070	0.03
Dry matter/gain	2.89	2.86	0.054	ns
Gain/dry matter	0.348	0.352	0.0070	ns

There was no effect of fish meal on average daily gain. Lambs fed diets without fish meal consumed more feed ($P < 0.006$) and were less efficient ($P < 0.010$) than lambs fed diets with fish meal. There was no difference in growth or efficiency between lambs fed diets containing commodity fish meal or Sea-Lac fish meal.

Table 4. Effect of fish meal on growth and feed intakes of lambs.

Item	No fish meal	Commodity fish meal	Sea-Lac fish meal	SE	P-value for No FM vs FM	P-value for CFM vs SLFM
Initial weight, lb	37	36	36	1.0	ns	ns
Final weight, lb	64	63	63	1.2	ns	ns
Average daily gain, lb	0.64	0.63	0.63	0.020	ns	ns
Daily dry matter intake, lb	3.83	3.45	3.60	0.091	0.006	ns
Dry matter/gain	3.02	2.74	2.86	0.071	0.008	ns
Gain/dry matter	0.331	0.368	0.351	0.0091	0.010	ns

Lambs were blocked on sex and location within the barn. Shown in Table 5 is this blocking effect which was undoubtedly mostly due to gender.

Table 5. Effect of gender^a on growth and feed intakes of lambs.

Item	Ram	Ewe	SE	P-value
Initial weight, lb	38	34	0.8	0.001
Final weight, lb	67	59	1.0	0.001
Average daily gain, lb	0.68	0.59	0.016	0.001
Daily dry matter intake, lb	3.77	3.49	0.072	0.008
Dry matter/gain	2.80	3.00	0.056	0.043
Gain/dry matter	0.359	0.341	0.0072	0.069

^aGender was a blocking effect that included the effect of gender and pen location. Undoubtedly, the major effect was gender, but other effects can not be ruled out. The information given here is provided to demonstrate the dramatic effect of gender differences.

Conclusions

Ⓢ Raw soybeans are almost as effective as soybean meal in providing supplemental protein to lambs fed barley-based diets. Although lambs fed diets containing soybean meal grew slightly faster, lambs fed diets containing raw soybeans consumed less feed so that feed efficiency was the same.

Ⓢ Including fish meal at 3% of the diet improved feed efficiency by about 8%. Commodity fish meal was at least as effective as Sea-Lac fish meal for improving feed efficiency. Adding fish meal to the diet did not improve rate of gain.

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