FISH MEAL AS A PROTEIN SOURCE FOR HOLSTEIN STEER CALVES

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Summary

Holstein steer calves (n = 96) were on experiment from 8 to 18 wk of age. Control calves were fed a diet in which all supplemental protein was from soybean meal; in the experimental diet, part of the soybean meal was replaced by fish meal. Both feeds were readily consumed, and consumption did not differ between treatments. Gains of calves fed fish meal were greater (P = .10) during the first 8 wk of the experiment; however, over the entire experiment, the difference was not significant. Overall results suggest that fish meal may improve weight gains and feed efficiency of younger and smaller calves.

(Key Words: Calves, Grower Diets, Fish Meal, Protein Source.)

Introduction

Approximately one-half of all calves born are bulls and, because of the widespread use of artificial insemination, few of these are needed for breeding purposes and, therefore, are available for production of meat. In recent years, large calf-feeding ranches have been developed that specialize in growing Holstein calves to a weight at which they are shipped to feedlots and finished on full feed. In this type of program, the calves essentially are on full feed from birth to slaughter. If properly fed and managed, the Holstein steer produces meat that is lean, tender, and flavorful.

The period from weaning to about 3 mo of age is still a high risk time for calves, with respiratory problems being especially serious. There is little information concerning optimum feeding programs for weaned Holstein calves that are kept on full feed. Specifically, the rumen undegradable protein requirement of this age animal is not known. Fish meal is a good source of high quality undegradable protein and may contain other special nutritional properties as well. The objective of this experiment was to evaluate fish meal as a partial replacement of soybean meal as a protein source for Holstein calves from 8 to 18 wk of age.

Procedures

Holstein steer calves (n = 96), 8 wk of age, were divided by body weight into two groups (heavy and light weight). Within each group, calves were assigned to two treatments, fish meal or soybean meal supplements. After assignment and placement in lots, the animals were weighed on 2 consecutive days, and the average of these weights was used as the beginning weight. The calves were weighed at 12 and 16 wk of age and on 3 consecutive days at the end of the experiment at 18 wk of age. Wither height was recorded at the beginning and end of the experiment.

The diets (Table 1) consisted of 1 part pelleted supplement (Table 2) and 3 parts whole shelled corn. Feed was added daily to ensure ad libitum consumption, and orts were

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measured weekly to allow calculation of weekly feed consumption.

Table 1. Analysis of Finished Feeds

Item	Fish Meal	Soybean Meal
Dry Matter, %	90.2	90.2
Crude Protein, %	16.3	17.1
Calcium, %	.72	.83
Phosphorus, %	.41	.42

Results and Discussion

All animals in the heavy group fed fish meal completed the experiment. Two calves in the light group on fish meal, five calves in the heavy group on soybean meal, and three calves in the light group on soybean meal were removed because of poor health, primarily respiratory problems.

Feed consumption is shown in Table 3. Both feeds were readily consumed, and consumption did not differ between treatments.

Body weights and gains are shown in Tables 4 and 5, respectively. Gains were greater on fish meal diets during the first 4 wk of the experiment, but the differences were not significant. Variability among animals is high at this age, as is shown by the large standard deviations. Differences between treatments from the fifth through the eighth wk of the experiment, as well as throughout the first 8 wk, were significant (P = .10).

Over the entire experiment, differences between treatments were not significant; weight gains were higher for the heavy group of calves fed diets containing soybean meal and for the light group of calves fed diets containing fish meal. It should be noted that calves removed from an experiment are often the ones that are not doing as well; thus, average gains of remaining calves are increased. The result of this would be that average gains of calves fed soybean meal would be inflated, because more calves were culled from that group.

Feed efficiency, expressed as amount of feed required per pound of gain, is shown in Table 6. Less feed was required when animals were fed fish meal during wk 1 to 4 and 5 to 8. During the last 2 wk of the experiment, the results depended on the group, with the light group benefitting more from the fish meal diet.

Heights at the withers at the beginning and at the end of the experiment and changes in wither height are shown in Table 7. Differences by treatment were not significant.

The results of this experiment suggest that fish meal may improve weight gains and feed efficiency in young calves, with more benefit likely for younger and smaller calves. The number of animals removed from the experiment may have been too small to draw conclusions; however, the possibility that fish meal may have provided some protection should be considered. More information is needed concerning the benefit of fish meal in rations for young dairy calves and for stressed animals.

Table 2. Composition of Supplement Pellets

Ingredients	Fish Meal	Soybean Meal
	---------- % ----------	
Soybean Meal	64.08	87.68
Fish Meal	14.00	
Wheat Middlings	11.45	
Limestone, ground	4.15	5.20
Alfalfa, dehydrated	2.50	2.50
Salt, mixing	2.00	2.00
Dicalcium phosphate		1.30
Potassium chloride	.90	.35
Trace mineral supplement	.38	.38
Vitamin supplement	.25	.25
Vitamin E supplement	.25	.30
Lasalocid	.05	.05
Calculated nutrient content and, in parentheses, analyzed content		
Crude protein, %	39.00 (38.54)	39.01 (39.05)
Undegraded protein, %	13.84	11.75
Metabolizable energy, Mcal/lb	1.08	1.08
Fat, %	2.18	.53
Acid Detergent Fiber, %	8.62	8.90
Neutral Detergent Fiber, %	13.31	12.32
Calcium, %	2.75 (3.16)	2.74 (2.53)
Phosphorus, %	.92 (.98)	.85 (.83)

Table 3. Average Daily Feed Consumption per Animal, lb

		Weeks of experiment					
Diet	Group	1	2	3	4	5	6
Fish meal	Heavy	5.1	5.5	6.4	6.6	7.3	8.8
	Light	4.4	5.3	5.7	5.9	6.8	7.9
Soybean meal	Heavy	4.0	4.6	5.7	6.2	6.6	8.1
	Light	4.2	5.1	5.7	6.4	6.4	7.7

		Weeks of experiment				
Diet	Group	7	8	9	10	1-10
Fish meal	Heavy	9.7	10.8	10.8	12.3	8.4
	Light	9.5	10.1	9.9	11.2	7.7
Soybean meal	Heavy	9.9	10.6	11.0	13.0	7.9
	Light	9.5	9.5	10.8	11.9	7.7

Table 4. Body Weights (lb) of Animals, (± Standard Deviation)

		Weeks of experiment			
Diet	Group	0	4	8	10
Fish meal	Heavy	159 ± 10	211 ± 26	305 ± 42	341 ± 49
	Light	140 ± 9	193 ± 29	285 ± 40	323 ± 45
Soybean meal	Heavy	156 ± 11	200 ± 39	296 ± 50	345 ± 47
	Light	140 ± 10	188 ± 35	265 ± 50	310 ± 50

Table 5. Gain (lb) in Body Weight of Animals (± Standard Deviation)

		Weeks of experiment				
Diet	Group	1-4	5-8	1-8	9-10	1-10
Fish meal	Heavy	52 ± 23	94 ± 20	146	36 ± 11	182 ± 45
	Light	53 ± 24	89 ± 17	142	38 ± 8	183 ± 41
Soybean meal	Heavy	43 ± 35	87 ± 25	130	39 ± 12	186 ± 45
	Light	47 ± 34	74 ± 23	121	39 ± 14	169 ± 48
	P[a]	.53	.09	.096	.71	.57

[a]P = Probability of difference between treatments, within initial weight groups.

Table 6. Feed Efficiency (Pounds Feed/Pounds Gain)

		Weeks of experiment		
Diet	Group	1-4	5-8	9-10
Fish meal	Heavy	3.17	2.73	4.45
	Light	2.81	2.70	3.86
Soybean meal	Heavy	3.30	2.84	4.29
	Light	3.16	3.13	4.07

Table 7. Withers Height and Increases in Withers Height, Inches

		Weeks of Experiment		
Diet	Group	0	10	Change (± standard deviation)
Fish meal	1	32.0	37.1	5.1 ± 1.5
	2	30.9	36.6	5.7 ± 1.5
Soybean meal	1	32.0	37.6	5.6 ± 1.3
	2	31.1	36.3	5.2 ± 1.5