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J.L. Morrill

P.G. Reddy

Keith C. Behnke

See next page for additional authors

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Effect of calf-starter protein solubility on calf performance

Authors

J.L. Morrill, P.G. Reddy, Keith C. Behnke, and James J. Higgins

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EFFECT OF CALF-STARTER PROTEIN SOLUBILITY ON CALF PERFORMANCE

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J. L. Morrill, P. G. Reddy, K₂ C. Behnke¹,
and J. J. Higgins

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Summary

Three starters containing differently processed protein supplements were fed to Holstein heifer calves, using an early weaning program. One starter contained soybean meal. The other starters contained soybean grits processed through an extrusion cooker to reduce the protein solubility to an intermediate (PDI > 50%) or low (PDI < 15%) level. Calf performance was similar on all three starters.

Introduction

Protein that is digested in the intestines by ruminants may come from microbial protein synthesized in the rumen or from feed protein that is not degraded in the rumen. Compared to quality of feed protein that can be fed, quality of microbial protein is intermediate. Therefore, under some conditions it is advantageous to somehow cause feed protein to escape rumen degradation. Proper heat treatment can cause protein to escape rumen degradation, yet be available for digestion in the intestines. This experiment was an effort to increase efficiency of protein utilization in the young calf by causing the protein to escape rumen degradation.

Procedures

Seventy-one Holstein heifer calves were assigned to one of three experimental groups at 1 day of age and remained on the experiment for 6 weeks. The calves were fed colostrum until 3 days of age, then milk until weaning. Each was fed at 8% of birth weight daily in two equal feedings. A prestarter (Table 1) was fed until consumption was $\frac{1}{2}$ lb. per animal per day, then a mixture of $\frac{1}{2}$ lb. prestarter and as much starter as the calf would eat was fed. The calves were weaned at any time after 2 weeks of age when they were consuming 1 lb. of dry feed daily, or at 3 weeks of age if not yet weaned.

Calves in the three groups were treated the same except for the starter they received. Calves in one group were fed a starter (Table 2) containing commercial soybean meal. Calves in the other groups were fed starters that differed in that the soybean meal was replaced by soybean grits processed through a Wenger X-20 Extruder at low heat to produce a product with a protein dispersibility index (P.D.I.) of 65.5 or at high heat to produce a product with P.D.I. of 13.3.

¹Department of Grain Science and Industry.
²Department of Statistics.

Feed consumption, weight gains, and other performance criteria of the calves were recorded.

Table 1. Composition of prestarter¹.

Ingredient	%
Whey, dried	46
7-60 ²	23
Skim milk, dried	19
Sodium caseinate	12
Additives	+

¹Calfweena, Merricks, Union Center, Wisconsin

²A mixture of milk solids and fat containing 7% protein and 60% animal fat.

Table 2. Composition of calf starter¹.

Ingredient	%
Alfalfa, ground	25
Corn, cracked	30
Oats, rolled	20
Sorghum Grain, rolled	8.5
Soybean Meal	10.0
Molasses, dry	5.0
Dicalcium Phosphate	.7
Limestone, ground	.3
Salt	.25
Trace Mineral Salt	.25
Vitamins A&D	+

¹Pellet, 3/8 inch Diameter

²1000 I.U. Vitamin A and 136 I.U. vitamin D per lb.

Results and Discussion

The amount of starter consumed and body weight gained are shown as weekly averages in Tables 3 and 4, respectively. There were no significant differences in either of these responses or in incidence of scours or general appearance of the calves with type of protein supplement used. Therefore, although the treatment used was effective in changing the solubility of the protein, under the conditions of this experiment these treatments did not cause a detectable change in calf response. Possibly, the responses would be different if other types of feedstuffs were used, especially if the other sources of protein were more completely degraded in the rumen than those used in this experiment.

Table 3. Weekly starter consumption, pounds¹.

Processing Condition	Weeks						Weekly average
	1	2	3	4	5	6	
Low heat	.11	.35	1.34	8.14	15.2	21.6	7.79
High heat	.15	.31	1.72	7.70	14.3	19.1	7.22
Soybean meal	.15	.35	1.56	7.04	13.0	19.1	6.80

¹ Differences from processing conditions were not significant ($P>.05$).

Table 4. Weekly weight gains, pounds¹

Processing Condition	Weeks						Weekly average
	1	2	3	4	5	6	
Low heat	3.3	1.5	4.2	4.6	10.3	13.9	6.3
High heat	4.0	1.1	5.9	5.1	8.8	12.3	6.2
Soybean meal	3.1	1.8	5.5	3.7	7.9	12.1	5.7

¹ Differences from processing conditions were not significant ($P>.05$).

Recommendations

Based on the results of this experiment, commercial soybean meal is as satisfactory a protein supplement for calf starters as a specially processed soybean protein source. However, previous results (see 1984 Dairy Day, Report of Progress 460, page 16) have shown the importance of processing whole soybeans and further research may demonstrate significant benefits from modified methods of processing soybean meal.