FATS AND PROTEINS RESEARCH FOUNDATION, INC.

Director's Digest

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BLOOD MEAL AND FEATHER MEAL IN COMBINATIONS

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SUMMARY

Rumen degradation, lamb digestion and calf growth studies were conducted to determine the effect of blood additions to feather meal. Protein bypass and digestibility were reduced when blood was hydrolyzed with feathers compared to blood added to feathers after hydrolysis. Protein efficiency was improved for feather meal when blood meal was added to the supplement. No differences were observed in protein digestion or efficiency between soybean meal and hydrolyzed feather meal.

INTRODUCTION AND OBJECTIVES

Feather meal is widely used in least cost ration formulations. Pure feather meal normally contains 90% crude protein and 3 to 5% fat. Previous research indicated that hydrolyzed feather meal protein was approximately 70% bypassed and 95 to 100% digestible. The protein efficiency value of feather meal, containing approximately 10% blood was similar to blood meal.

Processing methods affect the quality of feather meal and raw feathers may contain blood, heads and offal. Blood contamination causes little alteration in protein as both have similar protein contents. If all the blood from poultry slaughter is available, it will amount to about 10% of the dry weight of the feathers. The blood may be added before or after the feathers are hydrolyzed. While hydrolysis is necessary to make feathers nutritionally available to animals, hydrolyzing blood may reduce its nutritional value due to damage of the protein.

The amino acids that feather meal provides in the form of bypass protein may also vary with blood addition. The addition of blood to feathers may reduce the concentration of sulfur amino acids but at the same time provide increased lysine. Rumen protein degradation, digestion and growth trials were conducted to evaluate the effect of blood addition to feather meal.

EXPERIMENTAL DESIGN

Protein Degradation Trial

A dacron bag trial was conducted to determine the bypass value of feather meal with blood added before or after hydrolysis. Protein sources included soybean meal (SBM) and feather meal (FTH) without blood, ring dried poultry (BM) and two mixtures of 45% feathers and 55% raw poultry blood. Feathers and blood were either combined before or after steam hydrolysis of the feathers. On a dry basis, the mixtures contained about 33% blood. A corncob based diet was fed to 2 mature ruminally cannulated steers. Approximately 1 gram of each protein source was placed in 2 x 5 inch dacron bag (50 micron-pore size). Each feedstuff was placed in 3 bags within each steer. Bags were suspended in the rumen of both steers for 12 hours. After removal from the rumen, bags were washed to remove contamination. Total nitrogen was determined before and after ruminal digestion to determine bypass of each protein source.

Digestion Study

A lamb (60 lb) digestion trial was conducted to determine the relative digestibility of these same protein sources plus a urea control. Lambs were fed an ensiled corncobs and alfalfa diet that was formulared to be isocaloric (50% TDN) and isonitrogenous (11.5% crude protein). Diets were fed at 2% of body weight for a 10 day prefeeding and a 7 day fecal collection period. Feed, feces and orts were dried in a forced-air oven and analyzed for dry matter and protein.

Growth Trial

One hundred growing calves (529 lb) were fed for 112 days to evaluate the protein value of urea, SBM, FTH, BM and a 50:50 protein combination of FTH and BM. The slope ratio technique was used to compare protein sources. The basal diet contained 50% ground corncobs, 40% corn silage and 10% supplement. Diets supplied 11.5% crude protein, 57% TDN, .50% calcium and .30% phosphorous.

Calves were individually fed (at equal percent of body weight) once daily with Calan electronic gates. Calves were implanted with Compudose and initial and final weights were the average of 3 consecutive day weights taken before the morning feeding.

RESULTS AND DISCUSSION

Bypass protein of FTH was greater than SBM but less than BM ($P<.07$; Table 1). Adding raw blood to feathers and hydrolyzing together did not increase bypass above that of FTH without blood ($P>.10$). Adding blood after hydrolysis increased bypass ($P<.07$) compared to FTH. Total tract protein digestibility was similar for SBM, BM, FTH and the mixture of blood and feathers when blood was not hydrolyzed ($P>.20$). Protein digestibility of the blood and feather mixture was lower than the other treatments ($P<.07$) when the blood was hydrolyzed with the feathers. The reduced digestibility probably is a result of damage to blood protein during the hydrolysis process. Net bypass is an estimate of digestible protein presented to the small intestine. Hydrolyzing blood with feathers resulted in a 15% reduction in net bypass compared to blood added after hydrolysis.

The urea control calves gained .83 lb/day while the maximum gain due to protein supplementation was 1.62 lb/day. The most efficiently used protein sources (Figure 1) were BM and FTH-BM compared to SBM and FTH ($P<.05$). Soybean meal and FTH had similar protein efficiencies ($P>.20$). A possible complementary effect was observed when BM and FTH were fed together as the protein efficiency for the mixture was higher (2.62) than the average of BM and FTH (2.07). This was likely due to blood supplying lysine while FTH supplied sulfur amino acids. Previous research has shown that protein efficiency was similar for BM and FTH when FTH contained approximately 10% blood. The 10% blood addition may have been sufficient to meet the lysine requirement of growing calves.

Feather meal is a high-bypass, economical protein source for ruminants. Apparently because of a poor array of amino acids, it is best if combined with high lysine, bypass protein sources. Adding blood to FTH is costly as BM is approximately twice the cost of FTH. To optimize protein efficiency and minimize costs, 50% BM addition may not be practical. A lower portion of BM may elicit a similar response but the exact proportion of BM has not been determined. It is important to note that blood should only be added after feathers have been hydrolyzed.

Table 1. Effect of hydrolyzing blood with feathers on protein bypass and digestibility.

Protein source	Bypass[a]	Digestibility[b]	Net Bypass[c]
Soybean meal	26[d]	100[e]	26
Blood + raw feathers hydrolyzed, ring dried	76[e]	87[d]	63
Blood + hydrolyzed feathers then ring dried	82[f]	96[e]	78
Blood meal	90[g]	100[e]	90
Feather meal	73[e]	96[e]	69

[a]Bypass determined as percentage of protein remaining after 12 hours of ruminal incubation in dacron bags.
[b]Total tract digestibility determined in lambs.
[c]Net bypass = Bypass - indigestibility.
[d,e,f,g]Means within columns with unlike superscripts differ (P<.07).

Figure 1.
Protein Efficiency of Calves Fed Soybean Meal (SBM) Feather meal (FTH) and Blood Meal (BM).