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Relationship Between Quality of Animal Protein Sources and their Gross and True Metabolizable Energy in Cockerels

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ABSTRACT

To investigate relationship between quality of animal protein and true metabolizable energy (TME) and gross energy (GE), a number of samples of each of fishmeal, feather meal, meat meal and blood meal were collected from the local market and analyzed for crude protein contents. The GE contents of both high and low grades of fish meal, feather meal, meat meal and blood meal were 3281.27; 3146.35, 4266.85; 3976.65, 3548.20; 3054.77 and 3226.36; 3094.65 Kcal/kg dry matter, respectively. The respective value for TME contents were 2.61; 2.59, 3.5; 3.18, 2.59 and 2.112; 2.296, 2.271 Kcal/g dry matter, respectively. The results regarding the energy values show that high quality feed ingredients had high GE and TME values as compared to low grade ingredients indicating that the quality of feed ingredients has direct bearing on their energy values.

Key Words: Animal Protein; Quality; Gross energy; True metabolizable energy; Cockerals

INTRODUCTION

The two most important criteria for poultry feed formulation are its protein and energy content. A ration with improper energy and protein ratio cannot be termed as balanced and economical. A major part of protein requirements of poultry birds is met through vegetable and animal protein sources. Poultry nutritionists prefer animal protein sources because vegetable protein sources are deficient in certain essential amino acids, have anti-nutritional factors and low biological value. This is why animal protein sources viz. meat meal, blood meal, fish meal and feather meal are extensively used in poultry rations (Johnston & Coon, 1979).

Animal protein sources have high values of available amino acids and true metabolizable energy (TME). Therefore, in recent feed formulation, attention has been focused on TME and available amino acids content of feed ingredients. But the available amino acids and TME content of animal protein sources can vary greatly. The quality of animal protein sources is primarily dependent upon the composition of raw material used for processing (Johnson & Parsons, 1997).

This paper presents the analysis of different sources of animal proteins for proximate composition, gross energy (GE), available amino acids and TME content. Relation among quality of animal protein sources and their GE and TME has also been reported.

MATERIALS AND METHODS

Four animal protein sources i.e. blood meal, feather meal, meat meal and fish meal were used in the experiment to investigate the relationship between the quality of animal protein sources and their TME and GE content. Each protein source had two levels of crude protein (CP) i.e. fish meal 53.59 and 49.03% CP, feather meal 56.88 and 54.69% CP, blood meal 85.03 and 77.50% CP, meat meal 45.94 and 27.34% CP. Forty adult golden cockerals were used in experiment. The TME of each animal protein source was determined on four birds, and eight birds were kept as negative control for the estimation of endogenous urinary energy losses. After the adjustment period of seven days, the birds were kept without feed for 24 hours to empty their alimentary canal. After that, 30 g of coarsely ground feed ingredient was forced fed in the crop of each bird with the help of glass funnel.

The excreta was collected over a period of 48 hours in individual trays, oven dried and ground for estimation of GE as described by Harris (1970). This estimation of GE was further used for the calculation of TME. The feed samples were also analyzed for proximate composition (AOAC, 1990).

RESULTS AND DISCUSSION

Proximate composition. The moisture contents of all animal protein sources used in the experiment ranged from 5-10%. The CP content of various high and low quality protein sources was feather meals 56-57%, fish meal 47-54%, meat meal 27-46% and blood meal 77-83%.

The high quality fish meal was found better than low quality fish meal with respect to protein content. Both grades of fish meal had poor proximate composition as compared to National Research Council (NRC, 1984). It might be due to poor processing conditions and poor composition of raw materials used for processing (Wilder, 1973). Similarly, the

composition should have a positive correlation with quality of feather meal. The proximate composition of both types of feather and fish meal as compared to NRC might be due to adulteration, poor processing and bad storage conditions. The meat meal composition also followed similar trend.

Table I. Gross energy and metabolizable energy values of different protein sources

Animal Protein	Gross Energy Kcal / kg DM	TME Kcal / g DM
Fish meal (HG)	32.81.7	2.61
Fish meal (LG)	3146.35	2.59
Feather meal (HG)	4266.5	3.50
Feather meal (LG)	3976.65	3.18
Meat meal (HG)	3548.20	2.59
Meat meal (LG)	3054.77	2.11
Blood meal (HG)	3226.36	2.30
Blood meal (LG)	3094.65	2.27

DM= Dry matter; HG= High grade; LG= Low grade

In this study, TME as well as GE values of high and low grade fish meal were not significantly different from each other. This may be due to the possibility of higher fat of low grade fish meal. Kessler and Thomas (1981) found 3.26 Kcal/g dry matter TME in fish meal which was significantly higher than the one ever for high grade fish meal in Pakistan. The difference in TME of fish meal as reported by different workers may be attributed to the processing techniques (Tarr & Biely, 1973).

It was found that TME and GE values of high grade feather meal are significantly higher than that of low grade feather meal (Table I). Tarr and Biely (1973) pointed out that the processing technique could affect the nutritive value of feather meal depending upon the extent of the residual oil content in feather meal. Improper storage conditions or long storage time might be an other reason of low TME value of low grade feather meal. Kessler and Thomas (1981) determined that the TME content of feather meal was 3.51 Kcal/g dry matter. So, the TME value of high grade feather meal was comparable with the results of Kessler and Thomas (1981). So, the quality of feather meal can also affect the TME and GE values.

GE and TME values of high grade meat meal were significantly higher than low grade meat meal (Table I). Wilder (1973) concluded that adulteration could decrease the nutritive value of meat meal. Thus the low TME value of low grade meat meal might be due to adulteration because low grade meat meal had high ash content (17.0%) as compared to high grade meat meal (10.3%). In Pakistan, there is no proper technique for meat meal processing. Secondly, the meat collected from slaughter houses is from weak and diseased animals. This meal can be adulterated with hair and faecal material. This adulteration can affect quality of protein source and ultimately affect the TME and GE values.

TME and GE values of blood meal are not significantly different from each other as shown in table. Kessler and Thomas (1981) found some what higher TME values (3.89 Kcal/g dry matter) than that of local blood meal. The reason for this difference might be that in Pakistan, there is no standard technique for collection and processing of raw blood. The raw blood is collected from the slaughter house where due to unhygienic conditions it got mixed with faecal material, hair and other impurities. Moreover, during the processing of raw blood, no scientific procedure or equipments are used. Among all animal protein sources, blood meal is produced in the most crude manner in Pakistan. This is most critical factor due to which blood meal attains poor quality in our country.

CONCLUSION

Quality of animal protein sources had direct bearing on the GE and TME values. The high quality feed ingredients had high GE and TME values as compared to low grade ingredients. Therefore, high quality animal protein sources are better than low quality animal protein sources.

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