



Short communication  
**NUTRITIONAL POTENCY OF SARDINE FISH MEAL  
FOR RUMINANTS**

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**ABSTRACT**

Nutritional evaluation of Sardine fish (*Sardinella longieps*) meal was carried out to explore the possibility of utilization in livestock rations. The Sardine meal contained 56.3, 7.1, 24.4, 0.81 and 11.4% CP, EE, TA, CF and NFE respectively. It had 7.74% calcium, 5.02% phosphorus, 505.7 ppm iron, 166.4ppm zinc and was free from toxic elements like lead and cadmium. The higher proportion of B<sub>2</sub> (36.6%) and B<sub>3</sub> (30.3%) protein fractions indicated the potential of sardine meal for use as a rumen undegradable protein (RUP) source. Sardine meal is a rich source of arginine (4.89%), threonine (3.33%) and methionine and having the maximum extended chemical score of 100 for arginine and methionine. The essential amino acid index of 69.39% in Sardine meal signifies the superior quality of the meal. Based on nutritional analysis it was inferred that Sardine meal could be used as potential RUP source for high yielding livestock. (*Indian J. Anim. Nutr.*, 2005, 22(3): 201-203)

**Key words:** Protein fraction, Amino acid profile, Fish meal, Sardine

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The amino acid profile of fish meal is considered to be similar to that required for ruminant growth and milk production (Tamminga, 1982). Dried sardines and other small pelagic fish are important sources of feed for livestock mainly goat and cattle in Middle Eastern countries (Early *et al.*, 2001). In India fish meal/dry fish is used mainly in the ration of poultry. Fishmeal is used as a source of rumen undegradable protein (RUP) for high yielding ruminants in many countries. Hence an attempt was made to find out the nutritional suitability of sardine meal for ruminants.

The samples of sardine meal (10) were collected from different places in the West coast of India were analyzed for proximate composition, acid insoluble ash (AOAC, 1997), Ca, Mg, Fe, Zn, Mn, Co, Cu, Pb and Cd using atomic absorption spectro

photometer (M/S Perkin Elmer). The P content was estimated by colorimetric method (AOAC, 1997). The protein fractions *viz.*, A, B<sub>1</sub>, B<sub>2</sub>, B<sub>3</sub> and C were determined as per the procedure of Licitra *et al.* (1996) and NRC (2001). The respective fractions are dependant upon the estimation of insoluble nitrogen, true protein and nitrogen residue in ADF and NDF. Fraction A and B<sub>1</sub> are soluble in borate-phosphate buffer while B<sub>2</sub>, B<sub>3</sub> and C are insoluble. Extraction with neutral detergent isolates fraction A, B<sub>1</sub> and B<sub>2</sub> (soluble in neutral detergent) from fractions B<sub>3</sub> and C (insoluble in neutral detergent). Fraction C is the nitrogen insoluble in acid detergent. B<sub>2</sub> was calculated as 100 -(A+B<sub>1</sub>+B<sub>3</sub>+C). Amino acid composition was analyzed as per the method of Spackman *et al.* (1958) and Finalysin (1964) using HPLC (M/s. Shimadzu, Japan). Chemical score and essential amino acid index was calculated as per the method described by Chandler (1989).

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The chemical composition revealed it to be a good source of CP ( $56.3 \pm 1.76\%$ ), EE (5.5 to 10.0%), high total ash (13.9 to 32.3%) and acid insoluble ash (2.1 to 11.2%) confirming the earlier report (Combellas *et al.*, 1993). The variation in ash and AIA could be due to sand contamination or due to presence of bony fishes (Early *et al.*, 2001).

Protein fractions of Sardine meal indicated that it has higher proportion of B<sub>2</sub> (36.6%) and B<sub>3</sub> (30.3%) apart from being richer in the proportion of readily degradable protein fraction A (26.5%). The B<sub>1</sub> and C fractions were 5.25 and 1.29% respectively. However, Chalupa and Sniffen (1996) reported slightly higher value of B<sub>2</sub> and B<sub>3</sub> (38 and 42%, respectively). But lower value of A (5%) and higher B<sub>1</sub> (14%) in fish meal. Non protein nitrogen is denoted as the A fraction which is instantaneously degraded in the rumen. The true protein is broken down into B<sub>1</sub>, B<sub>2</sub> and B<sub>3</sub> fractions based on decreasing solubility and degradability. B<sub>1</sub> consists of rapidly degradable (120-400% h) components. B<sub>2</sub> fraction is slowly degradable (3-16% h) with intestinal digestibility of 100%. B<sub>3</sub> is very slowly degradable (0.06-0.55% per h). The higher B<sub>2</sub> and B<sub>3</sub> fractions reveals that Sardine meal is having considerable amount of slowly degrading protein fractions. Fraction C protein consists of maillard reaction proteins and nitrogen in lignin. This fraction is not degraded in the rumen and are considered indigestible in the intestine. The meager percentage of C (1.29) indicated that almost all the protein from Sardine meal can be utilized by the host animal. Thus, Sardine meal is a good source of undegradable protein and has a potential for use as a RUP.

The Ca content varied from 5.13 to 12.14% and the phosphorus from 3.26 to 7.48% respectively. The Ca:P ratio was narrower (1.54:1) than the recommended level of 2:1. The narrower Ca:P ratio will not be harmful in practical conditions as P is usually deficient and limiting mineral. The Sar-

dine meal was having 16.6, 505.7, 41.5, 166.4 and 8.8 ppm of Cu, Fe, Mn, Zn and Co respectively. The Zn:Cu ratio was 10:1, which is wider than the recommended ratio of 3:1 to 5:1. Thus the zinc content of Sardine meal has to taken into account while including Sardine meal. Sardine meal used in this study was free from toxic minerals like lead and cadmium.

Sardine meal is a very good source of arginine ( $4.89 \pm 0.4\%$ ), methionine ( $3.66 \pm 0.38\%$ ) and threonine ( $3.33 \pm 0.25\%$ ) and a poor source of lysine ( $2.77 \pm 0.3\%$ ). The higher methionine content was also corroborated by NRC (2001). The other limiting amino acids in the Sardine meal are valine ( $3.3 \pm 0.24\%$ ) and leucine ( $4.99 \pm 0.38\%$ ). However, Santos *et al.* (1998) reported that isoleucine, leucine and valine are limiting amino acids.

The extended chemical score was 100.0, 60.7, 62.5, 53.2, 43.3, 100.0, 62.3, 69.4, 56.0 and 46.5 for arginine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tyrosine and valine respectively confirming the earlier report (Santos *et al.*, 1998) for threonine and methionine. However, histidine, phenylalanine, valine and leucine score was lower than the reported values (Santos *et al.*, 1998). The lower extended chemical score for lysine indicated that considerable quantity of lysine would have been lost during processing of Sardine meal. The essential amino acid index of Sardine meal (69.4) was comparable to that reported value for fish meal (68) protein. Santos *et al.* (1998) opined that the essential amino acid index of fish meal was very close to essential amino acid index of microbial protein. It was inferred that Sardine meal was a potential source of RUP which could be incorporated in high yielding numinant ration.

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