

## Proximate Composition of Fish Feed Ingredients Available in Lakshmipur Region, Bangladesh

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**Abstract:** This study presents the availability of fish feed ingredients and their nutritive value in Lakshmipur region, southern Bangladesh considering the presence of large number of fish farms in those areas. A survey was conducted to collect the ingredients from the local markets and fish farms of the area. A range of commonly used feed ingredients for fish farming was available in the markets that include two types of fishmeal, different oilseed cakes, rice bran, rice polish, broken rice, beson, pulse, maize, wheat bran and wheat flour. All the common feed ingredients were found to be available throughout the year with exception of 'cheoa' type fishmeal which was produced from marine fish called cheoa fish. During the present study the protein percentage of the mustard oil cake, wheat bran, wheat flour and fish meal was estimated 35.17-37.25%, 14.84-15.40%, 14.15-17.73% and 51.32-65.34% respectively. The mean range of crude lipid was recorded as 10.73 to 15.52% in mustard oil cake, 4.09 to 9.71% in wheat bran, 2.94 to 4.57 % in wheat flour and 3.69 to 12.50% in fish meal. The analyzed ash contents of the samples of the fish feed ingredients collected from three areas were in the range of 14.79 to 18.84% in rice bran, 2.52 to 8.26% in wheat bran, 6.99 to 9.08 % in mustard oil cake, 2.5 to 3.64% in wheat flour and 15.16 to 34.14 % in fish meal. The feed ingredients viz. mustard oil cake, wheat bran, rice bran and wheat flour had no significant variations in their proximate composition in respect to place. The composition of the experimented ingredients indicated the crude protein to be the main component as the feed cost appears to be one of the major constraints against the greater expansion of fish farming. It is therefore imperative that the feed should substitute the animal protein with plant protein sources ingredients such as Soybean those are available and rich in protein level to reduce feed cost.

**Key words:** Proximate Composition • Fish Feed • Crude Protein • Fishmeal

### INTRODUCTION

The people of Bangladesh depend on fish for 58% of their animal protein requirement and fish consumption rate is currently 17.52 kg/ people/ year while demand of fish is 20.44 kg/ year/ people and total demand of fish is 29.74 MT per year [1]. With the increasing demand for food fish and the decline in capture fisheries production, aquaculture in Bangladesh is heading towards intensification. This shift from low density to high density culture i.e. traditional to semi intensive or intensive culture is consequently leading to an unprecedented rise in the demand for feeds more than that of fertilizers. Farmers shift gradually from no feed, through the use of

farm-made feeds, to factory-made feeds. This demonstrates a real possibility of increasing production and reveals the potential importance of aqua feeds in Bangladesh. Now aquaculture feeds have been considered a major subsector of the feed milling industry. From the economic point of view, feed cost appears to be one of the major constraints against the greater expansion of aquaculture [2].

The fish feed plays an important role in the value chain as it implies important control of the quality of raw materials, which is crucial for the food safety as well as efficient high quality feed types that ensures optimal growth for different fish species farmed under a variety of different conditions [3]. Economically productive

aquaculture systems depend upon an adequate supply of low cost feeds with high nutritional quality. The feed must be nutritionally adequate and commercial for the sound operation of a fish farm [4].

Formulated feeds are expensive as most of the ingredients are imported and prices are rising continually. Thus it is necessary to seek cost effective replacement to supply dietary protein from locally produced inexpensive materials in order to avoid high feed costs [5].

The nutrient balance of feed influences feed utilization and growth of fish. It is very essential to know the nutritional requirements particularly for protein, lipid and energy for optimum growth of a fish species as well as in formulating a balanced diet. Dietary protein and energy levels are known to influence the growth and body composition of fish. Improper protein and energy levels in feed increases fish production cost and deteriorates water quality. Insufficient energy in diets causes protein waste due to the increased proportion of dietary protein used for energy and the produced ammonia can reduce the water quality [6- 8]. Variety of fish feed ingredients are available in Bangladesh. Some common animal origin fish feed ingredients are fish meal, fish silage, bone meal, cattle viscera, poultry viscera, fish viscera, oyster shell meal, silkworm pupae, blood meal, crab meal, frog waste, snail muscle etc. Most of the animal origin fish feed ingredients are considered as protein supplements i.e. contains more than 20% protein [9].

There is a paucity of information on the nutrient content of fish feed produced by different feed industries in Bangladesh. There are also no reliable published information on chemical composition of commercial fish feed and feed ingredients in Bangladesh [10]. Bhuiyan *et al.* [11] made a survey to identify potential feed ingredients based on their availability, price and primary nutritional value. The farmers have to depend only on the existing information about the feed composition and growth performance that is given by the feed industry. The government has no legal legislation and control over the feed components and feed quality. Also there are no guidelines for the establishment of a new feed industry. So, there is a great possibility that the farmers will be deceived by the feed manufacturer. Therefore it is an urgent need to assess the actual nutritive value of the feed ingredients available in the market [12].

To develop suitable farm made fish feed, information about the availability and proximate composition of locally available feed ingredients is essential, but information based on this aspects are typically lacking and if available generally not reliable. Different Nongovernmental

Organizations (NGOs) and extension agencies working for aquaculture extension in the southern Bangladesh and they eagerly want to know the nutritive value of fish feed available in that region. As government has no legal legislation and control over the feed industries of Bangladesh, there is a great possibility of deceiving the farmers both in terms of nutritive value and cost of feed. Market of Lakshmipur district generally represent the typical fish feed market of this fish farming region. So these areas were selected for this survey, which will be able to represent the availability and quality of feed ingredients of the region. Therefore the present study was conducted to know and collect the locally available fish feed ingredients in the market of Lakshmipur area. In addition, the nutritive value of the fish feed ingredients and changes of nutritive value of the fish feed ingredients by place were investigated.

## MATERIALS AND METHODS

**Experimental Sites and Study Period:** A number of visit on fish feed market were carried out in Ramgati, Kamalnagar upazilla and Lakshmipur city in Lakshmipur district in southern Bangladesh during the period from March, 2011 to July, 2011 considering the presence of large number of fish farms in those areas. During the study period, fish feed ingredients were collected and then transported to the Fish Nutrition Laboratory, Department of Aquaculture, Bangladesh Agricultural University, Mymensingh.

**Collection and Storage of Samples:** Three fish feed markets named Alexander bazar in Ramgati upazilla, Hazirhat bazar in Kamalnagar upazilla and Lakshmipur city of Lakshmipur district were selected for samples collection. Samples of available feed ingredients such fish meal, rice bran, wheat bran, maize, pulse, oil seed cakes, broken rice (khud), beson, wheat flour etc were collected and packed in polyethylene bags to prevent initial spoilage and brought to the Fish Nutrition Laboratory, Department of Aquaculture, Bangladesh Agricultural University, Mymensingh as well as stored in a refrigerator for subsequent analysis.

**Proximate composition analysis:** Proximate analysis is usually the first step in the chemical evaluation of a feed ingredient, where the material is subjected to a series of relatively simple chemical tests so as to determine the content of moisture, crude protein, lipid, crude fiber, ash and digestible carbohydrate.

**Estimation of Moisture:** Moisture of fish is commonly determined by drying a sample at some elevated temperature and reporting the loss in weight in terms of moisture [13].

**Determination of Ash:** Ash in the products is readily determined by incineration from either raw or dried sample at about 600-700°C for 5-8 hours, depending on the method used. The residue is weighed and reported as ash.

**Determination of Crude Protein:** The crude protein of the fish was conducted by Micro- Kjeldhal method [14].

**Determination of Crude Lipid:** The fat content was determined quantitatively by extraction with a mixture of chloroform methanol (2:1). The mixture was allowed to stand overnight and lower lipid protein was transferred to a pretreated and weighed flask was heated to dryness. The difference in the two weights of the round joint flask gave the weight of the fat [15].

## RESULTS AND DISCUSSION

As Bangladesh is mainly agro based country, a large variety of agricultural crops wastages and byproducts are being used as fish feed. Although most are available throughout the year and all over the country, some are much localized. In this study the locally used fish feed ingredients were found to be fish meal, broken rice, maize, mustard oil cake, pulse, rice bran, snail shell meal, soybean oil cake, wheat bran, wheat flour. Among them only commonly used ingredients e.g. fish meal, mustard oil, rice bran, wheat meal and wheat flour were used for proximate composition analysis.

The analyzed ash contents of the samples of the fish feed ingredients collected three areas were in the range of 14.79 to 18.84% in rice bran, 2.52 to 8.26% in wheat bran, 6.99 to 9.08 % in mustard oil cake, 2.5 to 3.64% in wheat flour and 15.16 to 34.14 % in fish meal respectively (Figure 1)

Protein is the major growth promoting factor in feed. The protein requirement of fish are influenced by various factors such as fish size, water temperature, feeding rate, availability, quality of natural foods and overall digestible energy content of diet. The analyzed crude protein contents of mustard oil cake, wheat bran, wheat flour, fish meal varied between 35.17-37.25%, 14.15-17.73%, 14.84-15.40% and 51.32-65.34% respectively (Figure 2). The highest crude protein content (65.34%) was found in miscellaneous type fish meal of Lakshmipur city.

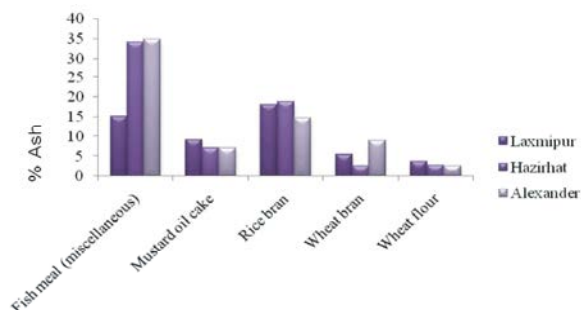


Fig. 1: Comparison of ash percentage of the ingredients in three regions.

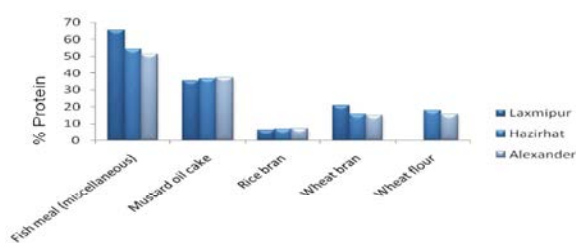


Fig. 2: Comparison of protein percentage of the ingredients in three regions.

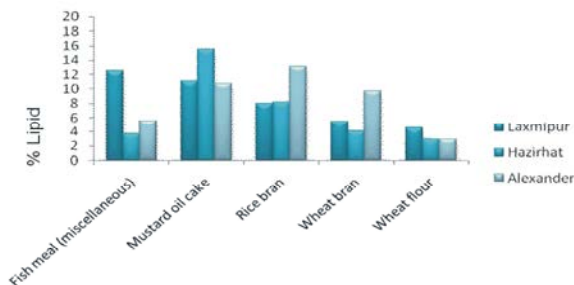


Fig. 3: Comparison of lipid percentage of the ingredients in three regions.

The analysed crude lipid contents of different fish feeds ingredients varied considerably among the three study areas. The mean range of crude lipid was recorded as 10.73 to 15.52% in mustard oil cake, 4.09 to 9.71% in wheat bran, 2.94 to 4.57 % in wheat flour and 3.69 to 12.50% in fish meal (Figure 3).

During the present study the protein percentage of the mustard oil cake was estimated as 35.17-37.25% which is more or less coincides with the findings of Fisheries Research Institute [9]. A nationwide survey was conducted by the Fisheries Research Institute to identify potential fish feed ingredients based on their availability, price and primary nutritional value. Eighty- three different types of ingredients, both of plant and animal origin were studied. They reported that the mustard oil cake contained about 33.30% protein.

Table 1: Proximate composition of fish feed ingredients.

Name of ingredients	Alexander bazar				Luxmipur				Hazirhat bazar			
	Dry matter	Ash	Crude protein	Crude lipid	Dry matter	Ash	Crude protein	Crude lipid	Dry matter	Ash	Crude protein	Crude lipid
Fish meal (miscellaneous)	89.55	34.97	51.32	5.58	90.52	15.16	65.42	12.50	86.21	34.14	54.34	3.69
Mustard oil cake	91.53	6.99	37.25	10.73	89.97	9.08	35.17	11.07	89.13	7.00	36.46	15.52
Rice bran	90.85	14.79	6.97	13.07	90.13	18.17	6.09	7.99	89.15	18.84	6.62	8.22
Wheat bran	90.08	8.96	14.84	9.71	88.03	5.31	20.71	5.44	87.96	2.51	15.40	4.09
Wheat flour	89.83	2.50	15.70	2.95	89.26	3.64	14.15	4.57	90.04	2.70	17.73	2.94

The protein percentage of the wheat bran and wheat flour were estimated as 14.84-15.40% and 14.15-17.73% respectively those are more or less similar with the findings of Fisheries Research Institute [9]. The findings were also similar to the investigation of Bashu [16]. In the present study the protein percentage of the fish meal was estimated as 42.57-65.34%. According to FRI [9], A<sub>1</sub>, A<sub>2</sub> and B grade fish meal had more or less 59.61, 50.81 and 44.74% protein respectively. Kim and Easter [17] conducted a study on chemical composition of various fish and fishmeal as feed ingredients and found Chai Bo fish contained 55.0% crude protein, some mixed small whole fish contained 51.9% at protein and fishmeal contained 56.8% crude protein in dry weight basis.

During the present study the mean range of crude lipid percentage were recorded as 10.73 to 15.52% in mustard oil cake, 4.09 to 9.71% in wheat bran, 2.94 to 4.57 % in wheat flour and 3.69 to 12.50% in fish meal respectively. De Silva [18] and Hasan *et al.* [19] reported that mustard oil cake with 2-15% and fish meal with 5-20% lipid contents respectively have a potential to be incorporated into aquafeed. The results of ash and lipid percentage were also close to the findings of Zaher [20].

This study showed that fish meal found in three markets has variation. Protein content of fish meal that found in Hazirhat and Alexander has no significant variations but have significant variations that found in Luxmipur city. Fish meal (miscellaneous) that found in Hazirhat and Alexander contain about 51.32-54.34% protein while fish meal (miscellaneous) that found in Luxmipur city contain about 65.34% protein.

There are some ingredients those are available and can replace the fish meal without changing the protein level and cost of feeds become low. One way of reducing feed cost is to substitute the animal protein with plant protein sources. Soybean is one of the important available protein rich ingredients, which can be used to partial replacement of fishmeal.

For improved practices besides management, supplementary feed is essential. In respect of fish producer of Bangladesh, good quality and low cost fish feed is the most important demand of farmer to reduce production cost. Farmers are at a turning point in their fish feeding strategies due to the high price of this feed. However, lack of knowledge and information make them uncertain about the application of other feeds. For formulation of such fish feed information about price, availability, nutritive value and seasonal variation on quality and availability are essential. The present study attempted to collect this information.

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