

PROXIMATE COMPOSITION OF DIFFERENT FEEDS USED OF SHRIMP FARM IN BAGERHAT DISTRICT



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PROXIMATE COMPOSITION OF DIFFERENT FEEDS USED OF SHRIMP FARM IN BAGERHAT DISTRICT



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Declaration

Proximate Composition of Different Feeds Used of Shrimp Farm in Bagerhat District

The results submitted in this thesis are entirely of the candidate's own investigations and no part of the results has been accepted for any degree, nor is it being concurrently submitted for any degree

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Dedicated To

My Beloved Parents



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The author

Abstract

The study was undertaken to analyze and compare the proximate composition of some commercial feeds and some ingredients of handmade feeds available in Bagerhat district through chemical analysis. Eight (8) commercial feeds and five (5) ingredients of handmade shrimp feeds were collected for a period of 4 months (April to July, 2010) from local markets and also from fish farmers. The commercial shrimp feeds were Quality Feeds Ltd. (QF), ACI Feed Ltd. (ACI), Saudi-Bangla Feed Ltd. (SBF), Mega Feeds Ltd. (MF) CP Feed Ltd (CPF), Titas Feed (TF), Teer Feed(TF), Shapla Feed (SF) and five (5) ingredients of handmade shrimp feeds were rice polish, wheat bran, mastered oil cake, maize bran and soybean. Proximate composition analysis involved the measurement of moisture, protein and lipid level in the feeds. In general, there was no large variation between analyzed and company declared nutrient contents of different feeds. However, two feeds such as Shapla and Quality had more than 2.5% differences between the analyzed and declared protein value. The analyzed protein contents of Shapla and Quality feed was 25.23% and 31.51% and the company declared protein value was 28% and 34% respectively. Similarly, Teer feed had lower protein content (17.04%) compared to the company declared value (22%). On the other hand, two feeds such as mega and Saudi bangle feeds had less difference (1%) between the analyzed value and the declared value. Among the feeds Saudi bangla, Titas and Teer feeds had similar lipid content and ACI feed had about 3.5% less lipid content compared to the company declared values. Except CP (83Tk/Kg) there was no large variation among the price of different feeds. The ingredients of handmade feeds maximum moisture content was found in maize bran (14.06%) and minimum was found in mastered oil cake (10.83%) and the maximum protein content was found in soybean (43.89%) and minimum was observed in rice polish (15.49%) and the highest lipid content was found in rice polish (9.95%) and lowest was found in maize bran (1.67%). The results of the study showed that Saudi bangla Feed Ltd had less difference between the analyzed value and the company declared value.

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CHAPTER ONE

INTRODUCTION

1. Introduction

1.1 Background of the study

Shrimp is one of the leading exportable products of Bangladesh. More or less 80% of the shrimp farming areas are in the southwestern region of Bangladesh while the rest are in the southeastern part. The main shrimp farming districts are Khulna, Bagerhat, Jessore, Narail, Gopalganj, Pirojpur and Noakhali. Shrimp is the second most important export item of Bangladesh. The increasing demand and steadily rising prices of shrimp encouraged its cultivation in the coastal belt of the country.

Fish is one of the most important sources of animal protein and has been widely accepted as a good source of protein and other elements for the maintenance of healthy body (Andrew, 2001). Fisheries sector play a significant role in nutrition, income, employment and foreign exchange earning of the country. Fisheries contribute about 63% to the nation's animal protein intake (DoF, 2003). Fish and shellfish are the primary sources of animal protein and valuable in the diet because they provide a good quantity (usually 70 per cent or more) of protein of high biological value, particularly sulphur containing amino acids (Latham, 1997).

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. Nowadays, the production of fish feeds is the fastest growing feed market in Bangladesh. At present, there are about 25 commercial fish feed industries in Bangladesh. Most of them are producing both poultry and fish feeds. The well known industries that produce fish and shrimp feeds are Saudi-Bangla Fish Feed Ltd., Aftab Feed Products Ltd., Quality Feeds Ltd., ACI Feed Ltd., Usha Fish Feed Ltd., Urbashi Fish Feed Ltd., Paragon Feed Ltd., Teer Feed Ltd., Mega Feed Ltd. and Rupashi Feed Ltd. The annual production capacity of a feed industry varies from 10,000 to 30,000 MT. At the same time, hundreds of small-scale noncommercial and on-farm feed manufacturers produce fish feed throughout the country for their own farm consumption.

When diets are formulated to meet the recommended nutrient requirements, it is necessary to know the nutrient composition. Individual feed ingredients may vary widely in composition because of variation in cultivars, growing conditions, processing and storage conditions, and nutrient status. Consequently, the total energy content of a specimen can be reconstructed from its proximate composition. The nutrient balance of feed influences feed utilization and growth of fish. It is very essential to know the nutritional requirements in terms of protein, lipid and energy for optimum growth of a fish species in order to formulate a balanced diet. Proximate analysis is used to estimate the relative amounts of protein, lipid, water, ash and carbohydrate in a specimen. Consequently, the total energy content of a specimen can be reconstructed from its proximate composition. Dietary protein and energy levels are known to influence the growth and body composition of fish (Lovell, 1989). 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 as a result ammonia can be produced that

hamper the water quality (Phillips 1972, Prather and Lovell 1973, Shyong *et al.* 1998). On the contrary, excessive energy in diets can lead to increased body lipid deposition and growth reduction because of lack of necessary nutrient for growth (Daniels and Robinson 1986, Van der Meer *et al.* 1997). From the economic point of view, feed cost appears to be one of the major constraints against the greater expansion of aquaculture (Kaushik, 1990).

There is a paucity of information on the nutrient content of fish feed produced by different feed industries in Bangladesh. There is a dearth of reliable published information on chemical composition of commercial fish feed and feed ingredients of Bangladesh (Hossain, 1996). Bhuiyan *et al.* 1989, conducted a survey to identify potential feed ingredients based on their availability, price and primary nutritional value which is the only available report in this case. 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. There is no monitoring by the government on the quality and nutrient content of the feeds produced by different feed manufacturers, even if there is a possibility to use unauthorized feed ingredients. So far, there has been no attempt to evaluate the nutrient content of feeds produced by commercial industries. Therefore, the present study investigates the nutrient composition of commercial and handmade shrimp feeds available in the Bagerhat region of Bangladesh and compares these values with those declared by the manufacturers.

1.2 Objectives

Understanding chemical compositions of various fish meals used in animal feed are essential for formulating diets for animal. The important chemical compositions include dry matter, crude protein, ether extract, total ash, calcium, phosphorus, salt and gross energy. Besides the above components, amino acid profile is also important. Fish are probably the most efficient converter of feed to flesh requiring less than 2 lb of basic feed stuffs to produce 1 lb of fish. In a land of agriculture like Bangladesh vegetable sources are always there in plenty to be used in different proportions in potential formulated fish feeds. From all these discussion it is now apparent that the formulation, utilization and acceptability of manufactured feeds for the fish thus constitute an important subject of research for the development of aquaculture in Bangladesh. To do all these the first important thing is to select potential ingredients available in this country.

The main objectives are

- To compare the analyzed nutrient values with declared values of the manufactured feed.
- To analyze the proximate composition of some ingredients of handmade shrimp feeds.

CHAPTER TWO

REVIEW of LITERATURE

2. Review of Literature

In United States the history backs prior to 1900 when many of the wheat flour, corn or other grain processing plant began to market their by-products such as wheat bran, corn bran, oat hulls, etc., as animal feeds by blending in sufficient amounts of minerals and supplementary protein ingredients to produce saleable rations (Stivers, 1970). After 1900 up until about 1930, the industry grew at a fairly slow rate, with growth coming primarily by a large increase in the number of small feed mills.

The pellets required less storage space and was generally cheaper than other feeds. Such pellets have a high moisture content (about 35% of total weight), and contain raw ingredients so that they must be refrigerated, which is somewhat of a disadvantage (Iversen, 1976).

Sound nutrition is the determinant for growth, maturation, reproduction and success in any field of animal husbandry. Qualitatively, the nutrient requirements of fish are the same as those of higher animals. Quantitatively, however, many different levels are used to optimize production of fish subject to variations in stocking density, initial age and weight, water temperature, water chemistry and management practices. Important points regarding nutrition target such as, gross food conversion efficiency, energy, protein, fats, carbohydrates, vitamins, minerals have been discussed in detail by Hastings, 1979; Bratt, 1970; Halver, 1972.

Halver, the pioneer researcher in the field of fish nutrition reported (1980) the nutritional requirements of cultivated warm water fish species. According to him tentative requirements for the ten indispensable amino acids, and sparing effects of several others are reported for only a few species of fish held under specific experimental conditions. These must be confirmed for

other species reared and conditions used, since the protein requirement and amino acid balance is the major determinant for growth, and is the greatest food source problem. Essential fatty acid needs for fish reared indicate that this component may be the second limiting factor for future practical diets.

Harris (1980) described in a detailed review about the nature of different feed stuffs that are being presently used for preparing formulated fish feed. He discussed the international feed nomenclature, the systematic collection and recording of data on feed composition, calculations used in summerization of feed composition data, energy feeds, non-chemical characteristics of energy feeds, quality in energy feed, protein supplements, vitamin and mineral supplements and miscellaneous additives providing as many as 44 references.

Raven and Walker (1980) discussed on the ingredients for fish feed manufacture in the United States.

Chow (1980) made a guideline for the establishment of a feed mill for manufacturing compounded feeds in developing countries.

Dicky and Haque (1985) prepared a report on Bangladesh livestock industry status in relation to fodder supply and consumption of animal products. In giving their view on the present and future prospects of the livestock industry they have also discussed various aspects of feed resources available in this country. Some of which may also be used in fish diets. In this report it is cited that Haque, 1985 (unpublished) BARC report) listed the 'Potential Unconventional Feedstuff Sources' for livestock of Bangladesh.

Islam (1977) prepared fish feed using some marine fish of Bay of Bengal applying wet-rendering method. On the average, the yield of the meals was 20% of the raw material and contained

57.99% protein, 7.84% oil, 21.71% ash and 9.8% moisture. The meal obtained after passing through 30 mm mesh seive had over 65% protein and nearly 12% ash.

Davis (2005) found that a 30%-protein diet offered at 100% of the expected daily intake resulted in shrimp growth comparable to that from a 40%-protein diet offered at 75% of the rate because the daily protein intakes were equal. Protein requirements can be met by greater quantities of a low-protein diet, but in most cases, the proper application of the higher-quality diet is more cost-effective, as shipping and feed production costs are reduced.

Mumtazuddin (1978) worked with some shellfishes that included mussel, clam, snail and crab. By employing wet rendering process meal with following range of composition was obtained:

Protein	50.38 – 56.25%
Fat	7.28 – 10.32%
Ash	20.12 – 22.53%
NPN	0.85 – 1.20%



The high dietary protein requirement of fish and shrimp is generally attributed to their carnivorous/omnivorous feeding habit, and their preferential use of protein over carbohydrates as a dietary energy source (Cowey, 1975).

CHAPTER THREE

MATERIALS & METHODS

3. Materials and Methods

3.1 Collection and preparation of samples for analysis

In this study, eight (8) commercial shrimp feeds and five (5) handmade shrimp feeds, available in local market of Bagerhat district were collected during the culture period (April to July, 2010). Both types of shrimp feeds were collected from local market and also fish farmer. After collection of feed samples, the samples were kept in a refrigerator before chemical analysis. The samples were taken from the refrigerator and kept in room temperature for one hour. Then the required amount of samples were finely ground by a mortar and kept in an airtight container for subsequent chemical analysis. Eight (8) commercial shrimp feeds were Quality Feeds Ltd. (QF), ACI Feed Ltd. (ACI), Saudi-Bangla Feed Ltd. (SBF), Mega Feeds Ltd. (MF) CP Feed Ltd, Titas Feed (TF), Teer Feed(TF), Shapla Feed (SF) and five (5) handmade shrimp feeds were Polish, Wheat bran, Mastered oil cake, Maize bran and Soybean. Grower feeds are collected for determination of proximate composition of different shrimp feeds. Proximate composition such as moisture, crude protein and crude lipid were analyzed on the basis of dry matter (DMB).

3.2 Determination of proximate composition

The proximate composition of different commercial shrimp feeds and handmade shrimp feeds were analyzed according to standard procedures given in Association of Official Analytical Chemists (AOAC 1980).The detailed procedure for the determination of protein, lipid and moisture were given below. Each experiment was conducted with the replication of three.

3.2.1 Determination of moisture

For determining the moisture, at first crucibles were cleaned, dried and then the weight of the crucible was taken. Then 2-3 g sample was placed in the crucible and weighted again. Difference between the two is the sample weight. Then the crucible with sample weight was put in a controlled oven and was dried at 105°C for about 24 hours until constant weight was reached and cooled in desiccators and weighted several times till the constant weight was achieved. The percentage of moisture content will be calculated by the following equation:

$$\text{Percentage (\%)} \text{ of moisture} = (\text{Weight loses}/\text{Original weight of sample}) \times 100$$

3.2.2 Determination of protein

The protein content of the sample was determined by micro-kjeldahl method. It involves conversion of organic nitrogen to ammonium sulphate by digestion with concentrated sulphuric acid in a microkjeldahl flask. The digest was diluted with distilled water, made alkaline with sodium hydroxide and distilled. The liberated ammonia was collected in a boric acid solution and was determined titrametrically. The percentage of protein in the sample will be calculated by the following equation:

$$\text{Percentage (\%)} \text{ of N} = \frac{\text{Strength of titrant} \times \text{strength of HCl} \times 0.014}{\text{Sample weight (gm)}} \times 100$$

$$\text{Percentage (\%)} \text{ of protein} = \text{Percentage (\%)} \text{ of N} \times 6.25$$

3.2.3 Determination of lipid

Crude lipid was determined by extracting the sample with methanol and chloroform solution. At first the sample was weighted and taken into a biker and methanol- chloroform (1:2) solution was (100 ml) added. After that the sample is homogenized by using an electric homogenizer and passed through a filter paper. 50 ml water was added with the filtered solution which turned into milky color and kept in separation funnel for 8 hours. Another beaker was dried in the oven weighted and poured clear extracted solution which contain lipid. Beaker was then kept in the oven at 70⁰ C until the evaporation of chloroform and methanol. The percentage of Crude lipid content was calculated by the following equation:

$$\text{Percentage (\%)} \text{ of fat} = (\text{Weight of extract} / \text{Weight of sample}) \times 100$$

3.3 Data analysis

Graphical and statistical interpretation of collected data was performed by using Microsoft office excel and SPSS 16 statistical programme with five percent level of significance. One- way ANOVA was performed to compare the variation of means within different shrimp feeds.



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CHAPTER FOUR

RESULTS

4. Results

4.1 Proximate composition of commercial shrimp feeds

4.1.1 Moisture

The mean moisture content of different shrimp feeds used in Bagerhat district are presented in the figure 1. Significant difference ($P = 0.039 < 0.05$) was observed in moisture content between different feeds.

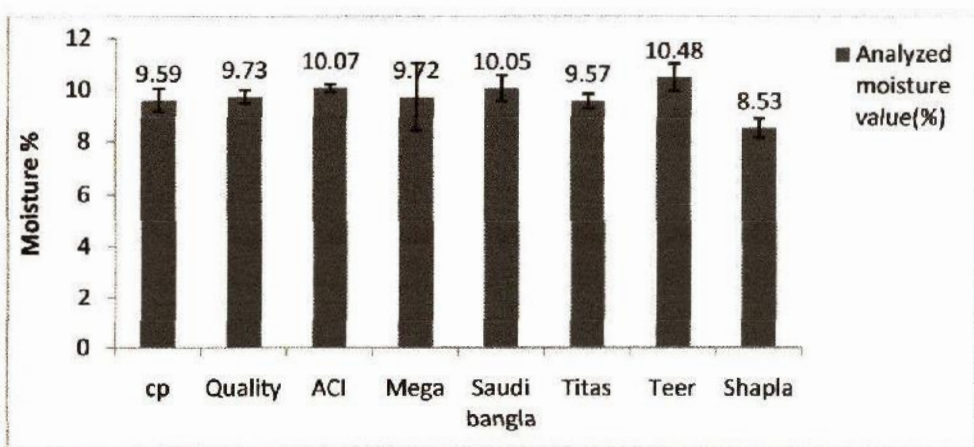


Fig. 1. The variation of moisture content among the analyzed shrimp feeds.

Comparison of the moisture content between the analyzed value and company declared value of different shrimp feeds are presented in the figure 2.

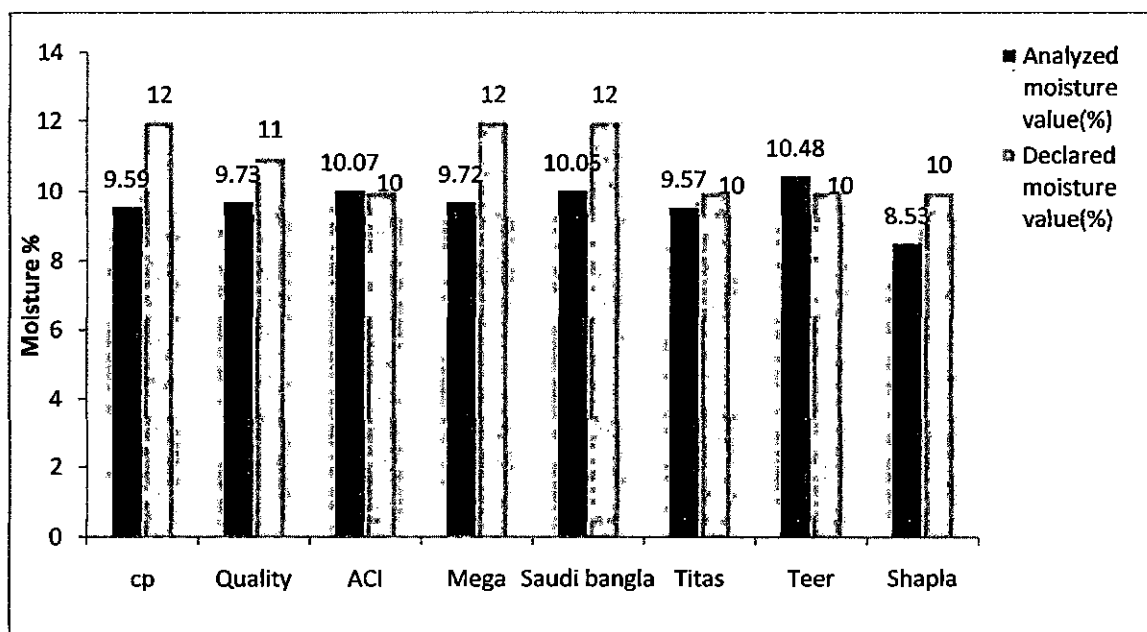


Fig. 2. Comparison of the moisture content between the analyzed value and company declared value of different shrimp feeds.

4.1.2 Crude protein

The mean protein content of different shrimp feeds used in Bagerhat district are presented in the figure 3. Significant difference ($P = 0.000 < 0.05$) was observed in protein content between different feeds.

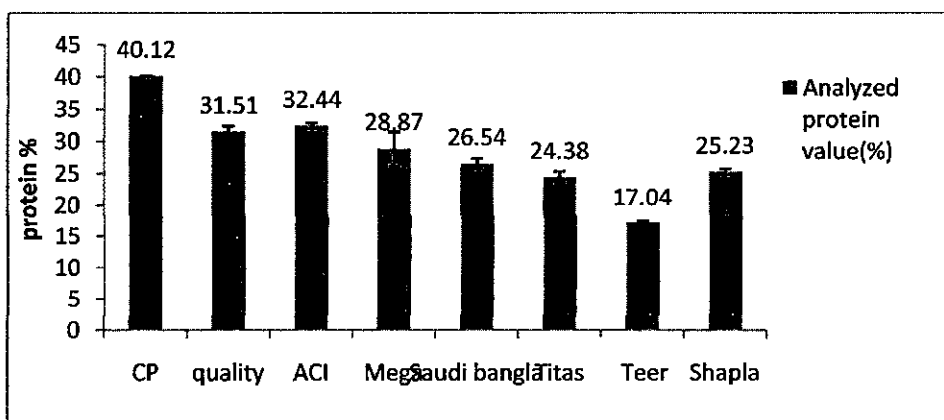


Fig. 3. The variation of protein contents among the analyzed shrimp feeds.

Comparison the protein contents between the analyzed value and company declared value of different shrimp feeds are presented in the figure 4.

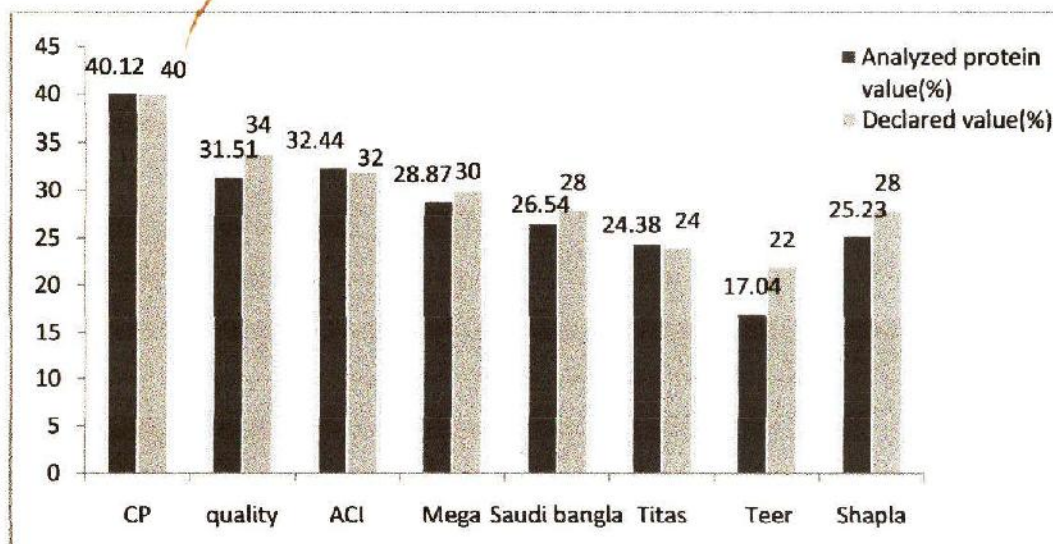


Fig. 4. Comparison the protein contents between the analyzed value and company declared value of different shrimp feeds.

4.1.3 Crude lipid

The mean lipid content of different shrimp feeds used in Bagerhat district are presented in the figure 5. Significant difference ($P = 0.000 < 0.05$) was observed in lipid content between different feeds.

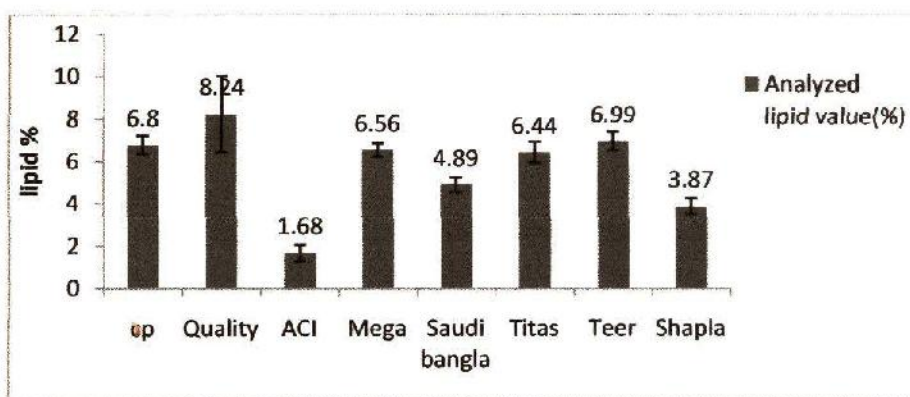


Fig. 5. The variation of lipid contents among the analyzed shrimp feeds.

Comparison of the lipid content between the analyzed value and company declared value of different shrimp feeds are presented in the figure 6.

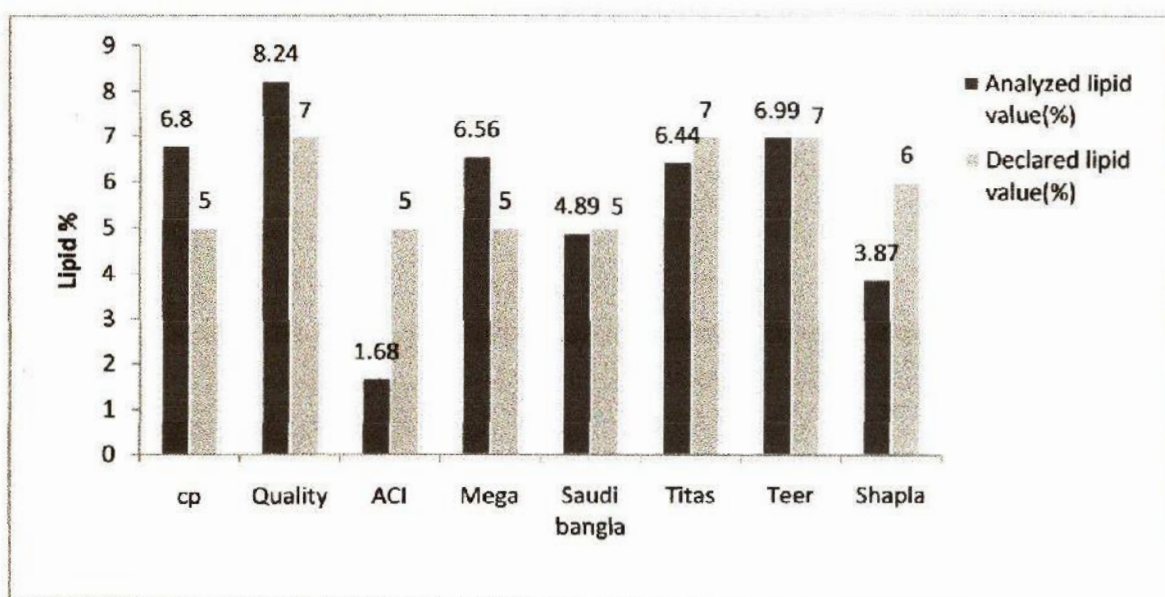


Fig. 6. Comparison of the lipid content between the analyzed value and company declared value of different shrimp feeds.

4.1.4 Price

The price of CP, Quality, ACI, Mega, Saudi bangle, Titas, Teer and Shapla shrimp feeds were 83Tk, 29Tk, 35Tk, 34Tk, 30Tk, 28Tk, 30Tk and 30TK per Kg respectively. The highest price was found in CP feed (83Tk/Kg) and lowest price was found in Titas feed (28Tk/Kg).



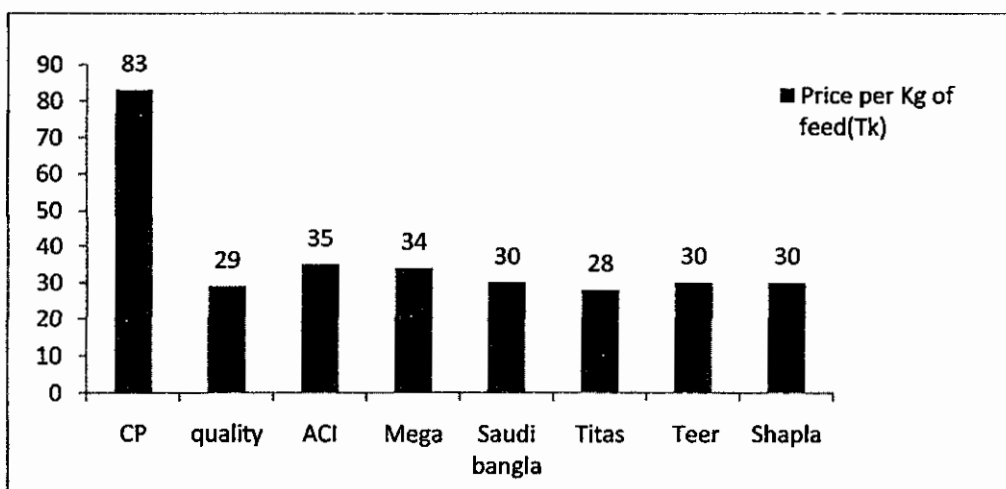


Fig. 7. Price of different commercial shrimp feeds.

4.1.5 Relationship between price and protein content

The highest price was found in CP feed (83Tk/Kg) and the highest protein content was found in CP feed (41.12%). On the other hand the lowest price value was found in Titas feed (28Tk/Kg) and the lowest protein content was found in Teer feed ((17.04%).

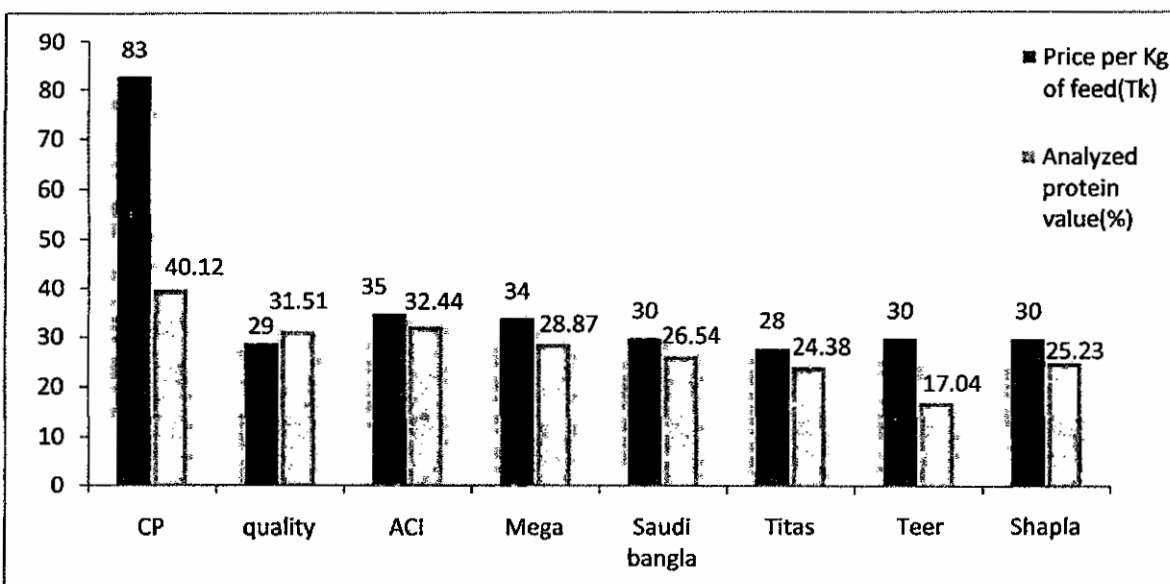


Fig. 8. Relationship between price and protein contents of different commercial shrimp feeds.

4.1.6 Relationship between price and lipid content

The highest price value was found in CP feed (83Tk/Kg) and the highest lipid content was found in Titas feed (6.99%). On the other hand the lowest price value was found in Titas feed (28Tk/Kg) and the lowest lipid content was found in ACI feed ((1.68%).

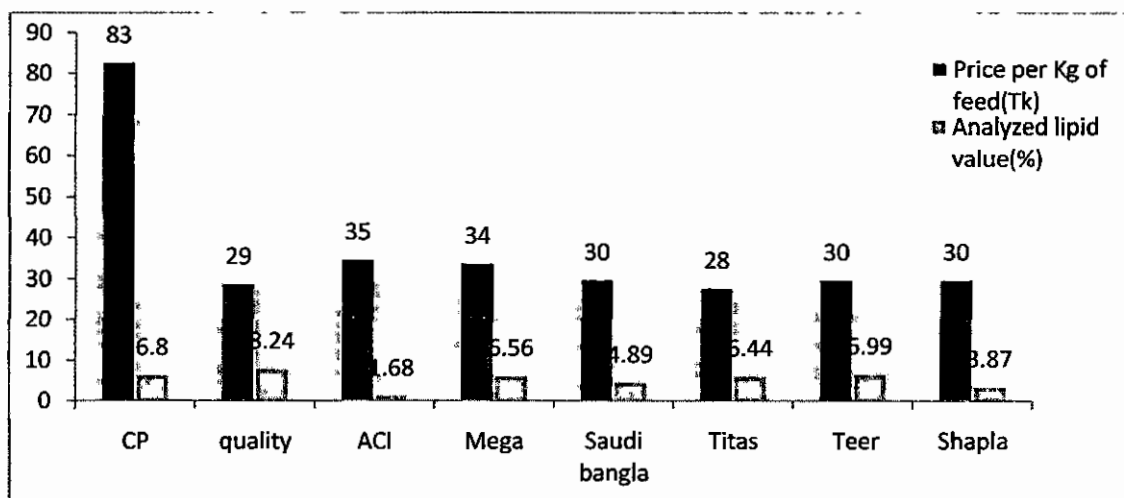


Fig. 9. Relationship between price and lipid content of different commercial shrimp feeds.

4.2 Proximate composition of some ingredients of handmade shrimp feeds

4.2.1 Moisture

The mean moisture content of different ingredients of handmade shrimp feeds used in Bagerhat district are presented in the figure 10. Mean moisture content vary significantly between different ingredients of handmade shrimp feeds ($P = 0.000 < 0.05$).

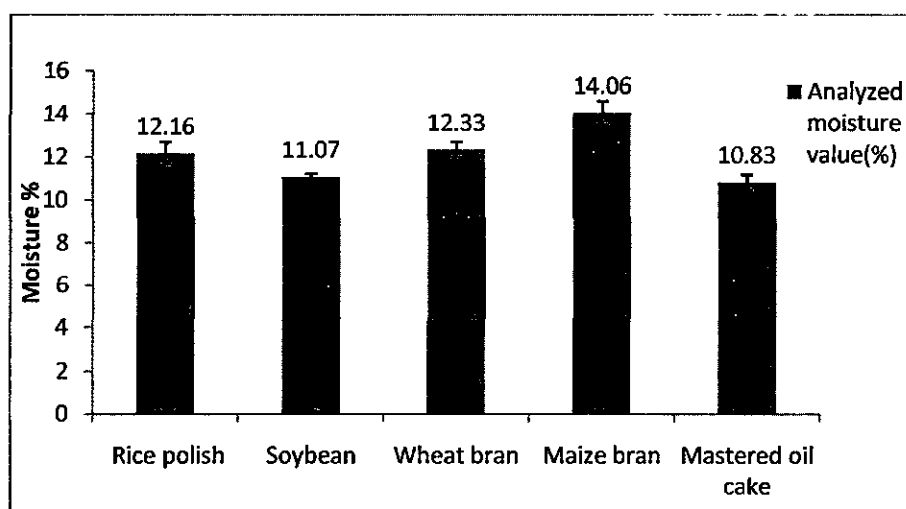


Fig. 10. The variation of moisture content among the ingredients of handmade shrimp feeds.

4.2.2 Crude protein

The mean protein content of different ingredients of handmade shrimp feeds used in Bagerhat district are presented in the figure 11. Mean protein concentration vary significantly between different handmade shrimp feeds ($P = 0.000 < 0.05$).

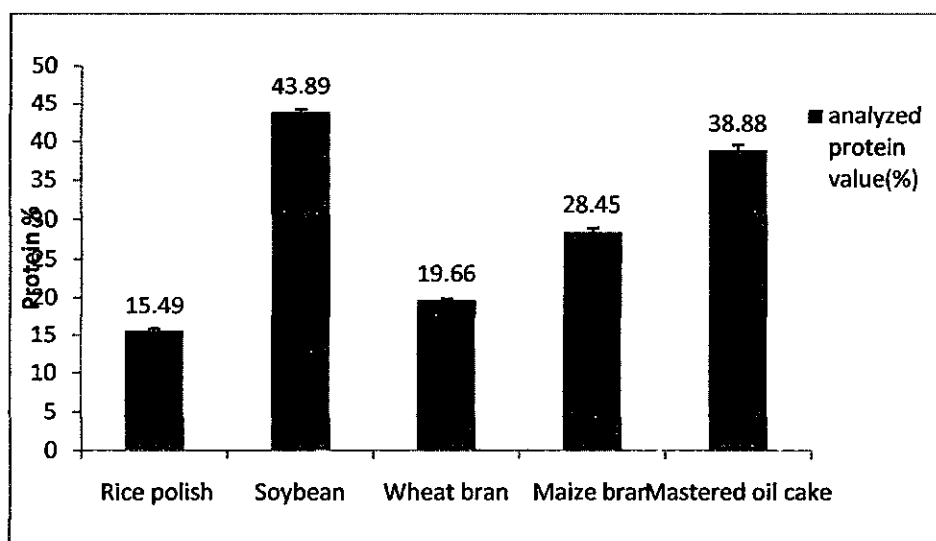


Fig. 11. The variation of protein contents among ingredients of the handmade shrimp feeds.

4.2.3 Crude lipid

The mean lipid content of different handmade shrimp feeds used in Bagerhat district are presented in the figure 12. Mean lipid concentration vary significantly between different handmade shrimp feeds ($P = 0.000 < 0.05$).

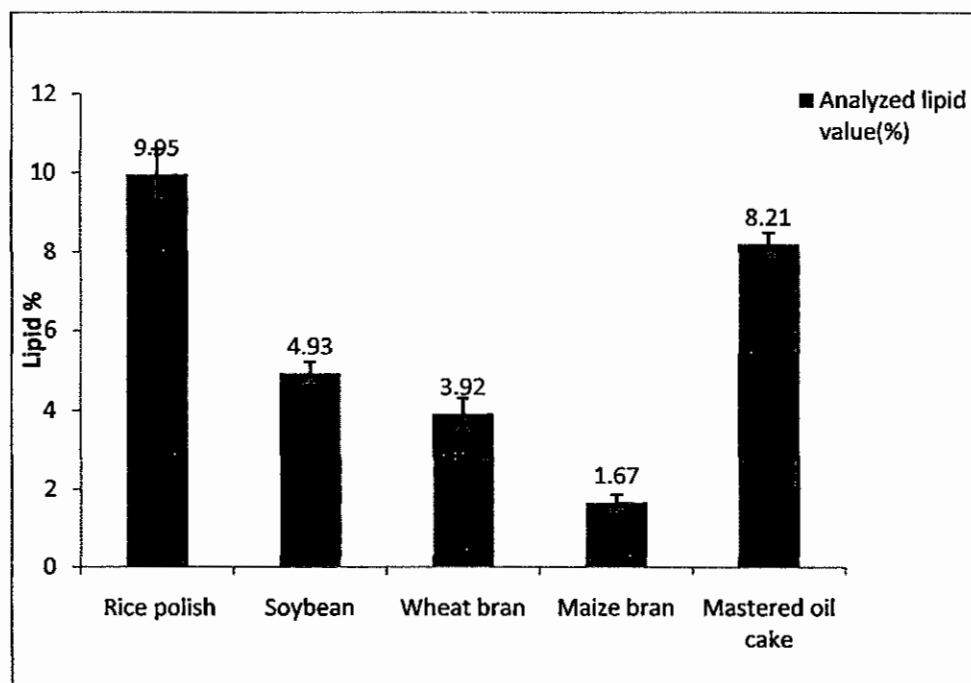


Fig. 12. The variation of lipid contents among the ingredients of handmade shrimp feeds.

4.2.4 Price

The price of rice polish, soybean, wheat bran, maize bran and Mastered oil cake were 24Tk, 37Tk, 27Tk, 25Tk and 28Tk per Kg respectively. The highest price was found in soybean (37Tk/Kg) and lowest value was found in rice polish (24Tk/Kg).

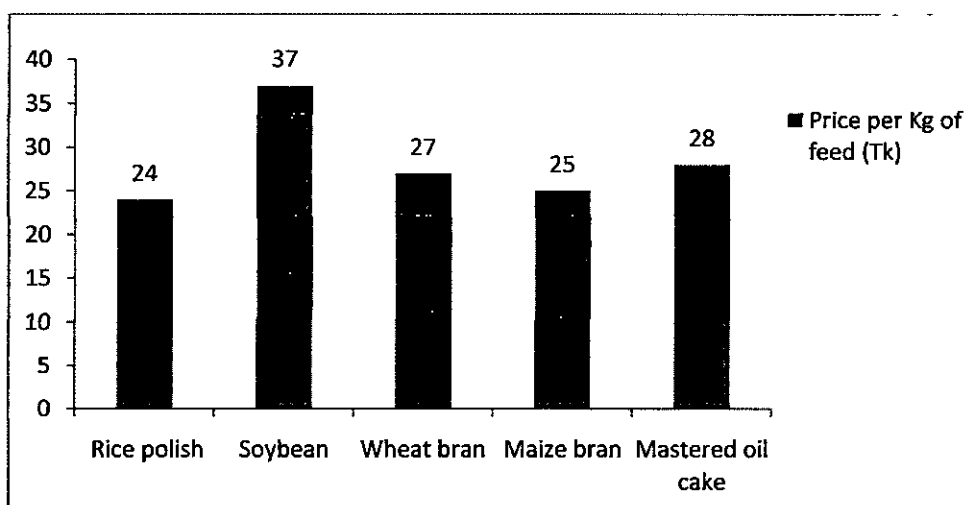


Fig. 13. Price value of different ingredients of handmade shrimp feeds.

4.2.5 Relationship between price and protein content

The highest price value was found in soybean (37Tk/Kg) and the highest protein content was found in soybean (43.89%). On the other hand lowest price value was found in rice polish (24Tk/Kg) and lowest protein content was observed in rice polish (15.49%).

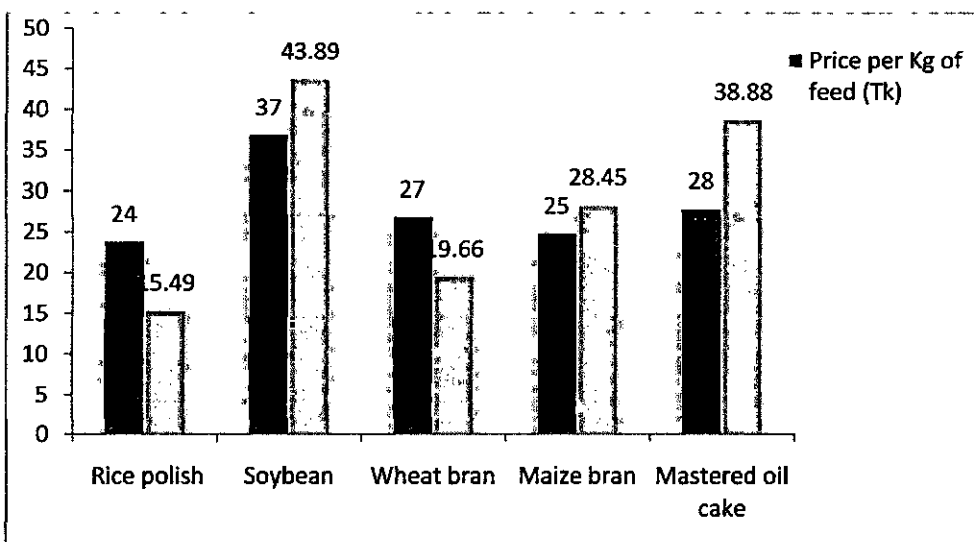


Fig. 14. Relationship between price and protein content of different ingredients of handmade shrimp feeds.

4.2.6 Relationship between price and lipid content

The highest price was found in soybean (37Tk/Kg) and the highest lipid content was found in rice polish (9.95%). On the other hand lowest price was found in rice polish (24Tk/Kg) and lowest lipid content was found in maize bran (1.67%).

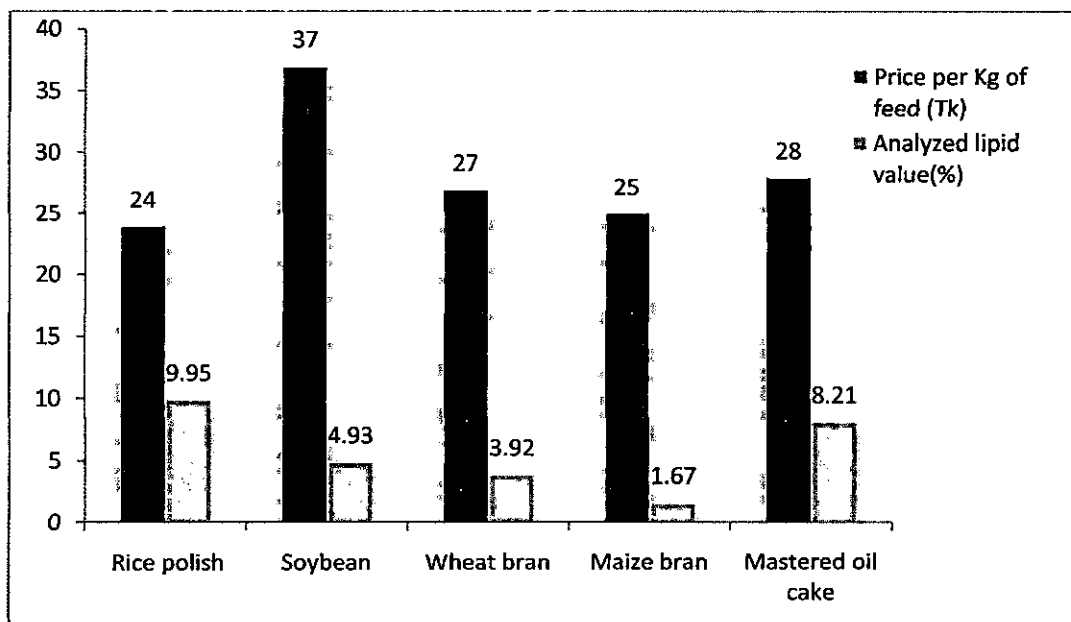


Fig. 15. Relationship between price and lipid content of different ingredients of handmade shrimp feeds.

CHAPTER FIVE

DISCUSSION

5. Discussion

5.1 Proximate composition of commercial shrimp feeds

The moisture contents were analyzed as 9.59%, 9.73%, 10.07, 9.72 %, 10.05%, 9.57%, 10.48%, and 8.53% in CP, Quality, ACI, Mega, Saudi bangle, Titas, Teer and Shapla respectively. The highest moisture content (10.48%) was found in Teer feed and the lowest (8.53%) was found in Shapla feed. The company declared moisture value of CP, Quality, ACI, Mega, Saudi bangle, Titas, Teer and Shapla shrimp feeds were 12%, 11%, 10%, 12%, 12%, 10%, 10% and 10% respectively. Except ACI and Teer feeds most of the collected feed samples contained lower moisture content than the company declared moisture content. But, only ACI feed had similar moisture content with the company declared value.

The analyzed protein contents of different feeds were 40.12%, 31.51%, 32.44%, 28.87 %, 26.54%, 24.38%, 17.04%, 25.23% in CP, Quality, ACI, Mega, Saudi bangle, Titas, Teer and Shapla feed respectively. The highest crude protein content (41.12%) was found in CP feed and the lowest (17.04%) was found in Teer feed. The company declared protein value of CP, Quality, ACI, Mega, Saudi bangle, Titas, Teer and Shapla shrimp feeds were 40%, 34% ,32%, 30%, 28%, 24% , 22%, 28% respectively. Two feeds such as Shapla and Quality had more than 2.5% differences between the analyzed and company declared protein value. Similarly, Teer feed had lower protein content (17.04%) respectively compared to 22% protein value declared by the company. On the other hand, the analyzed protein content in CP, ACI and Titas feeds had similar protein content to the declared by the company. Others two feeds such as mega and Saudi bangle feeds had less difference (1%) between the analyzed value and the declared value.

Feeds and feedstuffs contain nutrients and energy sources essential for fish growth, reproduction, and health. Deficiencies of these substances can reduce growth rates or lead to diseases and in some cases, excesses can cause a reduction in growth rate. Therefore, supply of inputs (feeds, fertilizers etc) has to be ensured so that the nutrients and energy requirements of the species under cultivation are met and the production goals of the system are achieved (Hasan 2001). Nowadays, commercial fish feeds are widely used to get more aqua cultural production. The present study was undertaken to know the actual nutrient content and compare the nutrient content of different commercial shrimp feeds available in Bangladesh. From the chemical analysis, it was observed that in Saudi bangla feed, more or less all the nutrients (protein, lipid, moisture etc) were similar to or above the range declared by the company. The values were also within the recommended nutrient levels for fish (NRC 1983).

Experimental work has shown that peptides, as well as free amino-acid, are far inferior to protein as a nitrogen source in the shrimp diet. Addition of glycine to the diet significantly stimulated feed intake. It has been concluded that the optimum dietary protein level for Penaeus japonicus is within the range of 52 to 57%; this level gave good results on the basis of weight gain and feed efficiency. Carbohydrate can spare $\frac{1}{3}$ of the protein in the diet.

The protein requirements for different shrimp species and sizes, reported as 25-55% of the diet, should be viewed only as general guidelines and the cost of feed is dictated largely by the quantity and quality of protein present (Davis, 2005). Protein quality, defined by the level and availability of essential amino acids, has the greatest effect on the efficient conversion of protein in formulated feed to final production. Andrews *et al*, 1972, has shown that white shrimp need 28-32 % dietary protein.

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 and quality of natural foods and overall digestible energy content of diet (Satoh 2000; Wilson 2000).

Most of the analyzed data on crude protein are more or less similar to the company declared values. The crude protein content of most of the feeds of different commercial feed industries analyzed are within the acceptable range recommended for fish (NRC 1983). Feeds of Saudi-Bangla Fish Feed Ltd. had optimum dietary crude protein for the fish mentioned by the company (Garling and Wilson 1976, Stanley and Moore 1983, Chuapoe huk and Pothisoong 1985, Satoh 2000, Wilson 2000).

The analyzed crude lipid contents of different shrimp feeds varied considerably among the feed manufacturers. The analyzed crude lipid contents were recorded as 6.8%, 8.24%, 1.68%, 6.56%, 4.89%, 6.44%, 6.99% and 3.87% in CP, Quality, ACI, Mega, Saudi bangle, Titas, Teer and Shapla feed respectively. The highest crude lipid content (8.24%) was found in Quality feed and the lowest (1.68%) was found in ACI feed. The company declared lipid value of CP, Quality, ACI, Mega, Saudi bangle, Titas, Teer and Shapla shrimp feeds were 5%, 7%, 5%, 5%, 5%, 7%, 7% and 6% respectively. Among the feeds Saudi bangle, Titas and Teer feeds had similar lipid contents compare to the declared value by the company. ACI feed had about 3.5% less lipid content compared to the company declared values. The lipid content of Quality, CP and Mega feeds had higher (about 2%) lipid content than the company's declared value. On the other hand Shapla feed had less lipid content (about 2%) than the company declared value.

Lipids are primarily included in formulated diet to maximize their protein sparing effect (Hasan 2001) by being a source of energy. This lipid values are lower than that of Cowey and Sargent (1979) who reported that in general, 10-20% of lipid in most diets gives optimal growth rates without producing an excessively fatty carcass.

Though dietary lipids are important nutritionally, the levels and types of lipids used in shrimp feeds are also dictated by economics, constraints of manufacturing procedures, and product quality. The lipid levels of commercial production feeds range 5-10% of the diet and generally rely on high-quality marine lipids to deliver essential fatty acid (Davis, 2005).

Among the feeds CP feed had high protein value and its lipid and moisture value were also better than the other shrimp feed. Its price value was so high, so this type of feed only used in case of semi intensive culture system in Bagerhat district. This type of feed has high protein value but due to its high price value it's not use in local farm. Quality feed had less protein and moisture value than the company declared value and had high lipid value than the declared value. ACI feed had high protein value but had about 3.5% less lipid content compared to the company declared values. The price value of ACI feed was higher compare to others feeds. Mega feed had less than 1% protein value compare to the company declared value and had higher (about 2%) lipid content than the company's declared value. Titas and Shapla are local shrimp feed company and the price value of these company are low, so locally many fish farmer used these types of feed in their shrimp farm. In case of Saudi bangle feed had less difference (1%) of protein value between the analyzed value and the declared value. Similarly Saudi bangle feed had similar lipid content compare to the declared value by the company. The price of Saudi bangla was also reasonable than the others feeds.

5.2 Proximate composition of different ingredients of handmade shrimp feeds

The analyzed moisture contents of different ingredients of handmade shrimp feeds were 12.16%, 11.07%, 12.33%, 14.04 % and 10.83% in rice polish, soybean, wheat bran, maize bran and mastered oil cake respectively. The maximum moisture content was found in maize bran (14.06%) and minimum was found in mastered oil cake (10.83%).

The analyzed protein contents of different ingredients were 15.49%, 43.89%, 19.66%, 28.45 %, 38.88%, in rice polish, soybean, wheat bran, maize bran and mastered oil cake respectively. The maximum protein content was found in soybean (43.89%) and minimum was observed in rice polish (15.49%).

The analyzed lipid contents of different ingredients were 9.95%, 4.93%, 3.92%, 1.67 % and 8.21%, in rice polish, soybean, wheat bran, maize bran and mastered oil cake respectively. The highest lipid content was found in rice polish (9.95%) and lowest was found in maize bran (1.67%).

The price of rice polish, soybean, wheat bran, maize bran and mastered oil cake were 24Tk, 37Tk, 27Tk, 25Tk and 28Tk per Kg respectively. The highest price was found in soybean (37Tk/Kg) and lowest value was found in rice polish (24Tk/Kg).

Some common fish feed ingredients which are originated from plant sources are- Maize bran, Suji, Rice flour, Rice bran, Rice polish, Wheat flour, Wheat bran, Sesame oil cake, Soybean grits, Mustard oil cake, Coconut oil cake, Lentil bran, Molasses etc. Most of the plant origin fish feed ingredients are obtained from seeds of the plants. These plant ingredients can be grouped

under heading bran, oil cake, flour, and others. Bran group includes rice bran, wheat bran, lentil bran etc. whereas oil cake group includes mustard oil cake, coconut oil cake, sesame oil cake etc. Oil cakes are obtained after processing of oil from the seeds. Flour group members are rice flour, wheat flour etc. and other ingredients are molasses, suji etc. Plant origin fish feed ingredients are mostly of less protein containing ingredients except oil cakes. Except these oil cakes almost all other plant origin ingredients are considered as basal or energy supplement (i.e. contains less than 20% protein) such as maize bran (12.20%), rice bran (10.26%), wheat bran (12.91%) etc.

Bhuiyan *et al.* 1989, has shown that mustard oil cake, rice polish, wheat bran and soybean contain 14.46%, 11.67%, 12.68%, 7.53%, moisture, 30.33%, 10.26%, 12.92%, 23.83% protein and 13.82%, 10.45%, 4.51%, 14.83%, lipid. Das, 1997 has shown that maize bran contain 12.20% protein and 7.60%, lipid.

CHAPTER SIX

CONCLUSION

6. Conclusion

The present study was successful in determining some aspects of proximate composition analysis of some commercial feeds and some ingredients of handmade shrimp feeds available in Bagerhat district. Among the feeds showed a little bit or far deviation from the company declared values. The results of the study showed that Saudi bangla Feed Ltd had less difference between the analyzed value and the company declared value. There is ample demand of shrimp in the international market and Bangladesh is blessed with an environment congenial for shrimp production. Nowadays, aquaculture feeds have been considered a major subsector of the feed milling industry. The industry suffers from significant production inefficiencies and is exposed to important social and environmental risks. The sector suffers from a lack of vision and strategic direction. However, the contribution of the industry both in terms of helping the poor as well as earning foreign exchange is immense and thus is considered by many as the future prospect of the country. The industry urgently needs an integrated strategy for sustainable development and to respond to emerging trends in the competitive global market place. As different feed ingredients and labor are abundant in Bangladesh with a cheap cost, there is a huge prospect to produce more and more cost effective nutrient rich feed for shrimp aquaculture in Bangladesh. The government must change the present policy and ensure strict monitoring and updating of standards to ensure success. The donors should outline policy framework based on standards required by the buyers and ask the government to ensure implementation. The role of the fisheries department should be clearly outlined and updated to ensure that the industry can operate smoothly. If all these strategies are implemented properly, Bangladesh can increase its market share and ultimately become one of the leaders in the global shrimp market.

CHAPTER SEVEN

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APPENDIX

Appendix

Photograph of experimental apparatus and different shrimp feeds



1: Digestion apparatus

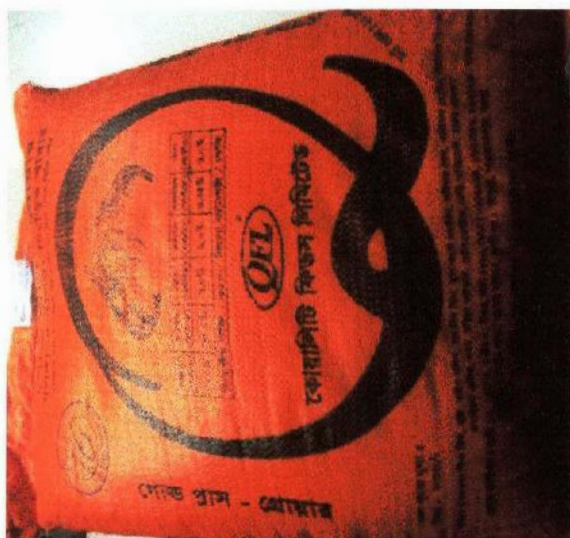


2: Distillation apparatus

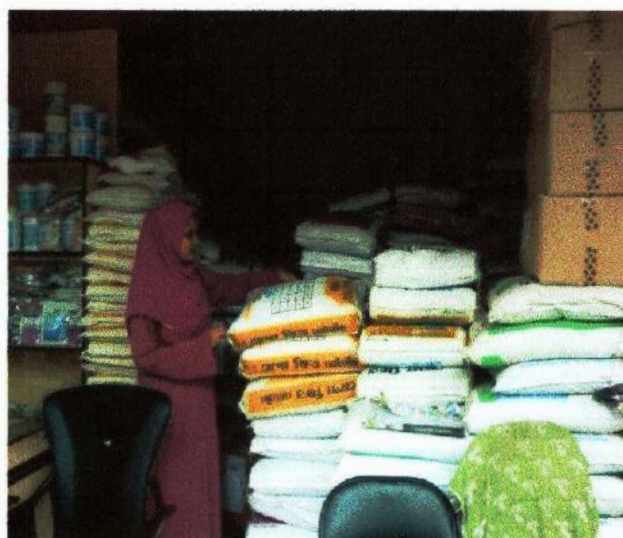


3: Lipid separation funnel





4: Quality feed



5: Mega feed



6: Saudi bangle



7: Collected sample

Table.1. Analyzed proximate composition ($\pm$ SD) of different commercial shrimp feeds available in Bagerhat district (dry matter basis %)

Feed company	Moisture % Mean $\pm$ SD	Protein% Mean $\pm$ SD	Fat% Mean $\pm$ SD
CP	9.59 $\pm$.44	40.12 $\pm$.03	6.8 $\pm$.43
Quality	9.73 $\pm$.25	31.51 $\pm$.86	8.24 $\pm$ 1.78
ACI	10.07 $\pm$.15	32.44 $\pm$.46	1.68 $\pm$.38
Mega	9.72 $\pm$ 1.29	28.87 $\pm$ 2.65	6.56 $\pm$.33
Saudi bangla	10.05 $\pm$.50	26.54 $\pm$.79	4.89 $\pm$.35
Titas	9.57 $\pm$.28	24.38 $\pm$.94	6.44 $\pm$.51
Teer	10.48 $\pm$.53	17.04 $\pm$.33	6.99 $\pm$.45
Shapla	8.53 $\pm$.35	25.23 $\pm$.49	3.87 $\pm$.37

Table.2. Analyzed proximate composition ($\pm$ SD) of different ingredients of handmade shrimp feeds available in Bagerhat district (dry matter basis %)

Feed Type	Moisture % Mean $\pm$ SD	Protein% Mean $\pm$ SD	Fat% Mean $\pm$ SD
Rice polish	12.16 $\pm$.52	15.49 $\pm$.32	9.95 $\pm$.65
Soybean	11.07 $\pm$.15	43.89 $\pm$.34	4.93 $\pm$.28
Wheat bran	12.33 $\pm$.34	19.66 $\pm$.16	3.92 $\pm$.39
Maize bran	14.06 $\pm$.54	28.45 $\pm$.48	1.67 $\pm$.20
Mastered oil cake	10.83 $\pm$.35	38.88 $\pm$.65	8.21 $\pm$.29

Table.3. One-way ANOVA table for comparison of significance of moisture level of different commercial feeds

Moisture	ANOVA				
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.760	7	.966	2.862	.039
Within Groups	5.399	16	.337		
Total	12.158	23			

Moisture	Descriptives							
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
CP	3	9.5967	.44298	.25576	8.4962	10.6971	9.21	10.08
Quality	3	9.7367	.25697	.14836	9.0983	10.3750	9.50	10.01
ACI	3	10.0700	.15716	.09074	9.6796	10.4604	9.89	10.17
Mega	3	9.7200	1.29410	.74715	6.5053	12.9347	8.55	11.11
Suadi bangla	3	10.0500	.50269	.29023	8.8012	11.2988	9.52	10.59
Titas	3	9.5787	.28290	.16333	8.8739	10.2794	9.34	9.80
Teer	3	10.4800	.53075	.30643	9.1615	11.7985	9.91	10.90
Shapla	3	8.5333	.35119	.20276	7.6609	9.4057	8.20	8.90
Total	24	9.7204	.72707	.14841	9.4134	10.0274	8.20	11.11

Table.4. One-way ANOVA table for comparison of significance of protein level of different commercial feeds

ANOVA					
Protein					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	966.150	7	138.021	111.282	.000
Within Groups	19.845	16	1.240		
Total	985.994	23			

Descriptives								
Protein								
					95% Confidence Interval for Mean			
	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
CP	3	40.1233	.03055	.01764	40.0474	40.1992	40.09	40.15
Quality	3	31.5100	.88097	.50863	29.3216	33.6984	30.56	32.30
ACI	3	32.4467	.46058	.26592	31.3025	33.5908	32.00	32.92
Mega	3	28.8700	2.65565	1.53324	22.2730	35.4670	26.32	31.62
Suadi bangla	3	26.5433	.79002	.45612	24.5808	28.5059	25.75	27.33
Titas	3	24.3867	.94574	.54603	22.0373	26.7360	23.42	25.31
Teer	3	17.0467	.33561	.19376	16.2130	17.8804	16.70	17.37
Shapla	3	25.2333	.49943	.28835	23.9927	26.4740	24.70	25.69
Total	24	28.2700	6.54747	1.33650	25.5052	31.0348	16.70	40.15

Table.5. One-way ANOVA table for comparison of significance of lipid level of different commercial feeds

ANOVA					
Fat					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	92.240	7	13.177	24.216	.000
Within Groups	8.706	16	.544		
Total	100.947	23			

Descriptives								
Fat								
					95% Confidence Interval for Mean			
	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
CP	3	6.8000	.43589	.25166	5.7172	7.8828	6.30	7.10
Quality	3	8.2400	1.78048	1.02796	3.8170	12.6630	6.19	9.40
ACI	3	1.6800	.38314	.22121	.7282	2.6318	1.42	2.12
Mega	3	6.5600	.33407	.19287	5.7301	7.3899	6.26	6.92
Suadi bangla	3	4.8933	.35233	.20342	4.0181	5.7686	4.50	5.18
Titas	3	6.4400	.51264	.29597	5.1665	7.7135	5.90	6.92
Teer	3	6.9900	.45508	.26274	5.8595	8.1205	6.49	7.38
Shapla	3	3.8767	.37501	.21651	2.9451	4.8082	3.50	4.25
Total	24	5.6850	2.09499	.42764	4.8004	6.5696	1.42	9.40

Table.6. One-way ANOVA table for comparison of significance of moisture level of different ingredients of handmade feeds

ANOVA					
Moisture					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	19.754	4	4.938	29.490	.000
Within Groups	1.675	10	.167		
Total	21.428	14			

Descriptives								
Moisture								
					95% Confidence Interval for Mean			
	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
Rice polish	3	12.1633	.52013	.30030	10.8713	13.4554	11.65	12.69
Sayobin	3	11.0767	.15948	.09207	10.6805	11.4728	10.97	11.28
Wheat bran	3	12.3300	.34598	.19975	11.4705	13.1895	12.00	12.69
Maize bran	3	14.0667	.54197	.31291	12.7203	15.4130	13.50	14.58
Mastered oil cake	3	10.8300	.35763	.20648	9.9416	11.7184	10.50	11.21
Total	15	12.0933	1.23717	.31944	11.4082	12.7785	10.50	14.58

Table.7: One-way ANOVA table for comparison of significance of protein level of different ingredients of handmade feeds

ANOVA					
Protein					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1767.220	4	441.805	2.430E3	.000
Within Groups	1.818	10	.182		
Total	1769.038	14			

Descriptives								
Protein								
					95% Confidence Interval for Mean			
	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
Rice polish	3	15.4933	.32005	.18478	14.6983	16.2884	15.27	15.86
Sayobin	3	43.8933	.34487	.19911	43.0366	44.7500	43.52	44.20
Wheat bran	3	19.6633	.16010	.09244	19.2656	20.0611	19.50	19.82
maize bran	3	28.4533	.48542	.28026	27.2475	29.6592	27.98	28.95
Mastered oil cake	3	38.8867	.65310	.37706	37.2643	40.5090	38.20	39.50
Total	15	29.2780	11.24099	2.90241	23.0529	35.5031	15.27	44.20

Table.8: One-way ANOVA table for comparison of significance of lipid level of different ingredients of handmade feeds

ANOVA					
Lipid					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	125.981	4	31.495	92.282	.000
Within Groups	3.413	10	.341		
Total	129.394	14			

Descriptives								
Lipid								
					95% Confidence Interval for Mean			
	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
Rice polish	3	9.9500	.65023	.37541	8.3347	11.5653	9.21	10.43
Sayobin	3	4.9300	.28213	.16289	4.2291	5.6309	4.63	5.19
Wheat bran	3	3.9267	.39514	.22813	2.9451	4.9082	3.50	4.28
maize bran	3	1.6733	.20648	.11921	1.1604	2.1863	1.53	1.91
Mastered oil cake	3	7.7000	1.00265	.57888	5.2093	10.1907	6.59	8.54
Total	15	5.6360	3.04014	.78496	3.9524	7.3196	1.53	10.43