

Article

Comparative analysis of nutritional quality of different fish feed available in greater Noakhali region, Bangladesh

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Abstract: An experiment was carried out to comparative analysis of nutritional quality of different fish feed from different feed dealers and industries in greater Noakhali region and to compare the values with those provided by the manufacturers. The feed samples were collected from different feed industries and dealer's shop of these region. Feed samples were collected during 10 August to 5 September, 2016. The collected feed samples were stored and analyzed in the Fish Nutrition Laboratory of the Department of Aquaculture in the Faculty of Fisheries, Bangladesh Agricultural University (BAU), Mymensingh for proximate composition (moisture, ash, crude protein, crude lipid, crude fiber, carbohydrate) following standard methods. Results showed that there was significant variation between analyzed and company provided nutritive values of different feeds. Some feed samples have low moisture level (difference 0.7 to 3.3%). Ash content of the experimental samples also show a variety of results compared to their labeled composition. Only some feed have more values to the company provided values, such as, Mega starter (12.13%) and Bengal grower (12.75) proportion with 12%. Some feed contains more difference range of 6.01% more than labeled values is RP feed (20.01%). Maximum feed samples had lower crude protein (difference 0.05 to 4.65%) than the company provided protein values. However, only crude protein of Bengal finisher (29.95%) and Aftab grower (28.07%) feeds were found to be almost same to the company provided nutritive values (30% and 28%). The lipid, ash and carbohydrates contents of the experimental samples also have a difference range. The highest lipid values are available in Provita starter (9.76%) and lowest values containing feed Setu grower (4.33%). The highest carbohydrates content in the feed Provita starter (36.84%). The findings of this study demonstrated that low quality commercial fish feeds were supplied to the fish farmers by majority of feed companies. Therefore, the study will generate some information to the farmers which will help to choose the best feed for their aquaculture production.

Keywords: nutritional quality; fish feed; Noakhali; Bangladesh

1. Introduction

Bangladesh is tremendously diversified with fishes and fisheries. According to report of FAO, (2016) in 2014 and 2015, Bangladesh took 5th Place in Inland Fish Production and 6th in total Aquaculture production. Bangladesh exports 83,524 mt of fish & fisheries products, price of this quantity is BDT 4,660.60 million Tk. This sector is contributing 1.92% of the total export earnings and 3.69% to the GDP. The contribution in GNP is BDT 19567.90 crore Tk, and contribution to agricultural sector is 23.12% (DoF, 2016). The people of

Bangladesh depend on fish for 60% of their animal protein. In Bangladesh fish consumption rate is 19.71 kg/ person/ year. Total demand of fish is 37.65 lakh mt per year and demand per person 21.90 kg per year (DoF, 2016). To fulfill the increasing demand of fish for food and decline in capture fisheries production, Aquaculture is heading towards intensification. That's why, it's consequently leading to an unprecedented rise in the demand for feeds. 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. Economically productive aquaculture systems depend upon an adequate supply of low cost feeds with high nutritional quality. The major cost in the fish industry is feed; it contributes about 40%-60% of total cost in fish culture. The nutritional quality of fish feed and the ingredients that are used in feed formulation as well as nutritional composition of finished goods or formulated diets are very sensitive issues in the field of fish nutrition. Nutrition and feeding play an important role in the sustained development of the aquaculture. Therefore, it is obligatory that feed resources continue to be produced and refined. There are a variety of commercial fish feed are available in Bangladesh. Some of the common feed are- Nursery feed, Pre-Starter feed, Starter feed, Grower feed, Finisher feed of different fish species like as Tilapia, Pangas, Carp, Koi, Sing, Magur and other fish species. These feed will very effective for growth and production rate of fishes if the nutritional value of these feed are accurate and perfect. Demand of fish feed is increasing day by day and number of fish feed companies are also increasing. There are a significant number of Feed Company are available in Bangladesh especially in Noakhali region. Noakhali region is a fertile land for Fish production, because of its geological status. For this reason, many renowned feed industries produce fish feed at this region. Some of the top Company are Glove Agrovet Limited, Bengal Feed and Fisheries Ltd, Partex Fish Feed Ltd, Mega Fish Feed, R.P Feed, Setu Feed, Provita feed etc. These industries not only manufacture fish feed but also they produce livestock feed such as poultry, cattle, pet animal etc. On the other hand, hundreds of small-scale non-commercial and on-farm feed industries produce fish feed throughout the country. There is a shortness of information on the nutrient content of fish feed produced by different feed industries in Bangladesh, as well as greater Noakhali region. There are also no reliable published information on composition of manufactured fish feed in Bangladesh. 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 importance of fish feed is increased with the intensification of aquaculture. However, commercial fish production fully depends on quality feed. Feed costs generally constitute the highest single operation cost of semi-intensive or intensive grow-out farming operation. It is therefore of great importance to the fish farmers to utilize their investments in feed as optimal as possible. Different NGOs and Extension Agencies working for aquaculture extension in Bangladesh are interested to know about the nutritive value of commercial fish feed of Bangladesh (Asif *et al.*, 2014; Islam *et al.*, 2014; Asif *et al.*, 2015; Islam *et al.*, 2015; Rahaman *et al.*, 2015; Sharif *et al.*, 2015; Sultana *et al.*, 2015; Hossain *et al.*, 2016b; Vaumik *et al.*, 2017; Razeim *et al.*, 2017; Islam *et al.*, 2017a; Asif and Habib, 2017; Hossain *et al.*, 2018; Mondal *et al.*, 2018 and Adhikary *et al.*, 2018;). Government has a legal legislation but still has very less or no control over feed industries of Bangladesh. The government has no legal legislation and control over the feed components and feed quality. There are also no guidelines for the establishment of a new feed industry. There is no monitoring by the government on the quality and nutrient content of feeds produced by different feed manufacturers, even if there is a possibility to use unauthorized feed ingredients and they do not maintain proper quality in manufacturing feed. Therefore it is an urgent need to assess the comparative analysis and actual nutritional quality of the feed available in the market. So these areas were selected for this comparative analysis, which will be able to represent the availability and nutritional quality of fish feed of the region. Therefore the present study was conducted to evaluate the fish feed industries of Noakhali region; to collect and find out the locally available fish feed details with feed type, ingredients sources, labeled nutrient contents and cost; to analyses the proximate composition of collected fish feed available in these feed mill to evaluate the nutritional value; to compare the nutritional composition with their labeled nutrient contents.

2. Materials and Methods

2.1. Experimental site and collection of fish feed samples

The experiment on nutritional quality analysis of different fish feed was conducted for the period of three months from August, 2016 to October, 2016. A large number of fish feeds were available in greater Noakhali produced by commercial feed mills and industries. The most popular commercial fish feeds available throughout the Noakhali region were Bengal Feed, Globe Agrovet Feed, RP Feed, Setu Feed, Partex Feed, Quality Feed, Provita Feed, Mega Feed, Nurani Ready Feed, Aftab Feed, Abis Feed. A total of 18 feed samples of 11 feed companies were collected. All of the feeds used in this study were collected from feed industries and

feed dealers' shops by the author himself. Duplicate same types feed samples of those selected 11 feed companies were collected two weeks later. After collection of feed samples, the samples were kept in a refrigerator and then transported to the fish nutrition laboratory, Department of Aquaculture, Bangladesh Agricultural University (Figure 1).

2.2. Laboratory facilities

The analysis of feed was carried out in the Fish Nutrition Laboratory of the Department of Aquaculture in the Faculty of Fisheries, Bangladesh Agricultural University (BAU), Mymensingh. The laboratory has available facilities for the determination of proximate composition viz. moisture, crude protein, crude lipid, ash, crude fiber and carbohydrate.



Figure 1. Map showing the sample collecting and analyzing location.

2.3. Analytical methods

2.3.1. Estimation of moisture

The change of weight is estimated under certain temperatures. Moisture of fish is commonly determined by drying a sample at some elevated temperature and reporting the loss in weight in terms of moisture (AOAC, 2000).

2.3.2. Determination of ash

Ash is the residues of the inorganic matter (mineral) of the sample after burning. If the sample in a muffle furnace at 600°C the organic matter is evaporate and residues are called ash. Ash content of each feed was estimated by following incineration method (Maynard, 1970).

2.3.3. Determination of crude protein

According to Kjeldhal methods proteins are hydrolyzed to amino and with H_2SO_4 . Further heating decomposes the amino acid releasing- Ammonia which immediately trapped on $(NH_4)_2SO_4$ and water. Micro kjeldhal method was to determine the crude protein (Jacobs MB, 1973; Mitchell P, 1972; Pearson *et al.*, 1977 and Bhuiyan *et al.*, 2016).

2.3.4. Determination of crude lipid

Fat is examined with low boiling organic solvent (petroleum ether/ diethyl ether, xylem) by soxhlet extraction and the extract thus obtained weighed after recovery of the solvent. Crude fat was determined through Soxhlet extraction technique (Maynard, 1970 and Jacobs, 1973) using hexane (65 °C-70 °C) as the solvent.

2.3.5. Determination of crude fiber

The A small amount of finely ground sample (1-2 g) was taken in to a filter crucible and was inserted into the hot extraction unit (Hot Extractor, Model-1017). Sufficient amount of pre-heated 0.128M H₂ SO₄ was added into the reagent heating system and few drops of octanol were added through the valves. The mixture was digested for 30 minutes. Acid was then removed from it by filtering and washing with boiling water. The residue in the flask was boiled with required amount of 0.223M KOH for 30 minutes and then filtered with subsequent washing in boiling water and acetone. The residual content was then dried in an oven at 105°C for a few hours and then ignited in muffle furnace at 550°C for 3 hours. The loss of weight represented the crude fiber.

2.4. Data processing and analysis

After collection of data, these were edited and coded. All the collected data were summarized and scrutinized carefully and recorded. Finally relevant tables were prepared in accordance with the objectives of the study. Data presented mostly in the tabular form because it is simple in calculation, widely used and easy to understand, soft word and Microsoft excel were used for data analysis and for chart, graph diagram preparation.

3. Result

3.1. Nutritive value of commercial feeds

In the experiment proximate composition of 18 feeds such as moisture, protein, lipid, ash, crude fiber and carbohydrate were analyzed in the laboratory (Table 1).

Table 1. Name of the feed companies.

Sl. No	Company Name	Type of feed
1	Partex Feed	Starter
2	Partex Feed	Finisher
3	Globe Agro vet	Nursery
4	Globe Agro vet	Grower
5	Bengal Feed	Starter
6	Bengal Feed	Grower
7	Bengal Feed	Finisher
8	Setu Feed	Starter
9	Setu Feed	Grower
10	R P Feed	Grower
11	Mega Feed	Nursery
12	Mega Feed	Starter
13	Mega Feed	Finisher
14	Aftab Feed	Grower
15	Provita Feed	Starter
16	Nurani Feed	Grower
17	Quality Feed	Starter
18	Abis Feed	Nursery

3.2. Moisture content

In the conduct experiment a total of 18 feed samples were analyzed to know the actual moisture content. Some feed samples contain more or less similar moisture percentage as these were labeled by the manufacturer. Others are found having deviated composition from their labeled value. The analyzed mean moisture content of fish feed varied from 9.3% to 15.33%. The highest moisture containing feed was RP grower feed. It contained 15.33% moisture. Mean moisture content of Mega finisher feed was 12.14% which was nearly same to labeled moisture (12%). The lowest mean moisture content in Mega Starter feed was 9.3% compared to the labeled moisture content (10%) having a difference of 2.57%. The analyzed results of different feed samples were shown in the Figure 2 (starter), and Figure 3 (grower).

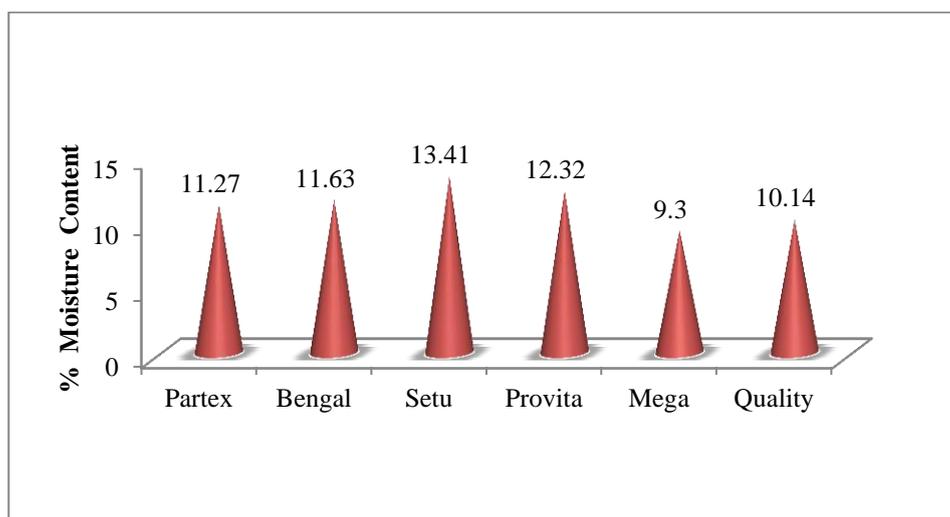


Figure 2. Moisture content of starter feeds of different companies.

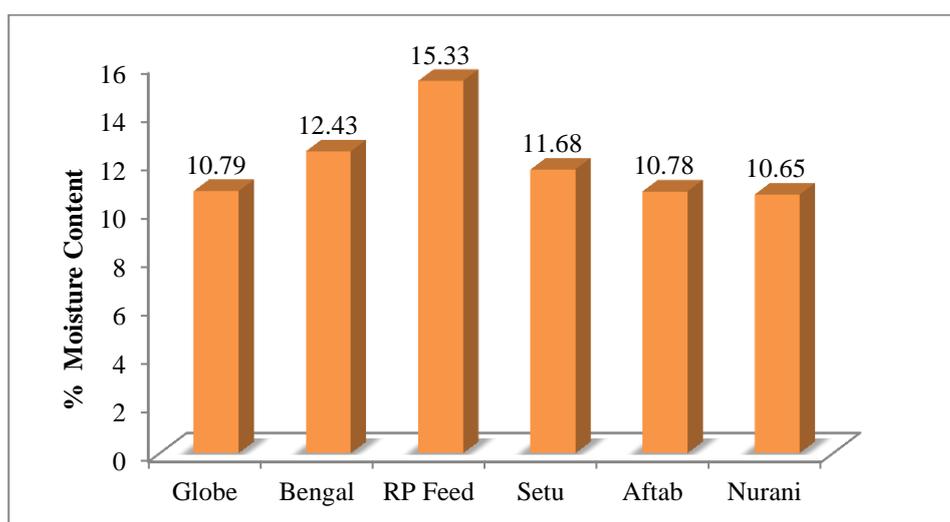


Figure 3. Moisture content of grower feed of different companies.

3.3. Crude protein content

A total of 18 feed samples were analyzed to know the actual crude protein content in the experiment. Some feed samples contain more or less similar crude protein percentage as those were labeled by the manufacturers. Others were found having deviated composition from their labeled value. The analyzed mean crude protein content of fish feeds varied from 21.65% to 34.40%. The lowest mean crude protein containing feed was Mega Finisher having 21.65% crude protein where the company provided protein value was 26%. The highest mean crude protein containing feed was Globe nursery, having 34.40% protein which was labeled with 32% crude protein. Crude protein content of different feeds is shown graphically in the Figure 4 (starter) and Figure 5 (grower).

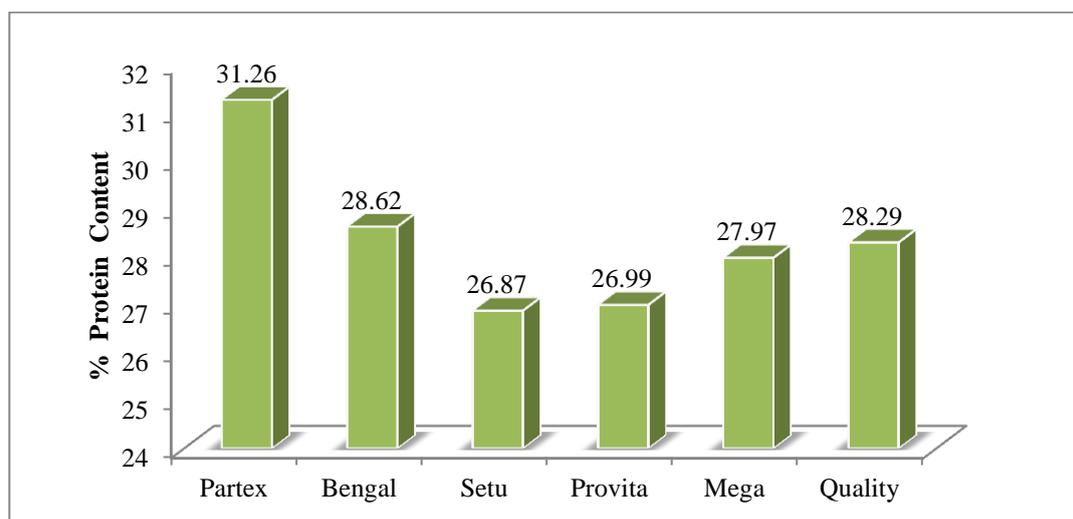


Figure 4. Crude protein content of starter feeds of different companies.

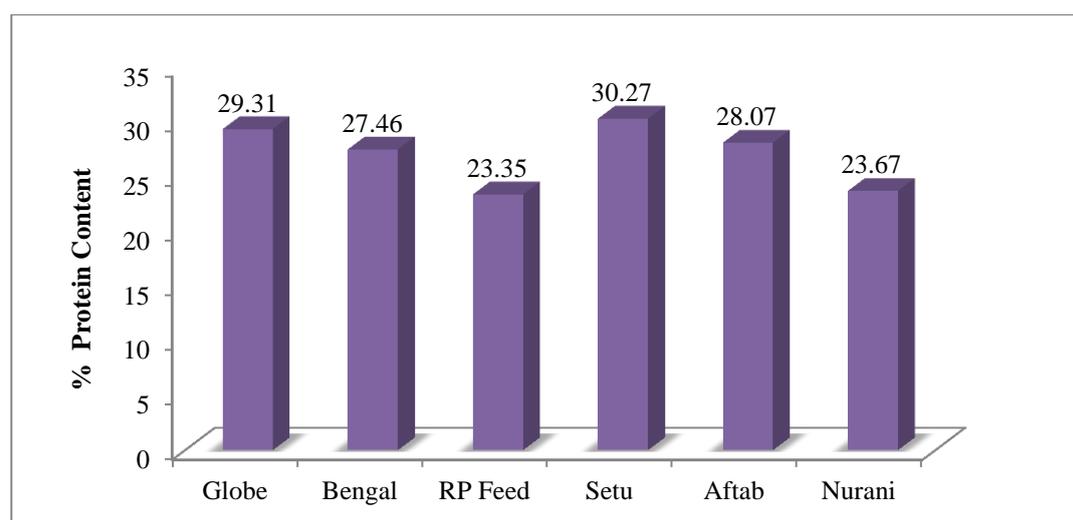


Figure 5. Protein content of Grower feed of different companies

3.4. Crude lipid content

In the experiment a total of 18 feed samples were analyzed to know the actual crude lipid content in the feeds. Some feed samples contain more or less similar crude lipid percentage as these were labeled by the manufacturer. Others were found having deviated composition from their labeled value. The analyzed mean crude lipid content of fish feeds varied from 4.33% to 9.76%. The lowest mean crude lipid containing 4.33% fiber was found in Setu grower feed where the company provided lipid value was 6%. The highest mean crude lipid containing feed was Provita starter feed having 9.76% protein which was labeled with 8% crude lipid. Result shows that neither of the feed companies provides the actual lipid content in their feed. Crude lipid content of different feed companies is shown graphically in the Figure 6 (starter) and Figure 7 (grower).

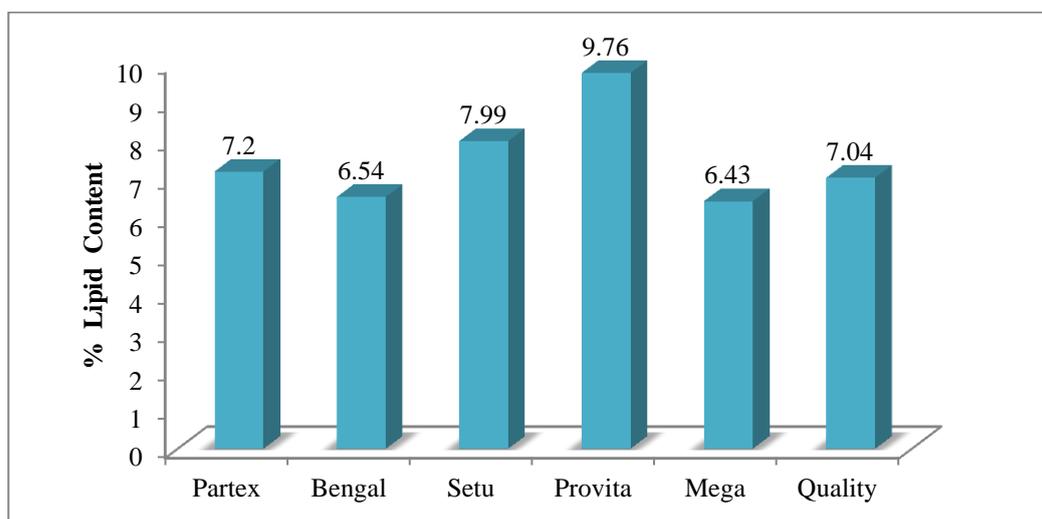


Figure 6. Lipid content of Starter feeds of different companies.

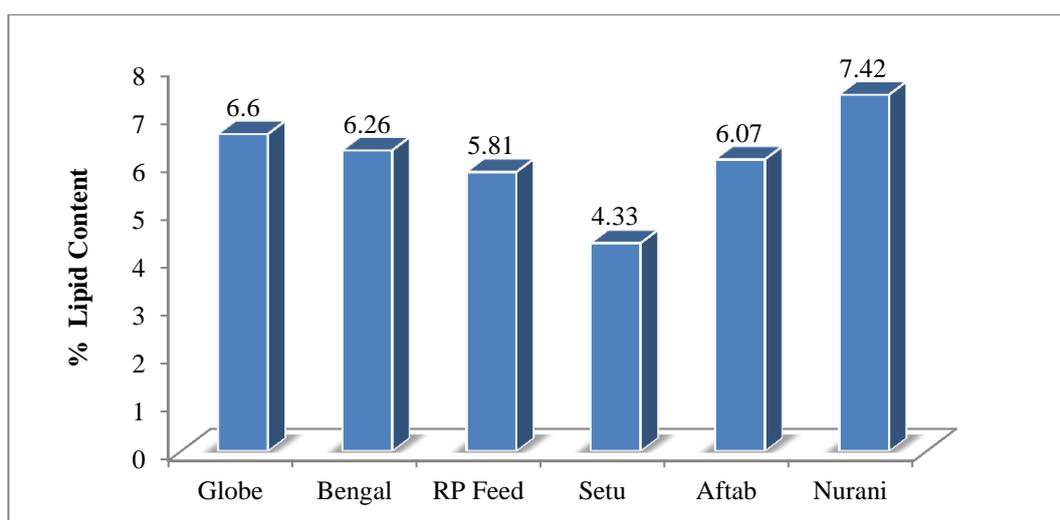


Figure 7. Lipid content of Grower feed of different companies.

3.5. Ash content

A total of 18 feed samples were analyzed to know the actual ash content in the experiment. Some feed samples contain more or less similar ash percentage as these were labeled by the manufacturer. Others were found having deviated composition from their labeled value. The analyzed mean ash content of fish feeds varied from 8.29% to 20.01%. The lowest mean ash containing feed was Aftab grower feed 8.29%, where the company provided ash value was 10%. The highest mean ash containing feed was RP grower feed having 20.01% ash which was also labeled with 14% ash. The mean crude ash value of most of the feeds was concentrated within 10-13%. There had significant difference between analyzed and labeled ash value. Only Mega starter and Setu starter were found having similar value between the labeled and analyzed value. The result of ash content analysis is shown graphically in the Figure 8 (starter) and Figure 9 (grower).

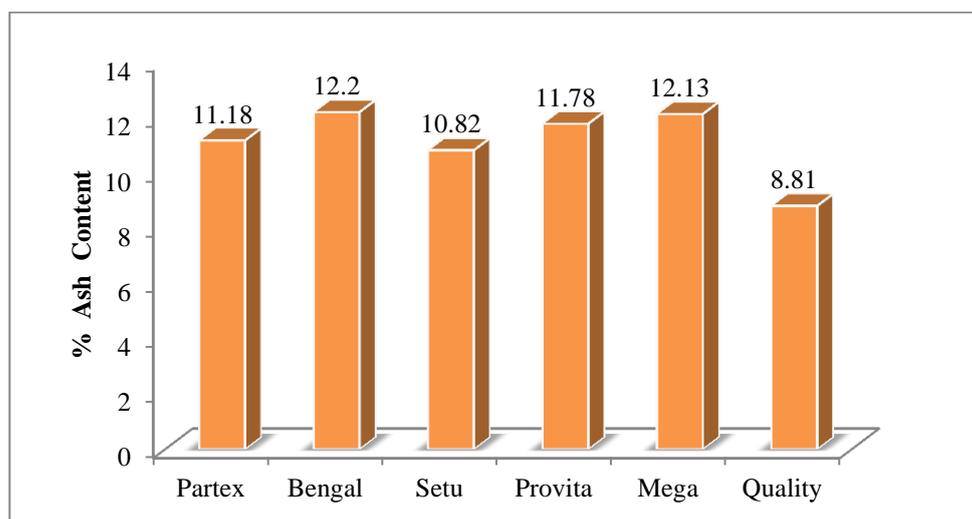


Figure 8. Ash content of Starter feeds of different companies.

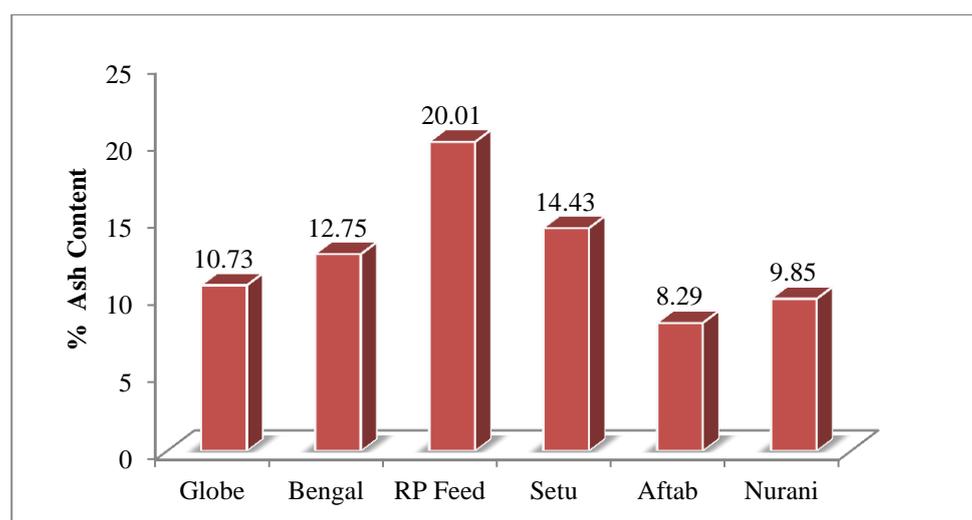


Figure 9. Ash content of Grower feed of different companies.

3.6. Crude fiber

In the experiment a total of 18 feed samples were analyzed to know the actual crude fiber content in the feeds. Some feed samples contain more or less similar crude fiber percentage as these were labeled by the manufacturer. Others were found having deviated composition from their labeled value. The analyzed mean crude fiber content of fish feeds varied from 3.60% to 7.82%. The lowest mean crude fiber containing feed was Globe (nursery) having 3.60% fiber where the company provided fiber value was 6.00%. The highest mean crude fiber containing feed was Nurani grower having 7.82% crude fiber which was labeled with 8.00% crude fiber. Result shows that the analyzed fiber content is more or less similar to the company provided value. Crude fiber content of the feeds is shown graphically in the Figure 10 (starter) and Figure 11 (grower).

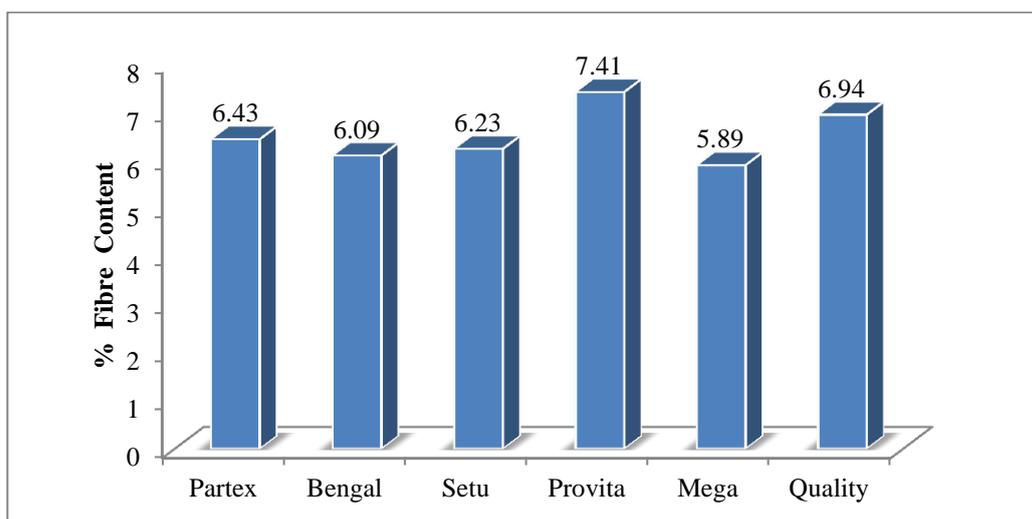


Figure 10. Crude fiber content of starter feeds of different companies.

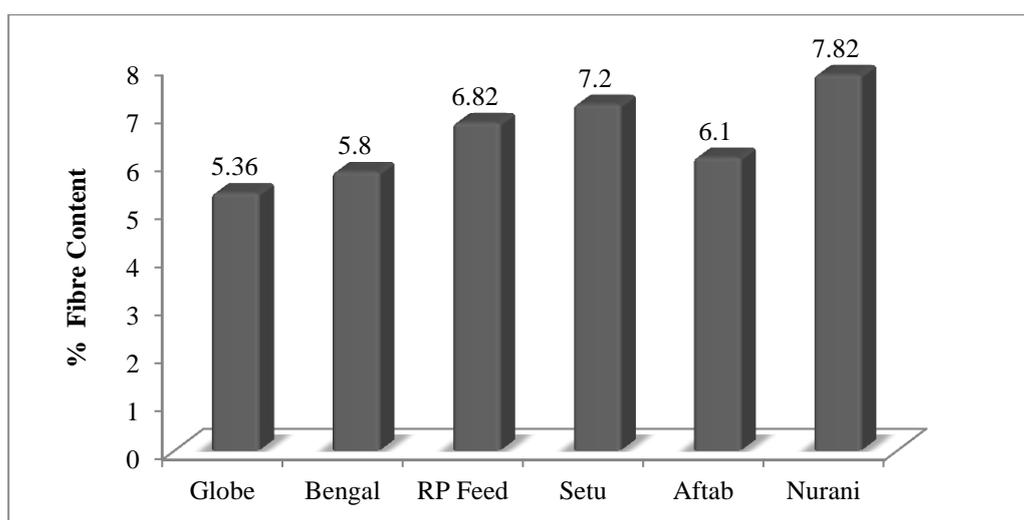


Figure 11. Crude fiber content of grower feed of different companies.

3.7. Carbohydrates

A total of 18 feed samples were analyzed to know the actual carbohydrate content in the feeds in the experiment. Some feed samples contain more or less similar carbohydrate percentage as these were labeled by the manufacturer. Others were found having deviated composition from their labeled value. The analyzed carbohydrate content of fish feeds varied from 27.95% to 36.84%. The lowest carbohydrate containing feed value was found in Abis nursery feed having 27.95% carbohydrate. The highest carbohydrate containing feed was Provita starter having 36.84% carbohydrate. Mean carbohydrate content of these feeds was 33.80%. Most of the feeds contain carbohydrates between the range 30% to 34% but labeled value of carbohydrates was below 30% or 30% in majority of feeds. Carbohydrate content of the feeds is shown graphically in the Figure 12 (starter) and Figure 13 (grower).

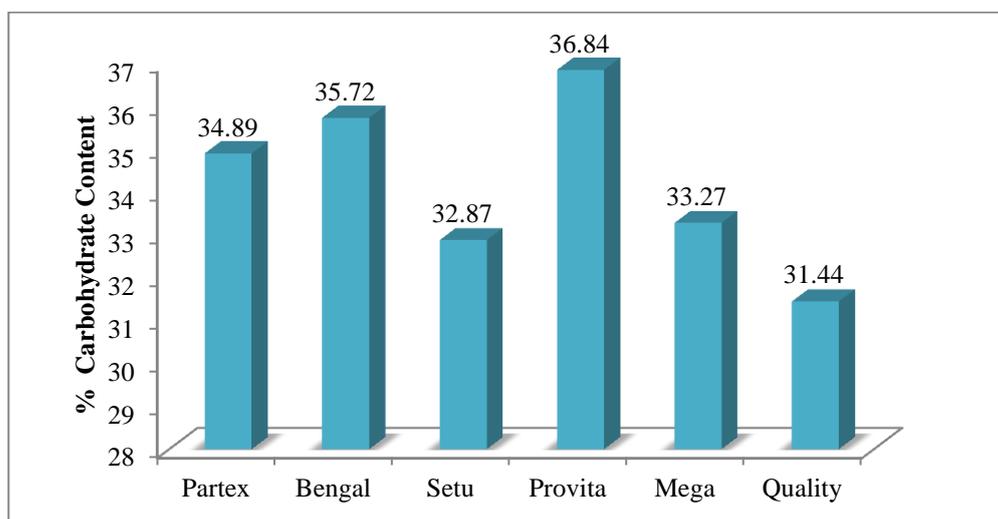


Figure 12. Carbohydrate content of Starter feeds of different companies.

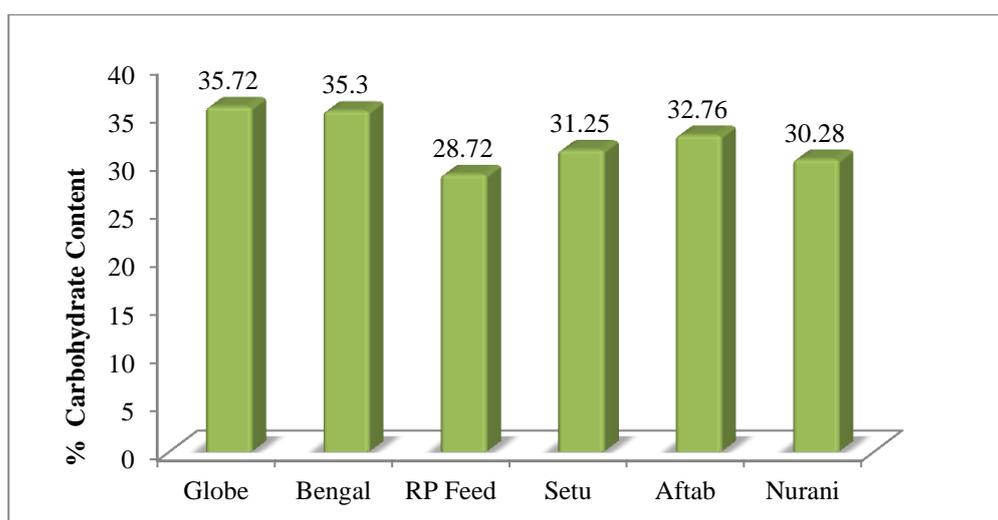


Figure 13. Carbohydrate content of Grower feed of different companies.

4. Discussion

Growth, health and reproduction of fish and other aquatic animals are primarily dependent upon an adequate supply of nutrient, both in terms of quantity and quality, irrespective of the culture system in which they are grown. 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). The moisture value of Partex starter, Partex finisher, Globe nursery, Globe grower, Bengal starter, Bengal grower, Bengal finisher, Setu starter, Setu grower, RP feed grower, Mega nursery, Mega starter, Mega finisher, Aftab grower, Provita starter, Nurani grower, Quality starter, Abis nursery was 11.27%, 10.11%, 13.52%, 10.79%, 11.63%, 12.43%, 11.59%, 13.41%, 11.68%, 15.33%, 8.91%, 9.30%, 12.14%, 10.78%, 12.32%, 10.65%, 10.14% and 7.43 respectively. Moisture range in fish feed 8-12% indicates good quality and most of the manufacturing companies have labeled maximum 10-12% moisture content in their feed. But in a number of feeds the actual moisture content was more than 12%. A good percentage of moisture containing feeds were Partex starter (11.27%), Globe Grower (10.79%), Bengal Starter (11.63%), Setu Grower (11.68%) and Aftab grower (10.78%). Globe nursery, Setu starter and RP grower feed contained more than 13% moisture. The reasons behind high moisture content may be lack of storage facilities; low quality feed ingredients or long time exposure to highly humid weather. The analyzed mean moisture content of fish feed varied from 7.43% to 15.33%. Dry feeds contain 8-10% moisture while the water content of moist feed ranges from 17 to 40% or more (Lall, 1991; Zaman *et al.*, 2017; Islam *et al.*, 2017b; Haq *et al.*, 2017; Rahman *et al.*, 2018; Rahman *et al.*, 2019; Biswas *et al.*, 2018 and Yeasmin *et al.*, 2018). Roy (2002) reported that a diet containing 9.8% moisture appears to be more suitable for GIFT tilapia. Therefore, variation of moisture content in aqua feed among

different industries was found due to lack of knowledge about moisture or for more profit. Ash value of Partex starter, Partex finisher, Globe nursery, Globe grower, Bengal starter, Bengal grower, Bengal finisher, Setu starter, Setu grower, RP feed grower, Mega nursery, Mega starter, Mega finisher, Aftab grower, Provita starter, Nurani grower, Quality starter, Abis nursery was 11.18%, 13.66%, 10.98%, 10.73%, 12.20%, 12.75%, 11.12%, 10.82%, 14.43%, 20.01%, 16.74%, 12.13%, 11.48%, 8.29%, 11.78%, 9.85%, 8.80% and 14.65%. The four top most mean ash containing feeds were RP grower, Mega nursery, Abis nursery and Setu grower having 20.01%, 16.74%, 14.65%, and 14.43% ash respectively. The analyzed ash contents of fish feed varied from 8.29% to 20.01%. Lowest value of ash (8.29%) was found in Aftab grower feed. There had a considerable difference between analyzed and labeled ash value. Labeled ash value of Globe Nursery (14%), Partex starter (14%), RP grower (14%) and Setu grower (14%), compared to analyzed 10.98%, 11.18%, 20.01% and 14.43% respectively indicate that the manufacturers provide unreliable difference composition of their products. Bhuiyan (2002) found that the diet containing 11.02% ash appears to be more suitable for carp polyculture. Roy (2002) reported that a diet containing 12.92% ash appears to be more suitable for GIFT tilapia. The Protein value of Partex starter, Partex finisher, Globe nursery, Globe grower, Bengal starter, Bengal grower, Bengal finisher, Setu starter, Setu grower, RP feed grower, Mega nursery, Mega starter, Mega finisher, Aftab grower, Provita starter, Nurani grower, Quality starter, Abis nursery was 31.26%, 28.08%, 34.40%, 29.31%, 28.62%, 27.46%, 29.95%, 26.87%, 30.27%, 23.35%, 33.74%, 27.97%, 21.65%, 28.07%, 26.99%, 23.67%, 28.29 and 31.02. The highest crude protein containing feeds were Globe nursery (34.40%), Mega nursery (33.74%), Partex starter (31.26%) and Abis nursery (31.02%). Labeled values of crude protein were more than the analyzed value except some Feed. The analyzed crude protein content of fish feeds varied from 21.65% to 34.40%. Lowest crude protein containing feeds were Mega finisher (21.65%), RP grower (23.35%), Nurani grower (23.67%), and Setu starter (26.87%). The labeled protein values of these feeds were 26%, 28%, 28% and 27% respectively. Result showed that the actual protein content in most of the feeds were always lower than the labeled value. This might be due to using low graded inputs as protein sources. The major and trust source of protein is fish meal, but high price and un-availability of fish meal compels feed manufacturers to use alternate sources of protein. Protein is the major growth promoting factor in feed. The protein requirement of fish is influenced by various factors such as fish size, water temperature, feeding rate, availability and quality of natural foods, overall digestible energy content of diet (Satoh, 2000 and Wilson, 2000). Wilson (2000) reported that most of the commercial catfish feeds contain 32% crude protein. Roy (2002) reported that a diet containing 27.87% protein appears to be more suitable for GIFT Tilapia. Hoq et al. (2003) reported that a protein level of 30% in formulated feed for feeding Tilapia fry in rearing hapas and nursery ponds is suitable. Mollah and Hossain (1990) reported that 39.5% protein appeared suitable for rearing of *C. batrachus*. Das et al. (1991) found that the diet containing 38% protein appears to be more suitable for *Labeo rohita* fingerlings. Bhuiyan (2002) found that the diet containing 20.71% protein appears to be more suitable for carp poly-culture. The highest Lipid containing feeds are Provita starter, Mega nursery, Partex finisher and Setu starter feeds contained 9.76%, 8.98%, 8.12% and 7.99% lipid respectively. Lowest value of lipid (4.33%) was found in Setu grower feed. The analyzed crude lipid content of fish feed varied from 4.33% to 9.76%. Usually in a balanced diet there have a reverse relationship between lipid and protein on their inclusion level. But in the current experiment this relationship was not found. Feeds containing high protein also contain high lipid. An excess of lipid have harmful consequences for fish. In trout four times the required amount slows growth and decreases feed efficiency. The current trend in feeding fish and salmonids in particular, is to increase the lipid content of the feed. This is justified by numerous studies carried out on several species. In the salmonids, it is estimated that an increase in lipid level from 10% to 20% allows the protein content to be lowered from 48% to 35% without altering growth performance. Wilson (2000) reported that lipid level in catfish feeds should be 5% to 6%. On the other hand, Luquet (2000) also stated that dietary lipid levels of 5% to 6% are often used in tilapia diet. Roy (2002) reported that a diet containing 9.48% lipid appears to be more suitable for GIFT tilapia. Crude fiber contents of the experimental sample was 6.43%, 5.46%, 3.60%, 5.36%, 6.09%, 5.80%, 4.46%, 6.23%, 7.20%, 6.82%, 5.27%, 5.89%, 6.67%, 6.10%, 7.41%, 7.82%, 6.94% and 6.23%. The highest five values of crude fiber were found in Nurani grower (7.82%), Provita starter (7.41%), Setu grower (7.20%), Quality starter (6.94) and RP grower (6.82%) feed, respectively. The analyzed crude fiber contents of fish feed varied from 3.60% to 7.82%. Lowest crude fiber containing feed was Globe (Nursery) having 3.60% fiber. It was observed from the result that feeds that contained more protein had less crude fiber. Bhuiyan (2002) found that the diet containing 13.31% crude fiber appears to be more suitable for carp poly-culture. Roy (2002) reported that a diet containing 10.75% crude fiber appears to be more suitable for GIFT tilapia. A certain amount of fiber in feed permits better binding and moderates the passage of feed through alimentary canal. However, it is not desirable to have a fiber content exceeding 10-12% in diets for fish, as the increase in fiber content would consequently results in the decrease of the quality of an unusable nutrient

in the diet (De Silva and Anderson, 1995; Zafar *et al.*, 2017; Ali *et al.*, 2016; Rahman *et al.*, 2015; Shabuj *et al.*, 2016; Hossain *et al.*, 2016a). The mean Carbohydrate values of Provita Starter, Bengal Finisher, Bengal Starter and Globe Grower are 36.84%, 36.03%, 35.72% and 34.18%, respectively having four highest carbohydrate value among 18 feed samples. Lowest value was found in Abis nursery feed (27.95%). Globe nursery feed contained high moisture and protein percentage and thus contained less carbohydrate. The analyzed carbohydrate contents of fish feed varied from 27.95% to 36.84%. Ali (2008) found that the diet containing 13% CHO appears to be more suitable for Nile tilapia. Bhuiyan (2002) found that the diet containing 34.53% CHO appears to be more suitable for carp polyculture. Roy (2002) reported that a diet containing 29.18% CHO appears to be more suitable for GIFT tilapia. Jean Guillaume *et al.* (1999) and Bhuiyan *et al.* (2018) found that crude energy content of carbohydrates is close to 16.7 KJ/g. when feeding fish, it is important to consider the value of carbohydrates as these values vary considerably. The protein sparing effect of digestible carbohydrates is also subject to much variability. However, the supply of digestible energy by inessential carbohydrates appears to have an overall beneficial effect in terms of improving growth and protein utilization of most fishes.

5. Conclusions

In the experiment a total of 18 feed samples were analyzed to know the actual ash content. Some feed samples contain more or less similar ash percentage as these were labeled by the manufacturer. Others were found having deviated composition from their labeled value. The analyzed mean ash content of fish feeds varied from 8.29% to 20.01%. The lowest mean ash containing feed was Aftab grower feed 8.29%, where the company provided ash value was 10%. The highest mean ash containing feed was RP grower feed having 20.01% ash which was also labeled with 14% ash. The mean crude ash value of most of the feeds was concentrated within 10-13%. There had significant deterrence between analyzed and labeled ash value.

Conflict of interest

None to declare.

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