Abstract

As poultry products act as a healthy food protein source, poultry farming is becoming more significant now a days throughout the world. Along with it serves in the economic growth. Broiler farming is at apex state in last few decades along with Sonali and Pigeon farming are exoteric in poultry sector in south-east Asian countries for their excellent contribution in the fulfillment of protein demand latterly. Production of quality poultry is extremely relies upon the quality of feed and its nutritional value that's why feed & nutritional management is an important issue in terms of poultry farming. The attribute of feed predominantly rely on the accurate nutrient extent of the feed. To oversee the variations in the chemical compositions of different obtainable commercial poultry feed was endeavored by this study from different markets of Chattogram, Bangladesh. For this purpose, nine different feed samples of obtainable commercial poultry feed such as were Nahar Broiler feed, ACI Broiler feed, Fresh Broiler feed, Teer Broiler feed, Broiler house feed sulov-1,Broiler house feed sulov-2, Nahar Sonali starter, Nahar Sonali grower and Pigeon mixed feed were analyzed for dry matter (DM), Total moisture (TM), crude protein (CP), crude fibre (CF), ether extract (EE) and total ash (TA) in the Animal Nutrition Laboratory, Department of Animal Science and Nutrition, Faculty of Veterinary Medicine, Chattogram Veterinary and Animal Sciences University (CVASU), Khulshi, Chattogram -4225, Bangladesh for the duration of February, 2021 to September, 2021. Results of proximate analysis indicated that there were wide ranges of variations in chemical compositions for different parameters for different feeds. For broiler, DM, CP, EE, CF and TA average values were 89%, 14.76%, 4.8%, 3.33%, 15.93% respectively. For Sonali, DM, CP, EE,CF and TA average values were 89.1%, 14.61%, 4.35%, 2.5% and 6.4% respectively and for Pigeon, DM, CP, EE,CF and TA average values were 63%, 8%, 3%, 10% and 7% respectively. This study was terminated that chemical composition of different obtainable commercial poultry feed were thoroughly fickle. The outcomes gained from this analysis will be convenient for proper feed management of poultry farming which conducts to the flourish poultry sector.

Keywords: proximate analysis, Dry Matter (DM), Total Moisture (TM), Crude Protein (CP), Crude Fibre (CF), Ether Extract (EE) and Total Ash (TA)

Chapter I: Introduction

Poultry farming is one of the most significant segments of agriculture throughout the world. Basically, it serves the both the nutritional requirement of the people as healthy food protein and their economic need (Mahesar *et al*., 2010). The poultry sub-sector also plays a significant role in maintaining agricultural development and alleviate malnutrition from Bangladesh (Hamid, 2016). It is considered as an entire part of farming system in Bangladesh and has generated both direct and indirect employment for around 6 million people (Ansarey, 2012). The sector estimates for 14% of the total value of livestock yield and is growing in short order (Raihan and Mahmud, 2008).

Poultry refers to domestic fowls in general but mainly to chickens, ducks, turkeys, guinea fowls, geese, pigeon, ostriches, peafowls and swans (Kekeocha, *et al*., 1986). Poultry provides human body with a wide range of nutrients and vitamins such as protein, vitamin B (thiamin, riboflavin, niacin and pyridoxine), vitamin E, zinc, iron and magnesium. Protein is essential for human body because it is the building component of bones, muscles, skin, cartilage and blood cells along with protein is necessary to produce hormones and enzymes and provides calories for the body and this poultry meat alone avails about 37% of the total meat outturn and about 22-27% of the total animal protein stocks in Bangladesh (Prabakaran, 2003).

In present days, the rapid population growth, increasing level of income, standard of living and taste for poultry products (meat and eggs) require effective management of birds to ensure optimum production and quality of the birds (FAO, 2002). For maximum performance and good health, it is crucial to supply the birds with the required amount of energy, protein, essential amino acids, minerals, vitamins and most importantly water. Practical poultry diets are formulated from a mixture of ingredients including cereal grains, cereal by-products, fats, plant protein sources, vitamin and mineral supplements, crystalline amino acids and feed additives. For the time being, there are 74 feed manufacturing and marketing company in the country such as Aftab Poultry, Aman Poultry, Bangladesh Rural Advancement Committee (BRAC), C.P. (Bangladesh) Co., Ltd., Kazi Poultry, Nourish Poultry, Paragon Poultry, Provita Poultry, Teer Poultry, ACI Poultry, Fresh poultry etc. They provide various poultry feeds based on species, types, age, production status etc.

In poultry sector, broiler farming is the most popular one among all the poultry farmers of Bangladesh because of the demand of broiler meat to the consumers. Along with broiler, a major proportion of people are inclining to Sonali meat as they are phenotypically similar in appearance with the local chicken and their price is higher than broiler and Cockrel (FAO, 2015). The Sonali is a crossbreed of Rhode Island Red (RIR) cocks and Fayoumi hens which was introduced in 1996–2000 in northern parts of Bangladesh, through the Smallholder Livestock Development Project and the Participatory Livestock Development Project (FAO, 2015). Since then, Sonali farming is rising and it earns the popularity for the meat purposes. Pigeon farming is also progressing mostly as hobby, but at the same time for economic benefits specially from breeding and as food (Kabir and Hawkeswood, 2021). Neither the production nor breeding can be possible if the birds are in deficit of nutritious feed and proper management. The farmers must make sure the supply of good quality feed without costing a fortune. There have been a few studies regarding the feed quality of the poultry. But considering the current COVID-19 pandemic, as the import of the raw materials for poultry feed were challenged, it is important that the birds are getting sufficient nutrients from the feed. There, this study was conducted to assess the nutritional composition of three important meat producing poultry.

Objectives:

1. To assess the nutritional composition of broiler, Sonali and pigeon feed.
2. To compare the differences of feeds from different poultry feed producing brands.

Chapter II: MATERIALS AND METHODS

Study area:

The study was conducted in the Department of Animal Science and Nutrition, Faculty of Veterinary Medicine, Chattogram Veterinary and Animal Sciences University (CVASU), Khulshi, Chattogram -4225, Bangladesh for the duration of February, 2021 to September, 2021.

Collection of samples:

A total of 9 feed samples of different poultry feed brand were collected from the local commercial feed depot of Pahartoli Bazar, Chattogram among which there were 6 commercial broiler feed, 2 commercial Sonali feed and 1 commercial pigeon feed. The brand names of the collected feeds were Nahar Broiler feed, ACI Broiler feed, Fresh Broiler feed, Teer Broiler feed and Pigeon mixed feed. About 200g of feed per sample were purchased, labelled and packaged in airtight zipper bags. The samples were brought back to laboratory of Animal Nutrition and stored under ambient temperature ready for analysis.

Analysis of samples:

The feed samples were analyzed in the Animal Nutrition Laboratory. Chemical analysis of the samples was carried out to estimate the dry matter, crude protein, crude fiber, ether extract and total ash content (**AOAC, 2006).**

Determination of Dry Matter:

To determine the moisture content of feed, a crucible was dried in an oven regulated at 105°C which was cooled in a desiccator and weighted. After that, 10 gm of feed sample was weighted into the enamel disc and kept into the. The enamel disc was removed from the oven with metal tong and cooled in desiccator and the weight was recorded after getting two constant weight of the sample **(AOAC, 1990)**. The moisture content was calculated by using the following formula.

$$\%DM = \frac{\text{Weight of crucible with dry sample} - \text{Weight of empty crucible}}{\text{Weight of feed sample}} \times 100$$

%Moisture = 100 - %DM

Determination of Crude Protein (CP):

Crude protein was estimated using Kjeldahl method. In this method, 0.5g dried sample was weighed and transferred into the Kjeldahl digestion flask. Catalyst was added into digestion flask. Then 1.25% sulfuric acid solution was used for digestion. For distillation, 40% W/V NaOH was added to the sample and the condenser was set. The ammonia steam distilled into 2% boric acid solution with 3 drops of methyl red indicator. The distilled ammonia was titrated with 0.1N HCl. Finally, N_2 and CP was calculated by following formula.

$$\mathbf{CP\%} = \frac{\mathbf{Volume\ of\ 0.1\ N\ HCl \times Normality\ of\ HCl \times 0.014 \times 6.25}}{\mathbf{Sample\ weight(g)}} \times \mathbf{100}$$

Here, 6.25 was the protein nitrogen conversion factor.

Determination of Crude Fat / Ether Extract (EE):

For the fat extraction approximate 2.0g finally grinded feed sample was placed in a cellulose thimble paper and fat extraction was carried out using Di-ethyl ether in a Soxhlet extractor for 3 hrs. The extraction flask was removed and placed in oven at 100˚C until constant weight was measured. Then extractible fat was calculated as percentage crude fat.

$$\mathbf{EE\%} = \frac{\mathbf{Weight\ of\ the\ flask\ with\ ether\ extract\ (g) - Weight\ of\ the\ flask\ (g)}}{\mathbf{Sample\ weight(g)}} \times \mathbf{100}$$

Determination of Crude Fiber (CF):

For estimation of crude fiber, 2 gm ground feed sample was taken and 125 ml 1.25% H_2SO_4 was added. The mixture was boiled under reflex for 30 minutes after which, it was washed several times with distilled water to make the sample acid free. Again, 125ml 1.25% NaOH was added in the sample, boiled for 30 minutes and washed thoroughly to remove alkali from the sample. The residue was put in the hot air oven at 100℃ to get a constant weight in an oven, cooled in a desiccator and weighed. The sample was incinerated in a muffle furnace at 550℃ for 2 hrs up to white ash appear. The crude fiber was calculated as the loss in weight on ash AOAC, (1990).

$$\mathbf{\%CF} = \frac{\mathbf{Wt\ of\ crucible, crude\ fibre\ and\ ash - Wt\ of\ Crucible\ with\ Ash}}{\mathbf{Weight\ of\ Feed\ sample}} \times \mathbf{100}$$

Determination of Ash:

To determine the ash content, a crucible was dried in an oven for 24 hrs then cooled and weighed. 5 gm of dried sample was taken in crucible and burned in a muffle furnace maintained at 550℃ until a white ash appeared. The crucible was transferred in a desiccator, cooled and weighed while it is mild warm. Ash percentage was calculated using the following formula.

$$\%\mathbf{Ash} = \frac{\mathbf{Weight\ of\ Crucible\ and\ Ash - Weight\ of\ Crucible}}{\mathbf{Weight\ of\ Feed\ sample}} \times \mathbf{100}$$

Estimation of Nitrogen Free extract (NFE):

Nitrogen free extract was calculated by subtracting %Moisture, %CP, %CF, %EE and %Ash from 100. The formula for NFE is as follows.

$$\%\mathbf{NFE} = \mathbf{100} - (\%\mathbf{Moisture} + \%\mathbf{CP} + \%\mathbf{CF} + \%\mathbf{EE} + \%\mathbf{Ash}$$

Data Analysis

Data related to chemical composition of commercial poultry feeds were compiled by using Microsoft Excel 2007 for descriptive statistics i.e., mean, median, mode, standard deviation and standard error for DM, CP, CF, EE and ASH.

Chapter-III: RESULTS

The results of the chemical analysis are presented below in Table 1. Dry matter, crude protein, ether extract, crude fiber and ash are expressed in percentage.

Table 1. Proximate analytical nutrients value of collected different broiler feed sample.

Serial no.	Name of samples	DM %	Moisture%	Crude protein %	Ether Extract %	Crude fiber %	Ash %
1	Nourish broiler	87.9	12.1	20.13	7	3	4.2
2	Teer broiler	90.6	9.4	10.15	4.5	4	13.8
3	Fresh broiler	89.7	10.3	14.7	4	2.5	7.4
4	ACI broiler	87.7	12.3	24.68	4.2	3.5	5.2
5	Broiler house feed sulov-1	89.5	10.5	10.7	4.4	5	11
6	Broiler house feed sulov-2	88.6	11.4	8.23	4.8	2	6.2

Dry matter (DM)

The DM contents differed among different feed samples. The average DM content of different feed samples in this study was 88.9%. The maximum and minimum DM% were 90.6 % in case of Teer broiler feed and 87.7% in case of ACI broiler feed respectively. The average DM content of respective broiler feed samples in this study was 89% and the average DM content of Sonali feed samples in this study was 89.1%. The DM content of Pigeon feed sample in the study was 63%.

Table 2. Statistical analysis of chemical composition of different Commercial poultry feeds

Parameter	Minimum	Maximum	Mean	Median	STD	SE
Moisture	9.4	12.3	10.85	10.85	2.05	1.45
CP	8.23	24.68	16.455	16.455	11.63	8.225
CF	2	4	3	4	1.41	1
EE	7	4	5.5	5.5	2.12	1.5
ASH	4.2	13.8	9	9	6.79	4.8

Crude protein (CP)

The ranges of highest and lowest CP content obtained in current study were 24.68% in case of ACI broiler feed and 8.23% in case of Broiler house feed sulov-2 respectively. The mean CP content of respective broiler feed samples in this study was 14.76% and the average CP content of Sonali feed samples in this study was 14.61%. The CP content of Pigeon feed sample in the study was 8%.

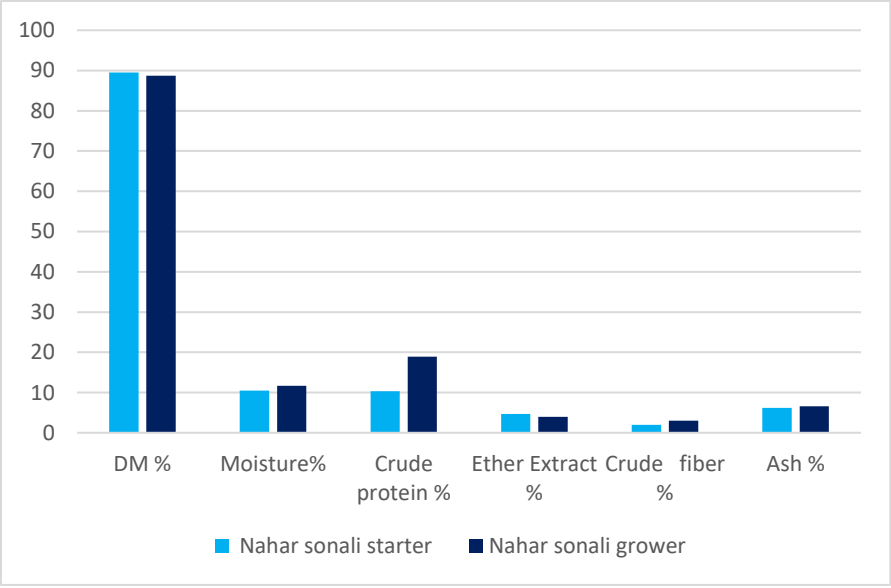

Figure1: Comparisons between Nahar Sonali starter and Sonali grower feed composition

Crude fiber (CF)

The average CF content of respective broiler feed samples in this study was 3.33%. The latitude of CF percent adopted in this study was (2-4) % in case of broiler house feed sulov-2 and Teer broiler feed. The mean CF content of Sonali feed samples in this study was 2.5% and in pigeon feed CF was 10%.

Table 3. Reference values for nutrients of Layer layer feeds recommended by different researchers

Reference	Moisture (%)	ME (kcal/kg)	CP (%)	CF (%)	EE (%)
Larbier, M. and Leclerc, B.(1992)	12	2750-2900	16-17	4	3.5-4.0
Banerjee, G.C. (1995)	10	2700	18	8	-
Verma D. N.(2006)	-	2700	18	-	-

Ether extracts (EE)

The mean EE content of respective broiler feed samples in this study was 4.8% in which the utmost EE obtained was 7% in case of Nourish broiler feed and lowest EE obtained 4% in study of Fresh broiler feed respectively. The average EE content of Sonali feed samples in this study was 4.35% and in Pigeon feed sample EE was 8%.

Total ash (TA)

The extent of TA percent acquired in existent study were 13.8% to 4.2% in between Teer broiler feed and Nourish broiler feed respectively. The mean Ash content of respective broiler feed samples in this study was 15.93% and the average Ash content of Sonali feed samples in this study was 6.4% and in pigeon the ash percentage was 7%.

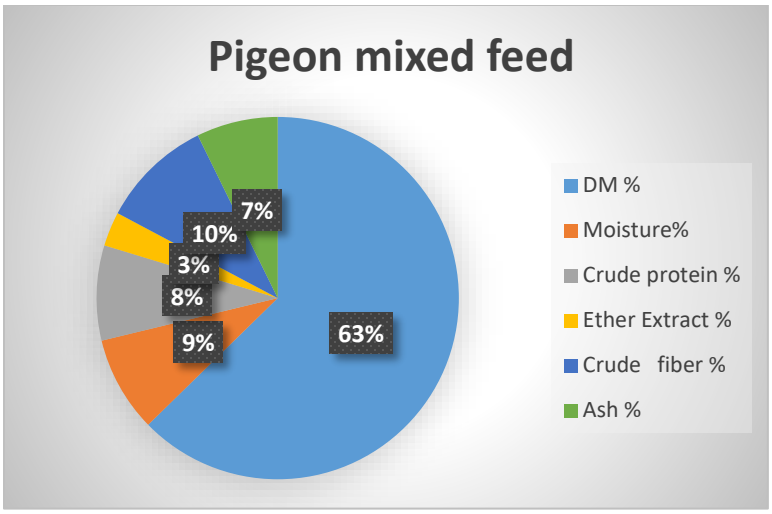

Figure 2: Composition of Pigeon mixed feed sample

Chapter-IV: Discussion

Chemical composition of different commercial poultry feed samples like DM, ASH, CP, CF, and EE contents have been presented in Table: 1.

The moisture content of feed determines the amount of water in the feed samples. It is an indicator of quality and a key to safe storage (Saiful *et al*., 2015). High moisture content of feed with high temperatures and poor aeration during storage predisposes feeds to mycotoxins and spoilage (NRI, 1995), which can pose health problems to birds when fed. From the results it was found that the maximum and minimum moisture content were respectively at 12.3% and 9.4 %. All the feed samples fell below the moisture content of 12% except Nourish broiler feed 12.1% and ACI broiler feed 12.3%. There were variations among the means of the moisture contents of the feed samples.

Crude Protein (CP) in chicken feed is required in a form of amino-acid synthesizing. Protein is required for carcass growth, egg production and feather development (Mbajiorgu *et al*., 2011). It is the major constituent and cost component of the feed (Kuashalendra *et al*., 2016; Elmasoeur and Russ, 2013). CP in the feed provides essential amino acids. Increased crude protein in diet of birds results in improvement in egg size and weight (Kuashalendra *et al*., 2016). The minimum requirement of CP by Larbier and Leclerc (1992) for layer starter, layer grower, layer, broiler starter and broiler finisher were respectively cited as 18.0%, 17%, 17%, 22% and 20%. The lowest CP (Table-1) was found in Broiler house feed sulov-2 was (8.23%) which was highly below the recommended minimum of 20% and the mean highest was found in ACI broiler feed (24.68%). A feed sample of lower CP content will affect development of carcass and eggs production (NRC, 1994). There were variations in the means of CP of the feed samples. Elmasoeur and Russ (2013) reported that due to high cost of protein materials for formulation of feed, some feed manufacturers resort to lower cheap protein materials for formulation and this may be because of low protein content in some feeds.

Fat in poultry diet improves the adsorption of fat-soluble vitamins and increases palatability of feed (Velmurugu *et al*., 2012). With the recommendation of Larbier and Leclerc (1992) the fat% of feed is 3.5 to 4%. The maximum fat% of Nourish broiler feed is maximum 7% and overall followed to the standard level of feed formulation. Increase in fat in broiler diet decrease feed intake and improves feed efficiency (Jeffri *et al.*, 2010) as in (Mohammadreza *et al.*, 2013). Fat

component of poultry feed helps to increase overall energy concentration and in turn improve productivity and feed efficiency (NRC, 1994).

The ash component of the feed describes the inorganic content of the feed and is mainly minerals. These are critical nutrients required in specific amounts in the poultry diets for stronger bone, blood clotting, enzymes activation and muscle contraction and eggshell formations (Jacquie *et al., 2018)*. A low ash content of the feed pre-disposes birds to diseases and poor eggshell formation. From the results (Table-2) it was found that the maximum and minimum Ash% were respectively at 13.8 % and 4.2 %.

The CF contents in the commercial feeds may vary. The maximum and minimum CF percent obtained in current study were 14% in case of Pigeon mixed feed and 2% in case of Broiler house feed sulov-2 respectively. And in other feed sample contains 4 to 5% CF which is respectively near able to the follow of researchers Larbier and Leclerc (1992).

Limitations

As there was no fund, it was not possible to conduct the study with a large sample size or in different regions of Bangladesh. The time was limited to conclude this study which was another limitation for the study. We could only estimate the complete proximate composition of feeds although there were some other components of the feed such as gross energy, individual mineral content, vitamins which was not estimated. As this study is very important for the poultry farmers, it can be performed with a larger sample size to ensure poultry nutrition.

Chapter- V: CONCLUSION

Poultry requires scientific feed ration formulation as any other livestock. The deficiency of any nutrient in poultry ration can adversely affect the production. For successful poultry farming the quality of feed is the determinant factor for growth and production (meat and egg) and every attempt must be put in place to ensure that feed prepared and sold by commercial feed manufacturers contain all the essential nutrients at the right amount for the nutriment of the poultry industry. The selection of feed ingredients for formulation of poultry feed should not be compromised. The development of birds largely depends on the nutritive value obtained in the feed ingredients that also enhances the profit of the farmers and companies by the large-scale production of poultry farming and reduce the poverty of Bangladesh.

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Biography

The author is Foysal Ahmmed, son of Md. Nurul Haque and Anowara Begum. He is the dweller of Shibpur, Narsingdi. He completed S.S.C in 2013 from Harishangan High School, Narsingdi and H.S.C in 2015 from Trust College, Dhaka. He got admitted in Chattogram Veterinary and animal Sciences University for the degree of Doctor of Veterinary Medicine course in 2015-2016 session. He is currently an intern student under the Faculty of Veterinary Medicine. He is very enthusiastic to be a researcher and is eager to be a skilled veterinarian in future.