COMPARATIVE ANALYSIS OF COMPANY LAYER FEED AND LOOSE LAYER FEED USING PROXIMATE ANALYSIS WITH AN EMPHASIS ON EGG PRODUCTION IN SOKHIPUR, TANGAIL REGION.

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List of Abbreviation

Abbreviation and Symbol	Elaboration
%	Percent
/	Per
Gm	Gram
Kcal/kg	Kilo-calorie per kilogram
CP	Crude protein
EE	Ether Extracts
CF	Crude Fiber
NFE	Nitrogen Free Extracts
DLS	Department of Livestock Services
H_2SO_4	Sulfuric acid
NaOH	Sodium hydroxide
&	And
HHEP	Hen House egg Production
HDEP	Hen day egg production

Statement of Author

I, Sayma Mahmud Moon, certify unequivocally that I have performed all the tasks detailed in this report. The data was gathered from Field, books, national and international periodicals, and other sources. All citations have been properly acknowledged. Consequently, I am solely responsible for collecting, manipulating, preserving, and publishing all data compiled in this report.

…….

The Author

Comparative analysis of company layer feed and loose layer feed using proximate analysis with an emphasis on egg production in Sakhipur, Tangail region

ABSTRACT

The purpose of the study was to provide a comparative, close-to-analytical image of the market feed (CP & Nourish) and loose feed (Loose feed) used in Sakhipur, Tangail, Bangladesh, which are produced on the farm according to the needs of the hens. Given that one of the primary determinants of successful chicken farming is feed quality, an effort was made to compare commercial feed and loose feed manufactured by farmers. The feed was created using a layer-by-layer approach. The following composition of these feeds was revealed by proximate analysis: moisture, ether extracts (EE), crude protein (CP), crude fiber (CF), nitrogen free extracts(NFE) and metabolizable energy (ME). Regarding the concentration of some nutrients, there were notable differences found in these meal samples. This experiment's results showed that the quality of market feeds used in area is better than loose feeds. The nutrients in loose feeds are far away from the standard. As a result, a marked deviation in term of production (HHEP,HDEP,Egg weight) are seen in loose feed & commercially available feed.

Keywords: Loose feed, HHEP, HDEP, Egg weight

Chapter 1: Introduction

Poultry, eggs, and meat are important sources of high-quality proteins, minerals, and vitamins that help maintain a balanced diet for humans. Bangladesh's poultry farming industry has grown significantly in the last several years. About 10.22 billion eggs and 1.46 million tons of poultry meat are produced commercially each year by 1 million business owners and 8 million individuals, according to estimates (One Health Poultry Hub,2024). According to the most recent data, there are up to 70,000 commercial farms, 206 breeder farms, and 16 grandparent farms. The majority of these are small-scale, with 500–2,500 birds on average.

The growth rate of commercial poultry farms is 15% annually, and over the next ten years, it is anticipated that investment in this industry would treble. The poultry sector is gearing up for exporting by 2024 (One Health Poultry Hub, 2024)

Animal protein in the form of meat or eggs is normally required by humans in an amount of 62.5 grams per day (BER, 2013). By promptly filling the void in the Bangladeshi population's protein supply, chicken farming greatly improves their nutritional state. Therefore, the fastest way to address the protein scarcity would be to give priority to extensive poultry production. Poultry was raised in backyard agricultural systems prior to the last thirty years, and some rural residents also kept a small number of birds.

The government is encouraging people living in rural and urban areas to produce chicken in an effort to meet demand for protein and create jobs. Although they constituted a relatively tiny portion of the agricultural landscape ten to fifteen years ago, Bangladesh currently boasts approximately 150000 government and private poultry farms (M.A. Saleque, 2017, Poultries in Poverty Alleviation).

The largest operational cost in industrial chicken production is feed. The range of this expense is 65–75 percent. As such, any improvement in layer performance resulting from dietary modifications will surely have a major effect on profitability. Chicken health is dependent on consuming enough water, protein, carbs, vitamins, and dietary minerals. It should be dry, soiled, and devoid of pollutants. (McNab, 1999)

Various corporate feeds, including Advance, ACI, Nourish, Euro, Kazi, CP, Aftab, and loose feed prepared by the farmers, are utilized by farmers in Sakhipur upazila,

Tangail. There is a huge difference in production cost depending on loose feed and commercial feed. Due to inappropriate feed selection some chicken farms are suffering significant losses. With the aforementioned contexts in mind, the current study was conducted to determine the effect of feed quality in terms of production

OBJECTIVES:

1. To understand the relationship between quality of layer feed & percentages of eggs production.
2. To compare the feed value of commercial feed and loose feed
3. To identify the best feed on the basis of quality and egg production.

Chapter 2: Materials and Methods

2.1 Study area

The study was performed at Sakhipur upazilla in Tangail. Total area of the place is 435.19 $km^{2.}$ The coordination of the study area is 24.319205°N 90.172466°E

2.2 Study period

The study was conducted for 8 weeks from 15.04.2024-14.06.2024

2.3 Procedure of data collection

In order to collect data correctly, farms were visited and meetings was held with the farm owner. I visited 6 farms in my study area to gather data. Using a questionnaire, the farm owner provided the information. Random selection was done in case of sample collection. Based on my parameters, the data is correctly gathered. Two parameters were used to get the data. The information below was gathered in accordance with these guidelines.

A. Regarding output efficiency

- The name of the strain
- The number of observations

- The mature body weight
- The peak production times and
- The mortality

B. Regarding Reproductive performance

- Name of strain
- Observation count
- Body weight at first laying
- Age at first laying
- Laying periods
- Hen Housed Egg Production
- Hen Day Egg Production

2.4 Data collection & Lab analysis

Information was gathered from different layer farms at Sakhipur, Tangail. The parameters included data collection, proximate analysis and data analysis.

The hen day and hen housed egg production was calculated according to North,(1996).

2.4.1 HHEP and HDEP

The following formula Measure the egg productivity in relation to the number of hens (housed) at the beginning of the laying period (ICAR)

Hen Housed Egg Production (%) = (No. of egg produced /No .of bird housed)× 100

Hen day egg production for one day (HDEP): The following formula measures the egg productivity of the live hens on any given day (ICAR).

Hen Day Egg Production (%) = (No. of egg produced /No. of birds available in the flock on that day)*100

2.4.2 PROXIMATE ANALYSIS

2.4.2.1 DETERMINATION OF MOISTURE

The moisture content of feed sample was done based on the difference between the net weight and the weight after drying to a constant weight. A clean dried Petri-dish was weighed (W1) and 5g of the samples were placed on it, and then weighed (W2). This was then placed in an oven at105 °C for 24hrs. The dish was removed and cooled in desiccators for 30 minutes and finally weighed (W3). Then moisture percentage was calculated according to AOAC(2006).

$$\text{Moisture \%} = \frac{\text{Weight of fresh sample} - \text{Weight of dried sample}}{\text{Weight of dried sample}} * 100$$

2.4.2.2 DETERMINATIONS OF CRUDE PROTEIN (C.P.)

0.50g dried sample was weighed and transferred into the Kjeldahl digestion flask. Catalyst was added into digestion flask. Then 1.25% sulfuric acid solution was added. After digestion the sample was cooled and 40% W/V NaOH was added. The digest was transferred into the steamed-out apparatus. The ammonia steam distilled into 2% boric acid solution with 3 drops of methyl red indicator. Then distilled ammonia was titrated with 0.01M Hcl. Finally, N2 was calculated then C.P was calculated by following formula.

$$\text{CP \%} = \frac{\text{Volume of standard N/10 HCL solution} * \text{Normality of standard HCL} * 0.014}{\text{Weight of sample}} * 6.25 * 100$$

Here,6.25 is the protein nitrogen conversion factor.

2.4.2.3 DETERMINATION OF CRUDE FAT / ETHER EXTRACT

For the fat extraction approximate 2.0g finely grinded feed sample was placed in a cellulose thimble paper and fat extraction was carried out using Hexose in a 250 ml Soxhlet extractor for 3 hrs. The sample was removed and air dried. Then sample was placed in oven at 80 ℃ a constant weight was obtained. Then extractible fat was calculated as percentage crude fat.

$$EE\% = \frac{\text{Weight of flask with ether extract} - \text{Weight of flask}}{\text{Weight of sample}} * 100$$

2.4.2.4 DETERMINATION OF CRUDE FIBRE (C.F)

2gm ground feed sample was taken then boiling with adding 125 ml 1.25% H2SO4 under reflex for 30 minutes. After then several time washed with hot for acid free from sample. Again in this sample 125ml 1.25% NaOH was added and same treatment was subjected for removing alkali free from sample. Then it was dried to a constant weight in an oven at 100 $\mathring{C}$ and cooled ina desiccators and weighed. The sample was incinerated in a muffle furnace at 550 $\mathring{C}$ for 5-6 hrs. The crude fiber was calculated as the loss in weight on ash AOAC (2006).

$$CF\% = \frac{\text{Weight of crucible , crude fiber and ash} - \text{Weight of crucible}}{\text{Weight of sample}} * 100$$

2.4.6 DETERMINATION OF ASH

A crucible was dried in an oven for 24 hrs. Then cooled and weighed. 5gm dried sample was taken in crucible and subjected to ashing in a muffle furnace maintained at 550 Ċ 5 to 6 hours.

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

2.4.7 CALCULATION OF NITROGEN FREE EXTRACTS (NFE)

Total NFE was calculated by difference [100-(%protein + %crude fiber + %crude fat+%Moisture + %ash)] as reported by Akubor et al (2000).

2.4.8 CALCULATION OF METABOLIZABLE ENERGY (ME)

The metabolizable energy content was calculated by using the following formula Lodhi et al (1976).ME = 32.959 (% CP + % EE *2.25 +% NFE) - 29.20

Photo: Proximate Analysis of feed

Chapter 3: Result and Discussion

3.1 Proximate component of feed samples of different farms

Chemical composition of different commercial poultry feed samples like Moisture, ME,CP, CF, and EE,NFE contents have been presented in Table 3.1.

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). From the table 3.1 it was found that the maximum and minimum moisture content were respectively at 11.69% and 10.23%. Moisture percentage all feeds were with standard level (10-12)%, according to Banerjee,G.C(1995) and Larbier er al.(1992). 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.

Name Of Farm	Feed Type	Moisture(%)	CP(%)	EE(%)	CF(%)	NFE(%)	ME(Kcal/kg)
Biplob	Loose 1	11.69	16	5	3.12	13	2556.3
Rafiq	Loose 2	10.49	16.4	4	3	16.61	2625.63
Siddiq	Loose 3	10.69	17.3	3.9	3.86	18.73	2615.64
Eliza	Loose 4	10.23	16.61	3.6	3.1	16.28	2558
Lipton	Nourish	10.82	17.5	3.94	5.14	15.76	2690
Abu shama	CP	10.66	17.2	3.3	5.76	17.38	2779.5

Table 3.1:Proximate analytical nutrients value of collected feed sample

Crude Protein (CP) in chicken feed is required for amino-acid synthesizing. According to table 1,between two commercial feed ,CP feed had lower protein content than nourish feed. On the contrary, Loose feed 2 and Loose feed 3 had cp over 17%. The minimum requirement of CP by Larbier and Leclerc (1992) for layer starter, layer grower, layer layer, broiler starter and broiler finisher were respectively cited as 18%, 17%, 17%, 22% and 20%. The lowest CP (Table 3.1) was found in Biplob loose feed which was (16%) and was 1% below from the recommended value for layer layer and the highest was found in Nourish feed (17.5%).A feed sample of lower CP content will affect development of carcass and eggs production (NRC, 1994). 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. In this study the cp content was almost within range except Biplob loose feed 1.

The EE content varied significantly among the different feed types analyzed in this study.The fat content of Nourish, Loose feed 2, loose feed 3 and loose feed 4 were 3.94%,4%,3.9,3.6 respectively which was in optimal range that found (3.5- 4) % EE in past research by Larbier and Leclerc (1992). All feeds had fat in standard range except Loose feed 1 which contain little higher fat(5%). If the fat percentage of layer feed exceeds 4% several issue can arise such as reduced egg production,obesity,poor feed efficiency,nutrient imbalance,less active etc. Fat in poultry diet improves the adsorption of fat-soluble vitamins and increases palatability of feed (Velmurugu et al., 2012).

Appropriate levels of crude fiber in layer hen diet is crucial for their overall health, productivity, egg quality.Crude fiber content of locally producing Loose feed 1,2,3,4 were 3.12%,3%,3.86% and 3.1% respectively which is a good comparison to past studies that found 4% and 8% fiber according to Larbier and Leclerc (1992) and Banerjee,G.C(1995).Conversely ready feed (Nourish and CP) has maintained standard fiber percentage. CF levels were highest in Abu Sama (5.76%) which is a ready feed marketed by CP and lowest in Biplob (3.12%) which is a loose feed.
Adequate CF is essential for digestive health, indicating that Abu Sama may promote better gut function in hens**.**

In this study, the NFE levels varied across the different feed types. The highest NFE percentage was observed in Lipton, which recorded a value of 55.8%. This high level of NFE indicates that Lipton (Norish Feed) provides a significant amount of readily available carbohydrates, potentially enhancing energy availability for the hens. The CP feed company also maintain a standard NFE that is 54.3%. Siddiq recorded the lowest NFE percentage at 45.42%. Among loose feeds, Loose feed 3 and 4 contained high percentage of NFE(51%). From previous study, in poultry feed formulation, the typical reference value for NFE is about 40-60% of the total feed(Shurson,G.C. et al,2021). High NFE is crucial for energy supply as poultry need readily digestible carbohydrates for growth and maintenance. In general, collected ready feed company (CP and Nourish) both had higher NFE than loose feed. This lower carbohydrate content may limit the overall energy available to the hens, potentially impacting their productivity and performance.

3.2 Metabolizable energy of feed samples of different farms

Energy is a vital aspect of layer finisher diets that directly influences production, health, and economic efficiency in poultry farming. Balancing ME in diets enhances feed efficiency, allowing hens to convert feed into energy effectively, which is critical for economic production. It is clearly seen from the table 3.1,the most remarkable fluctuation was noticed in ME contents of layer layer feed specially in loose feed. The table 3.1 illustrates that among the collected feeds from different farms, CP feed provides the highest metabolizable energy at 2779.5 kcal/kg, followed by Nourish feed at 2690 kcal/kg. Here,only the result of CP feed's energy percentage was consistent with estimates of (2700-2900) kcal/kg from earlier studies (Larbier,M.and Leclerc, B.1992; Banerjee,G.C.1995; Verma D.N.2006). In contrast, the loose feeds from four farms offer less energy than required. Among four loose feeds ,least energy supplied (2556.3 kcal/kg) farm was that offered Loose feed 1.Overall ,all loose feed samples ME (kcal/kg) values were more deviated from the standard value of different reference value than company feed (Larbier,M.and Leclerc, B.1992). That resulting made a clear difference between the productions in the farms.

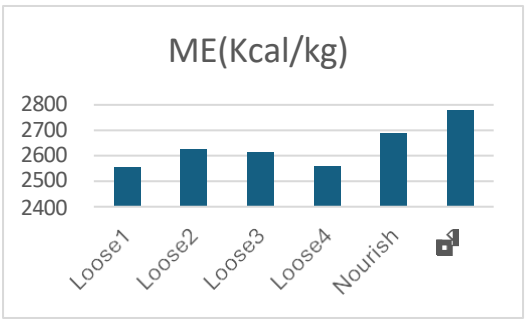

Fig 3.1 Metabolizable energy of six farms

3.3 HHEP and HDEP of different farms

HHEP (Hen House Egg Production) and HDEP (Hen Day Egg Production) are important metrics used to evaluate the performance of layer poultry farms.Figure-2 shows that the highest value of HHEP is for "NOURISH" (94.54%), followed by "CP" (91.54%), while the lowest is "LOOSE 1" (79.5%). As we observed that loose feed providing four farms had lower egg production over a given period, ranging between 79.5% and 85.27%.According to Abd EI-Hack et al., (2019),A standard HHEP for many commercial farm is 85% to 95%.

Similar to HHEP, a well managed layer farms aims to sustain HDEP values 90% or higher during peak production(Sankhayn et al.,2015). The data(Fig-3.3) seems to compare HDEP percentages across different categories, with "NOURISH" and "CP" performing significantly better compared to the "LOOSE" categories.This study found the farms offered commercially ready feed (CP,Nourish) had highest production (94%-95%) per day.But locally producing feed gave a low production performance (84%-89%) on that selected farm.

Both HHEP and HDEP are essential for evaluating the overall productivity and efficiency of layer operations, guiding management decisions to optimize performance.It is observed that the farmer use loose feed in their farm have low HDEP & HHEP than the farm use company feed(CP,Nourish).CP & Nourish both have HDEP,HHEP above 90%.

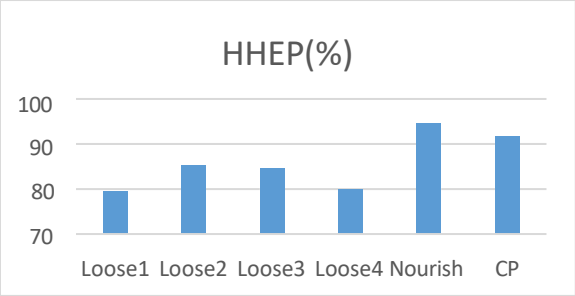

Fig 3.2 HHEP of six farms

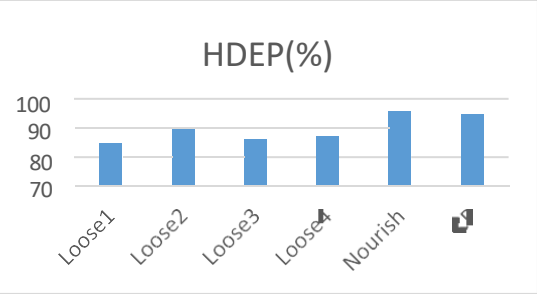

Fig 3.3 HDEP of six farms

LIMITATIONS OF THE STUDY

- In this proximate analysis, we estimate total N2, not the ultimate protein & NPN (Non Protein Nitrogenous Substance).
- Again it estimates % CP from N2 multiplying by 6.25 assuming that all protein contains 17-19% N2. So over & under estimation of N2 can be happened.
- During estimation of % CF, acid & alkali boiling is going on the hemicelluloses is partially destroyed. So there can be a little variation from the real value of % CF.
- Any deviation in results may be due to environmental or experimental error

Chapter 4: Conclusion

Poultry requires more scientific ration than any other livestock. The deficiency of a nutrient in layer ration can greatly affect the production and quality of eggs. The analytical nutrients in company feed samples were nearly standard level and mostly ME, CP were at recommended required level but fat percentage was slightly low (3.3%) in CP company feed. There are contradicted results about the effect of supplemental fat on egg production. The addition of fat has no effect on egg production. The production level of company (Nourish, CP) feed was about 90%- 95% which was satisfactory to owner. The analytical nutrients in Loose feed of four other farms were lower than recommended required level mostly ME. EE of loose feed farm 1 is 5% which was higher than standard level. Higher EE may cause fat deposition around ovary in layers which decrease the egg production. The production level (79%-87%) of farm that uses loose feed was less satisfactory than the farm fed company feed.

RECOMANDATION

Layer farm owners should be concerned during ration formulation of layer-layer birds to fulfill nutrient requirement of them and hence to increase productivity of eggs and meat and to make more profit.

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The Author

BIOGRAPHY

Sayma Mahmud Moon, daughter of **MD. Chan Mahmud Monir** and **Shahnaj Parvin**, was born on 26 may, 2000 at Sagardighi, Ghatail, Tangail. She passed her Secondary School Certificate Examination from Sakhipur Pilot Girls High School, Sakhipur, Tangail in 2016 (GPA 5.00). Then she passed her Higher Secondary School certificate examination from Shahid Sayed Nazrul Islam College, Mymensingh in 2018 (GPA 4.83). Now she is completing her one-year long internship program for fulfilling the requirement of Doctor of Veterinary Medicine (DVM) degree in Chattogram Veterinary and Animal Sciences University, Chattogram, Bangladesh. During her internship period she received her clinical training on Veterinary Medicine from CVASU Lab Rotation, ShahedulAlamQuadery Teaching Veterinary Hospital (SAQTVH), PRTC, Teaching & Training Pet Hospital and Research Center (TTPHRC), Anowara UVH, Sakhipur UVH and Intensive short course of veterinary diagnostic pathology and reproduction care from Universitas Brawijaya, Indonesia ,UPM Malaysia etc.

In the future she has interest to become a microbiologist.

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