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Proximate Analysis of Unconventional Feed Available in Boalkhali Upazila, Chattogram

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ABSTRACT

The study was conducted to evaluate the nutritional status of unconventional feed resources (UCFR) available in the Chattogram district. Unconventional feed resources refer to all those feeds that have not been traditionally used in another feeding and or are not normally used in commercially produced rations for livestock and poultry. A total of four tree leaves namely Jackfruit (*Artocarpus heterophyllus)*, Mango (*Mangifera indica)*, Banyan (*Ficus benghalensis)* and Mandar (*Erythrina fusca*) were considered for proximate analysis in the Animal Nutrition Laboratory, Department of Animal Science and Nutrition, Chattogram Veterinary and Animal Sciences University, Bangladesh. The laboratory analysis was performed according to the standard analytical procedure of Association of Official Analytical Chemists (AOAC). The results indicated that highest Dry mater (DM %) was in Jackfruits leaves whereas the lowest Dry matter (DM %) was in Mandar leaves. The highest Moisture % was in Mandar leaves whereas the lowest Moisture % was in Jackfruits leaves. The highest Crude protein (CP %) was in Mandar leaves whereas the lowest Crude protein (CP %) was in Mango leaves. The highest Crude fiber (CF %) was in Mandar leaves whereas the lowest Crude fiber (CF %) was in Banyan leaves. The highest Ether extract (EE%) was in Mango leaves whereas the lowest Ether extract (EE%) was in Jackfruit leaves and the highest Total Ash (TA%) was in Banyan leaves whereas the lowest Total Ash (TA%) was in Mandar leaves. In conclusion, the nutritional status of all tree leaves showed a higher Crude protein, Crude fiber, Ether extract and Total Ash content. Therefore, these tree leaves can be used as a potential source of nutrients in livestock and poultry feed as well.

Keywords: Unconventional feed resources, Tree leaves, Feed, Livestock, Proximate analysis, and Poultry.

INTRODUCTION:

The Unconventional feed resource refer to those feed that has been traditionally use in animal feeding and or are not normally used in commercially produced rations for livestock. Bangladesh is an agricultural country and about 64.96% of its people live in villages (World Bank collection of development indication, 2016). Their livelihood is dependent mainly on agriculture and animal husbandry. Bangladesh is a developing country with huge population. Livestock plays an important role in the economy of Bangladesh. About 83.9 percent of total households in this country own livestock. Total cattle, goat and buffalo population in this country are 25.7 m, 14.8 m and 0.8 m, respectively

(Banglapedia, 2015). There are about 24 million cattle and 14.69 million goats in our country (DLS, 2008-09). This creates a huge pressure on land, water and feeding resources. The feed of ruminants is divided into 3 components- Green fooder, Dry fodder and Concentrate. Imbalance in demand and supply of the feed resource which indirectly affects the production of livestock. Between the demand and supply the unconventional feed resource play a major role? In Bangladesh more than ninety three percent people are non-vegetarian. Hence, there is huge demand for non-vegetarian food especially livestock meat. In the past, people of Bangladesh were mostly dependent upon land based protein, but now days by developing urbanization and industrialization people fill their protein demand from livestock product. If our live-stock product increasing day by day then our total population able to fulfill their demand of protein source and able to build a happy life cause body need protein for metabolism & grow up. In urban people can get easily the protein source because there have good storage system of milk, meat, egg etc. So, the most of the farm are situated beside the urban area for easy supply of raw products (Hassen *et al*., 2022).

Now a day, the farms are use ready feed for their livestock. But problem in rural area, the people who are rear 2-3 or 3-5 cattle they have no much money for buying ready feed. So, they use unconventional feed or forage also which are available in different season. Feed is the major cost of livestock production accounting 65-75% of production cost (Prasad, 2005). The high and increasing prices for animal feed have compelled researchers in developing countries to direct their attention to unconventional feeds, with particular emphasis on protein source (Mishra, 2003). Qualitative and Quantative shortage of feeds and fodder affects the performance of production animal (Ravindra and Rajaguru, 1985).

The current study was conducted to find out the nutrient content of *Mangifera indica, Artocarpus heterophyllus, Ficus benghalensis* and *Erythrina fusca* leaves for large and small livestock diet. The specific objectives of the present study were to identify the nutrient status of *Artocarpus heterophyllus, Mangifera indica, Ficus benghalensis & Erythrina fusca* leaves in order to use in livestock diet as an unconventional feed and to examine for cheaper unconventional feed resource that can be used for plant protein instead of high cost animal protein.

MATERIALS AND METHODS:

Study area

The study was performed at Boalkhali upazila, located at 22.8778˚N- 91.9208˚E in Chattogram district which contain 9 unions. The total area of this upazila is 145.44 km^2.

Collection of plant material

The sample was carried out during my clinical placement at Upazilla Veterinary Hospital, Boalkhali, Chattogram during the period of 03.12.2018 - 31.01.2019. Approximately 500 gm fresh green leaves were collected from tree. Samples were carried by polythene bag and preserved in the laboratory for chemical analysis.

Preparation of sample

The collected leaves were first washed & then dried in the sun. Then the dried samples were cut and grinded to make homogenous powder.

Analysis of sample

Chemical analysis of the sample were carried out for Moisture %, Dry matter (DM) %, Crude protein (CP) %, Crude fiber (CF) %, Ether extract (EE) % and Total ash (TA) % in the Department of Animal science & nutrition laboratory, CVASU, Chattogram, Bangladesh.

Determination of Moisture

Moisture percentage was determined after determination of DM (dry matter). The enamel desiccator or crucible was dried in an oven regulated at 105°C which was cooled in a desiccators and weighted 5gm of sample was weighted into the enamel disc and kept into the oven (105°C) for 24 hours. The enamel disc was removed from the oven with metal tong. After that it was cooled in desiccator and the final weight was taken after getting constant weight (AOAC, 2000).

$$\%DM = \frac{\text{Weight of Crucible with Dry Sample} - \text{Weight of Empty Crucible}}{\text{Weight of Feed sample}} \times 100$$

$$\% \text{ Moisture} = 100 - \% \text{ DM}$$

Determination of Total Ash (TA)

The crucible was cleaned and dried in hot air oven. Than it was cooled in desiccator and weighted 5 grams of sample was placed there and the sample was burned up to no smoke in heater. The crucible with sample was cooled and transferred to the muffle furnace. Then the sample was ignited at 550-600°C for 6-8 hours until white ash. The furnace was cooled at 150°C and the sample was transferred to desiccators and weighted (AOAC, 2000).

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

Determination of Crude fiber (CF)

2 grams sample was weighted and taken into a beaker. 125ml of 1.25% H_2SO_4 was added into the beaker. Than it was fitted in condenser and placed on heater**.** The beaker was boiled for 30 minutes and removed from heater. After that it was cooled and filtered through filtering cloth. The sample was washed until it was free from acid. Residue of sample was transferred into same beaker. 125ml of 1.25% NaOH was added there and again fitted in condenser and placed on heater. It was boiled for 30 minutes and removed from heater which was cooled and filtered through filtering cloth. The sample was washed until it was free from alkali. Then residue of sample was transferred in a previously weighted crucible. The crucible was put into the muffle furnace & ignited at 600°C temperature for 5 hours. Then it was weighted after cooling AOAC, (2000).

$$\%CF = \frac{\text{Wt of CF}}{\text{Weight of Feed sample}} \times 100$$

$$= \frac{\text{Wt of Crucible with Dry Sample} - \text{Wt of Crucible with Ash}}{\text{Weight of Feed sample}} \times 100$$

Determination of Crude protein (CP)

0.5 gm sample was weighed and one spoon digestion powder mixer was added. Then 10 ml con^c H_2SO_4 was added & digestion flask was placed in for boiling. After that heat was increase gradually and continued up to clear residue (50 mins – hrs). The flask was removed and cooled, then 10 ml 2% boric acid and 3-4 drops mix indicator wash gave in conical flask. Both digestion flask and conical flask set in kjeldhal digestion apparatus for 4 minutes found distillate which are titrate against 0.1 N HCl. Titrate was continue until the color changed into pink. Then the volume was calculated (AOAC, 2000).

$$\text{Protein\%} = \frac{(\text{Titre} - \text{Blank}) \times \text{Normality of HCl} \times 14.007 \times 6.25}{\text{Sample weight(g)}} \times 100$$

Determination of Ether extracts (EE)

2gm dry sample was taken in an extraction. Thimble then placed in the Soxhlet extraction machine. The cork of thimble was above the siphon tube. A receiving flask was remaining and pour with ether then the thimble replace in the receiving flask. Then the Soxhlet extraction machines start. First placed in immersion for 45 minutes, then washing for 40 minutes and then 30 minutes in recovery. After that the thimble was remain in oven for 5-6 hours until dry, then remain in desiccator for 10 minutes and measure weight (AOAC, 2000).

$$\text{EE\%} = \frac{\text{Initial weight(g)} - \text{Weight after extraction(g)}}{\text{Sample weight(g)}} \times 100$$

Statistical analysis

Data were entered into a database (Spreadsheet of Microsoft Excel) and then those were analyzed with *p*-value by using Graph Pad Software.

RESULTS AND DISCUSSION:

Chemical composition of the *Artocarpus heterophyllus, Mangifera indica, Ficus benghalensis* and *Erythrina fusca* leaves collected from different areas in Chattogram. The results of the chemical composition

of *Artocarpus heterophyllus, Mangifera indica, Ficus benghalensis* and *Erythrina fusca* leave samples *eg.* Dry matter (DM %), Moisture (%), Crude protein (CP %), Crude fiber (CF %), Ether extracts (EE %) and Total ash contents (TA %) are shown in **Table 1**, **Table 2**, and **Table 3**.

Table 1: Chemical composition of Jackfruit leaves (*Arthrocarpus heterophylus)*, Mango leaves (*Mangifera indica)*, Banyan leaves (*Ficus benghalensis) and Mandar leaves (Erythrina fusca*) (DM basis).

Nutrients %						
Ingredient	**DM%**	**Moisture%**	**CP%**	**CF%**	**EE%**	**TA%**
Jackfruit leaves	99.95	0.03	25.29	22.62	2.18	11.04
Mango leaves	95.24	4.76	19.43	28.69	3.66	8.53
Banyan leaves	98.69	1.3	24.24	17.08	3	11.81
Mandar leaves	92.31	7.69	29.05	27.89	2.95	8.07

The data represent the mean value of four samples for tree leaves (n=4)
Where, DM % = Dry matter % , CP % = Crude protein % , CF % = Crude fiber %, EE % = Ether extract % and TA % = Total Ash %.

Table 2: The number of samples were very few (n=4) and the value are not normally distributed. So, log transformation was done for each sample.

Nutrients %						
Ingredient	**DM%**	**Moisture%**	**CP%**	**CF%**	**EE%**	**TA%**
Jackfruit leaves	1.99	-1.52	1.402	1.354	0.338	1.042
Mango leaves	1.97	0.677	1.288	1.457	0.563	0.93
Banyan leaves	1.99	0.113	1.384	1.232	0.477	1.072
Mandar leaves	1.96	0.885	1.463	1.445	0.469	0.906

The data represent the mean value of four sample for tree leaves (n=4). Log transformation use to transform skewed data in approximately conform to normality (Normal or near normal distribution).

Table 3: Hypothesis testing using one sample t-test for each variable.

Parameters	**Percent (%)**	**Mean**	**t-test (hypothetical population mean is lower)**	**Standard error**	**p-value**	**t-test (hypothetical population mean is higher)**	**Standard error**	**p-value**
DM%	1.99	1.98	1.9	0.008	0.002	2	0.008	0.1
	1.97							
	1.99							
	1.96							
Moisture%	-1.52	0.039	0.03	0.6	0.99	0.04	0.5	0.99
	0.677							
	0.113							
	0.885							
CP%	1.402	1.38	1.3	0.4	0.1	1.4	0.04	0.7
	1.288							
	1.384							
	1.463							
CF%	1.354	1.37	1.3	0.05	0.3	1.4	0.05	0.6
	1.457							
	1.232							
	1.445							
EE%	0.338	0.46	0.4	0.05	0.3	0.5	0.05	0.5
	0.563							

	0.477							
	0.469							
TA%	1.042	0.99	0.9	0.04	0.1	1	0.04	0.8
	0.93							
	1.072							
	0.906							

Here, t- test was done using both lower and upper mean. The data represent the Mean value of four sample for each tree leaves (n=4).

Dry matter

The result of dry matter content from four samples was 99.95%, 95.24%, 98.69% and 92.31% respectively (**Table 1**). The data showed that the DM% was significant in both lower and higher mean value (**Table 3**).

Moisture

The result of Moisture content from four samples was 0.03%, 4.76%, 1.3% and 7.69% respectively (**Table 1**). In **Table 3**, the data showed that the Moisture % was not significant.

Crude protein

The result of crude protein content in four samples was 25.29%, 19.43%, 24.24% and 29.05% respectively (**Table 1**). The data showed that the CP% was significantly better in lower mean value (**Table 3**).

Crude fiber

The result of crude fiber content was 22.62%, 28.69%, 17.08% and 27.89% respectively (**Table 1**). The data showed that the CF% was not significant (**Table 3**).

Ether extract

The result of ether extract content was 2.18%, 3.66%, 3.0% and 2.95% respectively (**Table 1**). The data showed that the EE% was not significant (**Table 3**).

Total ash

The total ash content was 11.04%, 8.53%, 11.81% and 8.07% respectively (**Table 1**). The data showed that the TA% was significantly better in lower mean value (**Table 3**). The main factor of low production in livestock is supply low quality of feed. As the people not more concern about this we have to tell them about the problems. Also people have no knowledge about nutritive value of feed. They use the feed and forage which are available in different season. If they concern about the nutritive value of feed and apply then their livestock production also increases. Feed cost become the most important factor in livestock production, increase self-sufficiency in feed production will be an important factor in future develop program (Ranghuramulu, 2003). If the village peoples more use unconventional feed so they need to nutritive value of this unconventional feed. Leaves are an important component of the diets of goat, sheep and cattle (Sontakke and kale, 2014). Leaves play a significant role in animal production by providing animal with feed resource rich in protein, energy and mineral at a time food is scarce on of low quality (Mishra, 2003). Tree leaves either in forms fodder, shrubs from an integral part of tropical farming system. Proximate analysis of plants revealed different due to Environment, climate, species, maturity and technique (Gaikwad, 2017). Mango trees leaves rich in antioxidant substance with having significant biological properties, the most important of which is anthelmintic it was discovered by (Abimbola, 2006; Ajayi *et al.,* 2005), the exact structure of this component would only be determined by Marcel and jean, (2012). Although, antioxidant is found in all tissue and part of mango tree (Jhaumeer, 2018). Study on Banyan trees leaves demonstrated that it include some medical compound having anti-hypersensitive, antithegenic, cardio protective, hypoglycemic, antimicrobial, anti-viral and anti-inflamatory properties (Saeed and Irshad, 2011). In four leaves sample, Erythrina *fusca*, the Moisture and Crude protein level was higher than others. Crude fiber percentage high in *Mangifera indica*. *Mangifera indica* leaves contained antioxidant, antiallergic, anti helminties and anti ameobic (Joseph, 2007). In *Arthrocarpus heterophylus* leaves with cane sugar juice tree could be recommended as a diet for lactating goat (Brenda and Dinh, 1999). In *Ficus benghaliensis* effects on diarrhea, haematuria, gastric problems, scabies, antidiabetes (Kassa, 2015). In *Erythrine fusca* legume contained high Crude protein and Dry mater and could be an excellent feed for most livestock (Piedas and Lylian,

1996). In this study, the result of proximate analysis of four tree leaves were some low and high with the previous study, this is due to seasonal variation. In winter season, crude protein % of Mango (*Mangifera indica)* leaves was 16.87% (Jack, 2007) but in my study 19.43% in summer season. In, India jackfruit (*Artocarpus heterophyllus)* leaves crude protein % was 24. 20% (Rita and Sarma, 2017) but in my study was 25.29%, due to area variation. By wet basis Banyan (*Ficus benghalensis)* leaves Crude protein % was 24.07 % (Saeed and Irshad, 2011) but in my study crude protein % was 24.24% due to dry matter basis.

In mandar *(Erythrina fusca*) leaves Crude protein% was in 29.04% (Nwali and Okaka, 2006) which result similar to me So, the Mango, Jackfruit, Banyan and Mandar leaves may be considered as non-conventional feed sources in poultry & livestock diet as these contain moderate levels of protein and fiber and also other nutrients. This study will also help in further studies if a feed trial in poultry and livestock with these leaves will be held.

CONCLUSION:

Increase in livestock & human population and decrease in land under cultivation has resulted in acute shortage of feeds and fodder for livestock which increase due to natural calamities like draught and flood. The shortage of feed resources for livestock feeding diverted majority of research in the field of animal nutrition to look into all possibilities to overcome this nutritional cricis. A major gap exists between the demand and supply of concentrates and green & dry fooders for feeding livestock in the world. To overcome this shortage, it is essential to increase the availability of feed and fooder for the different productions and functions of the animals. It also happens that certain Unconventional feeds are being traditionally fed to animal in particular region but the same may be neglected in other region. The main constraints to the use of unconventional feed resources are collection, dehydration for high moisture content and detoxification process. Processing technologies that are economic and practical are urgently required. Recent studies indicated that quite a large number of tree leaves, agriculture by product and agro - industrial waste materials could be used for livestock feeding. Therefore, it is important to explore rational feedstuff to enhance productivity. The owner or farmer has to knowledge the nutritive value of feed. This study will help in future study.

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CONFLICTS OF INTEREST:

The authors declare that they have no conflict of interest.

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