Nutritional Analysis of Local Grass Fulkher, Alkher and Puti grass in Chattogram District of Bangladesh

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ABSTRACT

. The objective of this study was to explore the proximate composition of wild native plants (Alkher, Fulkher and Puti grass) in different upazilas of Chattogram. Wild plants showed the excellent proximate composition and have potential to cultivate as forage to improve the food qualities for ruminant. It was seen that, despite being wild forage, the proximate components were quite satisfactory. Moisture content was high. The crude protein (CP) content was around 13% in Fulkher and Puti grass indicating good quality fodder. All the assessed species in the light of current findings (proximate composition) shows that they can good potential source of fodder for cattle and will be very helpful to fulfill the current crisis of fodder in the dry season when there's scarcity of fodder.

Key words: Native grass, Proximate component.

CHAPTER 1: INTRODUCTION

Wild grasses are very important in feeding grazing livestock. The health and performance of cattle depends on the availability and concentration of nutrients and mineral elements present in these grasses (Khan et al., 2013). Cattles face different types of physiological disorders, reproductive problems and diseases due to lower nutrient contents. Reduction in milk production and many diseases are the direct cause of mineral deficiency of both major elements and trace elements (Khan et al., 2013). Akram et al. (2008) also evaluated the effects of uncontrolled grazing that leads to overgrazed pastures. Grass is considered as most common feed for the livestock that can be best choice for fodder purposes due to the cosmopolitan availability, easy accessibility, good taste, fast digestibility and high nutritive values. So, grasses has a great potential to be utilized as an alternative source of forage for livestock and can be used to feed and provide the nutritive requirement when the normal sources of fodder are in shortage (Manzoor et al., 2013). Grasses provide feed to about 53% of the total fodder to the ruminants (Ukanwoko et al., 2012). There is a huge gap between available fodder and amount of consumption of fodder. For this reason, we need more fodder species. There have been a few researches done on fodder species of Bangladesh. Traditionally only a few plants species are used for fodder purposes and almost no data is available about the proximate and mineral analysis of most of the plants. The mineral and proximate compositions of grasses are commonly changed seasonally and both excess and deficient condition affects the productivity of grasses (Manzoor et al., 2013). In the villages of Bangladesh, the poor farmers mainly feed their livestock local weedy grasses which have rich nutrients and possess a great potential to be used as forage grasses. Nutritional, proximate and elemental analysis of these wild weedy grasses will result in the identification of potential forage grasses. That can play vital role in improving the financial condition of the farmers and will contribute in the economy of the country.

In this study, three uncommon local grassess of Chattogram, Fulkher, Alkher and Puti grass (scientific name not found) were evaluated for their potential use as fodder. Moreover, Puti grass was collected from two upazilas of Chattogram (Hathazari and Lohagara) to check whether there were some difference in their proximate composition and for the purpose of contributing to such work.

CHAPTER 2: MATERIALS AND METHODS

STUDY SITE:

The current investigation was carried out in three upazilas (Chandanaish, Hathazari and Lohagara) in Chattogram, Bangladesh. Chattogram is the major costal city and financial centre of Bangladesh. The sample was collected by department of livestock services (DLS), Chattogram from Chandanaish, Hathazari and Lohagara upazilas. Geographical Coordinates of Some important locations are given below:

1. Chandanaish Upazila 22.2111°N 92.0417°E
2. Lohagara Upazila 22.0402° N, 92.1008° E
3. Hathazari Upazila 22.5085° N, 91.8075° E

The study area lies on 12 meter above sea level. The climate is tropical having significant rainfall most months, with a short dry season. The average temperature in Chittagong is 25.7 °C / 78.2 °F. About 2794 mm | 110.0 inch of precipitation falls annually. In this region, the warmest month is May with an average high-temperature of 32.3°C (90.1°F) whereas the coldest month is January with an average temperature 20.5°C (69° F) .

LOCATION OF EXPERIMENTS:

The experiment was conducted at Animal Nutrition Lab, Department of Animal Sciences and Nutrition, Chattogram Veterinary and Animal Sciences University, Chattogram. The chemical analysis was done in the animal Nutrition Lab. The experiment was laid out in a completely randomized trial with two replications in each treatment.

COLLECTION AND PREPARATION OF SAMPLES:

Three local plants were selected for doing proximate analysis naming Fulkher, Alkher and Puti grass. Fulkher and Alkher grass were collected from Bengal Agro Farm, Chandanaish. On the other hand, Puti grass was collected from two upazilas (Hathazari and Lohagara). Each plant had two replications. Stems, leaves and other materials were collected. Then the forage materials were cleaned, chopped into small pieces up to 1-2 cm., weighed and sun dried for 2-3 days. After proper sun-drying the samples were kept in hot air oven at 105°C for determination of dry matter. After drying, the samples were grinded using blender machine and then kept in zip locked plastic bag, labeled and stored for chemical analysis.

PROXIMATE ANALYSIS:

Moisture Estimation:

Sample was taken in two crucibles (each crucible containing 10 gm of dried sample) and reweighed. Then the crucible were placed in hot air oven at 105°C and dried for 48-72 hours until stable weight. Then the crucibles were removed from the oven, cooled in the desiccator and weighed. Re-drying is done until constant weight is received. The moisture percentage is calculated as below:

$$\% \text{ Moisture} = (W-W_1)/W \times 100$$

Here,

W= Weight of fresh/air dried sample, W_1 = Weight of dried sample

Dry Matter Detection:

The amount of dry matter was investigated by using the formula-

Dry matter in percentage = 100 - % Moisture

Crude Protein Detection:

Crude protein was detected by taking sample of 1g in the flask and digested it with sulfuric acid and potassium sulfate. The sample was boiled till it became transparent. Then it was diluted by adding distilled water. Then the distillate was titrated against N/10 standard HCl solution.

Then the titrated volume was calculated-

$$\% \text{ Crude Protein} = \frac{A*B*0.014}{W} \times 6.25 \times 100$$

Here, A = Volume of saturated N/10 HCl solution, B= Normality of standard HCl solution, W= Weight of the sample.

Crude Fiber Estimation:

Crude fibers were measured with the help of a method of acid base digestion. About 1.25% of diluted sulfuric acid and 1.25% of sodium hydroxide used. The sample was taken in a beaker and 200 ml of sulfuric acid was added. For half an hour the sample was boiled and chilled and filtrated by using filter paper. The material was washed three times by using distilled water. The material was then transferred in to the beaker and again digested by using 200 ml of sodium hydroxide, boiled for 30 minutes, cooled and then filtered to obtain residues of the sample, washed three times by using distilled water. This material was dried by putting it in to the oven, cooled and weighed. The difference between the weights of the sample was the contents of crude fibers.

$$\% \text{ Crude Fiber} = \frac{W-W1}{W2} \times 100$$

Here, W=Weight of crucible, crude fiber and ash, W_1 = Weight of crucible and ash, W_2 = Weight of sample.

Ether Extract:

A dried sample (2 g) was taken into sohxlet apparatus to remove the ether soluble component present in it. The fat was extracted with ether. The extracted material was dried to a constant weight.

$$\% \text{ Ether Extract} = \frac{A-B}{W} \times 100$$

Here, A=Weight of the flask with ether extract

B=Weight of the flask, W = Weight of the sample

Ash detection:

The contents were burned at 60°C. Ash contents were investigated by using formulae:

$$\text{Ash \%} = \frac{W - W1}{W} \times 100$$

Nitrogen Free Extractable Substance [NFES] is calculated by using the equation of Harris et al. (1972).

NFE= 100 - (% Crude Protein + % Ash + % Ether Extract + % Crude Fiber)

CHAPTER 3: RESULTS AND DISCUSSION

Proximate analysis of all grass species showed essential variation in dry matter, organic matter, fat content, ash content, moisture content, crude fiber, crude protein and NFE values both phenologically and species to species (Table 1, Table 2,Table 3).

Dry Matter (DM):

Analysis of variance of data for DM showed highly significant ($P<0.05$) variation in all plant species. The dry matter content of the grasses ranged between 18.01% to 29.31%. From all the grass species, Alkher grass showed the highest dry matter 29.31% (Table 2). Fulkher grass showed dry matter of 18.01% (Table 1).

DM of Puti grass in Hathazari was 23.05% whereas in Lohagara it was 21.29% (Table 3). An increase in the amount of dry matter at Hathazari Puti grass might be due to the poor moisture conditions as a result of sand burial (Zhang et al., 1996).

Table 1. Proximate composition of Fulkher Grass

Proximate components	Percentage	SEM	P Value
DM	18.01^{b}	0.17	<.0001
CP	13.65^{a}	0.06	<.0001
CF	31.92^{b}	0.21	<.0001
EE	1.46^{ab}	0.10	0.03
ASH	10.82^{d}	0.04	<.0001
NFE	42.15^{a}	0.32	<.0001

Moisture content:

The moisture content of the grasses ranged between 70.69% to 81.99%. From all the plant species, Fulkher grass showed the highest moisture content which is 81.99% (dry matter is approximately 18.01%). On the other hand, Alkher grass showed the lowest moisture content which is 70.69% (dry matter is 29.31%). Moisture content of Puti grass varied a little between Hathazari (76.95%) and Lohagara Upazila (78.72%).

In present investigation, moisture contents were higher than the early findings of Qayyum et al. (2012), Aurelia et al. (2009), Tsoukala et al. (2006). In the growth of plants moisture content play very important role. Under poor nutrient conditions, there was little difference in the number of leaves between plants grown under high moisture content and low moisture content (Zhang et al., 1996).

Crude Protein (CP):

Analysis of variance of data for CP showed highly significant ($P<0.05$) variation in all plant species. The Crude Protein content of the grasses ranged between 9.80% to 13.83%. Puti grass of Hathazari showed the highest protein content (13.83%) whereas Alkher grass showed the lowest protein content 9.8%. CP of Fulkher was 13.65% whereas Puti grass (Lohagara) showed 13.13% protein.

There is a slight variation between CP content of Puti grass of Hathazari and Lohagara which may be due to compositional differences of soil's salinity, alkalinity, Nitrogen content. High rainfall increases the Nitrogen content of grass due to increased nitrogen fixation which might be a reason to the slight difference of CP content of Puti grass in two upazilas.

The average CP compares positively with that of good quality legume forages and far exceeds the minimum protein requirement of ruminants (10-12%) estimated by ARC (1985). Considering that, we can say the CP content of Puti grass and Fulkher is quite good. Crude protein is important for animals' growth and tissue repair (Lal, 2012). Deficiency of crude protein could result in reduced appetite, low feed intake and poor efficiency of food, causing lower growth and reduced development of cattle (NRC, 1985). Bose and Balakarishnan (2001) reported that crude protein below 6-7% may depress the microbial activity in ruminants due to less availability of nitrogen in the rumen. In our experiment, protein content of the grasses were greater than 6-7% which

indicates that these grasses may be used as feed in cattle when the other high yielding variety (HYV) grasses are not available specially in dry season.

Table 2: Proximate composition of Alkher grass.

Proximate components	Percentage	SEM	P Value
DM	29.31[a]	0.17	<.0001
CP	9.80[c]	0.06	<.0001
CF	33.49[a]	0.21	<.0001
EE	1.24[b]	0.10	0.03
ASH	15.73[b]	0.04	<.0001
NFE	39.74[b]	0.32	<.0001

Crude Fiber (CF):

Analysis of variance of data for CF showed highly significant ($P<0.05$) variation in all plant species. The crude fiber content of the grasses ranged between 27.22% to 33.49%. Puti grass at Hathazari showed the lowest fiber content 27.22% whereas Alkher grass showed 33.49% fiber content. Puti grass at Lohagara showed 29.22% of fiber content. Fulkher grass showed 31.92% of fiber.

It is seen that there has been a slight difference between the fiber content of Puti grass of Hathazari (27.22%) and Puti grass of Lohagara (29.22%). This may be due to change in soil composition in the two areas. The CF content of the grasses were lower than other tropical grasses ,which may be as high as 45% during advanced stage of growth (Uwechue, 1990).

Evidence from epidemiological studies recommend that increased fiber utilization may contribute to a reduction in the incidence of certain diseases like Diabetes, coronary heart diseases, colon cancer, high blood pressure, obesity and various digestive disorders (Eriyamremu and Adamson, 1994; FAO, 1990; Walker, 1978).

Ether Extract (EE):

Analysis of variance of data for EE showed highly significant (P<0.05) variation in all plant species. Ether extract of the grasses ranges between 1.24% to 1.81%. Alkher grass showed the lowest EE 1.24% whereas Puti grass Lohagara showed highest EE content 1.81%. Fulkher grass had 1.46% EE and Puti grass at Hathazari had 1.38% of EE content. The concentration EE approximated those of common forages, little variation was seen between the Puti grass of the two upazilas.

According to Babayemi and Bamikole (2006) the energy which is used by animal for body safe guarding and production is utilized from other extract. Higher energy level in plants is observed if ether extract value is higher as it stored large amount of energy.

Table 3: Proximate composition of Puti grass of Lohagara and Hathazari

Proximate components	Lohagara	Hathazari	SEM	P Value
DM	21.29^{c}	23.05^{b}	0.17	<.0001
CP	13.13^{b}	13.83^{a}	0.06	<.0001
CF	29.22^{c}	27.22^{d}	0.21	<.0001
EE	1.81^{a}	1.38^{b}	0.10	0.03
ASH	15.25^{c}	22.92^{a}	0.04	<.0001
NFE	40.59^{b}	34.65^{c}	0.32	<.0001

Ash Content

Analysis of variance of data for Ash showed highly significant (P<0.05) variation in all plant species. The ash content ranged between 10.82% to 22.91%. Puti grass Hathazari showed the maximum ash content 22.91% whereas Fulkher grass showed the minimum ash content 10.82%. Alkher grass showed 15.73% of ash content, Puti grass at Lohagara showed 15.25% of ash content.

It is seen that there is a remarkable difference between the Puti grass of of two upazilas (22.91% and 15.25%). There may be many reasons behind that. Water logging in the Lowlands may limit the availability of some minerals such as potassium whose uptake in water logged soils may be inhibited by a decrease in root cell energy caused by oxygen deficiency within the soil pore spaces (Steffens et al., 2005). Another reason may be that,

the forage is contaminated with soil which is not indispensable (Hoffman and Taysom, 2005).

Nitrogen Free Extract NFE):

Analysis of variance of data for DM showed highly significant ($P<0.05$) variation in all plant species. The NFE content ranged between 34.65% to 42.15%. Puti grass at Hathazari contained 34.67% NFE whereas Puti grass Lohagara contained 40.59% NFE. Alkher and Fulkher showed 39.74% and 42.15% NFE, respectively.

Figure 1. Collected raw sample

Figure 2. Raw sample after chopping

Figure 3. Digestion fluid mixing for CF analysis

Figure 4. Filtration of the mixture for CF analysis

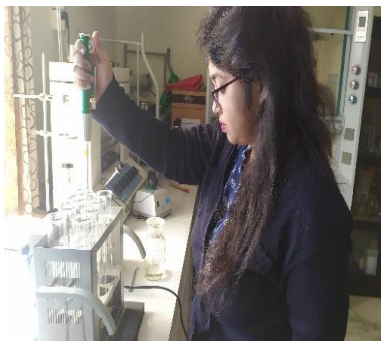

Figure 5. Adding of reagent for CP estimation

Figure 6. Titration for CP determination

Figure 7. Sample weighing for EE estimation

Figure 8. Sample being burnt for ash estimation

Figure 9. Samples given in the muffle furnace for ash estimation

LIMITATIONS

It would have been better if we could fractionate cell wall constituents of the plants into ADF and NDF. On the other hand, very little scientific information was found about the grasses as they were locally available and used only when there was deficiency of other fodder.

CONCLUSION

Currently, only few grasses proximate composition are known. No information is present about the locally available grasses which are used in the rural farmers at different upazilas in Bangladesh. The present study describes three wild weedy grasses that are produced in abundant in the Chattogram that were evaluated for their proximate composition. The results showed that these species can be a good source of nutrient when other grasses are scanty in the dry season.

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BIOGRAPHY

I am Syeda Munira Dilshad, daughter of Syed Md. Salim and late Jotsna Begum. I passed Secondary School Certificate examination in 2012 (GPA 5.00) followed by Higher Secondary Certificate in 2014 (GPA 4.40). I got scholarship from MERCK ANIMAL HEALTH-AMERICAN VETERINARY MEDICAL FOUNDATION in 2016. Now I am an intern veterinarian under the faculty of Veterinary Medicine in Chattogram Veterinary and Animal Sciences University, Bangladesh. In the future, I would like to work on Animal Nutrition and Feed Science of domestic animals in Bangladesh and the world as well.