PROXIMATE ANALYSIS OF PAKCHONG, GERMAN AND PARA GRASS IN DIFFERENT AREAS OF CHATTOGRAM DISTRICT

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List of Abbreviations

Abbreviation	Elaboration
DM	Dry Matter
CF	Crude Fibre
CP	Crude Protein
EE	Ether Extract
NFEs	Nitrogen Free Extracts
CLA	Conjugated Linoleic Acid
FAO	Food & Agricultural Organization

ABSTRACT

The investigation was carried out to explore the proximate composition of Pakchong, Para, German grass of different upazilas at Chattogram district, Bangladesh. Grasses were randomly collected from different areas of Chattogram district like Pakchong grass from Lohagara and Hathazari, Para grass from Raozan and Mirsharai, German grass from Hathazari and Mirsharai. These grasses showed high-quality composition in proximate analysis have potential to cultivate as forage to improve the food qualities for ruminants. Ruminants of Bangladesh largely depend on these grasses to overcome feed deficiencies and to perk up health problems. Proximate composition includes moisture content, dry matter, Crude protein, Crude fiber, Ether extract, Ash and Nitrogen free extractable substance (NFES). Pakchong grass of Hathazrai showed the highest Moisture & Ash content 88.31% & 17.33% respectibly and highest Crude Protein content was observed in German grass from Hathazari 11.64%. All the proximate components showed significant variation ($p<0.05$) in all plant species.

Keywords: Proximate, Grass, Dry matter, Crude Protein, Crude Fiber, Ruminants.

CHAPTER 1: INTRODUCTION

Proximate analysis provides meaningful information and also helpful in assessing the samples quality. The goal of this study were to explore the proximate composition of Pakchong grass, Para grass & German grass to improve the animal nutrition of that areas and to gain knowledge that how these grasses can fulfill the requirements of animals. The analysis gives basic information about moisture content, crude protein, crude fiber, ash and nitrogen free extract (NFE) contents of different grasses. Right amount of moisture in pasture can be a great economic importance for a cattle farmer. Some cattle rely on grass for their meals. On the other hand, too much moisture in grass can cause issues in the digestive system of cattle, while a lack of grass moisture, due to a drought, can be equally as rough on a cow's digestive system. Because grass traditionally helps cattle digest food and maintain proper bowel activity, moisture is the key to keeping cows healthy. The lower value of moisture content in plants indicates high calorific value (Nair *et al*., 2012). The digestion and proper elimination of wastes is largely affected by crude fibers present in diet. The crude fiber is a better fodder for animals (Esene *et al*., 2011). The fraction of carbohydrates is obtained by treating the crude fiber with acid and alkali (Vidita *et al*., 2013). The parts of plant containing crude protein and carbohydrates makes it beneficial for compounding of livestock feed (Esene *et al*., 2011). High content of protein is valuable for proper development and growth of children, adults, pregnant and lactating mothers. The required amount of protein for children, adults, pregnant and lactating is 13-19, 34-56 and 17-71 respectively (FND, 2002). Ash is inorganic residue, produces after burning of organic matter and water that is removed by heating, give the measurement of total amount of minerals present in the food. The heating process, destroy the food not minerals. Minerals has low volatility than other components in the food. The measurement of minerals is important because they may have pharmacological activity (Sunggyu, 2005). Ash values are important Qualitative standards and the purity and authenticity of sample is confirmed by this method. The more quantity of ash shows that plant has higher value of minerals. Higher digestibility of plants on consuming indicates that the much of the ash is insoluble in acid. Plant has higher energy value when the total amount of ash is lower so it is the indication of good bio fuel. The quantity of ash, depending upon the part of plant, age and treatment is different (Vermani *et al*., 2010). Forage fatty acids exert important effects on animal productivity at a number of levels. Lipids have a number of effects in the rumen- some that can increase feed efficiency (e.g., reducing methanogens and protozoa), others that can reduce it (e.g.,

reducing cellulolytic bacteria). Therefore, the objective of this study was to evaluate the proximate components of different cultivated fodder in different areas of Chattogram district.

CHAPTER 2: MATERIALS & METHODS

Study Area: The current investigation was carried out in different areas like Hathazari, Mirsharai, Raozan, Lohagara which almost represents the whole Chattogram district, Bangladesh. Geographical Coordinates of these locations are given below for quick access-

1. Hathazari Upazila 22.30'13"N & 91.48'27"E

2. Mirsharai upazila 22.46'6"N & 91.34'14"E

3. Raozan upazila 22.32'3"N & 91.56'11"E

4. Lohagara upazila 22.0'15"N & 92.6'20"E

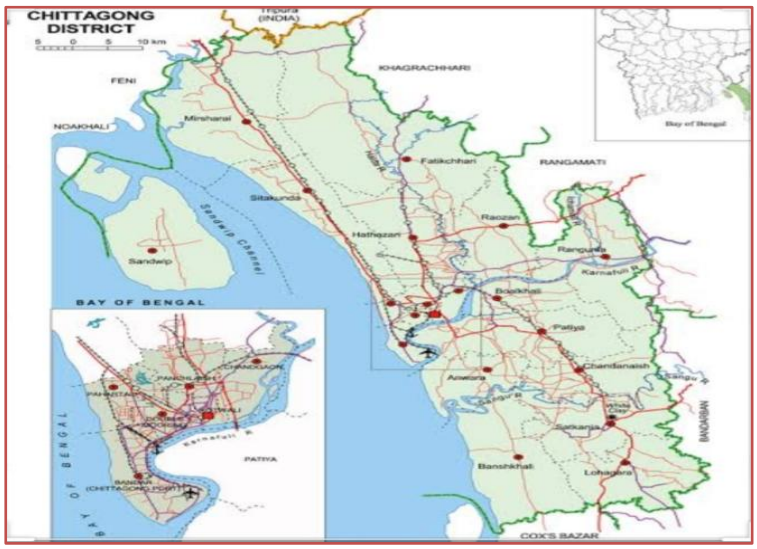

Figure 1: Study site

Sample Collection: Grass having potential as forage was collected randomly from the different study site of Chattogram. Each grass has 2 replicates of different sites. Grasses were collected which was not damaged by any material. Stems, leaves and other parts of grass were collected. Diggers and knifes were used for obtaining the parts of grasses. The selected forage grass samples were clean with water to rinse dust particles and other impurities. Grasses are stored in small brown paper bags.

Sample Identification: Table of these grasses with scientific, family and common name is given below (Table 1).

Table 1. Plants with scientific, family and common names:

Sl No.	Scientific name	Family	Common name
1.	*Pennisetum purpureum*	Poaceae	Pakchong grass
2.	*Echinochola polystachya*	Poaceae	German grass
3.	*Brachiaria mutica*	Poaceae	Para grass

Figure 2. Pakchong grass

Figure 3. German grass

Figure 4. Para grass

Proximate Analysis: This method was used for the analysis of crude protein (CP), crude fibers (CF), moisture contents, ether extract (EE), ash and dry matter (DM) of different grasses. Proximate components were determined by the method of AOAC (2000).

***Moisture Detection*:** The amount of moisture was also find out by using the following formula-

$$\% \text{ Moisture} = \frac{\text{Weight of sample before drying} - \text{Weight of sample after drying} \times 100}{\text{Weight of sample after drying}}$$

Dry Matter Detection: The amount of dry matter was investigated by using the formula-

% Dry matter = 100 – Moisture Content

Crude Protein Detection: Crude protein was detected by taking sample of 0.5g in the flask and digested it with sulphuric acid, the total organic nitrogen is converted to

ammonium sulfate. Ammonia is formed & distilled into boric acid solution under alkaline conditions. Add methyl red as indicator and titrated it with sulphuric acid until light pink color appeared. The amount of protein is measured by the amount of acid used.

***Crude Fibers Detection*:** Crude fibers were measured with the help of a method of acid base digestion. 1.25% of diluted sulfuric acid and 1.25% of sodium hydroxide used. Put 2gm sample in a beaker. 125 ml of sulfuric acid was added. Boiled the sample for 30 mins, chilled and filter the sample by using filter paper or cloth. The material was washed three times by using distilled water & then transferred in to the beaker and again digested by using 125 ml of sodium hydroxide, boil it 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 weight. The difference between the weights of the sample was the contents of crude fibers.

Figure 5. Acid boiling for CF estimation

***Ether Extract estimation*:** A dried sample (2 g) was extracted with petroleum ether (4-60 degree C) in Soxhlet apparatus to remove the ether soluble component present in it. The extracted material was dried to a constant weight in an oven at 105 degree C.

***Ash Detection*:** Take a sample of 2g, burn it at 600 degree celsius, burn all the organic contents. Ash contents were investigated by using formulae-

Ash % = (weight of ash x 100)/ weight of sample

Nitrogen Free Extractable Substance [NFES]:

100 - (Crude protein + Ash + ether extract + crude fiber)

CHAPTER 3: RESULTS AND DISCUSSIONS

The moisture content, DM, CP, CF, EE, Ash, NFEs of different grasses like Pakchong, German & Para grasses are varied from different places of Chattogram district and it may be due to Soil quality, Weather, Nutrition, Environmental factors, fertilizer used in lands etc.

Analysis of all proximate composition of different grasses is given below:

Pakchong grass: Pakchong grass contain a variety in values of proximate components & showed a significant variation in Lohagara & Hathazari upazila in Chattogram district. Less research was found on Pakchong grass in Bangladesh.

Table 2. Comparative proximate components for Pakchong grass at Lohagara and Hathazari upazila.

%	Lohagara	Hathazari	SEM	P value
Moisture	76.68^{b}	88.31^{a}	0.55	0.0001
CF	38.52^{a}	32.17^{b}	0.55	0.0012
CP	4.81b	8.84a	0.47	0.0054
EE	1.60	1.80	0.08	0.1518
Ash	10.01^{b}	17.33^{a}	0.58	0.0009
NFE	45.06^{a}	39.87^{b}	0.74	0.0079

The present findings of moisture contents are almost close to the findings of moisture contents (91%) of Napier grass (Johnson & Chime, 2018). Also CP contents are lower than the values of Kesang *et al*. (2015) (10.4%) and the findings of Kiyothung (2014) (16-18%). The concentration of CF is higher than the values investigated by Johnson and Chime (2018) (27.24%). Ether extract contents of Pakchong grass are much lower than the findings of Johnson and Chime (2018) (14%) observed in Napier grass. In present research Ash contents were almost close to the early findings of Abou-ashour (1984) (9.38-11.26%). NFES values are much higher than investigated by Johnson & Chime (2018) (16.45%). Analysis of variance of data for all proximate composition showed highly significant ($P < 0.05$) variations except ether extract for all plants species.

German grass: The values of proximate components in German grass shows a variation in different areas like Hathazari & Mirosorai upazila in Chattogram district which may be due to soil quality, weather, rainfall, nutrition etc.

Table 3. Comparative proximate components for German grass at Hathazari and Mirsorai upazila

	Hathazari	Mirsorai	SEM	P value
Moisture	88.16[a]	80.80[b]	0.66	0.0017
CF	39.95	41.57	0.57	0.1337
CP	11.64[a]	5.43[b]	0.33	0.0003
EE	1.37	0.90	0.1	0.0543
Ash	12.81[a]	8.71[b]	0.36	0.0017
NFE	36.23[b]	43.40[a]	0.78	0.0043

In present investigation moisture contents of German grass are higher than the findings of Jesmin (2009) (76.86%) and also values of Ialam *et al*. (2017) (80.03%). CP concentration are almost similar to the findings of Islam *et al.* (2017) (5.72%) and the values of Jesmin (2009) (10.79%). The CF findings of the present study are higher than the findings of Kanak *et al.* (2013) (34.4%) & almost same as the values of Islam *et al*. (2017) (41.18%). EE concentrations are lower as indicated by Islam *et al*. (2017) (3.72%) and than the values oesmin (2009) (2.64%). This research values for Ash are close to the findings of Khanum *et al.* (2007) (13.4%). The findings of Islam *et al*. (2017) (2.15%) is very much lower than the recent study. The similar findings of NFEs are present with the findings of Kanak *et al*. (2013) (43.5%). Current work also shows much higher values from the values of Islam *et al*. (2017) (27.39%).

Para grass: The proximate composition analysis findings are vary from Hathazari and Mirosorai upazila in Chattogram district. The components also showed a highly significant variation in different components of these areas and the values are given below-

Table 4. Comparative proximate components for Para grass at Hathazari and Mirsorai upazila

%	Hathazari	Mirsorai	SEM	P value
Moisture	85.33a	84.13b	0.30	0.0486
CF	37.38	38.43	0.44	0.1677
CP	9.71	9.36	0.30	0.4860
EE	1.34	1.18	0.08	0.2073
Ash	10.83	12.84	0.54	0.0579
NFE	40.74	38.19	0.90	0.1191

The moisture contents of Para grass are higher than the findings of Jesmin (2009) (78.62%) and the values of Gupta (1975) (64.5% to 77.3%). The present findings also higher than the values of Alam *et al*. (2015) (56.92% to 61.57%). CP concentrations are

almost same as investigated by Binh (1993) (9.54%), Jesmin (2009) (9.83%) and close to the findings of Haque and Stem (1993) (10.8%). The crude protein contents of Mohan *et al*. (1977) (4.8%), Alam *et al*. (2015) (3.92%) were lower than the crude protein contents of the present study. The present values of CF are almost same as the values of Kanak *et al*. (2013) (36.9%). EE values of Para grass are almost similar as the values investigated by Mohan *et al*. (1977) (1.73%) & the findings of Gill *et al.* (1979) (1.6%), higher than the findings of Haque & Stem (1993) (2.34%), the values of Alam et al. (2015) (2.56%), jesmin (2009) (2.68%) and the values investigated by Sen *et al*. (1978). The data of present analysis showed much higher concentration of Ash from work of Binh (1993) (5.9%) and the findings of Alam *et al*. (2015) (5.1%). The findings of NFEs are almost close to the values investigated by Kanak *et al.* (2013) (42.4%).

Variations of values of different grasses in different areas according to Proximate analysis:

Moisture contents: In the growth of plants moisture content play very important role. More leaves are produced by plant at high moisture content as compare to low moisture content, under rich nutrient conditions according to Zhang (1996). The high moisture content of the plant indicates that grass would have a very short shelf-life, susceptible to fast degradation and would require dehydration if preservation is desired. Also suggests that in cases of animal and human dehydration, this plant could prove useful in rapid re-hydration.

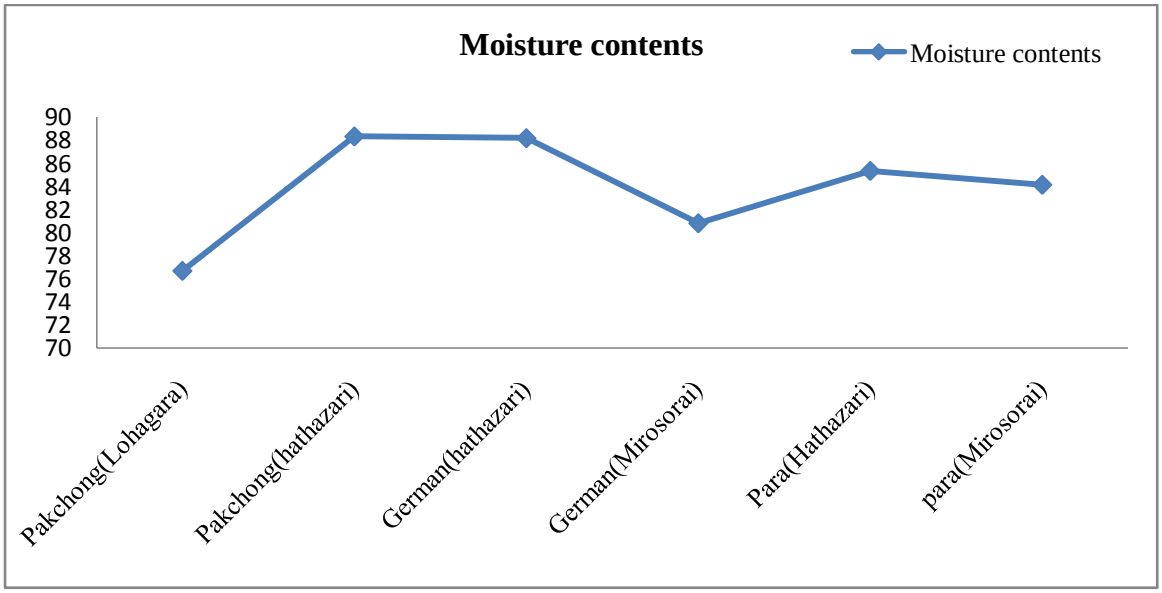

Figure 6. Fluctuations of moisture contents in different grasses.

Crude Protein (CP): The variation of protein concentration in plants showed mainly due to nitrogenous fertilizer used in grass land, nutrition etc & shows that this plant can involve significantly to the daily human protein requirements according to FAO/WHO/UNU (1991).

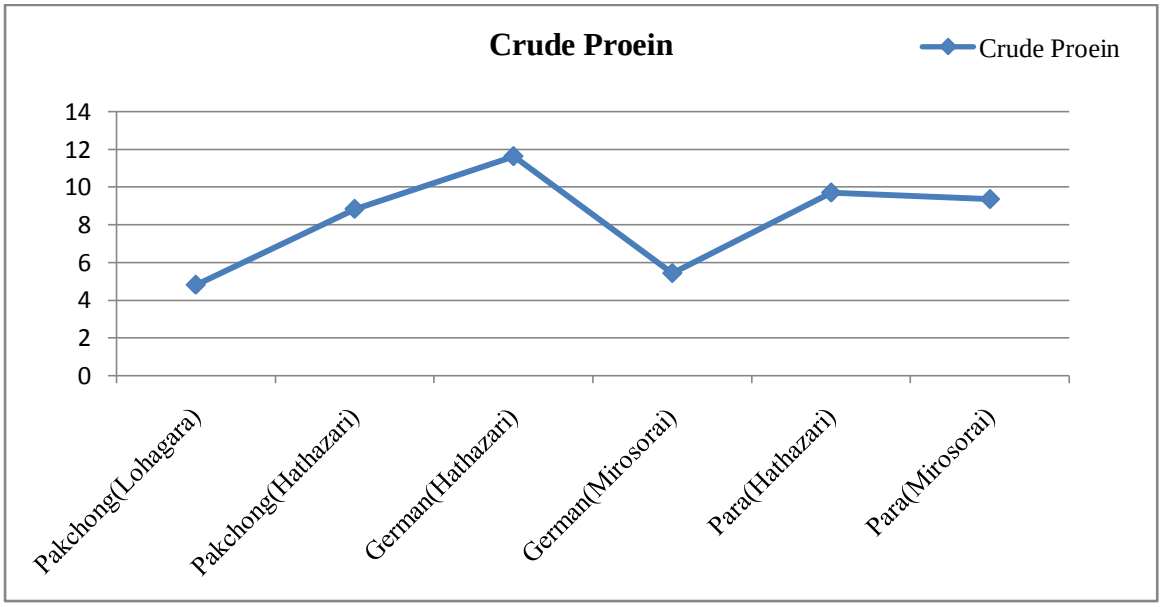

Figure 7. Fluctuations of Crude Protein in different grasses.

Crude Fibre (CF): Evidence from epidemiological studies recommend that increased fiber utilization may contribute to a reduction in the incidence of certain diseases like diabetes, coronary heart disease, colon cancer, high blood pressure, obesity, and various digestive disorders (Eriyamremu and Adam, 1994).

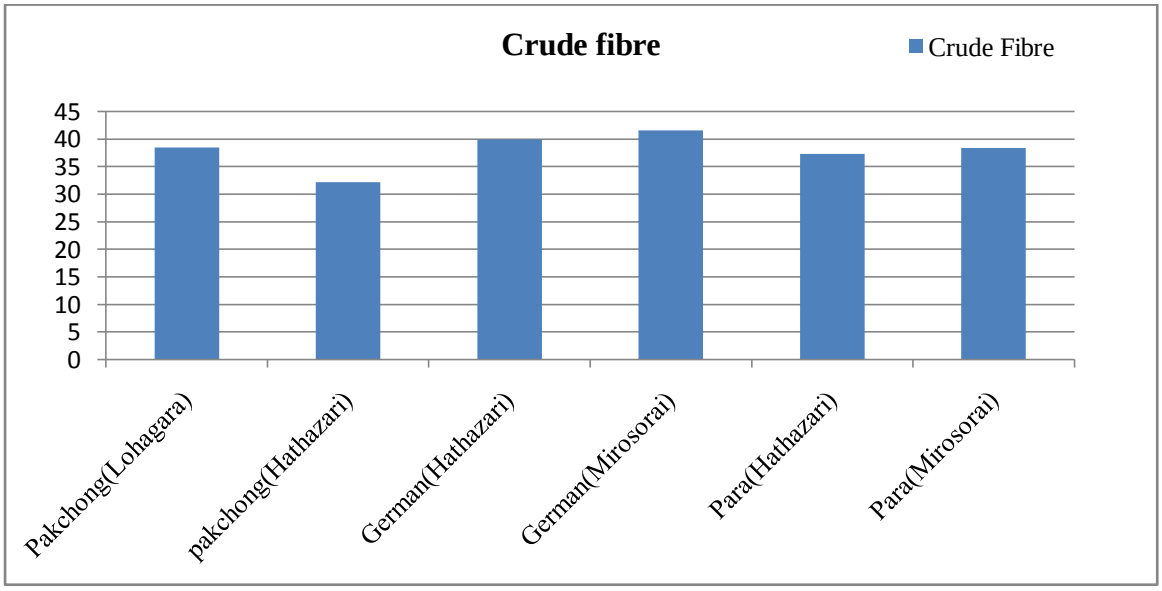

Figure 8. Fluctuations of Crude Fiber concentrations in different grasses.

Ether Extract: According to Babayemi and Bamikole (2006), the energy which is used by animal for body safe guarding and production is utilized from ether extract. Higher

energy level in plants is observed if Ether Extract value is higher because Ether extract store large amount of energy.

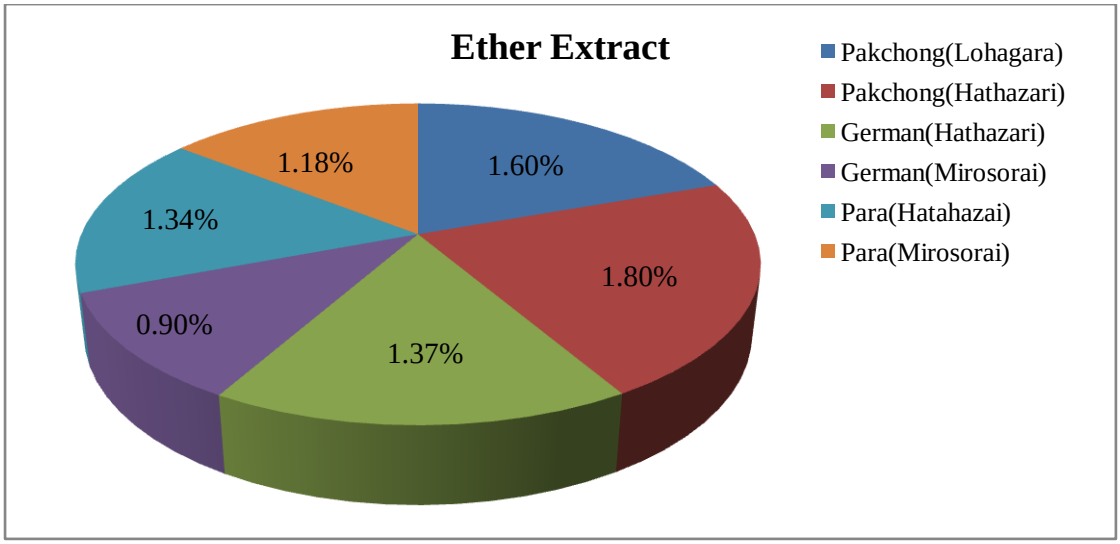

Figure 9. Fluctuations of Ether Extract values for different grasses.

Ash Contents: By nature Ash are devoid of protein, calories, energy or nutrients. If Ash contents of forage are unusually high, it specify that forage is contaminated with soil which is not indispensable (Hoffman *et al*., 2005).

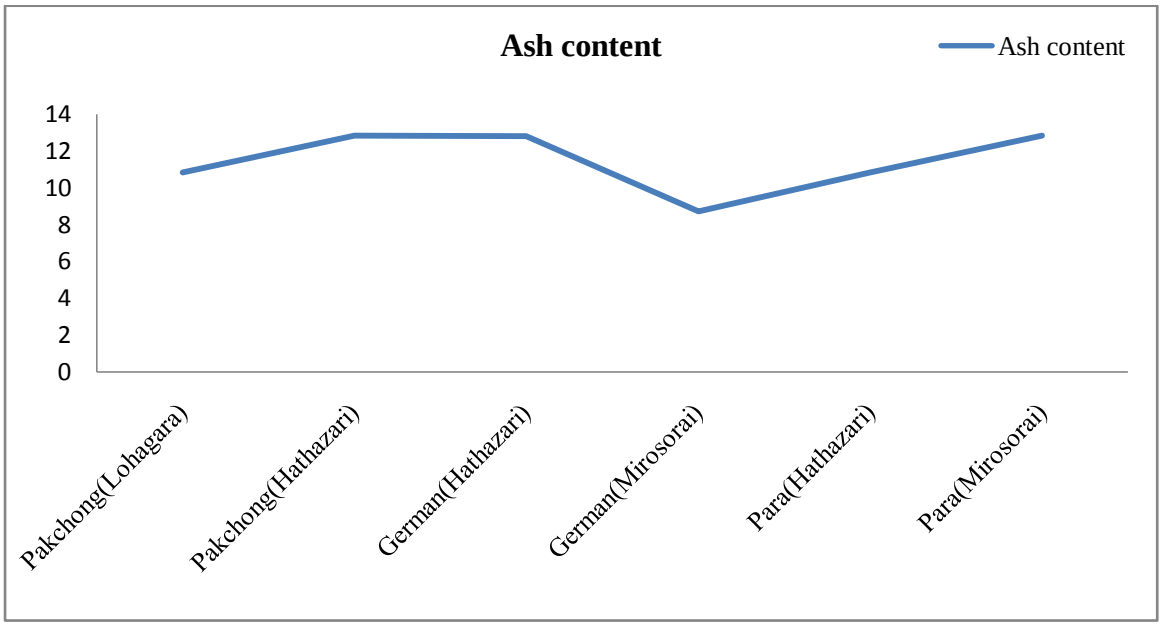

Figure 10. Fluctuations of Ash contents for different grasses in different areas.

Nitrogen Free Extracts (NFEs):

High level of NFES is available in plant due to nitrogen deficiency in soil and plant tissues. High quantities of NFES also cause to increase the food energy of seed (Murthy and Rao, 2009). Furthermore, higher alkaloids showed some sort of nutritional stress or composite relations between environment and soil.

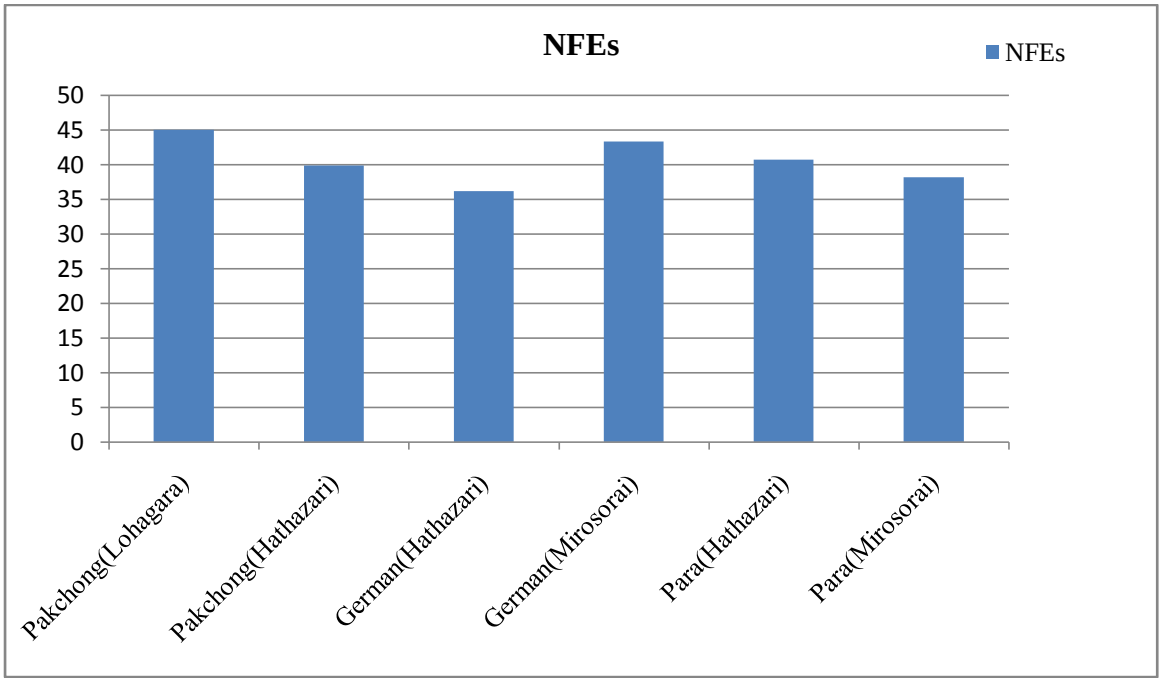

Figure 11. Fluctuations of NFEs values for different grasses.

CONCLUSION & RECOMMENDATION

Current study on the proximate composition of Pakchong, German and Para grass that are commonly fed to the animals in our country have exposed that these plants are proved as an excellent supply of dry matter, moisture content, crude protein, crude fibre, ether extract, NFES as well as net energy. We can also suggest that people of these areas can harvest these grasses for animals in Chattogram district to accomplish their nutrient requirement on these plants.

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The Author

BIOGRAPHY

I am **Khadija Begum**, daughter of **Nurul Hoque** and **Sajeda Begum**. I passed my Secondary School Certificate examination in 2011 (GPA 5.00) followed by Higher Secondary Certificate examination in 2013 (GPA 5.00). 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 as a Veterinary practitioner & do research on animal health improvement in Bangladesh.