CHAPTER-I

INTRODUCTION

Bangladesh is the country of south Asia, bordering the Bay of Bengal, between Burma and India. Bangladesh has a total area of 143,999 sq. km. The total population is 164 million(BBS,2012).Among of them 47% live below the poverty line and 27% live in extreme poverty. Over 25 million people are classified as the poorest by any standard of development(BBS, 2005)**.**Bangladesh is by mid 2008 classified as a low income country, i.e. with a GINA per capita of US $ 450 in 2006 below the cutting line of US $ 935 (World Bank, 2008). The economy of Bangladesh is agro based. About 21.77% of Gross Domestic products (GDP) come from agriculture sector of which livestock alone share 7.23%. (BBS, 2005-2006). Bangladesh have 24.7 million cattle,0.86 million buffalo,1.34 million sheep and goat,195 million poultry(DLS2006).Livestock plays an important role in the national economy of Bangladesh with a direct contribution of around 3% percent to the agricultural GDP and providing 15% of total employment in the economy. In Bangladesh about 75 percent people rely on livestock to some extent for their livelihood, which clearly indicates that the poverty reduction potential of the livestock sub-sector is high.

Bangladesh is an agricultural country. Animal is important for both agriculture and feed source. For animal health there are So many Conventional and unconventional feed. But price of Conventional feed is much than unconventional feed. So we can use unconventional feed as feed source of animal. There are multiple source of unconventional tree fodders for animal in Bangladesh. But many of them contain low nutrient components. In Asia, the volume of production is increasing at about 3% annually. We can use Ipil-Ipil (*Leucaena leucocephala*), krishnachura (*Delonex regia*), Moringa*(Moringa oleifera*).

Estimates of feed availability based on supplies of straw, bran and husk of food grains, whole grain and oil cake used in animal feed indicated that the total availability is much less than what is required for meeting the nutritional requirements of animals. Chronic shortages of feed and fodder, together with poor nutritive value of such feeds as are available, have lowered the productive capacity and fertility of Bangladesh livestock. The important sources of fodder are: a) fodder from forest, b) fodder from open grazing grounds,

c) fodder from the fallow lands and areas sown once, d) fodder from weeding of major crops, e) fodder from forage crops, and f) fodder from semi-forage crop residues. With the increasing number of dairy farms, the demand for fodder has increased but supply in the local markets is inadequate to Cater to the growing demand. Expert opinion is that the present total feed need is 30 million tons whereas supply is less than 15 million tons (Khamar, 1995).

To overcome the feed shortage of ruminants different types of tree leaves and leguminous trees are potential sources of relatively high quality fodder and can be a available source of many small holders. However farmers are often unaware of appropriate feeding strategies for combining tree fodders with poorer quality feeds to improve animal production. Lack of techniques to assess the nutritive value of fodder hampers livestock production. So this research program undertaken with the following objectives:

1. To assess the physical and functional qualities of different tree fodder leaves.
2. To determine the nutrient composition of different tree fodder leaves.
3. To compare nutritive value of different tree fodder leaves.

CHAPTER-II
REVIEW OF LITERATURE

Those feed ingredients which are potentially used as animal feed but not yet exploit interms of chemical composition proper feeding trial is not completed and is not available in the market are called unconventional feed. Here 3 unconventional tree leaves nutrients are evaluated and they can be considered as animal feed as they contain reasonable amount of nutrient composition. Fodder trees represent an enormous potential source of protein for ruminants in the tropics. Until relatively recently, these feed resources have been generally ignored in feeding systems for ruminants, mainly because of inadequate knowledge on various aspects of their potential use, as well as initiatives associated with the development of more innovative systems of feeding. The use of fodder trees has been secondary to these efforts, despite their potential value in prevailing small farm systems (Devendra, 1983). These alternative feeds merit increased research and development in the future (Devendra, 1990). This analysis highlights the potential value of fodder trees as sources of feeds, draws attention to results of work where there are clear demonstrable benefits, practical technologies that are potentially important, and emphasizes the need to accelerate their wider utilization in feeding systems for ruminants. However, not all these feeds are put to maximum and efficient use. Inefficient utilization is identified with low levels of animal production in which the contribution from ruminants (buffalo, cattle, goat and sheep) compared to non-ruminants is especially low. The unconventional tree fodders have since ancient times, played a very important role in human life. They have been used for food, medicine, fiber and other purposes and also as fodder for domestic animals. In these regions starch based foods are the main staple food which supply both energy and protein requirements. Thus protein deficiency is generally found among these people. To alleviate the situation, efforts are underway to explore the lesser-known tree fodders as sources of nutrient supplements. Increasing the utilization of unconventional tree fodders in ruminant’s diet known to be rich source of nutrients as well as dietary fiber can be a food based approach for ensuring the intake of these nutrients.

Chemical and statistical analysis: Proximate composition of the diets and test ingredients were determined by standard method of AOAC (1990).

The Ipil-ipil*(Leucaena leucocephala*) leaf evaluated for crude protein (CP), fat, crude fiber (CF), ash content, moisture content and nitrogen free extract (NFE). The CP 18 ± 0.12 % , fat 8 ± 0.11 %, CF 19 ± 0.15 % , ash 11 ± 0.13 %, moisture 62 ± .16% and NFE 8 ± 1.10 % were recorded. Among plant protein ingredients ipil-ipil leaf meal was considered as the most nutritive plant protein source after soybean meal.Ipil-ipil leaves gave a maximum gain in weight in Goat, Sheep and Cows. F. Ruskin. Ed. (1984) reported that Ipil-ipil is a palatable forage,digestable and serves to increase milk output in both the humid and monsoonal tropics for ruminanats.When using Ipil-ipil leaves in a rationed manner for fattening cattle it is equivalent to cottonseed cake (**D Thomas, BL Addy**.) and superior to groundnut cake (**B Hulman *et al***.). In Queensland, Australia, a very high live weight gain was recorded using Ipil-ipil leaves (**F. Ruskin.Ed.)**.

Several report showed that Ipil-ipil leaves could be a substitute for the imported protein supplements fed to dairy cows (**F. Ruskin.Ed.**).Henke and Morinta (**Henke *et al*. 1954**) reported that dairy cows produce milk with higher fat content when they are fed with Ipil-ipil leaves compared to similar cows feed on pasture and concentrates or ammoniated rice straw in grass-based diet. In Australia, Hawaii and Indonesia, annual milk production of 5000 to 9700 L/ha was recorded (**F. Ruskin.Ed.**). Feeding cows and buffalos on Ipil-ipil foliage at 10% of their diets produce higher milk yield by 20% than that of the control group (**S Ghatnekar *et al***.). Jones (**Jones *et Al***.) reported that feeding dairy on Ipil-ipil foliage increases milk fat and protein contents and also increases milk production by 14% on average.

However the use of Ipil-ipil for cattle feeding has some problems , due to mimosine toxicity. Symptom of mimosine toxicity includes infertility, decreased weight gain, goiter, cataract in young animal and also loss of hair (**Hegarty *et al***.).Cattle fed completely on Ipil-ipil will not die but may loss some of their coarse hairs. However, newborn calf shown signs of enlarged thyroids, which may result in death within a few days if their mothers have signs of toxicity (**F. Ruskin.Ed**.).

CHAPTER-III

Materials and Methods

The investigation on "Nutritional quality of unconventional tree fodder" was carried out July 2018 to September 2018 at Animal Nutrition laboratory of CVASU. The material and methods adopted for the study are stated in this section.

3.1. Collection and Preparation tree fodder sample

A total of 3 tree fodder leaves were randomly collected from different areas of Chittagong.Then the leaves are separated and dust was removed from the leaves. The samples were sun dried and grinded separately and stored in air tight container for proximate analysis.

3.2. Analysis of Nutrient composition of tree fodder leaves

The feed samples were analyzed for proximate composition such as, Dry matter (DM) moisture, crude protein (CP), Ether extract(EE), crude fiber (CF), Nitrogen free extract(NFE), total mineral matter (ash) as per AOAC (1990) andexpressed in percentage.

3.2.1. Moisture

Five grams of powdered sample (1sqmm) was weighed into a previously weighed crucible and dried in an oven at 60°C till a constant weight was attained.

$$\text{Moisture \%} = 100 - \left(\frac{\text{Initial weight (g)} - \text{Final weight (g)}}{\text{Sample weight (g)}} \times 100 \right)$$

3.2.2. Crude protein

The nitrogen content of feed was estimated by kjeldahl method .The crude protein content was calculated by multiplying with factor 6.25 and expressed on percent basis.

$$\text{Protein \%} = \frac{(\text{Sample—Blank}) \times \text{Normality of Hcl} \times 0.014 \times 6.25}{\text{Sample weight (g)}} \times 100$$

3.2.3. Crude fat

Moisture free sample was weighed in moisture free thimbles and crude fat was extracted by refluxing in soxhlet apparatus using petroleum ether as solvent. Percent crude fat was calculated by using following formula,

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

3.2.4 .Crude fiber

CF is obtained from the digestion of sample by boiling at 125ml sulphuric acid (1.25%) and then by boiling at 125ml sodium hydroxide (1.25%).finally deducting the value of ash from the residue.

$$\text{Crude fiber \%} = \frac{\text{Weight residue with crucible (g)} - \text{Weight of ash with crucible}}{\text{Weight of sample (g)}} \times 100$$

3.2.5. Total mineral matter (Ash)

Total mineral matter (ash) was determined by igniting samples in muffle furnace at 600°c for 3 - 4 hours. The total mineral matter was expressed as percent.

$$\text{Total mineral matter \%} = \frac{\text{Weight of crucible with ash (g)} - \text{Weight of crucible (g)}}{\text{Weight of sample (g)}} \times 100$$

3.2.6. Calculation of Nitrogen free extracts (NFE)

The NFE content was calculated by deducting the sum of the values for moisture, crude protein, crude fat, crude fiber and total mineral matter in 100.

3.2.7. Metabolizable energy (ME)

Fat, protein or carbohydrate can supply the estimated energy. So the metabolizable energy was calculated by using the following formula:

$$ME\ (Kcal/100gm) = [(3.5 \times CP) + (8.5 \times CF) + (3.5 \times NFE)]$$

3.2.8. Statistical analysis

All data were recorded after chemical analysis. The recorded data were tabulated for further analysis.

PICTURES

FIG: 1.1. IPIL-IPIL

FIG: 1.2.KRISHNACHURA

FIG: 1.3. MORINGA

Fig 1: Drying of glass wares

Fig 2: Estimation of CF

Fig 3: Estimation of crude Protein (CP)

Fig 4: Estimation of Ether extract (EE)

Fig 5: Estimation of DM

Fig 6: Estimation of Ash

CHAPTER-IV

RESULT AND DISSCUSSION

4.1 Dry matter (DM):

Dry matter content of different tree fodder is shown in the graph-1.The DM content was higher in Ipil-ipil leaf (37.23%), lower in Moringa leaf (31.44%).The DM percentage of krishnachura, Ipil-ipil, Moringa leaves ranges from 31-36. The dry matter of Ipil-ipil (*Leucaena leucocephala*) leaf was 65.84% observed by **Zamal *et al.*(2008)** which varies from this study. The dry matter (DM) value of the Moringa leaf in this study was lower than the values reported by **Olugbemi *et al.* (2010)** and **Mutayoba *et al.* (2011)**. They reported DM values of 93.7% and 87.20%, respectively. The value obtained in this study was lower (31.44%).

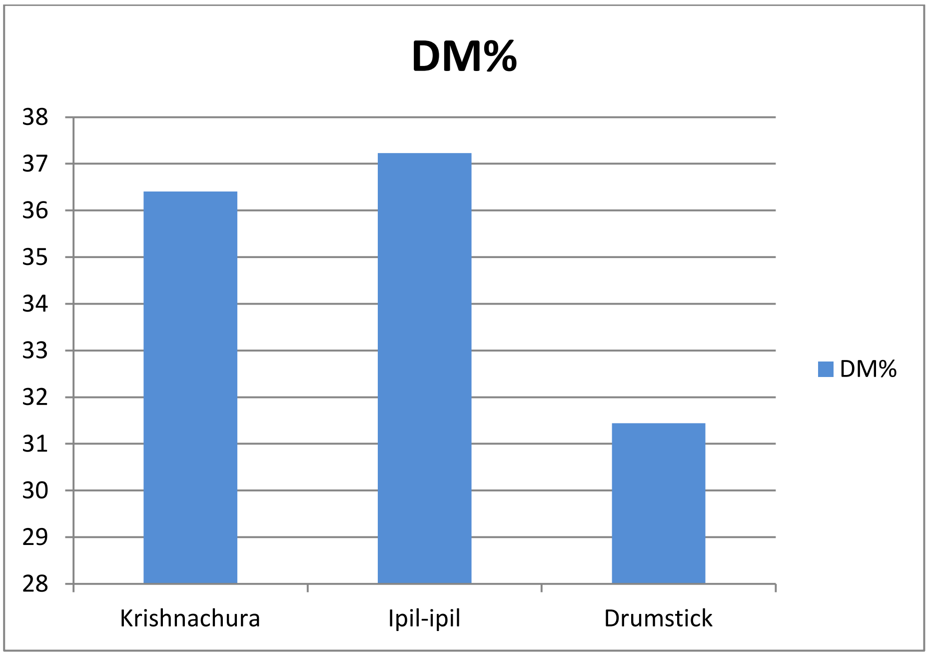

Figure 1: DM contents of different unconventional tree leaves (%)

Tab-1 Proximate analysis of three selected tree leaves:

Chemical composition	Krishnachura	Ipil-ipil	Moringa
DM%	36.41	37.23	31.44
ASH%	6.70	10.73	10.47
EE%	5.80	8.09	4.72
CP%	14.26	17.85	22.98
CF%	14.45	18.60	9.15
NFE%	22.38	7.51	21.24

4. 2. Ash:

Ash content of different tree leaves is shown in the graph 2 .The ash content was higher in Ipil-ipil leaf (10.73%), lower in Krishnachura leaf (6.70%).The ash percentage of Ipil-ipil (*Leucaena leucocephala*) leaf ranges from 4-11 observed by **Zamal *et al*.(2008)** which is lower than the value obtained in this study (10.73%).The Moringa leaves contained 10.47% ash which is similar **to Razia *et al*.(2009)**, they reported the ash value was 10.9% .

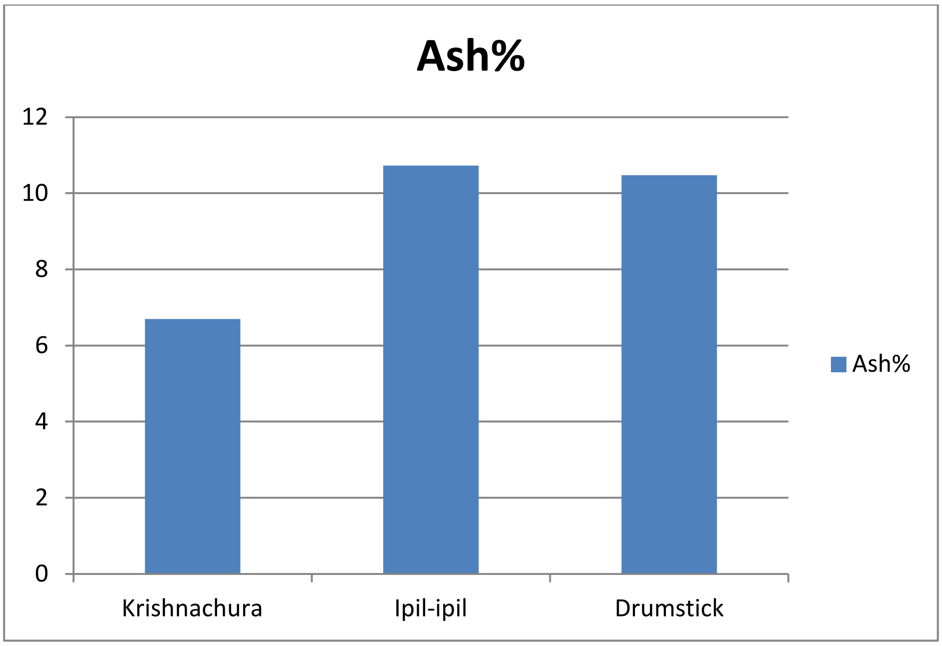

Figure 2: Ash contents of different unconventional tree leaves (%).

4.3. Ether Extract (EE):

Ether extract content of different tree leaves is shown in the graph 3. The ether extract content was higher in Ipil-ipil leaves (8.09%), lower in Moringa leaves (4.72%). The EE percentage ranges from 4-9. The Ipil-ipil (*Leucaena leucocephala*) leaf analyzed for EE (6 ± 0.11 %) was recorded by **Zamal *et al*.(2008)** which is slightly low than the value obtained in the study (8.09%).Krishnachura leaves contained 5.80% EE which is lower to **Razia *et al*.(2009)**, (9.5%) .

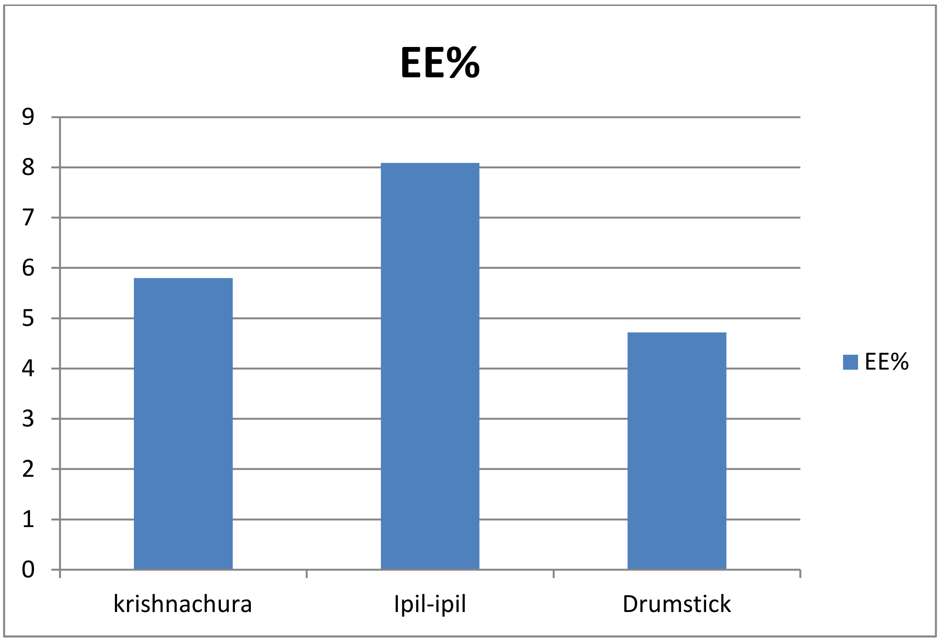

Figure 3: EE contents of different unconventional tree leaves (%).

4.4. Crude protein (CP):

Crude protein content of different tree leaves is shown in the graph 4. The crude protein content was higher in Moringa leaf (22.98%) and lower in Krishnachura leaf (14.26%).The crude protein percentage ranges from 14-23. The Ipil-ipil (*Leucaena leucocephala*) leaf analyzed and the CP (23± 0.12) % was recorded by **Zamal et al.(2008**) which was slightly higher than the observed value. The crude protein value of Maringa leaf reported by **Olugbemi *et al.* (2010)** was higher (27.44%) than the value obtained in this study (22.98%). **Mutayoba *et al.* (2011)** also reported higher (30.65%) crude protein in Moringa leaves.

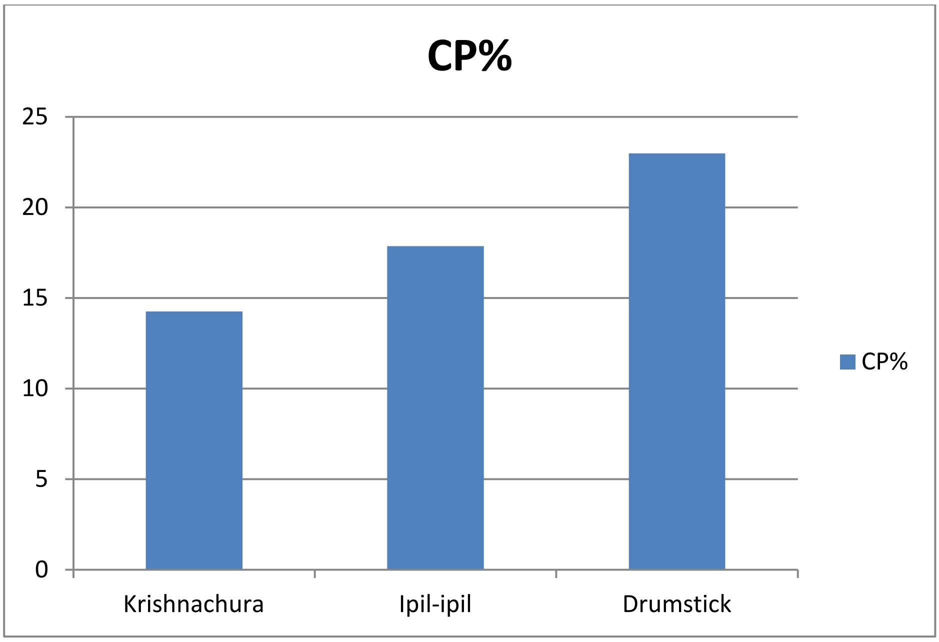

Figure 4: CP contents of different unconventional tree leaves (%).

4.5. Crude fiber (CF):

Crude fiber content of different tree leaves is shown in the graph 5. The crude fiber content was higher in case of Ipil-ipil (18.80%), lower in case of Moringa leaf (9.15%).

The CF percentage ranges from 9-19. The Ipil-ipil (*Leucaena leucocephala*) leaf analyzed for CF (41 ± 0.15 %) was recorded by **Zamal *et al*.(2008)**. Moringa leaves contained 9.15% CF which is higher to **Razia *et al*.(2009)**, (4.8%) .

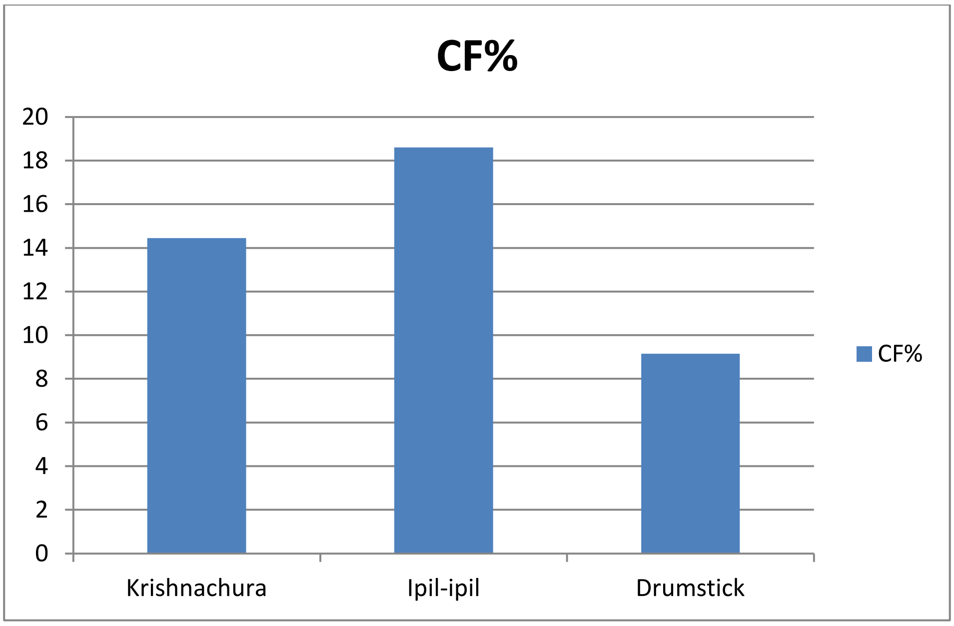

Figure 5: CF contents of different unconventional tree leaves (%)

4.6. Nitrogen free extract (NFE):

The Nitrogen free extract was higher in case of Krishnachura (22.38%), and lower in case of Ipil-ipil (7.51%) leaves. The Nitrogen free extract percentage ranges from 7-23. Nitrogen free extract in Ipil-ipil (22 ± 1.10 %) was recorded by (**Zamal *et al***).

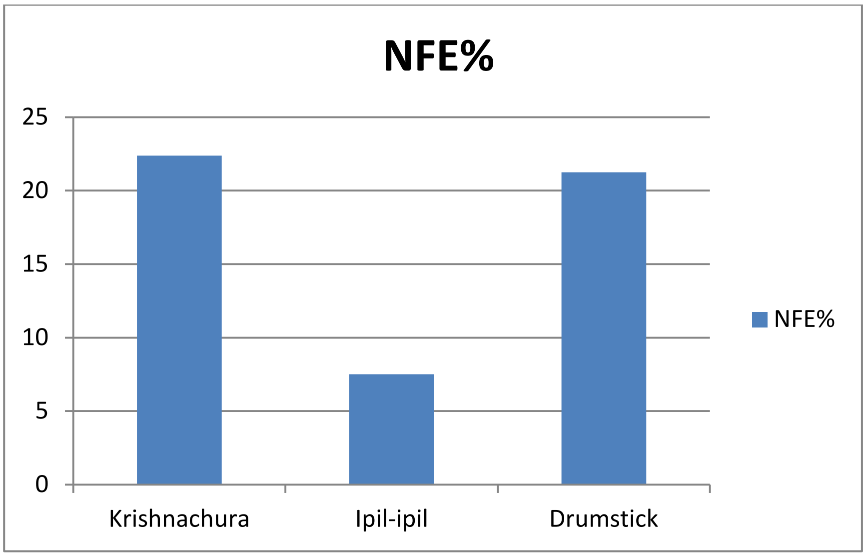

Figure 6: NFE contents of different unconventional tree leaves (%).

4.7. Metabolizable energy (ME):

The Metabolizable energy was higher in Moringa leaf (1777Kcal/Kg), and lower in Ipil-ipil leaf (1405 Kcal/Kg).The Metabolizable energy percentage ranges from 1405-1780 Kcal/kg. The Metabolizable energy of Krishnachura was (1607 Kcal/Kg).

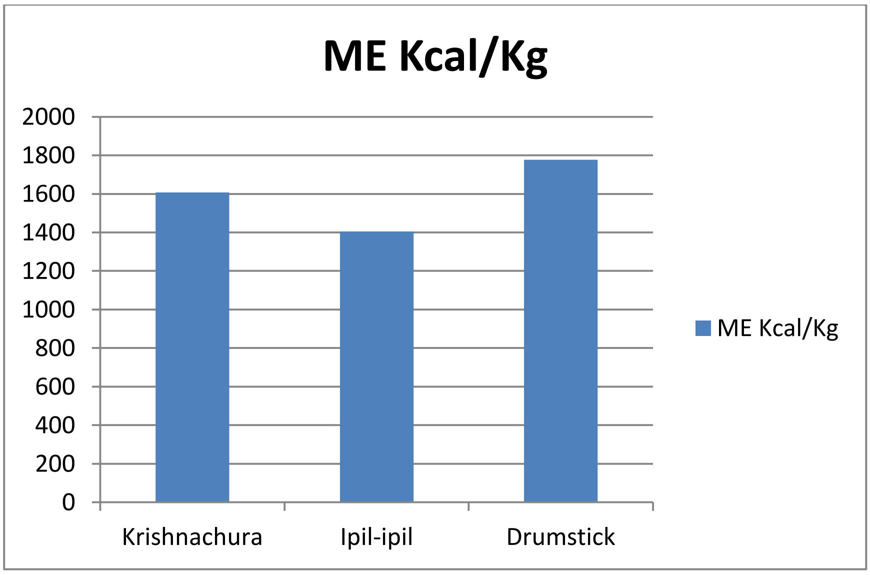

Figure 7: ME contents of different unconventional tree leaves (Kcal/Kg).

CHAPTER-V

CONCLUSION

From the study it was observed that the ash content was higher in Ipil-ipil leaf (10.73%), lower in Krishnachura leaf (6.70%). The ether extract content was higher in Ipil-ipil leaf (8.09%), lower in Moringa leaf (4.72%).The crude protein content was higher in Moringa leaf (22.98%), lower in Krishnachura leaf (14.26%).The crude fiber content was higher in Ipil-ipil leaf (18.60%), lower in Moringa leaf (9.15%). From this observation on the fodder trees indicates that, these feed resources are extremely useful for feeding domestic ruminants. This tree leaves can improve the performance of animals and reduced cost of feeding. These advantages justify more intensive and wider utilization of fodder trees in appropriate feeding systems and represent an important strategy for increasing the current level of contribution from livestock.

Recommendation:

1**.** Tree leaves can be used as animal feed however, its detail nutrient profile and toxicity need to be observe through detail analysis.

2. Feeding trial is essential to identify the optimum inclusion level of tree fodder in Animal and poultry feed.

CHAPTER-VI

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BIOGRAPHY

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