A STUDY ON EFFECTS OF MOLASSES AND ACETIC ACID ON ENSILLNG CHARACTERISTICS AND NUTRITIVE VALUE OF NAPIER GRASS SILAGE

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Contents

Table

Figures

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Abstract

Napier grass is frequently grown in tropical and subtropical nations due to its high dry matter content. By creating silage and combining acetic acid and molasses, we can increase their dry matter percentage, crude protein percentage, and ash percentage. The major objective of this experiment was to determine how molasses and acetic acid affected the silage of Napier grass. Here, we created the T0, T1, and T2 varieties of silage. T0 made only with Napiergrass. We used molasse& acetic acid in T1 (5% molasses + 5% acetic acid) and T2 (10% molasses + 5% acetic acid). They were observed for their physical characteristics, pH, and proximate percentages (moisture content, crude protein, crude fiber, and ash percentage). In comparison to the other two silages (T0 and T1), Silage T2 had a better color, odor, pH (pH 4.24), moisture content (78.65%), and Cp (11.25%). Thus, we say that molasses & acetic acid has good impact on fermentation of silage.

Keywords:Napier grass,Silage,Molasses,Acetic acid, Moisture,Crudefibre, Crude protein.

Introduction(Chapter 1)

Napier grass is an important fodder in Bangladesh because it has a good impact on our dairy cattle and goat production. It is one of the most promising grasses in tropical areas like Bangladesh because it has high potential dry matter, which helps increase ruminant production (Panna et al. 2019). It can grow in droughty areas, and it has first growing ability. As a result, our country farmers chose it first as a forage. But it has low digestibility, low herbage production, and low protein content. (Yokota, Okajima, and Ohshima, 1991). As a result, it cannot fill up the increasing animal production.

Silage making is another way of increasing animal production in tropical regions and can be fed when forage supplies are inadequate (Driehuis and Elferink 2000). Silage can be made from different crops and may be a more manageable product than hay (Zhang et al., 2022). Generally, tropical forages are low in water-soluble carbohydrates, which is very important for preserving silage (Yokota, Okajima, and Ohshima 1991). Ensiling of chopping Napier grass (1 cm) without its steam, we can make a good quality silage with the assembly of molasses and acetic acid.

Molasses is often added to silage as a sugar additive and is well known to increase fermentation and feeding quality (Yokota, Okajima, and Ohshima 1991). Molasses is commonly used to provide energy for lactic acid fermentation, and it has positive effects on pH and lactic acid levels (Arbabi and Ghoorchi 2008) [1]. As it creates an acidic environment during fermentation, it helps preserve the nutritional quality of silage and reduce the breakdown of proteins and other valuable nutrients, ensuring that the silage retains its nutritional value. (Bilal 2009**)** Acetic acid in low concentration (5% acetic acid) helps preserve the Napier grass silage. It also helps the fermentation process and transforms the sugars present in Napier grass into organic acids. This fermentation process not only preserves the forage but also improves its digestibility and palatability forlivestock**.** (Zanine et al., 2010).This kind of silage boosts dry matter intake, dry matter digestibility, and organic matter digestibility, boosting animal performance in ruminants when fermentation products are primarily lactic acid and acetic acid.

This research mostly focuses on

1. To investigate the effects of varying amounts of molasses and acetic acid on Napier grass silage.

2. To assess how nutrient-dense three different silages are.

Material Methods (Chapter 2)

Collection of samples

The sample Napier grass collected from the Upazilla Livestock Office and Veterinary Hospital was kaptai from their harvesting land. The Napier grass had 60 days of regrowth.

Preparation of silage

First of all, we chopped the Napier grass (1 cm) without steam and than prepared silage by mixing it with additives (molasses and acetic acid) and without additives. We prepared three kinds of silage on April 25, 23 and kept them for 30 days in a tight container.

Silage 1: Only Napier grass was kept in a tight container without any additives.

Silage 2: Here we mixed 5% molasses and 5% acetic acid in Napier grass and then kept it in a tight container.

Silage 3: Here we mixed 10% molasses and 5% acetic acid in Napier grass and kept it in a tight container.

Proximate analysis

Samples randomly taken from container approximately 200gm dried over night at 60°c and grind the dried sample finely.

Physical Characteristics-

Appearance, color, odor, fungus, and water content were tested immediately after opening the container.

Moisture

Samples were placed in an oven at 105 °C, and the weight loss was recorded until a constant weight was found. According to(Bodily 1956), dry matter was calculated.

Crude protein

Crude protein is determined by the microkjeldahl method. This method involves three steps. For digestion, a 0.5-g sample is oxidized with sulfuric acid in the presence of a catalyst. 2nd step distillation: digestible solute distilled with 2% boric acid in the presence of an indicator

Then the solution was titrated with standard alkali and the nitrogen amount calculated. The amount of crude protein obtained by multiplying the nitrogen value by 6.25

Crude fiber

2 g of the sample hydrolyzed with 1.25% sulfuric acid and 1.25% NaOH to estimate crude fiber (CF) by employing Mayanard's methods.

Ash

For determining ash, incinerate the dried sample at 6,000 for 24 hours. The residue was weighed and reported as an ash percentage.

Result (Chapter 3)

Physical qualities of silage

Table 1: Physical qualities of silage

Properties	**Silage (T0)**	**Silage (T1)**	**Silage (T2)**
Color	Greenish	Light brown	Golden Brown
Odor	Sour	Sour	Sour
Fungus	No	No	No
Water	No	No	No

P^H Value (table 2)

Table 2: pH value of silage

Parameter	**Silage 1**	**Silage 2**	**Silage 3**
P^H	4.74	4.53	4.24

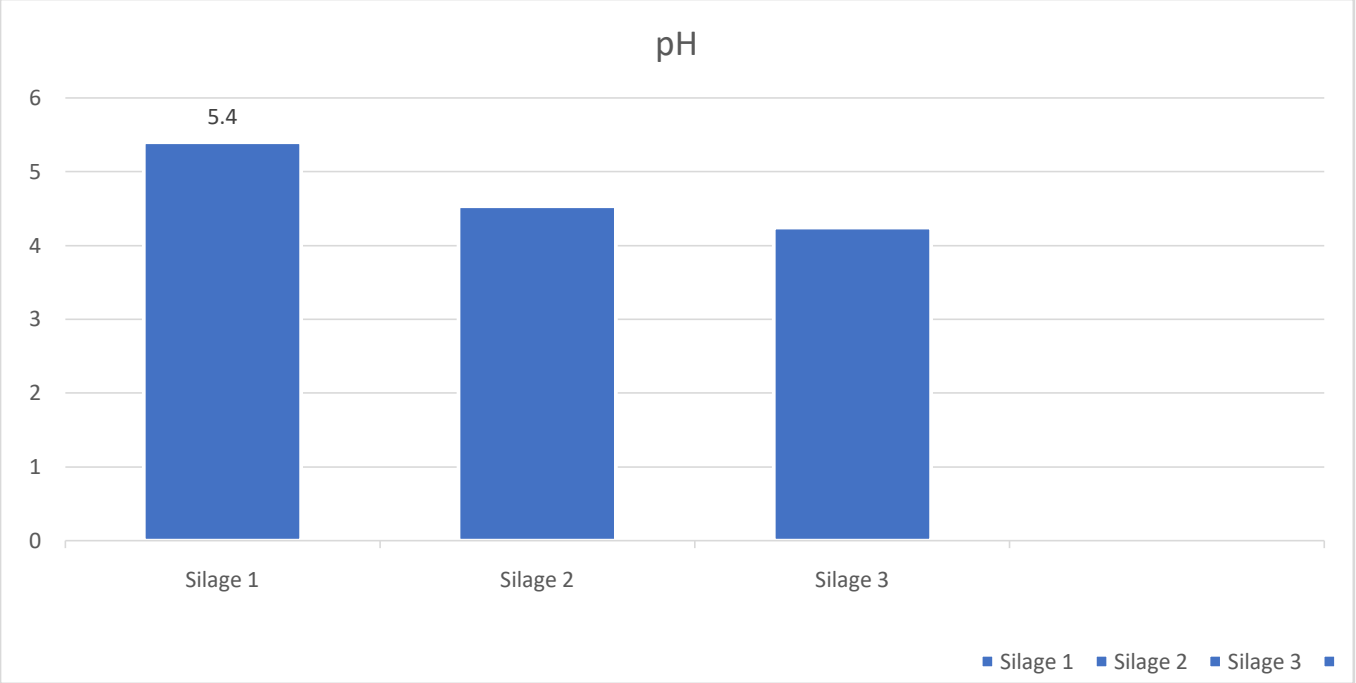

Figure 1: pH of silage

Chemical components of silage

Table 3: Chemical components of silage

Components	**Silage (T0)**	**Silage (T1)**	**Silage (T2)**
Moisture (%)	83%	80.85%	78.65%
CP (%)	8%	10.25%	11.25%
CF (%)	26.5%	30.5%	31%
Ash (%)	4.5%	4.3%	4.2%

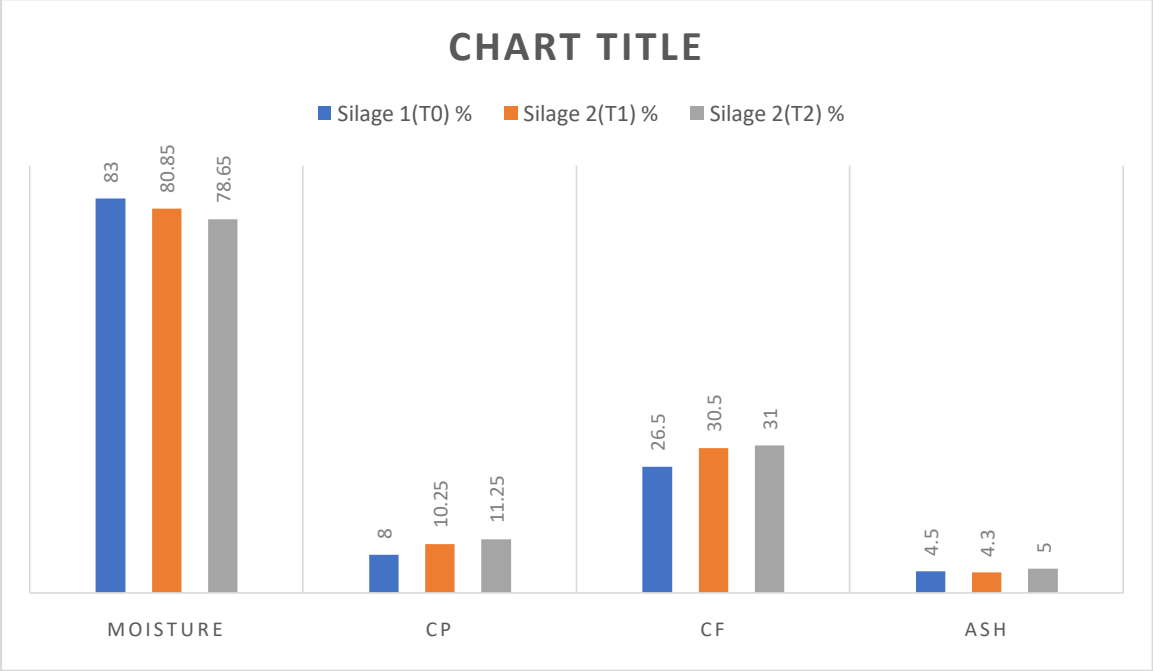

Figure 2: Chemical components of silage

Discussion (Chapter 4)

Physical quality characteristics of silage:

Color is a good indicator to determining the good quality silage .Basically, silage color is bright green or golden brown which indicates the good quality silage((Biosci et al. 2014).T2 and T0 color is golden brown and greenish. pH is another factor to determining the good quality silage below 4.5 is the best quality silage (Elferink et al. 2000). Here T2 silage pH (4.24) is lower than other two T0(4.74)&T1(4.53).The another parameter odor of the silage should be sour or acidic (Umami et al. 2023). We found T1, T2 & T0 silage odor issour. The silage should be free fungi or mold indicating a good aerobic stability and hygiene. We found no fungus & water in T1, T2, T3 silage due to maintaining tight ensiling & room temperature. Over all physical quality we saw that T2 silage is better than other two silage with comparison.

Chemical component analysis of silage

The silage's moisture content should range from 65% to 85%. Other than two (table 3), T2 silage's moisture percentage denotes high-quality silage. The silage should have a CP level of at least 10%, which denotes a high protein value and low fiber content. T1 (10.15%) and T2 (11.25%) Cp levels were greater in this study. Good-quality silage is also indicated by a CF level under 35%. CF levels were T0 (26.5%), T1 (30.5%), and T2 (31%), respectively, in this investigation. In this investigation, the ash percentage had no discernible impact T0 (4.5%), T1 (4.3%), or T2 (4.2%). So, we can say that T2 silage has excellent CF, CP, and dry matter, it is ideal for use as a silage in this study. Furthermore,T2 silage has a low pH which suggests that it can be stored for a long time. The Napier grass silage has a high pH value, low levels of lactic acid, VFA, and nitrogen when it isn't supplemented (Yokota, Okajima, and Ohshima 1991). The Napier grass silage's carbohydrate and enzymatic digestibility are both improved by the addition of additives such molasses (Randa et al. 2018). Acetic acid is not only an addition but also lowers pH and prevents yeast and mold from growing. Additionally, it functions as an antioxidant and antibacterial. The pH value dropped when Napier grass silage was treated with 2% PA (pyloriginous acid) (Dandan et al., 2022).We found T2 pH value is low due to additional treatment with acetic acid 5% acetic acid.In silage made from Napier grass, we discovered typical levels of moisture, crude fiber, and crude protein. However, we

discovered that it improved in terms of dry matter, crude fiber, and crude protein when we treated it with molasses and acetic acid. In general, T2 silage fared better than the two other silages that had been treated with 10% molasses and 5% acetic acid.

Conclusion

Here, only the silage quality of Napier grass is generally poor. Here quality is enhanced by other silage (T1) that contains 5% molasses and 5% acetic acid along with Napier grass acid. However, in this experiment, T2 silage, which had 10% molasses and 5% acetic acid fed to Napier grass, produced the silage of the highest quality. Therefore, we may conclude that silage's nutritional and fermentation quality could be enhanced by 10% molasses and 5% acetic acid.

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Biography

I am Partha Paul. I am the student of 23rd Batch and an intern veterinarian under faculty of veterinary medicine in Chattogram Veterinary and Animal Sciences University. I have passed Secondary School Certificate (SSC) in 2015 followed by Higher Secondary Certificate (HSC) in 2017. I come from Khondakar para from Rangunia. In the future, I would like to work as a veterinary practitioner and do research on clinical animal diseases in Bangladesh.