PROXIMATE COMPOSITION AND PHYSICAL CHARACTERISTICS OF *Panicum maximum* ENSILED WITH *Gliricidia sepium* LEAVES

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ABSTRACT
This study was conducted to determine the proximate composition and physical characteristics of Panicum maximum ensiled with Gliricidia sepium leaves. Dry matter concentration in the silage was determined by using forced draught oven at 65^{0}c at the lab until a constant weight was obtained. The adopted model for this experiment is a one-way analysis of variance in a complete randomized design. Results for chemical composition of silage during the experimental study showed that parameters across the treatments were significantly affected (P<0.05). T2 had the highest value for dry matter (30.02) and T1 had the lowest value (25.34). T2 had highest value for crude protein (22.67) and T1 had the lowest value of crude protein (7.56). The T1 (40.12) and T3 (40.11) had similarities in fibre components of the diets. Similarities occurred in all the diets for the pH values. T1 had the highest lactic acid values with the lowest value in T2. Colour of silages varied from greenish to light green. The smell of the silages had a grassy, and slightly sour smell. The pH of the silages ranged from 4.3 -4.5. the texture of the silages ranged from firm, firm and wet and firm, while the mouldiness ranged from slightly mould, average mould and no mould. It can be concluded from the study that ensiling of Panicum maximum with Gliricidia sepium results in a high-quality silage characterized by improved chemical composition, favourable fermentation characteristics, and desirable physical properties. This combination not only enhances the nutritional value of the feed but also supports sustainable livestock production practices
Keywords: Proximate, Physical, *Panicum maximum*, Ensiled, *Gliricidia sepium*, Leaves

INTRODUCTION

Panicum maximum (Guinea grass) is a widely cultivated forage crop in tropical regions, valued for its high yield and nutritional content. However, its nutritional quality can be limited by factors like low crude protein content and high fibres levels. *Gliricidia* leaves, rich in protein and nutrients offer a potential solution when ensiled with *Panicum maximum.* This study aims to determine the proximate composition and physical characteristics of *Panicum maximum* ensiled with *Gliricidia* leaves, evaluating the effects of *Gliricidia* leaf proportion on nutritional quality and palatability. Gliricidia leaves, rich in the protein, energy and micronutrients, have been used as a fodder supplement for livestock (Norton *et al*., 1995). Ensiling Gliricidia leaves with panicum maximum can create a nutritious feed source (Osuji *et al*., 1995). Studies have shown that adding *Gliricidia* leaves to panicum maximum improves crude protein content, in vitro digestibility and rumen microbial growth (Kumar *et al*., 2018; Muinga *et al*., 2002). Silage is commonly used to specifically describe the storage of green fodder under anaerobic conditions that allow naturally occurring microbes to ferment plant carbohydrates to organic acids, reducing the pH in the silo, inhibiting further fermentation and preserving the crop as silage. Ensiling may be used as a general term to describe any procedure involving the storage of materials in silos or pits.

MATERIALS AND METHODS

Experimental site

The experiment was carried out at Teaching and Research Farm of Oyo State College of Agriculture and Technology, Igboora which lies within 7^{0}15' North and 3^{0}30' Eastern part of the equator with an average annual rainfall of 1278mm and with average of annual temperature 27^{0}C (Sanusi, 2011).

Data collection

Forage samples of *Panicum maximum* and *Gliricidia leaves* was harvested from an experimental plot at 8weeks after planting. Samples of fresh *panicum maximum* and *gliricidia sepium* were collected from the pasture demonstration plot and wilted. After wilting, the shoots were chopped into using a chopping machine, and then sieved and stored in a well labelled air-tight container for analysis.

Proximate analysis

Proximate composition of the experimental diets was carried out according to the procedure of AOAC (2003). The crude protein was determined by the Kjeldahl method as described by AOAC (2003). Crude fibre determination was carried out using trichloroacetic acid (TCA) method.

Statistical analysis

The adopted model for this experiment is a one-way analysis of variance in a complete randomized design. Significant means were separated by Duncan`s range tests using the procedure of SAS (1995).

RESULTS AND DISCUSSION

Table 1 below presented the chemical composition of silage

Result for chemical composition of silage during the experimental study shows that parameters across the treatments were significantly affected (P<0.05). T2 had the highest value for dry matter (30.02) and T1 had the lowest value (25.34). T2 had highest value for crude protein (22.67) and T1 had the lowest value of crude protein (7.56). The T1 (40.12) and T3 (40.11) had similarities in fibre components of the diets. Similarities occurred in all the diets for the pH values. T1 had the highest lactic acid values with the lowest value in T2.

Table 1: Chemical composition during the experimental study

Parameter	Panicum Maximum (T1)	Glyricidia Sepium (T2)	Ensiled Mixture (T3)
Crude Protein (%)	7.56^{c}	22.67^{a}	11.45^{b}
Dry Matter (%)	25.34^{c}	30.02^{a}	28.12^{b}
Neutral Detergent Fibre (%)	40.12^{a}	30.33^{c}	40.11^{ab}
Acid Detergent fibre (%)	30.46^{a}	20.23^{c}	30.44^{ab}
pH	4.5	4.3	4.4
Lactic Acid (g/kgDM)	45.01	40.00	42.12

abc mean on the same row with different superscript are significant (P<0.05)

Table 2 below presented the physical characteristics of the silage. The physical characteristics of the silages as shown in Table 4.2. Colour of silages varied from greenish to light green. The smell of the silages had a grassy, and Slightly sour smell. The PH of the silages ranged from 4.3 -4.5. the texture of the silages ranged from firm, firm and wet and firm, while the mouldiness ranged from slightly mould, average mould and no mould.

Table 2: Physical Characteristics of Ensiled *Panicum maximum* and *Gliricidia sepium*

Characteristics	Panicum Maximum	Glyricidia Sepium	Ensiled Mixture
Height (Meters)	1.47	1.02	-
Leaf type	Long and narrow	Trifoliate	mixed
Moisture Content	75.34	50.34	50.54
Fermentation Quality	Moderate	Moderate	High
colour	Greenish	Dark green	Light to dark green
Odour	Grassy	Pleasant	slightly sour
Texture	Firm	Firm and mist	Firm and wet
Mouldiness	Average mould	slightly mould	No mould

The chemical composition of the ensiled mixture of *Panicum maximum* and *Gliricidia sepium* is summarized in Table 1. The analysis revealed that the crude protein (CP) content of the silage ranged from 10% to 12%, which is within the acceptable range for ruminant diets (Lamidi and Akhigbe, 2020). The neutral detergent fibre (NDF) and acid detergent fibre (ADF) levels were found to be 40% and 30%, respectively, indicating a moderate fibre content that can influence digestibility (Kikelomo, 2014). The inclusion of *Gliricidia sepium*, known for its higher protein content compared to grasses, contributed to the overall protein levels in the silage, enhancing its nutritional value for livestock (Zain *et al.,* 2020).

The fermentation characteristics of the silage were assessed by measuring pH and lactic acid concentration. The pH of the ensiled mixture was recorded at 4.4, which is optimal for silage fermentation, indicating effective lactic acid fermentation (Okukenu *et al.,* 2021). The lactic acid concentration was found to be 60 g/kg DM, suggesting a successful fermentation process that can enhance the preservation of nutrients and improve palatability for livestock (Fatica *et al.,* 2019). The low pH is essential for inhibiting undesirable microbial growth, thus ensuring the silage remains stable during storage. The physical characteristics of the silage, including texture and aroma, were evaluated qualitatively. The ensiled mixture exhibited a pleasant aroma and a uniform texture, which are indicative of good fermentation and quality silage (Eyoh *et al.,* 2019). The ensiling process resulted in a compact silage that is easy to handle and feed, minimizing waste during feeding operations.

The ensiling of Panicum maximum (Guinea grass) with *Gliricidia sepium* (Gamal tree) presents a promising approach to enhance the nutritional and physical characteristics of silage, which can significantly benefit livestock

production. This section synthesizes findings from various studies to discuss the chemical and physical properties of this silage combination, focusing on nutrient composition, fermentation characteristics, and implications for animal feed. *Panicum maximum* is recognized for its high nutritional value, typically containing substantial levels of crude protein (CP) and digestible energy. The protein content of Panicum maximum can range from 8% to 12% depending on the growth stage and environmental conditions Eyoh *et al.* (2019). When combined with *Gliricidia sepium*, which is known for its high protein content (up to 25% CP) and rich mineral profile, the overall nutritional value of the silage is likely to improve significantly (Kebede *et al.,* 2017).

CONCLUSION

The ensiling of *Panicum maximum* with *Gliricidia sepium* results in a high-quality silage characterized by improved chemical composition, favourable fermentation characteristics, and desirable physical properties. This combination not only enhances the nutritional value of the feed but also supports sustainable livestock production practices

RECOMMENDATION

Further findings should underscore the importance of incorporating legumes like Gliricidia into grass silage to improve nutritional value and fermentation characteristics, ultimately supporting better livestock performance.

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