COMPARATIVE EVALUATION OF NUTRITIVE QUALITY OF FORAGE GRASSES (MAIZE AND ELEPHANT GRASS) AND FORAGE LEGUMES (LABLAB AND MUCUNA)

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Abstract
The study was conducted to evaluate and compare the nutritional value of maize (*Zea maise)* and Elephant grass (*Pennisetum purpureum*)forages and lablab (*Lablab purpureum)* and mucuna (*Mucuna pruriens*)as animal feed. Twelve week post-planted forages were sampled in three replicates. Sub-samples were taken and oven dry 65˚C for 48hrs and constantly weight for dry matter determination. Thereafter, proximate and fibre fractions were determined. The results revealed that maize forage had significant higher DM and CF compared to elephant grass while elephant grass forage had higher CP, EE, Ash, NFE, ADF, AND and NDF(12.01%, 2.12%, 2.40%, 72.76%, 54.87% and 40.70% respectively). In contrast, lablab had higher CF, NDF and ADF than mucuna. Mucuna forage on the other hand had higher CP, EE and Ash (27.33%, .177% and 4.93% respectively).

Key word: maize, elephant grass, lablab, mucuna, analysis

INTRODUCTION

Feed quality and availability are major constraints in increasing ruminant animal productivity under tropical conditions. Under the tropical pattern of pasture production in the Savannah, sustainable supply of feeds can be achieved through judicious choice of suitable plant species, soil fertility management and fodder conservation practices (Kallah, 1990).Manipulation of forage species selection, production technique and conservation practices effectively bridge the gap of feed supply during the dry season for increment of growth, milk yield and survivability.Maize (*Zea mays*) is the third most important crop in the world (Bilal *et al*, 2008) and many countries make it available for livestock feeding. Forage maize provides high quality yields of palatable forage. It is an important crop for silage making due to its ease of cultivation, high dry matter yields, low buffering capacity and high concentration of water-soluble carbohydrates and ensile easily (Griffith's *et al.* 2004).Elephant grass (*Pennisetum purpureum*) is a robust perennial crop considered to be important forage in animal production due to its high yields, ease of propagation and broad ecological adaptation (Trisha, 2010). Young growth makes good hay, which can be fed as hay or pellets and can produce good quality silage. It can be well establishes from seed, although almost invariably planted from setts or splits. Legumes are considered as superior animal feed to grasses because of higher voluntary intake of digested nutrients (Goering *et al.* 1991; Thomson *et al.* 1991) and higher nutrient contents. The tropical legumes such as *Lablab purpureum* (Lablab)and *Mucuna pruriens* (Mucuna) may be used in improving ensiling quality of maize and elephant grass. There is a sporadic year-round shortage in supply of pasture, both in quantity and quality, despite the abundance availability of feed during the late rainy season (Muhammad *et al.* 2009). Therefore, the aim of the research is to evaluate the nutritional value of maize, elephant grass, mucuna and lablab forages.

Materials and method

Experimental site

The study was conducted at Central Laboratory of National Animal Production Research Institute Shika. Field grown foragematerials were sampledtwelve weeks post planting in triplicates. Fresh weight was determine using a weighing scale and sub-sample taken (200-350g) and oven dried at 65˚C for 48hrs, and reweighted to a constant weight to estimate the dry matter yield using the equation:

$$Dry\ matter\ percentage = \frac{weight\ of\ \ fresh\ sample - weight\ of\ \ dry\ sample}{weight\ of\ \ fresh\ sample} \times 100$$

Chemical and Statistical Analysis

The dried samples of forages material were ground using a hammer mill and passed through 1-2mm sieve. Proximate analysis was carried out to determine Nitrogen (N) for crude protein determination (Nx6.25), Crude Fibre (CF), Ether Extract (EE) and ash content according to (AOAC, 2005). Neutral Detergent Fibre (NDF) andAcid Detergent Fibre (ADF)according to Van-Soest *et al.* (1991). The data collected were subjected to Analysis of Variance using the General Linear Model Procedure of SAS, 2005. Differences between the means were considered significant at 0.05 probability level.

RESULTS

Proximate and fibre composition (%) of 12 weeks post-planted maize and elephant grass forages

The proximateand fibre fractions of maize and elephant grass harvested at 12-weeks post planting were presented in Table 1. The % dry matter (DM) of the forages varied significantly ($p<0.05$) form 90.50 to 95.50%. Higher DM was recorded from maize forage. Elephant grass forages had higher %CP (12.01%) compared to maize forage (8.36%). Significant ($p<0.05$) variation exist in CF contentwith the highest value observed in maize forage (30.77%). Elephant grass had significantly ($p<0.05$) higher percent EE, Ash, NFE, NDF and ADF (2.12, 2.40, 72.76, 58.87 and 40.70 respectively) compared to maize

Proximateand fibre composition (%) of lablab and mucunaforages at 12 weeks post-planting

The proximate and fibre composition of lablab and mucuna legume forages were presented in Table 2. There no significant differences ($p>0.05$) in DM and NFE contentsbetween the forages. Mucuna had significantly higher CP (27.33%). The variation in CF ranges from 11.57 to 13.23%, higher value was recorded from lablab forage. Mucuna had higher ($p<0.05$) EE and Ash compared to lablab (1.77% and 4.93%) and (0.86% and 4.67%) respectively. Lablab forage had significant ($p<0.05$) higher NDF (48.47%) and ADF (34.70%) compared to mucuna (43.49% NDF and 32.81% ADF).

DISCUSSION

Nutrient composition of maize and elephant grass harvested at 12 weeks after sowing

Maize and elephant grass forages are two popular forage crops used in animal husbandry. Understanding the factors influencing their DM content is crucial for optimizing their use as animal feed. The higher DM content in maizecompared to elephant grass of the same age can be attributed to differences in leaf structure. Maize forage has a more compact leaf structure than elephant grass (Fritz et al., 2018), which can lead to higher DM content. In contrast, the more open leaf structure of elephant grass can result in higher water content and lower DM content. Additionally, genetic control of soluble carbohydrate content plays a role. Maize forage tends to have higher levels of soluble carbohydrates, such as sugars and starches, which contribute to its higher DM content. This is due to genetic differences in the regulation of carbohydrate metabolism (Zhang *et al.,* 2018).This difference observed in the CP contents between the two grasses could be attributed to their varying maturity rates; elephant grass takes longer time to mature than maize, allowing for more protein accumulation

(Osuji *et al.,* 2015). Additionally, the difference in nitrogen uptake may play a role, as elephant grass has a more extensive root system than maize, enabling better nitrogen absorption and utilization (Mekonnen *et al.,* 2018).The higher CF content of maize compared to elephant grass could be attributed ithigher lignin complex polymer that contributes to fibre content (Jung and Allen, 2017) and thicker cell walls (Grabber *et al.,* 2015).Ether extract represent the oil/fat forage fraction. The higher EE concentration of elephant grass compared to maize forage could be attributed to higher lipid content in elephant grass leaves (Adebowale *et al.,* 2016; Oliveira et al., 2017).Similarly, the ash content in elephant grass may be attributed to differences in mineral uptake efficiency, with elephant grass having a higher efficiency, particularly for potassium and calcium, which contribute to its higher ash content (Lima *et al.,* 2018).The neutral detergent fibre (NDF) and acid detergent fibre (ADF) contents are also higher in elephant grass is be attributed to differences in cell wall composition, with elephant grass having a higher cell wall content, particularly in the stems, which contributes to its higher NDF and ADF content (Melo *et al.,* 2019). Additionally, the fibre structure of elephant grass is more complex, with a higher proportion of sclerenchyma cells, which contribute to its higher NDF and ADF (Oliveira *et al.,* 2017, this will further explain the higher NFE to the higher soluble carbohydrate content, particularly sugars and starches in elephant grass leaves (Santos *et al.,* 2019; Pires *et al.,* 2020).

Nutrient composition of Lablab and Mucunaat 12 weeks post planting

Higher nutrient profile is among the yardstick for determining forage quality. Mucuna forage prove superiorin term of CP, EE and ash content compared to lablab. The higher CP, EE and ash could be attributed to its higher amino acid and fatty acid composition (Adebowale *et al.,* 2017; Ogunwole*et al.,* 2017) and mineral density (Adebowale *et al.,* 2017).Lablab, on the other hand, exhibits higher crude fibre (CF), acid detergent fibre (ADF), and neutral detergent fibre (NDF) compared to mucuna, as observed in this study. This disparity may be attributed to higher cell wall content and lignin levels (Ezeagu *et al.,* 2015; Kumar *et al.,* 2017). It may also be due to differences in the proportion of soluble fibre, with lablab containing a greater proportion of insoluble fibre compared to mucuna, leading to higher CF, ADF, and NDF values (Ezeagu *et al.,* 2015).

CONCLUSION

Based on the finding of the study, elephant grass and mucuna were superior to maize and lablab forages due to their higher CP, EE and ash contents with corresponding CF, ADF and NDF. Feeding trial is recommended to ascertain voluntary feed intake and animal performance of such forages.

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Table 1. Proximate and fibre composition (%) of 12 weeks post-planted maize and elephant grass forages

Grasses	DM	CP	CF	EE	ASH	NFE	NDF	ADF
Maize	95.5[a]	8.36[b]	30.77[a]	1.29[b]	1.77[b]	61.73[b]	46.20[b]	37.40[b]
Elephant grass	90.5[b]	12.01[a]	20.71[b]	2.12[a]	2.40[a]	72.76[a]	54.87[a]	40.70[a]
SEM	0.29	0.007	0.007	0.007	0.009	0.007	0.102	0.041

Means with same letter superscript within column were comparable (p>0.05)
DM=dry matter, CP=Crude protein, CF=Crude fibre, EE=Ether Extract, NFE Nitrogen detergent fibre, NDF=Neutral Detergent Fibre, ADF=Acid Detergent Fibre

Table 2. Proximate and fibre composition (%) of lablab and mucuna forages at 12 weeks post-planting

Legumes	DM	CP	CF	EE	ASH	NDF	ADF	NFE
Lablab	91.70	24.06[b]	13.23[a]	0.86[b]	4.67[b]	48.47[a]	34.70[a]	57.11
Mucuna	91.43	27.33[a]	11.57[b]	1.77[a]	4.93[a]	43.49[b]	32.81[b]	57.32
SEM	0.36	0.007	0.001	0.013	0.009	0.05	0.129	0.007

Means with same letter superscript within column were comparable (p>0.05)
DM=dry matter, CP=Crude protein, CF=Crude fibre, EE=Ether Extract, NFE Nitrogen detergent fibre, NDF=Neutral Detergent Fibre, ADF=Acid Detergent Fibre