RESPONSE OF FIBER FRACTIONS OF *Panicum maximum* cv. Mombasa TO VARIED FERTILIZER LEVELS AND HARVEST TIME

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ABSTRACT

The experiment was carried out to investigate the response of fiber fractions of *Panicum maximum* cv. Mombasa to varied levels of fertilizer (NPK 15-15-15) and harvest time in Shika, North Western Nigeria. The experiment was laid out in 4x3 factorial arrangements in Randomised Complete Block Design (RCBD). The 2 factors were fertilizer levels (0, 200, 300 and 400 Kg/ha NPK 15-15-15) and harvest time (8, 10, and 12 weeks after planting, WAP). All data collected were subjected to analysis of variance. ADF values decrease significantly from 29.74% in unfertilised treatment to 28.01% in treatment with 400kg NPK. NDF was highest ($P<0.05$) (50.77%) in 400kg NPK fertilised treatment. NDF and lignin content of the forage increased with age. Fertilizer application influences fiber fractions of *Panicum maximum* cv. Mombasa and further studies should be done to understand this new cultivar better.

Keywords: **Fertilizer, Fiber, harvest-time, Mombasa, *Panicum*.**

Introduction

Fiber is one of the most important components in diets of ruminants. Fermentation of fiber in the rumen provides the rumen microbes with food to grow and multiply. The microbes in turn are utilised by the animal as a source of protein. Grass hay serves as a major source of fiber in ruminant's feed. NRC (1989) recommends that 75% of dairy cow's diet be traditional fiber source like grass hay in order to meet the fiber requirement of dairy cows. The forage specie, *Panicum maximum* is one of these extensively used forage grasses as ruminant feed (Correa and Santos, 2003). *Panicum maximum* (Guinea grass) is a native of tropical Africa, extending to the sub-tropics of South Africa. Mombasa is a new Cultivar of *Panicum maximum* with little studies on different aspects of its value in Nigeria. The use of inorganic fertilizers can significantly increase forages production, providing greater capacity and thus resulting in higher milk and meat production per unit of area used (Iwamoto *et al.*,2015). Thus, studies into the response of fiber fractions of Mombasa to varied levels of fertilizer (NPK 15-15-15) application and harvest time are important.

Materials and methods

Site of the experiment

The experiment was done at the Experimental Field of National Animal Production Research Institute, Shika, Kaduna State. Shika is located on Latitude 11°12' N and Longitude 7°33'E in the sub-humid zone of Nigeria (Ovimaps, 2016). The top soil (0-15cm depth) of the experimental site consists of 16% clay, 30% silt and 54% sand. It is a sandy loam soil. The soil is acidic with pH and Organic carbon values of 5.50 and 0.67% respectively. The Nitrogen content of the soil was 0.175% while the available phosphorus was 23.28ppm. The exchangeable cations present in the soil are Ca^{2+} (4.0), Mg^{2+} (1.50), K^{+} (0.64) and Na^{+} (0.32) all in meq/100g of soil. The soil has cation exchange capacity, exchangeable acidity and electrical conductivity of 8.70cmol/kg, 0.80cmol/kg and 0.070dsm respectively. Total annual rainfall of 906.40 mm with 76 days of rain was recorded in the study area. . The mean relative humidity and mean sunshine observed were 73.33% and 7.00 hours respectively. The maximum air temperature (35.16°C) was recorded in nearest Meteorological station (IAR, Zaria) in May whereas the minimum (18.65°C) was in October (IAR, 2016).

Experimental design and Sources of materials

The field was ploughed, harrowed twice and levelled to provide a good seedbed for proper seed germination and seedlings establishment. The experiment was laid in a Randomised Complete Block

Design (RCBD) with 4 treatments and 3 replicates. The fertilizer levels are 0, 200, 300 and 400 Kg/ha NPK 15-15-15 for treatment 1, 2, 3 and 4 respectively. The field was divided into 3 blocks of $47m^2$ each and 1m apart. Each block contains 12 experimental plots which were $3m^2$ each at 0.5m apart. Seeds were drilled in rows 50cm apart at the rate of 20kg/ha. The fertilizer was applied in two splits at 1 and 3 weeks after planting, applying half of the dose in each split. All plots were hand weeded twice at 3 and 5 weeks after planting. The forage was harvested at 12^{th} week after planting. The *Panicum maximum* cv. Mombasa's seeds were sourced from the Feed and Nutrition Research Programme of National Animal Production Research Institute, Shika, Zaria while the NPK fertilizer (15-15-15) was procured from Samaru Market, Zaria.

Chemical analysis

The Neutral detergent fibre (NDF), Acid detergent fibre (ADF) and lignin were determined according to methods of Van-Soest *et al.,* (1991).

Statistical analysis

Data collected were subjected to the analysis of variance procedure using General Linear Model Procedure of SAS (2005) and where treatment means differed significantly, they were separated using the Duncan's Multiple Range Test (DMRT).

Results

The fibre content of *Panicum maximum* cv. Mombasa, as influenced by fertilizer levels, is presented in Table 1. Acid detergent fibre (ADF) decreased as fertilizer rates increased. The control (29.74%) had the highest ($P<0.05$) ADF, treatments with 0 and 200 kg/ha NPK fertilizer were statically similar whereas treatment with 400kg/ha NPK fertilizer (28.01%) had the lowest ($P<0.05$) ADF content. Neutral detergent fibre (NDF) followed a trend opposite to ADF. Fertilizer levels did not significantly ($P>0.05$) affect the lignin content of *Panicum maximum* cv. Mombasa.

Figure 1 showed results of the response of Acid detergent fibre (ADF), Neutral detergent fibre (NDF) and lignin contents of Mombasa grass to harvest time. ADF was not influenced by harvest time but NDF and lignin content of the forage showed some significant changes. The % NDF differed significantly ($P<0.05$) from 49.18% and 49.52% at 8^{th} and 10^{th} week respectively to 50.48% at 12^{th} week. The result from this study indicated that the lignin content of the grass increased with age. Although lignin at weeks 10 (21.55%) and 12 (21.68%) were not statistically ($P>0.05$) different but were higher than that at week 8 (20.96%).

Discussion

The NDF in this study as affected by fertilizer rate is in concurrence with the trend reported by Okwori and Magani (2010) and Ortega-Gomez *et al.* (2011) in some grass species. However, Geleti and Tolera (2013) reported an inconsistent trend in NDF as *Panicum coloratum* matures with time. The trend observed in this study may be due to changes in the physiology of the plant as it matures. This reduces the amount of cell cytoplasm accompanied by an increase in percentage fibre content. The trend in lignin content of the *Panicum maximum* cv. Mombasa was similar to that reported by Gomide (1978) and Carpici (2001) whereas Geleti and Tolera (2013) observed an insignificant difference in lignin as grass matures. This can be attributed to the need for more fibre for support as the grass grows taller. It should be noted that all values in this study are above the 21% and 28% requirements of ADF and NDF respectively in lactating cows' diet`s (NCR, 1989) and by extension will be adequate for most classes of ruminants.

Conclusions and Recommendations`

In conclusion fertilisation and time of harvest influences fiber fractions. But further studies should be done with other fertilizers and rates and at other harvest periods higher than the one in this experiment to understand this new cultivar better.

Table 1: Effects of fertilizer levels on fibre fraction (%) of *Panicum maximum* cv. Mombasa

Treatment	ADF	NDF	Lignin
Fertilizer Levels			
0 kg/ha	29.74[a]	48.62[c]	21.68
200 kg/ha	29.01[b]	49.70[b]	21.44
300 kg/ha	28.76[b]	49.80[b]	21.29
400 kg/ha	28.01[c]	50.77[a]	21.21
SEM	0.25	0.28	0.48
LOS	*	*	NS
Weeks After Planting			
8 weeks	29.14	49.18[b]	20.96[b]
10 weeks	28.94	49.52[b]	21.55[a]
12 weeks	28.56	50.48[a]	21.68[a]
SEM	0.22	0.37	0.63
LOS	NS	*	*
Interaction			
FxW	NS	NS	NS

[a,bc] Mean values with different superscripts within a column differed significantly, SEM: Standard error of means, LOS: Level of significance, *: Significant at P<0.05, NS: Not significant at P>0.05, FxW: Interaction between fertilizer and weeks after planting, ADF: Acid detergent fibre, NDF: Neutral detergent fibre.

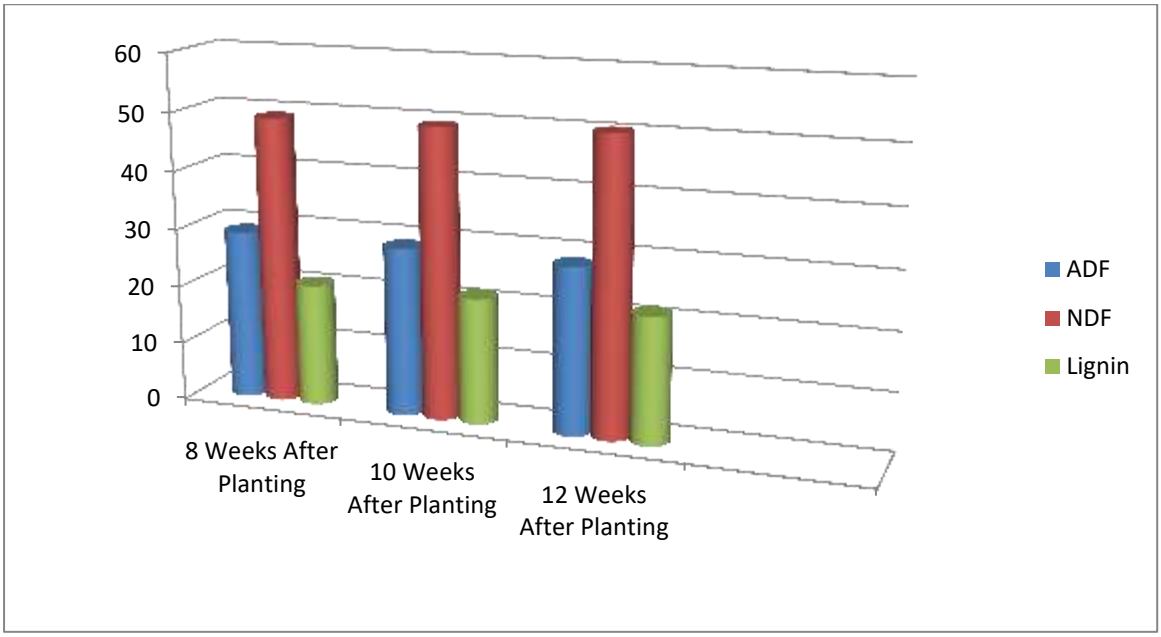

Figure 1: Effects of harvest time on fibre fraction of Panicum maximum cv. Mombasa

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