GROWTH COMPONENTS AND FORAGE YIELD OF *Panicum mombasa* AS INFLUENCED BY NPK (20:10:10) FERTILIZER RATES

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ABSTRACT
The study was conducted during the 2024 rainy season to evaluate the growth and forage yield of Panicum mombasa as influenced by NPK (20:10:10) fertilizer rates at different ages. It was laid out in 4 x 4 factorial in split-plot design and replicated 3 times with fertilizer levels (0, 50, 100, and 150 Kg/ha NPK 20:10:10) as main plot and harvest time (4, 8, 12 and 16 WAS) as sub-plot. There was a significant (P<0.05) effect of NPK (20:10:10) fertilizer rates on plant height, number of leaves, leaf length, leaf width, tiller numbers, and fresh and dry forage yields. Higher plant height (87.20cm), number of leaves (25.28), leaf length (62.22cm), leaf width (3.73cm), tiller number (7.46), fresh (12.64 t/ha) and dry (6.78 t/ha) forage yields were obtained at 150 kg/ha NPK. Significantly, the age at harvest affected the growth components and fresh and dry forage yields in which higher plant height (107.72cm), number of leaves (33.01), leaf length (81.22cm), leaf width (5.43cm), tiller numbers (9.37), fresh (16.80 t/ha) and dry (5.24 t/ha) forage yields were recorded at 150 kg/ha NPK for P. mombasa. There was a non-significant (P>0.05) interaction effect between fertilizer rates and age of harvest on growth components and fresh and dry forage yields of P. mombasa. In conclusion, the growth components, and fresh and dry forage yields of P. mombasa forage were improved when NPK fertilizer was applied at 150 kg/ha while P. mombasa forage harvested at 12WAS gave higher growth and better forage yield. It can be recommended that for better growth and yield of P. mombasa forage, 150 kg/ha NPK (20:10:10) should be applied and harvested at 12WAS.
Keywords: Growth, Fertilizer, Forage, Panicum

INTRODUCTION

The main limitations to animal production in Nigeria include a lack of green feed for at least half of the year, coupled with the low nutritive quality of the forages (Alan *et al.,* 2013). Also, soil fertility problems are found in most tropical pasture situations. Thus, the introduction of more nutritive forages and the use of fertilizers can help in alleviating these problems (Adewumi, 2007).

Panicum maximum cv. Mombasa being forage with high crude protein (10-14%) and herbage yield of up to 40.2 tonnes of dry matter per annum can be useful in alleviating the ruminant's nutritional crisis in Nigeria (Umar, 2018). There is little or no work on this new cultivar (*Panicum maximum* cv. Mombasa) in this part of the country. Therefore, this study is aimed at evaluating the effects of fertilizer levels and stage of harvest on yield and nutritive composition of *P. maximum* cv. Mombasa in Maiduguri.

Fertilizer contributes to the greater productivity of Mombasa guinea grass by increasing production per cycle and the number of harvest cycles. Increasing rates of nitrogen significantly increased CP and NDF concentrations in stems and leaves and; ADF concentrations in stems and reduction in the crude fiber content of stem (Hare *et al.,* 2015). In addition, it can also provide other supplementary effects that will increase the efficiency of the system as a whole, such as the production of silage or hay to be used during the dry season (Cecato *et al.,* 2001).

The maturity stage at harvest is the most important factor determining forage quality and forage quality decreases with delay in harvest time. The stage of maturity also affects the quality and quantity of grasses *P. Mombasa* inclusive. Dry Matter yield increases with advancing maturity, but quality declines (Taute *et al.,* 2002). Umar *et al*. (2021) noted that cutting interval and fertilizer application have a significant influence on the chemical composition of *P. maximum* forage. The objective of the study was to evaluate the growth components and forage yield of *P. mombasa* as influenced by NPK (20:10:10) fertilizer rates at different ages.

MATERIALS AND METHODS

Location of the Study

The study was conducted at the Pasture Experimental Field of the Teaching and Research Farm of the Department of Animal Science, University of Maiduguri. Soil of the experiment site was typical of a tropical region that was low in total nitrogen and available phosphorus with sandy loam textural class.

Sources of Experimental Materials

The seeds of *Panicum mombasa* were sourced from National Animal Production Research Institute, Shika, Ahmadu Bello University, Zaria while the NPK fertilizer (20:10:10) was procured from the Open Market in Maiduguri. The field was ploughed, harrowed, and leveled to provide a good seedbed for proper seed germination and seedling establishment.

Experimental Design and Layout

The experiment was laid out in 4 x 4 factorial arrangements in split-plot replicated three times with fertilizer levels (0, 50, 100, and 150 Kg/ha NPK 20:10:10) as main plots and stage of harvest (8 and 12 weeks after sowing, WAS) as sub-plot. The field was divided into 3 blocks of 9 x 3m ($27m^2$) and 1m apart. Each block contained 4 experimental plots which were 2 x 3m ($6m^2$) at 0.5m apart. Seeds were drilled in rows 50cm apart in June 2024 at a seed rate of 20kg/ha. The fertilizer was applied as a single dose at 3 weeks after planting. All plots were hand-weeded as the need arose. The forage was harvested in the 16th week after planting.

Parameters measured: Data on plant height, number of leaves, leaf length, leaf width, and tiller number, per plant, were taken at 4, 8, 12, and 16 weeks after planting. Five (5) plants per plot were randomly selected and tagged for the various measurements according to the methods of Tarawali *et al.* (1995).

***Forage yield*:** This was determined at 4, 8, 12, and 16 WAS by cutting plants within a $0.5m^2$ quadrant with a sickle to the height of 10cm above the ground level. The fresh forage was weighed in the field using a sensitive weighing scale and sub-samples were oven-dried at 65^0C for 48 hours and reweighed to estimate dry matter yield according to Tarawali *et al.* (1995).

Dry matter production was calculated as:

Dry matter (kg/ha) = Total FW x (DWss/FWss) x 10

Where:

Total FW = Total fresh weight from 0.5 m^2 in (g)

DWss = Dry weight of the sub-sample in (g)

FWss = Fresh weight of the sub-sample in (g)

Statistical Analysis: Data collected were subjected to the analysis of variance procedure using SAS (2005) significant means will be separated using the Duncan's Multiple Range Test (DMRT) (Duncan, 1955).

RESULTS AND DISCUSSIONS

Growth components of *Panicum mombasa* as influenced by NPK (20:10:10) fertilizer rates, age of harvest, and their interaction

There was a significant ($P<0.05$) effect of fertilizer rates on all growth components of *P. Mombasa* (Table 1). The increase observed in plant height, number of leaves, leaf length, leaf width, and tiller numbers could be attributed to the greater availability of nutrients which influenced the growth rate of the grass. The significant effect of NPK (15:15:15) fertilizer and increased growth components of *P. maximum* cv. Mombasa concurs with the findings of Umar (2018) at Shika, Zaria. In an earlier study by Alexandrino *et al.* (2005) with *P. maximum* cv. Mombasa and Adjolohoun *et al.* (2013) for *P. maximum* ecotypes, a significant fertilizer effect was reported. The values of plant height (105.80 – 133.70 cm), number of leaves (33.30 – 70.30), leaf length (46.10 – 55.70 cm), and tiller numbers (12.00 – 22.00) reported by Umar (2018) were above the values obtained in this present study whereas the leaf width (2.20 – 2.40 cm) was below the values obtained.

Table 1: Growth components of *Panicum mombasa* as influenced by NPK (20:10:10) fertilizer rates, age of harvest, and their interaction

Treatments	PH (cm)	NL (No.)	LL (cm)	LW (cm)	TN (No.)
Fertilizer Rate (kg/ha)					
0	52.78^{c}	20.76^{b}	40.97^{c}	2.70^{b}	5.70^{d}
50	69.37^{b}	21.67^{b}	49.64^{b}	2.88^{b}	6.36^{c}
100	70.39^{b}	23.76^{ab}	53.62^{b}	2.90^{b}	6.89^{b}
150	87.20^{a}	25.28^{a}	62.22^{a}	3.73^{a}	7.46^{a}
SEM	3.77*	1.50*	2.41*	0.20*	0.28*
Age of Harvest (WAS)					
4	18.30^{d}	14.66^{d}	14.66^{d}	0.92^{d}	1.98^{d}
8	64.91^{c}	18.58^{c}	47.03^{c}	1.82^{c}	6.46^{c}
12	88.82^{b}	25.25^{b}	63.55^{b}	4.05^{b}	8.55^{b}
16	107.72^{a}	33.01^{a}	81.22^{a}	5.43^{a}	9.37^{a}
SEM	3.77*	1.50*	2.41*	0.20*	0.28*
Interaction					
F x W	0.308	0.562	0.071	0.086	0.829

^{abcd}Means with different superscript within column differed significantly ($P<0.05$), SEM = Standard error of the mean, PH = Plant height, NL = Number of leaves, LL = Leaf length, TN = Tiller numbers, WAS = Weeks after sowing, F = Fertilizer rate, W = Weeks

All growth components studied increased as age was delayed from 4 to 16 WAS. This was in tandem with the report of Umar (2018) for *P. maximum* cv. Mombasa when cutting age was delayed from 6 to 12 WAS. The grass had enough time for physiological development and growth. The values of plant height (40.60 – 215.80 cm), number of leaves (23.20 – 65.00), leaf length (37.10 – 70.40 cm), and tiller numbers (5.00 – 23.00) reported by Umar (2018) were above the values obtained in this present study whereas the leaf width (1.60 – 2.60 cm) was below the values obtained. The variations may be ascribed to the composition of the NPK fertilizer, the amount applied, the stages of harvest, and the environmental differences. There was a non-significant (P>0.05) interaction effect between fertilizer rate and age of harvest on growth components of *P. mombasa*.

Fresh and dry forage yields of *Panicum mombasa* as influenced by NPK (20:10:10) fertilizer rates, age of harvest, and their interaction

The fresh and forage yield of *P. mombasa* as influenced by NPK (20:10:10) fertilizer rates, age of harvest, and their interaction is shown in Table 2. There was a significant (P<0.05) effect of fertilizer rates on fresh and dry forage yields of *Panicum Mombasa* (Table 2). The significant (P<0.05) effect of NPK fertilizer obtained in this study validates the findings of Umar (2018) who reported a significant (P<0.05) effect of fertilizer on fresh and dry forage yields of *P. maximum* cv. Mombasa, other varieties of *P. maximum,* and other grasses. The result obtained for the fresh forage yield was lower than the values 9.90 – 17.60 t/ha) while dry forage yield was higher than the values (2.30 – 4.20 t/ha) reported by Umar (2018) for *P. maximum* cv. Mombasa grown as a sole crop with NPK (15:15:15) applied at 0 – 400 kg/ha.

Similarly, fresh and dry forage yields increased as the age of harvest was delayed from 8 to 12 WAS. Umar (2018) reported higher fresh (8.60 – 21.00 t/ha) and dry (1.50 – 5.80 t/ha) forage yields when harvesting was delayed from 8 to 12 WAS. Higher fresh and dry forage yields obtained at 12 WAS agree with the findings of Umar (2018). This indicates that the stage of harvest influenced the yield of the plant (Mickan, 2006) and hence, dry matter yield increases as the plant age increases. Cook *et al.* (2005) also reported that DM production is strongly influenced by soil fertility and ranges from 7–34 t/ha/year. The principal effect of nitrogen fertilizer on tropical grasses is to increase forage yield, usually through the production of more photosynthetic apparatus (Ahmed, 2019). There was a non-significant (P<0.05) interaction effect between fertilizer rates and age harvest on fresh and dry forage yields of *P. mombasa*.

Table 2: Fresh and dry forage yield of *Panicum mombasa* as influenced by NPK (20:10:10) fertilizer rates, age of harvest and their interaction

Treatment	Fresh forage yield (t/ha)	Dry forage yield (t/ha)
Fertilizer Rate (kg/ha)		
0	6.27^{c}	2.69^{c}
50	7.03^{bc}	3.48^{bc}
100	9.71^{ab}	4.75^{ab}
150	12.64^{a}	6.78^{a}
SEM	1.54/3.08	0.69/1.38
Age of Harvest (WAS)		
8	3.60^{b}	1.02^{b}
12	16.80^{a}	5.24^{a}
SEM	3.07*	1.37*
Interaction		
F x W	0.942	0.415

^{abcd}Means with different superscript within column differed significantly (P<0.05), SEM = Standard error of the mean, WAS = Weeks after sowing, F = Fertilizer rate, W = Weeks

CONCLUSION AND RECOMMENDATION

In conclusion, the growth components, fresh and dry forage yields of *Panicum mombasa* forage were improved when NPK fertilizer was applied at 150 kg/ha while *Panicum mombasa* forage harvested at 12WAS gave higher growth components and better fresh and dry forage yield. It can be recommended that for better growth components and yield of *Panicum mombasa* forage, 150 kg/ha NPK (20:10:10) should be applied and harvested at 12WAS.

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