PRM -07

Some Agronomic Parameters of *Panicum maximum Cv Mombasa* Grass Regrowth in the Northern Guinea Savannah of Nigeria

G.G. James[1], J.T. Amodu[2], A. Musa[1], S.B. Abdu[1], M.R. Hassan[1], H.Y. Adamu[1], A. Musa[1] and Y.M. Ishiaku[2]
[1]Department of Animal Science Ahmadu Bello University, Zaria.
[2]National Animal Production Research Institute, Shika, Zaria
Corresponding author: S.B. Abdu; E-mail: sbabdu@gmail.com; Tel:+2348060398664

Abstract
A twenty four (24) weeks experiment was conducted from the onset of rains to investigate the dry matter yield and fresh fodder production of *Panicum maximum* cv Mombasa (Guinea grass) regrowth, during which plant height, number of leaves per plant and number of tillers per plant were measured. Measurements were taken at 6, 12, 18 and 24 weeks after the onset of rains in April. The experimental design used was a Completely Randomised Design (CRD). The results obtained from this experiment showed that there were significant ($p<0.05$) differences in plant height, number of leaves per plant and number of tillers per plant between weeks. The leaf-stem ratio was highest ($p<0.05$) at week 6 (1.5:1), but did not differ significantly ($p>0.05$) between weeks 12, 18, and 24. The results indicated that the dry matter yield increased from 5.7t per ha to 11.6t per ha. Fresh fodder production increased ($p<0.05$) significantly from 8.0 to 32 tonne per ha, respectively from week 6 to week 24. This study has shown the higher forage production potential, higher dry matter yield and biomass production of P. *maximum* were obtained as plant age increased.

Keywords: Regrowth, *Panicum maximum*, savannah

Introduction

Inadequate nutrition is one of the major factors that generally affect livestock productivity. The natural range pastures, crop residues and farm aftermath are low in nutrient hence cannot support any meaningful productivity (Leng, 1984). The use of cultivated forage crops (grasses and legumes) in ruminant livestock production systems in the tropics has increased tremendously (Kallah, 2004), this is because the cost of producing ruminant livestock on concentrates supplement is very expensive and prohibitive. Although several researchers in Nigeria have investigated the agronomic and yield potentials of both native and improved high yielding grasses (Amodu *et al.,* 2008).

Guinea grass (*Panicum maximum*) is a tall vigorous perennial grass with stem up to 3.5m tall that varies widely in growth habit; it is among the cultivated pastures. The forage crop is found in the tropical and sub-tropical areas with more than 900mm of rainfall and in a wide range of soils. The deep, dense and fibrous roots system allows Guinea grass to survive quite long drought periods, but it performs best on well drained soils of good fertility in high rainfall regions (Humphreys and Patrige,1995). Guinea grass is tolerant to shade or fire, but will not survive in areas with water logging or severe drought. It produces high yields of palatable fodder and responds widely to fertilizer application, but rapidly declines in nutritive value with age. It dies off if continually grazed closed to the ground and needs rest late in growing seasons (FAO, 2009).

The Objective of this study was to determine some agronomic parameters of *P. maximum* grass regrowth in the northern guinea savannah

Materials and Methods

The experiment was conducted in the year 2016, at the National Animal Production Research Institute (NAPRI), Shika, located on latitude 11°12'N, longitude 07°33'E and altitude 660m above sea level (Ovimaps, 2016). Shika is located 22km Northwest of Zaria in the Northern Guinea Savanna of Nigeria, it is classified as an area in the Northern Guinea Savannah of Nigeria, and according to (Aregheore, 2009), the soils in this zone are sandy, friable and relatively easy to cultivate. The experiment was conducted in an already established *Panicum maximum* grass field which was planted as a sole crop, at an intra-row spacing of 1m and inter row spacing of 0.5m in 2006. The pasture was sampled at 6, 12, 18 and 24 weeks after the onset of rain to count the number of plants and samples of the number of plants was cut at 10-15cm above the ground; Estimation of percentage emergence and establishment of *P. maximum* at 4 and 8 weeks after the onset of rains and yield components at 6, 12, 18 and 24 weeks post-emergence. Data collected were subjected to statistical analysis using the one way type of ANOVA procedure of Statistical Analysis System (SAS) version 9 (SAS, 2002). Significant difference between treatments means were separated using DMRT in the SAS software (SAS, 2002).

The model for this design is as follows: $Y_{ij}=\mu+\alpha_i+e_{ij}$

Where :
Y_{ij} = Output, μ = Population mean, α_i = Treatment effect age post regrowth (6, 12, 18 and 24 weeks), e_{ij} = Random error.

Results and Discussions

The results of agronomic parameters measured during plant growth are presented in Table 1. The establishment count for *P. maximum* recorded at 4 and 8 weeks after the onset of rain showed that there were 54 plants/m^2 and 50 plants/m^2 respectively after the onset of rain within a row. Percentage greenness at 4 and 8 weeks were 40% and 65%, respectively difference were significant ($p<0.05$). The Percent vegetative soil cover at 4 weeks post emergence was 45%, which later increased to about 80% at week 8 ($p<0.05$). Ekanayake *et al.* (1998) reported a marked increase in size of successive leaves (broader leaves) as plant matures, thereby increasing the surface area of soil covered by the leaves.

The height of *Panicum maximum* at 4 weeks post-emergence was 32cm, which later increased significantly ($p<0.05$) to 97cm at 8 weeks of age. Hazrat *et al*. (2004) found that plant height generally depends on inter-node expansion which caused increase in height with increase in water depth resulting in taller plant. The result obtained for the number of tillers showed that there were 7 and 9 tillers per plant at 4 and 8 weeks post-emergence respectively. The number of tillers recorded at week 4 was 182 while 225 tillers were recorded at week 8. Each tiller at 4 weeks had 1 leaf and at 8 weeks of age had 3 leaves ($p<0.05$). The differences in the number of tillers per plant and the number of leaves per tiller were all significantly higher in *P. maximum* grass at 8 weeks post-emergence. Narongrit (1999) reported that the numbers of tillers in plants usually show a general increase at the initial growth stage and then decline at the final growth stage.

There was a significant ($p<0.05$) difference in percentage greenness between *Panicum maximum* grass at 4 and 8 weeks post-emergence. Niinemets (2004) reported that leaf greenness tends to increase as the plant age increases due to increase in chlorophyll pigment in leaves. He also reported that plant structural and functional characteristics changes continuously with relative age.

Table 1. Estimation of percentage emergence and establishment of *P. maximum* at 4 and 8 weeks after the onset of rains.

Parameters	Periods of estimation		SEM
	4 weeks	8 weeks	
Greenness (%)	40[b]	65[a]	0.21
Soil cover (%)	45[b]	80[a]	1.76
Plant height (cm)	32[b]	97[a]	0.56
No. of plant/m^2	54	50	0.54
No. of tillers/ plant	7	9	0.91
No. of tillers/0.5m^2	182[b]	225[a]	1.76
No. of leaves/tiller	1	3	0.05

[a,b] Means with different letters across the rows are significantly different $p<0.05$, SEM = Standard Error of Means.

Table 2 shows the result of yield components of *P. maximum* at 6, 12, 18 and 24 weeks post-emergence. The result showed significant ($p<0.05$) difference in plant height. The height ranged from 35cm to 234cm at 6 weeks and 24 weeks post-emergence, respectively. The number of tillers per culm was significantly ($p<0.05$) highest at week 24 and lowest at week 6. The number of leaves per culm was not statistically ($p>0.05$) different at both week 6 and 12, respectively, but differed significantly ($p<0.05$) at weeks 18 and 24, which were similar and higher. The value for percentage green leaves per total leaves ranged from 60 to 95% at week 6 and week 24, respectively. The percentage of green leaves in week 18 and week 24 were not significantly ($p>0.05$) different. The leaf-stem ratio was highest at week 6 (1.5:1) and lowest at week 18 and 24 (1.2:1). The leaf to stem ratio was highest ($p<0.05$) at week 6 and declined ($p>0.05$) to 1.3 at week 12 and further to 1.2 at weeks 18 and 24 as shown in Table 2. The results obtained for fresh fodder and dry matter yield showed a significant increase ($p<0.05$) in yield of *P. maximum* grass with age from week 6 to week 24 post-emergence. Fresh fodder yield ranged from 8.0 ton/ha to 32 ton/ha in week 6 and week 24 respectively. The dry matter yield follow similar

pattern. This indicated that the stage of growth influenced the yield of plant (Mickan, 2006) and hence, the increase in dry matter yield as the plant age increased.

Table 2. Yield components of *P. maximum* at 6, 12, 18 and 24 weeks post-emergence.

Yield components	Periods of Estimation				
	6	12	18	24	SEM
Pant height (cm)	35^{d}	126^{c}	214^{b}	234^{a}	2.31
Tiller (No./culm)	3.8^{d}	4.6^{b}	4.2^{c}	5.4^{a}	0.11
Leaf (No./culm)	3.0^{b}	3.0^{b}	5.0^{a}	5.0^{a}	0.12
Green(% of total leaves)	60^{c}	80^{b}	95^{a}	95^{a}	0.20
Leaf-stem ratio	1.5:1^{a}	1.3:1^{b}	1.2:1^{b}	1.2:1^{b}	0.02
Fresh fodder yield (t/ha)	8.0^{d}	20^{c}	25^{b}	32^{a}	0.02
Dry matter yield (t/ha)	5.7^{d}	6.9^{c}	9.6^{b}	11.6^{a}	0.01

^{a,b,c,d}= Means in the same row with different superscripts differ significantly ($p<0.05$), SEM= Standard Error of Mean.

Conclusion and Recommendation

The results and findings of this study, it is therefore recommended that *P. maximum* be harvested as from week 24 after the onset of the raining (regrowth) in order to obtain higher fresh and dry matter yield production.

References

Amodu, J.T., Kallah, M.S., Adeyinka, I. A., Alawa, J.P. and Lakpini, C.A.M. (2008). The nutritive value of silages made from mixtures of pearl millet (*Pennisetum americanum*) and Lablab (*Lablab purpureus*) as feed for Yankasa rams. *Asian Journal of Animal and Veterinary Advances,* 3(2): 78-84.

Aregheore, E.M. (2009). Nutritive value of sweet potato (*Ipomea batatas*(L) Lam) forage as goat feed. Voluntary intake, growth and digestibility of mixed rations of sweet potato and Batiki grass (*Ischaemumaristatum var. indicum*). *Small Ruminant Research,* 51:235-241.

Ekanayake, I.J., Okarter, U.C. and Adeleke, M.T.V. (1998). Dry season dust alters photosynthetic characteristics of field grown cassava in the dry season in two agro-ecozones of Nigeria. In: Akoroda, M. O. and Ekanayake, I. J. (Eds.) *Root crops and Poverty Alleviation. Proceedings of Sixth Symposium of ISTRC-AB*, Lilongwe, Malawi, 22-28 October, 1995. pp 402.

FOA, (2009). *Panicum maximum*, Guinea grass, Colonial grass and Tangayika grass. http://www.fao.org/ag/agap/frg/Afris/Data/118.HTM

Hazrat, M.A., Mahmuda, K.M. and Lun, G.M. (2004). Influences of various level of water depth on rice growth in Rice-Fish culture under Wetland Rice Eco-systems. *Journal of Geo-Environment,* 4: 23-30.

Humphreys, L.R. and Patridge, I.J. (1995). A guide to better pastures for the tropics and sub-tropics. In: *Grasses for the tropics: Guinea grass (Panicum maximum*), 5th edition. Published by NSW Agriculture.

Kallah, M.S. (2004). Rangelands in Nigeria: A partial resource appraisal towards improving livestock production. In: Gefu, J.O. and Amodu, J.T. (Eds). *Forage production and management in Nigeria*. A training manual. National Animal Production Research Institute, Shika, Zaria. Pp: 9.

Leng, R.A. (1984). Supplementation of tropical and subtropical pastures for ruminant production. In: Gilchrist F.M.C. and Mackie R.I. (eds). *Herbivore nutrition in the subtropics and tropics.* Pp: 129-144.

Mickan, F. (2006). Forage cereals harvest and storage. When to cut for whole-crop cereal silage. Department of Primary Industry, Victoria Gov., Ag Note 1243.

Narongrit, W. (1999). Effect of cutting, Nitrogen, closing date and water on herbage and seed production in Ruzi grass (*Brachiaria ruziziensis* Germain and Everard). Plant Science (Seed echnology) at Massey University, New Zealand.

Niinemets, U. (2004). Adaptive adjustment to light in foliage and whole plant characteristics depend on relative age in the perennial herb *Leontodan hispidus*. *New phytologist* 162:683-696.

Ovimaps (2016). Ovi location map: Ovi earth imagery data.

SAS (2002). Statistical Analysis system Institute, users' guide 6th Edition. North Carolina U.S.A.