P-ISSN: 2305-6622; E-ISSN: 2306-3599

International Journal of Agriculture and Biosciences

www.ijagbio.com; editor@ijagbio.com

Short Communication

Pasture Yield and Mineral Composition of *Panicum Maximum* Treated with Magnesium Based Fertilizers

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Article History: Received: January 22, 2020 Revised: May 23, 2020 Accepted: May 28, 2020

ABSTRACT

The objectives were to determine the pasture yield and mineral composition of Guinea grass (*Panicum maximum) treated with magnesium-based fertilizers. An existing* monospecific pasture of *Panicum maximum* var Ntchisi was used. The experimental site measuring 27 x 11m was subdivided into 21 subplots of 3 x 3m and fertilized with six fertilizer combinations as follows (1) Magnesium fertilizer only (mg), (2) Magnesium + Nitrogen (Mg + N) (3) Magnesium + Phosphorus (Mg + P) (4) Magnesium + Potassium (Mg + K) (5) Magnesium + Nitrogen + Phosphorus (Mg + NP) (6) Magnesium + Phosphorus + Potassium (Mg + NPK) (7) No fertilizer (control). Mg, N, P and K fertilizers were applied at the rate of 20, 120, 60 and 60kg/ha, respectively along grass rows and the grasses cut at four weeks interval to determine yield and mineral (N, P, K, Ca and Mg) composition. The treatments were applied to the plots in a completely randomized design. The data obtained were subjected to analysis of variance (ANOVA) and treatment means where significant were compared using Duncan's multiple range test. The study revealed that %CP was higher in grasses treated with Mg + N fertilizer. This implies that uptake of N by grasses increased with N – fertilization. However, the reason for the decline in CP content of grass groups fertilized with Mg + NP cannot be explained.

Key words: Forage Yield, Mineral composition, Magnesium, Fertilizers

INTRODUCTION

Natural pasture grasses are wild and are characterized by low yield and poor nutrients as they grow on infertile and erosion degraded soils (Babayemi and Bamikole 2006). Tropical grasses have ability for high yield and the nutrients are simultaneously enhanced when treated with organic/inorganic fertilizers (Babayemi and Bamikole 2006). Thus, this study aimed at determining the dry matter yield and mineral composition of *Panicum maximum* treated with magnesium-based fertilizers.

MATERIALS AND METHODS

The experiment was carried out at the Teaching and Research Farm of University of Ibadan between June and October, 2002. The location is 7º 27[1]N and 3º 45[1]E at an altitude of 200 – 300m above sea level. The average annual rainfall was about 1250mm with a mean temperature of 25 – 29^{0}C.

An existing pasture of Guinea grass was modified to suit the research work. The experimental site measuring 27 x 11m was subdivided into 21 subplots of 3 x 3m allowing 1m space in-between the subplots for easy access. The grass in each subplot was arranged to form 3 rows measuring 0.5x3m with a space of 0.5m between rows. Soil samples were taken randomly (using an auger) to determine the pH and mineral constituent of the soil. The plots were rouged.

The treatments were applied to the plots in a completely randomized design with three replicates per treatment. There were seven treatments:

Treatment 1 (T_1): Magnesium fertilizer only. Treatment 2 (T_2): Magnesium fertilizer and Nitrogen (urea). Treatment 3 (T_3): magnesium fertilizer and Phosphorus fertilizer. Treatment 4 (T_4): Magnesium and Potassium fertilizers. Treatment 5 (T_5): Magnesium, Nitrogen, and Phosphorus fertilizers. Treatment 6 (T_6): Magnesium, Nitrogen, Phosphorus and Potassium fertilizers. Treatment 7 (T_7): No fertilizers (control).

Cite This Article as: Nwankwo CA, and Babayemi OJ, 2020. Pasture yield and mineral composition of *Panicum Maximum* treated with magnesium based fertilizers. Int J Agri Biosci, 9(3): 149-151. www.ijagbio.com

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Magnesium fertilizer was applied in form of $MgSO_4.7H_2O$ at the rate of 20kg/ha. Nitrogen fertilizer was applied in form of urea (N.P.K 46:0:0) at the rate of 120kg/ha. Potassium fertilizer was applied in the form of murate of potash at the rate of 60kg/ha and Phosphorus was applied in the form of single super phosphate at the rate of 60kg/ha. The grass was cut back to a height of 10cm above the ground. The grasses were harvested every 4 weeks of regrowth. The total (fresh) yield was weighed according to the plots and treatment using a top loading scale. Samples were randomly taken from the yield and dried in the oven at 65^{0}C until a constant weight was obtained for dry matter determination.

Chemical Analysis

Total nitrogen was determined by the kjeldahl method A. DAC (1990) and the amount of CP was calculated (N x 6.25). 2.0gms of each of the samples was weighed out and digested with $HNO_3/HCLO_3$ mixture (20mls HNO_3 + 5mls + $HCLO_3$) in a kjedahl flask, the digest was transferred with deionized water into a 100ml standard volumetric flask and was used for the determination of Ca, P, K and Mg using the atomic absorption spectrophotometer.

RESULTS AND DISCUSSION

The average dry matter (DM) yield varied from 5.885 to 9.78 tons/ha and these values varied significantly. The DM yield of grasses treated with Mg + N, Mg + P, Mg + K, Mg + NP, and Mg + NPK were not significantly different (P>0.05) but were significantly higher than that of the grasses treated with Mg only and the control. This result is made more significant by previous reports on increased yields with N, P, and K fertilizer application to forage (Wen-xi *et al.,* 2010; Coroneos *et al*., 1995). It was observed that Mg application did not increase DM yield.

Table 1: Physical and chemical properties of the soil on which the experimental grass

Parameters	Values
Soil pH (H_2^0) (1:1)	6.49
Nitrogen (%)	0.140
Phosphorus (ug/g)	23.36
Calcium (meq/100g)	0.61
Magnesium (meq/100g)	0.36
Potassium (meq/100g)	0.59
Sand (%)	89.12
Silt (%)	6.0
Clay (%)	4.6

Table 2: Major Mineral and Nitrogen composition of Panicum_maximum_treated with Mg based fertilizer.

	Treatments							
Parameters	1	2	3	4	5	6	7	SEM
Ca	0.24	0.23	0.27	0.32	0.26	0.31	0.28	0.03
Mg	0.36^a	0.32^{ab}	0.31^{ab}	0.35^a	0.26^{ab}	0.35^a	0.21^b	0.04
K	0.26	0.30	0.27	0.24	0.26	0.26	0.27	0.05
P	0.27^b	0.25^b	0.32^a	0.27^b	0.28^{ab}	0.29^{ab}	0.27^{ab}	0.01
N	1.85^b	2.17^a	1.73^{bc}	1.74^{bc}	1.83^{bc}	1.96^{ab}	1.57^c	0.61

a, b, c = Means in the same row with different superscripts are significantly different (P<0.05)

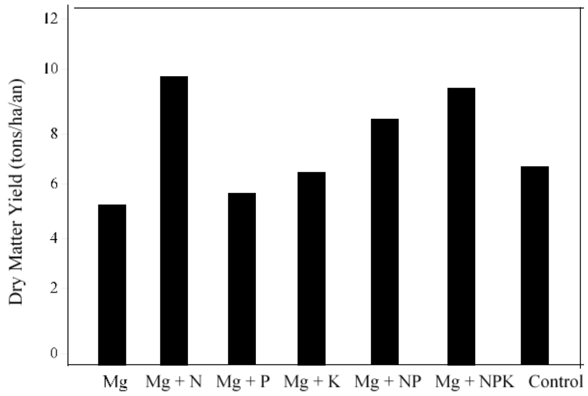

Fig. 1: Dry Matter yield per annum of Guinea Grass treated with Magnesium-based fertilizers

This goes against the report of Al'Shevskii and Derebon (1982), Marschner (2012) and Grzebijz (2013). Calcium content was not affected by the fertilizers applied. Mg content was similar among the grasses with Mg-fertilizer application. This would suggest that Mg-fertilizer increases herbage Mg content (Reid 1996; Maclntosh *et al*., 1973), contrary to the report of Ibrahim (2018) that Mg fertilizer application did not affect plant Mg content. P content of the grasses was increased by more than 4.35% in P-fertilized grasses indicating that more P was made available for uptake with P-fertilizer application. This corresponds with the report of Overman and Wilkinson (1990).

The lowering of P-content of herbage in Mg only, Mg + N and Mg + K-fertilized grasses may be related to the soil level and interaction between minerals which may affect their uptake by plants (Sauerback and Helal (1990); Grattan and Grieve (1999). The percentage CP content of grasses in this study are similar to those obtained by Peiris and Ibrahim (1995). Percentage CP was higher in grasses treated with Mg + N fertilizer. This would suggest that uptake of N by grasses increased with N – fertilization. The reason for the decline in CP content of grass groups fertilized with Mg + NP remain unexplained. However, the

CP content of all the grass groups were adequate to support microbial growth in the rumen (Krebs and Leng 1984).

Conclusion

It has been observed in studies that fertilizer application to grasses can increase yield and also increase the mineral content of grasses. In this study, magnesium-based fertilizers increase the mineral contents of grasses. By increasing herbage mineral content, animals might consume appropriate levels of the required minerals while grazing, thus producers would be less dependent upon unreliable commercial mineral supplements to provide livestock with enough dietary minerals.

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