PRM -05

Growth and Yield of *Brachiaria ruziziensis* and *Brachiaria mulato* as Affected by Manure Application

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Abstract
The experiment was conducted to determine the effects of swine manure application rates on the growth components and dry matter yield of *Brachiaria ruziziensis* and *Brachiaria mulato* II grasses. The experiment was a 3 x 2 factorial experiment laid out as a split-plot design with 3 swine manure application rates (0, 5, 10 t ha^{-1}) as the main plot and 2 *Bracharia* species (*B. ruziziensis and B. mulato* II) as the sub-plot replicated three times. Growth parameters were determined at 2, 4, 6 and 8 weeks of growth, while dry matter yield was determined at 8 weeks after sowing. Results showed that *B. ruziziensis* was morphologically taller than *B. mulato* II at all weeks of growth. The heights of the plants significantly (p<0.05) increased with increasing manure application rate at all weeks of growth. Significantly (p<0.05) higher yield (4.36 ha^{-1}) was recorded for *B. ruziziensis* than in *B. mulato* (3.00 ha^{-1}). Dry matter yield of the plants increased as the rate of manure application increased. In conclusion, herbage yield increased as the swine manure application rate increased also, better morphological traits and yield were obtained with *B. ruzuziensis* than with *B. mulato*.

Keywords: Bracharia grasses, dry matter yield, leaf number, plant height, swine manure

Introduction

Ruminants production are been faced with the limitation of high quality and quantity forages due to prolonged annual dry season that negatively affects the plant's performance. In order to mitigate the problem of poor nutrition for ruminant animals, the use of sown and purposely managed pastures have been widely suggested (Olanite, 2002; Ojo *et al*., 2015a). Bracharia species are low-growing decumbent perennial grass with the aggressive growth habit that provides a dense ground cover able to suppress weeds.

However, many grasslands are characterized by low productivity and can benefit from manure incorporation from different sources (Ojo *et al*., 2015b). Utilization of manure on low nutrient status of tropical soils can reduce fertilization cost associated with synthetic fertilizers (Van Wieringen *et al.,* 2005).

The objective of this study was to evaluate the growth and yield of *Brachiaria ruziziensis* and *Brachiaria mulato* as affected by swine manure application rates.

Materials and Methods

This study was carried out at the Federal University of Agriculture, Abeokuta, Nigeria on latitude 7^0 13 49.46 N and longitude 3^0 26 11.98 E.

The experimental land area was ploughed twice and allowed to rest for a period of two (2) weeks before harrowing. A plot measuring 510 m^2 was mapped out after harrowing. Prior to sowing, soil samples were randomly collected from the plots at the depth of 0 - 15 cm and analysis of the soil from the site indicated that it was sandy silt with pH of 6.75; organic carbon 1.27 %, available phosphorus 30.40 mg kg^{-1}, potassium 0.79 cmol/kg, calcium 3.36 cmol/kg, magnesium 2.42 cmol/kg, sodium 1.51 cmol/kg and total nitrogen 0.11%. Swine manure was collected and analysis of the swine manure nutrient status revealed that it contained calcium (4.76 %), magnesium (2.40 %), potassium (1.92 %), sodium (2.07 %), nitrogen (0.34 %) and phosphorus (12070 mg kg^{-1}). The manure was applied by manually raking them into the soil of individual plots according to treatment in a single application. The plots were left for two weeks for mineralization of the manure followed by weeding to keep the plots weed free as much as possible before sowing the grass. The seeds were drilled in rows at a spacing of 1.0 m intervals with a seed rate of 20 kg ha^{-1} in August. The inter-plot and intra-plot spaces were kept weed-free as much as possible throughout the experimental period by weeding manually.

The experiment was a 3 × 2 factorial experiment laid out in a split plot design comprising of 3 levels of swine manure application (0, 5 and 10 t ha^{-1}) as the main plot and two *Bracharia* species (*Brachiaria ruziziensis* and *Brachiaria mulato* II) as the sub-plot. Blocking was used to account variations in the soil. Each treatment was replicated three times using a block as a replicate. The effect of the applied manure on the growth of the species was evaluated at 2, 4, 6 and 8 weeks after sowing (WAS) and dry matter yield was estimated at 8 WAS. The data obtained were analysed as a two-way analysis of variance using the SPSS 20 statistical package.

Results and Discussion

There were significant (p<0.05) morphological differences in the height of the plants with the species. *Bracharia ruziziensis* was morphologically taller than *B. mulato* II at all weeks of growth (Table 1). The rate of manure application significantly (p<0.05) affected the plant height at all weeks. The heights of the plants significantly (p<0.05) increased with increasing manure application rate at all weeks of growth. Differences in the tiller numbers with the manure application rate was significant (p<0.05) only at 4 and 8 WAS. Plants fertilized with 5 t ha^{-1} of manure produced significantly (p<0.05) higher tiller numbers than other rates used. Morphological differences observed in *B. ruziziensis* and *B. mulato* in the present study, might be due to the genetic factors of the genera (Hani *et al*., 2006). Taller plants at higher rates of manure observed in the present study could be due to a higher amount of available nutrients from higher rate of manure application. Sahoo and Panda (2001) and Amanullah *et al*. (2009) also observed that plants were taller when higher rates of organic fertilizer were applied compared to the control plants. Differences in the leaf number of the two species were not significant (p>0.05). It shows that each of the varieties produced similar leaf numbers. Generally, leafiness is an important quality attribute in forage which indicate that the leafier a species the better its quality and higher intake is likely to be for ruminants (Omaliko, 1980). Higher leaf number will also give the plant opportunity of being able to trap enough sunlight for photosynthesis to take place. The higher grass tiller density recorded for manured plots agreed with reports of Ramivez Ariles (1993) that fertilizer boost tiller production in grasses.

Table 1: Effects of manure application rates on the growth characteristics of two *Brachiaria* species

	Plant height of two *Brachiaria* species			
Factors	2	4	6	8
B. mulato II	24.47^{b}	36.21^{b}	47.75^{b}	58.98^{b}
B. ruziziensis	41.16^{a}	64.24^{a}	75.77^{a}	86.88^{a}
SEM	3.63	3.32	3.33	3.34
0 t ha^{-1}	24.08^{b}	42.60^{ab}	54.09^{b}	65.25^{b}
5 t ha^{-1}	33.35^{ab}	49.67^{b}	61.05^{ab}	72.30^{b}
10 t ha^{-1}	41.00^{a}	58.41^{a}	70.14^{a}	81.25^{a}
SEM	4.88	6.97	6.95	6.94
	Leaf number of two *Brachiaria* species			
B. mulato II	9.89	11.75	15.49	19.23
B. ruziziensis	12.22	11.67	15.30	19.48
SEM	2.28	1.85	1.84	1.88
0 t ha^{-1}	8.33	9.41	13.30	17.13
5 t ha^{-1}	10.50	11.50	15.05	19.27
10 t ha^{-1}	14.33	14.22	17.85	21.67
SEM	2.68	2.16	2.17	2.23
	Tiller number of two *Brachiaria* species			
B. mulato II	4.39	5.38	7.32	9.32
B. ruziziensis	4.44	4.89	7.32	8.79
SEM	0.24	0.50	0.54	0.54
0 t ha^{-1}	4.33	4.60^{b}	6.49	8.50^{b}
5 t ha^{-1}	4.67	6.33^{a}	8.24	10.34^{a}
10 t ha^{-1}	4.25	4.48^{b}	6.44	8.34^{b}
SEM	0.30	0.53	0.59	0.59

^{ab}: means on the same column with different superscript differ significantly (p<0.05); SEM: Standard error of mean

Brachiaria ruziziensis had significantly (p<0.05) higher yield (4.36 ha^{-1}) than *B. mulato* (3.00 ha^{-1}) (Table 2). The rate of manure application also significantly (p<0.05) affected the yield of the plants. Dry matter yield of the plants increased as the rate of manure application increased. Plants that received 10 ha^{-1} of manure produced the highest dry matter yield. Higher yields obtained from the plants at higher manure rates had also been reported in earlier studies (Olanite, 2002; Ojo *et al*., 2015b). The present observation might be the results of better root development from increased nutrient levels at higher manure rates which could have provided a better habitat for the activity of beneficial soil and plant microbes that might have helped improve the growth and consequently the yield of the plants (Ayub *et al*., 2012). This observation implies a linear increase in yield of plants with higher

nutrient availability – although this is hypothetical, reports by Kering *et al*. (2012) who observed increased yield in heavy fertilized soils substantiate the observations of the present study.

Table 2: Effect of Manure application rate on the dry matter yield of two Bracharia species

Factors	Dry matter yield (ha^{-1})
Grass	
B. mulato II	3.00^{b}
B. ruziziensis	4.36^{a}
SEM	0.39
Manure	
0 t ha^{-1}	2.72^{c}
5 t ha^{-1}	3.14^{b}
10 t ha^{-1}	5.20^{a}
SEM	0.32

^{ab}: means on the same column with different superscript differ significantly (p<0.05); SEM: Standard error of mean

Conclusions

Bracharia ruziziensis morphologically had better growth rate and dry matter yield than *Bracharia mulato.* Plant height and yield of the plants increased with increasing rate of manure application. This could be due to higher mineralization rate of swine manure which enables the grass to absorb sufficient nutrients for its growth. Based on the result of this study, *Bracharia ruziziensis* was the better performing species and higher rate of manure application will improve the growth and yield of the grasses.

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