AGRONOMIC INDICES AND DRY MATTER YIELD OF *BRACHIARIA RUZIZIENSIS* AS AFFECTED BY COW DUNG AND AGE OF CUTTING IN THE SUDAN SAVANNAH ZONE OF NIGERIA

***Idowu, W.,[1] Garba, M.G.,[1] Akinde, T. S.,[2] Adeleke, R.A.,[3] Abdulsalam, M.,[4] Yusuf, A.,[1] Bello, S.S.[5] and Sani, R.T.[6]**

[1]Department of Animal Science, Federal University Dutsin-Ma Nigeria.
[2]Agricultural and Agricultural Technology Department, Federal Polytechnic Ayede, Oyo state.
[3]University of Abuja, Nigeria.
[4]Division of Agricultural Colleges, Samaru College of Agriculture, ABU Zaria
[5]Department of Animal Science, Ahmadu Bello University zaria, Nigeria
[6]National Animal Production Research Institute, Shika, Nigeria
Corresponding author, Email: waheedidowu@fudutsinma.edu.ng. phone: +2347031241187

ABSTRACT
Effect of cow dung and age of cutting on agronomic indices and dry matter yield of Brachiaria ruziziensis in the Sudan savannah zone of Nigeria was assessed in this study. The experiment was conducted at the Professor Lawal Abdu Saulawa Teaching and Research Farm, Department of Animal Science, Federal University Dutsin-Ma, Nigeria. The research was laid in a randomized complete block design (RCBD) in a 3 x 3 factorial arrangement, 3 rates of cow dung application (5, 10 and 15t/ha) and 3 ages of cutting (6, 8 and 10) weeks after planting. data on agronomic indices (Plant height, leaf length, leaf width, tiller number, number of leaves, leaf area index and dry matter yield) collected at 6, 8 and 10 WAP were subjected to 2-way analysis of variance (ANOVA). Results showed that all the agronomic indices were significantly affected (P<0.05) by cow dung application and age of cutting. 15t/ha rate of application and cutting at 10 WAP had a better agronomic indices when compared with other manure application rates and age of cutting, respectively. It was recommended that farmers use 15t/ha cow dung for cultivation of Congo grass and harvest same at 10 WAP for a higher agronomic indices in the Sudan Savannah Zone of Nigeria.
Keywords: Cow dung, Brachiaria, Growth, Age, Nutrition

INTRODUCTION

Feed scarcity is a major challenge facing ruminant production and productivity in Nigeria (Amole et al., 2022). This is partly due to rapid urbanization as a result of population explosion, leading to encroachment of grazing routes, leaving little or no grazing portion available for the increasing ruminant population (Brottem, 2021). This has often culminated in recurrent attack between herdsmen and farmers with wanton consequences on lives and livelihoods (Aruwayo *et al*., 2021). To this effect, establishment of ranches, commercial pasture production and sown pasture introduction have been called for (Gambari *et al.,* 2018), unfortunately most of our soil in the tropics are classified with poor nutrient status with its consequential effect on crops grown on them in terms of nutrient quality (Aregheore, 2002).

Cow dung is indeed considered an environmentally friendly alternative source of soil nutrients. It is a valuable bioresource for sustainable development, serving as a source of bio-fertilizer, organic manure, and soil amendment. Research has shown that cow dung improves soil nutritional status in terms of pH, electrical conductivity, nitrogen, phosphorus, and available carbon. Additionally, cow dung harbours a diverse group of microorganisms that can increase soil fertility and has been found to effectively regulate the soil bacterial community in agricultural settings. Therefore, the use of cow dung as a soil nutrient source aligns with eco-friendly and sustainable farming practices (Abhishek et al., 2014). Furthermore, in establishing sown pasture to curb the menace of clashes between herders and farmers, there is need for the choice of a suitable species of forage to be cultivated. Several studies have been conducted on *Brachiaria ruzizensis* showing the ease of its establishment by seed and tussock, high yielding, palatable, nutritious and well accepted by the ruminants (Idowu *et al*., 2023; Akinola, 2018).

The grass is an important fodder crop suitable for high rainfall areas and soils, and it is mainly planted through root slips as well as seeds. Livestock have shown significant live weight gains when grazing

on B. *ruziziensis*, and it has been used as a permanent or semi-permanent pasture for grazing or for cutting for green feed and conservation Pradit *et al*., (2006). Therefore, this research was focused on growth parameters of Congo grass as affected by cow dung application and ages of cutting in Dutsin-Ma, Sudan savannah zone of Nigeria.

MATERIALS AND METHODS

Experimental Site

The experiment was conducted at the experimental field of the Prof Lawal Abdu Saulawa Livestock Teaching and Research Farm, Department of Animal Science, Federal University Dutsin-Ma, Katsina State, Nigeria. Located on Latitude $11^0$9'45"N, and Longitude $07^0$38' E, at an Altitude of 610m above the sea level, along Kankara road is characterized by a defined wet and dry season. Wet season starts from early June to late September while the dry season is from September to June. The district's yearly temperature is 33.2˚ (91.76˚) and it is 3.74% higher than Nigeria's average. Dustin ma typically receive about 667 millimeters (2.18 inches) of precipitation and has 78 rainy days (16.09% of the time) annually (Weather and Climate, 2020).

Soil Samples of Experimental Site

Soil samples were collected for nutrient analysis from the experimental site with the aid of Soil auger at four corners and center of the plots at 0-30cm depth to make a composite for soil analysis at the beginning of experiment so as to ascertain the level of nutrient in the soil as well as determining the nutrient requirement. The soil sample was analyzed for physical and chemical properties as described by A.E.S (1998). The analysis was carried out at the chemical laboratory of the Department of Soil Science, Faculty of Agriculture, Ahmadu Bello University, Zaria, Kaduna State, Nigeria.

Land Preparation and Experimental Design

A gross land area measuring 9m×9m was used for the trial. The land was cleared and seed beds were prepared to meet a better condition for early establishment of seedlings. The experiment was laid out in a randomized complete block design (RCBD) with 3x3 factorial arrangements, replicated three times. 3 levels of poultry manure (5, 10 and15 t/ha) were the main plot factors and 3 stages of harvest (6, 8 and 10 weeks after planting) were the sub-plot factors. Forage samples cut at each stage of harvest was bulked, and sub-samples analyzed for proximate composition. The analysis was carried out at the Chemical Laboratory, Department of Animal Science, Ahmadu Bello University Zaria, Kaduna State, Nigeria.

.Source of Experimental Materials and Planting

Dried poultry manure was sourced from the Poultry Unit of the Prof Lawal Abdu Saulawa Livestock Teaching and Research Farm, Federal University Dutsin-Ma. The manure was applied by broadcasting and immediately incorporated into the soil with the use of hoe. Seed of *Brachiaria ruziziensis* used for the establishment was sourced from the Seed Store of the Prof Lawal Abdu Saulawa Livestock Teaching and Research Farm, the seeds was treated against insect attack using insecticide (Apron plus) at 5g/kg before planted in the nursery, where they were raised to seedling before being transplanted to the experimental field at three weeks after nursery establishment at a spacing of 50 x 20cm inter-row and intra- row space respectively, Weeds were kept under control throughout the experimental period.

Sample Collection and Preparation

Plant height (PH), number of leaves (NOL), leaf length (LL), leaf width (LW), tiller numbers (TN) and leaf area index (LAI) were measured each at 6, 8, and 10 weeks after planting (WAP). Samples of *Brachiaria ruziziensis* were harvested to 10cm from the ground level from the three middle rows at 6, 8 and 10WAP using a sickle (Tarawali *et al.,* 1995). Fresh forage sample was weighed immediately using a sensitive weighing scale. Representative samples from the three replicates of each treatment were mixed, and a sub-sample (120g) was taken from the bulked treatments. Further, the samples were packed in separate envelopes per treatment, oven-dried at 65^{o}C to a constant weight and subsequently weighed to estimate forage dry matter yield.

Statistical analysis

Data were subjected to two-way analysis of variance (ANOVA) using general linear model (GLM) procedure of SAS (2005). Means were compared using Duncan Multiple Range Test, (Duncan 1995) of SAS package at $P<0.05$..

RESULTS AND DISCUSSION

The use of animal manure in forage production is a sensible approach to reducing the environmental impact of waste products from livestock. By incorporating animal manure into forage production, the ecological footprint of livestock waste can be minimized. This approach can help mitigate greenhouse gas emissions associated with manure management and contribute to a more sustainable agricultural system (Horacio *et al*., 2017; Solomon *et al.,* 2023).

Table I: Agronomic indices of *Brachiaria ruziziensis* as affected by cow dung and age of cutting

Cow dung (t/ha)	PH	LL	LW	TN	NOL	LAI	DMY
5	90.15[b]	40.47[c]	2.46[b]	9.03[b]	46.17[b]	3.53[b]	6.28[b]
10	91.99[b]	45.34[b]	2.75[a]	12.81[a]	65.34[a]	6.63[a]	9.91[a]
15	101.80[a]	54.22[a]	2.79[a]	13.40[a]	68.06[a]	7.91[a]	11.20[a]
SEM	1.30	0.67	0.09	0.74	3.80	0.50	0.93
Cutting stages (WAP)							
6	77.60[c]	36.10c	2.55b	7.83c	39.89c	2.80[c]	8.32
8	94.93[b]	46.82b	3.05a	11.89b	60.52b	6.84[b]	8.58
10	111.42[a]	57.15a	2.41b	15.52a	79.10a	8.43[a]	10.92
SEM	1.30	0.67	0.09	0.74	3.80	0.50	0.93

[abc]Means with different superscripts differs significantly (P<0.05). PH= Plant height, LL= Leaf length, LW=Leaf width, TN= Tiller number, NOL= Number of leaves

All the agronomic indices of *Brachiaria ruziziensis* in this study were significantly affected (P<0.05) by rate of cow dung application (Table I) PH, LL, LW, TN and NOL increased with increasing rate of manure application, forage treated with 15t/ha exhibited the tallest height (101.8cm) while the least was observed in those treated with 5t/ha (90.15cm). The longest LL (54.22) was observed in plant manured with 15t/ha when compared with that of 10t/ha and 5t/ha application rates. The highest LW, TN and NOL were recorded in plants treated with 15t/ha rate of manure application, though statistically similar to those treated with 10t/ha but higher compared to the those treated with 5t/ha manure rate. LAI and DMY also followed the same trend as other agronomic indices.

Results indicated that cow dung application had great influence on the agronomic indices and yield of *Brachiaria ruziziensis*. This could be as a result of presence of essential nutrients in the manure, especially N, being the most limiting nutrient in grasses (MSU, 2022). This is in line with the previous studies (Maleko et al., 2019) of an increase in the agronomic indices and yield of *Brachiaria ruziziensis* fertilized with cow dung and reported the best growth and yield at 15t/ha application rate. Furthermore, age of cutting significantly affected (P<0.05) the agronomic indices and yield of *Brachiaria ruziziensis* in this study (Table I). There was a linear increase in all the agronomic indices as the age of cutting advanced, this could be attributed to increase in Relative growth rate (RGR), net assimilation rate (NAR) and overall biomass production all through the three stages of growth. Although, the DMY was not significantly affected by the age of cutting, the values of DMY recorded fall within the range of 5-27t/ha reported (Akinola, 2018) for *Brachiaria ruziziensis*. This is in agreement with the report of (Sani et al., 2020) who reported higher agronomic indices of *Brachiaria ruziziensis* at 10 week after planting. This implies that age at cutting and cow dung application could be used to manipulate growth and yield of *Brachiaria ruziziensis* for improved ruminant nutrition.

CONCLUSION

It was concluded that application of cow dung at 15t/ha and cutting at 10 WAP produced forage with higher growth rate and yield. It was therefore recommended that cow dung be applied at 15t/ha and harvested at 10 WAP for improved productivity of *Brachiaria ruziziensis* and enhanced ruminant nutrition in the Sudan Savannah of Nigeria.

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