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Effects of poultry manure rates on growth components and forage quality of Napier grass (*Pennisetum purpureum*) in semi-arid region of Maiduguri, Nigeria

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ABSTRACT

The study evaluated the effects of poultry manure rates on forage quality of Napier grass (*Pennisetum purpureum*) at the Pasture Field Teaching and Research Farm, Department of Animal Science, University of Maiduguri. Poultry manure was composted and applied at the rates of 0, 6 and 8 t/ha designated as treatments 1, 2 and 3, respectively in a Randomized Complete Block Design. Forage was harvested at 4, 6, 8, 10 and 12 weeks after sowing (WAS) and the forage dry matter yields were determined. Thereafter, growth components of plant regrowth were measured at 4, 6, 8, 10 and 12 weeks. The data obtained were analyzed using analysis of variance (ANOVA). The chemical compositions of Napier grass were not significantly ($P>0.05$) different among the treatments except for ash content in T1 (0t/ha) which had a higher value (6.25%). There were significant ($P<0.05$) differences in some growth components of the Napier grass, with T3 (8t/ha) having a higher regrowth height in all the weeks. However, T1 was significantly ($P<0.05$) different in leaf length among the treatments in all the weeks. Number of leaves and leaf width varied only in 6th week while the remaining weeks were not statistically ($P>0.05$) different. There was no significant ($P>0.05$) variation in fresh and dry herbage yield of Napier grass. The response of Napier grass to poultry manure on regrowth height was significantly ($P<0.05$) different at 6th, 8th, 10th and 12th weeks and between the treatments. The results of this study showed that plant regrowth increases with increase in age. It was concluded that application of poultry manure up to 8t/ha had no effect on forage fresh and dry herbage yield and all chemical composition except ash content of Napier grass and its regrowth height.

Keywords: Napier grass; poultry manure, growth components; forage quality

INTRODUCTION

Ruminants are reared basically on natural pastures that are not adequate in nutrients to meet the animals' nutrients requirement (Lamidi and Ogunkunle, 2015). Similarly, the changes in rainfall pattern and soil infertility of the semi-arid region have also added to the problems of pasture production and these technically lead to low productivity of ruminants. *Pennisetum purpureum* (Napier grass or elephant grass), has low water and nutrients

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requirement (Strezor *et al*., 2008). It can withstand drought conditions and is a pioneer species in arid lands (CABI, 2014). According to Aroeira *et al.* (1999), Napier grass is a fast-growing forage species and has potential for high animal productivity that depends on the climatic conditions, especially temperature and rainfall. Francis (2004) reported that with high input of fertilizer its yield ranges from 20 to 80 t DM/ha^{-1}year^{-1}.

Application of fertilizers supplements the soil with macronutrients needed by plants in large amounts like nitrogen, phosphorus and potassium. The use of inorganic fertilizer is appreciated by farmers because it is easy to handle, has a faster release of soil nutrients and is effective in improving soil fertility (Adesoji, 2015). However, its usage is limited by high costs and undependable availability. Also, farmers who use inorganic fertilizers cannot afford the recommended rates (Loks *et al.,* 2016). It therefore becomes necessary to explore organic fertilizers such as chicken manure as a very good alternative to mineral fertilizer. Organic fertilizer contains only plant and animal-based materials that are either by-products or end products of naturally occurring processes, such as manures, leaves and compost (Adesoji, 2015). Chicken manure is the feaces of chickens used as an organic fertilizer, especially for soils that are low in nutrients (Telkamp, 2015). In all animal manures, chicken manure contains the highest amounts of nitrogen, phosphorus, and potassium (Deborah, 1992). Composted chicken manure provides a slow release of macro and micronutrients, and acts as a soil amendment (Telkamp, 2015). The high organic matter content of chicken manure causes a slow release of soil nutrients, increase soil microbial population, improve soil quality and leave the soil safe and healthy (Adesoji, 2015).

Pennisetum purpureum accumulates a large quantity of dry matter (29 kg DM/ha/year in a single cut per year when growth is uninterrupted, while the yield varies from 10 to 40 kg DM/ha/year depending on soil fertility, climate and management (Schreuder *et al*., 1993). Consequently, with chicken manure which contains high potassium (Leo *et al.*, 2009; Doye *et al.*, 2009) and phosphorus and a higher percentage of total nitrogen as compared to other organic manure (Ibrahim, 2012) may result to a better production of this forage plant. The objective of this study was to investigate the response of Napier grass (*Pennisetum purpureum)* to different rates of composted poultry manure on growth components and forage quality.

MATERIALS AND METHODS

Experimental Site and Location

The experiment was carried out in Pasture Field of the Teaching and Research Farm, Animal Science Department, University of Maiduguri, Borno State, Nigeria. Maiduguri is located on latitude 11° 46' 18" N and 11° 53' 21" N and longitude 13° 02' 23" E and 13° 14'19" E and at an altitude of 354m above sea level (Alaku, 1983) in the Northeast semi-arid zone of Nigeria. The area is characterized by hot and dry climates with a short duration of rainfall (3-4 months) ranging from 150 - 600 mm annually. Ambient temperatures are low in December to January (15 -19^{0}C) and high in March to June (33 - 45^{0}C). The relative humidity is generally low (Alaku, 1983). The dominant texture class of the soil is sandy loam. The soil was generally well drained and appeared to be fairly homogenous (Rayar, 1983). The land is for both irrigation and rain fed farming system. The dominant crops cultivated are maize (*Zea mays*), wheat (*Triticum*), and groundnuts (*Arachis hypogea*). The vegetables cultivated are cabbage (*Brassica oleracea*), Spinach (*Amarantus*), Onions (*Allium cepa*), tomatoes

(*Lycopersicon esculentum*), etc and the area is dominated by short grasses, shrubs and small trees such as Acacia tree (*Acacia albida*), Desert date (*Balanites ficcusspp*), Neem tree (*Azadirachta indica*), Axel wood (*Anogeisus spp*), and Baobab tree (*Adansonia digitata*).

Soil Sample Collection and Analysis

Soil sample for the experimental plots were collected randomly from three (3) different spots at a soil depth of 0-15cm with the aid of spade and sacks. The soil was mixed thoroughly, and a sub-sample was collected for physical and chemical analysis at the Soil Science Laboratory, University of Maiduguri using standard procedures of AOAC (2005).

Land Preparation

Experimental land area measuring 9 m^2 with dimension of 9 × 9 m length and breadth was cleared of thorns, dry weeds, debris etc. The land was ploughed using hoe, and was further divided into 9 plots of 3 m^2 and inter and intra row spacings of 30 cm × 30 cm. Each plot consisted of five rows with five plant stands per row, making twenty-five plants per plot.

Composting of Poultry Manure (Organic Fertilizer)

Poultry manure from battery cage system was collected at the Poultry Unit of Teaching and Research Farm of Department of Animal Science, University of Maiduguri, Nigeria. The poultry manure collected was sorted and sundried to remove or reduce the moisture content and to generate temperature of about 65^0C which was enough to kill most pathogens, such as *E. coli* and *Salmonella* contained therein, according to procedure of Griffiths (2011). The cleaned sundried manure was loaded into a plastic drum to compost for six weeks. A sub-sample of the final composted poultry manure was taken for analysis to determine the nitrogen, phosphorus and potassium (NPK) contents. Result of the analysis is presented in Table 1. The same varying rates (0, 6 and 8 t/ha) was applied at planting time and four weeks after planting.

Table 1: Mineral contents (%) of composted poultry manure

Minerals	Percentages
Nitrogen	0.7
Phosphorus	0.45
Potassium	1.45

Experimental Treatment and Design

The composted poultry manure was applied to the soil at the rates of 0, 6 and 8 t/ha for treatments 1, 2, and 3 respectively. The experiment was carried out using a Randomized Complete Block Design (RCBD) replicated three times.

Planting and Cutting of Tillers

Young tillers of *Pennisetum purpureum* (Napier grass) were obtained from National Animal Production Research Institute (NAPRI) Shika, Zaria and cut at 25 cm with six nodes from its sheath. The cut tillers were planted by burying three nodes into the soil at a depth of 5 cm below the ground at a spacing of 30 × 30 cm between and within rows.

Gap Filling

After 2 weeks of planting, dead cuttings were replaced with healthy ones; obtained from the same source to ensure 100% plant population.

Fertilizer Application, Irrigation and Weeding

During land preparation, the composted poultry manure was applied at rates of 0, 6 and 8 t/ha after transplanting. By using the formula below:

$$Organic\ manure = \frac{\text{Poultry Manure kg/ha}}{10{,}000} \times plot\ size$$

Weeding was done every two weeks to ensure healthy growth of fodder. Irrigation was done every other day throughout the experimental period.

Measurement of Morphological Characteristics

At fourth week of forage regrowth, 5 middle row plants were tagged from each plot and measured plant height, leaf length and leaf width with the use of measuring tape, and number of leaves and tillers per plant were counted from the tagged plants. Plant height was measured from the base of the plant to the tip, leaf length was measured from the base of the leaf to the tip and leaf width was measured at the widest portion of the leaf, while number of leaves and tillers per plant were counted from the tagged plants. The plant heights, leaf lengths, leaf widths, number of leaves and tillers per plant obtained were recorded accordingly. Also, at the fourth week of regrowth, the grass was harvested at 15 cm above the ground level and forage fresh and dry matter yields were estimated. These processes were repeated at two weeks interval until the plants reached 12 weeks after planting (i.e. 4, 6, 8, 10 & 12).

Harvesting and Processing

The green (fresh) fodder from tagged middle row plants were harvested manually at 4, 6, 8, 10 and 12 weeks after planting, and biomass yield of the Napier grass was determined for each plot and converted into tons/ha using the formula below.

$$Fodder\ yield\ per\ hectare(Kg) = \frac{plot\ fodder\ yield\ x\ 10{,}000}{\text{plot size}}$$

Dry Matter Forage Yield

Accurately 200 g fresh forage were weighed (FW), oven dried at 65^{0}C for 48 hours and reweighed (to get a constant weight) to give an estimate of the dry matter yield. The formula below was used to calculate the dry matter yield.

$$Dry\ matter\ yield\ (Kg/ha) = TotFW \times \frac{\text{DWss}}{\text{FWss}} \times\ 10$$

Chemical Analysis

The dried forage samples were ground to pass through a 2 mm sieve to obtain the fine particle for chemical analysis. Samples were analyzed for dry matter (DM), crude protein (CP), ether extract (EE), crude fibre (CF) and ash contents, according to AOAC (2005) procedures. The fibre fractions (acid detergent fibre and neutral detergent fibre) were determined using the method of Van Soest *et al.* (1991).

Statistical Analysis

Data collected were subjected to analysis of variance (ANOVA) using Statistix 10.0 statistical package. Significant differences between means were separated using Least Significant Difference (LSD) at 0.05 level of significance.

RESULTS AND DISCUSSION

Properties of Soil at Experimental Site

The physical and chemical properties of the soil at experimental site before planting are shown in Table 2. The soil is sandy loam in texture with a neutral (7.28) pH, low in organic carbon (0.43%), nitrogen (0.25%), total phosphorus (2.1 mg/kg) and available potassium (0.45cmol/kg), which indicates the need to incorporate more fertilizer to the soil especially of nitrogen source.

Table 2: Chemical and physical properties of experimental soil for the study area

Properties	Values
pH (in H_2O)	07.28
Organic Carbon (%)	00.43
Electrical Conductivity (dS/m)	00.16
Nitrogen (%)	00.25
Phosphorus -Bray 1(mg/kg^1)	02.10
Potassium (cmol/kg^1)	00.45
Sodium (cmol/kg^1)	00.09
Calcium (cmol/kg^1)	01.00
Magnesium (cmol/kg^1)	08.30
Exchangeable Acidity (mg/kg)	01.60
Sand (%)	57.10
Clay (%)	14.70
Silt (%)	28.20
Textural Class	Sandy Loam

Effect of Poultry Manure Rates on Growth Components of Napier Grass

The results of the effect of poultry manure on growth components of Napier grass at 4, 6, 8, 10 and 12 weeks after planting are presented in Table 3.

Table 3: Effects of poultry manure rates on growth components of Napier grass at different plant age in semi-arid zone of Maiduguri, Nigeria

Plant Age (Weeks)	Treatments	Plant Height (cm)	Number of Leaves	Leaf Length (cm)	Leaf Width (cm)	Number of Tillers
4	T1 (0t/ha)	14.80	2.40	36.20[a]	0.52	2.80[b]
	T2 (6t/ha)	15.20	2.80	29.60[b]	0.76	4.40[a]
	T3 (8t/ha)	15.80	2.40	32.40[ab]	0.62	2.80[b]
	SEM	1.24[NS]	0.49[NS]	2.64*	0.12[NS]	0.60*
6	T1 (0t/ha)	17.40	5.20[a]	42.60[a]	0.80[b]	4.60[ab]
	T2 (6t/ha)	16.40	4.20[ab]	31.60[b]	0.96[a]	5.60[a]
	T3 (8t/ha)	17.80	3.20[b]	36.00[b]	0.68[b]	3.60[b]
	SEM	0.82[NS]	0.82*	2.58*	0.07*	0.72*
8	T1 (0t/ha)	27.00[a]	8.60	51.00[a]	1.06	4.80[b]
	T2 (6t/ha)	18.20[b]	8.40	34.40[c]	1.80	6.80[a]
	T3 (8t/ha)	25.20[a]	8.20	43.40[b]	1.06	4.40[b]
	SEM	1.75*	1.14[NS]	2.79*	0.08[NS]	0.91*
10	T1 (0t/ha)	28.80[a]	13.40	57.20[a]	1.38	5.20b
	T2 (6t/ha)	20.70[b]	11.80	40.60[c]	1.40	8.20 [a]
	T3 (8t/ha)	29.40[a]	12.00	49.20[b]	1.46	4.80b
	SEM	1.78*	1.39[NS]	3.07*	0.11[NS]	0.82*
12	T1 (0t/ha)	29.60[a]	13.60	58.20[a]	1.42	5.60[b]
	T2 (6t/ha)	21.80[b]	13.20	41.60[c]	1.48	8.40[a]
	T3 (8t/ha)	30.20[a]	12.40	50.20[b]	1.52	5.40[b]
	SEM	1.85*	1.20[NS]	3.35*	0.12[NS]	0.85*

t/ha = tonne/hectre, [abc]:means within same column with different super scripts in subgroup are significantly (P<0.05) different, *=significant difference (P<0.05), NS=Non-significant difference (P>0.05), SEM=Standard Error of Mean.

Plant height was found to be statistically similar (P>0.05) across the different fertilizer applications; at weeks 4 (14.80 – 15.80 cm) and 6 (16.40 – 17.80 cm), but differed significantly (P<0.05) between the treatments at weeks 8, 10 and 12; with taller plants from T1 (27.00, 28.00 and 29.00 cm) and T3 (25.20, 29.40 and 30.20 cm) than at T2 (18.20, 20.70 and 21.80 cm), respectively. The number of leaves per plant were also statistically similar (P>0.05) across the treatments; at weeks 4 (2.40 – 2.80), 8 (8.20 – 8.60), 10 (11.80 – 13.40) and 12 (12.40 – 13.6) but differed significantly (P<0.05) between the treatments at week 6. Plants in T1 (control) had significantly (P<0.05) higher value (5.20) compared with T3 (3.20) but similar to T2 (4.20).

Conversely, the leaf length differed significantly (P<0.05) between the treatments at weeks 4 – 12, with longer leaves of 36.20, 42.60, 51.00, 57.2 and 58.20 cm, respectively from plants in T1 (0 t/ha poultry manure application) while plants in T2 (6 t/ha poultry manure application) had shorter leaves of 29.60, 31.60, 34.40, 40.60 and 41.6 cm at 4, 6, 8, 10 and 12 weeks after planting. Leaf widths were also statistically similar (P>0.05) across the treatments; at weeks 4 (0.52 – 0.76 cm), 8 (1.06—1.80 cm), 10 (1.38 – 1.46 cm) and 12 (1.42 – 1.52 cm) but differed significantly (P<0.05) between the treatments at week 6. Plants in T2 (6 t/ha poultry manure application) had significantly broader (P<0.05) leaves (0.96 cm) compared with T1 (control) (0.80 cm and T3 (8 t/ha poultry manure application) (0.68 cm).

The number of tillers differed significantly (P>0.05) between the treatments at weeks 4 - 12. The number of tillers recorded in T2 were significantly (P<0.05) higher (4.40, 5.60, 6.80, 8.20 and 8.40) compared with those in T1 (control) (2.80, 4.60, 4.80, 5.20 and 5.60) and T3 (2.80, 3.60, 4.40, 4.80 and 5.40).

The value recorded for taller plants from T3 at week 12 (29.40 - 30.20cm) was much lower than the 37.00 cm reported by Jemziya and Mubarak (2018) for Napier hybrid in Chenkalady, Sri Lanka with application of different kind of organic fertilizers rates of 6 ton/ha at five weeks. The taller plants recorded when poultry dropping was used on Napier grass could be due to high levels of mineralization from the higher rate of poultry manure in T3 (8 t/ha poultry manure application) which the plants were able to utilize well. The higher values recorded in T1 for leaf length across the weeks shows antagonistic effect of the manure applied. The finding contradicts the work of Jemziya and Mubarak (2018), who reported sharp rise in leaf length treated with organic manures. From third week onwards, the plots treated with poultry manure had dramatic significant differences compare to the control treatments at 5% significant confidence level. Tiller number was higher on plants with 6 ton/ha across the weeks. The findings from this experiment agrees with the work of Jemziya and Mubarak (2018) who reported poultry manure gave the highest number of tillers 27 per bush. The highest values recorded in this study were lower compared with the values obtained by Jemziya and Mubarak (2018) of 27 tillers bush at five weeks when poultry manure was applied.

Effects of Poultry Manure Rates on Fresh and Dry Herbage Yield of Napier Grass

The results for fresh and dry herbage yield of Napier grass as affected by different rates of composted poultry manure in semi-arid zone of Maiduguri, Nigeria are shown in Table 4. The results showed that there was no significant (P>0.05) difference among the treatment groups in both the fresh and dry yields of Napier grass in the study area. However, T3 (8t/ha poultry manure application) recorded a higher numerical value (5.07kg) than T1 (control) and T2 (6t/ha poultry manure application) for fresh herbage yield while T2 and T3 recorded higher numerical value (3.07kg each) for dry herbage yield than T1. Furthermore, the results showed that plots with higher poultry manure application had better yield than those that had no or low poultry manure.

Table 4: Effects of poultry manure rates on fresh and dry herbage yield (kg) of Napier grass in semi-arid zone of Maiduguri, Nigeria

Treatments	Fresh yield	Dry yield
T1 (0t/ha)	4.00	2.40
T2 (6t/ha)	4.40	3.07
T3 (8t/ha)	5.07	3.07
SEM	1.76^{NS}	1.25^{NS}

t/ha = tonne/hectre, NS=non-significant difference (P>0.05), SEM=Standard Error of Mean.

Response of Regrowth Height of Napier Grass on Poultry Manure Rates at Different Plant Age

Table 5 showed the results of regrowth height of Napier grass at different rates of poultry manure application. Significant (P<0.05) differences were observed at all the fertilizer levels and at different plant ages (weeks), except at the early vegetative stage (week

4). Plants on T3 had longer (P<0.05) plant regrowth than the plants on T1 (control) and T2; at sixth week, and plants on T3 and T2 than on T1at eighth, tenth and twelve weeks.

Table 5: Response of regrowth height of Napier grass on poultry manure rates in semi-arid zone of Maiduguri, Nigeria

Treatments	Week 4	Week 6	Week 8	Week 10	Week 12
T1 (0 t/ha)	30.50	30.63^{c}	31.56^{b}	31.80^{b}	33.33^{b}
T2 (6 t/ha)	30.00	40.37^{b}	41.43^{a}	43.50^{a}	45.33^{a}
T3 (8 t/ha)	30.37	42.00^{a}	42.96^{a}	44.66^{a}	47.00^{a}
SEM	0.58^{NS}	0.57*	0.77*	1.05*	1.30*

t/ha = tonne/hectre, [abc]: means within same column with different superscripts are significantly (P<0.05) different, NS=non-significant difference (P>0.05), *= significant difference (P<0.05), SEM=Standard Error of Mean.

The results from this experiment revealed that poultry manure had significant (P<0.05) influenced on stem regrowth at 6th, 8th, 10th and 12th weeks after cuttings. Various cutting intervals were studied with elephant grass which revealed that both the choice of cutting interval and height of cutting are crucial to its performance. The authors found out that the main factor affecting growth, yield and persistence of swards is the defoliation intensity (Werner *et al*., 1966; Santana *et al*., 1989; Santos *et al*., 2001 and Wadi *et al*., 2004). The result of the study showed an increase in plant regrowth height as the level of poultry manure and age of the plant increases. This agrees with the studies of Mannetje (1992) who observed that elephant grass requires high levels of fertilizer and a regular water supply. It also agrees with the report of Gohl (1982) that the elephant grass is tolerant to drought and will grow in areas where the rainfall range is between 200-400mm, which concur with Maiduguri's rainfall pattern (Alaku, 1983). The higher value recorded at week 12 for regrowth is also in line with the result of Francis (2004) who stated that; elephant grass is a full sunlight species that can withstand drought conditions and is a pioneer species in arid lands. The result of the study is also in conformity with Orodho (2006) who recorded maximum regrowth of elephant grass at 6-8 weeks of the plant age, at the same height as the first harvest. The severity of defoliation causes physiological and morphological changes in the plant, especially during the regrowth period (Briske, 1986). The regrowth height at cutting interval in this study had a positive effect on the herbage yield performance of Napier grass grown in a semi-arid zone of Maiduguri, Borno State, Nigeria.

Effects of Plant Age on Growth Components of Napier Grass

The effect of age of plant on growth components of Napier grass grown in the semi-arid zone of Maiduguri, Nigeria is presented in Table 6. The results showed that there were significant (P<0.05) increase in all the growth components at different ages. All the parameters measured (plant height, number of leaves, leaf length, leaf width and number of tillers) showed significantly (P<0.05) higher values at 10th and 12th weeks and lower values at 4th and 6th weeks.

The result obtained from this study indicates that stage of growth had an influence on the growth components of the grass. The observed increase in all growth parameters as the age of plants increases could be due to massive growth in roots, stems and leaf development that enable efficient nutrient uptake, allowing the plant to continue to grow in all the growth parameters measured. The current result agrees with the work of Tiruset (2019) who observed that mean growth components of *Desho* grass had a progressive growth from the early to the late stage of maturity. A consistent increment in plant growth was observed by Asmare *et al.* (2017) for Desho grass (*Pennisetum pedicellatum Trin.*) at later stage of growth which is a line with the findings of this study.

Table 6: Effects of plant age on growth components of Napier grass

Age (week)	Plant height(cm)	Number of leaves	Leaf length(cm)	Leaf width(cm)	Number of tillers
4	15.26^{c}	2.53^{d}	32.73^{d}	0.63^{d}	3.33^{d}
6	17.20^{c}	4.20^{c}	36.73^{c}	0.81^{c}	4.60^{c}
8	23.46^{b}	8.40^{b}	36.73^{b}	1.06^{b}	5.33^{bc}
10	26.30^{a}	12.40^{a}	49.00^{a}	1.41^{a}	6.06^{ab}
12	27.20^{a}	13.06^{a}	50.00^{a}	1.47^{a}	6.46^{a}
SEM	1.09*	0.59*	1.70*	0.05*	0.44*

Effects of Poultry Manure Rates on Chemical Composition of Napier Grass

Results of chemical composition of Napier grass grown with different rate of composted poultry manure in the semi-arid zone of Maiduguri, Nigeria, is presented in Table 7. The results showed that there were no significant (P>0.05) differences between the treatments in all the chemical parameters analyzed except ash content. The ash content was significantly (P>0.05) higher from T1 (control) than T2 and T3. The dry matter (DM) contents ranged from 95.70 to 96.35 % and crude protein (CP) ranged from 11.35 to 11.59. The nitrogen free extract (NFE) values were from 65.90 to 67.75%, acid detergent fiber (ADF) values were from 25.60 to 28.24% and neutral detergent fiber (NDF) values were from 40.58 to 42.46%.

Table 7: Chemical composition (%) of Napier grass as affected by poultry manure rates in semi-arid zone of Maiduguri, Nigeria

Treatments	DM	CP	EE	CF	ASH	NFE	NDF	ADF
T1 (0t/ha)	96.07	11.39	3.87	17.75	6.25^{a}	65.90	40.58	25.60
T2 (6t/ha)	95.70	11.35	3.86	20.62	4.00^{b}	67.75	42.46	28.24
T3 (8t/ha)	96.35	11.59	3.92	18.50	4.12^{b}	66.33	41.07	26.30
SEM	0.86^{NS}	0.57^{NS}	0.22^{NS}	4.38^{NS}	0.86*	5.66^{NS}	41.07^{NS}	3.99^{NS}

Key: t/ha = ton/hectare, T1, T2 and T3 = treatments, ^{ab} means within same column with different super scripts are significantly (P<0.05) different, * = significant difference (P<0.05), NS = Not-significant (P>0.05), SEM = Standard Error of Mean, DM = Dry matter, CP = Crude protein, EE = Ether extract, CF = Crude fiber, NFE = Nitrogen free extract, NDF = Neutral detergent fiber, ADF = Acid detergent fiber.

CONCLUSION

The morphological characteristics of Napier grass was improved by the application of 6-8t/ha of composted poultry manure. Regrowth height was higher from plots treated with the higher poultry manure fertilizer application (8t/ha).

Based on the findings, it is therefore recommended that poultry manure application of 8 tons per hectare (8t/ha) is recommended for Napier grass production in the semi-arid region of Borno State, Nigeria; Napier grass cultivation with higher rates of organic fertilizer (poultry manure) and longer regrowth period of cutting is recommended in this study area for better plant growth components and herbage yields.

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