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Influence of variable rates of matured poultry manure on the growth and yields of guinea grass (*Pannicum maximum* Jacq.)

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ABSTRACT

A field trial was conducted between February and May 2015 at National Biotechnology Development Agency (BIODEC) Centre Owode Yewa South, Ogun-State Nigeria to evaluate the influence of matured poultry manure on the growth and yield of guinea grass (Pannicum maximum Jacq). The treatments consisted of T_1 0.5kg/M^2 bed (Equivalent of 5.0 Metric tonsha^{-1}), $T_2$1.0kg/M^2 bed (Equivalent of 10Metric tonsha^{-1}), T_3 1.5kg/M^2 bed (Equivalent of 15Metric tonsha^{-1}) and T_4 No application (control).The experiment was laid down in a Randomised Complete Block Design (RCBD) replicated four times. The treatments were applied onto the beds uniformly and mixed thoroughly; planting was done one (1) week after application. Plant height, number of tillers generated and fresh weights of twelve (12) randomly selected plants were taking from within the three (3) middle rows at fifth 5th week after planting, third 3rd week after the first harvest and third 3rd week after the second harvest. The data collected were subjected to a univariate General Linear Model (GLM) two ways Analysis of Variance (ANOVA) using IBM SPSS software statistical package 21.Significance mean differences were separated using Fisher's Least Significant Difference (LSD) at 5 percent level of confidence. The results showed that there was no significant ($P > 0.05$) difference in the treatments effect on plant heights during the 1st and 2nd harvest, subsequently significant difference ($P< 0.05$) existed on the grass in term of all the parameters measured. Mature poultry manure dosage treatment (T_2)1.0kg/M^2 bed (Equivalent of 10Metric tonsha^{-1}) was observed to be the best and thus recommended for dissemination and use by farmers in the ranches, paddocks and in forage home gardens.

Key words: Matured poultry manure, rooted tillers, guinea grass, ranch, grazing, global warming.

INTRODUCTION

Guinea grass which is botanically called (*Pannicum maximum* Jacq) belongs to the family Poaceae. The grass is well established through tropical countries of both hemispheres where they play important roles in beef and dairy production [1].Animals fed on dry grain diets suffer from numerous gastrointestinal and other diseases after being shipped hundreds or thousands of miles, feedlot and animals arrive at slaughter house facilities with lots of contaminations. Meat raised and sold as "grass-fed," on the other hand, comes from animals that are less likely to be contaminated by E. coli bacteria.

Sheep and goat production in the tropics were reared basically on natural pastures that were not adequate in nutrient to meet the nutrient requirement of the animals [2].Unprocessed products from 100 percent pasture-fed animals can be extremely healthful and humane [3].

Improving grazing management will increase production and quality of the grazing land when animals are allowed to graze certain paddock while allowing other paddock time to regrow thus permitting cattle to receive more nutritious and palatable forage.

Rotational grazing is essential if continuous production of young and palatable leafy herbage is to be maintained. Continuous inorganic fertilizer application may lead to soil acidity or alkalinity. Chemical fertilizers do not sustain soil fertility for long and after their continual use there is deterioration of soil characteristics since they release nutrients at a faster rate [4]. Application of farm yard manure has resulted in the improvement of both the productivity and quality of guinea grass. The dry matter yield was reported to be significantly higher at high farm yard manure rates unlike inorganic fertilizer, which showed a high crude protein (CP) concentration only in the first cut, farm yard manure consistently gave a high concentration of crude protein (CP)even at the fourth cut and the effect lasts longer than that of inorganic fertilizer [5]

Poultry manure contained the highest 1.9 and 2.3 percent of total nitrogen compared to other organic manure such as saw dust, goat manure and cow dung [6] (Table 4).

Animals fed with high quality hay or green pasture get their requirement of vitamins A and E. Vitamin D is supplied through exposure to sunlight, which is another advantage of pasture production [7]. Amino acids are the building blocks of protein—a crucial nutrient for growth and reproduction in animals. Rumen microbes synthesize these building blocks from ammonia, a by-product of fermentation in the rumen.

Emissions of methane from domestic ruminant animals can to some extent be reduced when producers use improved grazing systems with higher quality forage, since animals grazing on poor quality rangelands produce more methane (CH4) per unit of feed consumed[8].

Communal conflicts between the Fulani herdsmen and arable farmers have been a recurring decimal in Nigeria with resultant losses at various degrees between the two parties. Establishment and demarcation of ranches for nomads particularly by the local government authority especially along the identified nomadic route has been recommended [9].Animal fattening implies controlling what livestock such as cattle, sheep, goat etc eat by using high quality feed in order to generate faster weight gains. It is a strategic feeding option which produces a quick result in (2-3 months) and it is technically simple. High quality grasses and agro- industrial by products can be used as feed sources. In case of cattle, once they have eaten to their appetite and remain full, the chances of negative upsets are reduced considerably. In this regard, additional *libitum* feeding would result in increased daily weight gains of up to 700 gm per day. This is rarely achievable with low quality and quantity feed. Besides, *Panicum maximum* is often considered as one of the best species for beef production. However, there are vast differences between guinea grass cultivars in terms of potential production, quality of the herbage and reaction to N fertilization. [10]

The objective of this study therefore is to evaluate the extent at which difference dosage of poultry manure could influence the quality and quantity of guinea grass (*Pannicum maximum* Jacq) as a forage crops in the South western Nigeria.

MATERIALS AND METHODS

Experimental site

The experiment was carried out at the premise of NABDA (Biodec) Owode, Yewa South Ogun State, Nigeria between February and May, 2015. Geographically, Owode - Yewa lies between latitude 60 481 N, 20 571 E and longitude 6.80 N 2.951 E [11]. Specifically the Biodec research centre coordinate was recorded to be N 06^0 43.712^1 E 002^0 59.531^1 (Hand held GPS receiver, Model: etrex Legend H, Germin). Ecologically, the area lies in the rain forest zone with two raining seasons from February- July and September –November. The rest months are usually characterized by dry season.

Land preparation and manure application

The site was manually cleared and debris parked after which sixteen (16) beds of dimensions 1 m × 1 m x 0.15 m L x B xHsize were made with 0.5m between the beds as guard. Matured poultry manure of variable rates in gramme as treatment were spread evenly on the beds and thoroughly mixed using hand trowel and garden fork. The worked

beds were watered moderately to facilitate even spread of the nutrients and they were allowed to stay for one (1) week before planting.

Collection and preparation of planting materials and manure

Rooted tillers of guinea grass (*P. maximum*) used for the trial were sourced from within the premise of BIODEC centre, Owode –Yewa. The plants were uprooted with hoe and carefully separated into single plant (rooted tiller). The vigorous and approximately similar plants size were selected and prepared. The rooted tillers were cut to equal length of five (5cm) each. The roots were trimmed closer to the roots base and the weights of the prepared rooted tillers used for the trial ranges from 7 – 10 g. The matured poultry manure used was prepared following the procedure of [12].

Experimental lay-out and design

The rooted tillers were planted on the beds at a spacing of 20cm x 20cm making a total of 25 plants per bed and a plant population of 250,000 plants ha^{-1} .The experiment was laid out in a Randomised Complete Block Design (RCBD) with four replicates. The treatments were matured poultry manure: T_1 0.5kg/M^2 bed (Equivalent of 5.0 Metric $tonsha^{-1}$), T_2 1.5kg/M^2 bed (Equivalent of 10Metric $tonsha^{-1}$), T_3 1.5kg/M^2 bed (Equivalent of 15Metric $tonsha^{-1}$) and T_4 no application (control treatment).

Data collection and statistical analysis

Twelve (12) plants were sampled randomly in each treatment plot from within the inner three (3) rows of each bed for data collection at 5th week after planting (WAP),(2nd harvest) 3rd week after the first harvest as well as (3rd harvest) 3rd weeks after second harvest. The data collected were plant heights, number of tillers, and fresh weights of the grass. Plant heights were measured by straightening up the plants and measure the highest leave with ruler, while the number of tillers were obtained by counting the emerging tillers of the selected plant sample. Fresh weights were obtained by cutting selected plant sample at the base 6 cm from the soil surface, shredded and measured with the aid of digital sensitive balance (CAMRY, Model EK 5055) in grammes. Data were analyzed by General Linear Model (GLM) univariate two way Analysis of Variance (ANOVA) using IBM SPSS soft ware statistical package 21. Fisher's Least Significant Difference (LSD) was used to separate the means at 95% confidential level. Laboratory proximate analyses of the shredded fresh leaves were carried out per harvest using the method recommended by [13]. The mean proximate analysis was presented in (Figure 1)

RESULTS AND DISCUSSION

Plant height

There were notable differences in the effect of matured poultry manure on the plant growth in term of height during 1st harvest (5weeks after planting), 2nd harvest (3 weeks after 1st harvest) and 3rd harvest (3 weeks after 2nd harvest). The greatest mean plant height was computed to be 84.52cm, 97.85cm and 105.38cm for treatment T_2, while the least values 63.92cm, 81.46 and 93.34cm for treatment T_4 and T_3 and T_4 respectively during the period of the study. An increase in plant height was observed over the period of harvest. There was no significant ($P>0.05$) difference between the mean plant height at 1st harvest (5 weeks after planting). But significance ($P<0.05$) differences existed between the mean plant heights at 2nd harvest (3 weeks after 1st harvest) and 3rd harvest (3 weeks after 2nd harvest). (Table1). This tallies with the result of Adesina *et al* (2014) [14] who reported a significant increase in plant height of pepper with difference level of poultry manure.

Number of tiller

There was a notable effect of the poultry manure dosage on the number of tillers generated by the guinea grass. During the 1st ,2nd and 3rd harvest, the highest mean number of tiller growth 6.44, 11.35 and 21.36 were recorded from treatment T_2 while the least 4.22, 7.31 and 14.43 was obtained on treatment T_4 (control). However, there was a significant ($P<0.05$) difference in the number of tillers generated during the period of the trial. (Table 2).These findings are in line with those of Onyeonagu and Ugwuanyi, (2012) [15] who observed that tiller number and plant height of guinea grass (*P. maximum)* were generally increased with incremental application of nitrogen fertilizer.

Fresh weight

A variable impact of the treatment effect was recorded in all the harvest. The highest mean fresh weight 42.67g, 143.58g and 159.8g were computed respectively for treatment T_2 , while the least mean fresh weight were 22.92g, 34.61g and 100.71g for treatment T_4 (control). There were no significant ($P>0.05$) difference in the mean fresh weight during the 1st harvest (5weeks after planting) but significant ($P<0.05$) difference existed among the mean fresh weight at 2ndharvest (3 weeks after 1st harvest) and 3rdharvest (3 weeks after 2nd harvest)(Table 3).The highest mean fresh weight recorded on treatment T_2 may be attributed to the high total carbohydrate accumulated by the grass (Figure 1). This finding corresponds with that of Feisal *etal*,2012 [16] who observed an increase in the forage

yield of *Sorghumbi colour* as affected by chicken manure. Abusuar and El-Zalia 2010[17] also reported that as the rate of chicken manure increases, both fresh and dry yields of forages sorghum (*Sorghumbi color* (L) Moench also increases.

Table 1: Mean plant height (cm) of (*P. maximum)* as affected by different quantity of matured poultry manure

Plant height (cm) over the period of the trial				
Poultry manure Metric tons per ha	**5WAP weeks after planting**	**3 weeks after 1st harvest**	**3 weeks after 2nd harvest**	**Mean**
T1	70.90a	91.28a	99.17c	87.12
T2	84.52a	97.85a	105.38a	95.92
T3	76.76a	81.46a	99.97b	86.06
T4 Control	63.92a	83.80a	93.34d	80.35
LSD(0.05)	36.12	15.59	3.58	
Mean	74.02	88.6	99.46	
C.V (%)	9.083	4.986	2.26	
(P-value)	0.011	0.002	0.000	
(F-value)	6.771	11.387	19.179	
SEM	1.681	1.104	0.563	

Mean with same letter within the same column are not significantly different at 0.05 probability level using the Least Significant Difference (LSD), SEM - Standard error of the Mean.

Table 2: Mean number of tiller sprouts of (*P. maximum)*as affected by different quantity of matured poultry manure

Number of tiller sprout over the period of the trial				
Poultry manure Metric tons per ha	**5WAP weeks after planting**	**3 weeks after 1st harvest**	**3 weeks after 2nd harvest**	**Mean**
T1	5.44b	8.90c	19.59b	11.31
T2	6.442a	11.35a	21.36a	13.05
T3	4.92c	9.07b	19.05c	11.01
T4 Control	4.22d	7.31d	4.43d	8.65
LSD(0.05)	0.08	0.91	2.40	
Mean	5.26	9.16	18.61	
C.V (%)	6.015	11.649	8.12	
(P-value)	0.000	0.004	0.001	
(F-value)	34.993	9.708	15.282	
SEM	0.079	0.267	0.378	

Mean with same letter within the same column are not significantly different at 0.05 probability level using the Least Significant Difference (LSD), SEM - Standard error of the Mean.

Table 3: Mean fresh weight (g) of (*P. maximum)*as affected by different quantity of matured poultry manure

Fresh weight over the period of the trial				
Poultry manure Metric tons per ha	**5WAP weeks after planting**	**3 weeks after 1st harvest**	**3 weeks after 2nd harvest**	**Mean**
T1	33.47a	109.08b	152.67b	98.41
T2	42.67a	143.58a	158.80a	115.35
T3	38.57a	95.78c	141.25c	91.87
T4 Control	22.91a	34.61d	100.71d	52.74
LSD(0.05)	70.96	48.29	17.66	
Mean	34.40	95.76	138.61	
C.V (%)	27.391	8.119	8.00	
(P-value)	0.072	0.000	0.000	
(F-value)	3.281	136.847	22.614	
SEM	2.356	1.944	2.775	

Mean with same letter within the same column are not significantly different at 0.05 probability level using the Least Significant Difference (LSD), SEM - Standard error of the Mean.

Table 4: Nitrogen, Phosphorus and Potassium content of Organic Manure

	2010			**2011**		
Organic manure	**Total N (%)**	**P2O2**	**K2O**	**Total N(%)**	**P2O2**	**K2O**
Saw dust	1	1.9	1.5	1.2	1.9	1.6
Goat manure	1.3	1.7	1.72	1.5	1.8	1.5
Cow dung	1.8	2.5	1.34	1.9	2	1.4
Poultry dung	**1.9***	2.8	1.61	**2.3***	2.6	1.7

Source: Ibrahim et al, 2014

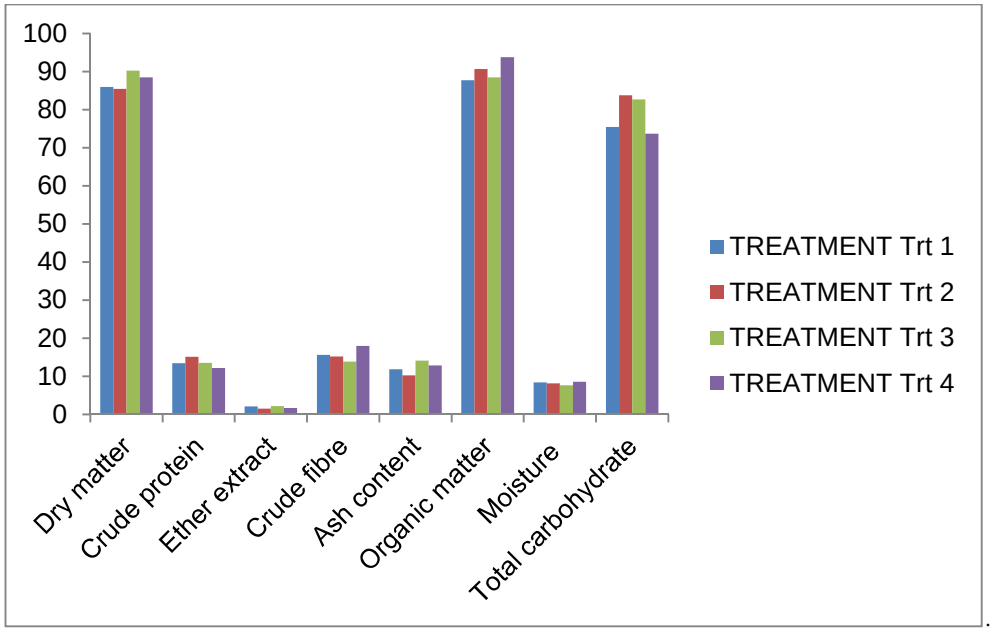

Figure 1: Mean proximate composition of the harvested forage grass *P. maximum*

CONCLUSION

Conclusively, the best growth, increased yields both in quality and quantity could be achieved in guinea grass when planted with different dosages of mature poultry manure. The study revealed that guinea grass (*Panicum maximum*) planted with matured poultry manure dosage of 10 Metric tons ha^{-1} could increase the yield of guinea grass thereby making available good quality and quantity forage for both common farm animals as well as semi domesticated bioresources like grass cutter in order to achieve best carcass and yield in a shorter period of time. Thus this is thus recommended for dissemination by change agents as well as for use in ranches, paddocks and forage home gardens.

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