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Effect of Manure Application on Herbage Yield, Nutritive Value and Performance of Wad Sheep Fed *Panicum maximum*

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Abstract
Effect of types of manure on herbage yield, nutritive value and performance of WAD Sheep fed native *Panicum maximum* was investigated. The experiment was laid out in a randomized complete block design with each plot replicated thrice. Poultry manure and sheep - goat manure were applied through broadcasting to an established *Panicum maximum* stand to supply 200kgN/ha and 0kgN/ha (control). Grass herbage harvested from experiment plot were fed as sole diets to West African dwarf sheep to determine feed intake (g/h/d), nutrient digestibility (%) and weight gain (g/h/d).
Results showed that *Panicum maximum* fertilized with poultry manure produced (P<0.05) higher values for biomass yield, number of tillers, tiller height, leaf length and leaf width. The chemical composition of *Panicum maximum* fertilized with poultry manure produced (P<0.05) higher CP and GE compared to sheep-goat manure. Similar trend of result was observed on mineral composition of *Panicum maximum* fertilized with poultry manure produced (P<0.05) higher values for P, K, Ca, Mg, Fe, Zn and Cu compared to sheep-goat manure. The feed intake (g/h/d), nutrient digestibility (%) and weight gain of the animals fed *Panicum maximum* fertilized with poultry manure produced higher values compared to its counterpart. It was concluded based on data obtained from this study that poultry manure application will promote higher yield and nutritive value for the *Panicum maximum*. Animals fed with this as sole diet and as short feeding regime experienced high weight gain.

Introduction

Nutrition is one of the most important factors that determine the profitability of any livestock venture (Alalade, *et al.,* 2012). Akinlade *et al.,* (2005) reported that a major problem facing small ruminant animal producer is how to feed the animals adequately in all year round. Consequently, the issue of palatability and nutritive quality changes has become of interest and great concern to researchers (Huston *et al.*, 1993). Ruminant animals rely on pasture for their nutrition than on any other feed resource (Aderinola *et al*.,2007).

All plants depend on soil for their supply of nutrients and grazing ruminant animals obtain the majority of their nutrient from plant growing on such soil. Fertilizers are needed to improve soil chemical and biological properties and this reflects on the phytonutrient contents and palatability of herbage plants (Alalade, *et al.*, 2013). Despite government subsidy on mineral fertilizer its cost and availability are subject of concern to many farmers. Fertilizer application for pasture production is limited because of the scarcity, financial implication and the greater importance attached to its use in arable crop production. Livestock farmers, many of whom are also crop producers prefer to use the little fertilizer they can afford to buy to boost grain yield rather than for pasture production in order to source cheaper alternative nutrient for crop production (Nweze and EzeIfeanyi, 2010). Manure is any material that could be added to soil to improve its fertility and improve plant growth. There are different types of manure and the most common organic manure available including cow, horse, sheep goat and poultry manure. Nweze and EzeIfeanyi, (2010) reported that the animal retain only 10% of the food mass they longest as they create large amounts of metabolic waste and incompletely digest organic matter.

Manure has longer lasting effect than the equivalent nutrient levels to chemical fertilizer. This is because a large proportion of the mineral nutrients are combined with organic substances which are released gradually as they decay. Hence improved yield may continue years after addition of manure to the soil (Plaster, 1992). *Panicum maximum* is a tropical grass, turfed and is perennial grass in nature. It is one of the most important tropical grasses and its occur naturally in Nigeria. It is high yielding and response very well to nitrogenous fertilizer application (Sodeinde, *et al.*, 2005) and can withstand regular cutting regrowths (Aganga and Tshwenyane, 2004). Physical characteristics such as high leaf production, low fibre content at an early stage of growths as well as relative availability are major factors that enhance the high intake and utilization of the grass by animals. It's very palatable to livestock at all stage and is one of the best fodder grasses in the tropic. A study by Aina and Onwuka (2002), showed that *Panicum maximum* was among frequently picked grasses by grazing sheep and goat. Hence in the current study the effect of type of manure with *Panicum* on its herbage yield and nutritive value were assessed.

Materials and Methods

Experimental Site

The experiment was carried out at the Teaching and Research Farm, Ladoke Akintola University of Technology, Ogbomoso, located in derived savanna zone of Nigeria. Ogbomoso lies at approximately 8° 7'' North of the equator and 4° 15''East of Greenwich meridian. The climate is characterized by fairly high uniform temperature (36.20°C) and moderate to heavy seasonal rainfall of about 1175mm (BATC, 2005).

Experimental Layout and Management Practice

The land used for the experiment was cleared and leveled manually to obtain a clean bed and laid out in a randomized complete block design. There were three treatments consisting of sole *Panicum maximum*, *Panicum maximum* fertilized with Sheep-goat manure mix and poultry manure. Each treatment was replicated thrice and each experimental plot measured 15mx15m with 1m path between plots. At the time of establishment two tillers of *Panicum* at a height of 15cm were planted per stand with a spacing of 50x50cm. After eight weeks it was cut back and manure were applied by broadcasting at the equivalent rate of OkgN/ha and 200kgN/ha respectively. Soil samples were collected before and after planting, bulked, air dried and kept till required and subjected to chemical analysis. Manures were poultry and sheep-goat collected from the poultry unit and sheep and goat unit at Teaching and Research Farm, Ladoke Akintola University of Technology, Ogbomoso.

Data collection

Data collection commenced twelve (12) weeks after manure application with *Panicum maximum* data were collected on nine *Panicum maximum* stand per plot on tiller number, tiller height, leaf width and leaf length. Tiller number and height, leaf length and leaf width measured randomly within each plot with the aid of the measuring tape, while the tillers were visually counted. Biomass yield was determined by manual harvesting of the grasses within each replicate in a 1m2 quadrat thrown once and weighed.

Soil Analysis

Before imposing treatments soil samples were randomly taken with the aid of soil auger at twenty (20) different locations within each replicate at 0-15cm depth and the analysis was done. At 12 weeks after establishment, soil samples for each treatment were also randomly taken with the aid of soil auger and analysed as described by (A.E.S 1998).

Animals and their management

Nine (9) West African dwarf sheep, about one year old weighing 12-15kg purchased from local markets were used in the study. These were randomly divided into 3 animals per treatment with each animal constituting a replicate. The animals on arrival were confined in the quarantine pen which had been previously washed and distinfected using lodophor solution. The animals were treated against internal and external parasite using Ivomec at 1ml to 10kg of body weight. They were also given long acting anti-biotic at 1ml to10kg of body weight. The animal was transferred into individual pens having the floor covered with wood shaving for the growth trial study.

Experimental diets

Panicum maximum forages were harvested manually at 12 weeks of regrowth at about 10cm above the ground level and chopped between 5 to 10cm lengths with the aid of cutlass and separately fed *ad libitum* to each experimental animal. *Panicum maximum* sole stand and *Panicum maximum* fertilized with Sheep-goat manure mix and poultry manure were fed to the animals on 100% of the *Panicum maximum* daily and at 3% of the body weight and water was given *ad libitum*.

Digestibility study

Nine (9) West Africa Dwarf sheep were used for a digestibility study. Three rams were selected per treatment. The animals were transferred into individual metabolic cages that allowed for separate collection of feaces and urine. They were in the cages for 21 days during which daily feed and fecal production were evaluated. They were given *Panicum maximum* alone. The animals were allowed to acclimatize for 14 days after which data on feed offered and faecal output were collected and weighed daily for 7 days. Sub samples of feed and faeces were taken and oven dried at 60^{0}C for 24 hours to determine dry matter content. Samples of the feed and feaces were kept till required for chemical analysis.

Chemical Analysis

Collected grass samples were oven dried at 60^{0}C for 48 hrs and ground. The finely ground samples were analysed for Crude protein (CP) according to A.O.A.C (1995). Neutral detergent fiber (NDF), acid detergent

fiber (ADF), acid detergent lignin (ADL) and gross energy (GE) were determined by the method of Van Soest *et al*., (1991). The mineral contents for K, Ca, Mg, Fe, Zn and Cu in digest were determined using atomic absorption spectrophotometer and Phosphorus was determined by Vonadomolybdate calorimetry method A.O.A.C, (1995).

Statistical Analysis

Data obtained were subjected to analysis of variance using General linear model of SAS, 2000. The significant means were separated using Duncan multiple range test.

Results and Discussions

Table1 shows the effect of manure application on herbage yield of *Panicum maximum*. There significant (P<0.05) differences among the parameters measured. Biomass yield, tiller number and height, leaf length and width were higher in *Panicum maximum* fertilized with poultry manure followed by sheep-goat manure while the least values were observed on the control treatment. The result shows that the use of poultry manure enhances production of higher herbage yield in *Panicum*. This is in line with the report of Alalade *et al.*, (2013) that poultry manure application to the pasture during establishment will help to establish pasture quickly and increase the forage yield of pasture species. Again Qamar Bilal *et al.*, (2000) reported that application of manure increased numbers of tillers and promoted plant height significantly over the control at all the stage of cuttings *Panicum*.

Significantly (P<0.05) differences were observed on the chemical composition of *Panicum maximum* in Table 2. *Panicum maximum* fertilized with poultry manure had higher crude protein and energy contents and was followed by sheep-goat manure treatment while the least value was observed on control treatment. This might be due to the activity of poultry manure in the soil nutrient and maintenance and promotes of plant growth. It probably supplied the necessary nutrient lacking in the soil through increase accumulation of organic matter. It also promoted the activities of living creation in the soil such as termite, earthworm and microbes and through these activities it can be improve the forage nutritive value in term of crude protein and energy contents of the forage. This is in line with recommendation of Alalade *et al.*, (2013) that poultry manure supplied the essential nutrients especially nitrogen which enhanced and encouraged vegetative growth. It is also supported by Alalade *et al.*, (2014) who explained that poultry manure was a good source of nitrogen, phosphorus and potassium required for good crop growth and maximum production.

Table 3, shows the effect of different manure application on mineral composition of *Panicum maximum*. There were significant (P<0.05) differences among the difference manure application. The results obtained for poultry manure had higher value for K, Ca, P, Fe, Zn and Cu respectively followed by sheep-goat manure treatment while the least value was observed on control treatment. This might be due to the fact that poultry manure was a valuable resource and it contained a significant amount of nitrogen, phosphorus, potassium, calcium, sulphur and many other macro and micro minerals. These results is in harmony with the report of Alalade *et al.*, (2013) that poultry manure was the richest in term of mineral and other nutrients.

Table 4, shows that feed intake (g/d/kg $^{0.75}$) of WAD sheep fed *Panicum maximum* fertilized with different manure. Poultry manure had significantly (P<0.05) increased DM, CP and ADL than the others. This agreed with the report of Alalade *et al.*, (2013) that application of organic manure improved the soil physical and microbial contents.

Table 5, revealed the nutrient digestibility of WAD sheep fed *Panicum maximum* fertilized with different manure. Poultry manure application were encouraged (P<0.05) higher DM, CP digestibility compared to sheep and goat manure produced by livestock. Moreover, the nutrient contents of poultry manure are among the highest of all animal manures. The use of poultry manure as soil amendment for forage plant will provide appreciable quantities of the entire major plant nutrient (Nweze and Eze ifeanyi, 2010).

Table 6, shows the average weight gain of WAD sheep fed *Panicum maximum* fertilized with poultry manure which were highest compared to sheep and goats manure while the least value was observed on control treatment. This might be because when nutritive value of forage improved, the experimental animals consumed more and this has lead to increased weight gain

Conclusions and Recommendations

Herbage yield and nutritional composition of *Panicum maximum* fertilized with poultry manure equivalent at the rate of 200kgN/ha were improved in derived savannah zone of Nigeria and these will ensure good quality forage. Finally, poultry manure can be a good alternative to the use of the unaffordable inorganic nitrogen fertilizer that has been recently discovered to pose threat to the environment on the long term basis.

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Table:1 Effect of different manure application on herbage yield of *Panicum maximum*

Manure type	Biomass yield(Kg/ha)	Tiller number	Tiller height (cm)	Leaf length(cm)	Leaf width (cm)
Sheep-goat	17000b	200.00b	185.66b	57.42b	2.50b
Poultry	28000a	300.00a	290.92a	80.46a	2.90a
Control	10500c	110.00c	146.35c	30.23c	1.80c
SEM	412.61	29.09	15.17	3.18	0.06

[abc]Means of the same column with different superscripts differ significantly (P<0.05) differences.

Table:2 Effect of different manure application on chemical composition of *Panicum maximum*

Manure type	CP%	NDF%	ADF%	ADL%	GE(Kcal/kg)
Sheep-goat	10.36^{b}	67.41^{b}	50.64^{b}	16.92^{b}	3.14^{b}
Poultry	12.91^{a}	54.16^{c}	40.55^{c}	14.15^{c}	3.15^{a}
Control	06.31^{c}	77.51^{a}	60.80^{a}	18.68^{a}	2.13^{c}
SEM	0.01	6.77	7.88	3.56	0.01

[abc]Means of the same column with different superscripts differ significantly (P<0.05) differences

Table:3 Effect of different manure application on mineral composition of *Panicum maximum*

Manure type	K%	Ca%	P%	Mg (mg/100g)	Fe (mg/100g)	Zn (mg/100g)	Cu (mg/kg)
Sheep-goat	0.22[b]	0.62[b]	0.51[b]	0.51[b]	260.60[b]	25.75[b]	5.00[b]
Poultry	0.32[a]	0.73[a]	0.62[a]	0.62[a]	272.90[a]	27.00[a]	6.30[a]
Control	0.11[c]	0.41[c]	0.30[c]	0.40[c]	223.00[c]	24.40[c]	4.93[c]
SEM	0.01	0.01	0.03	0.02	43.11	4.56	0.10

[abc]Means of the same column with different superscripts differ significantly (P<0.05) differences

Table:4 Feed intake (g/d/kg$^{0.75}$) **of WAD Sheep fed of *Panicum maximum* fertilized with different manure**

Manure treatment	Feed intake (g/d/kg$^{0.75}$)			
	DM (g/d/kg$^{0.75}$)	CP (g/d/kg$^{0.75}$)	NDF (g/d/kg$^{0.75}$)	ADL(g/d/kg$^{0.75}$)
Sheep-goat	429.40[b]	53.29[b]	228.90[b]	54.06[b]
Poultry	441.80[a]	69.99[a]	207.50[c]	39.85[c]
Control	418.82[c]	49.33[c]	232.60[a]	54.93[a]
SEM	48.00	5.89	23.67	8.12

[abc]Means of the same column with different superscripts differ significantly (P<0.05) differences

Table:5 Nutrient digestibility (g/kg) **of WAD Sheep fed of *Panicum maximum* fertilized with different manure**

Manure treatment	Nutrient digestibility (g/kg)			
	DM (g/kg)	CP (g/kg)	NDF (g/kg)	ADL(g/kg)
Sheep-goat	59.86[b]	29.82[b]	43.74[b]	20.75[b]
Poultry	60.84[a]	33.10[a]	15.43[c]	20.73[c]
Control	47.57[c]	13.73[c]	50.65[a]	58.95[a]
SEM	6.11	5.01	6.71	8.71

[abc]Means of the same column with different superscripts differ significantly (P<0.05) differences

Table:6 Average daily Weight change of WAD sheep fed with *Panicum maximum* fertilized with different manures

Parameter	Sheep-goat	Poultry	Control
Number of animals	3	3	3
Duration of feeding (in days)	28	28	28
Average Initial weight	15	15	15
Average final weight	16	16.5	15.2
Average weight gain(g/h/d)	35.7	53.6	7.1

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