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The Effect of Poultry Manure on Proximate Composition and *in vitro* Gas Production of *Panicum maximum* cv T 58 in the Derived Savanna Zone of Nigeria

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Abstract: The *in vitro* gas production and the proximate composition of field grown *Panicum maximum* cv T 58 (Guinea grass) harvested from poultry manured soil and harvested after 6 weeks of regrowth was determined. The experiment was a split plot design with three replicates. Poultry droppings increased the volume of the gas produced in both stem and leaf of *P. maximum* cv T 58. The result reveals that stems produce higher methane gas than the leaf. This indicates that the stem lost high energy compared to the leaves when fed to the ruminants. There were no significant differences ($P > 0.05$) in metabolizable energy (ME), organic matter digestibility (OMD) and short chain fatty acids (SFA) measured. *Panicum maximum* from fertilized poultry dropping recorded higher crude protein 8.40% content in the leaf compared with the stem of 5.08 %. Despite these variations, the forage generally contained adequate amounts of the minerals to meet livestock requirements. In production systems, the quality of *Panicum maximum* a major feed of grazing animals in south Western Nigeria could be enhanced by application of the poultry dropping to the soil.

Key words: Poultry droppings, proximate composition, *in vitro* gas production, panicum maximum cv T 58

INTRODUCTION

Inadequate nutrition is one of the major factors that generally affect livestock productivity. Despite the naturally endowed vegetations, there are still inadequate feeds and feed stuffs for livestock in Nigeria. Period of dry season is always stressful for livestock, as the environment is characterized by insufficient feeds, occasioned by scarce forage and fibrous standing hays. The negative effect of the period is obvious in the loss of weight, reduced milk production and high mortality of the animals. Incidence of disease outbreak is rampant as a result of low immunity arising from malnutrition. Ruminants relish guinea grass (Babayemi and Bamikole, 2004) but such forages become very scarce in the dry season. The production of the grass can be increased through the use of organic manure or farmyard manure like poultry droppings which is a waste product from the poultry industry. The *in vitro* gas production techniques is a relatively simple method for evaluating feed as large numbers of samples can be incubated and analyzed at the same time. For the past two decades, the techniques had been used in advanced countries as an instrument to determine the amount of short chain fatty acids, carbon dioxide and metabolizable energy of feeds for ruminants (Blummel and Orskov, 1993). Methane is an important gas among the gasses produced by ruminants during fermentation and has been reported by Babayemi and Bamikole (2006a,b) to be an energy loss to the animals and when emitted, contributes to the destruction of the ozone layer. The *in vitro* fermentation technique is capable of quantifying the amount of methane (energy loss) production (Flevez *et al*., 2005). This study was therefore conducted to evaluate the effect of organic fertilizer (Poultry dropping) on proximate composition and *in vitro* gas production of *Panicum maximum cv* T 58 in the derived savanna zone of Nigeria.

MATERIALS AND METHODS

Site of experiment: The experiment was conducted at the Teaching and Research farm of Ladoke Akintola University of Technology, Ogbomoso in the Derived savannah zone of Nigeria and the *in vitro* gas production was carried out at the Department of Animal Science, University of Ibadan, Nigeria.

Selected forage species: A newly introduced variety of Guinea grass from Cote d" Ivore (*P. maximum*) cv T 58 was selected for the experiment. The sward was cut back to a uniform height of 15 cm above the ground level.

Experimental design and procedure: The experiment which lasted 6 weeks was a split plot design with three replicates. It had the organic fertilizer as the main plot; the length was 22 m and the breadth 16 m. It was divided into subplots with each measuring 5 m x 7 m with the spacing of 0.5 m between and within row respectively. The plot was adequately labeled with their respective treatment tags. Each treatment was applied once, the three treatments received 3.5 kg of organic fertilizer (Poultry dropping) which was dissolve in water and broadcasted over the experimental plot. Soil samples was taken from the plots before and after treatment and prepared for mineral analysis as described by Little (1981). Samples of *Panicum maximum* were harvested from all the 9 sub plots, weighed and flip samples taken to the laboratory. The flip samples were oven dried at 70-80°C for 48 hours before being ground in a laboratory stain less steel mill using 1 mm-sieves.

Chemical analysis: All grass samples collected were weighed, oven dried and analyzed using standard analytical procedures. For the *in vitro* analysis, rumen fluid was obtained from three West African dwarf goats. The method for collection was as described by Babayemi and Bamikole (2006a,b) using suction tube in goats previously fed with 40% concentrates feed. The liquor was collected into the thermo flask that had been pre-warmed to a temperature of 39°C. Incubation procedure was as reported by Menke *et al.* (1979) using 120 ml calibrated transparent plastic syringe with fitted silicon tube. The sample weighing 200 mg (n = 6) was carefully dropped into syringes and there after, 30 ml inoculums containing cheese cloth strained rumen liquor and buffer (g/liter) of 9.8 $NaHCo_3$ + 2.77 Na_2HPO_4 + 0.57KCl + 0.47 NaCl + 0.12 Mg So_4 + 0.16 $CaCl_2$ + 1.0 Urea under continuous flushing with Co_2 was dispensed using another 50 ml plastic calibrated syringe. It was tapped and pushed upward by the piston in order to completely eliminate air in the inoculums. The silicon tube in the syringe was then tightened by a metal clip so as to prevent escape of gas. Incubation was carried out at 39 ± 1°C and the volume of gas production was measured every three hours at 3, 6 to 24 h. The post incubation period 4ml of NaOH (10 M) was introduced to estimate methane production as reported by Flevez *et al.* (2005).

RESULTS AND DISCUSSION

Table 1 reveals the proximate composition of *P. maximum* (cv T 58) after 6 weeks of regrowth were significantly (P < 0.05) different. The dry matter was highest in the leaf with 89.94, followed by control with 85.0 and least value of 70.07 in stem. The crude protein was high in leaf with 8.40 and low in the stem with 5.08. The crude fibre obtained was high in stem with 32.24 and low in leaf with 25.89. The ash content was high for both leaf and control with 11.96 and 11.5 respectively, low in stem with 9.62. The EE was only higher in leaf with 2.76 and low in stem and control with 1.64 and 1.4 respectively. The NFE observed was higher for both stem and leaf while lower value of 40.8 was obtained for control. The table 2 shows no significant (P > 0.05) difference among the in-vitro gas parameters measured. ME in the stem having the same value as the leaf. OMD value for stem (56.91 %) was slightly lower than the leaf

Table 1: Effect of poultry droppings on proximate composition of (%) Guinea grass (cv T 58) after 6 weeks of regrowth

Percentage Composition (%)	Control	Stems	Leaves
M	70.07[c]	89.94[a]	85.0[b]
CP	5.08[c]	8.40[a]	6.8[b]
CF	32.24[b]	25.89[c]	39.5[a]
ASH	9.62[b]	11.96[a]	11.5[a]
E.E	1.64[b]	2.76[a]	1.4[b]
NFE	51.42[a]	50.99[a]	40.8[b]

[a b c]Means in the same row are significantly different at (P < 0.05).

Table 2: Effect of poultry droppings on metabolizable energy (MJ/kg DM), organic matter digestibility (OMD) (%) and short chain fatty acids (SCFA) (µmol) of *Panicum maximum* cv T 58 after 6 weeks of regrowth

	In Vitro gas parameters		
Sample	ME (MJ/kgDM)	OMD (%)	SCFA (µmol)
PD stem	8.47	56.91	0.99
PD Leaf	8.47	57.67	0.97
SEM	0.084	0.036	0.015

Table 3: Effect of poultry droppings on *in vitro* characteristics of *Panicum maximum cv* T 58 after 6 weeks of Regrowth

Sample	A	B	C	Y
PD stem	9.00[ab]	35.0[a]	0.03[a]	23.50[a]
PD Leaf	8.00[b]	35.0[a]	0.04[a]	23.50[a]
SEM	0.297	0.850	0.08	15.800

[a b c]Means in the same row are significantly different at (P < 0.05).

(57.67%) while SCFA measured were higher in the stem (0.99) than the leaf (0.97). Tables 3 and 4 shows effect of poultry droppings on *in vitro* characteristics and *in vitro* gas production (incubating period) of *Panicum maximum* cv T 58 were both significantly (P > 0.05) different and were shown in the graph (Fig. 1) and chart (Fig. 2) respectively. The volume of gas produced (Y) in leaf was higher than that of the stem due to many factors that may determine the amount of gas produced. These include fermentation, the nature and level of fibre, the presence of secondary metabolites (Babayemi and Bamikole, 2004) and potency of the rumen liquor for incubation. Gas production is a function and a mirror of degradable carbohydrate and therefore, the amounts depends on the nature of the carbohydrates (Makkar *et al.*, 1995). The *in vitro* gas production pattern of the *Panicium maximum* cv T 58 harvested from poultry dropping plots indicated that more degradation of dry matter were still possible beyond 24 hours. The high crude protein in the leaf enhanced microbial multiplication in the rumen which in turn determined the extent of fermentation. (Babayemi and Bamikole, 2004). Methane production indicates an energy loss to the ruminant and many tropical feed stuffs have being implicated to increase methanogenesis (Babayemi and

Table 4: Effect of poultry droppings on *in vitro* gas production of *Panicum maximum* cv T 58) after 6 week of Regrowth

	Incubating period						
Sample	6	9	12	15	18	21	24
PD Stem	9.0^{b}	14.5^{a}	2.2^{ab}	26.3^{ab}	33.7^{a}	38.3^{a}	44.0^{a}
PD Leaf	8.0^{b}	13.0^{a}	20.0^{c}	27.0^{ab}	31.7^{ab}	37.3^{ab}	43.0^{a}
SEM	0.284	0.516	0.319	0.677	0.603	0.424	0.59

^{abc} Means in the same row are significantly different at ($P < 0.05$).

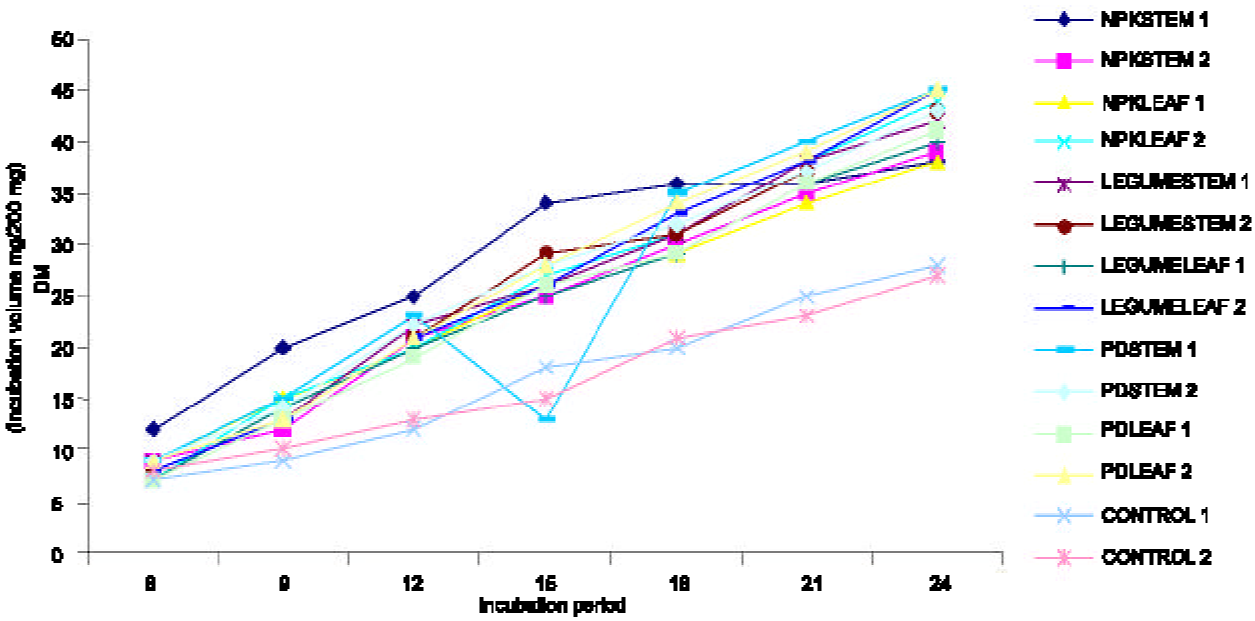

Fig. 1: *In vitro* gas production of Guinea grass enriched with organic, in-organic and legume fertilizers

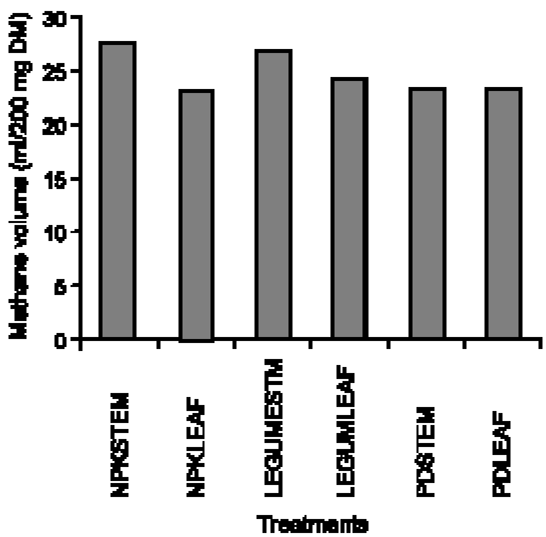

Fig 2: Methane production of Guinea grass fertilized with organic, in-organic and legumes.

Bamikole, 2006a; Babayemi *et al.*, 2006b). The metabolizable energy (ME), organic matter digestibility (OMD) and short chain fatty acids (SCFA) production pattern of the *Panicum maximum* cv T 58 is presented in Table 2, the value ranged from 8.47 ME, 56.91 OMD and 0.99 SCFA. There were no significant differences ($P < 0.05$) among the leaf and stem in ME, OMD and SCFA. These results was against the findings of Aregheore and Abdulrazak (2005) that feed stuffs that are inherent with certain antinutritive factors had been reported to be low in metabolizable energy and organic matter digestibility. Coming down to evaluate the nutritive value of the grass, the *in vitro* method revealed that less of methane (CH_4) gas was produced while more of the short chain fatty acids (SCFA) were recorded. This reveals that the grass will be readily utilized after digestion for maintenance and production. No antinutritional factor was identified to be present in the grass *Panicum maximum* cv T 58. In Fig. 1, the graph shows that the volume of the gas produced in both stem and leaf was increasing as the hour increases, but on getting to the 18 h., 21h and 24 h. The same volume of gas was produced. Figure 2 shows the chart shows that leaf produce lower methane gas than the stem. This indicated that the stem had high energy loss compared to the leaves when fed to the ruminants (Babayemi and Bamikole, 2004; Getachew *et al.*, 1999).

Conclusion: The results of the present study suggest that application of poultry manure to the sward of *Panicum maximum* encouraged high level of energy loss when harvested and fed to ruminant at about 6 weeks of age. This sward should be allowed more time to mature before it could be fed adequately to ruminants. Nevertheless, nutrient requirement of sheep could be met at 6 weeks of age.

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