EFFECT OF ORGANIC AND INORGANIC MANURE ON CHEMICAL COMPOSITION AND *IN SACCO* DEGRADABILITY OF GAMBA GRASS (*ANDROPOGAN GAYANUS*) HARVESTED AT FOUR WEEKS

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ABSTRACT

This study was aimed at assessing the long time effect of organic and inorganic manure (control, pig waste, poultry litter, cow dung and NPK fertilizer) on the nutritive value and digestibility using the nylon bag technique. The experiment was carried out at the teaching and research farm University of Ibadan between March and September 2014. Seedlings of *A. gayanus* were planted on a total land area of 1382.5m^2 which was cleared and subdivided into 30 sub plots of 4m x 4m with 1m within and between plots respectively. The experiment was laid out in a completely randomized design of five manure treatments i.e cow dung, pig waste, poultry litter, NPK 15:15:15 and control. The Manure type affected ($p<0.05$) CF, ASH ADF and NDF but had no ($p>0.05$) effect on CP, DM and NFE and potential degradability. It was recommended from this study that farmers should adopt the use of organic manure of animal origin such as pig waste, cow dung and poultry litter respectively as a viable alternative for ease of establishment of this grass species as livestock feeds in order to remove competition with humans on conventional feed stuff.

Keyword: *Andropogan gayanus*, manure, digestibility.

INTRODUCTION.

It is the portion of the digestive tract known as the rumen and its distinctive population of microorganism that provides ruminants with the genetic potential to derive energy from widely varying fibrous feeds. The nutritional values of forage species are low in the dry seasons compared to the wet season Buxton, (1996). Concentrations of nutrients according to McDowell *et al.,* (1983) in forage plants are dependent upon the interaction of a number of factors. Such as plant species, soil type, plant age, pasture management and climate. Most soil used to grow plants, including ornamentals, grass and vegetables, needs its basic nutrients replenished over time. Fertilizers boost the soil's reserves of elements essential to the healthy growth and development of plants. Although conventional and organic fertilizers both add needed nutrients to the soil, organic fertilizer differs because it is derived from natural sources as opposed to being synthetically manufactured. Although organic and synthetic fertilizers add the same nutrients to the soil, organic fertilizers work in a different way. Organic fertilizers work double duty by providing required nutrients to growing plants while also feeding the soil. In Nigeria, forage species still serve as source of essential elements for grazing animals. However, little information is available on the nutrient status of grazing animals and of the forages upon which they subsist. Onyeonagu *et al*., (2013) It therefore becomes essential to replenish the soil with the nutrient elements to increase the forage production, improve nutrient quality of forage and to enhance establishment of range land. Farmers mostly use inorganic fertilizer but the usual unavailability of these fertilizers alongside it high price and potential pollution effect on the environment makes organic manure a veritable alternative.

MATERIALS AND METHOD

The experiment was carried out at the teaching and research farm of the University of Ibadan. An area of 1382.5m^2 was mapped out ploughed and allowed to rest for a period of two weeks before harrowing. The area was divided into two blocks and each block was subdivided into 60 sub plots of 4m x 4m with 1m within and between plots respectively. The grass seedlings were planted at a depth of 2cmwith a spacing of 1m x1m within and between rows with a total of 16 planting spots per plot. The grasses were planted in the month of March and were cut back to a height of 15cm for data collection in the month of July. Basal application of manures (treatment) was done three weeks after the emergence of the grass.

The experiment was laid out in a completely randomized design CRD Weed control was done manually with the use of a hoe throughout the experimental period.

Chemical composition: Crude protein, crude fibre, ash and ether extract were determined according to the method of AOAC (1990) and fibre analysis was carried out using the method of Van Soest *et al.* (1991).

Determination of Degradability

In determining the degradability of the experimental grass, the rumen degradability study of the grass were carried out at the intensive care unit of the Department of Animal Science University of Maiduguri using two fistulated bulls fitted with a stable cannulae.

Procedure

3g of the milled sample were weighed into a nylon bag each measuring 5x10cm with a pore size of 50microns. The nylon bags with the samples were inserted in to the rumen via the cannulae with the use of a sample holder. The sample holder was perforated to allow the movement of rumen microbes in and out of the sample holder as well as coming in contact with the feed sample but not the sample bags out of the holder. The sample holder serves as a confinement for the nylon bags for easier evacuation /removal of the bags from the rumen after incubation. The nylon bag with the sample is incubated for a period of 6, 12, 18,24,36,48 and 72 hours respectively to be incubated (digested) then evacuated. After evacuation of the nylon bag from the rumen of the bull, the cannulae and area surrounding it was cleared of rumen content, spillage and disinfected with the use of a disinfectant (dettol) the nylon bag with the sample was rinsed under tap water immediately to stop further fermentation. The residue was the oven dried at 60^{o}c for 24 hours and weighed. The degradability was calculated as the difference in weight between the initial weight of the sample and the final weight of the sample before and after incubation respectively (McDonald 1995). Dry matter disappearance was determined as

$$\% \text{ DMD} = \frac{A - B}{A} \times 100$$

Where A= initial weight before incubation, B= final weight after incubation.

3.3 Statistical Analysis

Data obtained were subjected to Analysis of Variance (ANOVA) using SAS (2010) and means were separated using Duncarn multiple range test of the same package.

RESULTS AND DISCUSSION

Chemical composition of *ANDROPOGON GAYANUS*

TABLE 1. Main effect of manure type on chemical composition of *Andropogon gayanus kunt (g/100g)*

TREATMENT	CP	CF	EE	DM	ASH	ADF	NDF	NFE
CONTROL	7.9600^{b}	24.4889^{a}	6.2433^{c}	39.3889^{a}	5.1633^{a}	51.0833^{a}	58.8833^{a}	17.1956^{a}
NPK	8.2311^{ab}	23.60889^{c}	6.54222^{ab}	40.1889^{a}	4.8722^{bc}	49.8000^{b}	57.7667^{b}	16.5567^{a}
CD	8.2656^{ab}	23.52^{d}	6.48444^{b}	39.6444^{a}	4.94556^{b}	50.9833^{a}	58.7000^{a}	17.2811^{a}
PL	8.7800^{a}	23.72333^{b}	6.50667^{ab}	40.1333^{a}	4.84778^{c}	50.333^{ab}	58.9667^{a}	16.0089^{a}
PW	7.8922^{b}	23.6733^{bc}	6.63111^{a}	40.3667^{a}	4.71889^{d}	50.6833^{ab}	57.9833^{b}	16.7178^{a}

,b,c: means on the same column with different super superscript are significantly different($p<0.05$).
CD= cow dung, PW= pig waste, PL= poultry litter, NPK fertilizer, SEM= Standard error of mean.

The neutral detergent fibre (NDF) which is a measure of the plant cell wall content is the chemical component of the feed that determines its rate of digestibility. NDF is inversely related to plant digestibility (Mc Donald *et al*.1995; Gillespie 1998.) NDF in grasses results in longer retention time and reduces feed intake by ruminants. The higher the NDF the lower the plant digestible energy. The NDF value observed in this study was lower than 75% reported by Babayemi and Odedire (2008). The highest value of 58 .966 % was recorded at poultry litter treated A. gayanus was lower than 60%

reported by Babayemi and Odedire (2008) for A gayanus.. ADF value ranges between 49.80- 51.08% This variation may be due to the fact that the complete plant at harvesting period was chopped and milled together for this analysis. Bamikole and Babayemi *et al.,(*2006) also reported that stages of harvesting , storage, fertilizer application, soil fertility, climate and region could affect chemical composition. The dry matter content ranges between 39.38.- 40.36%. The crude protein content of the grasses were significantly different ($p<0.05$) the crude protein value obtained in this study ranges between 7.89- 8.78% .The variation in CP with that of the cited authors could be as a result of change in climate as well as the nitrogen content of the soil. Bamikole and Babayemi (2006) observed that Cp of grasses intercropped with legumes increases as a result of nitrogen fixation in to the soil by legumes. The crude fiber content varies significantly ($p<0.05$) which ranges between 23.52-24.48%.The value was lower than that reported by Mohammed *et al* .,(2002) who reported 31% CF in hay of A gayanus. Crude fiber content tends to increase as the plant matures Waziri *et al.*,(2013) reported that CF increases as plant matures this makes the plant tensile, strong, erect for exposure to needed sunlight , maturation of seeds and easy harvesting. The ether extract varies significantly ($p<0.05$) across the treatments with respect to harvesting stage (maturity). The value obtained in this study ranges between 6.24-6.63% The value obtained was lower than 9.20 repoted by Waziri *et al*.,(2013) Ether extract found mainly on the leaves of plants assists in the formation of protective layers constituent of many membrane and major source of stored energy. The ash content value ranges from 4.71-5.16%. The value obtained was lower than 10.50 reported by Babayemi and Odedfire(2008) and also lower than the range of 7- 12% as observed by AFRIS (1980) and Duke (1983) although there was no specification on the stage of maturity for the determination of their ash values. The difference could be due to high absorptive capacity of mineral elements from the soil by the plant and its perennial nature. These study observe that the ash value tends to increase as the plant matures since the organic matter content of plants are determined by the difference in ash content in percentage from 100. It's a clear indication that the lower the ash content the higher the organic matter.

Dry Matter Disappearance

Table 2 Main effect of manure type and age at harvesting on Percentage disappearance of *Andropogon gayanus Kunt(% ml/200mg)*

TREATMENT	6HRS	12HRS	18HRS	24HRS	36HRS	48HRS	72HRS
CONTROL	47.767[a]	49.875[a]	55.484[a]	61.323[a]	70.946[a]	77.731[a]	79.032[a]
NPK	49.122[a]	52.161[a]	57.173[a]	63.402[a]	74.032[a]	80.731[a]	82.321[a]
CD	49.475[a]	52.846[a]	57.769[a]	64.020[a]	74.643[a]	81.354[a]	82.961[a]
PL	48.898[a]	52.156[a]	56.906[a]	62.971[a]	72.280[a]	78.926[a]	80.427[a]
PW	49.170[a]	52.479[a]	57.510[a]	64.489[a]	74.336[a]	81.174[a]	82.651[a]

The dry matter disappearance observed in these study was within the range of 79.032- 82.961% The 72hr period of incubation was the period in which grasses were expected to reach their potential degradability as reported by Orskov and Mc Donald (1979).

Effective Dry Matter Degradability

Rumen turnover rate which is the sum of passage rate and degradation rate in the rumen are not only influenced by intrinsic plant characteristics but also by extrinsic factors with in the rumen environment such as rumen pH, rumination, absorption and stimulation of microbial population At 72hrs incubation periods the cow dung treated forages had higher dry matter degradability value than the control. The digestibility of a feed stuff is defined by the potential degradability of the material, the rate of degradation of this potential degradable fraction and its residence time in the rumen (Orskov *et al., 1980*).

CONCLUSION

These study shows that *A.gayanus* can be cultivated in south western Nigeria with the use of organic manure to obtain a high quality yield that can meet the nutrient needs of grazing animals at a lower cost and higher yield compare to the use of inorganic manure which has high cost and low long time effect on the soil. These study shows that *A.gayanus* responds well to organic manure and yields high nutritional content and digestibility. This was observed in the rate of disappearance from the nylon bag with respect to incubation period with organic manure treated forages showing the highest rate of potential degradability.

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