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PALATABILITY INDEX OF THREE TROPICAL GRASSES AS INFLUENCED MANURE TYPE AND HARVEST AGE

Dele, P.A.[1*], Akinyemi, B.T.[1], Ojo, V.O.A.[1], Amole, T.A.[2], Sowande, O.S.[3], Arigbede, O.M.[1] and Olanite, J.A.[1]

[1]Department of Pasture and Range Management, Federal University of Agriculture, Abeokuta

[2] International Livestock Research Institute, Ibadan

[3] Department of Animal Production and Health, Federal University of Agriculture, Abeokuta

* Corresponding author: delepa@funaab.edu.ng

ABSTRACT

A cafeteria trial was carried out on three tropical grasses fertilized with four animal manures and harvested at four different ages with the use of fifteen yearling calves. The experiment was a 5x3x4 factorial in a split-split-plot design with three replicates. The four animal manures (cattle, swine, poultry and sheep and goat) and no manure (control) were used as the main plots; three grass species [*Megathyrus maximus* (Local), *M. maximus* (Ntchisi) and *Cenchrus purpureus*] were the sub-plots and four age at harvest [4, 8, 12 and 16 weeks after planting (WAP)].The results of the grasses consumed as affected by the manure type during the cafeteria studies showed that swine manured grasses intake (0.40 kg) was significantly higher ($P<0.05$) than other manure sources. Also, the grasses harvested at 8 weeks after planting (WAP) were the most (0.38 kg) consumed while the grasses harvested at 4 WAP were the least consumed. The effect of species was significant ($P<0.05$) on the consumption of the grasses as the *M. maximus* (Local) recorded the highest (0.34 kg) while the *C. purpureus* recorded the least consumption value. The age at harvest effect on the coefficient of preference of the grasses showed that the grasses harvested at 8 WAP were significantly higher than those harvested at other ages. In conclusion, the coefficient of preference and relative palatability index in this study was in favour of grasses fertilized with swine manure, *M. maximus* (Local) and grasses harvested at 8 weeks after planting.

Key words: cafeteria, grasses, manure, preference, tropical,

INTRODUCTION

Palatability is said to be influenced by texture, leafiness, fertilization, dung or urine patches, moisture content, pest infestation, or compounds that cause a forage to taste sweet, sour, or salty (Ball *et al*., 2001). Reid *et al.* (1992) reported higher preference of N-fertilized *Panicum virgatum* cv. Trailblazer compared with unfertilized of same cultivar by sheep. Palatability may be influenced by species, strains, manuring and management of cutting and grazing (Garner, 1963). Ivins (1952) and Garner (1963) stated that nitrogenous manures increase the palatability of grasses. Organic manures are known as valuable sources of nutrients, especially nitrogen, for improving grassland productivity (Liacos and Papanastasis, 1986). One way to improve sown pasture production in the tropics is the use of animal excreta/dung that are readily available because of the large quantities of animal manures generated daily from high volume of

animal production activities on varying scales (Osuhor *et al.*, 2002; Fasae *et al*., 2009), which will also serve as a way to reducing environmental pollution, instead of the more expensive commercial fertilizers. Cummins (2014) stated that the higher preference for grasses favoured them at a younger stage of growth or plant maturity. There are dearths of literatures or relatively few studies on the effect of animal manures on the palatability of tropical grasses. Hence, the objective of this study was to evaluate palatability index of tropical grasses as influenced by animal manures applied and harvest age.

MATERIALS AND METHODS

Experimental site

The field experiment was conducted at the Organic Research Farm and Cattle Unit, Federal University of Agriculture, Abeokuta, Ogun State.

Land preparation, manure collection, analysis and application

11.2 The land was cleared, followed by ploughing after which the land was allowed to rest for a period of two weeks before harrowing. The experimental land measuring 4,265 m^2 was mapped out after harrowing. Manure from four animal species applied is that of cattle, sheep and goats, swine and poultry. The sheep and goats dung were bulked together as one in ratio 1:1 of the dry matter because of the quantity available during the period of the experiment. The manures were collected 14 days before the application and sub-samples were taken from each manure type and analyzed prior to application to determine their nutrient composition. The rate of application was 300 kgN and quantities of the manures were determined based on the nitrogen content of the manure and nutrient compositions of the manures

Sourcing of planting materials and planting

The grass species planted are *M. maximus* (Local), *M. maximus* (Ntchisi) and *C. purpureus*. The grasses were planted at the spacing of 0.5 m x 0.5 m so that each plot had forty-eight stands. The plots were well labeled with the treatments indicated.

Experimental design, plot management and Harvesting of forage materials

The study was a 5 x 3 x 4 factorial experiment in a split-split-plot design with an experimental area measuring 4,265 m^2 divided into three (3) replicates. The manure (Cattle, sheep and goats, swine, poultry and no manure-control) treatments were allotted to the main plot, the grass (*M. maximus* (Local), *M. maximus* (Ntchisi), and *C. purpureus*) species to the sub plot while the age at harvest (4, 8, 12 and 16 weeks after planting) were also allotted to the sub-sub plot.

Preparation of forage sample for cafeteria trial, Experimental animals and housing

At each age at harvest, forage materials were harvested a day before introducing them to the animals to allow for wilting under shade. Fifteen calves with five calves per replicate between the age 8 and 9 month old were used to evaluate the free choice intake of the forages. The treatments were assigned within 5 consecutive days of data collection (Reid *et al.*, 1992). The calves were confined in a feeding pen made of concrete and they were fed together. The forages were introduced into 15 different feeding troughs of

about 70 cm x 40 cm x 23 cm in dimension which were placed in the feeding pen and with two troughs being empty at each end to nullify any border bias. The animals were allowed to have access to the forages for 30 minutes per day after which the forages were withdrawn from them to determine the preference of forages offered.

Feeding for data collection and calculation

A known weight of grasses (2 kg) were randomly collected from the experimental plot comprising 15 treatments at each age at harvest and were distributed into 15 different feeding troughs. The preference for the forages were calculated as the percentage of the forage consumed relative to forage offered for five days

% Consumption = (forage offered – forage remnant)/forage offered x 100

The forage preferred was assessed from the coefficient of preference (COP) value according to Babayemi *et al*. (2006). The COP is expressed below as:

COP = intakes for the individual forage/average intake of the forages

Relative palatability index (RPI) was calculated according to Larbi *et al.* (1993).

The RPI is as expressed below:

RPI (%) = Consumption values for each species/ Forage consumption highest value x 100

Data analysis and presentation

Data collected were subjected to analysis of variance and the treatment means separated using Tukey'HSD using SAS (1999) package and means were presented graphically.

RESULTS

The results of the grasses consumed as affected by the manure type during the cafeteria studies. The intake (0.40 kg) of swine manured grasses was significantly higher ($P<0.05$) than the others as the unfertilized grasses had the least intake. The grasses harvested at 8 weeks after planting (WAP) were the most (0.38 kg) consumed while the grasses harvested at 4 WAP were the least consumed The effect of species was significant ($P<0.05$) on the consumption of the grasses though the *M. maximus* (Local) recorded the highest (0.34 kg) while the *C. purpureus* recorded the least consumption value (Figure 1).

The coefficient of preference (COP) of the grasses as recorded (1.31) in this study shows that the swine manured grasses was significantly higher ($P<0.05$) than others as the unfertilized grasses recorded the least (0.77) value. The COP of the grasses as affected by the species recorded the highest value for *M. maximus* (Local) although the value was ($P<0.05$) significantly different from the other species. The age at harvest effect on the COP of the grasses showed that the grasses harvested at 8 WAP were significantly higher than those harvested at other ages (Figure 2).

The relative palatability index (RPI) of the grasses as affected by the manure type, species and age at harvest was as presented in Figure 3. The RPI as affected by the three treatment factors followed similar trends as COP.

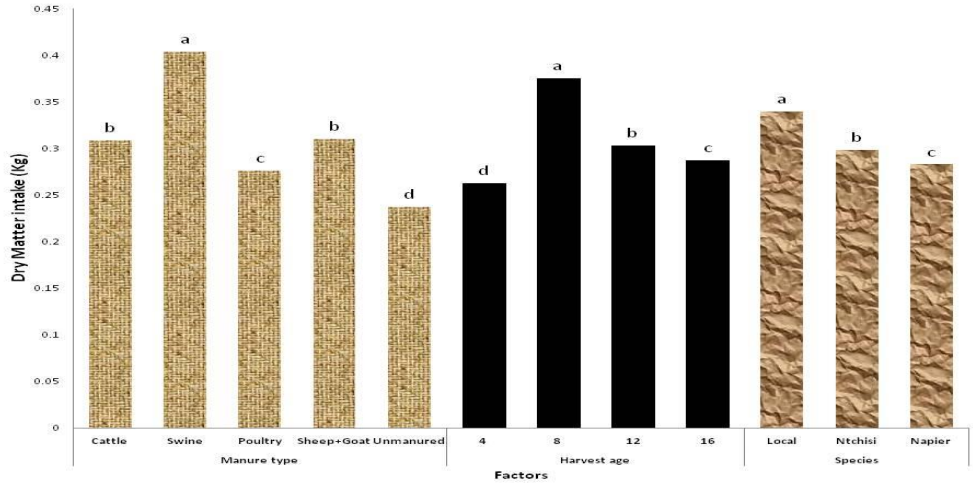


Figure 1: Dry matter intake as influenced by manure type, harvest and species

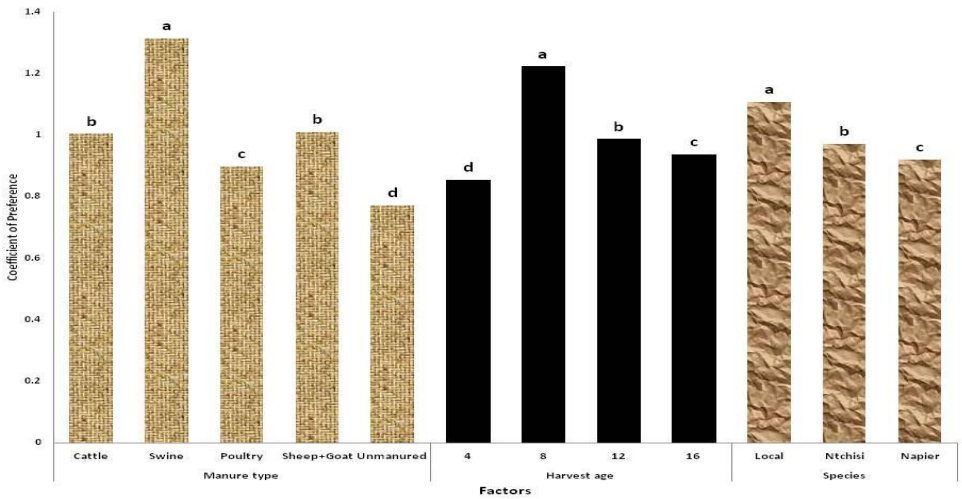


Figure 2: Coefficient of preference as influenced by manure type, harvest and species

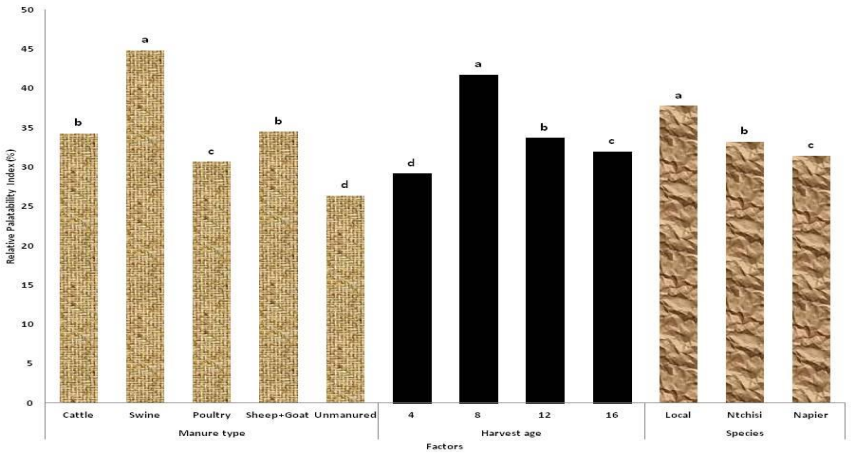


Figure 3: Relative palatability index as influenced by manure type, harvest and species

DISCUSSION

The forage preference in terms of dry matter intake as affected by the manure type applied indicated that the growing calves consumed more of swine manured grasses than other three fertilized grasses and that the least consumed is the unfertilized grasses. The reason for this look complex as was supported by Milne (1991) that diet selection in ruminants is complex. The higher consumption of *Megathyrus maximus* (Local) in this study is in line with the findings of Babayemi (2007) when West African Dwarf goats were fed *Megathyrus maximus* than *C. purpureus* and found that the goats consumed more of *Megathyrus maximus* than *C. purpureus*. The reason for this might be due to the coarse and tough nature of *C. purpureus.*The harvest age effect on the quantity of grasses consumed is in favour of grasses harvested at 8 WAP and it might also be because of the high moisture at 4WAP as reported by Garner (1963) that higher moisture content do affect intake,

The coefficient of preference (COP) with the manure type shows that the animals preferred grasses based on manure type used in this order Swine manure>Sheep and goats dung>Cattle>Poultry dropping>Control. The COP of swine manure, Sheep and goats dung and cattle dung fertilized grasses is greater than one. This indicates that the poultry droppings and unfertilized grasses were rejected by the animals as their COP values were less than one. The COP as affected by the species shows that *Megathyrus maximus* (Local) as highly preferred to the other two species being that its COP value is higher than unity. This is in line with the report of Babayemi (2007) that the COP of *Megathyrus maximus* (Local) higher than that of *P. purpureum*. The age at harvest influence on the COP of the grasses favoured the grasses harvested at 8WAP meaning that its COP is greater than one (unity) thereby making the grasses acceptable.

The relative palatability index (RPI) of between 26.37 to 44.86 %, fell within the range (0 to 70 %) reported by Goatcher and Church (1970) as the preference range for ruminant animals. The exact reasons for the differences in the relative palatability of the calves could not be fully understood in this study. This is because palatability is a complex phenomenon determined by dietary type and environmental variables

(Molyneux and Ralph, 1992). However, it could be argued that the calves used in this study preferred familiar forages as reported by Cheeke (1986). This might be the reason why the RPI of the *Megathyrus maximus* (Local) is higher than that of others. The higher relative palatability of *M. maximus* was also confirmed by Inam-Ur-Rahim *et al.* (2008). The RPI of the manured grasses were higher than that of the unfertilized which is in line with the report of Hartley *et al*. (1995) that animals preferred forages that are fertilized than the unfertilized ones

Conclusion

The coefficient of preference and relative palatability index in this study was in favour of grasses fertilized with swine manure, *M. maximus* (Local) and grasses harvested at 8 weeks after planting.

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