NSAP 47th Annual Conference (JOS 2022) CONFERENCE PROCEEDINGS
THEME: SECURING ANIMAL AGRICULTURE AMIDST GLOBAL CHALLENGES

FERTILIZER TREATMENTS AS A MEANS OF IMPROVING FORAGE QUALITY OF TWO TROPICAL GRASS SPECIES DURING LATE RAINY SEASON IN ABEOKUTA, SOUTH WESTERN, NIGERIA

Ewetola, I. A.[*], Amisu, A. A.[+] and Olanite, J. A.[+]

[*]Department of Animal Nutrition and Forage Science, College of Animal Science and Animal Production, Michael Okpara University of Agriculture, Umudike, Abia state.

[+]Department of Pasture and Range Management, College of Animal Science and Livestock Production, Federal University of Agriculture, Abeokuta, Ogun state

*Corresponding author: ewetolaibb@gmail.com/ewetola.ibrahim@mouau.edu.ng/ 08035019127

Abstract

This experiment was carried out to evaluate proximate composition and fibre fractions of *Panicum maximum* and *Andropogon tectorum* as affected by fertilizer types during the late rainy-season in Abeokuta, Ogun State, Nigeria. The study consisted of four fertilizer treatments (NPK 20:10:10 [NPK] fertilizer, Aleshinloye organo-mineral [AOM] fertilizer, Poultry manure [PM], without fertilizer i.e. control) and two grass species (*P. maximum* var Ntchisi and *A. tectorum*) and was therefore 4 x 2 factorial arrangement laid out in split plot design, forming total 8 treatments replicated thrice. Forages were harvested 8 weeks after cut back (WAC) using $1m^2$ quadrat. Sub–samples were taken from each plot, weighed and oven dried at $65^{oC}$to constant weight to determine proximate composition and fibre components. Result revealed that ether extra (EE) and Hemicellulose were affected significantly ($P<0.05$) by grass species, while dry matter (DM), (EE) and non fibre carbohydrate (NFC) values were significantly ($P<0.05$) different due to influence of fertilizer types. Therefore, the results from this study established that fertilizer treatments does not influence the majority of the parameters determined for proximate composition and fibre components during late rainy season in Abeokuta, South Western, Nigeria.

Key words: Fertilizer, fibre fractions, proximate composition, season, tropical grasses,

Introduction

Season during which the plants up take available nutrients would be expected to exert certain influences on plant performance, since, nutrients release to the plant is majorly depends on temperature and moisture content availability (Jerry *et al.*, 2015). Ammonium-N is rapidly converted to nitrate-N in soil by microbes when soil moisture and temperature are suitable to microbial activities. Ammonium-N is predominant in soil during cool, wet conditions (Griffith *et al.*, 1997). Pasture species take up most of the N in the form of nitrate, Nitrate-N after being absorbed into plants will be converted to ammonium-N for incorporation into protein metabolism (Sun *et al.*, 2008). In order to a certain the facts given above, this study was conducted to evaluate proximate composition and fibre fractions of two tropical grass species during rainy season in Abeokuta, South-Western Nigeria.

Materials and methods

Experimental site and design

This experiment which was carried out at the Pasture Unit of the Teaching and Research Farms of Federal University of Agriculture, Abeokuta, Ogun State, Nigeria. Four fertilizer types (mineral fertilizer, organo-mineral fertilizer, Poultry manure, without fertilizer i.e. control) and two grass species (*P. maximum* var Ntchisi and *A. tectorum*) and was therefore 4 × 2 factorial arrangement laid out in split plot design, forming total 8 treatments replicated thrice.

9.1.1.1 Plots management

At the late rainy period in the year 2016, the established pasture were cut back on 8th September, 2016, to stimulate new re-growth and inter plots spaces and gang ways were weed free. Also, proper pegging and labelling of the plots were ensured for easy identification during data collection.

9.1.1.2

9.1.1.3 Harvest of forage materials

9.1.1.4 Forages were harvested 8 weeks after cut back using $1m^2$ quadrat. Samples were taken from each plot and sub–samples were taken, weighed and oven dried at 65^{oC} to constant weight milled for proximate composition and fibre fractions analysis.

9.1.1.4.1 Determination of proximate composition

The contents of dry matter (DM %), crude protein (CP), ether extract (EE) and ash were determined according to A.O.A.C. (2000). Non-fibre carbohydrates (NFC) was calculated as NFC = 100-(CP%+ash%+EE%+NDF %).

9.1.1.4.2 Determination of fibre fractions

Neutral detergent fibre (NDF), acid detergent fibre (ADF) and acid detergent lignin (ADL) were determined Van Soest *et al*. (1991) while cellulose was calculated as the difference between ADF and ADL and hemicellulose as the difference between NDF and ADF.

9.1.1.5 Statistical analysis

Data collected were subjected to Analysis of variance using SAS (R) package (Muenchen, 2009) and significant means were separated using Duncan's Multiple Range Test (Duncan, 1955) at 5% level.

9.1.1.6

9.1.1.7 Experimental model

$Y_{ijkl} = \mu + F_i + G_j + (FG)_{ij} \sum_{ijk}$

μ = population mean

F_i = effect of fertilizer type

G_j = effect of grass species

$(FG)_{ij}$ = interaction of fertilizer type and grass species effects

$\sum_{ijk}$ = Residual error estimate

Results and Discussion

Table 1 shows proximate composition (%) and fibre fractions of two tropical grasses harvested 8weeks after cut back during the late rainy season as affected by fertilizer types. It was revealed that ether extra (EE) and Hemicellulose were affected (P<0.05) by grass species, while dry matter (DM), (EE) and non fibre carbohydrate (NFC) values were significantly different due to influence of fertilizer types. *A. tectorum* recorded the higher value (13.84%) for EE, whereas *P. maximum* (Ntchisi) had the lower value (10.77%) for this parameter. The highest values (97.33% and 13.10%) were recorded in poultry manure (PM) and Aleshinloye organo-mineral (AOM) for DM and EE, respectively. In contrast, grasses without fertilizer application (control) had the highest value (16.56%) for NFC, while grasses fertilized with NPK fertilizer obtained the lowest value (10.65%) for NFC.

This result indicated that the CP and ash contents of the grasses under fertilizer treatments did differed from the grasses under control treatment. This might be attributed to low moisture content in the soil which might have affected the uptake of nitrogen during this period of the study. Another reason that might be responsible for this observation if the moisture content was adequate, possibly might be microbial activities which mainly depend on soil temperature and soil moisture content. Ammonium-N is rapidly converted to nitrate-N in soil by microbes when soil moisture and temperature are suitable to microbial activities. Ammonium-N is predominant in soil during cool, wet conditions (Griffith *et al.,* 1997). However, this observation agrees with the finding by Yossif and Ibrahim (2013) that mean values of crude protein, crude fibre and ash contents were not significantly affected by fertilizer. But, not in conformity with the report by Khan *et al*. (1999) that application of urea and cow manure increased the CP content of native grasses. The highest non-fibre carbohydrate (NFC) observed in *A. tectorum* under the control treatment is an indication that the materials are rich in soluble sugar. This could be attributed to low amount of fibrous components in the harvested materials. The fibre fraction obtained in the grasses under fertilizer treatments indicates that nitrogen supplied did not influence the fibre components of the forage materials. This observation could be attributed to stage of maturity the materials were harvested and conforms with the findings by Noor *et al*. (1988) that nitrogen fertilizer did not decrease crude fibre, in variant with report by Hassan-Amin (2011) that the CP and crude fibre (CF) were significantly affected by nitrogen sources in the both seasons but plants harvested at 30 days interval had the lower crude fibre irrespective of nitrogen levels.

Table 1:Main effects of fertilizer types on proximate composition (%) and fibre fractions of *P. maximum* and*A. tectorum* during the late rainy season

Factors	DM	CP	EE	Ash	NFC	NDF	ADF	ADL	HEM	CEL
Grass species										
A. tectorum	95.00	8.67	13.84^{a}	10.52	13.55	53.42	20.92	6.67	32.50^{b}	14.25
P. maximum	95.17	8.17	10.77^{b}	10.94	12.37	57.75	20.83	8.25	36.92^{a}	12.58
SEM	0.73	1.00	0.42	0.24	0.67	1.43	0.70	0.54	1.20	0.78
Fertilizer types										
Control	93.17^{b}	9.50	10.23^{b}	10.88	16.56^{a}	52.83	19.67	6.83	33.17	12.83

AOM	93.67[b]	8.00	13.10[a]	10.40	11.67[bc]	56.83	21.83	7.83	35.00	14.00
NPK	96.17[ab]	7.17	13.03[a]	10.82	10.65[c]	58.33	20.67	8.17	37.67	12.50
PM	97.33[a]	9.00	12.87[a]	10.82	12.98[b]	54.33	21.33	7.00	33.00	14.33
SEM	0.76	1.37	0.77	0.34	1.16	2.17	0.91	0.84	1.90	1.16

[a, b, c:] means in the same column with different superscripts are significantly different (P<0.05)

SEM= Standard error mean DM=Dry matter, CP= Crude protein, EE= Ether extra

NFC= Non fibre carbohydrate, NDF: Neutral detergent fibre, ADF: Acid detergent fibre, ADL: Acid detergent lignin, HEM: Hemicellulose, CEL: Cellulose

A. tectorum= *A. tectorum*, *P. maximum* (N) = *P. maximum*; AOM=Aleshinloye organo-mineral fertilizer;PM=Poultry manure; NPK=N.P.K. 20:10:10

References

A. O. A. C. (2000). Official techniques of analysis. 17th ed. Assoc. Offical Analytical Chemists. Gaithersburg, MD.

Duncan, D. B. (1955). Multiple Range and Multiple F-Test. Biometrics, 11, 1-5.

Griffith, S. M., Alerman, S.C., Streeter, D. J. (1997). Italian ryegrass and nitrogen source fertilization in western Oregon in two contrasting climatic years. I. Growth and seed yield. *Journal Plant Nutrition* 20: 419-428.

Hassan-Amin, M. M. (2011). Effect of different nitrogen sources on growth, yield and quality of fodder maize (Zea mays Li). *Journal of the Saudi Society of Agricultural Sciences* 10(1): 17-23.

Jerry, H. C. and Debbie J. R. (2015). Impact of fertilization on forage production and animal performance. Colloque surles Plantes fourtrageres. Page 1 -7.

Khan, R. I., Alam, M. R. and Amin, M. R. (1999). Effect of season and fertilizer on species composition and nutritive value of native grass. *Asian-Australian Journal Animal Science*. 12(8): 1222-1227.

Muenchen, R. A. (2009). R for SAS and SPSS users. Doi:10.1007/978-0-387-09418-2 Edition: 1st. Publisher: Springer. ISBN: 978-0-387-09417-5.

Noor, M., Nasir, M. B. and Imtiaz, A. Q. (1988). Effect of N fertilization and harvesting intervals on the yield and nutritional value of Napier grass. *Pakistan Journal Agricultural Resources* 9 (4): 478-482.

Sun, X., Luo, N., Longhurst, B. and Luo, J. (2008). Fertilizer Nitrogen and factors affecting pasture responses. *The Open Agriculture Journal*2:35-42.

Van Soest, P. J, Robertson, J. B and Lewis B. A. (1991). Techniques for dietary fiber, neutral detergent fiber, and nonstarch polysaccharides in reflection to animal production. *Journal Dairy Science* 74:3583–3597.

Yossif, A. M and Ibrahim, Y. M. (2013). Effect of fertilizers (Urea, farmyard and chicken manure) on Growth and yield of Rhodes grass (*Chloris gayana* L. Knuth.). *Universal Journal of Plant Source* 1(3): 85-90.