Paper ISSN 0189-0514
Online ISSN 1427-4410
J. Anim. Prod. Res. (2023) 35 (1):82-87

National Animal Production Research Institute
Ahmadu Bello University
P.M.B 1096, Shika-Zaria,
Kaduna State, Nigeria.
Email:japr@napri.gov.ngUrl:journals.napri.gov.ng

PROXIMATE COMPOSITION OF *BRACHIARIA COBRA* AS INFLUENCED BY NITROGEN APPLICATION AND AGE AT HARVEST

***Amisu, A. A., Ogunbote, O. B. and Nnabuife, E. V.**
Department of Pasture and Range Management, College of Animal science and Livestock Production, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria.

**Corresponding Authors Email amisuaa@funaab.edu.ng; Mobile: +2348052056564*

ABSTRACT

This research was conducted to evaluate the proximate composition of *Brachiaria cobra* as influenced by nitrogen application and age at harvest. The study was laid out as 2 x 2 factorial arrangements in a Randomized Complete Block Design (RCBD) with 3 replicates (Blocks). The 2 factors were fertilizer application (Control and NPK application) and harvest time (6 and 8 weeks after regrowth). Results showed that fertilizer had significant (P<0.05) influence on all proximate parameters evaluated of *Brachiaria cobra*. *Brachiaria cobra* fertilized with 120kg/ha recorded significant (P<0.05) higher dry matter (92.75%), crude protein (12.70%), ether extract (19.35%) and Ash (18.10%) contents compared to the unfertilized *Brachiaria cobra* with lower dry matter (89.50%), crude protein (8.33%), ether extract (17.03%) and Ash (14.73%) contents. The effect of age at harvest differ significantly (P<0.05) on proximate composition (%) of the grass except for ether-extract and Ash contents. However, *B. cobra* harvested at 8 weeks recorded higher (P<0.05) dry matter (92.00%) and lower crude protein (8.83%) compared to grasses harvested at 6 weeks with higher crude protein (12.20%) and lower dry matter (90.25%) contents. It was concluded from the result that application of 120 N kg/ha fertilizer to *B. cobra* and harvesting at 6 weeks produced a higher dry matter and good quality.

Key words: *Brachiaria cobra*, fertilizer, harvest, Nitrogen, grass

INTRODUCTION

Livestock have the capacity to utilize natural resources with low opportunity cost by grazing on drylands and feeding on straw and other biomass not directly consumed by humans and convert them into high value products such as meat and milk. This makes livestock production, particularly ruminant livestock, attractive for the poor. Globally, it is estimated that about 70% of the world's 1.4 billion extreme poor depend in one way or another on livestock (FAO, 2009). However, as the pressure on land use grows, with more grazing land converted to crops, the more the opportunity cost of rangeland is increasing. Grass forage production is influenced by the varietal potential including growth and development processes within the grass and soil nutrient availability. Grasses have a relatively high demand for nutrients. Bereket *et al*., (2016) reported that most grasses removed an average of 14-18 kg nitrogen (N) and 1.8 kg of phosphorus (P) per ton of dry matter. However, the amounts of nutrients removal vary depending on the grass species and the seasonal conditions. High nutrient uptake and removal occur in the wet seasons due to increased nutrient availability in soil solution. Productivity of forages is limited by low soil fertility especially in the low pH and N and P deficient soils that are common in Afican region. Nitrogen is an important element in grass production due to its role in photosynthesis and influence in the chlorophyll molecule (Oliveira *et al*. 2010). Where available N from soil is not sufficient for forage production, application of fertilizer N may provide immediate responses in forage grasses (Batista *et al*., 2014). Silveira *et al*. (2015) working with different N rates (0, 60 and 120 kg ha-1 per year) on *Paspalum notatum* for a period of three years, observed that the dry matter yields increased linearly with

application rates of N. However, responses to P have only been reported in the season of application during grass establishment due to the role of P in roots formation but not in later seasons. Higher nutrient removal is reported in improved grasses than indigenous grass species though some grasses have also been bred for low soil fertility regions (Rao *et al*., 1993). Brachiaria is an African genus comprising about 100 species. Extensive germplasm collection in Africa followed by strategic research on the agronomy, forage quality and animal production, genetics, cytogenetics, plant breeding, and biotic and abiotic stress adaptation over the past two decades in Latin (Carlos, 2020). America resulted in the selection of vigorous and productive Brachiaria grasses, as well as the development of four commercial hybrids (Mulato, Mulato II, Caymán and Cobra) through breeding. Brachiaria grasses have become the most widespread and economically important forage grasses in tropical America, and their adoption is increasing in East Africa and South East Asia. An estimated 90 million hectares are planted with Brachiaria in Brazil only (Carlos, 2020). Brachiaria grasses stand out for their ability to be productive and persistent under low soil fertility conditions, with some genotypes showing contrasting and/or intermediate behavior in terms of their water use (i.e., 'water saving' or 'water-spending' behavior for their targeting to either long or intermittent drought periods respectively) (Carlos, 2020).The objective of this study was to evaluate the proximate composition of *Brachiaria cobra* as influenced by fertilizer application and age at harvest

MATERIALS AND METHODS

Experimental design

The field size measuring $24m^2$ was divided into three while the experiment was laid out as 2 x 2 factorial arrangements in a Randomized Complete Block Design (RCBD). The 2 factors were Nitrogen fertilizer application (control and NPK application) and harvest age (6 and 8 weeks after regrowth). The fertilizer, NPK 20:10:10 was source from a reputable store within Abeokuta metropolis and applied at the rate of 120N kg ha^{-1}.

Sample Collection and Preparations

The field work was carried out at Barry Ashmond integrated Farms, Onibotunje Village, Wasinmi, Ogun State, while the chemical analysis was carried out at the Laboratory Department of Pasture and Range Management, Federal University of Agriculture, Abeokuta (FUNAAB), Ogun State, Nigeria. The existing pasture field planted in November, 2022 was cut back, leaving the stubbles for regrowth. The experimental land measured $1500m^2$ (50m x 30m) and area of 24 m^2 (2 m x 12 m) was map out and peg, having each plot measuring (2m x 1m). A boundary of 1m was made between the sub-plots and the blocks.

Grasses were harvested at 6 and 8 weeks after regrowth. The grasses were cut with the aid of sickle at 5 cm above ground level within three $1m^2$ quadrants randomly thrown per plot with the use of a quadrant. The total forage material harvested from each plot were weighed as fresh weight (FW), after which a sub-sample weighing 500g was taken and oven-dried at 65^0C to constant weight for chemical analysis. The dried samples were taken, weighed, milled, and sieved through a 1mm sieve for analyses to determine the proximate composition of the grass.

Determination of Proximate Composition

The dry matter (DM), crude proteins (CP), ether extract (EE), and ash of the *Brachiaria cobra* samples were determined according to AOAC (2000), and data collected were subjected to two-way analysis of variance (ANOVA) using SAS (2014) package, and effective means were separated using HSD test of R package at a 5% level significance.

Data collected were subjected to two-way analysis of variance and the treatment means were separated using HSD test of R package at a 5% level significant.

RESULTS AND DISCUSSION

Results

The main effects of fertilizer was significant ($p<0.05$) on all the proximate parameters of *Brachiaria cobra* (Table 1). *B. cobra* fertilized with 120kg/ha recorded significantly ($p<0.05$) higher dry matter percent (92.75%), crude protein (12.70%), ether extract (19.35%) and ash (18.10%) contents compared to the unfertilized grass which had lower values for these parameters.

Age at harvest differ significantly ($p<0.05$) on proximate composition (%) of *Brachiaria cobra* except for ether extract and ash contents. However, the grass harvested at 8 weeks recorded higher ($p<0.05$) dry matter (92.00%) and with lower crude protein (8.83%) while in contrast, *B. cobra* harvested at 6 weeks had higher crude protein (12.20%) and lower dry matter (90.25%) content.

Interaction effect of nitrogen fertilizer and age at harvest on the proximate composition (%) of *Brachiaria cobra*

Interaction effect of fertilizer and age at harvest significantly ($p<0.05$) influenced the proximate composition of *Brachiaria cobra* (Table 2). Dry matter content (96.01%) was highest in *B. cobra* fertilized with 120Nkg/ha harvested at 8 weeks with similar value (90.83% and 90.84%) in the control plot harvested at 6 weeks and *Brachiaria cobra* from 120Nkg/ha plots harvested at 6 weeks respectively. *Brachiaria cobra* fertilized with 120Nkg/ha harvested at 6 weeks recorded higher crude protein (14.46%) and ether extract (14.61%) with least crude protein (11.53%) recorded for unfertilized *Brachiaria cobra* harvested at 8 weeks. However, control plots harvested at 6 weeks recorded higher ash (17.62%) content over lower ash (17.02%) content in the fertilized grass harvested at 6 weeks.

Table 1: Main effects of fertilizer and age at harvest on the proximate composition (%) of *Brachiaria cobra*

Treatment	DM	CP	EE	Ash
Fertilizer				
0kg/ha	89.50^{b}	8.33^{b}	17.03^{b}	14.73^{b}
120kg/ha	92.75^{a}	12.70^{a}	19.35^{a}	18.10^{a}
SEM	1.12	1.51	1.19	1.41
Age at harvest				
6weeks	90.25^{b}	12.20^{a}	17.68	17.22
8weeks	92.00^{a}	8.83^{b}	18.70	15.60
SEM	1.12	1.51	1.19	1.14

^{a,b,ab} means in each column with different superscript are significantly different, ($p < 0.05$)
DM= Dry Matter, EE= Ether Extract, CP=Crude Protein, SEM=Standard Error of the Mean.

Table 2: Interaction effect of nitrogen fertilizer and age at harvest on the proximate composition (%) of *Brachiaria cobra*

Fertilizer	Age at harvest	DM	CP	EE	Ash
0kg/ha	6weeks	90.83[b]	12.53[ab]	13.36[a]	17.62[a]
	8weeks	91.68[b]	11.53[b]	14.03[a]	17.30[a]
120kg/ha	6weeks	90.84[b]	14.46[a]	14.61[a]	17.02[a]
	8weeks	96.01[a]	12.80[ab]	14.20[a]	17.24[a]
SEM		1.09	1.33	1.50	1.79

[a,b,ab] means in each column with different superscript are significantly different, ($p < 0.05$)
DM= Dry Matter, EE= Ether Extract, CP=Crude Protein
SEM=Standard Error of the Mean

Discussion

It is quite evident that there were great variations in the proximate composition of *B. cobra* as affected by fertilizer application and age at harvest. *B. cobra* fertilized with 120Nkg/ha harvested at 6 weeks had the excellent nutritional value, with crude protein (CP) concentration ranging from 8.33- 12.70% which fell within the range of 8.2– 11.28 % reported by Bilal *et al*. (2001) for *P. purpureum* when farmyard manure was applied, also above the 7% minimum requirement for maintenance of ruminant animals (Minsonm, 1990), was slightly higher than the value of 8 % recorded by Norton *et al*, (1992) for optimal ruminal functioning. These values were also above the minimum range of 6.5 - 8.00% prescribed for optimal performance of tropical ruminant animals (Minsonm, 1990). The increase in nitrogen content of the soil increases the CP of the grass which could be attributed to higher fertilizer leading to enhancement of leafiness and leaf to steam ratio of the grass which has high protein content than stems. This result agrees with finding of Nyfeler *et al*. (2011) that nitrogen is essential among nutrient to get significant increase in forage especially with a linear increase in CP level of *Brachiaria ruziziensis.* The generally high CP level found in this grass implies that ruminants consuming the grass will have access to higher intake of protein needed for optimal body maintenance and growth (Anele *et al*., 2011). The CP content also decrease with increased age at harvest whereby *B. cobra* harvested at 8 weeks had a lower CP (8.83%) compare to CP (12.20%) in grasses harvested at 6 week. The decrease in CP content in this study with advancement in age is in line with the findings of Dele (2012) and Tilahun *et al*. (2017) for *P. purpureum* and *P. pedicilatum*, respectively. Similarly, Bayble *et al*. (2007) and Ansah *et al*. (2010) reported a decreasing trend in CP content for Napier grass with increased in harvesting age. The dry matter (DM) in this study increases with increased fertilization and age at harvest. This might be due to rapid vegetative growth of plants as indicated from the rapid increase in water soluble portion of different parts of the forage plant with the increasing levels of N fertilizer. Similar results with the observation in oat fodder (Uddin *et al*., 2005) where they found significant increase in DM content. The findings of the present experiment were in contrast with the observation for Napier grass by Khaleduzzaman *et al*. (2007) which indicated a significant decrease in DM content with the increasing level of N fertilizer from 0 to 160 kg/ha. The higher ether extract (EE) contents recorded from the grass fertilized with 120Nkg/ha harvested at 6 weeks shows that the fertilization probably promoted accumulation

of oils in the plants minerals, which can be converted to energy in high producing animals (Chilliard, 1993). The results from this study was in line with the investigation by Uddin *et al*. (2005) in which EE content of oat forage increased significantly with the increasing level of N fertilizer from 0 to 115kg N/ ha. Ash content of *B. cobra* in this study ranged from (17.30 – 17.62%) which was significantly higher at 120Nkg/ha fertilizer with least value in control plot. However, this finding was in contradiction of the study of Abdi (2014) on C*enchrus ciliaris* and *Panicum maximum* and Priyadarshani, *et al.* (2013) on jumbo grass reported lower ash contents with higher rate of nitrogen fertilizer levels. The content of ash in this study decreased as the grass increase in age which is similar to the study of Lounglawan *et al*. (2014) which reported the decrease in ash as the age increased. Total ash content in interaction of fertilizer and age at harvest was reduced at early harvest of 6 weeks. This could be due to excess nutrient in the soil.

CONCLUSION AND RECOMMENDATION

In conclusion, *Brachiaria cobra* can be fertilized with NPK 20:10:10 at the rate 120Nkg/ha and harvesting at 6 weeks after regrowth for high crude protein, ether extract and Ash contents.

REFERENCES

Anele, U.Y., Sudekum, K.H., Hummel, J., Arigbede, O.M., Oni, A.O., Olanite, J.A., Bottger, C., Ojo, V.O.A. and Jolaosho, A.O. 2011. Chemical characterization, *in vitro* dry matter and ruminal crude protein degradability and microbial protein synthesis of some cowpea (*Vigna unguiculata* L. Walp) haulm varieties. *Animal Feed Science and Technology* 163 (2-4):161-169.

Ansah, T., Osafo, E. L. and Hansen, H. H. 2010. Herbage yield and chemical composition of four varieties of Napier (*Pennisetum purpureum*) grass harvested at three different days after planting. *Agricultural and Biology Journal of North America* 1, 923–929.

AOAC (2016). Official Method of Analysis 20th edtion. Association of Official Analytical Chemists Washington D.C

Batista, K., Giacomini, A. A., Gerdes, L., Mattos, W. T., Colozza, M. T. and Otsuk, I. P. 2014. Influence of nitrogen on the production characteristics of ruzi grass. *African Journal of Agricultural Research*. 9: 533-538.

Bayble, T., Melaku, S. and Prasad, N. K. 2007. Effects of cutting dates on nutritive value of Napier (*Pennisetum purpureum*) grass planted sole and in association with Desmodium (*Desmodium intortum*) or Lablab (*Lablab purpureus*). *Livestock Research for Rural Development*. 19, 11

Bereket, D., Worku, B., Tewodros, T and Tesfaye, A. 2016. Best fit practice manual for Desho grass (*pennisetum pedicellatum*) production and management in SNNPRS, Ethiopia.

Bilal, M. Q., Saeed, M. and Sarwar, M. (2000). Effect of Varying Levels of Nitrogen and Farm Yard Manure Application on Tillering and Height of Mott Grass. *International Journal of Agriculture and Biology*. 1560–8530/2000/02–1-2–21–23.

Carlos Seré (2020). "Investing Sustainably in African Livestock Development: Opportunities and Trade-Offs" ZEF Working Paper Series, ISSN 1864-6638, Center for Development Research, University of Bonn

Chilliard, Y. 1993. Dietary fat and adipose tissue metabolism in ruminants, pigs, and rodents: A review. *Journal of Dairy Science*. 76:3897–3931.

Dele, P. A. 2012. Evaluation of dry matter yield and nutritive quality of forage, hay and silage produced from three grasses fertilized with animal manures. Ph. D. Thesis, Federal University of Agriculture, Abeokuta.

FAO. 2009. The State of Food and Agriculture: *Livestock in the Balance*.

Khaleduzzaman A. B. M, Islam N., Khandaker Z. H., Akbar M. A. 2007. Effect of different doses of Nitrogen and phosphorus fertilizer on yield and quality of Napier grass (*Pennisetum purpureum*). *Bangladesh Journal of Animal Sc*ience, 36 (1-2): 41-49.

Lounglawan P., Lounglawan W. and Suksombat W. (2014). Effect of cutting interval and cutting height on yield and chemical composition of King Napier grass (*Pennisetum purpureum x Pennisetum americanum*). APCBEE Procedia, 8, 27–31.

Norton, B.W., kamau, F.K. and Rosevear, R. 1992. The nutritional value of some tree legumes as supplements and sole feed for goats. *Proc. of the sixth A.A.A.P Anim. Sci. Cong*, 23-28 November 1992. Volume III, pp. 151.

Nyfeler, D., Huguenin-Elie, O., Suter, M., Frossard, E., and L¨uscher, A. 2011. Grass–legume mixtures can yield more nitrogen than legume pure stands due to mutual stimulation of nitrogen uptake from symbiotic and non-symbiotic sources. *Agr. Ecosyst. Environ.* 140 (1): 155–163.

Oliveira, D. A., Bonfim-Silva, E. M., Silveira, C. P. and Monteiro, F. A. 2010. Nutritional value of the Signal grass in the first year of recovery following nitrogen and sulphur applications. *R. Bras. Zootec*. 39: 716-726.

Priyadarshani, N. D. A., Amarasinghe, M. K. T. K., Subasinghe, S., Palihakkara, I. R and Kumarasinghe, H. K. M. S. 2013. Effect of organic and inorganic fertilizers on biomass production, oil yield and quality of vetiver (*vetiveria zizanioides* l.). *The Journal of Agricultural Sciences*. volume 8, Number #1.

Rao, I. M., Zeigler R. S, Vera R. and Sarkarung S. 1993. Selection and breeding for acid-soil tolerance in crops: Upland rice and tropical forages as case studies. *BioScience*. 43: 465.

SAS (2014). Statistical analysis system version 9.2. SAS Institute Inc., Cary.

Silveira, M. L., Vendramini, J. M. B., Sellers, B., Artur, A. G. and Dupas, E. 2015. Bahia grass response and N loss from selected N fertilized sources. *Grass Forage Science* 70: 154-160.

Tilahun,G., Asmare, B. and Mekuriaw, Y. 2017. Effects of harvesting age and spacing on plant characteristics, chemical composition and yield of desho grass (*Pennisetum pedicellatum Trin*.) in the highlands of Ethiopia. *Tropical Grasslands-Forrajes Tropicales* 5(2):77–84.

Uddin M. M., Khandaker Z. H. and Sultana M. N. 2005. Effect of levels of nitrogen with or without phosphorus fertilizer on oat (*Avena sativa*) forage production harvested at various ages: I. yield and nutrients content. *Bangladesh Journal of Animal Science*. 34 (1-2): 63-71.