PROXIMATE COMPOSITION OF PLANT PARTS OF *Pennisetum purpureum* HARVESTED AT SELECTED LOCATIONS IN SOUTHWEST NIGERIA

***Okukenu, O. A., Dele, P. A., Akinyemi, B. T., Jolaosho, A. O., Olajide, A. A. & Oriola, R. A.**

Department of Pasture and Range Management
College of Animal Science and Livestock Production
Federal University of Agriculture, Abeokuta, Ogun State, Nigeria.
P.M.B 2240
**E-mail: femi_okukenu@yahoo.co.uk*

ABSTRACT

This study was carried out to evaluate the proximate composition of plant parts of *Pennisetum purpureum* harvested at selected locations in South-west Nigeria. The experiment was laid out in a 6 × 2 factorial design comprising of six (6) locations (Ewekoro, Odeda, Ibarapa, Ido, Oriade and Ejigbo) and two (2) plant parts (stem and leaf) replicated three times. The dry matter (DM) value ranges from 83.83% in *P. pupureum* harvested at Ibarapa to 93.00% in *P. purpureum* harvested at Ejigbo and *P. purpureum* harvested at Ido had the highest (10.71%) crude protein (CP) content with the lowest value (9.68%) observed in *P. purpureum* harvested at Odeda. Meanwhile, *P. purpureum* harvested at Oriade had the highest (7.33%) ether extract (EE) content with the lowest value (5.17%) observed in *P. purpureum* harvested at Ewekoro. The leaf fraction of the harvested *P. purpureum* recorded the highest value (88.16% and 11.74%) for DM and CP content respectively with the lowest value (5.67%) for EE content and the leaf fraction also had the highest value (15.00% and 13.60%) for Ash and NFC content respectively. The leaf fraction of *P. purpureum* harvested at Ejigbo recorded the highest value (94.33%) DM content with the lowest value (81.00%) observed in stem fraction of *P. purpureum* harvested at Ibarapa and the CP content range from 7.83% in stem fraction of *P. purpureum* harvested at Odeda to 12.38% in leaf fraction of *P. purpureum* harvested at Ido. While the leaf fraction of *P. purpureum* harvested at Ewekoro and Ejigbo had the lowest value (4.67%) of EE content with the highest value (8.00%) observed in stem fraction of *P. purpureum* harvested at Ibarapa, Ido and Oriade. It is therefore concluded that there were variations in the nutrient of *P. purpureum* harvested at the selected locations with different plant parts.
(Keywords: natural pasture, *Pennisetum purpureum*, plant parts, location)

INTRODUCTION

The ever-increasing human population and their high demand for animal protein, especially from meat and milk will depend on better utilization of available feed resources by the ruminant livestock for improving household food security and income (Kabi and Bareeba, 2008). Among feed resources, forage crops, especially grasses have shown unique characteristics in different agricultural systems. They can be grown in harsh environments, utilized as functional components in providing environmental services in soil erosion control and greenhouse gas emission mitigation efforts (Beard and Green, 1994) and income generation as basic animal feed (Wright and Turhollow, 2010). Currently, there is increasing demand for ruminant animal products owing to the growing population and improved livelihoods (Dastagiri, 2004). Ruminants rely more essentially on pasture for their nutrient requirement than any other feed resources and inadequate feed supply is a major constraint of livestock production in sub-Saharan African countries (Arigbede *et al.*, 2011). Forage is important to livestock production since it is a major source of ruminant feed and nutrition for sustainable animal protein and ruminant is the largest source of animal protein. Forage crops make up a significant part of the total agricultural land in Africa and provide a critical food supply for the livestock industry. Grasses are the most abundant flowering plants that are useful to man. They are one of the most important sources of nutrients for domesticated ruminants during a large part of the year (Taweel *et al.*, 2005). The nutritive value of forage, as related to ruminants, may be regarded as the product of the intake of the forage and its digestibility, with intake being the more important of the two parameters (Mott, and Moore, 1969).

MATERIALS AND METHODS

The research was carried out at the Laboratory of Pasture and Range Management Department of the Federal University of Agriculture, Abeokuta. The grass was harvested from natural pastures from selected locations across south-west Nigeria. The plant were separated into two (2) parts (stem and

leaf) and oven dried for laboratory analysis. The study was laid out in 6 × 2 factorial design comprising of six (6) locations (Ewekoro, Odeda, Ibarapa, Ido, Oriade and Ejigbo) and two (2) plant parts (stem and leaf) and data collected were subjected to a Two-way analysis of variance and the treatment means were separated using Duncan's Multiple Range Test using SAS (1999) package. The dry matter, crude protein, ether extract and ash contents of the milled grass sample was determined according to procedure of A.O.A.C. (2000) and NDF was determined according to Van Soest *et al,* (1991). Non-fibre carbohydrate was calculated as NFC = 100 - (CP+Ash+EE+NDF)**.**

RESULTS AND DISCUSSION

There was significantly ($p<0.05$) difference on the proximate composition of plant parts of *Pennisetum purpureum* harvested at different location in South-west (Table 1). It is quite evident that there were variations in the proximate composition of the *Pennisetum purpureum* across locations as revealed in the study and these variations could be affected by various factors, in which seasonality and species specific feed resources were known to be the major factors in affecting the nutritive value of native grasses (Subhalakshmi *et al.*, 2011). It was also reported by Kavana *et al.* (2007) that bimodal distribution of rainfall, uneven seasonal growth and availability of pasture had been considered as the major limitations to constant supply of forage for ruminant animals. The dry matter (DM) value ranged from 83.83% in *P. pupureum* harvested at Ibarapa to 93.00% in *P. purpureum* harvested at Ejigbo and the leaf fraction of the harvested *P. purpureum* recorded the highest value of 88.16% for DM content. The increase in the DM value of the leaf proportions as the *Pennisetum purpureum* advance in age conforms to the submission of McDonald *et al*. (1995) who reported that dry matter content increases with advancing maturity which reflects decrease in cell content. *P. purpureum* harvested at Ido had the highest (10.71%) crude protein (CP) content with the lowest value (9.68%) observed in *P. purpureum* harvested at Odeda while the leaf fraction of the harvested *P. purpureum* had the highest value of 11.74% for CP content (Table 1). There was significantly ($p<0.05$) difference on interaction effect of location and plant parts on the proximate composition of harvested *P. purpureum*. The leaf fraction of *P. purpureum* harvested at Ejigbo recorded the highest value (94.33%) DM content with the lowest value (81.00%) observed in stem fraction of *P. purpureum* harvested at Ibarapa and the CP content range from 7.83% in stem fraction of *P. purpureum* harvested at Odeda to 12.38% in leaf fraction of *P. purpureum* harvested at Ido (Table 2). The crude protein content of the *P. purpureum* was considerably influenced by location. There were variations in CP contents of the *P. purpureum* with the different location and this was in comformity with the report of Da Silva *et al*. (2011) in which similar reports was also obtained from previous findings of Teka *et al.* (2012). The variation in the crude protein of *Pennisetum purpureum* might also be attributed to site potential in terms of differences in edaphic factors and temperature condition.

P. purpureum harvested at Oriade had the highest (7.33%) ether extract (EE) content with the lowest value (5.17%) observed in *P. purpureum* harvested at Ewekoro while the leaf fraction had the lowest value (5.67%) for EE content (Table 1). While the leaf fraction of *P. purpureum* harvested at Ewekoro and Ejigbo had the lowest value (4.67%) of EE content with the highest value (8.00%) observed in stem fraction of *P. purpureum* harvested at Ibarapa, Ido and Oriade (Table 2). The ash content range from 13.00% in stem fraction of *P. purpureum* harvested at Odeda to 15.33% in leaf fraction of *P. purpureum* harvested at Ibarapa, Ido , Ejigbo and Oriade. Meanwhile, the leaf fraction of *P. purpureum* harvested at Odeda recorded the highest value (14.47%) of NFC content and stem fraction of *P. purpureum* harvested at Ewekoro had the highest value (63.67%) for NDF with the lowest value (52.33%) observed in leaf fraction of *P. purpureum* harvested at Oriade (Table 2). The higher fibre levels of the grasses in this study might be a demerit in facilitating the colonization of ingesta by rumen microorganisms, which in turn might induce higher fermentation rates, hence digestibility, intake and animal performance might be impaired.

Table 1: Proximate composition (%) of plant parts of *Pennisetum purpureum* harvested at selected locations in south-west

Factors	DM	CP	EE	ASH	NFC	NDF
Locations						
Ewekoro	88.17^{b}	10.31^{a}	5.17^{c}	14.83^{ab}	9.69^{b}	60.00^{a}
Odeda	86.00^{bc}	9.68^{b}	6.83^{ab}	13.33^{b}	14.15^{a}	56.00^{b}
Ibarapa	83.83^{c}	9.77^{b}	6.83^{ab}	14.67^{ab}	13.07^{ab}	55.67^{b}
Ido	85.83^{bc}	10.71^{a}	6.83^{ab}	14.67^{ab}	11.79^{ab}	56.00^{b}
Oriade	87.00^{bc}	10.59^{a}	7.33^{a}	14.67^{ab}	12.41^{ab}	55.00^{b}
Ejigbo	93.00^{a}	10.57^{a}	5.83^{bc}	15.17^{a}	12.10^{ab}	56.33^{b}
SEM	1.20	0.67	0.53	0.49	1.14	1.33
Plant parts						
Leaf	88.16^{a}	11.74^{a}	5.67^{b}	15.00^{a}	13.60^{a}	54.00^{b}
Stem	86.00^{b}	8.81^{b}	7.28^{a}	14.11^{b}	10.80^{b}	59.00^{a}
SEM	0.91	0.14	0.28	0.28	0.62	0.57

$^{a, b, c}$:Means in same column with different superscripts are significantly ($p<0.05$) different.
SEM= Standard Error of Mean, DM= Dry matter, EE= Ether extract, CP = Crude protein, NFC= Non- fibre carbohydrate, NDF= Neutral detergent fibre

Table 2: Interaction effect of locations and plant parts on the proximate composition of *Pennisetum purpureum*

Locations	Plant parts	DM	CP	EE	ASH	NFC	NDF
Ewekoro	Leaf	91.00^{abc}	11.28^{c}	4.67^{c}	15.00^{a}	12.72^{a}	56.33^{bcde}
	Stem	85.33^{de}	9.35^{d}	5.67^{bc}	14.67^{a}	6.65^{b}	63.67^{a}
Odeda	Leaf	86.00^{cd}	11.53^{bc}	6.67^{ab}	13.67^{a}	14.47^{a}	53.67^{def}
	Stem	86.00^{cd}	7.83^{f}	7.00^{ab}	13.00^{a}	13.83^{a}	58.33^{b}
Ibarapa	Leaf	86.67^{cd}	11.06^{c}	5.67^{bc}	15.33^{a}	13.61^{a}	54.33^{cdef}
	Stem	81.00^{e}	8.48^{e}	8.00^{a}	14.00^{a}	12.52^{a}	57.00^{bcd}
Ido	Leaf	86.33^{cd}	12.38^{a}	5.67^{bc}	15.33^{a}	13.62^{a}	53.00^{ef}
	Stem	85.33^{de}	9.03^{de}	8.00^{a}	14.00^{a}	9.97^{ab}	59.00^{b}
Ejigbo	Leaf	94.33^{a}	12.14^{ab}	4.67^{c}	15.33^{a}	13.53^{a}	54.33^{cdef}
	Stem	91.67^{ab}	9.00^{de}	7.00^{ab}	15.00^{a}	10.66^{ab}	58.33^{b}
Oriade	Leaf	87.33^{bcd}	12.03^{ab}	6.67^{ab}	15.33^{a}	13.63^{a}	52.33^{f}
	Stem	86.67^{cd}	9.15^{de}	8.00^{a}	14.00^{a}	11.18^{ab}	57.67^{bc}
SEM		0.67	0.27	0.24	0.21	0.51	0.58

$^{a, b, c\ldots f}$:Means in same column with different superscripts are significantly ($p<0.05$) different

REFERENCES

Arigbede, O. M., Anele, U. Y., SuDekum, K. H., Hummel, J., Oni, A. O., Olanite, J. A. and Isah, A. O. (2011). Effects of species and season on chemical composition and ruminal crude protein and organic matter degradability of some multipurpose tree species by west African dwarf rams. *Journal of Animal Physiology and Animal Nutrition* (96): 250-259.

Beard, J .B. and Green, R. L. (1994). The role of Turf grasses in environmental protection and their benefits to humans. *Journal of Environmental Quality* (23): 1–16.

Dastagiri, M. B. (2004). Demand and supply projections for livestock products in India. National Center Agric. Econ. and Policy . Res. Policy Paper 21.

Kabi, K. and Bareeba, F. B. (2008). Herbage biomass production and nutritive value of mulberry (Morus alba) and Calliandra calothyrsus harvested at different cutting frequencies. *Animal Feed Science and Technology* (140): 178–190.

Teka H. I., Madakadze, C., Angassa, A. and Abubeker, H. (2012). Effect of Seasonal Variation on the Nutritional Quality of Key Herbaceous Species in Semi-arid Areas of Borana, Ethiopia. Department of Plant Production and Soil Science, University of Pretoria, South Africa. *Indian Journal of Animal Nutrtion* 2012.29 (4): 324-332

Wright, L. and Turhollow, A. (2010). Switch grass selection as a ‘‘model’’ bio-energy crop: A history of the process. *Biomass and Bio-energy*. (34): 851–868.

Taweel, H. Z., Tas, B. M., Smit, H. J., Elgersma, A., Dijkstra, J. and Tamminga, S. (2005). Improving the quality of perennial ryegrass (*Lolium perenne* L.) for dairy cows by selecting for fast clearing and/or degradable neutral detergent fiber. *Livestock Production Science* (96): 239-248.

Mott, G. O. and Moore, J. E. (1969) Forage evaluation techniques in perspective. Proceedings of the National Conference on Forage Quality Evaluation and Utilization, Nebraska, Lincoln, U.S.A.

SAS (1999). Statistical Analysis System Institute Inc., SAS/ 24. STAT Programme, Carry, NC: SAS Institute Inc.

A.O.A.C. 2000. Official methods of analysis 15th edition. Association of Official Analytical Chemists, Washington D.C.

Van Soest, P. J., Robertson, J. B. and Lewis, B. A. 1991. Methods for dietary fibre, neutral detergent and non-starch polysaccharides in relation to animal nutrition. *Journal of Dairy Science* 74(10):3583-3597.

Kavana, P. Y., Kizima, J. B. and Masakia, B. J. (2007). Constraints to use of natural pasture for ruminants production along the eastern coast of Tanzania.

Subhalakshmi, B., R. Bhuyan, D.N. Sama, K.K. Sharma and A. Bora. (2011). Effect of variety and stage of harvest on yield, chemical composition and *in vitro* digestibility of hybrid Napier (*Pennisetum purpureum x P. americanum*). *Indian Journal of Animal Nutrition 28: 418-420.*

McDonald, P., Edwards, R. A., Greenhalgh, J. F. and Morgan, C. A. 1995. Animal Nutrition 5th edition. United Kingdom.

Da Silva, D. S., de Andrade, M. V. M., de Andrade, A. P., de Souza Carneiro, M. S. and de Oliveira, J. S. 2011. Bromatologic composition of the herbaceous species of the Northeastern Brazil Caatinga. Review Brasilera De Zootecnia 40: 756-764.