VARIATIONS IN THE PROXIMATE COMPOSITION OF SOME FORAGE SPECIES DURING THREE RAINING SEASONS AND THEIR IMPLICATIONS FOR RUMINANT ANIMAL NUTRITION, IN BOBI GRAZING RESERVE, NIGER STATE, NIGERIA

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ABSTRACT
The Experiment was carried out in Bobi Grazing Reserve, Niger state, Nigeria from May – October, 2014 – 2016 to evaluate proximate composition of six forage species namely Paspalumcommersonii,Cyperusesculentus,Hyparrhe niachrysegyrea,Digiteriasmutsii,Seteriabarbata and Brachiariadeflexa. The Study revealed thatforPaspalumcommersonii in 2014 – 2016 the dry matter (DM), crude protein (CP), crude fibre (CF), ether extract (EE), ash content (AC), and nitrogen free extract (NEF) were statistically significant (p<0.05), proximate composition of Cyperusesculentus, Hyparrheniachrysergyrea, Digiteriasmutsii, Seteriabarbata and Brachiariadeflexawas also showed significant (p<0.05) differences from 2014 – 2016. Similarly, ash content was significantly high (p<0.05) in Cyperusesculentus, Digiteriasmutsii, Seteriabarbata and Brachiariadeflexa in 2014.Nitrogen free extract of 66.30% was recorded in Digiteriasmutsii in 2015, which was the highest of all forage species evaluated. Also, dry matter of 89.19% was observed in 2014 for Digiteriasmutsii. Digiteriasmutsii showed a high crude protein value of 10.74% as compared to other species. Digiteriasmutsiiand Brachiariadeflexa can be established as a major forage in Bobi Grazing Reserve, also this can be established with leguminous species to provide high quality forage for animal use.

Key Words: Proximate Composition, Raining Season, Forage Species, Bobi Grazing Reserve

1.0 INTRODUCTION

Livestock production has mostly been subsistence oriented and characterized by very low reproductive and production performance; this is mainly due to inadequate feeds ,in terms of quality and quantity (Malede, 2013). Ruminant livestock are crucial to Nigeria's industrial prosperity since they provide other essential resources for the country's growth and development in addition to feeding the country's continually increasing population (Bolaji*et al.,* 2015). In most tropical countries, inadequate supply of feeds is the bottleneck to livestock production. Basically, this is due to the dependence of livestock on naturally available feed resources and little development of forage crops for feeding to animals (Alemu,*et al*, 2007).

Seasonal variation affect the availability of nutrients from the soil to forage species (Ezenwa*et al*, 1995). Where climate is characterised by clearly defined wet and dry season, forages growth is very rapid during the wet season, but as the soil dries out the forage matures and dies (McDowell *et al,* 1983).

The rate at which forage grows is dependent upon the environment, the nutrient available and amount of leaf within the sward which is intercepting light (Minson, 1990). Immediately after forage are grazed, there is a period of slow regrowth followed by accelerated rate and finally a period of decreasing growth as the forages matures(Eze, 2010).

The composition of dry matter of forages is very variable, for example, the crude protein content may range from as little as 30g/kg in very matured forages to over 300g/kg in young, heavily fertilised forage. The fibre content is broadly related inversely to the crude protein content, and the acid – detergent fibre may range from 200 to over 450g/kg in very mature species of forages (Thomas *et al,* 1991)

The moisture content of forages is very important where a forage is being harvested for conservation, its high in very young forages usually 750 – 850g/kg and falls as the plant matures to about 650g/kg. Weather condition, however greatly influence the moisture content (Durr*et al,* 2005).

Water soluble carbohydrates of forages include fructans and sugar glucose, fructose,sucrose,raffinose,andstarchyose. Forages of tropical and subtropical origin accumulates starches, instead of fructans in their vegetative tissues and these are stored primarily in the leaves.

The water – soluble carbohydrates concentration of forages is very variable ranging from as little as 25g/kgDm in some tropical species to over 300g/kgDm in some cultivated forages (Buxton, 1996).

Ruminant animals rely more essentially on pasture for their nutrients requirement than on any other feed resources. Grass-legumes mixture provide balanced diet as compared to grass alone. Balanced diet is essential for normal physiological functions of ruminant animals (McDonald *et al,* 1995). It has also been shown that when feed fed containing high amount of crude protein is given to the ruminant animals, their performance and productivity is enhanced and they are better equipped to fight

diseases as a result of improved immune system (Tudsri*et al*, 2002)

In Nigeria, forages species still serve as sources of essential elements for grazing animals little information is available of the nutrients status of some forages grazed by animals in different months in raining season. The nutrients status of these forages in the different months of the raining season is a function of multiple factors which interact with one another to produce varied affects (Eze, 2010). It is vital to investigate how seasonal variation of different months influence the nutrients components of different forages in Bobi Grazing Reserve, Niger State, Nigeria.

This study was thus planned to investigate the effects of wet season in different months of 2014, 2015 and 2016 on the proximate composition of some forages found in Bobi Grazing Reserve, Niger State, Nigeria.

2.0 MATERIALS AD METHODS

2.1 Study Area.

The experiment was carried out in Bobi Grazing Reserve located in Marigalocal Government Area of Nger State. Bobi Grazing Reserve is located on coordinate N09.0102 and E006.05682. The Grazing Reserve covers 30.222 hectares of pasture land and was carved out in 1970 and gazette in 1998 to enable the Fulani herdsmen feed their cattle without wondering from one place to another.

The site is endowed with abundant natural resources such as rivers, mineral, forest resources, fertile soil and good weather condition well suited for growth of various types of crops, livestock and fish farming. The state experience two seasons dry and wet. The length of the wet season decrease from the south to the North with annual rainfall varying from 1,600mm in the south to 1,160mm in the North. The raining season last for 5 – 6 month in the northern part and 7 – 8 months in the south beginning in April or May. The dry season period starts in October/November and extends to March/April of the succeeding year (Iloeje, 2001).

2.2 Collection and Preparation of Forage Samples for Proximate Analysis.

Forage samples were collected for laboratory analysis from May – October, 2014 – 2016. Forage samples collected under each quadrat was separated in to species and oven dried at 65oc to a constant dry weight. Forage samples was grounded in a laboratory miller with 1mm sieve screen for preparation of samples for proximate analysis. Samples were analysed for dry matter (DM), crude protein (CP), crude fibre (CF), ash content (AC), Ether Extract (EE), and Nitrogen free Extract (NFE), according to AOAC (2000).

2.3 Experimental Design and Statistical Analysis

Effect of botanical composition (g/m^2), dry matter yield Kgdm/ha, proximate analysis of forages and Body weight gain/hectare, grazing days/hectare, was analyzed using the GLM procedure of SAS, were analyzed as a completely randomized block design using general linear model of (SAS Inst, carries, NC 2000).

3.0 RESULTS AND DISCUSSION

3.1 Proximate composition of *Paspalumcommersonii*

Proximate composition of *Paspalumcommersonii*from 2014 to 2016 is presented in Table 1 All the proximate values determined showed significant ($P < 0.05$) differences. High dry matter (DM), crude protein (CP),and ash recorded in 2014 was as a result of farming activities allowed on the grazing land. Application of organic and inorganic fertilizer to sown crops might have increase forage growth, yield and crude protein value in all the forages species because of wash down of some of these nutrients through rain water to the grazing area. Also the early rain received in early month of May, 2014 could have contributed to early forage growth and development which allowed absorption of dissolve nutrients in the soil. Other factors that have contributed to high dry matter and crude protein in 2014, was as a result of mineralization of organic matter in soil because of adequate moisture in the soil which allowed decay and decomposition and release of nutrients to the soil for forage use. (Omalle, 2022).

Table 1 Proximate Composition of*Paspalumcommersonii* from 2014 – 2016

Forage species	Composition	2014	2015	2016	SEM
Paspalum	dry matter	80.43^{a}	71.70^{b}	69.50^{c}	1.94
	Crude aprotein	7.33^{a}	5.31^{c}	6.31^{b}	0.06
	Crude fibre	12.50^{a}	6.50^{c}	10.16^{b}	0.87
	Ether Extract	0.95^{b}	0.95^{b}	1.21^{a}	0.04
	Ash content	8.33^{b}	4.33^{c}	8.71^{a}	0.70
	Nitrogen free extract	51.65^{b}	55.63^{a}	43.11^{c}	1.85

abc Means with different superscript on the same row are significantly ($p<0.05$) different

SEM Standard error of means

3.2 Proximate Composition of *Cyperusesculentus*.

Proximate composition of *Cyperusesclentus* is presented in Table .2

Dry matter, crude protein, ether extracts. Ash content, and nitrogen free extract values were all significantly ($p<0.05$) different across 2014, 2015 and 2016. Also the early rain received in early month of May, 2014 could have contributed to early forage growth and development which allowed absorption of dissolved nutrients in the soil hence the better array of nutrients in 2014. Soil conditions also influences the proximate composition of forages and other crop by- products (Ocheja, *et al* 2015,

Table 2 Proximate Composition of*Cyperusesculentus*from 2014 - 2016

Forage Species	composition	2014	2015	2016	SEM
Cyperus Esculentus	Dry matter	83.42^{a}	62.00^{c}	75.37^{b}	3.68
	Crude protein	8.71^{a}	7.90^{b}	6.77^{c}	0.82
	Crude fibre	12.99^{b}	5.80^{c}	17.12a	1.65
	Ether extract	0.98^{b}	2.30^{a}	0.94^{c}	0.22
	Ash content	10.49^{a}	5.66^{c}	10.11^{b}	0.78
	Nitrogen free extract	50.22^{a}	40.44^{b}	40.33^{c}	1.64

AbcMeans with different superscript on the same row are significantly ($p<0.05$) different SEM Standard error of means.

3.3 Nutrient composition of *Hyparrheniachrysegyrea*i

Nutrient composition of *Hyparrheniachrysegyrea* as presented in Table 3 , showed that all the proximate parameter values were significantly ($p<0.05$different across 2014, 2015 and 2016. The better array of nutrients observed in 2014 could be attributed to early rain fall and better rain fall distribution .The crude protein value range of 8.00 – 10.66% were above the critical value of 7 – 8% required to ensureminimum ammonia level in the rumen for the normal function of the rumen , the values were also below the range of 12 – 18 % recommended for growing ruminants in the tropics (NRC, 1996).

Table 3 Proximate Composition of*Hyparrheniachrysegyrea* from 2014 – 2016

Forage Species	composition	2014	2015	2016	SEM	
Hyparrhenia chrysegyrea	Dry matter	87.66^{a}	81.66^{b}	70.79^{c}	1.94	
	Crude protein	10.66^{a}	8.00^{c}	$8,39^{c}$	0.61	
	Crude fibre	15.22^{a}	6.50^{c}	10.16^{b}	0.87	
	Ether extract	0.95^{b}	0.95^{b}	1.21^{a}	0.04	
	Ash content	8.33^{b}	4.33^{c}	8.71^{a}	0.70	
	Nitrogen free extract	51.64^{b}	55.63^{a}	43.11^{c}	1.85	

a, b ,c mean with different superscript on the same row are significantly ($p<0.05$) different
SEM Standard Error of Means

3. 4 Proximate composition of *Digiteriasmutsii*

Proximate composition of *Digiteriasmutsii* is presented on Table 4

All the proximate values determined were significantly ($P<0.05$) different, with the year 2014 having the best array of nutrients, the crude protein range of 7.49 – 10.47 %were above the minimum of 7 to 8 % required for normal function of the rumen(Lakpini*et al* 2002), the the dry mater of 83.60 – 89.19 % is high and desirable meaning that it can provide adequate forages for animals (Aduku,2004)leading to higher dry matter intake (Ocheja 2020)

Table 4: Proximate composition of *Digiteriasmutsii*

Forage Species	composition	2014	2015	2016	SEM
Digiteria Smutsii	Dry matter	89.19[a]	83.60[c]	84.87[b]	1.17
	Crude protein	10.74[a]	8.40[b]	7.94[c]	0.76
	Crude fibre	19.44[a]	4.73[c]	9.33[b]	2.17
	Ether extract	1.30[b]	3.20[a]	0.70[c]	0.38
	Ash content	11.54[a]	5.00[c]	7.31[b]	0.96
	Nitrogen free extract	46.20[c]	66.30[a]	49.51[b]	3.12

a, b,c mean with different superscript on the same row are significantly ($p<0.05$) different
SEM Standard Error of Means

3.5 Nutrient composition of *Seteriabarbata*

The nutrient composition of *Seteriabarbata* is presented on Table 5

The array of nutrients appears to be best in 2014 and least in 2015, this could be attributed to rainfall amount and distribution. The dry matter value of 87.74% was high while 59.49% (2015) and 66..83% (2016) were less than impressive (Aduku, 2004) , the crude fibre of 22.22% was adequate , however 4.41% for 2015 and 8.61% for 2016 were far beiow recommended values for ruminants (NRC, 1996), these very low values may be as a result of laboratory and or computational errors

Table 5 Proximate Composition of *Seteriabarbata* from 2014 - 2016

Forage Species	composition	2014	2015	2016	SEM
Seteria Barbata	Dry matter	87.74[a]	59.49[c]	66.83[b]	4.55
	Crude protein	9.66[a]	7.33[b]	7,30[c]	0.72
	Crude fibre	22.22[a]	4.41[c]	8.16[b]	2.71
	Ether extract	1.00[b]	2.34[a]	0.16[c]	0.32
	Ash content	10.45[a]	4,33[c]	10.10[b]	0.99
	Nitrogen free extract	44.41[a]	41.11[b]	40.34[c]	0.63

a, b ,c mean with different superscript on the same row are significantly ($p<0.05$) different
SEM Standard Error of Means

3.6 Proximate composition of *Brachiariadeflexa*

The proximate composition of *Brachiariadeflexa* is presented in Table 6

Result showed that dry matter, crude protein, crude fibre, ash content and nitrogen free extract all were significant ($p<0.05$) across the years. Crude protein (10.41 %), dry matter (88.80%) and ash(10.5%) were highest in 2014, the year 2014 appears to have the best array of nutrients , this colud be due to higher rain fall and distribution in 2014 Pasture growth in Bobi Grazing Reserve is extremely slow and result in to poor forage seasonal distribution and low quality forages. The dry matter of 88.80% recorded in 2014 was high and desirable ,since it will provide sufficient quantity of feeds for animals (Aduku, 2004)The nitrogen free extracts value range of 44.33 – 49.49% were moderate (NRC, 1996)

Table 6:Proximate Composition of*Brachiariadeflexa* from 2014 - 2016

ForageSpecies	composition	2014	2015	2016	SEM
BrachiariaDeflexa	Dry matter	88.80[a]	65.89[c]	78.80[b]	3.88
	Crude protein	10.41[a]	8.37[c]	8.39[b]	1.01
	Crude fibre	17.57[a]	4.81[c]	11.12[b]	1.84
	Ether extract	0.88c	2.94[a]	1.33[b]	0.31
	Ash content	10.45[a]	4.55[c]	9.71[b]	0.92
	Nitrogen free extract	49.49[a]	46.31[c]	44.33[b]	1.52

a, b ,c mean with different superscript on the same row are significantly ($p<0.05$) different
SEM Standard Error of Means

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

- There were significant differences in the proximate composition of the forages across the three years examined.
- The year 2014 had the best array of nutrients and 2015 had the worst

4.2 Recommendations

- Forage species such as *Paspalumcommersonii, Linus Brachiariadeflexa, Digiteria and Seteriabarbata* together with leguminous species like violet can be established as sole forage and legumes because of their high level of prevalence.
- *Digiteriasmutsii, Brachiariadeflexa, Seteriabarbata and Hyparrheniachrysegyrea* can be established as major forages in BobiGrazing Reserve because of their high dry matter yield and protein content.
- *Paspalum* as a sole forage and a leguminous species can be established on the grazing reserve because of its good composition and high dry matter yield
- Irrigation should be carried out at Bobi grazing reserve to supplement rain fall

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