DETERGENT FIBRE ANALYSIS AND PROXIMATE COMPOSITION OF 12 IMPROVED TROPICAL FORAGE LEGUME SPECIES IN THE SOUTHERN GUINEA SAVANNA OF NIGERIA

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ABSTRACT
This study was conducted to assess the detergent fibre fractions and proximate composition at maturity of 12 tropical improved forage legumes. The results showed significant (P<0.05) differences among the 12 forage legume species for detergent fibre analysis. The lignin content ranged from 10.66% for *Cajanus cajan* to 14.70 for *Lablab purpureus*. ADF content ranged from 26.13% to 32.04% *for Gliricidia sepium* and *Desmodium intortum* respectively. The NDF for the legume species ranged from 42.88% to 54.70% for *Gliricidia sepium* and *Centrosema pascuorum*, respectively. The percent dry matter ranged from 95.70% in *Lablab purpureus* to 98.83% in *Cajanus cajan*. Percent crude protein (CP) recorded ranged from 9% in *Cajanus cajan* to 17.75% in *Aeschynomene americanum*. Ash percent of the forage legume species ranged from 5.32% in *Stylosanthes hamata* to 8.52% in *Leucaena leucocephala*. The percent dry matter ranged from 95.70% in *Lablab purpureus* to 98.83% in *Cajanus cajan*. The results obtained in this study revealed that most of the forage legumes species have the potential to supply adequate nutrients for ruminant production.
Keywords: Agro-ecology, Detergent fibre, Forage legumes, Proximate, Nutrient.

INTRODUCTION
The low level of animal production from the savanna ecology of Nigeria is generally associated with the inadequacy of good quality forages. Apart from crop residues, the major feed resource is the natural range which limits animal productivity due to its poor quality. Nutritive value of forages depends in part upon the availability of nutrients in the plant for the animal. This availability is controlled by the chemical composition of the forage in respect to factors limiting the utilization of cellulose and hemicelluloses which includes lignin, and total amount of plant cell wall substances. With these points in mind the objective of this study was to assess the detergent fibre fractions and proximate composition at maturity of 12 improved forage legumes grown in the southern guinea savanna of Nigeria for establishment.

MATERIALS AND METHODS
The study was conducted from May to November, in 2015 to 2016 Cropping Seasons at the Pasture field of the Livestock Teaching and Research Farm, College of Animal Science of the University of Agriculture, Makurdi, Nigeria. Makurdi is located on latitude 07º 41' N, longitude 08º 37'E and altitude 106.4 m (NIMET, 2016). Twelve (12) forage legume species: (*Cajanus cajan* (L) Millsp, *Stylosanthes hamata* (Verano), *Gliricidia sepium* (Gliricidia), *Centrosema pubescens* (Centro), *Mucuna pruriens-white seeded, Alysicarpus vaginalis, Leucaena leucocephala, Desmodium intortum, Lablab purpureus* (Rongai), *Mucuna pruriens-black seeded, Aeschynomene americanum and Centrosema pascuorum* (Centro) were used for the study. The twelve line plots were arranged in a Randomized Complete Block Design (RCBD) with three replicates for the field experiment, while a Completely Randomized Design (CRD) was adopted for the pot

experiment and replicated three (3) times. The total plot size was 36m^2 with each Unit plot having a size of 0.75m^2. The fibre fractions (NDF, ADF and ADL) were estimated by the method of Van Soest *et al*., (1991). According to AOAC (2012), leaf samples were analyzed to determine dry matter, crude protein (Kjeldahl process), ether extract, crude fiber and nitrogen free extract at maturity. Dry matter was estimated by oven drying the forage species of known weight at 70ºC until constant weight was attained and moisture content was determined by difference.

RESULTS AND DISCUSSION

Table: Detergent Fibre Fractions (%) at Maturity for Field and Pot Experiments

Specie	Lignin	ADF	NDF
Cajanus cajan	10.66^{e}	27.48^{cd}	46.98^{f}
Stylosanthes hamata	12.36^{cd}	28.44^{bcd}	46.38^{f}
Gliricidia sepium	11.80^{de}	26.13^{d}	42.88^{g}
Centrosema pubescens	14.20^{ab}	29.99^{ab}	50.01^{cde}
Mucuna pruriens (white)	14.17^{ab}	29.60^{abc}	49.85^{de}
Alysicarpus vaginalis	13.01^{bcd}	29.91^{abc}	51.30^{bcd}
Leucaena leucocephala	12.86^{bcd}	27.50^{cd}	48.28^{ef}
Desmodium intortum	14.09^{ab}	32.04^{a}	52.12^{bc}
Lablab purpureus	14.70^{a}	30.91^{ab}	50.19^{cde}
Mucuna pruriens (black)	13.88^{ab}	31.15^{a}	53.28^{ab}
Aeschynomena americanum	11.66^{de}	29.98^{ab}	51.47^{bcd}
Centrosema pascuorum	13.97^{ab}	31.60^{a}	54.70^{a}
SEM	**0.920**	**1.469**	**1.345**

a, b, c = Means on the same column with different superscripts are significantly (P<0.05) different.
SEM: Standard Error of Mean, ADF: Acid Detergent Fibre, NDF: Neutral Detergent Fibre

Proximate Composition of the Forage Legume Species at Maturity

Species	DM %	ASH %	EE %	CF %	CP %
Cajanus cajan	98.83^{a}	6.08^{e}	18.11^{c}	14.11^{f}	9.00^{g}
Stylosanthes hamata	96.29^{cd}	5.32^{f}	13.29^{g}	29.83^{b}	10.29^{f}
Gliricidia sepium	97.40^{b}	7.42^{c}	14.41^{f}	16.06^{e}	13.54^{d}
Centrosema pubescens	97.90^{ab}	6.32^{de}	16.91^{d}	18.90^{d}	12.96^{de}
Mucuna pruriens (White)	96.42^{c}	5.47^{f}	17.32^{d}	36.91^{a}	15.56^{b}
Alysicarpus vaginalis	96.58^{c}	7.25^{c}	15.72^{e}	15.41^{e}	12.36^{e}
Leucaena leucocephala	97.47^{b}	8.52^{a}	19.42^{b}	11.67^{h}	15.53^{b}
Desmodium intortum	96.80^{bc}	7.34^{c}	21.22^{a}	13.95^{fg}	14.52^{c}
Lablab purpureus	95.70^{d}	8.32^{a}	18.20^{c}	13.23^{g}	17.50^{a}
Aeschynomena americanum	96.50^{c}	6.52^{d}	16.90^{d}	21.10^{c}	17.75^{a}
Centrosema pascuorum	97.60^{ab}	7.93^{b}	12.87^{g}	16.12^{e}	15.50^{b}
Mucuna pruriens (Black)	96.50^{c}	5.34^{f}	17.48^{d}	19.33^{d}	13.37^{d}
SEM	**1.29**	**0.22**	**0.35**	**0.47**	**0.36**

a, b, c = Means on the same column with different superscripts are significantly (P<0.05) different
SEM: Standard Error of Mean; DM: Dry matter; EE: Ether extract; CF: Crude fibre and CP: Crude protein.

The mean ADF and NDF fractions obtained in the present study compare favorably with those reported by Oji and Isilebo (2000) for selected browses of southern Nigerian. Meissner *et al*. (1991) observed that NDF level of forage above 65% can limit feed intake. However, note that there are no forage legume species of the present study that is up to that threshold level. This is suggesting that the intake of the tested forage legumes will not be hindered in this agro-ecological zone. The dry matter content of the forage plants obtained in the present study compared favourably with the findings of Oduozo and Adegbola (1992) (90.50 - 92.70%). A mean ash content of 6.82% was obtained which compares favourably with Mecha and Adegbola (1980) who reported mean ash values of 6.92, 6.10, 8.93 and 7.96% for trees, shrubs, herbs and grasses, respectively. Crude protein (CP) contents of all the species of this study were higher than 10% except for *Cajanus cajan*, which is sufficient for ruminants (Subba, 1999).

CONCLUSION AND RECOMMENDATION

The results obtained in this study revealed that most of the forage legumes species have the potential to supply adequate nutrients for ruminant production. The foliage of the plants contained moderate to high levels of crude protein at maturity. It is recommended that *Cajanus cajan*, *Lablab purpureus*, *Centrosema pascuorum*, *Centrosema pubescens* and *Mucuna pruriens* (White and black seeded) be adopted by livestock farmers and pasture agronomists in this location to establish ranches and fodder banks based on their ability to adapt, establish well and meet nutrient requirements for ruminants.

REFERENCES

Abayomi, Y.A., Fadayomi, O., Babatola, J.O. and Tian, G. (2001). Evaluation of selected legume cover crops for biomass production, dry season survival and soil fertility improvement in a moist savannah location in Nigeria. *African Crop Science*, 9(4): *615-628.*

AOAC. 2012. Official Methods of Analysis of AOAC international. 19th edition. AOAC International, Gaithersburg, Maryland, USA. Mecha, I. and Adegbola, T.A. (1980). Chemical composition of southern Nigerian forages eaten by goats. In: Browse in Africa: The current state of knowledge. Le-Houerou, H.N. (Ed.). ILCA, Addis Ababa, Ethiopia Pp. 303-306.

Meissner, H.H., Viljoen, M.D. and Van Nierkeki, W.A. (1991). Intake and digestibility by sheep of *Anthephora*, *Panicum*, Rhode and Smuts finger grass pastures: Proceeding of the 4th International Rangeland Congress, September 1991. Montipellier, France. 1991; 648-649.

NIMET, (2016). Meteorological Information for Makurdi. Nigerian Air Force Base, Tactical Air Command (TAC) Metrological Station.

Oduozo, P.C. and Adegbola, T.A. (1992). The chemical composition, nutrient intake and digestibility of some tropical forage hays fed to rabbits. *Journal of Animal Production Research.* 12(1 & 2): 49 -54.

Subba, D.B. (1999). Tree fodders and browse plants as potential nutrient suppliers for ruminants. In preceedings of the 3rd National Workshop on Livestock and Fisheries Research, Nepal Agricultural Research Council, Kathmandu, Nepal.

Van Soest, P.J., Robertson, J.B. and Lewis, B.A., (1991). Methods for Dietary Fiber, Neutral Detergent Fiber, and Non Starch Polysaccharides in relation to Animal Nutrition. *Journal of Dairy Science* 74, 3583±3597.