HERBAGE, GRAIN AND LEAF DRY MATTER YIELD OF SOME TROPICAL FORAGE LEGUMES IN THE SOUTHERN GUINEA SAVANNA OF NIGERIA

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ABSTRACT
The southern guinea savanna agro-ecological zone of Benue State is endowed with natural grassland dominated by un-improved forage species, mainly grasses. A two year study was therefore conducted at Makurdi, Southern Guinea Savanna Agro-ecological zone of Benue State, Nigeria to evaluate the adaptability and performance of ten (10) improved forage legume species obtained from National Animal Production Research Institute (NAPRI). Data collected include; fresh herbage yield, grain yield and leaf dry matter. The results showed significant ($P<0.05$) differences among the 10 forage legume species for fresh herbage yield, grain yield and dry matter yield. The Fresh herbage yield of the legume species in the field ranged from 15.85 t/ha to 216.16 t/ha for *Leucaena leucocephala* and *Cajanus cajan*. The grain yield in the field ranged from 0.81 t/ha for *Leucaena leucocephala* to 9.13 t/ha for *Mucuna pruriens* (white seeded). The leaf dry matter yield ranged from 0.37 t/ha for *Leucaena leucocephala* to 4.40 t/ha for Lablab purpureus. Generally, in the pot, mean values obtained were similar. In conclusion, the forage legume species under study have the ability to adapt, establish and yield favourably in the southern guinea savanna zone of Nigeria.

Keywords: Herbage, grains, Dry matter, Yield, Forage Legumes.

INTRODUCTION
Scientists in Nigeria have identified suitable pasture plants to meet the variations of the agro-ecological zones, therefore, different grasses and legumes are found in the different agro-ecological zones (Agishi, 1983). A wide range of legumes are available, with each species having its own agronomic requirements, thus, making it more or less suitable for a particular producer's purpose. Given that seedling establishment and growth can be influenced by multiple environmental factors (Zheng *et al*., 2005), detailed information on the emergence, growth and development of legume forage seedlings under different environmental factors are required for devising appropriate management practices and choosing the right species (Sanderson and Elwinger, 2004). Herdsmen and rural livestock farmers within the southern guinea savanna zone particularly in Benue state have been plagued with gross inadequacy of nutritious pasture. It has further led to the incessant resource conflicts between herdsmen and rural crop farmers as a result of indiscriminate and unconsented encroachment of farmlands with cultivated crops not yet harvested by grazing cattle in search for nutritious feed. Abayomi *et al.* (2001) have evaluated legume cover crops but this study will have a wider scope of forage legume species for performance evaluation.

MATERIALS AND METHODS
The study was conducted from May to November, in 2015 and 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 at latitude 07° 41' N, longitude 08° 37'E and altitude 106.4 m

(NIMET, 2016). Seeds of ten (10) forage legume species: (*Cajanus cajan* (L) Millsp, *Stylosanthes hamata* (Verano), *Centrosema pubescens* (Centro), *Mucuna pruriens-white seeded, Alysicarpus vaginalis, Desmodium intortum, Lablab purpureus* (Rongai), *Mucuna pruriens-black seeded, Aeschynomene americanum and Centrosema pascuorum* (Centro) obtained from Feeds and Nutrition Research Programme of National Animal Production Research Institute (NAPRI), Shika, Zaria were used for the study. A digital weighing scale was used weight of the samples. The ten 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 times as well. The total plot size was 12 m x 6 m with each unit plot having a size of 1.5 m x 0.5 m. The seeds were sown using the sowing depth specifications for each legume species. Data on fresh herbage yield per plot per hectare was taken by weighing the fresh portion of the whole plant after harvest at maturity and grain yield (t/ha) was taken by weighing only the grains harvested at maturity. Data on leaf dry matter yield was taken by oven drying the leaves of the whole plant at constant weight. Data generated was subjected to analysis of variance (ANOVA) using the Minitab Statistical Software (MSS) (Version 16) (2016) for both field and pot experiments. Means that showed significant differences were subjected to mean separation using the Fisher's Least significant difference (LSD) of the MSS at the 5% level of probability ($P \leq 0.05$).

RESULTS AND DISCUSSION

Table 1: Mean squares for fresh herbage yield, grain yield and dry matter yield after sowing (field experiment)

Source of Variation	**DF**	**(FHY)**	**(GY)**	**(LDM)**
Replication	2	0.17	0.0315	0.00248
Treatment	9	8782.84*	25.8278*	3.74549*
Error	18	0.06	0.0186	0.00121

DF: Degree of Freedom; FHY: Fresh Herbage Yield; GY: Grain Yield; DM: Dry Matter

Table 2: Fresh herbage yield, grain yield and dry matter yield after sowing (pot experiment)

Source of Variation	DF	(FHY)	(GY)	(LDM)
Treatment	10	13764*	31.8338*	3.90800 *
Error	20	246	0.0340	0.00159

DF: Degree of Freedom; FHY: Fresh Herbage Yield; GY: Grain Yield; DM: Dry Matter

Table 3: Mean values of fresh herbage yield (t/ha), grain yield (t/ha) and leaf dry matter yield of the forage legumes species at maturity

Specie	Herbage Yield		Grain Yield		Leaf Dry Matter	
	Field	Pot	Field	Pot	Field	**Pot**
Cajanus cajan	216. 16^{a}	267.33^{a}	3.52^{e}	3.67^{c}	1.53^{e}	1.61^{d}
Stylosanthes hamata	35.77^{j}	39.43^{de}	1.15^{i}	1.15^{g}	0.54^{j}	0.61^{h}
Centrosema pubescens	38.05^{h}	42.44^{de}	4.50^{c}	4.86^{b}	0.64^{i}	0.68^{g}
M. pruriens (white)	58.34^{g}	64.89^{cd}	9.13^{a}	9.95^{a}	1.63^{d}	1.72^{c}
Alysicarpus vaginalis	35.07^{j}	38.49^{de}	1.46^{h}	1.51^{f}	0.87^{g}	0.89^{f}
Desmodium intortum	36.12^{i}	39.82^{de}	1.84^{g}	1.74^{ef}	0.78^{h}	0.85^{f}
Lablab purpureus	74.17^{c}	79.93^{bc}	2.46^{f}	2.70^{d}	4.40^{a}	4.53^{a}
M. pruriens (black)	63.23^{e}	69.48^{c}	8.89^{b}	9.72^{a}	1.67^{c}	1.70^{c}
A. americanum	89.09^{b}	97.67^{b}	1.92^{g}	1.97^{e}	2.20^{b}	2.30^{b}
Centrosema pascuorum	65.32^{d}	72.18^{bc}	4.69^{d}	5.09^{b}	1.28^{f}	1.38^{e}
SEM	0.252	15.69	0.136	0.184	0.035	0.040

Means on the same column with different superscripts are significantly (P<0.05) different.
SEM: Standard Error of Mean

The high fresh herbage and grain yield reported for *Cajanus cajan, Aeschynomena americanum, Lablab purpureus, Centrosema pascuorum, Centrosema pubescens* and *Mucuna pruriens* (White and black seeded) could be attributed to the favorable growing conditions in this location which can adequately provide feed for better livestock production in the location. This report agrees with Norton (1994b) which stated that animals with access to more leguminous forage crops perform better than those kept on natural grassland in milk yield, weight gain, reproductive performances and survival rates. Variations in the fresh herbage yield between *Centrosema pascuorum* and *Centrosema pubescens* could be attributed to differences in the genetic composition of both varieties. The high herbage and grain yield for *Centrosema pubescens, Mucuna pruriens* (white and black seeded) and *Centrosema pascuorum* indicates an advantage in forage legume production for livestock feeding as pasture producers can select for pasture establishment and seed production. The low grain yield reported for *Cajanus cajan, Lablab purpureus, Aeschynomena americanum* and *Stylosanthes hamata* indicates that these species can be selected for their potential for forage production only. The leaf dry matter (LDM) yield reported for *Lablab purpureus, Aeschynomena americanum, Mucuna*

pruriens (white and black seeded) and *Centrosema pascuorum* was highest out of the ten forage legume species evaluated in this study which suggests that they have potential for producing adequate feed required for livestock production in the location. The LDM yield of *Lablab purpureus, Aeschynomena americanum* and *Centrosema pascuorum* were lower than that reported by Nworgu and Ajayi (2005) which could be attributed to the level of soil fertility, climatic zones, seasons and agronomic practices adopted.

CONCLUSON

This work has demonstrated that the forage legume species under study have the tenacity to adapt and establish favourably in the southern guinea savanna zone of Nigeria. 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, fodder banks and produce seeds based on their ability to adapt, establish and to meet nutrient requirements for ruminants.

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