EVALUATION OF NUTRITIONAL COMPOSITION AND SECONDARY PLANT COMPOUNDS OF FIVE PLANTS IN KABBA, KOGI STATE

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ABSTRACT
The study was conducted to evaluate the proximate, minerals composition and secondary plant compounds of five plants (Ficus *thonningii*, *Vitellaria paradoxa*, *Vitex doniana*, *Spondia mombin*, and *Pterocarpus echinatus,)* as potential feed for ruminants. Proximate composition (dry matter (DM), crude protein (CP), crude fibre (CF), ether extract (EE), neutral detergent fibre (NDF), Acid detergent fibre (ADF), acid detergent lignin (ADL), hemicelluloses, cellulose and ash), energy, minerals composition (Na, K, P, Ca, Mg, Fe, Zn, Mn and) and anti-nutritional composition (tannin, phenol, oxalate, phytate, alkaloid and saponin) were analyzed. The results showed that the CP content of *F. thonnigii* (20.41%),*V. doniana (20.45%), P.echinatus (19.60)* were higher than *V.paradoxa* (14.38%), and *S. mombin* (15.34%) . The CF was significantly ($P<0.05$) different with *F.thonningii* having the highest value (23.41%) while *P.echinatus* had the least value (12.68%).The energy content of the forages ranged from 1388.8KJ/100gdm – 1745.50KJ/100gdm. The minerals constituents of the forages were statistically ($P>0.05$) similar except K, P and Mg. The anti-nutrients levels of the forages were all within the range that ruminant's animals could utilize. The study revealed that the investigated plants had inherent potentials that can be used for feeding ruminant animals.

INTRODUCTION
Browse plants, beside grasses, constitute one of the cheapest sources of feed for ruminant. The diversity and distribution of browse plants in Nigeria have received early attention in studies carried out from the different parts of the country (Soliva *et al., 2005).* The trees and shrub legume forages are rich in most essential nutrients such as proteins and minerals and tend to be more digestible than grasses and crop residues (Carew *et al.*, 1989). They also serve other useful purposes such as the provision of food, drugs, life wood and building poles and recycling of nutrients. Browse leaves and pods form a natural part of the diet of goats which meets over 60 percent of the forage requirement and has been used by traditional farmers as sources of forage in Nigeria. There are several types of leguminous and non – leguminous trees used as forage by ruminants. Several tree species could be effective sources of fodder during normal as well as scarcity periods (Reddy, 2006). Browse plants play significant roles in nutrition of ruminant livestock in tropical regions. Browse species, because of their resistance to heat, drought, salinity, alkalinity, drifting sand, grazing and repeated cutting, are the major feed resource during the dry season (Fagg and Stewart, 1994). Some parts of browse species can be found during the dry season including pods, fruits and leaves. The nutritional importance of browse is especially significant for free ranging animals in extensive communal system of production and browsing wild animals. One of the major constraints to ruminant's production in Nigeria is inadequate feed. This is due to seasonal fluctuation of fodder in quantity and quality as well as failure of farmer to identify some available forage that can easily be grown intensively and preserved in form of hay or silage. Therefore this study was conducted to evaluate the potentials of some selected browse plants as feed resources for ruminant animals.

MATERIALS AND METHODS
Study area and collection of samples
The study was conducted in Kabba which is located within the Southern Guinea Savanna Ecological Zone of Nigeria (Latitude $07^0$53N and longitude $6^0$8E and $6^0$3E). The rainfall spans between April to November with the peak in June to September. The dry season extends from December to March (Kabba College of Agric Metrological Station 2011). The selected forages

(Ficus thonningii, vitex doniana, vitellaria paradoxa, spondia mombin and pterocarpus echinatus) were harvested from five locations within the study area. leaves sample were randomly taken from seven stands per specie in each of the location. The samples taken were pooled for each plant species.

Preparation of samples and laboratory analysis

The samples were oven dried at 60^{0}C for three days to constant weight to determine the dry matter (DM). Dried samples were milled to pass through 20mm sieve and stored in air tight container pending analysis. Crude protein (CP), crude fibre (CF), ether extract (EE) and ash contents of the forages were determined according to AOAC (1995), while the Nitrogen free extract (NFE)was calculated. The fibre content (Cell wall fractions); Neutral detergent fibre (NDF), Acid detergent fibre (ADF) and Acid Detergent Lignin (ADL) were determined according to Van Soest *et al.* (1991). Cellulose and hemicellulose were calculated. The secondary metabolites; Saponins, Phenols, Alkaloids, Tannin Oxalate and Phytate were qualitatively determined as established by Babayemi *et. al.*, (2004).

Statistical Analysis

Data collected were subjected to analysis of variance procedure of SAS, (2000) and significant differences among means were compared using Duncan' Multiple Range Test (SAS, 2000).

RESULTS AND DISCUSSION

The dry matter (DM) content of the feeds ranged from 90.78% - 96.40%, while the crude protein (CP) ranged from 14.38% - 20.45% with *Vitellaria paradoxa* having the lowest value of 14.38%. However, this value is well above the critical 8% CP value requirement by ruminants for optimum microbial activities in the rumen (Norton, 2003). For the crude fibre (CF), *F. thonningii* had the highest CF (23.14%) while *Pterocarpus echinatus* had the lowest value (12.68%). The ether extract (EE) content of the sampled ranged from 5.47% (*F.thonningii*) to 9.43% (*P. echinatus*). Ash content ranged from 5.32% (V.doniana) to 12.40% (*P.echinatus*).The result compared favourably with the report of Omoniyi *et al.* (2013). These values indicate that these plants are rich source of minerals. Nitrogen free extract (NFE) was higher in *S.mombin* (54.06%) while F.thonningii had the least recorded value (34.86%).The Neutral detergent fibre (NDF) was higher (P<0.05) for *V. paradoxa* (59.09%) and least for *F. monningii* (39.16%). The value of *Ficus thonningii* in this present study competes favourably with the report of Omoniyi *et.al.* (2013) who obtained (38.07%) in *Ficus thonningii*. The ADF was lowest in *Ficus thonningii* while *V. paradoxa* had the highest value which was statistically similar to the values recorded for*S. Mombin* and *V. doniana*. The Acid detergent lignin of the samples (P <0.05) ranged from (20.32%) in *F.thonningii* to (29.99%) in *S. mombin*, these values compared favourably with the report of Isah *et al.* (2012) who reported 24.32 for *Ficus thonningii* and 27.59% for *Spondia mombin*. The hemicellulose content ranged from (P<0.05) 8.50% (*F. thonningii*) to19.71% (*S.mombin*). The value of *Ficus thonningii* recorded in this study is higher than the value of *Ficus thonningii* reported for *Ficus surs* by Omoniyi et al. (2013). The Cellulose value ranged (P<0.05) between 10.34% - 23.74%. The energy content of the forages varied from 1388.80% – 1745.50%. The minerals constituents (sodium, magnesium, potassium, calcium, magnesium, iron, zinc, manganese and lead) of the forages varied considerably in the study.

The tannin content of the samples (P<0.05) varied from (1.05%) in *F. thonningii* to 3.08% in *S. mombin*. This value compare favourably with (1.17%) for *Ficus exasperate* but lower (7.71%) for *Spondia mombin* reported by Fadiyimu *et.al.* (2011). Phenol level ranged from 2.49% (*P.echinatus*) to 3.24% (*V.paradoxa*). The Alkaloid content of the forages varied between 2.43% (*S.mombin*) to 3.43% (*P.echinatus*).The saponin level recorded ranged between (0.15% - 3.43%). The Phytate contents ranged (P<0.05) from 0.21% - 0.40%. The oxalate value of the forages varied from 0.16% - 0.36%

CONCLUSION

This study revealed that the investigated browse plants are able to meet the nutrients requirements of ruminant animals, when offered sole or as supplement.

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Table 1: Chemical composition of some browse plants

Parameters	*F. thonngii*	*V.paradoxa*	*V.doniana*	*S.mombin*	*P.echinatus*	*SEM*
Dry matter (%)	94.42	96.40	95.41	94.63	90.78	0.34
Crude protein (%)	20.41^{a}	14.38^{b}	20.45^{a}	15.34^{b}	19.60^{a}	0.42
Crude fibre (%)	23.41^{a}	16.02^{c}	20.26^{b}	15.43^{cd}	12.68^{d}	0.31
Ether extract (%)	5.47^{b}	8.94^{a}	7.82a^{b}	7.77^{ab}	9.43^{a}	0.33
Ash (%)	15.85^{a}	8.32^{b}	9.32^{b}	7.40^{b}	12.40^{a}	0.11
Nitrogen free extract (%)	34.86^{b}	48.65^{ab}	42.15^{b}	54.06^{a}	45.89^{b}	0.66
Neutral detergent fibre (%)	39.16^{b}	59.09^{a}	56.31^{a}	44.48^{b}	54.37^{a}	0.86
Acid detergent fibre (%)	30.66^{b}	45.81^{a}	45.18^{a}	38.11^{ab}	41.31^{a}	1.04
Acid detergent lignin (%)	20.32^{b}	23.67^{b}	21.44^{b}	29.99^{a}	27.64^{a}	0.11
Hemicellulose(%)	8.56^{b}	13.28^{b}	20.80^{a}	19.71^{a}	13.06^{b}	0.78
Cellulose (%)	10.34^{b}	22.14^{a}	23.74a	8.12^{b}	13.67^{b}	1.13
Energy (KJ/100g)	1388.80^{b}	1650.0^{ab}	1745.50^{a}	1711.30^{a}	1715.90^{a}	33.39
Sodium (g)	0.43	0.03	0.04	0.04	0.04	0.002
Potassium (g)	1.52^{c}	1.52^{c}	1.23^{d}	2.04^{b}	2.40^{a}	0.02
Phosphorus (g)	0.10^{b}	0.14^{a}	0.08^{c}	0.10^{b}	0.10^{b}	0.002

Calcium (g)	0.08	0.10	0.10	0.10	0.09	0.01
Magnesium (g)	0.17[a]	0.13[b]	0.22[a]	0.20[a]	0.23[a]	0.14
Iron (g)	0.05	0.18	0.06	0.10	0.03	0.02
Zinc (g)	0.01	0.01	0.01	0.01	0.01	0.00
Manganese (g)	0.10	0.02	0.02	0.04	0.01	0.002
Lead (g)	0.01[a]	0.02[a]	0.02[a]	0.01[a]	0.01a	0.01

[abcd]: means in the same column with different superscript differs significantly P<0.05. *F. Thonningii – Ficus Thonningii, V. paradoxa – Vitellaria, V. doniana – Vitex doniana, S. mombin – Spondia mombin, P.echinatus – Pterocarpus echinatus*

Table 2: Some antinutritional composition of studied browse plants

Parameters	*F. thonngii*	*V.paradoxa*	*V.doniana*	*S.mombin*	*P.echinatus*	*SEM*
Tannin	1.05[b]	3.05[a]	2.21[a]	3.08[a]	2.18[a]	0.10
Phenol	3.20[a]	3.24[a]	2.69[b]	3.07[a]	2.17[b]	0.05
Alkanoid	2.43[c]	2.43[c]	3.31[a]	2.43[b]	3.43[a]	0.03
Saponin	3.33[a]	1.30[c]	0.15[e]	2.51[b]	0.28[d]	0.004
Phytate	0.28[a]	0.25[b]	0.21[c]	0.40[a]	0.25[b]	0.004
Oxalate	0.21[c]	0.16[d]	0.36[a]	0.27[b]	0.24bc	0.06

[abcde]: means in the same column with different superscript differs significantly P<0.05. *F. Thonningii – Ficus Thonningii, V. paradoxa – Vitellaria, V. doniana – Vitex doniana, S. mombin – Spondia mombin, P.echinatus – Pterocarpus echinatus*