NUTRITIONAL VALUE AND PREFRENCE OF SELECTED BROWSE PLANTS OF THE HUMID ZONE BY WEST AFRICAN DWARF GOATS

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Abstract

About 500 g each of fresh leaves and apical growth of 11 browse species: Albizia zygia, Alchornea cordifolia, Dialum guineense, Gliricidia sepium, Leucaena leucocephala, Macaranga barterii, Newbouldea laevis, Palisota hirsuta, Sarcocephalus latifolus, Spondias mombin and Vernonia amygdalina were used for the study. The fodder species were placed in plastic feeding troughs, replicated three times and randomly placed in three locations around the perimeter of the paddock. Animals were exposed to the fodder for 4h/d 12d. Number of visits, number of bites per visit and time spent eating the browses were measured with stop watches. Dried samples of test species were ground through 1mm screen and used for chemical analyses. The range in CP, tannin, NDF and ADF were 170.0g kg^{-1} DM - 334.4g kg^{-1} DM, 0.05g kg^{-1} DM – 8.1g kg^{-1} DM, 315.3gkg^{-1} DM – 664.0gkg^{-1} DM and 212.8gkg^{-1} DM - 442.0gkg^{-1} DM respectively. Number of visits, number of bites, time spent per visit and coefficient of preference ranged from 0.0 -12.2, 0.0-113.9, 0.0-27.7sec and 0.0-0.48 respectively. From the results, goats preferred the browse species in the following order: L. leucocephala > A.cordifolia > S.mombin > S.latifolus > A.zygia > D. guineense > P. hirsuta > M. barterii > G.sepium, N. laevis and V.amygdalina.

Key words: WAD goats, Browse plants, Preference, Nutritional value.

Introduction

Inadequate quantity and quality of feed especially in the dry season has been known to be largely responsible for the major limitation in livestock productivity in the tropics. These browse plant species have high potentials as important feed resources for ruminants since they remain green all year round, thus constituting a ready source of feed during off season feeding (Oji *et al.*, 2007). Several indigenous and exotic browse species have been investigated for inclusion in ruminant feeding systems in Nigeria (Fadiyimu *et al.*, 2011). Nutrient composition of some indigenous browse species of Southern Nigeria has been characterized (Oji and Isilebo 2000; Okoli *et al.*, 2001). Unfortunately, the major challenge to the use of browse plants as alternative feed resources to livestock is the presence of anti-nutritional factors (Olafadehan, 2011).

Overcoming the constraints of inadequate knowledge of the nutritive value and productivity of most browse species would ensure maximization of the use of these multipurpose trees and shrubs by livestock. The present study therefore examines the nutritional value of and preference for browse species by WAD goats.

Materials and Methods

Fresh leaves and apical parts of 11 browse species: *Albizia zygia* (DC) J.F. Machr, *Alchornea cordifolia* (Mull. Arg), *Dialium guineense* Wild, *Gliricidia sepium* (Jacq.) Walp, *Leucaena leucocephala* (Lam), de wit, *Macaranga* barterii (Mull. Arg). *Newbouldia laevis* (P. Beauv), *Palisota hirsuta* (Thunb) K. Schum, *Sarcocephalus latifolus* (Smith) Bruce, *Spondias mombin* (L.) and *Vernonia amygdalina* (Del.) were harvested from their natural habitat. The browse species were fed to five West African Dwarf goats to determine their preference using the cafeteria method (Larbi *et al.*, 1993). Animals' behavioural pattern and dry matter intake were determined by the method described by Mtenga *et al.* (1992). Animals were kept in an open paddock (25 m x 25 m) with a two weeks regrowth of *Panicum maximum*. About 500 g of each fodder specie were offered to the goats in plastic troughs 30 cm in diameter, in three replicates randomly placed in three locations. The test feed placement were randomized every day to avoid "habit reflex" (Kaitho *et al.*, 1996). The animals were exposed to the fodder for four hours each day for 12 days with a 7-d adjustment and 5-d collection periods. The coefficient of preference (COP) of each browse specie was determined by the procedures of Karbo *et al.* (1996). Number of visits, number of bites per visit and time spent per visit eating the species were recorded with stop watches'. Grab samples of fresh leaves offered and refusals during the 5-d collection period were weighed and dried at 60°c

for 48 h in a Gallenkamp moisture extraction oven for dry matter determination. The dried samples were ground in a hammer mill (Christy and Norris laboratory Mill) through a 1mm screen and stored in polythene bags for chemical analyses.

Proximate composition of samples was determined by the AOAC (1990) methods. Neutral detergent fibre (NDF), acid detergent fibre (ADF) and acid detergent lignin (ADL) were analyzed by the method of Goering and Van Soest (1970) while tannin was assayed by the procedures of Ogbai and Berhan (1997). Data on browse preference were analyzed as a split-plot design.

Result and Discussion

The chemical composition of the selected browse species is presented in Table 1. Crude protein (CP) ranged from 163.8g kg^{-1}DM in *M. barterii* to 334.4g kg^{-1}DM in *G. sepium*. Significant differences ($P<0.05$) were observed within nutrients and between species. There were fairly high values of ash, CF, NDF, ADF and ADL in the species studied but tannin concentrations were relatively low except for *A. zygia* and *P. hirsuta*.

The CP content of the browse species were within the range in values of 136.5 to 258g kg^{-1} DM given by Okoli *et al.* (2003) except for *A. zygia* and *L. leucocephala* with higher values. The low NDF, ADF and ADL values of *G. sepium* could be responsible for the high CP values of this leguminous browse specie. Significant variations in CP values have been identified by Reddy (2006). The NDF and ADF values were within the range reported by Okoli *et al.* (2003) except for *A. zygia*. The relatively high tannin content, high NDF and ADF values of *A.zygia* could be responsible for the relatively low dry matter intake of this specie and less acceptance by the goats (Kalio *et al.*, 2006). Tannin content was significantly least ($P<0.05$) in *G.sepium* (0.05g kg^{-1}Dm) the variations in DM content of the browse species could be attributed to stage of growth (Oji *et al.*, 2003).

The mean values for the preference parameters are shown in Table 2. Dry matter intake of the browses ranged from 0.0g d^{-1} in *V.amygdalina* and *G.sepium* to 308.7g d^{-1} in *L.leucocephala*. Number of bites, number of visit and time spent were significantly ($P<0.05$) lowest in these species. *Gliricidia sepium* was totally rejected by goats in this study but the work of Wahua and Oji (1987) showed a wide acceptance. An animal may find a specific feed acceptable or unacceptable (Marten, 1978). There were significant variations ($P<0.05$) also among species in number of bites per visit, time spent and feed dry matter intake. High intake was as a result of longer time spent eating the browse. Intake of green fodder are affected by plant species, stage of maturity, level of phytochemicals among others (Kalio *et al.*, 2006). Coefficient of preference (COP) was used to rank the species in order o preference: *L. leucocephala* > *A. cordifolia*> *S. mombin* > *S. latifolus* > *A. zygia* > *D. guineense* > *P hirsuta* > *M. barterii* > *G. sepium, N. laevis, V. amygdalina.*

Conclusion

The browse species were found to have appreciable level of crude protein and may serve as valuable supplements to low quality diets especially in off season feeding.

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Table 1. Chemical composition of the browse species fed to the WAD goats

Browse Species	Parameters, gkg^{-1}DM									
	Dry matter	Crude protein	Crude Fibre	Ether Extract	Ash	NFE	Tannin	NDF	ADF	ADL
	963.8^{b}	321.9^{a}	370.3^{a}	25.4^{d}	25.0^{d}	221.2^{c}	8.1^{a}	664.0^{a}	422.8^{a}	103.6^{b}
A. zygia	951.7^{c}	195.0^{c}	76.2^{c}	26.1^{cd}	37.8^{cd}	516.5^{a}	0.63^{cd}	412.9^{c}	337.0^{ab}	66.1^{c}
A. cordifolia	968.6^{a}	170.0^{cd}	375.3^{a}	23.4^{e}	26.5^{d}	373.4^{bc}	1.8^{bc}	556.1^{ab}	442.0^{a}	116.5^{ab}
D. guineense	926.2^{cd}	334.3^{a}	140.8^{cd}	56.5^{d}	26.5^{d}	349.0^{bc}	0.05^{e}	352.2^{e}	80.3^{d}	47.4^{cd}
G. sepium	950.1^{c}	313.1^{ab}	160.4^{c}	70.6^{a}	56.6^{b}	349.4^{bc}	2.1^{bc}	380.0^{cd}	212.8^{c}	61.2^{c}
L.leucocephala	954.6^{c}	163.8^{d}	259.9^{b}	39.5^{c}	76.1^{a}	415.3^{b}	1.5^{bc}	399.0^{c}	311.3^{ab}	77.8^{bc}
M. barterii	969.8^{a}	206.3^{c}	289.9^{b}	68.1^{a}	37.1^{cd}	317.2^{bc}	2.6^{bc}	546.2^{ab}	414.6^{a}	121.5^{ab}
N. laevis	961.6^{b}	186.3^{c}	173.0^{c}	50.9^{bc}	44.2^{c}	507.2^{a}	4.5^{b}	415.4^{c}	270.4^{b}	147.1^{a}
S. latifolus	950.6^{c}	228.1^{bc}	102.6^{d}	27.4^{cd}	80.6^{a}	512.3^{a}	1.3^{cd}	315.3^{d}	215.6^{c}	81.9^{bc}
S. mombin	952.5^{c}	245.6^{bc}	203.3^{bc}	59.1^{b}	45.6^{c}	393.9^{b}	2.7^{bc}	497.9^{b}	340.5^{ab}	66.0^{c}
V. amygdalina	969.5^{a}	291.3^{b}	-	29.3^{cd}	52.7^{b}	-	0.4^{d}	360.9^{cd}	277.0^{b}	74.5^{bc}
Mean	956.2	241.4	225.3	43.3	46.2	402	2.3	445.0	307.1	86.7
SEM	3.8	19.1	29.8	5.4	5.7	28.8	0.6	32.2	32.4	9.4

NFE: Nitrogen free extract, NDF: Neutral detergent fibre ADF: Acid deterge nt fibre, ADL: Acid detergent lignin

^{a,b,c,d,e} Means within same column with unlike superscripts differ significantly (P<0.05)

Table 2. Mean values of the preference parameters of the browse species by WAD goats

Browse species	Parameters				
	FDMINT (gd^{-1})	NOVIT	NOBIT	TPERVIT (sec)	COP
A. zygia	128.8^{c}	6.8^{cd}	98.6^{a}	115.4^{cd}	0.18
A. cordifolia	262.6^{b}	8.5^{bc}	92.4^{ab}	270.7^{a}	0.40
D. guineense	85.9^{d}	7.8^{cd}	74.6^{bc}	197.2^{b}	0.12
G. sepium	0.0^{e}	0.0^{e}	0.0^{e}	0.0^{f}	0.00
L. leucocephala	308.7^{a}	9.0^{bc}	94.8^{ab}	217.1^{ab}	0.48
M. barterii	77.7^{d}	9.5^{bc}	57.6^{c}	77.8^{de}	0.05
N. Laevis	4.6^{e}	1.3^{e}	12.0^{d}	13.2^{ef}	0.00
P. hirsuta	54.7^{d}	5.2^{d}	53.1^{c}	69.9^{de}	0.08
S. latifolus	135.0^{c}	12.1^{a}	95.7^{ab}	84.7^{cd}	0.02
S. mombin	245.1^{b}	11.1^{a}	113.9^{a}	150.2^{bc}	0.38
V. amygdalina	0.0^{e}	0.3^{e}	1.8^{e}	1.4^{f}	0.00
Mean	118.4	6.5	63.1	108.8	
SEM	11.3	2.5	7.9	50.6	

FDMINT: Feed dry matter intake NOVIT: Number of visits NOBIT: Number of bites
TPERVIT: Time spent per visit COP: Coefficient of preference
^{a,b,c,d,e,f} Means within same column with unlike superscripts differ significantly (P<0.05)