Niger Agric. J. 33. (2002): 128-135

AN ASSESSMENT OF THE NUTRITIVE VALUE OF BROWSED PLANTS IN MAKURDI, NIGERIA

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ABSTRACT

Twenty-five plant species were identified as useful cattle feedstuff during peak dry season in Makurdi, Benue State. Leguminous species accounted for over 48% of the browse. The browsed plants were classified on the basis of frequency of browsing into those heavily, moderately or occasionally browsed by cattle and analysed for chemical constituents. The samples showed high nutritive potentials with crude protein values of 14% in 92% of the samples. The lowest crude protein value was in *Mucuna poggei* (10.9%) while the highest was in *Lonchocarpus cyanescens* (31.7%). The heavily browsed group was superior to the other groups in protein content (21.4%) and in calculated *in vitro* organic matter digestibility (IVOMD) (50.6%). The IVOMD values ranged from 32.7 to 52.4%. The relationship between IVOMD and crude protein was negative and non-significant (r = - 0.22). Generally, the mineral content was high with the heavily browsed species containing higher calcium (1.52%) and phosphorus levels (0.35%) than either the moderately (1.22% Ca and 0.22% P) or the occasionally (1.15% Ca and 0.32% P) browsed groups. The vital role of browse as a feedstuff for cattle especially in the dry season and the need to propagate them in plantations in the Middle Belt zone were emphasized.

INTRODUCTION

The values of browse plants as one of the cheapest feed resources for livestock especially during the dry season has long been recognized (Rose-Innes and Mabey, 1964; Lawton, 1968; Vesey-Fit-zerald, 1973; Le Houerou, 1980). The importance of browse is most appreciated when the dry season is prolonged and during periods of scarce and low rainfall. Browse trees and shrubs become the major sources of protein, vitamins and frequently mineral elements for livestock when grasses are scarce. In Nigeria, browse plants have been evaluated for their chemical constituents by Saleem et al. (1979), Mecha and Adegbola (1980) and Carew *et al.* (1980) for the north-west, South-east and south west, respectively. Except for the scanty consideration in the broad study of browse species of the Sahelian and Sudanian zones of west Africa (Le Houerou, 1980), Guinea zone (Audru,

1980) and the Sudano-sahelian zone (Cisse, 11980), the middle Belt Zone and in particular the Benue State has not specifically been evaluated for its vast browse plants. The value of browse plants in the middle Belt Zone of Benue state is well know in traditional pastoralism. During the dry season pastures in the Northern parts of the country which provide the needs of over 90 percent of the cattle and 60 percent of the sheep and goat (FAO, 1966) decline markedly in both quality and quantity. These pastures could provide just a sub-maintenance diet (De leeuw, 1971; Zemmelink, 1974), a situation that triggers off annual seasonal migration of the Fulani pastoralists to the Middle Belt zone in search of green pasture and water. In the middle Belt zone however, there is shortage of green pasture in the late dry season just before the start of the rains. This period, which may last for 2-4 months, is very crucial in livestock feeding on account of frequent bush fires, which raze a large part of the grass cover. It is during this bridging period that browse plants become heavily relied upon by stock as sources of fresh green feedstuffs.

This study was undertaken to identify and determine the nutritive characteristics of plant species browsed by cattle during the dry season in Makurdi, in the middle belt zone of Nigeria.

MATERIALS AND METHOD

Environment of study

The study was conducted in areas around the University of Agriculture, Makurdi (Latitude 7^0 41' N, Longitude 8^0 37' E, elevation, 97m above sea level). The rainy season extends from April to October and the average annual rainfall ranges from 1397mm, the dry season lasts from November to March. The annual environmental temperature ranges from 21.6^0C to 42.0^0C and the relative humidity from 52.18% in the morning to 69.1% in the afternoon.

Collection of samples

Leaves of browse plants grazed by the University's cattle herd numbering 70 mature animals were collected weekly (from 30 December, 1991 to 28 February, 1992) between 0800 and 1500 hours. Samples of the plants were taken to the Department of Forestry for identification; the local names of the plants and information about them were checked in the literature. The animals were carefully observed as they grazed and their behaviour with respect to browse preference was used as the basis for sample collection. Samples were collected and grouped according to those heavily browsed, moderately browsed or occasionally browsed.

Chemical Analysis

The leaves collected were oven-dried at 60^0 C for 48 hours, milled and analyzed for dry matter (DM), crude protein (CP), crude fibre (CF), ether extract (EE), nitrogen-free extract (NFE), ash, calcium and phosphorus using the A.O.A.C. (1980) methods. The digestible crude protein (DCP) was estimated as DCP (%) = 0.93 CP- 3.52 (Dermarquilly and Weiss, 1970) and *in vitro* organic matter digestibility (IVOMD) was estimated as Y=57.49-0.232 X – 0.725 Z where Y is the true *in vitro* organic matter digestibility, X is the crude fibre and Z is the ether extract (Geri and Sottini, 1970).

RESULTS AND DISCUSSION

The plant species commonly browsed by cattle in Makurdi area are presented in Table 1 while their chemical constituents are summa-rized in Table 2, Table 3 and Table 4.

Among the browsed species leguminous browse accounted for 48% of the plants sampled. The content of CP in the herbage ranged from 10.93% in *Mucuna poggie* to 31.71% in *Lonchocarpus-cyane-scens*. About 92% of the CP values ranged between 15 and 26% The heavily browsed

plants had the highest CP followed by the moder-ately and occasionally browsed species (average 21. 41 ± 4.28, 17.6 ± 4.29 and 19.47 ± 19.29 and 19.47 ± 6.13% CP respectively) Saleem *et al.* (1979) have reported relatively higher CP content in the heavily browsed plants of North Western Nigeria. It would appear that selectivity of browsing was dictated by the level CP. In this study, the heavily browsed plants were richer in CP and lower in CF. However, some species such as *Mucuna poggei* and *Cassia sieberiana* with high fibre and low protein content were preferred more to *Lonchocarpus cyanescens* and *Ludwigia octovalis* (Tables 3 and 4). It should however be noted that nutritive value is totally independent of palatability and quantities consumed. Browse plants are known to contain certain levels of tannins, which could affect palatability. It has been reported (Donnelly and Anthony, 1969; Robbins *et al.* 1987) that the binding of feed tannins to the salivary proteins and epithelium of the mouth makes the feed unpalatable and depresses voluntary intake. On the other hand, certain tannin-rich plants have been reported by Provenza *et al.* (1990) to be readily ingested by mammalian herbivores. It has been suggested that the differences could partly be due to the different nature of tannins present (Clausen *et al.*, 1990).

The CF content of the herbage varied widely (3.0-26.5%). The heavily browsed plants were lowest in CF (10.36± 7.45%). The moderately browsed species averaged 18.77% CF, which is comparable to the value of 18.30% obtained for tropical West African browse in the dry season (Le Houerou, 1980). Browse plants have been reported to be lower in CF than grasses harvested at the same time (Mecha and Adegbola, 1980). In this study, the EE value ranged from 2.0% in *Ludwigia octovalis* to 30.0% in *Lonchocarpus cyanescens.* The mean value for the occasionally browsed species (10.21± 9.33%) was higher than that for the heavily or moderately browsed plants. The overall mean value of 7.05% is higher that the mean value (4.2%) for African browse (Le Houerou, 1980) and 3.6% for South-Eastern Nigeria browse (Mecha and Adegbola, 1980). The chemical composition of browse plants is known to be affected by the locality (Majumdar *et al*, 1967).

The mean total ash content of browse plants in this study was 11.9% of which calcium was 1.29% and phosphorus, 0.29%. The mean value is superior to the 10.9% reported for West African browse species (Le Houerou, 1980) and to the 6.29% reported for the South Eastern Nigeria browse plants (Mecha and Adegbola, 1980). The calcium content of the heavily browsed plants (1.52%) was relatively higher than the values for the moderately (1.22%) and occasionally (1.15%) browsed species. The phosphorus content varied extensively from 0.08% in *Sterospermum kunthianum* to 0.61% in *Aspilla helianthoides.* The calcium/ phosphorus ratio of 4:5 is much higher than the optimum of 1.0 to 2:0. The mineral content of browse is generally high and adequate; hence deficiencies in roughages may be offset in animals that have access to browse plants.

Beef cattle can obtain the prescribed minimum requirement of 0.18% phosphorus by grazing a mixture of browse trees and shrubs (Saleem *et al.*, 1978). The calcium content of browse is high and adequate and may not need supplementation. In the case of phosphorus, supplementation is necessary. Calcium tends to accumulate in plants during periods of drought and is less in concentration when soil moisture is high (McDonald *et al.*, 1973). The DCP were high and ranged between 6.65 and 25.96% in *Mucuna poggei* and *Lonchocarpus cyanescens* respectively. The DCP values follo-wed closely the trend of CP in the browse plants. The heavily browsed plants had the highest mean DCP (16.39%)

followed by the occasionally browsed (14.59%) and the moderately browsed (12.86%). Forages containing less than 6-7% CP are usually poorly digested due to non-availability of sufficient nitro-gen for rumen microbial activity (Glover and Dougall, 1960). The digestibility of CP tends to approach zero value below 3.7% (Milford and Minson, 1966). The IVOMD values were fairly high and ranged between 32.72 and 52.44% in *Lonchocarpus cyanescens* and *Passiflora foetida* respectively. The heavily browsed group averaged 50.6% while the moderately and occasionally browsed types were 49.58 and 46.36% digestible respectively. The relationship between IVOMD and CP was negative and non significant (r =- 0.22). This is at variance with the results obtained by Saleem *et al.* (1979). It is probable that differences in tannin levels of the species affected the relationship. The range of IVOMD in this study (32.72-52.44%) is far below the range of 54.0-70.0% for Ghana browse plants (Mabey and Rose-Innes, 1964), but close to 35.6-69.0% (Saleem *et al.*, 1979) and 37.5-54.0% (Carew *et al.*, 1980) for Southern Nigeria browsed plants. The differences could be due in part to the methods used. Our values were computed from regression equation.

CONCLUSION

In conclusion, browse plants undoubtedly play a major role in the nutrition of livestock by provision of protein, vitamins and frequently mineral elements, which are lacking in pastures during the dry season. In Nigeria, browse plants are never cultivated or nurtured in plantations. In view of the high nutritive values especially the species mostly preferred by animals, there is the need to plant and nurture them in plantations as well as establishing them in grazing reserves. The seasonal influx of migrant pasto-ralists in Benue state make the establishment of brows .plantations a necessity. An increase in the population of browse trees and shrubs in the Southern Guinea Savanna area in general and Makurdi area of Benue state in particular would make possible the transformation of the pastoral nomadic or transhumant animal production systems into settled agro- pastoral systems. There is need for more work to identify and evaluate the nutritive value of more browse species in the middle belt zone as well as determining cultural practices that would ensure proper establishment, management and productivity of the browse plants.

ACKNOWLEDGEMENT

The authors wish to thank Messrs J. K. Akinpelu and C. Agana for technical assistance and Mr. P. O. Ekwuno and colleagues in the Department of forestry for plant identification.

TABLE 1: Plant species browsed by cattle in Makurdi

Family	Species
Heavily browsed	
Compositae	*Tridax procumbens* Linn
Caesalpiniaceae	*Afzelia Africana*. Sm
Passifioraceae	*Passiflora foetida*. Linn
Compositae	*Aspilia helianthoides* (Schum and Thonn)
Bignoiacae	*Sterospermum kunthianum* Cham
Caesalpiniaceae	*Daniellia oliveri* (Rolfe Dalz) Hutch
Papilionacea	*Pterocarpus erinaceus* Poir
Moderately browsed	
Papilionaceae	*Calagonium mucuhoides* Desv.
Verbenaceae	*Itex donianan*. Sweet
Ochaceae	*Lophira lanceolate* Van Tregh ex keay
Papilionaceae	*Crotalaria retusa* Linn
Euphorbiaceae	*Securinga virosa* (Roxb ex willd) Baili
Meliaceae	*Psendodrela kotschyi* (Schweing Harms)
Acanthaceae	*Asystasia gangetica* (Linn) T. Anders
Papilionaceae	*Mucuna poggie*. Tanub
Caesalpiniaceae	*Cassia sieberiana* DC
Papili onaceae	*Tephrosia bracteolate* Gull and perr.
Verbenaeae	*Clerodeudrum capitatum* (Willd) Schum & Thonn
Occasionally browsed	
Caesalpiniacease	*Burkea Africana* Hook
Sapotaceae	*Vitellaria paradoxa* Gaertn. FF
Caesalpiniaceae	*Piliostigma thoningil* (Schum) Milne-Redh
Combretaceae	*Combretum lamprocarpum* Diels
Caesalpiniaceae	*Piliostigma thoningil* (Schum) Milne-Redh
Combretaceae	*Combretum Lamprocarpum* Diels
Papilionaceae	*Lonchocarpus cyanescens* (Schum & Thonn) Benth
Onagraceae	*Ludwigia octovalis (Jacq.)* P. Raven
Rubiaceae	*Sarcocephalus latifollius* (Sm) Bruce

Table 2 Chemical composition and nutritive value of heavily browsed plant species in the dry season in Makurdi

Browse species	Chemical composition in dry matter (%)									
	DM	CP	CF	EE	NFE	ASH	Ca	P	DCP (%)	IVOMD (%)
Tridax Procumbens	93.00	24.06	9.00	4.50	34.94	20.50	1.81	0.55	18.86	52.14
Afzelia Africana	95.00	15.31	9.00	6.00	59.19	5.50	1.95	0.50	10.72	51.05
Passiflora foetida	90.00	26.25	3.00	6.00	44.25	10.50	1.55	0.34	20.89	52.44
Aspilia helianthoides	94.00	20.79	7.00	6.00	41.71	19.50	1.31	0.61	15.81	51.52
Sterospermum kunthianum	95.00	19.69	9.00	11.00	36.31	19.00	1.25	0.08	14.79	47.43
Pterocarpus erinaceus	95.00	17.50	26.50	5.00	37.00	9.00	1.51	0.11	12.76	47.83
Danielllia oliveri	90.50	26.25	9.00	5.00	45.75	4.50	1.23	0.27	20.89	51.78
Mean	93.63	21.41	10.36	6.07	42.74	12.64	1.52	0.35	16.39	50.60
SD	1.97	4.28	7.48	2.24	8.35	6.88	0.28	0.21	3.97	2.08

Table 3 Chemical composition and nutritive value of moderately browsed plant species in the dry season in Makurdi

Browse species	Chemical composition in dry matter (%)									
	DM	CP	CF	EE	NFE	ASH	Ca	P	DCP (%)	IVOMD (%)
Calapogonnuim mucunoides	90.00	15.31	26.00	9.50	28.19	11.00	1.60	0.19	10.72	44.57
Vitex doniana	95.00	19.70	14.00	3.00	46.80	11.50	1.15	0.41	14.80	52.07
Lophira laneolata	95.00	15.31	21.00	6.50	43.69	8.50	1.41	0.12	10.72	47.91
Crotalaria retusa	93.00	15.31	16.50	3.50	49.19	8.50	1.40	0.09	0.72	51.12
Securinega virosa	94.00	18.10	11.50	4.00	44.90	15.50	1.71	0.14	13.31	51.92
Clerodendrum capitatum	92.50	26.01	17.00	2.50	38.49	8.50	1.05	0.09	20.66	51.73
Pseudodrela kotschyi	90.00	17.50	18.50	4.00	42.00	8.00	1.02	0.32	12.76	50.30
Mucuna poggei	95.00	10.93	16.50	5.00	55.07	7.50	1.18	0.14	6.65	50.04
Asystasia gangetica	95.00	24.06	18.00	4.50	31.94	16.50	1.02	0.33	18.85	50.05
Cassia sieberiana	95.00	16.10	23.00	6.50	41.90	7.50	0.95	0.42	11.46	47.44
Tephrosis bracteolate	96.00	15.40	24.50	5.00	39.60	11.50	0.98	0.19	10.81	48.18
Mean	93.68	17.61	15.77	4.91	41.98	10.41	1.22	0.22	12.86	49.58
SD	2.08	4.27	4.45	1.99	7.53	3.15	0.26	0.13	3.99	2.31

Table 4 Chemical composition and nutritive value of occasionally browsed plant species in the dry season in Makurdi

Browse species	Chemical composition in dry matter (%)									
	DM	CP	CF	EE	NFE	ASH	Ca	P	DCP (%)	IVOM D (%)
Burkea Africana	85.50	14.00	20.50	7.00	32.50	11.50	1.33	0.11	9.51	47.66
Vitellaria paradoxa	95.00	15.31	11.50	12.00	40.19	16.00	1.20	0.51	10.42	46.12
Piliostigma thoningii	85.00	20.59	24.00	10.00	25.41	5.00	1.07	0.25	15.63	44.67
Combretum lamprocarpum	95.00	17.50	15.50	5.50	46.00	10.50	0.96	0.41	12.76	49.91
Lonchocarpus cyanescens	95.00	31.71	13.00	30.00	14.79	5.50	0.96	0.24	25.96	32.72
Ludwigia octovalis	95.50	21.87	19.00	2.00	32.63	19.50	1.02	0.24	16.82	51.63
Sarcocephalus latifolius	96.00	15.31	8.50	5.00	46.69	20.50	1.50	0.45	10.72	51.89
Mean	92.36	19.47	16.00	10.21	34.03	12.64	1.15	0.32	14.59	46.37
SD	4.87	6.13	5.46	9.33	11.48	6.26	0.21	0.14	5.69	6.60

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