A NOTE ON THE CHEMICAL COMPOSITION, INTAKE AND DIGESTIBILITY OF SOME DRY SEASON FORAGES FED TO GOATS

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ABSTRACT

The chemical composition of the leaves of three trees, *Acioa barteri, Anacardium occidentale* (Cashew) and *Mangifera indica* (Mango) and a herb, *Aspillia africana* (Haemorrhage plant), their dry matter intake (DMI, g/day) and digestibilities (%) of dry matter (DM), organic matter (OM), crude protein (CP) and crude fibre (CF) were determined in West African dwarf goats. The chemical composition of three grass species, *Andropogon gayanus* (Gamba grass), *Cynodon nlemfuensis* (Giant star grass) and *Panicum maximum* (Guinea grass) was also determined to compare with those of the browses.

The browses had higher CP (8.1-11.3%), acid detergent lignin (6.9-15.1%), Calcium (0.5-2.3%) and lower CF (9.6-23.5%) than the grasses which had 3.2-4.9% CP, 4.3-8.1% lignin, 0.43- 0.53% Ca and 24.4-28.1% CF.

The consumption of fresh forages (g/d) varied from 193 on *Acioa barteri* to 918 on *Aspilia africana*. The highest DM intake was obtained on *Aspilia africana*. Apparent digestibility values (%) were: DM, 59.9-69.7; OM, 61.0-71.1; CP, 40.9-68.2 and CF, 39.3-64.9. *Acioa batereri* was the least digested of the forages.

The higher CP content of the browses and their availability and acceptability by goats during the dry season in contrast to the low CP of the grasses indicates their potential for feeding goats. *Acioa barteri* is unsuitable as sole food for goats.

Key Words: Chemical composition, Intake, Digestibility, Forages, Goats, Dry Season.

INTRODUCTION

One of the major problems of ruminant animals production in Nigeria is the seasonal variation in the availability and nutritional value of the natural grassland (Oyenuga, 1957). The grass becomes dry, coarse, fibrous and less digestible during the dry season resulting in reduced feed intake and weight losses of the animals. Supplementary feeds are not usually available or the cost is prohibitive. Browse plants are therefore being used to supplement available grass during the dry season. Mecha and Adegbola (1980) found that herbs, shrubs and trees of Southern Nigeria were on the average richer in crude protein than grasses during the dry season. Browses have a great potential for dry season feeding though factors such as ease of harvesting by man or animal, voluntary intake level, digestibility and presence of toxic components need to be taken into consideration (Saleem *et al*, 1979).

The chemical composition and *in vitro* digestibility of some Nigerian browses have

been investigated (Saleem *et al*, 1979, Carew *et al*, 1981, Mecha and Adegbola, 1980) but information on *in vivo* digestibility is lacking, This experiment was therefore set up to compare the nutrient content of some tree and herb leaves used as fodders for goats during the dry season, with three grasses and to determine the digestibility of the browses.

MATERIALS AND METHODS

Location

The experiment was conducted at the University farm located at an altitude of 447 metres above sea level, between latitude 6° 5′ and 6° 53′ N and longitudes 7° 22′ and 7° 26′ E. The natural vegetation is the Derived Savanna (Keay, 1959). The dry season months are November to February.

Forages

Seven forages comprising of three tree leaves (*Acioa barteri, Anacardium occidentale*, and *Mangifera indica*) a herb (*Aspilia africana*) and three pasture species (*Andropogon gayanus, Cynodon nlemfuensis* and *Panicum maximum*) were analyzed for chemical components. Only the mature leaves and leaves plus edible twigs in the case of *Aspilia africana* were analyzed. The grasses were not used in digestibility study since they have become coarse and have started to dry up. The forages were harvested and analyzed from mid-December to mid- January.

Animals and their management

Twelve (12) male West African dwarf goats 7 to 9 months of age with an average weight of 12 kg were dipped and dewormed against ecto- and endo-parasites respectively. They were kept in a house with a concrete base, with a wooden wall of 1.5m high and with asbestos roofing and concrete floor. The goats were randomly divided into four groups of three animals per group and a group was assigned to one of the forages. Each goat was kept in a metabolism cage equipped with feed and water troughs. The forages were harvested daily and 2 kg of each was fed fresh to each animal. Feed refusals were weighed the following day to determine intake. The feeding experiment lasted for four weeks. Faeces collection was done during the fourth week and the total faeces collected was dried at 80°C for 48 hours, and milled to pass through a 1 mm sieve. Forage samples were also collected for chemical analysis.

Chemical analysis

The proximate analysis of the forages and the faeces was done by the AOAC (1975) methods. Calcium was determined after wet digestion, with an Atomic Absorption Spectrophotometry (Unicam SP 90A) and phosphorus by the vanadomelybdate method of Kitson and Kellon (1944). Acid detergent fibre (ADF) and acid detergent lignin (ADL) were determined according to van Soest (1963).

Experimental design and statistical analysis

The mean values for nutrient digestibility were subjected to analysis of variance and compared using Duncan multiple range method (Steel and Torie, 1960).

RESULTS AND DISCUSSION

The chemical composition of the forages is presented in Table 1. The crude protein content (%) ranged from 3.2 for *Andropogon gayanus* to 11.3 for *Aspilia africana*. The tree leaves have on the average higher CP content than the grasses. The CP value of 4.85% for *Panicum maximum* is higher than 2.48 to 3.48% reported by Obioha and Ndukwe (1976) for different varieties of *Panicum maximum* harvested in

Table 1
Chemical Composition of the browses and grasses in the dry season

	Acioa barteri	*Anacardium occidentale*	*Aspilia africana*	*Mangifera indica*	*Andropogon gayanus*	*Cynodon nlemfuensis*	*Panicum maximum*
Crude protein	8.06	9.41	11.26	9.14	3.20	4.88	4.85
Crude fibre	22.60	21.10	9.58	3.50	24.40	28.10	27.75
Ether extract	2.10	3.05	1.80	3.95	2.90	2.65	2.85
Ash (silica-free)	3.12	2.50	9.78	3.83	3.18	4.98	5.83
Nitrogen free extract	57.24	61.94	61.23	57.08	64.82	58.09	56.07
Acid detergent fibre	64.50	32.50	34.35	29.30	30.50	36.50	36.10
Acid detergent lignin	15.05	11.70	11.15	6.90	5.40	4.30	8.10
Calcium	1.40	0.53	2.30	1.05	0.43	0.43	0.53
Phosphorus	0.11	0.08	0.29	0.09	0.10	0.25	0.18

Table 2
The intake + and nutrient digestibility of browses by goats

	BROWSES			
	Acioa barteri	*Anacardium occidentale*	*Aspilia africana*	*Mangifera indica*
Forage (fresh) intake, g/day	$193^{c} \pm 23.3$	$553^{b} \pm 24.3$	$918^{a} \pm 45.0$	$404^{b} \pm 33.7$
Dry matter intake, g/day	$106^{a} \pm 18.9$	$243^{b} \pm 12.9$	$248^{b} \pm 12.9$	$204^{b} \pm 10.0$
Dry matter intake, % body weight	$0.88^{a} \pm 0.10$	$2.03^{b} \pm 0.29$	$2.07^{b} \pm 0.30$	$1.70^{b} \pm 0.18$
Weight gain, kg/day	-0.01	0.01	0.02	0.01
Nutrient digestibility:				
Dry matter	$59.9^{a} \pm 2.45$	$69.5^{b} \pm 2.64$	$67.1^{b} \pm 2.59$	$69.7^{b} \pm 2.64$
Organic matter	$61.0^{a} \pm 2.47$	$71.1^{b} \pm 2.67$	$68.8^{b} \pm 2.62$	$71.1^{b} \pm 2.67$
Crude protein	$40.9^{a} \pm 2.63$	$51.7^{b} \pm 2.96$	$68.2^{c} \pm 3.40$	$56.7^{b} \pm 3.10$
Crude fibre	$39.3^{a} \pm 2.80$	$64.9^{c} \pm 3.72$	$53.1^{b} \pm 3.26$	$43.3^{b} \pm 3.30$

+ Means bearing different superscript in each row are significantly different ($P < 0.05$).

Mid-December. Their CP values of 5.78% for *Cynodon nlemfuensis* is higher than 4.88% obtained in the present report. The higher CP content of tree leaves compared to grasses in the dry season is consistent with the results of McLeod (1973), Wilson (1977) and Mecha and Adegbola (1980). The CF values ranged from 9.6 to 28.1%. The tree leaves had the highest CF content and the herb, *Aspilia africana* had the lowest. The CF of the grasses is much less than values of 39 to 42% reported by Obioha and Ndukwe (1976). The chemical composition of forages is affected by factors such as stage of maturity, type and level of fertilizers applied and the variety of the forage (Ademosun, 1970, 1973; Olubajo *et al*, 1974).

The other extract values of 1.80 to 3.95% did not show any consistent pattern but tree leaves had slightly higher ether extract than grasses (Adegbola, 1985). The silica-free ash content of *Aspilia africana* was particularly high (9.8%). The ADF content of *Acioa barteri* was very high but the ADF values of the forages fell within the range of 13 to 67% reported by Ranjhan (1980) for fodder tree leaves of India. *Acioa barteri* also had the highest content of ADL (15.1%). *Anacardium occidentale* and *Aspilia africana* also had relatively high content of ADL. The high ADL level of *Aspilia africana* may be due to the inclusion of edible twigs in the part analyzed. The ADL of the tree leaves was on the average higher than that of the grasses. The mean Ca content of the tree leaves is higher but P content is lower than that of the grasses.

The mean fresh and dry matter intakes (DMI) and digestibility of DM, OM CP and CF are shown in Table 2. *Acioa barteri* was the least consumed on both fresh — and dry basis. There were no significant differences ($P < 0.05$) in the consumption of *Aspilia africana, Mangifera indica* and *Anacardium occidentale* on dry basis but intakes on these forages were much higher than that of *Acioa barteri*. The DMI of the animals is less than 2.7 to 3.1% of body weight reported by Devendra (1967) and much less than 8.3% obtained by Carew *et al* (1981).

The digestibility of dry matter (DMD) varied from 59.9 for *Acioa barteri*. to 69.7% on *Mangifera indica*. The low digestibility of the DM of *Acioa barteri* could be due to the high lignin content which depresses digestibility. The *in vitro* DMD estimates of browse trees of Sudan Savanna by Saleem *et al* (1979) ranged from 35.6 to 69.0% and for species of Southern Nigeria, Carew *et al* (1981) reported 36.9 to 54%. The organic matter digestibility (OMD) for each forage was slightly higher than the DMD. The crude protein digestibility (CPD) of the trees was lower than that of *Aspilia afritana. Acioa barteri* CP was the least digested. Wilson (1977) obtained CPD values of 16 to 63% for Australian trees. There are no known published values of CPD for tree leaves of Nigeria. The crude fibre digestibility (CFD) was lowest for *Acioa barteri* (39.3%). *Anacardium occidentale* had significantly higher CFD than the other forages. The low CFD of *Acioa barteri* may be attributed to the high level of ADF and especially ADL.

Mortality

One of the goats fed on *Acioa barteri* died and was replaced during the experiment. Post mortem report indicated harmorrhagic enteritis. The other goats fed the same plant remained stunted long after the experiment was over, lost much of the hair around the eyes and later died. This would seem to indicate that *Acioa barteri* contains some compounds toxic to goats and therefore the forage should not be fed as sole food.

The advantages of the browses is their availability and high nitrogen content during the dry season (Wilson, 1977) when the gras-

ses are dry, coarse and unacceptable to the animal. *Asphilia africana*, being a shrub disappears by the end of January but bushes of this herb may be utilized for some time during the dry season. Even though available, the browses fed in this study could be used only for maintenance due to their low intake.

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