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Studies of selected browses of South-Southern part of Nigeria with particular reference to their proximate and some anti-nutritional constituents

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Target Audience: *Animal Scientist, Feed Millers, Farmers*

Abstract

Four commonly utilized browse plants (Daniella oliveri, Sarcophalus, latifolia, Vitex doniana and Ficus thoningii) were harvested from Obubra in Cross River State, Nigeria and analysed for proximate and some anti- nutritional components of the leaves. A high variability was recorded in values of crude protein (17.50 - 26.25%), crude fibre (26.15 - 44.40 %), Ash (5.15 - 13.90 %), ether extract (2.20 - 5.20 %) and nitrogen free extract (10.25 - 40.17 %). The concentration of anti-nutritional factors were generally low. Tannin content ranged from 0.30 to 5.1 µg/g, phytate 0.18 to 4.03 µg/g, oxalate 0.39 to 12.30 µg/g, saponins 0.002 to 3.60 µg/g and alkaloids 0.001 to 2.38µg/g. The results showed that the browse plants studied have good levels of nutrients, low and safe levels of anti-nutritional factors. Based on these results, it is therefore recommended that, the browse plants may be actively encouraged in the feeding of livestock.

Key words*: Chemical nutrients, ever green forages, leaf meal, toxic constituents*

Description of problem

The search for alternative cheap sources of feed to improve the scope of animal production which may as well increase the amount of protein intake by Nigerians cannot be over emphasized, so it continue to challenge the professionals in livestock farming in Nigeria to search for more feed resources that could be fed to livestock. This search for alternative feed resources has over the past few decades rekindled research interest in the use of tropical browse plants as sources of nutrients for ruminants as well as non-ruminants (1; 2).

Browses constitute an abundant biomass in farmlands, bush fallows and forests in the humid tropical environment of south southern Nigeria. They are commonly utilized in the wild by small-holder livestock farmers for feeding small ruminants (3). The potential of leaf meals from these tropical trees and shrubs to yield relatively higher levels of crude protein and minerals and lower crude fibre levels than tropical grasses has also been recognized (4). Many of these browse plants are in the wild, used as medicinal plants in feeding of ruminants in villages without having information on the content that sustained the animals so the need to scientifically evaluate their nutritive importance as well as the phyto-chemical constituents of some of them so as to add to the range of the already known browses that are used in feeding ruminants and non-ruminants.

The feeding of browse forages to animals especially in the dry season is too essential because grasses and herbaceous legume forages are scarce at that time, so it is becoming too necessary that more effort should be intensified for a search for more. The nutrient

composition as well as some of the anti-nutritional constituents of *Daniella oliveri, Sarcophalus, latifolia, Vitex doniana* and *Ficus thoningii* should be evaluated to see its level so that it could be used in feeding livestock. This is because some of the leaves of these plants are eaten by human, are abundantly available and remain green all year round. They seem to be even luxuriant at the peak of the dry season. Adegbola and Oduozo (5) and Alawa and Amandi (6) opined that some of the limiting factors associated with using browse plants as animal feeds include procurement, storage, high fibre content , toxic substances, poor feed intake, poor digestibility and consequent low performance of the animals. However, there is need to investigate the nutritional composition of these browse plants because of their availability as alternative feed resources to livestock. Wahua and Oji (7; 8) among others, have characterized the nutrient composition of some indigenous browse plants of South Eastern part of Nigeria. These studies showed that crude protein and crude fibre contents of such plants ranged from 15.3% to 33.3% and 2.7% to 15.6%, respectively. However, tropical browses have been shown to contain varying quantities of condensed tannin and other anti-nutritional substances in their biomass that affect their optional utilization by animals (9).

Scanty information are available on the nutrient composition of these forages. Tegbe *et al* (10) reported in their study that, the proximate composition (g/100g) of *Ficus* leaf meal have dry matter ((40.61%), crude protein (18.51%), crude fibre (19.41%), ether extract (5.57%) and ash (10.87%). The values which were similar to the data reported by (11) and they indicated that the mean crude protein content of *Ficus* species were consistent with the report of (8) on the crude protein of browse plants in tropical West Africa. The authors also were of the view that the level of CP in *Ficus* is higher than the critical level of 7g/100 g Dm at which feed intake of the animal is depressed. Bamikole *et al* (11) reported that *Ficus* species have good levels of nutrients particularly protein for livestock feeding and that the level of anti-nutritional factors is low and a good acceptability level is guaranteered in *Ficus.* Abejishi *et al* (12) in their preliminary study using *Vitex doniana* and *Ficus thoningii* on the feeding of rabbits reported the proximate composition of the forages to be in the range of crude protein of 8.75 to 18% which were within the range of 5.00 to 35.00% reported by (13) for tropical forages and also within the range reported by (14) of 7.00 to 28% for most forages. The CF range of 7.32 to 22.08 was a bit lower than the value 9.00 to 30.0% obtained by (13) and the values 9.0 to 37% reported by (14). The EE range of 2.00 to 6.41% of the forages were also within the range of 1.5 to 12.00% reported by (14). That these differences observed could be attributed to variations in location and varieties of forages.

It was therefore, the aim of this present study to evaluate the proximate composition as well as some anti-nutritional constituents of the leaves of these four browses species. *Daniella Oliveri* (DO) *Sarcocephalus latifolia* (SL) *Vitex doniana* (VD) and *Ficus thoningii* (FT), the leaves of which are available all year round and even luxuriant at the peak of dry season, with the aim of determining if they can be added to the range of forages that can be fed to livestock.

Materials and Methods

Sources of the browse plants.

The fresh leaves from the apical portions of the branches of the four selected browse plants, *Daniella oliveri* (DO), *Sarcocephalus latifolia* ,(SL), *Vitex doniana* (VD) and *Ficus thoningii* (FT) were harvested from the surrounding bushes of Obubra community, where the Cross River University of Technology, Faculty of Agriculture and Forestry is located. They were identified at the Department of Forestry of the University.

Chemical analysis

Fresh foliage of the selected browse plants were sun-dried for 3 days, cut into pieces (2 to 5 cm), oven-dried at 60 to 70^{o}C for 24 hours and milled thoroughly with a laboratory milling machine and screened for subsequent analysis. Proximate composition was determined for percentage of dry matter (DM), crude protein (CP), crude fibre (CF), ether extract (EE), ash and nitrogen free extract (NFE) according to the methods of (15).

Nutritional/Chemical Analysis

The analyses were carried out at University of Uyo, Akwa Ibom State laboratories, using the methods outlined by the Association of Official Analytical Chemists (15).

Proximate Analysis

The analyses entail the determination of moisture to get dry matter (DM), crude protein (CP), ether extracts (EE), crude fibre (CF), ash and Nitrogen free extract (NFE).

***Determination of antinutritional factors* of the browse plants:**

Phytate was determined according to the method of (16) and by titration method described by (17).–Saponin was determined gravimetrically by the method of (18). Oxalate was determined using the titration technique described by (19). The Folin-Denis Spectrophotometric method (20) was used to determine tannin content while alkaloid was determined using the gravimetric method of (21).

Results and Discussion

Results of proximate analysis are extensively employed in research and industry for quick estimation of nutrient potentials of feedstuffs. Although such results may not give a true indication of the nutritive value of a feed, they supply clues in research, to plan of potential value for further in vitro or in vivo studies (1; 2). Proximate analysis is specifically useful in screening the potentials of the array of tropical browse plants utilized by indigenous farmers for ruminant feeding. It also gives out values that should be used in ration formulations.

The proximate composition of the wild forages used in this study, presented in Table 1 are generally comparable to the nutrient values of the forages, especially CP and CF which were within the ranges of 15-30% CP and 20 - 45% CF (22). This however, were against the CP and CF values of 12-22% and 16-26% respectively obtained by (23) and 12-16% CP and 15-25% CF obtained by (24) or tropical forages. There were also within the range of crude protein of 8.75 to 18% reported of the browse plant used in the experiment (12) and within the range of 5.00 to 35.00% reported by (13) for tropical forages and is also within the range reported by (20) of 7.00 to 28% for most forages. The CF range of 26.15-44.40 was higher than 7.32 to 22.08 (12) and within the range except the upper value of 9.00 to 30.0% obtained by (13) and that reported by (14) of 9.0 to 37%. Aduku and Olukosi (25) observed that the range of fibre required in rabbit diets reflects a high requirement for forage in the diet for optimum growth.

The EE range of 2.00 to 6.41% present in the experimental forages was also within range of 1.5 to 12.00% reported by (12) and (14). The few differences observed could be attributed to variations in location and varieties of forages (26).

Table 1. Proximate composition (g/100g) of the four browse plants

Browse plants	DM	CP	CF	ASH	EE	NFE
Daniella Oliveri	41.8±0.90	21.9±0.95	26.2±0.85	7.45±0.5	4.35±0.52	40.2±0.81
Sarcocephalus Latifolia	32.6±0.85	19.5±0.97	35.6±0.80	5.65±0.76	2.2±0.45	27.1±0.08
Vitex doniana	40.9±0.91	17.5±0.86	36.7±0.82	5.15±0.53	2.5±0.19	38.1±0.53
Ficus thoningii	27.9±0.93	26.3±0.76	44.4±0.58	13.9±0.34	5.2±0.42	10.3±0.56

DM= dry matter, CP= crude protein, CF= crude fibre, EE= ether extract and NFE= nitrogen free extract

The anti-nutritional factors of experimental browse plant leaves are shown in Table 2. The percentage components of anti-nutritional factors in this present study were low and comparable with the reports of (27). Among the anti-nutritional factors, the tannin content of 1.22, 2.34, 5.1 and 0.34 µg/g obtained in *Ficcus thoningii, Vitex doniana, Daniela oliveri*, and *Sarcocephalus latifolia* respectively were comparable to values (0.13 to 6.31%) reported previously by (28). A threshold concentration of 5% tannin had been reported above which there is rejection of browse plants by goats (29).

The phytin levels reported in this study ranged from 0.42 to 4.02 mm/100g, which is lower than the 13.80 to 25.20 mm/100 g reported by (30) for the south-eastern browses in Nigeria. These levels are unlikely to have any adverse effects on animals. The oxalate content of the browse species was not consistent with the reported values (1.49 to 5.79%) of some browse plants relished by ruminants in Nigeria (31). Oxalate content in this present study was low. It has been reported that 20 g/kg oxalate can be lethal to chicken (32). The saponin content of 0.002-2.55 mm/100 g was also low as in other leguminous browse species. Report from (18) shows values of 3.24% and 3.47% for *Parkia biglobosa* and *Afzelia* Africana respectively. Feedstuffs containing saponin had been shown to be defaunating agents (33). Cheeke (34) reported that saponin has effect on erythrocyte haemolysis, reduction of blood and liver cholesterol, depression of growth rate, bloat (ruminant) inhibition of smooth muscle activity, enzyme inhibition and reduction in nutrient absorption. Saponins have been reported to alter cell wall permeability and therefore, to produce some toxic effect when ingested (35). The anti-nutritional effects of saponins have been mainly studied using alfalfa saponins. Sharma and Chandra (36) observed that 4-7 weeks of *ad libitum* feeding of albizia gave rise to toxic manifestation in sheep. Symptoms included, listlessness, anorexia, weight loss and gastro-enteritis. The toxicity of saponins can be reduced by repeatedly soaking the feed in water, though the level recorded in this present study may not pose any problem to the animals.

Table 2. Anti-nutritional factors of experimental browse plant leaves

Anti-nutrient (mm/100 g)	FT	VD	DO	SI
Tannin	1.22±0.13	2.34±0.08	5.10±0.10	0.34±0.02
Phytate	4.02±0.02	0.18±0.02	-	0.42±0.01
Oxalate	12.3±0.15	0.39±0.01	-	-
Saponins	3.60±0.15	-	0.002±0.001	1.25±0.01
Alkaloids	-	0.89±0.01	0.001±0.001	2.38±0.01

Ft= Ficcus thoningii, Vd = Vitex doniana, Do = Daniela oliveri, Sl = Sarcocephalus latifolia, (-) = not present

Conclusion and Applications

1. The proximate composition of the forages had good nutrient profiles which is perceived can support the maximum performance of livestock.
2. The anti-nutritional factors were also observed to be low which implies that, it may not interfere with nutrient absorption and utilization by livestock.
3. The study portrayed that all the forages apart from supporting livestock growth, may not pose any health hazards of any nature since human being used them as vegetables in soup preparation and others used them as medicinal leaves in orthodox medicine.
4. Based on these findings, the forages particularly *Ficus thoningii* with the highest levels of nutrients may be actively encouraged in the feeding of livestock.

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