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PROXIMATE COMPOSITION AND TANNIN CONTENT OF SOME MULTIPURPOSE TREE LEAVES

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ABSTRACT

Leaves from tree legumes *Enterolobium cyclocarpum* (EC), *Pterocarpus santalonoides* (Ps), *Gliricidia* ɘ*pium* (Gs), *Leucaena leucocephala* (LL) and *Senna slamea* (Ss) were analysed for ash, crude protein (CP), ·ude fibre (CF), Ether entract (EE) neutral detergent fibre (NDF), acid detergent fibre (ADF) and tannins. The ɜh (7.85 ± 0.22 – 10.11 ± 0.10), CP (10.07 ± 0.11 – 26.27 ± 0.30), CF(8.16 ± 0.15 – 14.76 ± 0.68), E(2.21 ± 1.47 – 8.41 ± 0.34), NDF(49.24 ± 0.08 – 66.51 ± 0.46) and ADF(27.84 ± 0.15 – 45.66 ± .49) of the tree leaves varied between plants. Ash content of *P. santolonoides* (7.85 ± 0.22) was least ·hile that of *E. cyclocarpum* was highest (10.11 ± 0.10). *L. leucocephala* had the highest CP(26.27 ± .30) and *S. siamea* (10.07 ± 0.11) the least. However, CF content was highest in *S. siamea* (22.80 ± .53) and least in *P. santalonoides* (8.16 ± 0.15). The contents of tannin in *E. cyclocapum, P. santalonoides,* *. sepium, L. leucocephale* and *S.siamea* were 0.254 ± 0.005mg/g, 0.388 ± 0.016 mg/g, 0.485 ± .023mg/g, 0.267 ± 0.013mg/g and 0.607 ± 0.06, respectively. The results suggest that the tree legumes ave potential as supplements. Also, the trace amounts of tannins (0.254 ± 0.005 – 0.607 ± 0.06) ɘtected are less than suggested amounts (30 mg/g) that can adversely affect their nutritive value.

Key words – Trees, Chemical composition, anti-nutrients and tannins.

INTRODUCTION

There is an increasing interest in the use of trees as fodder particularly in the tropics where native pastures and crop residues constitute the major feed resource. The pastures and crop residues, are seasonally available, of low quality and therefore require appropriate supplemention.

Multipurpose trees (MPTs) contain a lot of proteins, caretenoid precursors of vitamin A and a number of minerals (Le Houerou, 1980; Kuma Vaithiyanathan, 1990; Olasson and Wellin-Berger, 1991) especially in the dry season and therefore suitable for supplementing low quality grasses (Kaitho *et al*, 1993). The advantages of the use of trees as forage include availability and accessibility to farms, source of dietary nutrients, laxative influence on the alimentary system, reduction in the requirements for purchased concentrates and reduced cost of feeding (Devendra, 1988).

However, the presence of tannins and other phenolic compounds in large number of nutritionally important shrubs and trees hamper their utilization as animal feed (Tolera *et al*, 1997). Because they may result in reduced availability of nitrogen and amino acids required for microbial growth since tannins form strong complexes with proteins (Barry and Duncan, 1984; Reed, 1995). And, the voluntary intake and the efficiency of extraction of nutrients from the feed during digestion are the most important determinants of nutritive value of feed (Tolera and Sundstol, 200).
According to Fadiyimu (2000), the utilization of trees as livestock fodder supplements can only be maximized by knowledge of the nutritive

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value of the trees' edible components.

The objectives of this study therefore were to determine the chemical composition and tannin (the most widely spread anti-nutrient in all vascular plant) contents of five multipurpose trees namely *Enterolobium cyclocarpum* (EC), *Pterocarpus santalonoides* (PS), *Senna siamea* (SS), *Gliricidia sepium* (CS), *Leuceana leucocephala* (LL).

MATERIALS AND METHODS

Enterolobium cyclocarpum, and *Pterocarpus santalonoides* leaves were obtained from arboretum (place where plants are grown for scientific study) of the international centre for Research in Agro-forestry (ICRAF) while leaves of *Gliricidia sepium* (GS), *Leuceana leucocephala* (LL) and *Senna siamea* were from arboretum of the International Livestock Research Institute (ILRI) both in Ibadan. All samples were harvested in February (dry season) of 1999, and oven-dried at 60°C for 48 hours.

Dry samples were ground through 1.00 screen. Ash was determined by igniting samples at 600°C for 1 hour. Moisture, ether entract, crude protein was determined according to methods of AOAC (1990). Neutral and Acid detergents (NDF and ADF) were determined according to Goering and Van Soest (1970). Hemicellulose was calculated as difference between NDF and ADF.

Tannin content of samples was measured by modified Vanillin hydrochloric acid method of Price *et al*, (1978).

Reagent used for tannin analysis include methanol, 5% vanillin solution, 1% Hcl in methanol, 8% Hcl in methanol and vanillin reagent (obtained by mixing 5% vanillin Solution with 8% Hcl in methanol 50:50 Mixture).

One per cent Hcl in methanol was used to obtain extract from 0.2g of each sample for 20 minutes at 30°c and centrifuged. Supernatant was assayed at 30°c. 5ml of vanillin was added to 1ml of the extract. The reaction mixture was left for 20minutes at 30°c before absorbance was read at 500nm against a blank using a spectrophotometer 20 (Bausch & Lomb).

The blank contained 4% Hcl in methanol. A catechin standard curve from 0.00 – 0.10 was then used to calculate tannin levels.

TABLE 1: CHEMICAL COMPOSITION OF THE MPTS LEAVES.

%	E. C.	S. S.	P. S.	G. S.	L. L.
NDF	60.82 ± 0.33	52.19 ± 0.44	66.51 ± 0.46	49.24 ± 0.08	53.37 ± 0.55
ADF	40.83 ± 0.86	31.20 ± 0.25	45.66 ± 0.49	27.84 ± 0.15	31.33 ± 0.13
Hemi Cellulose	19.99 ± 1.17	20.99 ± 0.49	20.85 ± 0.06	21.40 ± 0.15	22.02 ± 0.68
Ether extract	2.21 ± 1.47	4.05 ± 0.05	4.57 ± 0.22	8.41 ± 0.34	3.95 ± 0.22
Ash	10.11± 0.10	8.03 ± 0.08	7.85 ± 0.22	9.31 ± 0.10	8.15 ± 0.11
C Protein	14.45 ± 0.48	10.07 ± 0.11	15.32 ± 0.62	19.26 ± 0.23	26.27 ± 0.30
C.Fibre	14.76 ± 0.68	22.80 ± 0.53	8.16 ± 0.15	9.92 ± 0.23	13.08 ± 0.07

* Values shown are mean of three replicates.

Calculation was done using the formular

$$X mg/g = \frac{OD \times \text{Volume of extract}}{\text{Slope} \times \text{weight of sample}}$$

Where OD = optical density of glass.

RESULTS

The determined chemical composition of the MPTs leaves studied are shown in Table 1. The ether extract values of the five MPTs were relatively similar. Crude protein (CP) was highest for *L. leucocephala* and least in *S.siamea* however crude fibre was highest in *S. siamea* and least in *P. santabnoides*.

Ash level in *P. santalonoides* were least while *E. cyclocarpum* had the highest value. Variation between ash content of MPTs was not wide. The NDF and ADF values of *P. santalonoides* were highest followed by *E. cyclocarpum* while *G. sepium* had least of both, however, differences in NDF and ADF content of *S. siamea* and *L. leucocephala* was minimal.

Tannin contents of five MPTs studied shown in Figure 1. Tannin content of *S. siamea* 0.607 ± 0.006 mg/g was highest followed by *G. šepium* (0.485 ± 0.023 mg/g) and *P.santalonoides* (0.388 ± 0.016 mg/g) while that of *E. cyclocarpum* (0.254 ± 0.005 mg/g) was least. And *L. leucocephala* values (0.267 ± 0.02 mg/g) being similar to *E. cyclocarpum*.

DISCUSSION

Wide variation in both crude protein and crude fibre were observed between species. Similar observations were made on tropical and Indian (Makker *et al*, 1991) browse species. The crude protein content of the leaves being medium to high (Asiegbu and Anugwa, 1988; Fadiyimu, 2000) make them valuable protein source for livestock in the tropics.

Relatively high NDF and ADF contents of the leaves could be as a result of their being harvested during the dry season (February). NDF and ADF contents increase from rainy to dry season (Arigbede and Tarawali, 1997) also level of maturity influence their content. The fibre fractions in these legumes may form an important source of energy for farm livestock.

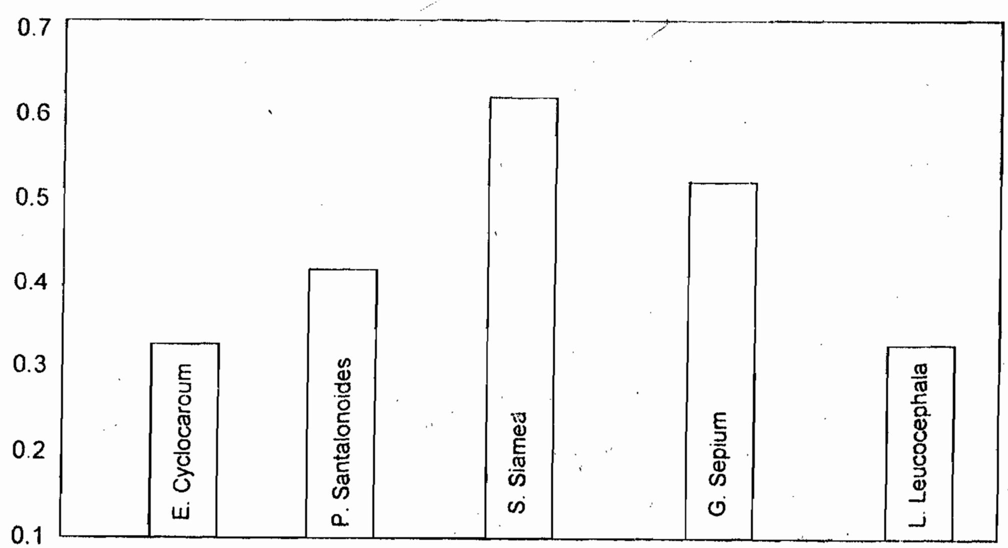

Fig.1: Tannin Content of Five MPTs Leaves.

Detection of tannins, a group of naturally occurring polyphenolic compounds (Goering and Van Soest, 1970) which form complexes with proteins, carbohydrates, alkaloids, vitamins and minerals (Makkar *et al*, 1996) in all MPTs studied may result in reduced availability of nutrients. However, since only trace amounts (0.254 – 0.607 mg/g) were detected, the effects will be beneficial (Mc Leod 1974; Mangan, 1988).

CONCLUSION

Results suggest potential usefulness of MPTs as animal feed. Although, their utilization can better be evaluated with in-vivo trials. The use of other essays for determination of tannin is expedient since most common assays do not determine the concentration of tannins in absolute terms. Also, it may be necessary to investigate and identify the presence of other anti-nutrients where present for better understanding of the nutritional effects of the MPTs.

Based on the CP values obtained in this study *L. leucocephala* is richest followed by G. sepium, the least being *S. siamea*. However, the complete resistance of the defoliating psylid (*Heteropsylla cubana*) which has devasted *L. leucocephala* in many parts of the tropics (Simon and Stewart, 1994) and high coumrain levels of *G. sepium* (Stewart, 1996) makes it necessary for more vigorous research on other promising species. Furthermore, treatment: physical, chemical or biological may be necessary for enhanced utilization of MPTs. Presently studies on utilization of biodegraded MPTs for feeding sheep are on, in the University of Ibadan.

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