

## NUTRITIVE VALUE AND FORAGE ACCEPTABILITY OF SOME SELECTED BROWSE PLANTS BY WEST AFRICAN DWARF GOATS

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### ABSTRACT

Prohibitive cost of concentrate diets for ruminants in the tropics during the dry season necessitates continuous search for less expensive and high nutritive feedstuff therefore a study was carried out to investigate the suitability of utilizing some selected browse plants: *Enterolobiumcyclocapum*, *Gliricidiasepium*, *Leucaena leucocephala*, *Gmelina arborea*, *Azadirachta indica* which were chemically analysed for dry matter (DM), crude protein (CP), crude fibre (CF), ash, ether extract (EE), nitrogen free extract (NFE), in the feeding of livestock. The proximate composition was used to assess the nutritive value of the leaves. A free choice study was carried out using ten West African dwarf goats to determine the coefficient of preference (COP) of the forages using a cafeteria method. Results revealed that the chemical composition of the forages varied significantly ( $p < 0.05$ ). The dry matter, crude protein, crude fibre, ash, ether extract, and nitrogen free extract ranged between 9.6-21%, 11.0-26.4%, 9.7-14.2%, 9.1-14.7, 11.0-15.2% and 26.5-58.3% respectively. The mean daily intake was highest (5.9 kg) in *L. leucocephala* and lowest (0.5kg) in *A. indica*. The coefficient of the forage was best in *Leucaena leucocephala* (1.8). The preference ranking for the forages in descending order was *L. leucocephala* > *G. sepium* > *G. arborea* > *E. cyclocapum* > *A. indica*. The study revealed that *Leucaena leucocephala* was most preferred and acceptable amongst the selected browse plants suggesting the potentials of these selected browse plants with the exception of *A. indica* as a feed supplement for goats.

**Keywords:** Nutritive, forage, acceptability, browse, plants, West African Dwarf goats.

### INTRODUCTION

The potentials of multipurpose trees and shrubs as alternative fodder resources in ruminant nutrition have been investigated and evaluated for inclusion in livestock production. Unfortunately, the adoption of most of these forages by farmers has been faced with several challenges such as diseases and pests attack, presence of anti-nutritional factors and insufficient knowledge about their potential feeding value. There is therefore the need for continuous screening of browse plants to identify those with good potentials as livestock's fodder and which could serve as supplement or substitute to the poor quality and available grasses (Oji, *et al.*, 2007).

Goats are multi-functional animals and play a significant role in the economy and nutrition of small and marginal farmers in most developing countries. Small ruminants especially goats can efficiently survive on available shrubs and trees in adverse harsh environment of low fertility land where no other crop can be grown. In spite of their continuous neglect and little or no attention given to them, they have however, fulfilled a most useful task by way of supplying a part of human population with milk, meat, hair, leather and other products (Kalioet *al.*, 2006).

Indigenous browse species are useful source of animal feeds, as these plants remain green during the dry season and provide vegetation with better nutritive value than other annual grass and herbaceous species that become withered (Ademosun, 1988). There are different methods of assessing nutritive value of plants, these include chemical analyses, in-vitro digestibility and feeding trial.

Free choice intake and acceptability study is a quick assessment of physical quality of a feed. Coefficient of Preference (CoP) is a direct measure of acceptability and nutritional capability of feedstuff or forage. In recent time, cafeteria technique has been used to assess the acceptability of some forage (Bamikoleet *al.*, 2004, Babayemiet *al.*, 2006). Voluntary intake is the overall acceptance and relish with which an animal consumes any given feedstuff or diet depending on appearance, odour, taste, texture, temperature and auditory properties of the food. Thus this study evaluated the nutritional composition of some browse plant leaves (*Enterolobiumcyclocapum*, *Gliricidiasepium*, *Leucaena leucocephala*, *Gmelina arborea* and *Azadirachta indica*) and how readily these selected forages are consumed by West African Dwarf goats with a view to make appropriate recommendation to farmers who practice cut-and-carry system of grazing.

## MATERIAL AND METHOD

### Collection of samples and acceptability study

Five different browse plants namely *Enterolobiumcyclocapum*, *Gliricidiasepium*, *Leucaena leucocephala*, *Gmelina arborea* and *Azadirachtaindica* were used for the study. Ten West African Dwarf goats were used in the cafeteria feed preference study which lasted for two weeks including one week of adaptation. The forages were harvested fresh with 4kg each of the forages introduced on cafeteria basis to the animals between 8.00a.m and 2.00p.m in five different plastic feeders. The positioning of the forages was changed daily to prevent bias by the animals taking a particular part of the pen as the position for a particular type of forage. The amount consumed was monitored for six hours daily and quantity consumed for each forage was recorded. The animals were then released for grazing. Feed preference was determined from the coefficient of preference (COP) value calculated from the ratio between the intakes of each individual feed sample divided by the average intake on DM basis of the five feed samples according to the procedure described by (Karboet *al.*, 1993, Bamikoleet *al.*, 2004). On this basis, a feed was taken to be relatively preferred if the calculated COP value is greater than unity. The results from this were used to rank the various forage.

COP = Intake of individual forage offered/ mean intake of all the forage offered

### Chemical Analysis

The air-dried samples of browse plants were oven dried at 105<sup>0</sup> to a constant weight for dry matter determination (DM). The samples were milled in a hammer mill to pass through 1mm mesh sieve and stored in an air tight container at room temperature for laboratory analysis. Proximate analysis; crude protein, crude fibre, ash, ether extract and nitrogen free extract were analysed in triplicates using standard procedure of AOAC, 2012.

### Statistical Analysis

Data obtained were analysed and subjected to analysis of variance procedure (ANOVA) of SAS 2012. Significant means were separated by Duncan's Multiple Range Test of the same package.

## RESULTS AND DISCUSSION

**Table 1: Proximate composition (%) of selected browse plants**

Samples/ parameters	Dry matter	Crude protein	Crude fibre	Ash	Ether extract	Nitrogen free extract
<i>Enterolobiumcyclocapum</i>	11.1 <sup>b</sup>	12.6 <sup>c</sup>	9.7 <sup>d</sup>	10.6 <sup>b</sup>	13.7 <sup>b</sup>	53.0 <sup>a</sup>
<i>Gliricidiasepium</i>	19.8 <sup>c</sup>	25.5 <sup>a</sup>	13.1 <sup>b</sup>	11.1 <sup>b</sup>	13.8 <sup>b</sup>	26.5 <sup>d</sup>
<i>Leucaena leucocephala</i>	9.6 <sup>a</sup>	26.4 <sup>a</sup>	14.2 <sup>a</sup>	9.9 <sup>c</sup>	15.2 <sup>a</sup>	37.7 <sup>c</sup>
<i>Gmelina arborea</i>	11.9 <sup>b</sup>	11.0 <sup>c</sup>	12.0 <sup>c</sup>	9.1 <sup>c</sup>	11.2 <sup>c</sup>	58.3 <sup>a</sup>
<i>Azadirachtaindica</i>	21.0 <sup>d</sup>	15.3 <sup>b</sup>	10.1 <sup>c</sup>	14.7 <sup>a</sup>	11.0 <sup>c</sup>	48.6 <sup>b</sup>
SEM	0.02	0.34	0.12	0.16	0.05	0.06

a,b,c,d : mean value in the same row are significantly (p<0.05) different., SEM : Standard error of mean.

The proximate composition of the selected browse plants studied is presented in Table 1. All parameters analysed differed significantly (p<0.05). The dry matter content of these forages ranged from to 9.6% in *L. leucocephala* to 21.0% in *A. indica*. Since dry matter content is lower than 21%, the volume of water in the rumen increases and has depressive effect on the intake level in spite of high forage digestibility. Crude protein ranged from 11.0% in *G. arborea* to 26.4% in *L. leucocephala*. The crude protein content of the browse plants exceeds the minimum recommended range of 7.0-8.0% for efficient functioning of rumen micro-organisms (Van Soest, 1994). Also, it is in agreement with the findings of Bamikoleet *al.*, 2003 and Falola, 2016 who

reported Crude Protein range of 10-37% for most tropical forage and browse plants. Browse plants have been reported to have high crude protein of high digestibility, vitamins and minerals (Odeyinka, 2001; Asaolu *et al.*, 2011). The lowest nitrogen free extract (NFE) value (26.5%) was observed in *G. sepium* which was significantly ( $P < 0.05$ ) different from the values recorded for other treatments, this implied that the soluble carbohydrates could support the production of volatile fatty acids in the rumen during fermentation (Blumme *et al.*, 1997b).

**Table 2: Mean of daily intake of selected browse plants and the coefficient of preference by WAD goats.**

Browse plants	Mean daily intake (kg/DM)	Coefficient of preference (CoP)	Ranking of forage preference
<i>E. cyclocapum</i>	0.90	0.33	4 <sup>th</sup>
<i>G. sepium</i>	5.50	1.69	2 <sup>nd</sup>
<i>L. leucocephala</i>	5.90	1.80	1 <sup>st</sup>
<i>G. arborea</i>	3.30	1.01	3 <sup>rd</sup>
<i>A. indica</i>	0.50	0.16	5 <sup>th</sup>

Presented in Table 2, is the Coefficient of preference (COP) for five different browse plants.

The mean daily intake ranged from 0.50 kg/DM in *A. indica* to 5.90 kg/DM in *L. leucocephala*. Intake of green fodders is affected by plant species, stage of maturity and level of phytochemical present in the forage (Kalio, *et al.*, 2006). Intake during grazing does not depend only on diet quality but also directly correlated to forage distribution and availability which can partly explain the lower level of intake observed.

It was observed that the highly preferred browse plants gave higher COP as observed in similar studies for other forages (Karboet *et al.*, 1996). Similarly, the desire for the West African Dwarf goats to obtain adequate nutrients from these forages to meet their daily body requirements may have accounted for their preference for one browse plant to the other. According to Steel (2006), goats with free access to feed will vary their intake depending on the energy available from the food. Variations in nutrient compositions occurred among the forages. The study revealed that the West African Dwarf goats exhibited least acceptance for *A. indica*. This may be attributed to the very low nutritive value of the browse plant as a result of its high crude fibre (Oyenuga, 1978). Earlier studies have also reported that animals preferred certain feeds over others, which resulted into higher preference ranking as has been observed in the present study where *L. leucocephala* was the most preferred followed by *G. sepium*.

Coefficient of preference was used to rank the different forages in order of preference; *L. leucocephala* > *G. sepium* > *G. arborea* > *E. Cyclocapum* > *A. indica*.

## CONCLUSION

Highest nutritive values and coefficient of preference observed with *L. leucocephala* in this study showed its potentials of meeting nutrient requirements of goats with high level of crude protein as well as cheaper alternative feed supplement for goat feeding during dry season.

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