

## Comparative performance of West African Dwarf goats fed *Alchornea cordifolia* and *Gliricidia sepium* supplemented with *Pennisetum purpureum*

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**Target Audience:** ruminant animal farmers, researchers and students in the field of ruminant nutrition

### Abstract

*Alchornea cordifolia* and *Gliricidia sepium* leaves are widely found and available in Delta State Nigeria, *Alchornea* is a relatively unexploited browse plant, however much research has been carried out on *gliricidia sepium*, with goats on free grazing randomly browsing on *Alchornea* leaves, thus making it necessary for a comparative study to access its nutritional potentials. Using Completely Randomised Design, Eighteen (18) West African Dwarf (WAD) goats were used to investigate the performance of goats fed *Alchornea cordifolia* and *Gliricidia sepium* leaves supplemented with *Pennisetum purpureum*. The experimental diet consist of *Alchornea cordifolia* plus *Pennisetum purpureum* as diet A, *Gliricidia sepium* plus *Pennisetum purpureum* as diet B, and a Concentrate plus *Pennisetum purpureum* as diet C which served as a control diet. All Data collected during this study were subjected to the Analysis of Variance (ANOVA) and means compared using the Duncan Multiple Range Tests. Goats fed diet A (*Alchornea cordifolia* plus *Pennisetum purpureum*) recorded a lower and significant dry matter intake (858g/day) when compared with goats fed Diet B (*Gliricidia sepium* plus *Pennisetum purpureum*) (955.33g/day), There was an encouraging weight gain in the various experimental groups. The average weight gain of goats on the experimental diet A (1.22kg), B (1.14kg) and C (1.43kg) were not significantly ( $p>0.05$ ) different, though goats on the concentrate diet recorded a higher weight gain. On the basis of average weight gain per day (g/day), goats on diet A (*Alchornea cordifolia* plus *Pennisetum purpureum*) (13.56g/day) were comparable to goats on diet B (*Gliricidia sepium* plus *Pennisetum purpureum*) (12.679g/day). The results from the study shows *Alchornea cordifolia* leaves as a potential feed for WAD goats

**Key words:** *Alchornea*, *Gliricidia*, Performance; Comparative;

### Description of problem

The estimated population of goats in Africa is about 291 million, of these, 53.8 million are from Nigeria (1). An appraisal of these figure shows that Nigeria is blessed with abundant livestock, Goats are considered the second most important livestock species in Nigeria and also contribute 24% of meat supply in the country [2]. Yet, the availability of animal protein in the diet of most Nigerians remain a major problem. The major problems

militating against the production of goats in the tropics are poor feeding, parasites associated with ruminants, disease management and poor genetic make-up (3). Browse plant have an advantage over the grasses due to their ability to resist drought and tend to be available throughout the year, and they constitute one of the cheapest source of feed for ruminants (4). Browsers and shrubs which are part of the natural vegetation are accessible to the majority of small-holders farmers and may be

a useful feed supplement in small ruminant production (3). *Alchornea cordifolia* is a relatively unexploited browse plant for goats. Information on the use of *Alchornea cordifolia* leaves is still limited. It is valuable in subsistence agriculture because its foliage is frequently fed to grazing animals or processed into leaf meal for non-ruminant (5). *Gliricidia sepium* on the other hand is a well exploited browse plant with previous research showing *Gliricidia sepium* as a suitable feed for ruminants and can be consumed in large

quantities without deleterious effect on animal performance (5). The nutritive value of *Gliricidia sepium* was also reported (6), (7), (8), and (9) to between 3.2 and 4.2% nitrogen and can also be used as a source of supplemented energy for animal feeding. Thus, it becomes necessary for this comparative research to ascertain the nutritive and performance characteristics of *Alchornea cordifolia* against a recognized browse (*gliricidia*).

**Table 1: Chemical composition of experimental diet (%)**

Nutrients	<i>Alchornea cordifolia</i>	<i>Gliricidia sepium</i>	<i>Pennisetum purpureum</i>	Concentrate diet
Dry matter	64.45	58.52	60.12	98.69
Crude protein	17.10	20.63	9.92	13.74
Crude fibre	3.67	9.69	22.68	2.12
ASH	5.65	4.42	2.25	5.39
Ether extract	2.95	3.65	2.65	5.54
NFE	35.08	20.10	20.62	71.90
NDF	66.10	51.46	62.65	33.47
ADF	48.20	29.03	40.2	38.20

**Table 2: Dry Matter intake and changes in live weight of West African dwarf goats fed *Alchornea cordifolia*, *Gliricidia sepium* and concentrate diet supplemented with *Pennisetum purpureum***

Parameters	<i>cordifolia</i> + <i>p. pupureum</i> .	<i>G. sepium</i> + <i>P. pupureum</i>	Control concentrate + <i>P. pupureum</i>	SEM
Average dry matter intake for grass (g)	496.21 <sup>a</sup>	533.57 <sup>a</sup>	447.21 <sup>a</sup>	27.37
Average dry matter intake for Browse (g)	362.42 <sup>a</sup>	421.76 <sup>b</sup>	-	16.06
Average dry matter intake-for concentrate (g)	-	-	460.74 <sup>b</sup>	16.06
Total Average dry matter intake (g)	858.63 <sup>a</sup>	955.33 <sup>b</sup>	907.95 <sup>b</sup>	32.7
Initial weight (kg)	8.39 <sup>b</sup>	7.61 <sup>b</sup>	5.91 <sup>a</sup>	0.26
Final weight (kg)	9.61 <sup>c</sup>	8.75 <sup>b</sup>	7.34 <sup>a</sup>	0.45
Average Weight gain(kg)	1.22 <sup>a</sup>	1.14 <sup>a</sup>	1.43 <sup>b</sup>	0.12
Average Body weight gains (g/day)	13.56 <sup>a</sup>	12.67 <sup>a</sup>	15.89 <sup>b</sup>	0.21

abc = means with the same superscript on the same row are not significant ( $p > 0.05$ ) different.

## Materials and Methods

### *Experimental site, Animal Management and Data collection*

The experiment was carried out at the Goats and Sheep unit of Delta State University Teaching and Research Farm. The pen was further partitioned to house the experimental groups. A total of eighteen (18) West African Dwarf goats were used for this experiment with 6 animals per treatment in a completely randomized experimental design. WAD Goats between the ages of 7 – 9 months were considered for this experiment. The goats were treated against internal parasites using Albendazole, and against external parasites using diazintol. The Animals were assigned to three (3) groups (six animals per group) and allotted each to *Alchornea cordifolia* plus *Pennisetum purpureum*, *Gliricida sepium* and *Pennisetum purpureum* and a control group allotted to a concentrate diet containing 14% Crude protein plus *Pennisetum purpureum* respectively. The animals were fed with the different experimental feed once daily at 9.00am and fresh water was made available to the animals. The feed offered to the animals in

each group was first weighed and the residues were also weighed before a fresh feed was supplied to the animals the next morning for 90 days. During the last seven days of the experiment, digestibility trial was carried out, during which fecal samples were collected, weight and measured. During the last seven days of the experiment, metabolic trials were carried out, and feed and fecal samples were collected, weight and measured, the urine samples collected were discarded due to impurities. The animals were weighed once a week in the morning before feeding. Live weight changes were estimated as the difference between the initial and final body weights of the animals during the experiment.

### *Proximate and Statistical Analysis*

Experimental feeds and fecal samples were subjected to proximate analysis to determine proximate composition using the method of AOAC (10). All Data collected during this study were subjected to the Analysis of Variance (ANOVA) and means compared using the Duncan Multiple Range Tests (11).

**Table 3: Nutrient Digestibility (%) by West Africa Dwarf Goats Fed *Alchornea cordifolia*, *Gliricidia sepium* and Concentrate Diet Supplemented with *Pennisetum purpureum***

Parameter	A	B	C	SE.M
Dry matter	77.2 <sup>a</sup>	81.52 <sup>a</sup>	85.70 <sup>a</sup>	2.45
Crude protein	59.83 <sup>a</sup>	62.17 <sup>a</sup>	76.74 <sup>a</sup>	5.29
Crude fibre	72.80 <sup>a</sup>	63.70 <sup>a</sup>	66.52 <sup>a</sup>	2.58
Ether extract	61.07 <sup>b</sup>	56.60 <sup>a</sup>	63.52 <sup>b</sup>	2.03
Nitrogen free extract	44.50 <sup>a</sup>	46.65 <sup>a</sup>	70.52 <sup>b</sup>	8.34
Acid detergent fibre	61.72 <sup>b</sup>	54.50 <sup>a</sup>	56.54 <sup>a</sup>	2.68
Neutral detergent fibre	42.45 <sup>a</sup>	53.65 <sup>b</sup>	66.40 <sup>c</sup>	2.38

abc = means with the same superscript on the same row are not significantly different (P>0.05).

A = *Alchornea cordifolia* + *Pennisetum purpureum*

B = *Gliricidia sepium* + *Pennisetum purpureum*

C = Concentrate + *Pennisetum purpureum*

## Result and Discussion

Presented in Table 1 is the nutrient composition of *Alchornea cordifolia*,

*Gliricidia sepium pennisetum purpureum* and the concentrate diet, with crude protein content (CP) of 17.20%, 20.63%, 9.92% and 13.74%,

respectively. *Gliricidia sepium* recorded a higher crude fibre content (9.69%). The CP recorded for *A. cordifolia* leaves in this study is comparable with the value (16.10%) previously obtained (3). The crude protein values obtained for *A. cordifolia* obtained were comparable to the crude protein content values reported for other browse plants such as *Albizia lebbek* 22.3%, *Leucaena leucocephala* 23.8%, *Pakia biglobosa* (17.9%), *Interolobium cyclo carpum* (19.0%) (12) and *Gmelina arborea* (16.80%) (4). the crude protein value of 20.63% obtained in *Gliricidia sepium* leaves in this study is comparable with previously reported values by earlier workers which were 20.69%; (6); 19.99% (13); . This value (20.63%) is however higher than the value (15.60%) (14), and lower than the value obtained by (15). This is perhaps due to difference in edaphic characteristics to which the plants were exposed and to possible variation in plant age, and climate (14). The CP content obtained for *A. cordifolia* and *G. sepium* was far above the 7% recommended for tropical livestock (3). Digestibility of nutrients (Table 3) was fairly high in all the treatment groups. The crude protein digestibility was higher in goats on diet B (63.70%) when compared to goats on diet A (59.83%), however this was not significantly different ( $p > 0.05$ ). The high content of dry matter, crude protein and energy suggests that *Gliricidia sepium* and *Alchornea cordifolia* leaves may serve as a complete fodder for livestock because they are rich in protein and minerals, however, supplementation with grasses should be practised as most browse plants do not support weight gain when fed solely (17). The high digestibility of crude protein in these browses may be attributable to the presence of fermentable energy sources in the diets through the supplementation with elephant grass (*Pennisetum purpureum*) which allowed nitrogen contents of the browses to be utilized more efficiently (17). Based on the

values recorded for nutrient digestibility in this study, *Alchornea cordifolia* leaves compared favorably with *Gliricidia sepium* leaves when fed to goats. As shown in Table 2, significant ( $P < 0.05$ ) difference existed between values recorded for the average dry matter intake of animals on diet A and B. The intake of *Gliricidia sepium* was significantly higher than those for *Alchornea cordifolia* leaves. The browse intake value for *Gliricidia sepium* compares favorably with the value 477g/day (6), 466g (7) but higher than 233.89g/day (8). Although there was a higher grass intake by goats in diet B (*Gliricidia sepium* plus *Pennisetum purpureum*) there was no significant difference ( $p > 0.05$ ) in intake between goats on diet A and B. In a similar experiment (15) on protein supplementary values of cassava, *Leucaena* and *Gliricidia* leaf meal in goats fed low quality *Panicum maximum* hay, the browse intake recorded for *Leucaena* and *Gliricidia* were 278g/day and 282g/day respectively, these were however lower than the browse intake recorded for goats on the various experimental diets in this study. The high intake of browses in this experiment could be as a result of the better quality of grasses which may have aided better intake as it provides a source of energy which is effectively utilized by the Rumen microbes (17). There was an encouraging weight gain in the experimental groups. The average weight gain of goats on the experimental diet A(1.22kg), B(1.14kg) and C(1.43kg) were not significantly ( $p > 0.05$ ) different, though goats on the concentrate diet recorded a higher weight gain. On the basis of average weight gain per day (g/day) goats on diet A (*Alchornea cordifolia* plus *Pennisetum purpureum*) (13.56g/day) were comparable to goats on diet B (*Gliricidia sepium* plus *Pennisetum purpureum*) (12.679g/day). The average weight gain obtained for goats on diets B and C in this experiment were similar to values (1.25kg) obtained in an experiment (18)

on supplementary value of *Gliricidia sepium* hay for West African dwarf goats kept on range. However, weight gains per day for goats on diet B was not similar to the value (18.12g/day) recorded (15) in an experiment based on average weight gain over a year. Values recorded for weight gain in this experiment are similar to the values recorded for *Tephrosia bracteola* (1.25kg) (14.88g/day) (12), but this were not similar to reported live weight gain of growing West African dwarf goats on a sole *Gliricidia* diet which were 17.5 – 20g/day (18), 27.0g/day (8) and 23.3g/day (19).

### Conclusion and application

1. *Alchornea cordifolia* leaves show good potentials as feed for goats due to the high nutritive values judging from the body weight gains of goats fed the leaves when compared to goats fed *Gliricidia sepium*, which is a well-known browse used for feeding goats and other livestock.
2. Based on this study, WAD goats offered *Alchornea cordifolia* supplemented with *Pennisetum purpureum* and *Gliricidia sepium* supplemented with *Pennisetum purpureum* had comparable performance as *Alchornea cordifolia* leaves compares favourably with *Gliricidia sepium* leaves as fodder for goats though it is relatively unexplored.

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