

EFFECT OF THREE TROPICAL BROWSE PLANTS ON PRODUCTIVITY OF WEST AFRICAN DWARF GOATS IN THE NORTHERN GUINEA SAVANNAH OF NIGERIA

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Abstract

An experiment was conducted to determine the effect of feeding tropical browse plants on the productivity of West African Dwarf goats. A total of twelve young growing West African Dwarf (WAD) goats (all bucks) aged between 5-6 months with an average initial body weight of 10.74 kg were used for the experiment. The animals were allotted to four treatments which were freshly harvested *Gmelina arborea*, *Leucaena leucocephala*, *Grilicidia sepium* and control which consist of mixture of grasses (*Pennisetum pedicellatum*, *Andropogon gayanus*, *Seteriaanceps*, *Panicum maximum* and *Eleusineindica*). The performance of goats were observed on weekly basis from weeks 1 to 6 which showed significant ($P < 0.05$) variations in final body weight, body weight gain, daily weight gain and FCR. Feed intake and body weight gain were at highest peak in week 6 for goats fed with *Gmelina arborea*, although FCR was better in *Gliricidia sepium* at week 6. The combined analysis study shows that feeding *Leucaena leucocephala* gave the highest weight gain of 1.76 kg/head and the best feed conversion ratio of 4.41, respectively which were significantly ($P < 0.05$) different from other varieties of browse plants fed to goats and the control feed. The result obtained also showed that West African Dwarf goats can successfully be raised solely on tropical browse plants or mixture of grasses (control) for improved performance and provide a means of sustenance for the animals during the period of feed scarcity. It is therefore recommended that browse plants be propagated and used as supplementary feeds in feeding ruminant animals.

Key words: Tropical, browse plants, productivity and West African Dwarf goats.

Introduction

In Nigeria, feeding ruminants with browse plants by most herdsmen and stock owners has become an option since grasses and crop residues cannot longer sustain them throughout the 5 to 7 months of feed scarcity. Many browse plants such as *Gmelina arborea*, *Leucaena leucocephala* and *Gliricidia sepium* have being identified to be consumed by small ruminants, especially goats, hence they are called 'browsers'. These browse plants have shown benefit to crop production and animal improvement. Good quality browse plants when available in large quantity have the capacity of supporting maintainance, growth and productivity of small ruminants. Browse plants have great potential as source of high quality nutrient for ruminants, being high in protein, minerals and vitamins (Okagbare *et al.* 2001; Omonkanye *et al.* 2014). The objective of this study was to explore the potentials of feeding some tropical browse plants on the productivity of West African dwarf goats.

Material and methods

The experiment was conducted at the College of Agriculture and Animal Science, Ahmadu Bello University, Experimental Farm. Twelve (12) young growing West African Dwarf (WAD) bucks

aged between 5-6 months with an average initial body weight of 10.74 kg were used for the experiment. The animals were de-wormed before the start of the trial and housed in their individual pens. The animals were allotted to four treatments which consist of freshly harvested *Gmelina arborea*, *Leucaena leucocephala*, *Grilicidia sepium* and as the control mixtures of grasses (*Pennisetum pedicellatum*, *Andropogon gayanus*, *Seteriaanceps*, *Panicum maximum* and *Eleusineindica*). All animals were fed at 3 % of their body weight at 8.00 a.m. daily and were allowed 14 days for feed adaptation before data collection. Feed offered and feed remaining from each animal was weighed. Intake was calculated as the difference between feed offered and feed remaining. Each animal was weighed at the beginning of the experiment and at the end of each week thereafter. Average daily weight gain was calculated as differences between final and initial body weights and this was divided by number of days of feeding. Fresh drinking water as well as salt licks were provided *ad libitum*. The trial lasted for 63 days.

Chemical and Statistical Analysis

Proximate analysis was carried out to determine Nitrogen (N) for crude protein determination (N x 6.25), crude fibre (CF), ether extract (EE), nitrogen free extract (NFE) and ash content

according to AOAC (2005). Determination of neutral detergent fibre (NDF), acid detergent fibre (ADF) and acid detergent lignin (ADL) was by the method of Van-soest *et al.* (1991). The constituent of acid detergent fibre and neutral detergent fibre was determined as described by AOAC (2005).

Data collected were subjected to Analysis of Variance and significant means were compared using Duncan's Multiple Range Test (DMRT) of SAS (2005).

Results and Discussion

Table 1: Proximate composition of three browse plants and five grass mixtures fed to West African Dwarf goats in the Northern Guinea Savannah of Nigeria

Parameters	Gmelina	Leucaena	Gliricidia	Grass mixtures
Dry matter	23.76	22.84	24.15	32.80
Crude protein	21.10	22.00	21.06	10.25
Crude fibre	19.00	20.50	18.60	22.50
Ether extract	4.22	9.50	3.50	4.06
Ash	8.60	6.50	9.90	8.40
Nitrogen free extract	52.92	58.50	53.06	45.21
Neutral detergent fiber	57.90	39.80	48.70	55.72
Acid detergent fiber	39.40	34.30	36.54	42.23
Lignin	10.50	12.40	13.50	16.30

The proximate analysis in Table 1 showed that the highest dry matter 32.8 % and crude fiber 22.5 % were obtained in the control treatment. The highest 22.00 % crude protein was observed in Leucaena and was 0.94 % CP and 0.90 % CP higher than Gliricidia and Gmelina respectively, while the lowest 10.25 % CP was obtained in the control. The highest 9.5 % EE, 58.5 % NFE were obtained in Leucaena while lowest 3.5 % EE in

Gliricidia and 45.21 %NFE in control were observed. The highest values of 42.23 % ADF and 16.3 % lignin was obtained with the control. Values of CP obtained were above the 7 % CP recommended for Tropical livestock by NRC (2007) below which will result in weight loss. The values obtained for Gmelina and Leucaena were similar to those reported Omokanye, *et al* (2014).

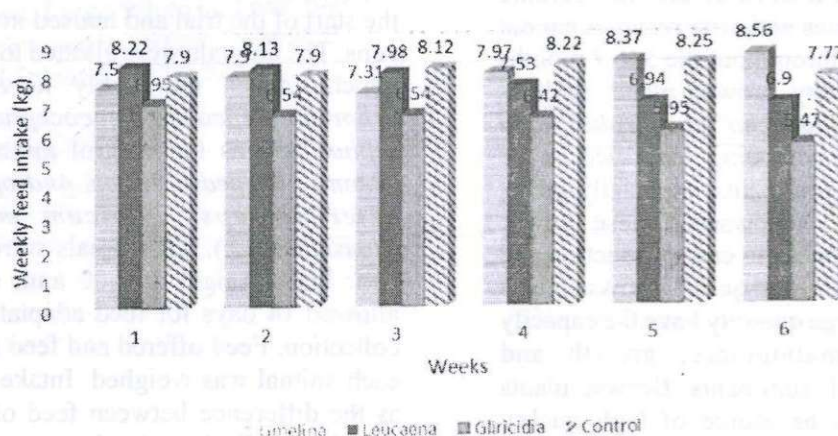


Figure 1: Weekly feed intakes of West African Dwarf goats fed tropical browse plants and grass mixtures

The average weekly feed intakes of west African dwarf goats fed three tropical browse plants (Figure 1) showed that Leucaena had the highest (8.22kg/head) feed intake in week 1 and 2 and declined afterwards. Feed intake for bucks fed mixtures of grasses increased from 7.9kg/head in week 1 to 8.25kg/head in week 5 then declined to 7.77kg/head in week 6. The intake of Gmelina was lower than those of Leucaena and the control

but higher than those of Gliricidia in weeks 1 to 3 and increased sharply from week 4 to 6 with the highest (8.56kg/head) in week 6. However, bucks fed with Gliricidia had a decreased feed intake (6.95 to 5.47kg/head) in week 1 to 6. The average feed intake (8.03kg/head) in Table 2 was significantly ($P < 0.05$) highest for the control and lowest (6.47kg/head) for bucks fed Gliricidia. Feed intake depends on the palatability and

nutritive value of feeds. The values of feed intakes reported in this study confirmed the earlier report of Kallah (1991), that palatability rating of *Gmelina arborea* is high especially in goats. The decline in feed intake of *Leucaena leucocephala* at the later part of the study may be attributed to the presence of toxic amino acid (minosine)

content Nuwanyakpa (1986). Carew (1983) reported that the smell of *Gliricidia* foliage was probably repulsive to animals, though it takes 3 to 7 days to get goats used to the smell hence, once offered consistently animals acquaint themselves with the smell and taste thus, consumed in preference to any other browses as observed in the present study

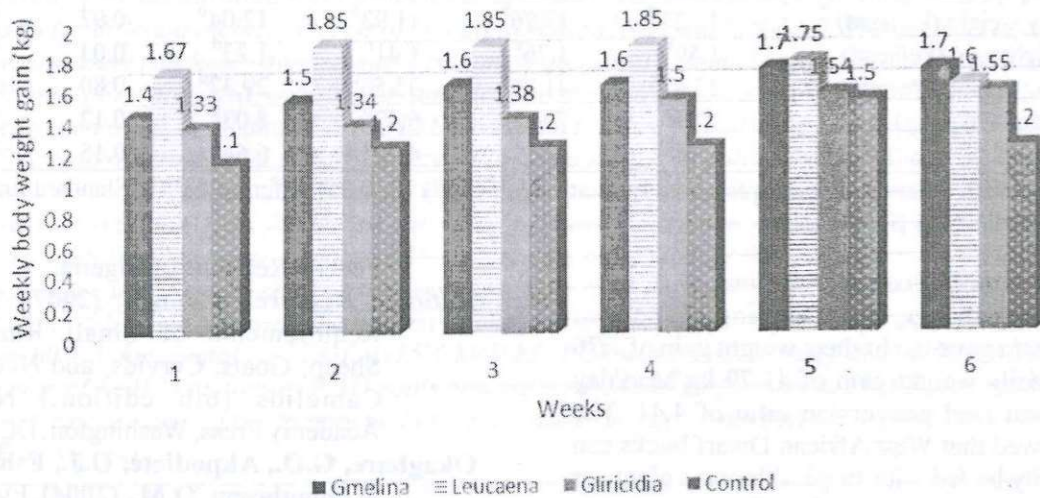


Figure 2: Weekly body weight gain of West African Dwarf bucks fed tropical three browse plants and grass mixtures.

The average weight gain of West African dwarf bucks fed three tropical browse plants (Figure 2) showed that the highest (1.8kg/head) weight gain were obtained in goats fed *Leucaena* from weeks 2 to 4 and declined at week 6. There was a progressive increase in weight gain of goats fed *Gmelina*, *Gliricidia* and the control from Weeks 1 to 6, except that the control decreased (1.2kg/head) at week 6. In Table 1, the average

final weight (12.76kg), body weight gain (1.76kg/head) and daily weight gain (41.79g/head/day) were significantly ($P < 0.05$) highest for goats fed *Leucaena* compared to the control and other browse plants. Ajayi (2015) reported that weight gain depends on feed intake and degradability. The highest final body weight and daily weight gain of goats fed *Leucaena* was a clear indication of proper feed utilization by the animals.

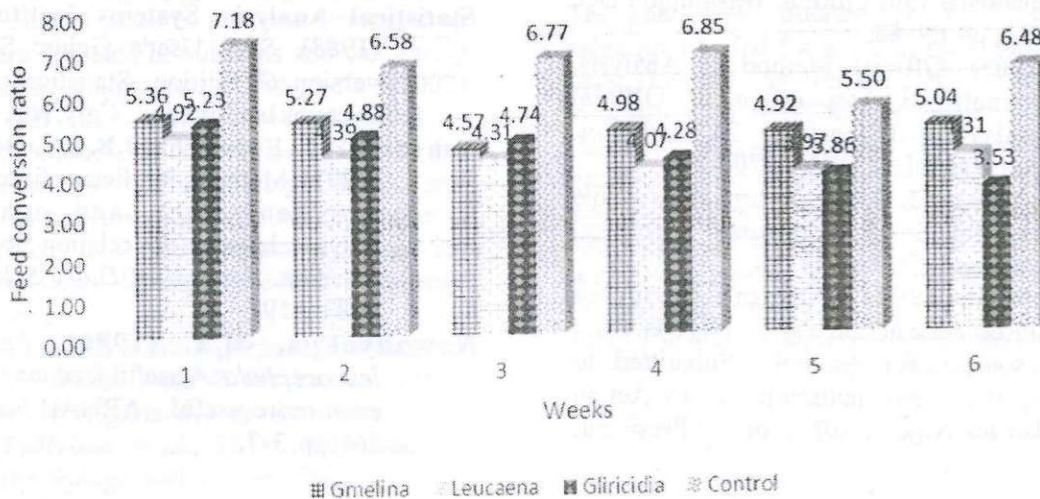


Figure 3: Weekly feed conversion ratio of West African Dwarf bucks fed some fresh tropical browse plants

The weekly feed conversion ratio of West African Dwarf goats (Figure 3) showed that the best (4.92, 4.39, 4.31 and 3.97) FCR was observed in goats fed *Leucaena* from week 1 to 5. At week 6, goats fed *Gliricidia* had the best (3.53) FCR. The FCR of goats fed control feed was higher in weeks 1 to 6

as compared to all the three browse plants. The best (4.41) FCR in Table 2 was observed in goats fed *Leucaena*. The poor FCR in the control could be attributed to the stage of harvest and probably little feed intakes.

Table: 1 Combined analysis of the performance of West African Dwarf bucks fed with fresh tropical browse plants

Parameters	Gmelina	Leucaena	Gliricidia	Control	SEM	LOS
Initial body weight (kg/head)	10.64	11.00	10.51	10.81	0.11	NS
Final body weight (kg/head)	12.23 ^{ab}	12.76 ^a	11.92 ^b	12.04 ^b	0.92	*
Body weight gain (kg/head)	1.59 ^b	1.76 ^a	1.41 ^c	1.23 ^d	0.03	*
Daily weight gain (g/head/day)	37.97 ^b	41.79 ^a	33.56 ^c	29.37 ^d	0.80	*
Feed intake (kg)	7.94 ^a	7.62 ^a	6.47 ^b	8.03 ^a	0.12	*
Feed conversion ratio (FCR)	5.14 ^b	4.41 ^a	4.70 ^b	6.64 ^c	0.15	*

*abc means with different superscripts across rows are significantly (P<0.05) different. SEM= Standard Error of Mean, LOS= level of significance

Conclusions and Recommendations

This study shows that feeding *Leucaena leucocephala* gave the highest weight gain of 1.76 kg/head, daily weight gain of 41.79 kg/head/day and the best feed conversion ratio of 4.41. The result showed that West African Dwarf bucks can successfully be fed with tropical browse plants or grass mixtures for improved performance and at the same time provide sustenance for animals during the period of feed scarcity. It is therefore recommended that browse plants should be propagated in rangelands.

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