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## FEED INTAKES, LIVE WEIGHTS AND BLOOD CONSTITUENTS OF GROWING WEST AFRICAN DWARF GOATS MAINTAINED ON DIETS VARYING IN *LEUCAENA LEUCOCEPHALA* LEAF MEAL CONTENTS

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### ABSTRACT

A 16 weeks study was carried out to examine the feed intakes, live weights and blood constituents of eighteen growing West African dwarf (WAD) goats maintained on diets varying in *Leucaena leucocephala* leaf meal (LLLM) contents. There were three dietary treatments (Diet 1 (0% LLLM), Diet 2 (7.5% LLLM) and Diet 3 (10.0% LLLM)) each treatment was allocated equal number of animals (n = 6). The haematological constituents examined were blood proteins (total protein, albumin and globulin), blood ions (Na<sup>+</sup>, K<sup>+</sup> and Cl<sup>-</sup>) and blood chemistry (Aspartate transaminase (AST) and Alanine transaminase (ALT)). Goats on Diet 3 had significantly (p<0.05) higher body weights, blood protein and globulin contents than their counterparts on other Diets. However, blood albumin content of goats on Diet 1 was significantly (p<0.05) higher than those of their counterparts on other Diets. Except Cl<sup>-</sup> in wk 6, Cl<sup>-</sup>, Na<sup>+</sup> and K<sup>+</sup> contents were significantly higher on LLLM free diet than values recorded on other diets. Except for ALT and AST in wk 6 LLLM diets had significantly higher values for ALT and AST than LLLM free diet. Increase in LLLM constituent of diet favoured increase in live weight and blood protein content but it decreased blood albumin content of the growing WAD goats.

### KEYWORDS

Feed intakes, Live weights, Blood, WAD goats and *Leucaena leucocephala*.

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### INTRODUCTION

Goats play an important socio economic role in tropical countries<sup>1</sup>. Goat production forms an integral segment of cultural system in Nigeria. Productivity of goats is adversely affected by seasonal variations that make year round forage availability for feeding difficult. The consequences of feed shortage include poor growth, occasional

weight loss, low birth weight, lowered resistance to disease and overall reduction in goat populace<sup>2</sup>.

Feeding in livestock management is widely acknowledged to account for over 60% of the production cost. Protein is the main limiting nutrient in diets of livestock and protein feed ingredients are expensive. The high price of conventional protein feed ingredients has diverted research into the use of leaves of some legumes notably *Leucaena leucocephala*. Leaves of *Leucaena leucocephala* are of high protein content<sup>3</sup> and had been used to replace conventional protein feed ingredients<sup>4</sup>.

The influence of diets on blood constituents has been well documented<sup>5,6</sup>. There is dearth of information on the use LLLM as protein feed ingredients in diets of growing WAD goats. This study intends to examine the feed intake, body weight and blood constituents of growing WAD goats fed diets varying in LLLM contents.

## MATERIAL AND METHODS

### Experimental site

The study was carried out at the Teaching and Research Farm of Ladoke Akintola University of Technology (LAUTECH), Ogbomosho Oyo State, Nigeria. Ogbomosho is a town located in the derived savanna zone of Nigeria and lies on 8°7'N and 4°15'E of the equator<sup>7</sup>.

### Animals and acclimatization period

Eighteen growing West African Dwarf (WAD) goats were used for the study. The goats were kept in pens inside a roofed house. Each pen accommodated three goats and had water and feed troughs. During a four week acclimatization period, the goats were allowed unrestricted access to cassava peels, maize, soybean chaffs and water between 08:00 and 10:00hr daily on ad libitum basis and were drafted to graze on *Panicum maximum* and *Pennisetum purpureum* grasses around animal house vicinity between 10:00 and 16:00hr. The goats were confined to their respective pens between 16:00 and 10:00hr on cassava peels, maize, soybean chaff and water.

### *Leucaena leucocephala* leaf meal (LLLM) preparation

Fresh leaves of *Leucaena leucocephala* were harvested from Pasture Introductory Unit of

Teaching and Research Farm, LAUTECH Ogbomosho. The leaves were sun-dried for two weeks and milled using a milling machine with 1mm sieve to obtain *Leucaena leucocephala* leaf meal (LLLM).

### Experimental diets and design

The feed ingredients in the experimental diets are presented in Table No.1. The LLLM was incorporated at three levels of inclusion (Diet 1(0% LLLM), Diet 2(7.5% LLLM) and Diet 3(10.0% LLLM). The experimental design was a Complete Randomized Design.

### Experimental measurements

#### Growth trial

The goats were weighed on day one of the trial before their respective experiment diets were served. Subsequent measurements were taken on the last day of weeks four, eight and twelve of the study.

#### Feeding trial

Each group comprising three goats were served a known weight of their respective experimental diets between 07:30 and 08:00hr and were retained on the diets water till 10:00hr. At 10:00hr, all the goats were drafted to graze on *Panicum maximum* and *Pennisetum purpureum* grasses within the animal house vicinity till 16:00hr. At 16:00hr, the goats were returned to their respective pens and had unrestricted access to water and their respective experimental diets till 07:30hr the following morning. At 7:30hr, the residual (remaining) diets in the feed troughs were removed and weighed before fresh diets were served. Daily feed intake of each group of goats was the difference between the quantity of feed served at 07:30hr and the residual feed emptied at 07:30hr the following day.

#### Blood samplings

Between 07:00 and 08:00hr on the last day of acclimatization period before the goats were assigned treatments, three goats were randomly selected; in line with the appropriate animal ethics and procedures, blood was drawn from jugular vein of each goat as described by<sup>8</sup> into two 5ml pre-cooled heparinized and un-heparinized vacuum tubes (Becton Dickinson Vacutainer System, Europe) and preserved in a plastic container fortified with ice blocks. Subsequent blood samples were taken between 07:00 and 08:00 hr on the last day of weeks

6 and 12 of the study. The goats on each dietary treatment were pooled together and the blood samplings were carried out in three randomly selected goats.

#### **Laboratory analysis**

Experimental diets were subjected to proximate analysis as described by<sup>9</sup>. Blood samples were analysed for blood proteins (total protein, albumin and globulin), blood ions (Na<sup>+</sup>, K and Cl<sup>-</sup>), and blood chemistry (Aspartate transaminase (AST) and Alanine transaminase (ALT)) at the Pathological Laboratory of University of Ibadan, Nigeria.

#### **Statistical analysis**

Feed intakes, live weights and blood data were subjected to a one way analysis of variance (ANOVA) using the Minitab Software Statistical Package<sup>10</sup>. Treatment means were compared using the standard error of the difference (s.e.d.) between means for significance (p<0.05).

## **RESULTS AND DISCUSSION**

### **Health status of animals and experimental data**

All the animals were in good state of health throughout the study. The data of proximate composition, feed intakes and live weights and blood constituents are presented in Tables No.2, 3 and 4, respectively.

### **Proximate composition, feed intake and live weight**

Proximate results of the experimental diets (Table No.2) revealed that LLLM containing diets had higher CP contents than LLLM free diet; previous workers<sup>3,4</sup> reported same trend which they ascribed to the high crude protein (CP) content of *Leucaena* species. There was no definite trend in the feed intake of the goats (Table No.3), however, goats on Diet 3 had significantly (p<0.05) higher body weights than their counterparts on Diets 1 and 2 (Table No.3). The higher mean body weight recorded for goats on LLM diets relative to the mean weight of goats offered LLLM free diet agrees with previous reports that *Leucaena* species improves body weight of animals<sup>11</sup>.

### **Blood constituents**

Blood protein data revealed that the goats on Diet 3 had significantly (p<0.05) higher body blood protein

and globulin contents than their counterparts on Diets 1 and 2 (Table No.4). Mean blood albumin content of goats on LLLM free diet (Diet 1) was significantly (p<0.05) higher than those of their counterparts on Diets 2 and 3. With the exception of Cl<sup>-</sup> content in wk 6, Cl<sup>-</sup> content in wk 12, Na<sup>+</sup> and K<sup>+</sup> contents in wks 6 and 12 were significantly higher on Diet 1 than values recorded on Diets 2 and 3. Except for ALT and AST in wk 6 LLLM diets had significantly higher values for ALT and AST than LLLM free diet. The higher blood protein content of goats fed LLLM diets relative to their counterparts on LLLM free diet is consistent with report of a previous study<sup>5</sup> on Nguni goats fed *Leucaena leucocephala* grass mixture.

**Table No.1: Feed ingredients (%) contained in the experimental diets**

S.No	Feed ingredients	Diet 1 (0% LLLM)	Diet 2 (7.5% LLLM)	Diet 3 (10% LLLM)
1	LLLM	0	7.5	10
2	Wheat offal	35	35	35
3	Rice bran	16	16	16
4	BDG	34	26.5	24
5	Cassava peel	14	14	14
6	Salt	0.5	0.5	0.5
7	Bone meal	0.5	0.5	0.5
8	Total	100	100	100

LLLM and BDG refer to *Leucaena leucocephala* leaf meal and Brewery dry grains, respectively.

**Table No.2: Proximate composition (%) of the experimental diets**

S.No	Proximate composition	Diet 1 (0% LLLM)	Diet 2 (7.5% LLLM)	Diet 3 (10% LLM)
1	Crude protein	13.22	19.43	22.08
2	Crude fibre	9.23	11.32	7.01
3	Nitrogen extractives	69.34	53.91	51.35
4	Ether extractives	2.00	4.91	6.94
5	Ash	6.21	10.43	12.62

**Table No.3: Feed intakes and live weights of WAD goats fed diets varying in levels of LLLM inclusion**

S.No	Parameters	Diet 1 (0% LLLM)	Diet 2 (7.5% LLLM)	Diet 3 (10% LLLM)	s.e.d.
<b>Feed intakes</b>					
1	Wk1	0.91	0.89	0.89	0.03
2	Wk4	1.37 <sup>a</sup>	1.08 <sup>b</sup>	1.18 <sup>b</sup>	0.06
3	Wk8	1.11	1.18	1.13	0.08
4	Wk12	1.20 <sup>a</sup>	1.22 <sup>b</sup>	1.07 <sup>a</sup>	0.06
<b>Live weights</b>					
5	Wk1	6.98 <sup>a</sup>	7.89 <sup>ab</sup>	8.57 <sup>b</sup>	0.42
6	Wk4	7.01 <sup>a</sup>	7.81 <sup>ab</sup>	8.49 <sup>b</sup>	0.40
7	Wk8	7.05 <sup>a</sup>	7.90 <sup>ab</sup>	8.53 <sup>b</sup>	0.43
8	Wk12	7.21 <sup>a</sup>	8.00 <sup>ab</sup>	8.60 <sup>b</sup>	0.43

<sup>ab</sup>Means with different superscripts within a row are significantly different (p<0.05).

**Table No.4: Blood constituents of WAD goats fed diets varying in levels of *Leucaena leucocephala* leaf meal (LLLM) content**

S.No	Blood Constituents	Diet 1 (0% LLLM)	Diet 2 (7.5% LLLM)	Diet 3 (10% LLLM)	s.e.d.
<b>Blood proteins</b>					
1	TP Wk6	4.89 <sup>a</sup>	5.04 <sup>a</sup>	5.85 <sup>b</sup>	0.22
2	TP Wk12	4.83 <sup>a</sup>	4.61 <sup>a</sup>	6.42 <sup>b</sup>	0.20
3	ALB Wk 6	4.03 <sup>a</sup>	2.99 <sup>b</sup>	3.07 <sup>b</sup>	0.12
4	ALB Wk 12	4.04 <sup>a</sup>	1.96 <sup>b</sup>	3.19 <sup>c</sup>	0.05
5	GLOB Wk 6	0.86 <sup>a</sup>	2.05 <sup>b</sup>	2.78 <sup>c</sup>	0.23
6	GLOB Wk 12	0.81 <sup>a</sup>	2.65 <sup>b</sup>	3.23 <sup>c</sup>	0.19
<b>Blood chemistry</b>					
7	ALTWk 6	7.53 <sup>a</sup>	8.56 <sup>a</sup>	10.11 <sup>b</sup>	0.50
8	ALTWk 12	7.40 <sup>a</sup>	5.94 <sup>b</sup>	10.23 <sup>c</sup>	0.27
9	ASTWk 6	124.14 <sup>a</sup>	127.77 <sup>a</sup>	136.86 <sup>b</sup>	2.40
10	ASTWk 12	124.82 <sup>a</sup>	89.61 <sup>b</sup>	112.30 <sup>c</sup>	2.29
<b>Blood ions</b>					
11	Na <sup>+</sup> Wk 6	146.50 <sup>a</sup>	128.01 <sup>b</sup>	126.66 <sup>b</sup>	4.95
12	Na <sup>+</sup> Wk 12	143.00 <sup>a</sup>	113.68 <sup>b</sup>	102.43 <sup>b</sup>	8.94
13	Cl <sup>-</sup> Wk 6	99.83	102.56	102.32	1.47
14	Cl <sup>-</sup> Wk 12	100.17 <sup>a</sup>	89.75 <sup>b</sup>	88.06 <sup>b</sup>	2.28
15	K <sup>+</sup> Wk 6	25.18 <sup>a</sup>	18.70 <sup>b</sup>	18.69 <sup>b</sup>	0.95
16	K <sup>+</sup> Wk 12	25.00 <sup>a</sup>	13.30 <sup>b</sup>	13.16 <sup>b</sup>	0.72

<sup>abc</sup>Means with different superscripts within a row are significantly different (p<0.05).

## CONCLUSION

Increase in LLLM constituent in diet favoured increase in live weight and blood protein content but it decreased blood albumin content of growing WAD goats.

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## CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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