EFFECS OF FEEDING MAHOGANY (*Swietenia macrophylla*) LEAVES SUPPLEMENTED WITH BREWERS DRIED GRAINS ON CARCASS AND BLOOD PARAMETERS TO WEST AFRICAN DWARF GOATS

Abdullahi, M[1]; Abdullahi, S[1], Addass, P. A[1].,., Salihu, S. S[1]., Nasuru, J[1]., Danladi, Z. S[1] Midalah, B. D[2] and Aliyu, S[1]
[1] Federal University of Agriculture, Mubi Adamawa State., Nigeria
[2]Department of Animal Production, Adamawa State University, Mubi. Nigeria.
Corresponding author: mohammedabdullahi3232@gmail.com 07046405458

Abstract
The experiment was conducted at Adamawa State University farm in the small ruminant unit. The pen was demarcated into four treatments and each treatment was replicated three times making a total of twelve experimental animals. The objective of this study was to determine proximate composition, hematology, serum biochemistry parameters and carcass characteristics of West African Dwarf goats fed mahogany (Swietenia macrophylla) leaves. *The treatments were T_1, T_2, T_3 and T_4 that received Mahogany leaves basal diet which were supplemented with 0g, 50g, 100g, and 150g of brewers' dried grain (BDG) across treatments. Randomized Completely Design (CRD) was employed in the study. The result obtained from the study showed that feeding mahogany leaves supplemented with brewers dried grains enhanced the quality of carcass especially the West African dwarf goats. Effects of the experimental diets on blood profiles of the experimental animals showed that the PCV values which indicate the relative proportion of plasma and red blood cells were 39.61 to 41.23% respectively. Hemoglobin (Hb) values of 5.75 - 6.55 g/dl recorded in this study may be an indication of the healthy animal, effects of the experimental diets on carcass characteristics of West African dwarf goat's showed that the weights of blood ranged from 315.00g (T4) to 452.00g (T3). The Hides/skin, non-carcass, digestive organs, fore and hind limbs weights were significantly ($p < 0.05$) different across treatments. Results of the research revealed that feeding mahogany (Swietenia macrophylla) leaves gives healthier animals and impacts superior qualities of carcass. It is therefore recommended that mahogany (Swietenia macrophylla) leaves could be used as basal diet for fattening goats with little supplementation. However, the mahogany (Swietenia macrophylla) leaves should be substituted at higher levels.*

Description of Problem

Meat plays significant role in human nutrition and culture. The meat industry provide livelihood for many people, for farmers and ranchers to processors and retailers. Goat farming has gained popularity in recent years due to the increasing demand for goat meat and dairy products. However, the success of goat farming operation relies heavily on the quality of feed provided to the animals. Feed quality plays a crucial role in the determining the overall costs efficiency and sustainability of a goat farmer (Bhattacharya, 2020). Hematology is the study of blood and its components. Hematological parameters can provide valuable information about the health status of the animals (Kumar, *et al.* 2020). Further stated that variation in blood parameters of animals are due to several factors such as feeding levels, age, sex, breed, and physiological status of the animals. The objective was to determine proximate composition, hematology and serum biochemistry parameters, carcass characteristics of West African Dwarf goats fed mahogany (*Swietenia macrophylla*) leaves (Cronnin, *et al.*, 2018).

Materials and Methods

Study Area

The study was conducted at the Small Ruminant Unit of the Adamawa State University Teaching and Research Farm, Mubi. The area lies within the Northern-Guinea Savannah zone of Nigeria. It is located between latitude 10°16.6′6.9″ north of the equator and longitude 13°16′1.2″ east Greenwich Meridian with 560 meters above sea level. The dry season of the area commences in November and ends in March, while the wet season begins from April and end in late October. The mean annual rainfall is about 1050 mm. The relative humidity is extremely low (20-30%) between January and March but reaches a peak of about 80% in August and September. The

maximum temperature can reach 40°C particularly in April while the minimum temperature is about 12°C between December and January (ADSU Metrological Station, 2019).

Sources of the Feeds

The feeds were obtained from two different sources in and around Mubi environs. The mahogany leaves were obtained from the wild by lopping the trees and collecting the leaves and bagging after drying under the shade. While brewers' dried grain was bought from the local beer brewers.

Sources of Animals

Twelve West African Dwarf bucks of average age of 12 months and mean live weight of 12 kg were sourced from the local markets in and around Mubi. Their ages were determined through their dental formulae.

Experimental Animals and Management

Twelve West African Dwarf bucks of average age of 12 months and mean live weight of 12 kg was sourced from the local markets in and around Mubi. Their ages were determined through their dental formulae. They were then housed individually in pens measuring 1.5m2 and 1.5m high. The floor of the house was made of concrete and covered with wood shavings to absorb moisture from the animals' dung and urine. The animals were quarantined for two weeks during which they were fed the experimental diets for adaptation and dewormed with Albendazol. At the end of the adaptation period, the animals were tagged, randomly allocated to treatments and balanced on weight basis for all the treatments. They were weighed to get the initial weights before embarking on data collection.

Experimental Treatment and Design

There were four treatments with each treatment replicated three times, making a total of twelve experimental animals. The treatments were T_1, T_2, T_3 and T_4 that received Mahogany leaves *ad-libitum* basal diet which was supplemented with 0g, 50g, 100g, 150g of brewers' dried grain (BDG) across treatments and were allocated to Randomized Complete Design (CRD).

Parameters Determined

Parameters that were determined; are proximate compositions of feed ingredients, carcass, hematological and serum biochemical indices. Proximate compositions were determined using the methods described by AOAC (2005). Hematological parameters were determined by drawing 10mls of blood from jugular veins of each animal into a sample bottle containing anticoagulant, Ethylene Diamine Tetra Acetic Acid (EDTA). These samples were used for the determination of the packed cell volume (PCV), Haemoglobin (Hb) concentration, red blood cell counts (RBC) and wite blood cell counts (WBC). The total serum protein, serum albumin, globulin and blood glucose was determined in the blood serum. The serum was obtained by allowing the blood to coagulate in order to separate the serum and cells. Packed cell volume was measured for each animal using the micro haematocrit method. Haemoglobin concentration was also measured using (acid haematin) method. Red blood cells were determined with the aid of Neubaur counting chamber (Haemocytometer). Blood smears was used for total white blood cell (WBC) counts determination. Serum samples were also taken and used in the determination of serum urea, total cholesterol, total protein and albumin as described by (Fasae, *et al.*,2007).

Data Analysis: All data obtained was subjected to analysis of variance (ANOVA) using the SAS (2002) package. Means was separated using the Duncan's multiple range test (Duncan).

RESULT

The result of proximate composition, hematology and serum biochemistry, carcass characteristics of West African Dwarf goats fed mahogany (*Swietenia macrophylla*) leaves was presented in the Tables below.

White blood cells (WBC) of (6.30 to 11.40 $x10^3$/ µl) obtained in the study, attributes to the resistant reaction to pathogens within the body and destroy foreign organisms in the body there by defending the body against foreign germs. Babale. *et al*. (2019) obtained similar findings which is comparable to the decrease in WBC of the present study. Thus, animal with low white blood cell count are exposed to high risk of disease infection, while those with high white blood cell count are capable of generating antibodies in the process and have high resistance to diseases and enhanced adaptability to local environmental and disease preventive condition (Abasi *et al*., 2014). The red blood cell count (RBC) values obtained in this study (9.00 - 14.20 mg/dl) were higher than those of (Coppock, *et al.,* 2006). this may be associated with iron deficiency, internal bleeding, some types of anemia or some vitamin deficiency.

Total protein values ranged from 57.60 - 69.50 mg dl -1; albumin 17.20 - 31.50 mg dl-1 and globulin 17.20 - 33.50 mg dl-1 as obtained from this study. The results of total proteins (g dl-1), albumin (mg dl-1) and globulin (mg dl-1), the values obtained showed significant difference ($P < 0.05$) among the treatment groups. For globulin values, that of T_4 proved to be the highest. These suggested the importance of microbiologically increased level of supplementation in improving the nutritive value of small ruminant diets and performance. The values of the plasma total lipids (mg dl-1), being glucose (28. 00 - 50.00 mg dl-1) and Blood-N (17.20 – 20.20 mg dl-1) were obtained in this research. They were significantly difference among the treatment groups.

Effects of the diets on whole sale cuts of growing West African dwarf goats showed that the weight for the breast, shoulder, legs and shanks were significantly ($P < 0.05$) different. However, the weights for flanks, racks, and loins also showed significance.

Table 1: Composition of Experimental Diets.

	Treatment			
Feeds	T_1	T_2	T_3	T_4
BDG (g)	0g	50g	100g	150g
ML	*ad lib*	*ad lib*	*ad lib*	*ad lib*
Salt (NaCl) %	1.5	1.5	1.5	1.5

BDG: brewers dried grains, ML: mahogany leaves, T: treatments

Table 2: Chemical Composition of Experimental Feeds

Parameters	**Brewers dried grain (BDG)**	**Mahogany leaves (*Swietenia macrophylla*)**
Dry matter (DM) %	9.00	91.12
Crude protein (CP) %	19.61	8.64
Crude fiber (CF) %	15.82	18.40
Ether extract (EE) %	6.50	3.75
Ash %	9.2	4.36

Table 3: Blood Profile of West African Dwarf Goat Fed Experimental Diets

Parameters	**T_1**	**T_2**	**T_3**	**T_4**	**SEM**	**LOS**
PVC (%)	27.00^a	28.00^a	21.00^b	28.00^a	0.50	**
Hb (%)	8.3^b	9.40^a	6.70^c	9.30^a	0.50	**
RBC (10^6)	11.20^c	15.00^a	9.00^d	14.20^b	0.25	**
WBC (10^9)	9.40^b	11.40^a	6.30^c	11.00^a	0.25	**
Prot. (mg/dl)	69.50^a	62.70^c	57.60^d	64.60^b	0.50	**
Alb. (mg/dl)	17.20^d	23.00^b	31.80^a	31.50^a	0.25	**
Glob (mg/dl)	17.20^d	24.00^c	31.00^b	33.50^a	0.36	**
Gluc (mg/dl)	42.00^b	28.00^c	50.00^a	42.00^b	0.50	**

PCV: Packed Cell Volume; Hb: Hemoglobin; RBC: Red Blood Cell; WBC: White Blood Cell; N: Nitrogen; Prot.: Protein; Alb.: Albumin; Glob: Globulin; Gluc: Glucose; SEM: Significance error means; LOS: Level of Significance.

Effects of the experimental diets on carcass characteristics of West African dwarf goats are shown in Table 4. The weights of blood ranged from 315.00g (T_4) to 452.00g (T_3). Though, the values did not comprehend any specific pattern, it was significant ($P< 0.05$), statistically. The Hides/skin, non-carcass, digestive organs, fore and hind limbs weights were significantly ($P< 0.05$) different across treatments. The values in this study were similar to those reported by Babale. *et al*. (2019), when they fed West African dwarf goats with groundnut haulms and cowpea husk based diets. The resemblances in this trial may be as a result of the presence of the following in the dressed carcass: legs, visceral (liver, heart, lungs, and kidney), head. Percentage of dressing may be affected by several factors e.g. fat portion of the body; fill and size of alimentary canal; hair

and hide weight etc. While some consider offal as part of the dressing process, some don't. So, it may also influence the dressing percentage. Let's say for example, hot carcass weight is well-thought-out to include the alimentary canal and the head without the legs as reported by Fasae, *et al*. (2007). Nevertheless, warm carcass weight was thought to rule out the all visceral including head, feet, skin not leaving out the abdominal fat as reported by Ukanwoko, *et al* (2009). When the latter is compared to the former, we tend to have a low percentage of dressing.

Table 4: Effects of Diets on Carcass Characteristics of West African Dwarf Goats.

Parameters	**T_1**	**T_2**	**T_3**	**T_4**	**SEM**	**LOS**
Live weight	11.6	11.46	12.12	12.17	0.69	NS
W B (g)	332.67^{b}	376.00^{b}	452.00^{a}	315.00^{d}	3.14	**
W F L (g)	825.00^{b}	554.00^{d}	945.67^{a}	749.00^{c}	0.46	**
WS (g)	570.00^{d}	578.00^{c}	583.00^{b}	614.00^{a}	0.50	**
W H (g)	939^{b}	807.00^{c}	1027.00^{a}	722.00^{d}	0.50	**
Trachea	15.00^{c}	18.00^{b}	24.00^{a}	19.00	0.50	**
Lungs	67.67^{d}	91.00^{b}	130.00^{a}	81.00^{c}	0.46	**
Liver	155.00^{d}	175.00^{b}	211.00^{a}	166.00^{c}	0.50	**
Kidney	31.00^{d}	43.00^{b}	47.00^{a}	14.00^{c}	0.50	**
Pancreases	11.00^{b}	43.00^{b}	47.00^{a}	9.00^{c}	0.50	**
Heart	60.00^{a}	60.00^{a}	58.00^{b}	38.00^{c}	0.50	**
Esophagus	15.00^{c}	16.00^{c}	33.00^{a}	19.00^{b}	0.50	**
Rumen	145.00^{d}	264.00^{c}	299.00^{b}	306.00^{a}	0.50	**
Reticulum	90.00^{b}	61.00^{c}	113.00^{a}	55.00^{d}	0.50	**
Omasum	37.00^{d}	46.00^{c}	46.00^{c}	52.00^{b}	0.50	**
Abomasum	55.00^{c}	73.00^{b}	56.00^{c}	80.00^{a}	0.50	**
SI	322.00^{d}	425.00^{a}	336.00^{c}	340.00^{b}	0.50	**
LI	31.00^{d}	55.00^{b}	79.00^{a}	50.00^{c}	0.50	**
Breast	187.00^{d}	248.00^{b}	270.00^{a}	200.00^{c}	0.50	*
Shoulder	648.00^{c}	689.00^{b}	752.00^{a}	588.00^{d}	0.50	**
Legs	335.00	277.00	355.67^{a}	254.00^{d}	0.46	**
Shanks	458.00^{b}	422.00^{c}	514.00^{a}	383.67^{d}	0.46	
Flanks	329.00^{c}	410.00^{b}	506.00^{a}	327.00^{d}	0.50	**
Rack	556.00^{a}	553.00^{b}	545.00^{c}	425.67^{d}	0.46	**
Lions	518.00^{d}	668.00^{b}	707.00^{a}	576.00^{c}	0.56	**
WT	65.00^{c}	103.00^{a}	95.00^{b}	66.00^{b}	0.50	**
Neck	385.00^{b}	361.00^{c}	408.00^{a}	298.00^{d}	0.50	**
Hind limbs	789.00^{d}	917.00^{b}	995.00^{a}	804.00^{c}	0.50	**
Ribs	349.00^{c}	384.67^{b}	516.00^{a}	343.33^{d}	0.50	**
Rumen	1664.00^{d}	1869.00^{c}	2256.00^{a}	2254.00^{b}	0.46	**
Reticulum	240.67^{b}	60.00^{d}	125.00^{c}	304.00^{a}	0.50	**
Omasum	63.00^{d}	93.00^{c}	148.00^{b}	326.00^{a}	0.56	**
SI	464.00^{c}	807.33^{a}	406.00^{d}	646.00^{b}	0.50	**
LI	200.00^{c}	302.00^{a}	154.00^{d}	260.00^{b}	0.50	**
EC	3.61^{b}	3.82^{a}	3.49^{b}	3.20	0.04	**WB:

weight of blood; WFL: weight of fore limbs; WS: weight of skin; WH: weight of head SI: small intestine; LI: large intestine; EC: empty carcass; SEM: Standard error means; LOS: Level of Significance.

Conclusion and Application

Mahogany (*Swietenia macrophylla*) leaves improved blood parameters such as PCV, hemoglobin, Albumin, Globulin, indicating better health and carcass development of West African Dwarf Goats. It is therefore recommended that mahogany (*Swietenia macrophylla*) leaves could be used as basal diet for fattening goats with little supplementation. However, the mahogany (*Swietenia macrophylla*) leaves should be substituted at higher levels.

Based on this it is recommended that West African Dwarf Goats should be fed with Mahogany (*Swietenia Macrophylla*) leaves supplemented with brewers dried grains encourages production at lower cost. Hematology and serum biochemistry profile should be checked to ascertain physiological parameters. Farmers should be encouraged to practice this procedure for better production along the chain of the economic value. Further research should be evaluated the long-term health effects of Mahogany (*Swietenia Macrophylla*) supplementation, and its impact on meat quality.

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