HAEMATOLOGY AND SERUM BIOCHEMICAL PARAMETERS OF MUTURU CATTLE FED DIETS CONTAINING THREE DIFFERENT BROWSE LEAVES

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ABSTRACT
This study evaluated the effects of three browse plants: Leucaena leucocephala, Gmelina arborea, and Gliricidia sepium on the haematological and serum biochemical parameters of Muturu cattle. Diets incorporating these plants at a 15% inclusion level were fed to the animals for 8 weeks, with water provided ad libitum. Haematological parameters, including packed cell volume (PCV), haemoglobin, red and white blood cell counts, neutrophils, basophils, and others, as well as serum biochemical parameters such as total protein, albumin, globulin, urea, and creatinine, were assessed. Data were analyzed using one-way analysis of variance, and significant means were separated using Duncan's multiple range test. The results showed no significant differences ($p>0.05$) in haematological parameters, which remained within normal ranges for healthy cattle. However, serum biochemical analysis revealed significant differences ($p<0.05$) in albumin and urea levels, while other parameters, including aspartate aminotransferase, total bilirubin, and creatinine, fell within normal ranges. In conclusion, the inclusion of L. leucocephala, G. arborea, and G. sepium at 15% in concentrate diets had no adverse effects on haematological parameters and only influenced albumin and urea levels among serum biochemical parameters.
Keywords: Browse plants, Diets, Haematology, Serum biochemistry, Muturu cattle

INTRODUCTION

Muturu cattle, indigenous to West Africa, are renowned for their adaptability to local environmental conditions and resistance to diseases such as trypanosomiasis (Ode *et al*., 2016). Understanding the haematological and serum biochemical parameters of these cattle is essential for assessing their health status, diagnosing diseases, and evaluating the impact of different dietary regimens (Ochefu *et al*., 2022).

Browse leaves, which are the foliage of shrubs and trees, serve as vital feed resources for ruminants, especially during periods when conventional forages are scarce. Incorporating various browse species into the diets of cattle has been shown to influence their haematological and biochemical profiles, reflecting changes in metabolism, nutrient utilization, and overall health (Mbanasor *et al* 2003).

Blood analysis serves as a crucial tool for evaluating the health status of animals, as it reflects their physiological, nutritional, and pathological conditions. According to Pasciu *et al*. (2023), biochemical and hormonal blood parameters are key factors when assessing various aspects such as nutrition, sex, age, health, and physiological status in animals. Similarly, Astuti *et al*. (2021) highlight that blood metabolite profiles are important in evaluating the health and nutritional status of cattle.

Despite the recognized importance of browse leaves in ruminant nutrition, there is limited information on how different browse species affect the haematological and serum biochemical parameters of Muturu cattle. This study aims to fill this knowledge gap by evaluating the effects of diets containing different browse leaves on these parameters in Muturu cattle. The findings will contribute to optimizing feeding strategies that enhance the health and productivity of this indigenous breed.

MATERIALS AND METHODS

Description of experimental site

The experiment was conducted at the Muturu Cattle breeding and multiplication unit, Institute of Food Security, Environmental Resources and Agricultural Research (IFSERAR) farm, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria. The region is 76m above sea level and falls within Latitude $7^0$13'34'7 N and $3^0$23'43 E. The climate is humid and located in the forest zone of Southwestern Nigeria and at the Laboratory of Veterinary Medicine Teaching Hospital, (COLVET) FUNAAB.

Preparation of feed ingredients

Feed ingredients were sourced from a reputable feed-mill around Abeokuta. The browse leaves which are common and readily available were harvested within the University campus. The browse leaves included: *Gmelina arborea*, *Gliricidia sepium* and *Leucena leucocephala*. The harvested leaves were sun-dried to reduce the moisture content and limit the Anti-Nutritional Factors (ANFs) present in the leaves. Sixteen animals (16) were sourced from an already existing herd at the Muturu unit at IFSERAR. The animals were assigned to four treatments accordingly. The research lasted for 60 days (8weeks) and during this period the animals were fed with concentrates diets containing test ingredients in the morning and grass was given in the afternoon. The animals were fed with 5% of their body weight per day of the duration of the research and leftovers from both concentrates and grass were weighed daily to determine the quantity taken by each animal. Water was available *ad-libitum.*

Blood Sample Collection

Blood was collected at the 8th week of the feeding trial, 10ml of blood was drawn from the jugular vein of the animal using a syringe and hypodermic needle per animal. 5ml of blood sample was ejected into a bottle containing ethyl dimethyl tetra acetic acid (EDTA) which prevented coagulation and allowed proper evaluation of hematological parameters. The other 5ml blood sample was released into a plain bottle with no anti-coagulant.

RESULTS AND DISCUSSION

Table 1: Effects of diets containing different browse plants on the haematological parameters of Muturu cattle

Parameters (%)	*NR	Control	*Gmelina*	*Gliricidia*	*Leucaena*	SEM	p-value
PCV g/dl	24-46	35.00	40.33	39.67	41.00	1.482	0.530
Hb $x10^{12/L}$	8-15	11.67	13.33	13.33	14.00	0.499	0.445
RBC $x10^{9/L}$	5.0-10.0	15.967	16.00	17.667	18.667	0.598	0.327
WBC	4.0-12.0	6.67	7.00	8.00	7.33	0.372	0.688
Neutrophil	15-33	37.00	37.33	37.00	38.00	0.607	0.949
Lymphocytes	45-75	62.67	60.67	61.67	59.33	0.701	0.425
Eosinophil	0-4	0.00	0.67	0.33	0.67	0.193	0.627
Basophil	0-2	0.00	0.67	0.33	0.33	0.142	0.487
Monocytes	0-8	0.33	0.67	0.67	1.67	0.207	0.095
MCV	40-60	22.00	25.33	22.67	22.00	0.921	0.590
MCH	11-17	7.33	8.33	7.67	7.67	0.279	0.701
MCHC	30-36	33.33	33.33	33.33	34.00	0.195	0.596

*=Merck. 2011, PCV = Pack cell volume, Hb = Heaoglobin, RBC = Red Blood Cell, WBC= White Blood Cell, MCV=Mean Corpuscular Volume, MCH=Mean Corpuscular Haemoglobin, MCHC=Mean Corpuscular Haemoglobin Concentration, NR=Normal Range

Table 1 shows the effect of diets containing three different browse leaves on haematological parameters of Muturu cattle. The parameters measured included packed cell volume (PCV), haemoglobin (Hb), red blood cell (RBC) count, white blood cell (WBC) count, and differential leukocyte counts. The results indicated no significant differences ($p>0.05$) among the treatment groups, with all values falling within established normal ranges for healthy cattle. The PCV values ranged from 35.00% to 41.00%, aligning with the normal reference range of 24% to 46% for cattle. Similarly, Hb concentrations were between 11.67 and 14.00 g/dL, within the typical range of 8 to 15 g/dL. These suggest that the inclusion of these browse plants did not adversely affect the oxygen-carrying capacity of the blood. RBC counts observed were higher than the standard reference range of 5.0 to 10.0 $x10^{12}$/L. This discrepancy may be attributed to breed-specific variations, as haematological parameters can differ among cattle breeds (Ochefu *et al* 2022). WBC counts ranged from 6.67 to 8.00 $x10^{9}$/L, falling within the normal range of 4.0 to 12.0 $x10^{9}$/L, indicating no immunological stress or infection among the cattle. Differential leukocyte counts, including neutrophils, lymphocytes, eosinophils, basophils, and monocytes, showed no significant differences across treatments and remained within normal ranges. This stability suggests that the dietary inclusion of these browse plants did not elicit any inflammatory or allergic responses.

The inclusion of *Leucaena leucocephala, Gmelina arborea,* and *Gliricidia sepium* at 15% in Muturu cattle diets did not significantly affect most serum biochemical parameters (Table 2). Serum parameters have been reported to be important in the proper maintenance of the osmotic pressure between the circulating fluid and the fluid in the tissue space so that the exchange of materials between the blood and cell could be facilitated (Isidahomen *et al*., 2012; Shittu *et al*., 2016). Serum values remain largely within normal physiological ranges. Total protein levels ranged from 3.33–4.67 g/dL, which were below the report of Olalere *et al*. (2024) and lower than the normal range of 6.7–7.5 g/dL. This reduction could indicate limited protein availability in the diet or alterations in hepatic protein synthesis due to the experimental browse plants. Albumin levels showed a significant difference ($p<0.05$), with *Leucaena*-fed cattle exhibiting the highest values (3.67 g/dL), falling within the normal range (2.0–3.8 g/dL). This suggests that *Leucaena leucocephala* may enhance hepatic synthesis of albumin

Table 2: Effects of diets containing three different browse plants on the serum biochemical parameters of Muturu cattle

Parameters (%)	*NR	Control	*Gmelina*	*Gliricidia*	*Leucaena*	SEM	p-value
Total Protein g/dl	6.7-7.5	4.67	3.33	4.67	4.67	0.333	0.441
Albumin g/dl	2.0-3.8	2.33[a]	2.00[a]	2.67[a]	3.67[b]	0.225	0.017
Globulin g/dl	3.0-3.5	2.33	1.33	1.67	1.33	0.256	0.528
Cholesterol mg/dl	-	141.33	129.67	166.0	128.00	6.834	0.169
AST U/L	60-125	105.33	107.00	99.00	104.00	3.941	0.929
ALT U/L	-	34.33	34.00	36.00	32.67	1.657	0.939
ALP U/L	-	45.33	45.00	47.67	43.00	2.253	0.935
Total Bilirubin mg/dl	0-1.6	1.00	1.00	0.67	0.67	0.112	0.596
Conjugated Bilirubin mg/dl	0.00	0.00	0.08	0.00	0.00	0.00	0.00
Urea mg/dl	10-25	42.00[a]	38.67[ab]	41.00[ab]	37.33[a]	0.789	0.121
Creatinine mg/dl	0.5-2.2	2.00	1.33	1.67	1.00	0.195	0.330

[ab] Means on the same row having different superscripts that are significantly different (p>0.05). *=Merck. 2011, AST = Aspartate aminoransferace, ALT= Alanine aminotransferase, ALP = Alkaline phosphatase, NR=Normal range.

compared to the other browse plants, as albumin is a marker of liver function and nutritional status. Globulin levels, which contribute to immune function, were lower than the reference range (3.0–3.5 g/dL) across all treatments, with no significant differences ($p > 0.05$). This could reflect dietary limitations in promoting adequate globulin synthesis, though further studies on immune markers may clarify this observation.

Urea levels showed a trend toward significance ($p<0.05$), with *Leucaena*-fed cattle having the lowest mean value (37.33 mg/dL), still above the normal range (10–25 mg/dL). Increased urea levels may indicate increased protein catabolism or reduced renal clearance, which could be related to dietary protein content (Merck, 2011). Creatinine levels ranged from 1.00 to 2.00 mg/dL and were within the normal range (0.5–2.2 mg/dL), suggesting no negative effects on renal function.

CONCLUSION

The study showed that the inclusion of these browse leaves did not cause any significant negative effects on the health or metabolic functions of the cattle, making them potentially suitable for inclusion in cattle diets without detriment to their general health.

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