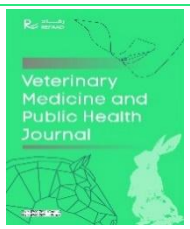
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Veterinary Medicine and Public Health Journal (VMPH)

Journal Homepage: https://www.refaad.com/Journal/Index/7

E-ISSN 2707-7195 | P-ISSN 2707-7187

Vol. 7, No. 2, 2026, pp. 89 - 98



Haematological and Serum Biochemical Parameters of Red Sokoto Goats fed Diets Containing Graded Levels of Leuceana (*Leuceana leucocephala*) Leaf-Meal Based Diets as Supplement to Crab Grass (*Digitaria Horizontalis*)

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Original Research Article
https://doi.org/10.31559/VMPH2026.7.2.5
Received: 27 Jan 2026
Revised: 1 Mar 2026
Accepted: 19 May 2026

How to cite this article: Yakubu, Y. K., et al. (2026). Haematological and Serum Biochemical Parameters of Red Sokoto Goats fed Diets Containing Graded Levels of Leuceana (Leuceana leucocephala) Leaf-Meal Based Diets as Supplement to Crab Grass (Digitaria Horizontalis). *Veterinary Medicine and Public Health Journal*, 7 (2), 89-98. https://doi.org/10.31559/VMPH2026.7.2.5

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Abstract:

Objectives: The study was carried out to evaluate the effects of Leucaena leucocephala leaf -meal based diets on the haematological and serum biochemical parameters of growing Red Sokoto Bucks (RSB) fed a basal diet of Digitaria horizantalis.

Methods: Sixteen (16) growing Red Sokoto bucks averagely 8 - 9 months of age, weighing 10 - 11 kg ± 0.5 were used for the study. Four treatment supplement (0, 5, 10 and 15%) inclusion levels of leucaena leaf meal were formulated and designated as T1, T2, T3 and T4 respectively. The bucks were weighed at the beginning of the experiment and weekly thereafter, while feed intake was recorded daily. The experimental design is a complete randomized design (CRD) the experiment lasted for a period of sixty-three (63) days after an adjustment period of 14 days. Data collected were subjected to Analysis of Variance (ANOVA). Proximate composition of the supplemental diet, (Leucaena leucocephala Leaf meal) and the basal diet (Digitaria horizantalis) were determined using the methods of AOAC, (2005).

Results: The result revealed significant ($p<0.05$) difference in all the Haematological and serum biochemical indices of the bucks, but almost all the values fell within the normal range of haematology and serum values for healthy Red Sokoto bucks.

Conclusion: Leucaena leucocephala leaf meal can be included in supplement diets for red Sokoto goats up to 15% without adverse effects on the haematological and serum biochemical parameters of red sokoto goats.

Keywords: *Haematological; Serum Biochemical Parameters; Red Sokoto Goats; Leuceana leucocephala Leaf-Meal; Supplement; Crab Grass.*

1 Introduction

Ruminant animals constitute a very important part of the livestock sub-sector of the Nigerian agricultural economy. The potential of small ruminant production in alleviating the low animal protein intake by man in developing nations such as Nigeria has been reported (Fajemisin *et al*., 2019). Recently, more attention has been paid to small ruminant production in the tropics as their advantages are becoming more understood than ever before, particularly for their ability to produce meat, milk and skin, even in hostile environments (Konlan *et al*., 2022).

Goats are the most prolific of all domesticated ruminants under tropical and subtropical conditions (Webb and Mamabolo, 2024) and they play a significant role in livelihoods of the rural populace in most developing countries like Nigeria. Apart from serving as a vital protein source, goats also provide income for meeting household needs (Peacock, *et al*., 2005). Not with standing, the high cost of formulating livestock feed has been a major constraint militating against the increased production of valuable sources of animal protein (Okoruwa *et al*., 2013) in Nigeria.

Small ruminants suffer scarcity of feed supply and pasture quality in the Arid region of West Africa, especially during the dry season when the natural vegetation is of poor nutritive value (Aye, 2017). Specifically, for goat production in Nigeria, Ahamefule and Elendu (2010) identified feed shortage as a major constraint. Native rangelands produce the cheapest source of nutrients for goats, and for a greater part of the year, grasslands do not supply sufficient nutrients to animals for greater productivity (Vincent *et al*., 2012).

Ruminants consuming forage-based diets are fed supplements to conserve forage, improve animal performance, and increase economic returns (Kunkle *et al*., 2020). A protein supplement alone to low energy diet has no effect on growth rate. Concentrate supplements should contain high energy and moderate amounts of protein to allow a content of about 6g protein per mega joule Metabolizable energy (ME) in the whole ration (concentrate and roughage) (Mtenga and Madsen, 2008). The shortage in feed supply due to high cost and seasonality, have caused ruminant livestock farmers to search for alternative feed resources that are inexpensive and readily available which are not directly required as component of human dietaries and can economically supplement the feed ingredients in rations without adverse effects on the rumen microbial fermentation and performance of the animals (Oluremi *et al*., 2017). Similarly to reduce this nutritional constraints, it is recommended that forage and crop residues be incorporated in Animal Diets (John and Debrah, 2010).

Leucaena leucocephala is a relatively fast-growing tree in the production of forage. Reynolds & Atta-Krah (2016) reported that the browse plant has the ability of being available all year round because of its drought resistance, persistence, vigorous growth and re-growth and palatability. *Leucaena leucocephala* is a tree legume noted for its high nutritive value for ruminant production (Babayemi *et al* 2006), being high in proteins, vitamins and minerals (Odeyinka, 2021). Its amino acid pattern is comparable with that of soya bean and fish meal (Vincent *et al*., 2012) and other animal feed sources available in developing nations. *Leucaena leucocephala* leaves have been found to play a valuable role in providing supplemental nitrogen to goats fed maize residues under the village system of management (Fasae *et al*., 2011). It is readily available in smallholder settlements in south west Nigeria (Fasae *et al*., 2011), although it has its origins in Central America and the Yucatan Peninsula of Mexico (Vincent *et al*., 2012).

Leucaena foliage (leaflets plus stems) contains both nutrients and roughage and makes a ruminant feed roughly comparable to alfalfa forage. When dried, the leaflets readily fall off, providing a feed that is 25-30% protein, even after correcting for Mimosine nitrogen (Puma 2021). According to Akgul (2017) In Malawi, Thailand and Philippines, leaflets are sun dried both for local forage and for export to Europe, Japan and Singapore. It has been found that dried leaves can be compressed into feed pellets without milling and without adding water, molasses, or other binders. Grove *et al*., (2019). Leucaena's protein is of high nutritional quality. According to Nuttaporn and Naytat (2019), its amino acids are well balanced, much as in alfalfa. The leaves are also a rich source of carotenoids and vitamins.

Inadequate year round supply of quality forages and or feed is a major problem to the productivity of ruminant animals in the tropics (Abubakar *et al*., 2011). The situation is particularly more devastating for the Sudano-Sahelian belt, the traditional home of most Nigerians ruminant Livestock, which is characterized by a long dry season of about 7-8 months (October – May). Livestock farmers face their greatest challenges

during these dry season when a "Staircase" pattern is observed in Animal as a result of inadequate Feed (Adegbola, 2002). During this period, the available Feed is scarce and of low quality, such that animals are not able to meet their protein and energy needs with consequent marked weight losses and productivity (Adegbola, 2002).

Some multipurpose trees have nutritional properties that can be beneficial if incorporated in livestock feed. Utilising some of these properties to their full potential can result to sustainable livestock production (Melesse *et al.,* 2011). Examples of these trees include *Leucaena leucocephala, Moringa oleifera*, *Parkia biglobosa, Aspilia africana, Ficus* exasperate and others.

The utilization of the legumes mixture depends on their chemical composition, digestibility and presence of anti-nutritive factors as well as their acceptance. Among the most important shrub in Nigeria is *Leucaena leucocephala*. (Odeyinka 2021). *Leucaena leucocephala* is very rich in protein and several studies have been conducted on its utilization and toxicity.

Leucaena leucocephala leaves can be fed to ruminants fresh, sun dried or dehydrated product of commercial forages drier. (Mary 2016). Haematological and serum biochemical analysis are important in testing the safety of feed materials, serum biochemical analysis offers a diagnostic baseline for the diagnosis and treatment of animals (Oyibo *et al*., 2020; Joshi *et al* 2005; Tambuwal *et a*l 2002)

The study was designed to evaluate the Haematological and Serum Biochemical parameters of Red Sokoto Bucks fed diets containing graded levels of *Leucaena leucocephala* leaf meal as supplement to a Basal Diet of *Digitaria horizantalis*.

2 Materials and Methods

2.1 Experimental Site

The experiment was conducted at the Livestock Unit of Teaching and Research Farm, Federal College of Horticulture Dadin-Kowa, Gombe state, Nigeria. Dadin-kowa, YamaltuDeba Local Government Area , located in the savannah zone of North- Eastern Nigeria, on latitude 11^0.30N and longitude 100^0 20E and on altitude of 240m above sea level (Yarima *et al* 2024), The area is characterized by short rainy season (4-5 months) with annual rainfall of 760mm to 1100mm, and long dry season (6-7 months). The ambient temperature could be as low as 24^0C during the dry cold season (October-January) and as high as 44^0C during the dry hot season (February-May). (Ibeje and Okoro 2023).

2.2 Experimental Bucks, Housing and Management

A total of 16 Red Sokoto bucks aged between 8–9 months old with an average weight of 10-11 kg ± 0.5 were purchased from the livestock market within Kuri Town. All the animals were treated against internal and external parasites using Levarmisole (Kepro B.V. Holland, 1ml per 20 kg body weight), sprayed with Triatix (cooper Ltd) and injected with long acting oxytetracycline 20% LA (Invesa Spain 1ml per 10kg body weight) before the commencement of the experiment (Wadda, *et al*., 2014). The animals were housed individually in separate pens. Experimental supplement were supplied at 3% of the animal's body weight and water was given *ad libitum* and the experimental animals were allotted to four treatments supplements containing *Leucaena leucocephala* leaf meal at inclusion levels of 0, 5, 10, and 15% and designated as T_1, T_2, T_3 and T_4 respectively. Daily feed intake and weekly live weight changes was recorded. The trial lasted for 63 days after an adjustment period of two weeks.

2.3 Experimental Diets and Animal Feeding

Leucaena leucocephala leaves were sourced from Orchard Farm, Federal College of Horticulture Dadin Kowa, Gombe State. Nigeria. The leaves were sun-dried on concrete floors for 48 hours, where it became crispy, to reduce/deactivate the mimosine content; it was milled and stored in synthetic bags before incorporation in the diets as described by (Oyewole, *et al*.,2021; Oloche, *et al*., 2014). Four supplements were formulated containing *Leucaena leucocephala* leaf meal at 0, 5, 10 and 15%.

During the adjustment period which lasted for two weeks, the animal were fed the experimental supplements and the basal diet to enable them adapt to the feeding regimes. The animals were individually fed *leucaena l*eaf meals at varying levels based on treatments levels. Four supplements were formulated in such a way that *leucaena leucocephala* leaf meal was included at different levels as T_1, T_2, T_3 and T_4 comprising of four animals per treatment. During the experiment, feeding was done every morning at about 08:00am. During the feeding trials each animal was offered its respective basal diet of 600g/head/day of *Digitaria horizontalis* (Crab grass)

at 08:00am followed by the concentrate at 300g per head per day at 04:00pm. As described by Ocheja, (2020).

The animals were weighed at the beginning of the experiment and weekly thereafter. The experiment lasted for a period of sixty-three days after two weeks adaptation period, Ingredients composition and their calculated nutrients analysis are presented below;

Table 1: Ingredients Composition of the Experimental Supplements

Ingredient	**Treatments (kg)**			
	1	2	**3**	**4**
Maize offal (kg)	50.00	50.00	50.00	50.00
Rice bran (kg)	17.00	17.00	17.00	17.00
Groundnut cake (kg)	30.00	25.00	20.00	15.00
Leucaena leaf Meal (kg)	**0.00**	**5.00**	**10.00**	**15.00**
Bone meal (kg)	2.00	2.00	2.00	2.00
Wood ash (g)	0.50	0.50	0.50	0.50
Table salt (g)	0.50	0.50	0.50	0.50
Total (%)	**100.00**	**100.00**	**100.00**	**100.00**
Calculated Nutrients Content				
Crude Protein (%)	18.87	18.24	18.56	18.60
Crude Fiber (%)	13.39	13.79	14.18	14.58
M. E (kcal/kg)	2828.20	2824.89	2821.58	2818.27

2.4 Experimental Design

The 16 Red Sokoto Bucks were allotted to four dietary treatments (T_1, T_2, T_3 and T_4) each treatment was replicated 4 times in a Complete Randomized Design (CRD).

2.5 Data Collection

The parameters determined include the followings; -

2.6 Chemical Analysis

Samples of the *Leucaena leucocephala* leaves and the concentrate supplements were prepared for proximate analysis. Protein content of the samples were analyzed using kjeldhal procedure, ADF, NDF, crude fibre, and ash content were determined according to the method of Van Soest. (1991).

2.7 Feed Intake

Feed intake of the experimental animals was obtained by weighing the quantity of supplemental concentrate and that of the Crab grass (*Digiteria horizontalis*) given daily at 08:00am and 02:00pm respectively any leftover were also weighed to obtain the voluntary feed intake by subtracting the left over from the initial feed given.

2.8 Blood Sample Collection

At the end of experiment, two sets of blood samples were collected in sample bottles from each research bucks via the jugular vein with the use of disposable syringe and sterile needles for laboratory test to determine the following;

- **Hematological Parameters**

The hematological parameters were analyzed according to the method described by Joshi *et al*., (2022). This sample bottle contained Ethylene Diamine Tetra Acetic Acid (EDTA) as anti-coagulant, to determine the following;

a. Packed cell volume (PCV),
b. Haemoglobin (HB),
c. Red blood cell (RBC),
d. White blood cell (WBC),
e. Neutrophil (N),
f. Lymphocyte (L),
g. Eosinophil (E) and
h. Monocyte (M)

- **Serum Biochemical Indices**

The Serum Biochemical Indices were analyzed according to the method described by Ogunsami (2002).The sample bottle with no EDTA was used to determine the following; -

a. Aspartate amino tranferase (AST)
b. Creatinine
c. Glucose
d. Total protein (TP)
e. Albumin (ALB)
f. Sodium (Na)
g. Urea (UR)
h. Total cholesterol (TC).

2.9 Data Analysis

Data obtained from the study were subjected to analysis of variance (ANOVA) using SPSS version 23 (2015), and treatment means that are

significantly different were separated using least significant difference (LSD).

3 Results and Discussions

3.1 Chemical Composition of Experimental supplements, *Leucaena leucocephala* Leaf meal and Forage (*Digitaria horizantalis)*

The chemical composition of concentrate diets, the forage (*Digitaria horizontalis)* and *Leucaena leucocephala* leaves are presented in Table 2.

The crude protein values of the concentrate diets at different inclusion levels were found to be 11.35% to 12.55 %. While crude protein percentages of *Leucaena leucocephala* leave is 21.85 %. The crude Fibre of the concentrate diet, forage and *Leucaena leucocephala* leaves ranged from 13.49 to 15.49 % and 14.85 and 12.50% respectively. Acid detergent Fibre (ADF) and neutral detergent Fibre (NDF) ranges from 5.13 to 15.37% and 19.40 to 43.54 across the treatments.

The high crude protein content of the concentrate diet shows it is high enough to meet the optimum microbial need in the rumen (Yahaya *et al*., 2020). The values for all the treatment groups were above the 7% minimum protein requirement for optimum microbial growth in the rumen (Baba *et al*., 2021). The values also falls within the 10 to 12% crude protein requirement for growth performance of goats (Gatemby 2022).

The results follow similar pattern to the report of Puma (2021) that semi-arid browse plants are high generally in Fibre. Rajendran *et al*.,(2021) also reported values for NDF and lignin contents across different ecological zones as follows; 401 and 117g kg DM in the sahelian zone, 457 and 105 g kg DM in sub humid zone and 436 and 93 g kg DM in the humid zone respectively.

Table 2: Chemical Composition (%) of Experimental Diets, Leucaena leaves and the forage (*Digitaria horizantalis).*

Parameters	T_1	T_2	T_3	T_4	Leucaena leaves	Forage (*Digitaria horizantalis)*
Dry matter	99.17	99.06	99.43	99.55	99.55	98.25
Ash content	3.94	3.55	3.15	2.84	2.30	1.26
Crude fat	0.63	0.24	0.35	0.13	5.05	0.036
Crude Protein	11.36	11.35	11.73	12.55	21.85	3.1
Crude fibre	15.49	15.00	13.65	13.49	12.50	14.85
CHO	67.75	68.89	70.55	70.45	63.51	79
Energy (Kcal/kg dm)	3224.7	3218.6	3255.1	3264.4	2950.2	3355.8
ADF %	5.13	8.56	12.64	15.37	19.40	32.38
NDF %	9.28	23.62	28.35	34.19	43.54	61.82

CHO means carbohydrates, ADF; Acid Detergent Fibre and NDF; neutral detergent fibre.

3.2 Haematological Parameters of The Experimental Bucks Supplemented with Graded Levels of *Leucaena leucocephala* Leaf meal.

The Results of the Haematological Parameters of Red Sokoto Bucks fed varying Levels of the Experimental Diets is presented in Table 3.

3.2.1 Packed Cell Volume (PCV) %

Significant ($p<0.05$) differences were observed in Packed Cell Volume (PCV). The PCV range of 21.50 – 28.50% observed in this study for the experimental Bucks fell within the normal PCV Range of Goats (21 – 35%) reported by Tambuwal *et al*. (2002) showing that the Protein Contained in the Experimental Diets were adequate for the Experimental Bucks in this study. Low PCV values is an indication of Poor Crude Protein Diets.

3.2.2 Haemoglobin(Hb) g/dl

The range of Haemoglobin (Hb) values (7.05 – 9.65 g/dl) obtained in this study were within the Normal Range of 7 – 15g/dl and 8.08 - 9.50g/dl reported by Tambuwal *et al*. (2002) for Red Sokoto Goats and Ogundu *et al*. (2018) for West African Dwarf Goats respectively. This might also be related to the Crude Protein in the Diets. Haemoglobin functions as an oxygen carrier from the Lungs to all other Parts of the Body Daramola *et al*. (2015).

3.2.3 Red Blood cell (RBC) /L

Red Blood Cell Count (RBC) was significantly ($P<0.05$) Higher in Diets1, 3 and diet 4 (3.80, 3.90 and 3.60×10^{12}/L) compared to Treatment 2 . RBC Values were below the Normal Range Values (5-8 $\times10^{12}$/L) for Goats. The Low values of RBC count observed from this Present Study may be associated with Anaemia or Deficiency due to Diarrhoea (as observed during the Trial) which

depressed Performance. This has been documented by Milliam (2020).

3.2.4 White Blood Cell (WBC) /L

White Blood Cell count (WBC) was significantly (P<0.05) Higher in Treatment 3 (15.85 $\times 10^9$/L) compared to Treatment 2 (6.35$\times 10^9$/L). The WBC count recorded in this Study was within the Normal Range of Haematology Parameter for Goats, (6.8-20.1 $\times 10^9$/L) (Radostits *et al.*, 2020; Etim *et al.*, 2023). The high Value observed for WBC may be due to addition of *Leucaena leucocephala* leaves in the Diet which Contributes to the Nutritional status of the Diet (Mohammed *et al.*, 2014).

3.2.5 Neutrophils (%)

The Neutrophils (N) was significantly (P<0.05) Higher in Diet2 (39.00%) for the Experimental Bucks. The Range of Neutrophils observed in this study was between 28.50 – 39.00% which is similar to 28.67 – 40.00% reported by Ukanwoko and Uhumuavbi (2020) for Red Sokoto Bucks fed *Xylopia aethiopica* seed Meal Diets, and these range fell within the Normal Range of 17 – 52% and 23.90 – 49.80% reported by Tambuwal *et al* (2002) and Hyelda *et al* (2017).

3.2.6 Lymphocyte (%)

The values for Lymphocytes (56.50 – 66.50%) observed in this Present Study also falls within the Normal Range of 47 – 82% as reported by Tambuwal *et al*. (2002). There was more L than N in this Present Study. This agrees with (Ibrahim *et al.* 2014) who reported that Goats have more Lymphocytes than Neutrophils.

3.2.7 Eosinophils (%)

The range of Eosinophils values (1.00 – 2.00%) obtained in this study were within the Normal Range of (1 – 7%) for Goats reported by Ukanwoko and Uhumuavbi (2020).

3.2.8 Monocyte (%)

The values observed (2.50 – 5.50%) were significantly higher than the Normal Range values of (0-10%) reported by Tambuwal *et al*. (2002).
The mimosine content appears not to have had an influence on the haematological values.

Table 3: Heamatological Parameters of the Experimental Bucks Supplemented with Graded Levels of *Leucaena leucocephala* leaf meal.

Parameters	(T_1) 0% LL	(T_2) 5% LL	(T_3) 10% LL	(T_4) 15% LL	SEM	LOS	Normal Range
Packed Cell Volume (%)	25.00^{b}	21.50^{c}	28.50^{a}	25.50^{b}	1.08	*	21-35
Haemoglobin Conc. (g/dl)	8.40^{ab}	7.05^{c}	9.65^{a}	8.95^{a}	0.40	*	7-15
Red Blood Cell (X10^{12}/L)	3.80^{a}	2.40^{b}	3.90^{a}	3.60^{a}	0.26	*	3.5-13.5
White Blood Cell (X10^{9}/L)	14.00^{a}	6.35^{d}	15.85^{a}	12.80^{c}	1.43	*	6.8-20.1
Neutrophils (%)	36.00^{a}	39.00^{a}	28.50^{d}	35.50^{bc}	5.03	*	17-52
Lymphocyte (%)	56.50^{d}	57.50^{c}	66.50^{a}	58.50^{b}	4.98	*	47-82
Eosinophils (%)	2.00^{a}	1.00^{b}	2.00^{a}	1.50^{b}	0.18	*	1-7
Monocytes (%)	5.50^{a}	2.50^{d}	3.00^{bc}	4.50^{b}	0.69	*	0-10

$^{Abc.}$ Means within the Same Row with Different Super Scripts Differs Significantly (p<0.05), * Means at 95% (p<0.05), Source (Normal Range): (Tambuwal *et al. 2002*), LL = *Leucaena leucocephala*, SEM = Standard Error of Mean, LOS = Levels of Significant.

3.3 Serum biochemical Parameters of the Experimental Bucks Supplemented with Graded Level of *Leucaena leucocephala* Leaf meal.

The Results of the Serum Biochemistry of Red Sokoto Bucks fed varying levels of the Experimental Diet is represented in Table 4.

3.3.1 Urea (mmol/L)

The Normal Blood Urea Nitrogen values reported for Goats were 5.48± 0.41mmol/L (Ismartoyo *et al.*, 1993) and 3.57-7.14mmol/L Safari *et al.* (2011). The Values observed in this Study (4.40 – 6.20 mmol/L) were all within the Normal Range Expected for Healthy Red Sokoto Goats (RAR 2009). This indicates that Leucaena can be included up to 15% in the Diets of Red Sokoto Bucks to supplement other low quality Feed Resources without affecting the Liver Function.

3.3.2 Glucose (mmol/L)

The values obtained for Blood Glucose Level varied (P<0.05) across the Treatments with the

highest Value observed in T_2(4.35 mmol/L) containing 5% LL inclusion level. The Normal Physiological Range of Blood Glucose in Goats has been reported to be within a Range of 2.78-3.89 mmol/L (Sakha *et al.*, 2019). Therefore, the Concentration of Blood Glucose observed in this Study fell within the Normal Range except for T_2 which is slightly higher than the Normal.

3.3.3 Creatinine (mmol/L)

The Creatinine content of the Bucks increased with increasing *Leucaena leucocephala* supplementation with the highest value of 84.50mmol/L except for Treatment 3 (75.00mmol/L).

Creatinine values of 75.00 – 84.50mmol/l observed in this study also falls within the Normal Range (60-140mmol/l) reported by Research Animal Resources (RAR 2009).

Creatinine is known to have a Link with kidney Function and at High Levels it is Possible to results in Kidney Disease (Kaneko *et al*. 2024).

3.3.4 Total Cholesterols (mg/dl)

Cholesterol values in the current study are generally higher than the Range of 61.50 – 92.00 mg/dL reported by Ngi (2012) for West African Dwarf Goats fed Composite Graded Levels of Sweet Orange Peel Meal. The observed values (91.00 –105.50mg/dL)are however Comparable to the Range of 109.92 – 111.45 mg/dL (2.9 ± 0.02 mmol/L) reported by Njidda *et al.* (2013) for Red Sokoto Goats fed on Natural Grazing Rangeland in Northern Nigeria and fall within the 65 – 136 mg/dL Normal Range for Goats (Merck , 2010). Although differences exist in the cholesterol values among the Treatments.

3.3.5 Total Protein (g/L)

The values obtained for Total Protein Level varied ($P<0.05$) across the Treatments with the Highest Value observed in T_2 containing 5% LL inclusion Level. The Normal Physiological Range of Blood Protein in Goats has been reported to be within a Range of 30 – 65g/l (RAR 2009). Therefore, the Concentration of Blood Protein observed in this study fell within the Normal Range.

3.3.6 Albumin (g/L)

There were significant ($p<0.05$) differences in the ALB values in this Study. The ALB values Ranged from 28.50 – 35.00 g/l and this Range compares favorably with the normal range value for Red Sokoto Goats as described by (RAR, 2009).

3.3.7 Alkaline Phosphate (iu/L)

ALP values of 11.90 – 17.50 iu/L reported in this Study fell within the Normal Range of (12 – 34 iu/l) for Red Sokoto Goats described by (RAR 2009).

Table 4: Serum Biochemical Indices of Red Sokoto Bucks fed Diets containing Graded Levels of *Leucaena leucocephala* Leaf meal as Supplement to Crab Grass.

Parameters	(T1) 0%LL	(T2) 5%LL	(T3) 10%LL	(T4) 15%LL	SEM	LOS	Normal range
Urea(hmol/L)	5.40^{ab}	5.10^{b}	4.40^{c}	6.20^{a}	0.48	*	1-10.5
Glucose(mmol/L)	3.35^{d}	4.35^{a}	3.50^{bc}	3.70^{ab}	0.16	*	2.78-3.89
Creatinine (mmol/L)	78.50^{b}	84.50^{a}	75.00^{c}	84.50^{a}	2.24	*	60-140
Total cholesterol (mg/dl)	105.50^{a}	98.50^{b}	92.50^{c}	91.00^{d}	3.34	*	65 – 136
Total Protein (g/L)	56.50^{b}	58.00^{a}	53.00^{c}	50.50^{d}	1.57	*	30-65
Albumin (g/L)	35.00^{a}	31.50^{b}	30.00^{c}	28.50^{d}	1.47	*	20-42
Alkaline phosphate (iu/L)	17.50^{a}	11.90^{d}	13.50^{bc}	14.40^{b}	1.47	*	12-34

$^{Abc.}$ Means with in the Same Row with Different Super Scripts differ Significantly ($p<0.05$), * Means at 95% ($p<0.05$), Source (Normal Range): (RAR2009), LL = *Leucaena leucocephala*, SEM = Standard Error of Mean, LOS = Levels of Significance.

4 Conclusion and Recommendations

4.1 Conclusion

Based on the findings of this study, it can be concluded that, *Leucaena leucocephala* leaves can be included in the supplement diets of Red Sokoto Bucks fed a basal diet of *Digiteria horizantalis* up to 15% without any detrimental effect on Haematology and Serum Biochemical parameters.

4.2 Recommendations

- *Leucaena leucocephala* Leaf Meal can be included in the Concentrate supplement diets of Growing Red Sokoto Bucks fed a basal Diet of *Digiteria horizantalis*, for optimum values of

haematological and serum biochemical parameters.

- Further Research should be conducted to check the effects of Inclusion of *Leucaena leucocephala* leaf-meal on the Milk Yield and Composition of Red Sokoto Goats.

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