

HAEMATOLOGY AND SERUM BIOCHEMISTRY OF RABBITS FED SELECTED LEGUME FORAGES AND TIGER NUT RESIDUE BASED – DIET

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ABSTRACT

A study was conducted to assess selected tropical legume forages and tiger nut residue based-diet on haematology and serum biochemistry of grower rabbits. Twenty-four rabbits of 2-3 months of age were used for the experiment. They were divided into four treatment groups with 6 rabbits in each treatment and replicated three times with 2 rabbits per replicate. Experimental diet was formulated to meet the nutrient requirement of grower rabbits using tiger nut residue. All the rabbits in the treatment groups were fed the experimental diet. Legumes forages were fed to the rabbits using completely randomized design such that T₁ (control) received concentrate without any forage, T₂ received concentrate and *Centrosema pubescens*, T₃ received concentrate and *Calopogonium muconoides* while T₄ received concentrate and *Leucaena leucocephala*. All management practices necessary for the production of rabbits were observed. Data on haematological indices (Red Blood Cells, haemoglobin, packed cell volume, white blood cells, lymphocytes, mean corpuscular haemoglobin) and serum biochemical indices (creatinine, total protein, Alanine amino transferase and aspartate amino transferase) were assayed and subjected to ANOVA. Results of Haematological and serum biochemical indices showed significant differences ($P < 0.05$) in all the treatments although they were within normal ranges for healthy rabbits. It was concluded that tiger nut residue, *Centrosema pubescens*, *Calopogonium muconoides* and *Leucaena leucocephala* did not have any negative effect on haematological and serum biochemical indices of grower rabbits. It is recommended that tiger nut residue, *Centrosema pubescens*, *Calopogonium muconoides* and *Leucaena leucocephala* be fed to grower rabbits.

Keywords: Haematology, Serum, Rabbit, Biochemistry, Legume forages, Tiger nut residues.

INTRODUCTION

The level of animal protein intake is a concern in Nigeria where there is low supply in meat and other animal products. Evans *et al.*, 2023 reported that in Nigeria, the available protein is given at 45g/caput/day with animal protein accounting 8g/caput/day. This short fall in animal protein can be bridged through intensive rabbit production and other livestock species (Christopher *et al.* 2019; Evans, *et al.*, 2023; Christopher, *et al.*, 2024). However, the production of rabbit is limited because of lack of information on forages and forage preference by the rabbits, diseases infestation and poor nutrition (Evans *et al.*, 2023). It has been noted that while intensive system of production restricts animal from being infected; it denies them free access to fresh green leaves whose contributions would enhance their growth and productivity. Succulent legumes plants like *Leucaena leucocephala*, *Centrosema pubescens*, *Calopogonium muconoides* are available around homestead and are believed to contain reasonable levels of certain valuable nutrients and this resource appear not to have been assessed with regards to haematology and serum biochemical indices to be applied in rabbit feeding. However, they have been reported to possess anti nutrients which can cause disease and affect the growth and productivity of the rabbits. Olumide *et al.* (2020) reported that tiger nut is rich in energy and also identified to contain alkaloids, phytate and tannins. Asides this, research has further shown that forages need to be supplemented with concentrate to improve on the wellbeing of rabbits (Christopher *et al.*, 2024). Tiger nut has levels of anti-nutrients, and may affect haematological and serum biochemical components of rabbits. Etim (2010) reported that Haematology and serum biochemistry are necessary tools in medical diagnosis of disease and is considered integral part of clinical laboratory diagnosis in animals.

There is dearth of information on the use of legumes such as *Centrosema pubescens*, *Calopogonium muconoides*, *Leucaena leucocephala* and tiger nut residues as an alternative feed ingredient for concentrate feed. Hence, the purpose of this study was to evaluate the effects of these legumes and tiger nuts residues-based diet on the haematological and serum biochemistry profile of rabbits.

METHODOLOGY

The study was conducted in the Teaching and Research Farms of the Rabbitry Unit of Department of Animal Science, Obio Akpa Campus, Akwa Ibom State University, Experimental rabbits and tiger nut residue were purchased from a reputable source and the legume forages harvested all within the University community. Tiger nut residue was dried for 3 days to free the residue from mold. Harvesting of the forages was done on every eve of the day proceeding feeding.

40% tiger nut residue was used to formulate the experimental diet. Other ingredients were adjusted such that the diet met the requirements of growing rabbits. Ingredients and calculated nutrient composition of the experimental diets are presented in Table 1. Twenty-four (24) rabbits of mixed sex between 2-3 months of ages were used for the experiment. They were housed in a well washed and disinfected hutches measuring 60 x 45 x 45. The rabbits were divided into four treatment groups with 6 rabbits to each treatment and replicated 3 times with two rabbits in each replicate. Rabbits were fed in a completely randomized design such that rabbits in Treatment 1 (control) had only concentrate, Treatment II had concentrated and *Centrosema pubescence*, Treatment III had concentrated and *Calopogonium mucoides*; Treatment IV had concentrated and *Leucaena leucocephala*. Feed and water were given *ad-libitum*. All routines management practices were observed and the experiment lasted for 56 days.

Data Collection

At the end of the feeding trial three rabbits were selected from each treatment group (one per replicate) and used for the determination of the haematological and serum biochemical indices.

Statistical Analysis

All the data obtained were subjected to one-way analysis of variance (ANOVA) for a Completely Randomized Design. Means were compared using Duncan's New Multiple Range Test (SPSS, 2011).

Table 1. Composition of the experimental diet

Ingredients	Composition
Tiger nut residue	40.00
Soybean	20.00
PKC	5.00
Wheat offal	30.00
Bone meal	4.00
Lysine	0.25
Methionine	0.25
Vitamine premix	0.25
Salt	0.25
Total	100.00
Calculated	
ME (kcal/kg)	2716.32
Crude protein (%)	17.78
Crude fibre (%)	10.03
Ash (%)	2.75
Nitrogen free extract	69.44

The results of the tiger nut residue meal-based diet and the different legume forages on haematological indices and serum biochemistry are presented in Tables 2 and 3

RESULTS AND DISCUSSION

The haematological and serum biochemical indices of rabbits fed tiger nut residue-based diet and selected legumes is presented in Tables 2 and 3

Table 2: haematological indices of Rabbits Fed Tiger Nut Based Diets and Selected Forages

Parameter	Experimental treatments				SEM	Normal Ranges
	T ₁ (Control)	T ₂ (CT)	T ₃ (CP)	T ₄ (LL)		
PCV(%)	32.00 ^c	35.00 ^b	38.00 ^a	37.00 ^{ab}	7.33	30-50
Hb (g/dl)	9.90	10.90	11.60	10.90	0.31	9-15
RBC(x10 ³ /ul)	4.40	4.70	5.40	5.30	0.28	4-10
WBC(x10 ³ /ul)	5.90	6.30	7.50	7.10	0.31	5-12.5
Lymphocytes(%)	77.00 ^a	69.33 ^b	60.00 ^c	54.00 ^d	2.66	40-80
MCH(pg)	32.00 ^a	22.33 ^b	22.00 ^b	21.00 ^b	1.37	20-35
MCV(fl)	72.00 ^{ab}	74.00 ^a	69.00 ^c	70.00 ^{bc}	0.63	65-95
MCHC(g/dL)	22.00 ^b	31.33 ^a	31.33 ^a	29.33 ^a	1.20	20-37

^{abcd}: Means across treatment bearing different superscripts are significant (p<0.05). MCV = Mean corpuscular volume. MCH = Mean corpuscular haemoglobin. MCHC = Mean corpuscular haemoglobin concentration. SEM = Standard Error of Mean, WBC = White Blood Cell. PCV + Packed Cell Volume. Hb = Haemoglobin, RBC + Red Blood Cell. CT= Centro, CP=Calpogonium, LL=Leucena.

Table 3: Serum Biochemistry indices of Rabbits fed tiger nut-based diets and selected forages

Parameter	Experimental treatments				SEM	Normal Ranges
	T ₁ (Control)	T ₂ (CT)	T ₃ (CP)	T ₄ (LL)		
Creatinine (g/dl)	75.00 ^d	153.00 ^a	134.00 ^c	146.00 ^b	9.28	50-200
Total protein (g/dl)	55.00 ^c	61.00 ^b	62.33 ^b	65.00 ^a	1.13	50-75
AST(U/l)	27.00 ^d	41.00 ^b	52.00 ^a	36.00 ^c	2.73	25-60
ALT(U/l)	17.00	29.66	43.00	30.66	2.79	10-60
Cholesterol (g/dl)	5.50 ^a	2.10 ^c	4.10 ^b	2.20 ^c	0.49	1.0-8.0

abcd: Means across treatment bearing different superscripts are significant ($p < 0.05$). AST = Aspartate Amino Transferase, ALT = Alanine Amino Transferase CT = Centro, CP = Calopogonium, LL = Leucena..

The haematological indices in this study showed significant effect ($P < 0.05$) amongst the treatment groups. Haemoglobin, packed cell volume, red blood cells, mean corpuscular haemoglobin concentration are indices used to detect the oxygen carrying capacity, anaemia and blood cells count. The lymphocytes and the white blood cells are responsible for detection of infection and the strength of the body immune system. Although there were significant differences ($P < 0.05$) in the indices in all the treatment groups, they were within the normal ranges recommended for healthy rabbits. The differences may be attributed to the source of legume and the disparity in nutritional composition of the different legumes. This ranges obtained from this study agrees with Etim *et al.* (2014). The findings of this study imply that neither tiger nut residue nor any of the legumes had a negative influence on the haematological indices of grower rabbits.

Serum biochemical indices in this study also showed significant difference ($P < 0.05$) in all the treatments. Total protein measures the globulin and albumin levels and abnormal levels depicts infection and nutritional deficiency and malnutrition. Serum test with abnormal levels of aspartate amino transferase and alanine amino transferase signals liver problem. The presence of high-level creatinine in the blood indicates poor kidney function, an inability of the kidney to filter creatinine, a waste product in the blood. Experimental diet and the legume forages maintained the healthy levels of biochemical parameters, a clear indication that levels of antinutrients in these studied forages and tiger nut residue posed no negative effect to health of rabbits. This study agrees with Etim *et al.* (2013) who reported normal ranges of serum biochemical indices of rabbits.

CONCLUSION

Haematology and serum biochemistry are tools for detecting nutritional abnormality. Tiger nut based-diet and legume forages (*Centrosema pubescence*, *Calopogonium mucoides* and *Leucaena leucocephala*) did not show negative effect on both blood and serum parameters.

RECOMMENDATION

From the findings of this research, it is recommended that tiger nut residue-based diet and any of the legume forages should be used in feeding grower rabbits for maintenance of healthy ranges of indices of Haematology and serum biochemistry of grower rabbits.

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