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EVALUATION OF THE BLOOD PROFILE OF GROWING RABBIT BUCKS FED GRADED LEVELS OF *Tephrosia bracteolata* LEAF MEAL

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ABSTRACT

Twenty-five (25) grower rabbit bucks of mixed breeds weighing between 875.80 - 878.60 g were randomly allocated into five (5) treatment groups with five (5) rabbit bucks per treatment. Each rabbit buck served as a replicate. The rabbit bucks were fed diets containing 0%, 20%, 25%, 30% and 35% *Tephrosia bracteolata* leaf meal diets designated as T_1, T_2, T_3, T_4 and T_5 respectively. The experimental diets and clean drinking water were served ad-libitum throughout the experimental period of twelve (12) weeks. The result of the experiment showed no significant ($P>0.05$) differences among the treatments for packed cell volume (PCV), haemoglobin concentration (Hb), mean corpuscular haemoglobin concentration (MCHC) and monocytes. The values were within the normal range for healthy rabbits. The values of red blood cell count, mean corpuscular volume, mean corpuscular haemoglobin, red cell distribution width, white blood cells, platelets, neutrophils and lymphocytes were also within the normal range for rabbits. There was no significant ($P>0.05$) difference in all the serum biochemical parameters. Only alkaline phosphatase, glucose and urea were within the normal range. This study revealed that dietary inclusion of *Tephrosia bracteolata* leaf meal up to 35% per feed had no adverse effect on the blood profile of rabbit bucks. It was recommended that *Tephrosia bracteolata* leaves can be used in rabbit diets without any adverse effect.

Key words: Blood profile, rabbit bucks, *Tephrosia bracteolata*

INTRODUCTION

In Nigeria and other developing nations, scarcity of animal protein and protein deficiency gap calls for an urgent attention to avert protein related malnutrition (Taiwo *et al.*, 2005; Ekenyem *et al.*, 2006; Omodele and Okere, 2014). The Nigerian Society of Animal Production (NSAP) (2009) noted that the Nigerian livestock industry contributes about 9-10 percent of the gross domestic product (GDP) and only 35.5% of the protein intake of Nigerians. Thus, while it was recommended that about 28% (65 g) of estimated minimum protein requirement for an average Nigerian per day should be obtained from animal protein (Imoh, 2002), only 10 grams is derived from animal sources. The low level of animal protein intake by Nigerians, and other citizens of other developing countries have generated concern as it affects tissue repair and maintenance in the aged people, tissue formation and mental development of youth and labour force (Akinmutimi, 2004).

One reason for the protein deficiency gap is that livestock production in the tropics is not keeping pace with human population growth rate put at 3.2% (NPC, 2006). Another critical reason is the scarcity and high cost of conventional feedstuff for domestic animals. Feed cost is estimated to be over 70% of the

total cost of intensive livestock production (Oruwari *et al.,* 1995; Oluremi *et al.,* 2008). This percentage contrasts with what is obtainable in the developed countries (Tackie and Flesncher, 1995). Cereal such as maize is an excellent source of energy for livestock, but it is expensive due to short supply and high competition between man and livestock. To solve this nutritional problem, there is need for the production of fast growing and short generation interval animals such as rabbits against the background of its nutrients intake and utilization from unconventional sources. Unconventional sources of feed are less competitive, not expensive and can be efficiently converted by rabbits to meat and other consumable animal products.

Tephrosia bracteolata is a shrub plant which attains early maturity, possesses high nutritive value and is found in many tropical and sub-tropical environments especially in the guinea savannah region (Dalziel, 1957). *Tephrosia bracteolata* leaves and roots have some medicinal values. The leaf-preparation is used in the treatment of whitlow, toothache, earache, and open wound (Onaolapo, 2000). Onalolapo (2000) also reported that *Tephrosia bracteolata* is not toxic but safe for human and animal consumption. *Tephrosia bracteolata* is good in fixing nitrogen to the soil, stabilizes soil aggregate and reduces the methanogenesis in ruminants which causes global warming by depleting the valuable ozone layer (Ogungbesan, 2011). Intensive approach to rabbit production would however entail the use of alternative nutritionally viable sources other than the conventional ones to enhance the production of meat at affordable price. Such alternative plant sources are currently under investigation; they are being evaluated for nutritiveness, availability, acceptability and affordability. It is in light of the above that *Tephrosia bracteolata* leaf meal, relatively unexploited forage, is being assayed for its feed value (Jiwuba *et al*. 2016). Due to the shortages in supply of cereals and oil seeds, and the resultant increase in prices and other conventional feedstuffs, the use of *Tephrosia bracteolata* leaf meal which is abundantly available in Nigeria is currently being explored. There is dearth of information on the blood profile of rabbit bucks fed *Tephrosia bracteolata* leaf meal. Haematological and serum biochemical studies are widely used for the diagnosis of animal diseases as well as investigation of blood damage, feed toxicity and protein quality (Jiwuba *et al*. 2016).

The aim of this study was to determine the haematology and serum biochemical parameters of rabbit bucks fed graded levels of *Tephrosia bracteolata* leaf meal.

MATERIALS AND METHODS

The study was conducted at the Rabbitry Unit of the Livestock Teaching and Research Farm, Federal University of Agriculture, Makurdi, Benue State. Makurdi lies on latitude 7° 44' North and longitude 8° 31' East, and is within the Southern Guinea Savannah belt of Nigeria. The daily temperature ranges between 21.6°C in December/January and 42.6°C in February/March. The annual rainfall (April through October) ranges from 1,105 mm – 1,600 mm and relative humidity is highest (69 %) between August and September and lowest (39 %) between January and March (TAC, 2009). *Tephrosia bracteolata* leaves were harvested from the wild from various locations in Makurdi metropolis, Benue State. The test ingredient (*Tephrosia bracteolata* leaves) was dried under shade. Poultry growers' marsh was obtained from livestock feed shops. Forages (*Tridax procumbens)* were harvested from the wild and administered equally to the animals across the treatments. Drugs required for medication were purchased from veterinary and livestock feed shop.

Experimental Animals, Design and Management

A total of twenty-five (25) mixed breed, grower rabbit bucks were obtained from a reputable, rabbit farm in Makurdi and used for the twelve (12) weeks experiment. The cages, feeders and drinkers were properly cleaned and disinfected seven days before the arrival of the rabbits. The rabbits were reared in individual hutches made of iron/wire netting. The rabbits were allowed to adjust to the new environment after which five rabbits each were randomly allocated to each treatment group, with each rabbit serving as a replicate in a completely randomized design. Standard rabbit husbandry practices including, medications against external and internal parasites, recommended sanitary measures and other health practices were observed throughout the experimental period. Feed and water were provided *ad-libitum*.

Experimental Diet

Five experimental diets tagged T_1,T_2, T_3, T_4 and T_5 were prepared with T_1 having no *Tephrosia bracteolata* leaf meal and served as the control, while T_2, T_3, T_4, and T_5 contained 20%, 25%, 30% and 35% *Tephrosia bracteolata* leaf meal replacement levels respectively.

Table 1: Composition of grower rabbits experimental diets (kg/100kg)

Ingredients	**T_1**	**T_2**	**T_3**	**T_4**	**T_5**
CGF	100.00	80.00	75.00	70.00	65.00
TBLM	-	20.00	25.00	30.00	35.00
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Calculated Analysis					
Crude protein	14.88	15.20	15.29	15.37	15.45
ME (kcal/kg)	3088.64	2915.53	2872.26	2828.99	2785.71
Crude fibre	6.89	12.04	13.34	14.62	15.91
Ether extract	4.75	4.22	4.08	3.96	3.82
Ash	12.93	11.97	11.74	11.49	11.26
NFE	60.55	56.56	55.56	54.57	53.57

T1-T5= Treatments 1,2,3,4 and 5. CGF= Commercial growers feed, TBLM= *Tephrosia bracteolata* leaf meal, ME= Metabolisable energy in kilo calorie per kilogram. (ME kcal/kg = [37× %CP + 81.8 × %EE + 35.5 × %NFE], Pauzenga (1985). NFE= nitrogen free extract. *Tridax procumbens* = This was administered across the treatments (T_1-T_5) at 30g each to avoid biasness in feed administration and to also take care of crude fibre deficiency in T_1.

Haematological Indices

At the end of the feeding trial, three (3) rabbits per treatment were selected at random and blood samples were collected from the jugular vein into labelled test tubes containing anti-coagulant, *Ethylene Diamine Tetra Acetic Acid* (EDTA) and were used to determine the packed cell volume (PVC), red blood cells count (RBC), haemoglobin concentration (Hbc), white blood cells count (WBC), monocytes, lymphocytes and neutrophils. Erythrocytic indices such as mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration were calculated. All haematological characteristics were determined by conventional laboratory methods at the

Veterinary Teaching Hospital, Federal University of Agriculture, Makurdi.

Serum Biochemical Parameters

Blood sample were collected as stated above in a set of sample bottles without EDTA. The sample was used to analyze for serum metabolites. The parameters determined were total protein, albumin, urea, glucose, cholesterol, serum transaminases (alanine aminotransferase ALT; aspartate aminotransferase AST), alkaline phosphatase, creatinine. All serum biochemical parameters were analyzed at the Veterinary Teaching Hospital, Federal University of Agriculture, Makurdi.

Statistical Analysis

The data collected were subjected to one way analysis of variance (ANOVA) using Minitab version 16 (2014). Significant treatment means were separated using Fisher's Least Significant Difference (LSD) in the statistical software.

RESULTS

The results of the effect of *Tephrosia bracteolata* leaf meal on haematological parameters of rabbits are presented in Table 2. Mean corpuscular volume, mean corpuscular haemoglobin, red cell distribution width, white blood cell, platelet, neutrophils and lymphocytes were significantly ($P<0.05$) different among treatments, while the packed cell volume, haemoglobin, red blood cell count, mean corpuscular haemoglobin concentration and monocytes were not significantly ($P>0.05$) different .

The results (Table 3) of the effect of *Tephrosia bracteolata* leaf meal on serum biochemical parameters of rabbit bucks, Shows that Alkaline phosphatase, glucose and urea were significantly ($P<0.05$) different among the dietary treatments, whereas Alanine aminotransferase, aspartate aminotransferase, creatinine, total protein, albumin and total cholesterol were not significantly ($P>0.05$) different .

Table 2: Haematological indices of rabbit bucks fed graded levels of *Tephrosia bracteolata* leaf meal

Parameters	T_1	T_2	T_3	T_4	T_5	SEM
PCV (%)	38.90	43.87	38.53	34.00	31.90	8.16
Hb (g/dl)	11.80	12.13	11.07	9.43	9.07	2.15
RBC ($10^{12/l}$)	6.10	6.02	5.76	5.33	5.26	3.94
MCV (fl)	34.10^{b}	72.70^{a}	66.87^{a}	63.87^{a}	60.83^{a}	14.15
MCH (pg)	9.93^{b}	20.07^{a}	18.97^{a}	17.60^{a}	17.27^{a}	3.62
MCHC (g/l)	307.00	279.67	285.33	279.00	283.00	18.84
RDW (%)	20.20^{a}	15.87^{b}	15.97^{b}	15.90^{b}	15.93^{b}	1.80
WBC (10^{9}/l)	9.57^{a}	5.40^{c}	6.80^{bc}	8.73^{ab}	6.53^{bc}	1.38
PLT (10^{9}/l)	129.33^{c}	127.33^{c}	225.33^{b}	303.67^{a}	242.00^{ab}	35.38
NEUT (%)	37.87^{cd}	29.70^{d}	47.83^{bc}	55.17^{ab}	70.07^{a}	8.20
LYMPH (%)	56.30^{ab}	68.17^{a}	49.53^{bc}	38.87^{c}	25.07^{d}	7.42
MONO (%)	5.77	2.13	2.60	5.97	4.87	2.48

T1-T5= Treatments 1, 2, 3, 4 and 5. SEM = Standard error of mean. PCV= packed cell volume. Hb= Haemoglobin. RBC= Red blood cell count. MCV= mean corpuscular volume. MCH= mean corpuscular haemoglobin. MCHC= mean corpuscular haemoglobin concentration. RDW= red cell distribution width. WBC= white blood cell count. PLT= Platelet. NEUT= neutrophils. LYMPH= Lymphocytes. MONO= Monocytes. $^{a, b, c, d}$ = means on the same row with different superscripts are significantly ($P<0.05$) different.

Table 3: Serum biochemical parameters of rabbit bucks fed graded levels of *Tephrosia bracteolata* leaf meal

Parameters	T_1	T_2	T_3	T_4	T_5	SEM
ALT (u/l)	22.33	24.33	22.33	21.33	25.00	3.93
AST (u/l)	28.33	32.67	29.00	26.67	30.67	4.18
CREAT (mg/dl)	1.33	2.47	1.87	1.93	2.13	0.65
T.P (g/l)	5.40	4.67	5.60	4.83	5.27	8.40
ALB (g/dl)	3.07	2.67	2.90	2.83	2.97	3.50
ALP (u/l)	22.33^{a}	16.00^{b}	20.33^{ab}	17.00^{ab}	21.00^{ab}	3.22
GLU (g/dl)	116.00^{ab}	102.67^{ab}	100.33^{b}	98.67^{b}	120.33^{a}	9.76
UREA (mg/dl)	28.00^{ab}	22.00^{b}	27.00^{ab}	32.33^{a}	27.33^{ab}	5.23
T. CHOL (mmol/l)	19.82	26.67	26.31	34.05	26.31	0.55

$^{a, b, c, d}$ = means on the same row with different superscripts are significantly (P<0.05) different.
T1-T5= Treatments 1, 2, 3, 4 and 5. SEM= Standard error of mean. ALT= Alanine transferase. AST= Aspartate transferase. CREAT= Creatinine. T.P= Total protein. ALB=Albumin. ALP= Alanine phosphatase. GLU= Glucose. T. CHOL = Total cholesterol.

DISCUSSION

Packed cell volume values obtained in this study ranged from 31.90 to 43.87 %. These values were within the normal range for rabbits (RAR, 2011). The result in this study is in agreement with the reports of Ahemen *et al*. (2013) when *Moringa oleifera* leaf meal was fed at graded levels to rabbits. Packed cell volume values obtained in this study were within the range considered to be normal values for rabbits. These values are an indication that the nutritional status of the rabbits is adequate. The haemoglobin (Hb) values obtained in this study were within the normal range (9.4 to 17.4 g/dl) as recommended by (MediRabbit.com, 2017). The result agrees with the range (10 to 15 g/dl) recommended by RAR (2011), which is an indication of good oxygen transport in the blood. Mean corpuscular haemoglobin concentration were within the normal reference (27.00 to 34.00 g/dl) values (MediRabbit.com, 2017). The monocytes value (2.13 to 5.97%) reported in this study were also within the normal range reported by RAR (2011). The result in this study is also in tandem with the reports of Ahemen *et al.* (2013) when *Moringa oleifera* leaf meal was fed at graded levels to rabbits.

The red blood cell count, white blood cell counts and platelet values were within the normal range for rabbits (RAR, 2011; Kagya-Agyemang *et al.*, 2013; MediRabbit.com, 2017). The normal red blood cell count value is an indication of good oxygen and circulation in the blood of the rabbits (Ahemen *et al.*, 2013). These results indicated that the animals were healthy because white blood cells below the normal range are an indication of allergic conditions and parasitic infections (Ahamefule *et al.*, 2008). Mean corpuscular haemoglobin values were found to be within the range considered for normal clinically healthy rabbits (MediRabbit.com, 2017) except for Treatment 1 which was fed the control diet. The blood differential counts such as Neutrophils (29.70 to 70.07 %) and lymphocytes (25.07 to 68.17 %) reported in this study were also within the normal range (RAR, 2011). The normal

haematological indices reported in this study imply that the processes of blood formation and functions were not interfered by the inclusion of *Tephrosia bracteolata* leaf meal in the diet of rabbit bucks.

The results of alanine aminotransferase (ALT), aspartate aminotransferase (AST) reported in this study are in line with the normal values 10 - 45 µ/l, 12 - 67 µ/l and 10 – 120 µ/l, 14 – 113 µ/l reported by RRR (2002) and RAR (2011). The normal serum biochemical parameters obtained in this study is an indication that the inclusion of *Tephrosia bracteolata* leaf meal has no negative effect on the health status of the rabbit bucks. Alkaline phosphatase values obtained in this study were significantly ($P<0.05$) different among treatment groups and were within the normal range of 4 to 20 µ/l and 5 – 20 µ/l recommended by RRR (2002) and RAR (2011) respectively. The results of the total protein and albumin obtained in this study were not significant among the treatments. The values obtained were within the normal range 5.4 – 7.3 g/dl and 2.4 – 4.5 g/dl as recommended by RRR (2002). Total protein value obtained in this study agreed with the findings (5.4 – 7.5 g/dl) reported by Kaya-Agyemang *et al.* (2013). The Albumin values obtained in this study agrees with the report of Ahemen *et al* (2013) when *Moringa oleifera* leaf meal was fed to rabbits. Albumin value also agrees with the reported values of Ladipo *et al.* (2015). The value (1.33 to 2.47 mg/dl) obtained for creatinine in this study is in conformity with the value (0.5 to 2.2 mg/dl) and (0.8 to 1.8 mg/dl) recommended by RRR (2002) and RAR (2011) respectively. The value obtained in the study also agrees with the reported values of Ahemen *et al.* (2013). The glucose obtained in this study varied from 98.67 to 120.33 g/dl which is in line with the normal range 75 to 150 g/dl recommended by RAR (2011). The results also agree with the value reported by Ahemen *et al* (2013). Normal blood sugar level implies that the experimental diets were palatable and met the requirements for growth and development. Urea levels reported in this study were within the range (10 to 33 mg/dl) recommended by RRR (2002). Urea level in the blood is an indication of good quality dietary protein in the fed ingredient (Okorie, 2006).

CONCLUSION

The result of this study showed that *Tephrosia bracteolata* leaf meal will support a normal blood profile. From the results, it was concluded that inclusion of 35 % *Tephrosia bracteolata* leaf meal in rabbit diets has no adverse effects on the blood profiles of growing rabbits.

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