

Haematology and Blood Biochemistry of West African Dwarf Bucks Fed Graded Levels of Black Plum (*Vitex doniana*) Leave Meal

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Abstract: Fifteen (15) West African Dwarf bucks with average initial weights of 10kg were used in an experiment to investigate the effect of varying levels of *Vitex doniana* leaf meal on the haematology and serum biochemistry of West African Dwarf buck. The animals were randomly signed to five treatments in a completely randomized design and the experiment lasted for twenty-eight (28) days. At the end of the feeding trial, blood samples were collected from the jugular veins of the animal for the determination of haematological and serum biochemical characteristics using standard laboratory methods. The effects of graded levels of *Vitex doniana* leaf meal on haematology of West African dwarf reveals that red blood cell (RBC) significantly ($p < 0.05$) increase with concurrent increase in *Vitex doniana* leaf meal whereas the haemoglobin (Hb) and packed cell volume (PCV) reduced with the addition of the leaf meal. Other parameters were not significantly ($p < 0.05$) different from the control, although it varies with increase in the leaf meal addition. The serum biochemistry of West African dwarf bucks showed that total protein (TP), albumin (ALB), urea and glucose significantly increase with increase in *Vitex doniana* leaf meal. Alkaline phosphatase (ALP), Alanine aminotransferase (ALT) and Aspartate aminotransferase (AST) was significantly ($p < 0.05$) influenced by the increase in *Vitex doniana* leaf meal inclusion. The ALT and AST were not significantly ($p < 0.05$) different ($p < 0.05$) from the control in treatment D. All the haematological and serum biochemical characteristics of the bucks were within the normal standard blood ranges for apparently healthy bucks. The study therefore concludes that farmers can supplement goat feed with up to 20% *Vitex doniana* leaf meal in formulated diets meant for goats, without fear of compromising haematopoietic processes and chemistry

Keywords: Feed, bucks, leaf meal, blood.

INTRODUCTION

Production of ruminant animals in developing African countries is often characterized with low level of efficiency. The apparent inefficiency of ruminant production was attributed to unfavourable climate, disease prevalence and feed shortage especially during dry seasons. The first two factors tend to encourage adoption of intensive ruminant farming system which can further aggravate the problem of inadequate feed supply. The cost of feed accounts for about 60% of total intensive production cost compared to 40% value under extensive production system (Atteh, 2002). A large reduction in feed cost is achievable by the use of unconventional feed resources such as fodder or shed tree leaves to bring about improvement in ruminant production efficiency in the resource poor developing countries like Nigeria.

The aim of the present work was to exploit the potential of *Vitex doniana* (black plum) leaves, which presently are of little economic value for goat feeding under intensive system of production. The work aims at assessing the nutritive value of *Vitex doniana* leaves through a feeding trial with goats.

Materials and Methods

Site and Period of the Study: Feeding trials and laboratory analyses were conducted in the Livestock unit of the University Farm and the Animal Production Laboratory respectively at the Department of Animal Production, University of Ilorin located on Latitude 08° 29'N; Longitude 004° 35'E; Elevation 308 m. having a mean annual rainfall of 98.75 mm that is spread largely over the months of May to October.

Collection and Processing of *Vitex doniana* Leaves

Fresh leaves were collected from *Vitex doniana* (Black plum) trees on the University of Ilorin farm during the dry season months of November and December. Leaf samples were identified at the Faculty of Life Science.

University of Ilorin Herbarium and a sample deposited with assigned voucher number. The leaves were subsequently air-dried for 10 days and kept inside jute bags in a well ventilated open shed that was protected from rain and direct rays of sunlight. The leaves were later processed by grinding in a hammer mill to pass through 2-mm sieve and kept in jute bags for subsequent feed formulation. Samples of the leaves were analyzed for gross energy, dry matter and chemical components (Table 1).

Feed Formulation and Processing: The leaves were mixed with crushed maize, soy bean meal, bone meal and sodium chloride in the different inclusion levels of 0, 5, 10, 15 and 20g/kg of leaves to feed as indicated on Table 1. The resultant feeds were processed into crumbles to reduce dustiness, facilitate handling and encourage intake by animals. Each feed was wetted with about 2% (V/W) clean drinking water and sun-dried on concrete slab for 5 – 6 hours.

Experimental Design and Animal Management: A 28 – day growth and nutrient digestibility trial was conducted with fifteen weanling male West African Dwarf goats of average initial live weight of 10.50 ± 0.34 . Goats were divided into five dietary treatment groups of three bucks each in a completely randomized design. Animals in treatment A (control) were given formulated diet with no *Vitex doniana* leaf meal while the other four treatment (B, C, D and E) had *Vitex doniana* leaf meal in varying inclusion level of 5, 10, 15 and 20g/kg of feed respectively. The animals were fed 300g/day of the formulated feed throughout the experimental period. *Panicum maximum* were also provided in abundance for the bucks.

On the 28th day, blood was collected by jugular vein puncture with hypodermic needles and syringe from three animals per treatment into two (2) clean test tubes, one with an anticoagulant, Ethylene Diamine tetra Acetate (EDTA) for haematological analysis and the other without EDTA for serum biochemical analysis. All haematological parameters were determined by conventional laboratory methods of Baker and Silvertown (1982). Serum biochemical indices were assayed using standard laboratory methods (Ochei and Kolhatkar, 2007). All data were analyzed using the analysis of variance (ANOVA) procedure following a completely randomized model (Steel and Torrie, 1980) and the levels of significance were determined using the Duncan's Multiple Range Test.

Table 1: Composition of basal experimental diet

Ingredients	% Inclusion
Maize	30
Groundnut cake	14
Wheat offal	33
Rice bran	10
Palm kernel cake	10
Table Salt	1
Premix	0.25
Limestone	1
Bone meal	0.75
Total	100

Table 2: Proximate composition of experimental diets and *Vitex doniana* leaf meal

Where A is the control (basal diet without *Vitex doniana* leaf meal), B (basal + 5g *V. doniana*), C (basal + 10g *V. doniana*), D (basal + 15g *V. doniana*), E (basal + 20g *V. doniana*), V (*Vitex doniana* leaf meal)

Parameter (%)	A	B	C	D	E	V
Dry matter	84.62	91.46	90.88	90.98	91.51	92.75
Moisture content	15.38	8.54	9.12	9.02	8.49	7.25
Crude fat	3.94	4.98	2.91	4.39	5.42	6.44
Crude protein	16.19	16.59	19.69	16.79	15.31	8.53
Crude fibre	6.05	13.40	8.35	9.03	9.14	7.15
Ash content	8.69	10.23	8.33	9.50	8.56	8.26

doniana), D (basal + 15g *V. doniana*), E (basal + 20g *V. doniana*), V (*Vitex doniana* leaf meal)

RESULTS AND DISCUSSION

The effects of graded levels of *Vitex doniana* leaf meal on haematology of West African dwarf reveals that red blood cell (RBC) significantly increase with concurrent increase in *Vitex doniana* leaf meal whereas the haemoglobin (Hb) and packed cell volume (PCV) reduced with the addition of the leaf meal (Table 3). Other parameters were not significantly different from the control, although it varies with increase in the leaf meal addition. Table 4 shows the effects of graded levels of *Vitex doniana* leaf meal on serum biochemistry of West African dwarf bucks. The result showed that total protein (TP), albumin (ALB), urea and glucose significantly increase with increase in *Vitex doniana* leaf meal. Alkaline phosphatase (ALP), Alanine aminotransferase (ALT) and Aspartate aminotransferase (AST) was significantly influenced by the increase in *Vitex doniana* leaf meal inclusion. The ALT and AST were not significantly different ($p < 0.05$) from the control in treatment D.

Table 3: Effects of graded levels of *Vitex doniana* leaf meal on haematology of West African dwarf bucks

Parameters	A	B	C	D	E	±SEM
Red blood cells $\times 10^{12}/L$	12.68 ^d	12.88 ^c	13.18 ^b	13.22 ^b	13.89 ^a	0.03
Haemoglobin (g/dl)	9.86 ^b	10.70 ^a	10.63 ^a	9.22 ^c	9.36 ^c	0.26
Packed cell Volume (%)	26.00 ^b	28.33 ^a	29.00 ^a	24.00 ^c	24.33 ^c	1.32
White blood cells $\times 10^9/L$	13.33 ^a	13.00 ^{ab}	13.00 ^{ab}	12.56 ^b	12.78 ^{ab}	1.81
Neutrophils (%)	21.67 ^{ab}	20.00 ^b	23.33 ^a	23.33 ^a	23.33 ^a	1.84
Lymphocyte (%)	83.70 ^{ab}	90.03 ^a	78.45 ^b	77.04 ^b	74.07 ^b	1.23
Monocytes (%)	2.33 ^b	3.00 ^a	1.33 ^c	1.33 ^c	1.33 ^c	0.37
Eosinophil (%)	0.00 ^b	1.00 ^a	0.00 ^b	0.00 ^b	0.00 ^b	0.87

a, b, c, d – means along the rows with different superscripts differ significantly ($p < 0.05$). A (basal diet without *Vitex doniana* leaf meal), B (basal + 5g *V. doniana*), C (basal + 10g *V. doniana*), D (basal + 15g *V. doniana*), E (basal + 20g *V. doniana*).

Table 4: Effects of graded levels of *Vitex doniana* leaf meal on serum biochemistry of West African dwarf bucks

Parameters	A	B	C	D	E	±SEM
Total protein (g/L)	10.00 ^b	11.67 ^a	9.65 ^{ab}	9.15 ^b	11.33 ^a	1.19
Albumin (g/L)	3.67 ^c	3.77 ^b	3.67 ^c	3.00 ^d	4.44 ^a	0.35

Urea (mmol/L)	2.00 ^d	2.53 ^c	3.10 ^b	2.07 ^d	5.73 ^a	0.26
Creatinine (μmol/L)	0.24 ^d	0.39 ^a	0.24 ^d	0.27 ^c	0.31 ^b	1.04
Glucose (mmol/L)	0.57 ^b	0.87 ^a	0.33 ^c	0.30 ^c	0.83 ^a	0.05
ALP (IU/L)	86.00 ^c	68.67 ^d	98.00 ^b	108.33 ^b	108.33 ^a	2.83
ALT (IU/L)	27.67 ^a	26.00 ^b	21.67 ^c	28.00 ^a	17.67 ^d	1.19
AST (IU/L)	90.33 ^b	83.33 ^b	88.00 ^b	92.00 ^b	142.33 ^a	0.91

a, b, c, d – means along the rows with different superscripts differ significantly ($P < 0.05$). A (basal diet without *Vitex doniana* leaf meal), B (basal + 5g *V. doniana*), C (basal + 10g *V. doniana*), D (basal + 15g *V. doniana*), E (basal + 20g *V. doniana*). ALT- Alanine aminotransferase, ALP- Alkaline phosphatase and AST- Aspartate aminotransferase

Red blood cell (RBC) of $13.89 \pm 0.03 \times 10^{12}/L$ obtained for buck receiving *Vitex doniana* leaf meal at level of 20g in treatment E was significantly ($P > 0.05$) higher than all other treatment. RBC values of $12.88 \pm 0.03 \times 10^{12}/L$ in treatment A and $13.89 \pm 0.03 \times 10^{12}/L$ in treatment E were in contrast with the report of Kocatepe (2012) in Saanen goats but was within the range reported by Daramola *et al.* (2005) in West African Dwarf goat. It could be said that RBC value changes with breed. It therefore shows that *Vitex doniana* has no negative effect on the health status of the animal. Haemoglobin concentration (g/dl) were significantly higher ($P > 0.05$) in treatment B and C while A was slightly different from treatment C and D. The haemoglobin concentration was within the normal range reported by Daramola *et al.* (2005). Increase in haemoglobin implies that the animals were able to transport oxygen to tissues for oxidation of ingested food so as to release energy for the other body functions (Olorunnisomo *et al.*, 2012). The PCV value fell within the normal range reported by Tambuwal *et al.* (2002) for Red Sokoto goat; *Vitex doniana* leaf meal has positive effect on treatment two and three but this decrease at four and five. The WBC counts were in contrast with the report of Kocatepe (2012) on Saanen goat. This different could be as a result of breed, environmental factor and age of the animal. Neutrophil, the most abundant of white blood cell type increases from treatment B to C but constant till treatment E which means *Vitex doniana* has no significant effect again with 20g of the leaf meal. Lymphocytes are the largest type of white blood cell and it is a granulocyte. It is significant ($P > 0.05$) at treatment B while it was constant at treatment C, D and E. Eosinophil was only significant in treatment B. Eosinophils are responsible for fighting infections of parasitic worms. These cells release toxins that kill the worms and are also involved in the inflammatory response when there is an allergic reaction. This fell within normal range reported by (Daramola *et al.*, 2005; Zamiri and Heidari, 2006). Total protein value is significantly high ($P > 0.05$) compared with the control. *Vitex doniana* leaf seems to improve the total protein which serves as buffer in the maintenance of Acid-base balance and a carrier of essential blood constituents such as hormone, vitamins and certain minerals. Plasma protein helps to transport calcium, phosphorus and other substances in the blood by attachment to the albumin (Dacie and Lewis, 2001; Okukpe *et al.*, 2015). Albumin which is most abundant serum total protein, in this study, it is high in treatment five but no significant different between other treatments and control. This implies that *Vitex doniana* leaf meal at 20g improve Albumin level. Urea and creatinine are waste products of protein metabolism and waste generated from creatine respectively. High value of urea is toxic to the body likewise the high value of creatinine shows a renal dysfunction. Though, urea is high in treatment E followed by treatment C, while the others including control are indifferent, but these values still fell within the normal range reported by Daramola *et al.*, (2005). Hence, the leaf meal has no deleterious effect on bucks. Glucose level was significantly different at treatment B compared with control but decreases at treatment C, but gradually increases at treatment E. When glucose is lower than the normal range, it is an indication of hypoglycaemia while higher levels are indication of hyperglycaemia (Okukpe *et al.*, 2015). Alkaline phosphatase (ALP) increases with increase in level of the leaf meal inclusion. Alanine aminotransferase in this study fell within normal range reported by Kocatepe (2012) on Saanen goat, also

Aspartate aminotransferase increases with increase in level of leaf meal inclusion but still within the normal range (Ochei and Kolhatkar, 2007).

CONCLUSION AND RECOMMENDATION

In conclusion, *Vitex doniana* leaf meal has a valuable non-conventional feedstuff potential. Livestock farmers can use it as a feed supplement in the diet of West African dwarf bucks with up to 20g/kg concentrate feed, without fear of compromising haematopoietic processes and blood chemistry. Further investigation is suggested to determine the possibility of 100% *Vitex doniana* leaf meal in West African dwarf goat diets and its effect on blood chemistry as well as other physiological processes.

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