HAEMATOLOGICAL AND SERUM BIOCHEMICAL INDICES OF WEST AFRICAN DWARF GOATS FED *BUCCHOLZIA CORICEA* SUPPLEMENTED DIETS

Omoniyi M. O.*, Akinsira H. D., Oyepitan O. P., Ezekiel J. D., Akinsola I. S., Omotoso O. B., Fajemisin A. N., and Osho I. B.
Department of Animal Production and Health, Federal University of Technology, Akure, Nigeria
**dupeferanmi@gmail.com*

ABSTRACT
The study was carried out to determine the haematological profile and serum biochemical indices of West African Dwarf (WAD) goats fed wonderful kola (Buccholzia coricea) supplemented diet. The study involves 20 WAD goats of age 1-2 years range with an average live weight 6.77±16 kg. Four experimental diets (treatment) were formulated such that 0, 0.2, 0.4, 0.6 and 0.8% of the wonderful kola meal was partially replaced with wheat offal and were incorporated into the formulated feed. The dietary treatments were designated as DI (control), D2, D3, D4, and D5, respectively. The feeding trial lasted eight weeks, during which period feed and water were provided ad libitum. A Completely Randomized Design (CRD) was employed for the study and all data obtained from the experiment were subjected to one-way analysis of variance (ANOVA to compare the results from the four dietary treatments. Results obtained from this study. revealed that the haematological profile and serum biochemical indices of goats recorded no significant (P > 0.05) differences between dietary treatments. The study concludes that wonderful kola seed meal fed goats as supplements to diets will not pose adverse effects on the blood characteristics of goats. The study concludes that the wonderful kola seed when fed as supplements diets will not pose adverse effects on the blood characteristics of goats.
Keywords: Goats, wonderful kola, haematology, serum biochemistry

INTRODUCTION

Ruminant is sometimes used to refer solely to animals which are raised for consumption, and sometimes called farmed ruminants, such as cattle, sheep, and goats. Goats support the means of providing a source of income and employment for many rural households. The demand for goat products, including meat and milk, remains high due to their nutritional value and cultural preferences. The prominent breed of goat in Nigeria is West African Dwarf goats. Few plants and plant products are medicinal to support human health which ought to be used to improve animal health. Among such plant is Wonderful kola, (*Buchholzia coriacea* plant in which the seed is edible and medicinal in human. *Buchholzia coriacea* (Capparaceae) is a forest tree, which is also known as musk tree. The seeds are edible and have a sharp and pungent smell with a hot spicy taste (Adisa *et al*., 2011). It is a medicinal plant reputed for several biological activities such as abortifacient and cytotoxic, antihelmintic, antimicrobial, hypoglycemic (Adisa *et al*., 2011), and anti-inflammatory (Ezike, *et al*., 2015) effects. Concentrates are fed to the goats to meet up with the standard nutritional requirement of goat. Depending on age, different classes of Goats require 12-18% Crude Protein on Dry Matter (DM) basis in their diets (Luginbuhl, 2015). In this study, the blood of the goats well fed concentrate supplemented wonderful kola diet were collected ant tested for serum and biochemical indices. Blood biochemistry studies are usually carried out to establish the diagnostic baseline of blood characteristics for routine management practice of farm animals (Daramola *et al*., 2015). Blood act as a pathological reflector of the status of exposed animals to toxicant and other conditions as reported by Isaac *et al.* (2013). Therefore, because of the nutritional potential of *Buchholzia coriacea* due to their reported quality protein, carbohydrate, and mineral content will help in maximizing the productivity of WAD goats and also ensure their well-being. Therefore, this research is carried out to investigate the impact of *Buchholzia coriacea* supplemented diet on hematological and serum biochemical indices of West African Dwarf goats and thereby improving the productivity of goats.

MATERIALS AND METHODS

The study was carried out at the Teaching and Research Farm and the Nutrition Laboratory of the Animal Production and Health Department, Federal University of Technology, Akure, Nigeria.

Twenty (20) West African Dwarf goats (WAD) weighing from 9.15-16.35kg of age 1-2 years were used for the experiment. The goats were acclimatized for 30 days during which routine managements like feeding on grasses and concentrate supplement was employed so as to stabilize them. The goats was vaccinated against Peste-Petit de Ruminante (PPR/kata) using Tissue culture rinderpest vaccine at the rate of 1mL per 10kg body weight of an animal, treated against endo- and ecto- parasite using Ivermectin at 1mL per 10kg b.w. of an animal subcutaneously, and drenched with Albendazole against ectoparasites and skin infections.

They were randomly allocated to five (5) treatments of four (4) replicates each. The goats were allocated to five (5) treatments and were fed twice daily under the natural light dark cycle. The goats were fed with cassava peel-based concentrates with various levels of wonderful kola flour and formulated feed, in which they were fed 500g per day and was later increased based on their feed intake. Water was given *ad libitum* along with the feed after washing the drinkers.

The seeds of wonderful cola were gotten from open markets in Akure metropolis, Ondo State. The seeds were subjected to washing, slicing, drying in an oven at 40ºC for 72 hr and milling using grinding machine. The resulting flour was packed in a polyethylene bag and kept in freezer prior to formulation. The flour was supplemented into the diet as specified in each treatment. Four experimental diets were formulated at 0, 0.2, 0.4, 0.6, and 0.8% of wonderful kola seed meal and partially replaced with wheat offal, with other conventional feed ingredients in fixed amount and designated as D1(Control), D2, D3, D4, and D5 respectively as shown in (Table 1) .

Table 1: Gross composition of experimental diet (%)

Ingredients	D1	D2	D3	D4	D5
Cassava peel meal	50.00	50.00	50.00	50.00	50.00
Wheat offal	26.00	25.80	25.60	25.40	25.20
Wonderful kola seed meal	0.00	0.20	0.40	0.60	0.80
Palm kernel cake	20.00	20.00	20.00	20.00	20.00
Premix	1.00	1.00	1.00	1.00	1.00
Urea	1.00	1.00	1.00	1.00	1.00
Bone Meal	1.00	1.00	1.00	1.00	1.00
Common salt	1.00	1.00	1.00	1.00	1.00
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

The 10mL of blood from twenty (20) goats was be collected through jugular vein under aseptic condition by using 15 gauge, 4 inches needles and transferred into sterilized specimen bottle (EDTA and non EDTA bottles) the EDTA bottle was used to collect blood for hematological analysis while the non EDTA bottle was used to collect blood for serum analysis. The collection of the blood samples was done in the morning to avoid excessive bleeding and stress on the goats. Then the sample was placed in 15mL of centrifuged at 2000-3000 rpm for 15min. The serum was be separated, kept in plastic vials and stored in deep freeze at -20°C for estimation of blood biochemical constituents. This provide an insight of the health status and the performance of the goats that were fed wonderful kola seed meal.

A Completely Randomized Design (CRD) was employed for the study and all data obtained from the experiment were subjected to One-way Analysis of Variance (ANOVA) and means were separated using Duncan Multiple Range Test (DMRT) SPSS (21.0).

RESULTS AND DISCUSSION

The packed cell volume (PCV) of the WAD goats fed with wonderful kola supplemented diets fall within the normal range of 21-35% reported for healthy goats (Ajayi *et al*., 2017 and Anya *et al*., 2018). PCV is used as an index of toxicity in feed samples and a reduction in the concentration of PCV suggests the presence of toxic factor(s) (Anya *et al*., 2018). Therefore, in this present study, the obtained PCV values implied the good/quality dietary protein. Haemoglobin (Hb) is blood pigment that carries oxygen. Its high concentration implied good carriage capacity of oxygen to various parts

of the body. The haemoglobin concentration values obtained in this study falls within the range of haemoglobin values (7-15g/dL) suggested for healthy goats, this is an indication that the goats have sufficient blood pigment for proper transportation of oxygen for healthy living. Red blood cell and Hb of goats fed with wonderful kola supplemented diets had good blood oxygen carriage capacity since the values obtained for Hb and RBC were within normal range for healthy small ruminant as reported by Omotoso and Fajemisin, (2020) and Anya *et al*. (2018). WBC of the goats was influenced by dietary treatments. However, the obtained values were within normal range for healthy goats and sheep (Plumb, 2018). Consequently, it could be said that the immune system of the goats was not compromised by the inclusion of wonderful kola in the diets and this revealed that the goats would have defense ability against infection.. The neutrophils, basophils and monocytes values observed during this study fell within the recommended values for healthy goats by Tambuwal *et al.* (2002). The eosinophils fell within the normal range suggested (1-8%) for healthy goats (Fadiyimu *et al*., 2010). This indicated that there was no allergic reaction imposed by the dietary treatments.

Table2: Haematological Indices of WAD goat fed wonderful kola seed supplemented diet

	DIETS					P
Parameters	**D1**	**D2**	**D3**	**D4**	**D5**	**value**
PCV (%)	43.33±1.45^{a}	34.33±0.67^{b}	36.33±1.45^{b}	39.33±2.40^{ab}	36.33±2.90^{b}	0.06
WBC(x10^{3}µL)	15.87±1.52^{b}	28.93±3.94^{ab}	18.63±0.60^{ab}	19.77±0.55^{ab}	31.73±8.48^{a}	0.01
RBC (x10^{6}µl)	4.50±0.17^{a}	3.63±0.07^{b}	3.80±0.12^{b}	4.10±0.21^{ab}	3.77±0.26^{b}	0.04
Hemoglobin (g/dL)	14.53±0.50^{a}	11.43±0.37^{b}	12.27±0.50^{b}	13.57±0.78^{ab}	11.93±0.98^{b}	0.04
Lymphocytes (%)	37.33±1.76^{ab}	31.67±2.03^{bc}	28.00±3.21^{c}	43.33±3.53^{a}	28.33±2.40^{c}	0.01
Neutrophils (%)	58.33±2.03^{b}	64.67±3.28^{ab}	70.33±2.60^{a}	56.33±3.06^{b}	28.33±2.40^{b}	0.01
Monocytes (%)	4.33±0.33^{a}	1.33±0.33^{b}	1.00±0.58^{b}	1.33±0.88^{b}	0.33±0.33^{b}	0.00
Basophils (%)	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00
Eosinophils (%)	0.00±0.00	1.33±0.88	0.00±0.00	0.00±0.00	0.00±0.00	0.13
MCV (*fl*)	96.34±0.65	94.49±0.10	95.56±0.97	95.84±0.97	96.31±1.19	0.57
MCHC (g/dL)	33.54±0.14	33.28±0.43	33.76±0.75	34.51±0.64	32.87±0.90	0.33
MCH (*pg*)	32.31±0.31	31.45±0.44	32.26±0.37	33.07±0.55	31.65±0.75	0.26

a,b,c = means within the same row with different superscripts are significantly (P<0.05) different .A = 0.00g/100kg basal, diet. B = 0.20g/100kg basal, C = 0.40g//100kg basal, D = 0.60g/100kg, E =0.80g/100kg. PCV= packed cell volume, WBC= White Blood Cell, RBC= Red Blood Cell, MCV= Mean Cell Volume, MCH= Mean Cell Hemoglobin, MCHC= Mean Cell Hemoglobin Concentration

The total protein observed in this study ranged from 53.33 – 62.93 g/dl and fell below the normal range of 6.3 – 8.5 g/dl reported for WAD goats (Opara *et al*., 2010 and Ileyemi, 2017). The high value of total protein implies that the diet contains adequate crude protein because high values of serum total protein are indicators of quality protein of the experimental diet (Aletor *et al*., 1998). Globulin concentrations ranged from 29.33 g/dl (diet D) and 38.93g/dl (diet C). These values were higher than 1.6-16 g/dl reported for WAD goats (Daramola *et al*. 2005), indicating that wonderful kola inclusion in the diets demonstrated the

Table 3: Serum biochemical indices of WAD goats fed wonderful kola seed supplemented diet

	DIETS					
Parameters	**D1 (0)**	**D2 (0.2)**	**D3 (0.4)**	**D4 (0.6)**	**D5 (0.8)**	**P-value**
Total Protein	56.57±3.06^{a}	54.37±3.93^{b}	62.93±1.09^{a}	53.33±2.60^{b}	51.07±0.55^{b}	0.07
PO_3	18.33±0.88^{a}	14.33±3.18^{ab}	8.33±2.91^{b}	20.33±2.40^{a}	20.00±1.15^{a}	0.00
AST	12.33±1.20	11.00±2.65	12.30±2.88	7.00±0.00	15.00±8.00	0.72
ALT	16.67±2.33^{bc}	22.67±1.20^{a}	18.67±1.76^{ab}	17.67±0.88^{bc}	12,.67±1.20^{c}	0.02
ALB	23.33±3.18	23.33±2.03	24.00±1.75	24.00±1.73	22.67±1.20	0.99
TB	10.33±0.88	9.67±0.88	9.33±0.88	12.00±1.15	11.33±0.88	0.30
DB	3.67±0.33^{b}	3.33±0.33^{b}	4.00±0.58^{b}	4.33±0.88^{b}	6.00±0.00^{a}	0.03
GLB	33.23±0.33^{b}	31.03±1.93^{bc}	38.93±0.23^{a}	29.33±0.88^{c}	28.40±0.10^{c}	0.00
GLBR	0.70±0.10^{ab}	0.75±0.22^{ab}	0.62±0.03^{b}	0.82±0.04^{a}	0.80±0.06^{ab}	0.17

a,b,c = means within the same row with different superscripts are significantly (P<0.05) different. A = 0.00g/100kg basal, diet. B = 0.20g/100kg basal, C = 0.40g//100kg basal, D = 0.60g/100kg, E =0.80g/100kg. PO_3= Alkaline phosphatase (i.u), AST= Aspartate transaminase (i.u), ALT= Alanine transaminase (i.u), ALB= Albumin (g/dl), TB= Total Bilirubin (g/dl), DB= Direct Bilirubin (g/dl), GLB= Globulin, GLBR= Globulin Ratio

potential to boost immunity in the goats due to the therapeutic potential of the seed (Ijarotimi *et al*., 2015). ALT is an enzyme found in the highest amount in the liver and typically used to detect liver injury (Pratt, 2010). The values observed in this study were within the normal range (0-30 i.u) reported by Ileyemi (2017) for ruminants but higher than (8.9 i.u) reported by Daramola *et al*. (2005) for healthy goats. The goats maintained good health condition, improved cellular protein synthesis and general performance.

CONCLUSION

Results obtained in this study showed that wonderful kola seed can be utilized by goats as feed supplement in diets without adverse effects on their haematological profile and serum biochemical indices. It is therefore recommended that farmers can adopt the formulation of Diet D (0.60%) as it offers a combination of beneficial aspects from both serum and hematological perspectives, making it a potentially suitable choice for supporting the overall health and well-being of West African dwarf goats. Goat farmers can adopt the use wonderful kola seed powder as additive in diet for goats to enhance good performance and better productivity.

REFERENCES

Aletor, V. A. (1998). Allelochemicals in plant foods and feeding Stuffs. Part I. Citation:Yacout MHM. Anti-nutritional factors and its roles in animal nutrition. *Journal of Dairy Vetinaryand Animal Research.* 4(1):237–239.

Adisa R.A., Choudhary M.I., and Olorunsogo O.O., 2011, Hypoglycemic activity of Buccholzia coriacea (Capparaceae) seeds in streptozotocin-induced diabetic rats and mice, *Exponential Toxicology Pathology*, 63:619-25

Daramola, J. O., Adeloye, A. A., Fatoba, T. A., and Soladoye, A. O. (2005). Haematological and biochemical parameters of West African Dwarf goats. *Livestock Research for Rural Development, 17*(8): 95

Fadiyimu, A. A. Alokan, J. A. and Fajemisin, A. N. (2010). Digestibility, Nitrogen balance and haematological profile of West African dwarf sheep fed dietary levels of *Moringa oleifera* as supplement to *Panicum maximum.* Journal of American Science. 6(10): 634-643.

Ijarotimi O.S., Nathaniel F.T., and Faramade O.O., 2015, Determination of chemical composition, nutritional quality and anti-diabetic potentials of raw, blanched and fermented wonderful kola (Buchholzia coriacea) seed flour, J. Hum Nutrition. Food Sci., 3(2): 1060.

Iriadam, M. (2007). Variation in certain hematological and biochemical parameters during the peri-partum period in Kilis does. *Small Ruminant Research,* 73 (1): 54-57.

Ileyemi, H. E. (2017). Bilirubin in Ruminants Animal: A Case Study of Awotan Community, Ido Local Government, Ibadan, Oyo State. A Project Submitted to The Polytechnic, Ibadan, Oyo State. pp 48.

Omotoso, O. B., Ogunshola, O. J., Omoleye, S. O and Alokan, J. A. (2017). Haematological and Serum Biochemical Responses of West African Dwarf Goats Fed Panicum Maximum Replaced With Untreated Cocoa Pod Husk Meal. *Animal Research International* 14(3): 2826 – 2835.