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Effect of Biochemically Treated *Jatropha curcas* Kernel Cake ON Heamatological and Serum Biochemical Parameters of Red Sokoto Goat

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ABSTRACT
The study was conducted to investigate the effect of Biochemically treated Jatropha kernel cake on heamatological and serum biochemical parameters of Red Sokoto goats (n=20). Four experimental diets were formulated to include treated Jatropha kernel cake at 0% (diet A) which was the control, 10% (diet B), 15% (diet C) and 20% (diet D) as replacement for groundnut cake. Five (5) animal each were randomly allotted to each experimental diet in a complete randomize design and fed the diets (5% body weight) for 70 days. Blood sample were collected from jugular vein of the animals at the end of the feeding trial for heamatological indices and serum biochemical analyses and the data obtained were subjected to one way analysis of variance (ANOVA) and means differences were separated using Duncan Multiple Range test of SAS 9.1 version statistical package. It was observed that the heamatological parameters were not statistically difference ($p>0.05$) across the treatment except for lymphocyte (57.17%) in which animals fed diet A was significant ($p<0.05$) highest and the least diet B (47.75%) but were all within the normal range. The serum parameters were significantly ($p<0.05$) difference across the treatment but were within the normal range values except for blood glucose which was lower than normal range value (48-76mg/dl). It was concluded that feeding goats with diets containing biochemically treated *Jatropha curcas* kernel cake up to 20% inclusion had no effect on heamatological indices and serum biochemical parameters.

Keywords: Biochemical, Heamatological, *Jatropha curcas* kernel cake, Red Sokoto goat, Serum

INTRODUCTION

Heamatological studies are useful in the diagnosis of many diseases as well as investigation of the extent of damage to blood (Togun, *et al*., 2007). Heamatological studies are of ecological and physiological interest in helping to understand the relationship of blood characteristics to the environment (Hyelda *et. al*., 2017) and so could be useful in the selection of animals that are genetically resistant to certain diseases and environmental conditions.

Heamatological and biochemical parameters are good indicators of the physiological status of animals (Khan & Zafar, 2005) and changes in this parameters are often used to determine various status of the body and stresses due to environmental, nutritional and/or pathological factors (Afolabi, *et al*., 2010). Serum bio-chemical and heamatological references constitute important panels in the diagnosis, prognosis and treatment of livestock diseases via the investigations of myriads of parameters influencing blood and serum biochemical indices among which are packed cell volume (PCV), mean corpuscular volume (MCV), total blood glucose (TBG), total protein (TP), urea, creatinine, uric acid, alanine aminotransferase or alanine transaminase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), lactate dehydrogenase (LDH), creatinine kinase (CK), albumin (Alb), c-glutamyl transpeptidase (GGT), amylase, globulin, cholesterol, very low density lipoprotein (VLDL), triglyceride, folate, vitamin A and E, triiodothyronine (T3), thyroxine (T4), free triiodothyronine (fT3) and free thyroxine (fT4) concentrations, serum retinol and α-tocopherol concentration in livestock animals (Yokus *et al*., 2006). The following parameters namely: species, breed, sex, age, malnutrition, illness, reproductive status, season, nutrition and management systems etc. can affect serum biochemistry of livestock animals (Swanson, *et al*., 2004). All these parameters influencing the heamatology and serum bio-chemistry of various livestock animals are typically under two broad categories e.g. genetic and non-genetic parameters. Genetic parameters include the breed and genotype of the animal while the non-genetic parameters include the age, sex, management system, medication, health status and environmental factors such as nutrition, hormone and climate. Haematological values of farm animals are also influenced by geographical location, season, climate, day length, time of day, life habit of species, nutritional status, physiological status of individual animal and other non-genetic factors (Afolabi, *et al*., 2010 and Etim *et al*., 2014). Laboratory blood tests would be a vital tool to help detect any deviation from normal state of wellbeing of animals (Menon *et al*., 2013). Haematology and serum biochemistry assay of livestock also determine the physiological disposition of the animals to their nutrition (Menon *et al*., 2013). The serum vitamin, protein and lipid concentrations are affected by diet/nutrition (Swanson, *et al*., 2004). It was reported that Omani goats reared under intensive system with commercial feeds had higher levels of serum vitamin B12 relative to their counterpart reared under extensive system with greens and forages (Al-Zadjali, *et al*., 2004)

Goats and other ruminants in the humid tropics of West Africa including Nigeria suffer from seasonal reduction in feed supply and pasture quality hence, the need to search for alternative feed components that are feasible, locally available and accessible among tropically cultivated plants in order to eliminate competition existing between livestock, industries and man for the available conventional feedstuff without interfered with the health status of the animals. The effects of diets on blood

and serum chemistry should be of paramount interest since blood transports gases, nutrients, hormones and excretory products within the body (Aletor *et al*., 2012). Animal protein still remain the major source for human protein requirement. Red sokoto goat among other breeds is known for excellence with reference to its skin quality which is used in production of morocco leather. Beyond its meat quality; it is also a good milker. Therefore, efforts should be intensified to improve its production and performance in order to exploit these potentials. Good and adequate feeding regime using non-conventional feedstuff among which, *Jatropha curcas* kernel is considered as a good source of dietary proteins, energy and fibre. *Jatropha* is a multipurpose plant of the family *Euphorbiaceae* and well documented throughout continents like South America, Asia and Africa. It has over two hundred names which suggests it various uses (Belewu, 2008). The name Jatropha was derived from the Ancient Greek words *iatros* (doctor) and *trophos* (feed) because of its many potential medicinal applications (Elbehri *et al*., 2013). Jatropha plants are used to make fences and shelter to protect animals from wind or erosion (Elbehri *et al*., 2013). The roots yield an oil that has anthelmintic properties, the leaves are used as feed in the rearing of silkworms, and in human nutrition as a vegetable for their antimicrobial and anti-inflammatory properties (Makkar *et al*., 2009). Jatropha latex is used as dye or as a pesticide/molluscicide and **t**he fruit hulls can be used as green manure or to produce biogas. *Jatrophas curcas* in addition to being a source of oil, it also provides a cake that serves as a highly nutritious and economic protein supplement in animal feed (Becker and Makkar, 1998) but contains toxic thermostable lipo-soluble phorbolester and other antinutritionals factors which must be removed or lowered to level that do not elicit toxic response for livestock animals. Therefore this study investigates the effect of biochemically treated Jatropha curcas kernel cake on heamatological and serum biochemical parameters of Red Sokoto goat.

Materials and Methods

Experimental Period and Location: The experiment was carried out for 70 days at the Teaching and Research Farm, Federal College of Education (Technical) Bichi, Bichi Local Government, Kano state, Nigeria.

Collection and Preparation of the substrate: The substrate (dehulled *Jatropha curcas* kernel) was purchased from reputable source and milled using hammer milled, dried and then soaked in solvent (Petroleum ether) for 24 hours after which it was squeezed in a sieving cloth and air dried for three daysto get rid of the oil. The defatted cake was autoclaved at 121°C for 15 minutes.

Chemical treatment of the Jatropha kernel cake: The defatted cake after autoclaving was treated with Ferric chloride solution ($FeCl_3.8H_2O$) at180mg/kg kernel cake to achieve homogenous paste like texture.

Inoculation and incubation of the Jatropha kernel cake: The treated Jatropha kernel cake was inoculated with the spores of the bacteria (*Pseudomonas aeroginosa*)

obtained from Department of Microbiology, University of Ilorin Laboratory. The inoculated substrate was covered with black polythene bags and incubated at room temperature to allow the organism to grow over the substrate for nine days. After which the growth was terminated by oven dried at 70^{o}c for 24 hours. The spent substrate was then used in the formulation of the experimental diets.

Experimental diets: Four experimental diets wereformulated in which Diet A was the control (without treated J. curcas kernel cake) while Diets B, C and D contained 10, 15 and 20% inclusion level of treated J. curcas kernel cake respectively as replacement for Groundnut cake. Other ingredients were of fixed proportions (Table 1).

Experimental animal and management: Twenty weaners Red Sokoto (Maradi Breed) goats of mixed sex used for this experiment were purchased from local markets in Bichi, Kano State, Nigeria. The animals were treated against ecto and endo parasites using Ivomec. The animals were then randomly assigned to the experimental diets with five animals per treatment in a completely randomized design model. The feeding trial lasted for 70 days period including 14 days for acclimatization period. Feeding was based on 5% body weight of the individual animal and water was given *ad libitum*.

Collection of Blood sample: Blood samples were collected last week of the experimental period from the jugular vein of the animals using needle and syringe. The blood samples were collected into two different tubes one containing ethylenediamine tetra acetate (EDTA) - an anticoagulant for the heamatology and the other plain tubes for serum analysis. The analysis was carried out at Nigeria Air Force (NAF) hospital Kano, Kano State Nigeria.

Statistical analysis: Data collected from various blood parameters were subjected to one-way analysis of variance in a completely randomized design model using the software package of SAS9.1 and Duncan's Multiple Range test of the same software was used to separate the means.

Table 1: Composition of Experimental Diets

Ingredients	**Diet A (0%)**	**Diet B (10%)**	**Diet C (15%)**	**Diet D (20%)**
Cassava waste	40.00	40.00	40.00	40.00
Cowpea husk	38.00	38.00	38.00	38.00
Groundnut cake	20.00	10.00	5.00	0.00
Treated *Jatropha curcas* kernel cake	0.00	5.00	15.00	20.00
Salt	1.00	1.00	1.00	1.00
Premix	1.00	1.00	1.00	1.00
Total (kg)	100.00	100.00	100.00	100.00

Results and Discussion

Table 2 shows the heamatological of experimental animal fed the experimental diets. There was no significance difference ($p>0.05$) in the mean of WBC($x10^9$/L) and its components except lymphocytes in which animal fed diet A had highest (57.17%) significantly ($p<0.05$) lymphocytes followed by diet C (51.43%) which was significance difference ($p<0.05$) from diet D (48.57%) and B (47.75%) but were all fell within normal range values (Tambuwal *et. al*., 2002) and were in agreement with previous study (Belewu *et. al*., (2010) and Hyelda *et. al*., 2017) while the value of white blood cell reported in this study was lower than 11.98-18.90 (Okunlola *et. al*., 2015) for red Sokoto goat, 7.47-9.57 (Belewu *et. al*., 2010) for WAD goat but fell within the normal range 6.8-20.1 (Tambuwal *et. al*., 2002). This implies that the animal's immune system is normal and the variation could be due to environment or type of feed. The RBC ($x10^{12}$/L), PCV (%), and Haemoglobin (g/dl) of the experimental animals fed diets A, B, C and D were not significantly ($p>0.05$) difference. The PCV and RBC obtained in this study were lower than previous report 27.25-32.75 (PCV) and 1.80-2.83 (RBC) (Okunlola *et. al*., 2015) for red Sokoto goat and 20.33-29.66 (PCV) and 1.28-2.25(RBC) for WAD goat (Belewu *et. al*., 2010) and also lower than normal range 21-35 (PCV) and 3.5-13.5 (RBC) reported by Tambuwal *et. al*.,(2002). Meanwhile, the heamoglobin reported herein was in line with normal range value (7-15) for red Sokoto goat (Tambuwal *et. al*., 2002) although was lower than result obtained (8.55-12.58) by Okunlola *et. al*., (2015) and 8.90-10.40 (Hyelda *et. al*., 2017) in red Sokoto goat, this shows that the blood of these animals is rich inoxygen while lower PCV and RBC in this study indicated that the animals were anaemic.

Table 3 shows the serum biochemistry parameters of experimental animal fed the experimental diets. There were no significant differences ($P<0.05$) among the serum parameters across the diets.

The blood glucose level (mg/dl) of the experimental animal fed diet A (29.78), B (32.57), C (29.52) and D (29.50) were not significantly difference ($p>0.05$) meanwhile, there were significance difference ($p<0.05$) among the means of total protein (g/dl), creatinine (mg/dl), cholesterol (mg/dl) and urea (mg/dl) of the experimental animals fed the experimental diets. There was no significance difference ($p>0.05$).

Table 2: Heamatology Indices of Experimental Animals Fed Experimental Diets

Parameters	NR	Diet A	Diet B	Diet C	Diet D	SEM	P-Value
White blood cell X(10^9)	6.9-20.1[1]	6.93	14.67	9.96	13.53	1.42	0.203
Neutrophil (%)	17-52[1]	30.60	34.23	34.28	40.68	1.77	0.255
Lymphocytes (%)	47-82[1]	57.17[a]	47.75[c]	51.43[b]	48.57[c]	1.13	0.0001
Monocytes (%	0-10[1]	3.00	3.33	3.83	3.33	0.47	0.957
Eosonophil (%)	1-7[1]	6.00	6.00	5.67	5.67	0.60	0.996
Red blood celL X(10^{12})	3.5-13.5[1]	1.66	1.24	1.40	1.32	0.07	0.173
Packed cell volume (%)	21-35[1]	20.93	20.70	18.83	17.50	1.03	0.667
Haemoglobin (g/dl)	7-15[1]	9.50	9.23	8.67	8.20	0.29	0.468

Mean with the same superscript in row are not significantly different (P>0.05)
NR[1] -Normal range valueaccording to Tanbuwal, *et al*., (2002)
NR[2]-Normal range valueaccording to Fraser and Mays (1986)

Table 3:Serum Biochemistry of Experimental Animals Fed Experimental Diets

Parameters	NR	Diet A	Diet B	Diet C	Diet D	SEM	P-Value
Glucose level (mg/dl)	48-76[2]	29.78	32.57	29.52	29.50	0.63	0.0040
Total protein (g/l)	6.1-7.45[2]	5.93[d]	6.66[a]	6.47[b]	6.18[c]	0.12	0.0001
Cholesterol level (mg/dl)	65-136[1]	61.36[d]	65.62[b]	61.71[c]	87.63[a]	4.09	0.0001
Creatinine (mg/dl)	0.7-1.5[2]	0.58[b]	0.58[b]	0.64[a]	0.63[a]	0.01	0.0001
Urea (mg/dl)	13-28[2]	22.39[a]	15.60[c]	12.02[d]	19.05[b]	1.46	0.0001

Mean with the same superscript in row are not significantly different (P>0.05)
NR[1] -Normal range value according to Tanbuwal, *et al*., (2002)
NR[2]-Normal range value according to Fraser and Mays (1986)

between animals fed diets A (0.58) and B (0.58) for creatinine whereas, they were significantly difference (p<0.05) from diets C (0.64) and D (0.63) which are (p>0.05). The blood glucose level reported herein was lower than previous results 32.9±3.8 (Opara *et al*., 2010) and 68.33±1.21 (Waziri *et al*., 2010) and also lower than normal range value 48-76mg/dl (Fraser and Mays, 1986). This implies that the blood sugar level which is the main energy source for normal metabolism of the animals is insufficient which could be attributed to weaken of the animal as observed. The total protein level (g/l) obtained in this study was in agreement with previous results 5.6-6.8g/dl (Hyelda *et. al*., 2017) and fell within the normal range value 6.1-7.45g/dl (Fraser and Mays, 1986), higher than 4.4±1.5 (Tambuwal *et. al*., 2002) and lower than 7.1±0.1 (Daramola *et. al*., (2005) in WAD goat. The Cholesterol level reported herein was higher than 60.95-73.25mg/dl (Okunlola *et al*.,2015) but fell with normal range 65-136mg/dl (Tambuwal *et. al*., 2002). The creatinine in this present study was lower than 0.79-0.93mg/dl (Okunlola *et. al*., 2015) and also lower than normal range value of 0.7-1.5mg/dl (Fraser

and Mays, 1986). This implies that the animal's kidney is not impaired. The urea level of the experimental animals was in line with previous result of between 13.45-20.17mg/dl (Hyelda*et al*., 2017) and fell within normal range value 13-28mg/dl (Fraser and Mays, 1986). In general the total protein, creatinine and urea level of the animals fed the experimental diets were within normal range values which implies that the animals were not suffered from protein deficiency.

CONCLUSION

It was concluded that feeding goats with diets containing biochemically treated *Jatropha curcas* kernel cake up to 20% inclusion had no effect on heamatological and serum biochemical parameters.

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