Available online at www.refaad.com
VMPH 2(1); 2021: 17-22
Research Article

www.refaad.com

Veterinary Medicine and Public Health Journal (VMPH)

Journal Homepage: https://www.refaad.com/views/vmph/home.aspx

ISSN : 2707-7195(Online) 2707-7187(Print)

Hematology and serum biochemistry of yearling West African dwarf goats fed cashew nut shell based diets

Ocheja J O*[a], Halilu A[b], Shittu B A[c], Eniolorunda S E[d], Ajagbe A. D[e] and Okolo S. E[e]

[a] Department of Animal Science, Federal University, Kashere, Nigeria.
[b] Department of Animal Science, University of Calabar, Nigeria.
[c] Department of Animal Science, University of Ibadan, Nigeria.
[d] Department of Animal Science, University of Abuja, Nigeria.
[e] Department of Animal Production, Kogi State University, Anyigba, Nigeria.

*** Corresponding author:** Ocheja J O. Email: josiahocheja@yahoo.co.uk

How to cite this article: Ocheja J O. et al., Hematology and Serum Biochemistry of Yearling West African Dwarf Goats Fed Cashew Nut Shell Based Diets. Veterinary Medicine and Public Health Journal 2(1); 2021: 17-22.

DOI: https://doi.org/10.31559/vmph2021.2.1.3 **Received Date:** 15/10/2020 **Revised Date:** 20/11/2020 **Accepted Date:** 12/12/2020

Abstract

Yearling West African dwarf bucks were allotted into four (4) dietary treatments of four goats each. The goats were fed bamboo leaves at 250g/goat/day and concentrate supplement diets containing 0%,10%,15%and 20% cashew nutshell for T1, T2, T3 and T4 respectively at 150g per goat/day for a duration of sixty-three (63) days. The experimental design was a completely randomized design ,data were analyzed using a one way analysis of variance and least significant difference to separate the significant means.(SPSS version 23, 2015 edition) Concentrate diets and bamboo leaf samples were analyzed using the methods of AOAC (2000)), on the last day of the experiment blood samples for hematological and serological studies were collected in sample bottles from the jugular veins of the goats ,using needles and syringes. Values for daily supplement intake (62.40 – 98.80 g), and total daily feed intake (249.98- 285.10 g) were significantly($P<0.05$) different, daily bamboo intake (182.75 – 187.63g) were not significant. ($P>0.05$) All the hematological parameters determined were not significantly($P>0.05$) different, only the cholesterol (4.80- -9.88Mmol/l) showed significant($P<0.05$) difference amongst all the serological parameters tested. It was therefore concluded that cashew nutshell up to 15% level of inclusion in supplement diets for yearling West African dwarf goats had no adverse effects on the hematological and serum biochemical indices of the goats Cashew nut shell at 15% level of inclusion was recommended in supplement diets for yearling West African dwarf goats. Further research using other species of ruminants such as sheep and cattle was also recommended.

Keywords: *Hematology; Serum; Yearling; Fed intake; West African Dwarf Goats.*

1. Introduction

Inadequate feeding is a major setback to ruminant livestock production in Nigeria. This has also led to low milk and meat production, high mortality of young stock and low growth rate. (Malu-Kagu *et.al.,* 2018) During the long dry season feeds become scarce, most grasses dry up and become low in nutritive value and as such not suitable for livestock production (Abubakar *et. al*., 2005). The use of Agro by-products have been suggested by some researchers (Arigbede *et.al*.,2012 Ocheja *et. al.,* 2017; Okpanachi *et.al.,*2018:) as a way of mitigating this problem

According to Esonu *et.al.,* (2001) Blood bio chemical constituents reflect the physiological response of animals to their internal and external environments, which include feeds and feeding, 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)

When using agro by-products it is important to assess the health status of the animals because some are known to affect blood parameters. (Olabanji *et.al*.,2007) A readily available and fast means of assessing the clinical and nutritional health status of the animals in feeding trial may be the use of blood analysis.

Orheruata and Akhuomoigbe (2006) reported that biochemical indices of animals may give some insight as to the production performance potentials of West African dwarf goats.

Endogenous substances could manifest through reduced protein utilization thereby increasing the catabolism of amino acid which would be subsequently degraded into urea and creatinine (Sathyamorthy *et.al*., 1981).

Accurate determination of creatinine clearance is crucial to rational drug therapy because many drugs are either partially or totally eliminated by the kidney (Schalm *et.al*., 1975).

Hematological and serological studies are important since, many by –products are now used to feed ruminant animals. due to inadequate grasses as well as high cost of feed materials especially during the long dry season. The safety of these materials may be tested through blood analysis (Oyibo *et.al.,* 2020).

The aim of this work therefore was to assess the hematological and serum biochemical profiles of yearling west African dwarf goats fed, supplement diets containing graded levels of cashew nutshell.

2. Materials and Methods

2.1 Experimental Location:

The experiment was conducted at the Sheep and Goat unit of Livestock Teaching and Research farm, Kogi State University, Anyigba. Anyigba is located in the derived Guinea Savannah zone of Nigeria on latitude $7^0 15'$ and $7^0 29'$ N of the equator and longitudes $7^0 11'$ and $7^0 32'$E of the Greenwich meridian. The zone lies in the warm humid climate of the tropics with clearly marked wet and dry season in April to October and November to March respectively, the annual rainfall ranges from 1400-1500mm, the ambient temperature is about 25^0C with the highest in March and April the average altitude is 420 meters above sea level (Ifatimehin and Ufuah,2006).

2.2 Feed preparation, Experimental Animals, and Management:

Sixteen growing West African dwarf bucks were used for the study the animals were housed individually and treated with Ivomec, for endo and ecto parasite control at 0.4ml each and oxytetracycline, hydrochloride and procaine penicillin at 3.0ml each as prophylactic treatment to provide a good and common health status. The bamboo leaves used for this experiment were obtained from within Kogi State University campus, Anyigba. and wilted for 24hours to reduce the moisture content before feeding. the concentrate feed components were cashew nut shell, Maize offal (MO), Bambara nut offal (BO), Fish offal (FO), Rice offal (RO), Wood ash (WA), Bone meal and Table salt as shown in Table 1 below. These ingredients were mixed together and ground to desired texture. The goats were allotted in a Completely Randomized Design (CRD) into four (4) treatments. Each treatment had four (4) goats. Each goat was fed 150g of the supplement diet per day one hour after serving them 250g of Bamboo leaves.

Feed served the goats was weighed daily and the left over was also weighed and subtracted from the quantity of feed served to determine the feed intake. The goats were weighed at the beginning and end of the experiment. The study duration was sixty-three (63) days, after a preliminary feeding period of 7 days.

Table (1): Composition of Supplement Diet (% Dry matter)

Ingredients	Composition/Treatments			
	T_1	T_2	T_3	T_4
Cashew nut shell	0	10	15	20
Maize offal	20	15	13	10
Bambara nut offal	52	52	52	52
Fish offal meal	5.0	5.0	5.0	5.0
Rice offal	18	13	10	8.0
Wood ash	2.0	2.0	2.0	2.0
Table salt	1.0	1.0	1.0	1.0
Bone meal	2.0	2.0	2.0	2.0
Total	100	100	100	100
Calculated nutrient content (% DM)				
Nutrients Crude protein	18.70	18.15	18.09	18.01
Crude fibre	16.31	16.32	16.46	16.83
ME (Kcal/kgDM)	3000	3050	3095	3132

2.3 Blood Sample Collection:

The blood samples for hematological and serological studies were collected in sample bottles from the jugular vein of each goat using needles and syringes. The blood samples for serological analysis were put in sample bottles containing ethylene diamine tetra acetic acid (EDTA) anticoagulant, the blood samples were centrifuged thus allowing the clear sample to be separated for testing.

The Serum was analyzed for creatinine, urea, alkaline phosphate cholesterol and blood sugar according to the method of Baker and Silverton (1985). Uncoagulated blood samples were analyzed for hematological parameters such as packed cell volume, hemoglobin concentration, red blood cell count, white blood cell count, mean corpuscular volume, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration.

2.4 Proximate Chemical Analysis:

Samples of the bamboo leaves and the supplement diets were analyzed for their proximate composition using standard procedure according to AOAC (2000)

2.5 Experimental design and Statistical Analysis

The experimental design was a completely randomized design (CRD). Data were analyzed using a one-way analysis of variance (ANOVA) and significant differences were separated using least significant difference (LSD) with the aid of SPSS version 23, 2015 edition

3. Results and Discussion

3.1 Proximate Composition of Bamboo leaves and Concentrate Diets:

The proximate composition of the browse and concentrate diet is summarized in Table 2.

The protein content of the diets and Bamboo leaves fell within the values of 12-18% recommended for growing ruminants in the tropics (NRC 1996). The ether extracts value for the Bamboo was within the recommended values, while that of the concentrate diets were all above the range of 5-6% which if exceeded may impede appetite and fibre digestion in the goats (Maithison *et.al.*, 1997).

Table (2): Proximate Composition and Fibre Fractions of Experimental Diets (% DM)

Nutrients	Treatments			
	T1	T2	T3	T4
Crude protein	18.89	18.44	18.39	18.20
Crude fibre	16.33	16.58	16.62	16.85
Nitrogen free extracts	50.11	44.93	46.95	45.91
Ether extracts	5.05	8.75	10.64	12.33
Ash	9.62	8.30	7.40	6.71
Dry matter	93.35	94.99	95.57	91.75
Acid Detergent fibre	16.54	17.82	17.82	17.08
Neutral Detergent fibre	30.51	30.29	29.36	29.67
Cellulose	10.43	10.83	10.50	10.20
Hemicellulose	13.97	12.47	12.28	12.59
Lignin	6.11	6.79	6.58	6.88

3.2 Feed Intake of Experimental Goats

The feed intake of the experimental goats is presented in Table 3.

Values for daily supplement intake, and total daily feed intake were significantly ($p<0.05$) different.

The daily supplement intake of 62.40- 98.65 g, and total daily feed intake of 249.98 – 285.10g were lower than 75.33 – 94.43 g and 253.00 – 399.87g reported by Oyibo *et. al.*, (2020) who fed browse plants supplemented with a concentrate diet, but higher than 130.74 – 210.37g reported by Arigbede *et. al.*, (2012). who fed cassava leaf- based diets to West African dwarf goats, these discrepancies could be due to the type of concentrates and browse fed to the goats? The daily Bamboo leaf intake was however not significant ($P>0.05$)

Table (3): Feed Intake Data

Parameters	Treatments				SEM
	T_1	T_2	T_3	T_4	
Daily Supplement Intake (g)	98.65[a]	97.51[a]	95.33[a]	62.40[b]	4.66
Daily Bamboo leaf Intake (g)	186.45	185.10	182.75	187.63	16.88
Total Daily Feed Intake (g)	285.10[a]	282.6[a]	278.08[a]	249.98[b]	14.90

a, b, Treatment means on the same row with different superscripts differ significantly ($p<0.05$)
SEM Standard Error of Means

3.3 Hematological Profile of the Experimental Goats

The hematological profile of the experimental Goats is shown in Table 4

All the hematological parameters determined were not significantly ($P>0.05$) different, the values were within normal ranges for goats {Daramola *et al* 2015) this signifies that the supplement diets were safe for the goats. This result ranks with that obtained by Ocheja *et al.*, (2016), for growing West African dwarf goats fed graded levels of cashew nutshell. and that of Okpanachi *et al., (*2018) who fed sun dried cashew pulp meal-based diets to West African dwarf goats. Abnormally low packed cell volume, red blood cell count and heamoglobin concentration indicates anaemia and high parasitic burden of which the goats were free from. Abnormally high white blood cell count suggests infection (Olabanji *et al* 2007), which was not the case with the experimental Goats.

Table (4): Hematological Profile of yearling West African Dwarf Goats Fed Bamboo leaf and supplementary Diets Containing Graded Levels of Steam-Treated Cashew Nut Shell

Parameters	Treatments				SEM
	T_1 (0 % CNS)	T_2 (10 % CNS)	T_3 (15 % CNS)	T_4 (20 % CNS)	
White blood count (×103/µL)	18.70	19.60	20.54	19.70	1.73
Red blood count (×103µL)	1.74	1.68	1.66	1.71	0.16
Packed cell volume (%)	28.90	28.60	28.35	28.31	0.94
Hemoglobin (g/dL)	9.52	9.25	9.88	9.47	0.42
Mean Corpuscular volume (fl) Mean Corpuscular	23.63	24.60	24.21	23.25	1.86
Hemoglobin (pg) Mean Corpuscular Hemoglobin	82.45	82.40	80.94	83.55	12.83
Concentration (g/dL)	402.75	396.65	391.55	385.95	8.65
Lymphocytes (%)	61.55	68.25	64.60	63.50	8.40
Granulocytes (%)	24.35	26.25	25.25	25.35	1.77
Monocytes (%)	13715	13.40	13.15	12.56	1.04

SEM = Standard Error of the Means.
CNS= Cashew Nutshell

3.4 Serum Biochemical Profile of Experimental Goats

The serum biochemical profile of the experimental goats is summarized in Table 5. The values for blood sugar, creatinine, urea and alkaline phosphate were not significant (p>005). However, values for cholesterol which ranged from 4.08–9.88 Mmol/l were significant (p<0.05). All the biochemical parameters evaluated were within normal ranges reported for goats except for cholesterol(T_4) that was above normal value; (Daramola *et.al.*,2015), normal values for alkaline phosphate range from 42- .77.5ul^{-1} (Blood *et al* 2007), higher creatinine values suggest muscular wastage.

Abnormally high alkaline phosphate is indicative of bone disease, liver disease, bile obstruction meaning that the goats were free from these conditions. Variations could also be due to feed collection and handling of blood samples, genetic, environment, sex and age of animals. Normal urea values indicates that the protein was well utilized, it also indicates that the quality of protein fed was high (Oyibo *et al* 2020).

Table (5): Serum Biochemical Profile of Experimental Goats

Parameters	Treatments				SEM
	T_1	T_2	T_3	T_4	
Blood Sugar (mg/dl)	38.99	39.68	40.05	39.74	1.07
Creatinine (mol/l)	17.99	1808	1 8.26	17.54	0.98
Urea (mmol/l)	1.25	134	128	1.31	0.33
Alkaline phosphate m/l	57.92	58.10	57.55	57.65	0.05
Cholesterol (Mmol/l)	4.08^a	6.75^b	7.02^b	9.88^c	0.36

a, b, c Treatment means on the same row with different superscripts differ significantly (p<0.05)
SEM Standard Error of Means

4. Conclusion and Recommendations

4.1 Conclusion

All the hematological parameters determined did not show significant differences, only the cholesterol showed significant differences across the treatment means, with the value for T_4 being above the normal values for goats.
Cashew nut shell up to 15% level of inclusion in supplement diets for yearling West African dwarf Goats, had no adverse effects on the hematology and serum biochemistry of the goats.

4.2 Recommendations

Cashew nut shell up to 15% level is recommended in supplement diets for yearling West African dwarf Goats without adverse effects on hematological and serum biochemical profiles of the goats. Further research should be carried out using other species of ruminants such as sheep and cattle.

References

[1] AOAC (2000). Association of Official Analytical Chemists. Official methods of Analysis 17th edition Washington, D.C. Pp. 3 – 22.

[2] Arigbede, A.O., Adedeji, O.Y., Falola, O. O. and Saka, A.A. (2012). "Performance characteristics and nutrient intake of West African Dwarf Goats fed cassava leaf hay- based diets". Proceeding of 17th Annual Conference of Animal Science Association of Nigeria, Abuja 9th -13th September, Pp. 559-562.

[3] Baker F.S & Silverton R.E (1985). laboratory technology 5thedition, Butter S.C London RP 481-494.

[4] Blood D.C Studdert V. P & Gay,C C (2007). Saunders Comprehensive Veterinary Dictionary 3rd Edition Elselvier New York. Pp 1963- -1968.

[5] Daramola, J O Adelofe, A A, Fatoba, I A & Soladoye A I (2015). "Hematological and biochemical parameters of West African dwarf goats". Livestock Research for Rural Development 17(8): 2025.

[6] Esonu, B.O, Emamelon, O.O, Udedible, A.B, Hobert. U & Iheukumere, (2001). "Performance and blood chemistry of weaner pigs fed raw Mucuna (velvet bean) meal". Trop Anim. prod.invest. 4:49-54.

[7] fatimehin, O.O, & Ufuah M. E (2006). "The effect of a spatial Structure on Rural Economy; A Case of Kogi State University on Anyigba and its Environs Confluence". Journal of Environmental Studies, 1(2): 61-70.

[8] Maithison, G. W., McAlhster, T. A., Cheng, K. J., Dong, Y., Galbraith, J. & Dmytruk, O. (1997). "Methane from farm animals. Abstract of workshop on greenhouse Gas Research in Agriculture", Saint Foy March 12 – 14, Pp. 40 – 45.

[9] Malu-kagu H A, Zarak, H.K Abbo & I.D Mohammed (2018). "Assessing the nutritive value of some common tropical feeds for feeding Ruminants in a semi-arid environment of Nigeria". Nig.J. Animal science technology, 1(1):31-37.

[10] NRC, National Research Council, (1996). Nutrient requirements of beef cattle 7th Rev. Ed. National Academy Press Washington, DC. P. 27.

[11] Ocheja J. O, Ayoade J. A, Attah, S, Okwori A. I, .Ocheni j & Oyibo ,A (2016). "Blood Parameters and Qrgan Weights of growing west African Dwarf Goats fed Diets containing graded levels of steam-treated". cashew nut shell. 3(4):17 - 22

[12] Ocheja, J.O, Oguche, G.H.E, Omata, S. B, Ode.CO & Oyibo A (2017). "performance and hematological profile of growing warf goats fed concentrate diets supplemented with browse plants". J. Agric. prod. and tech. 6:27-32.

[13] Okpanachi, U, Okpanachi GAC Kaye-J,Agu C.I & Odah E.O (2018). "Hematological profile and serum

biochemistry of West African Dwarf goats fed sun-dried yellow cashew pulp-based diets". journal of applied science 19(4):319-324. https://doi.org/10.3923/jas.2019.319.324.

[14] Olabanji, R. O, Farinu, G. O, Akinlade J. A, Ojebiyi O. O, Odunsi A. A. & Akingbade A. A (2007). "Studies on Hematological and Serum biochemical characteristics of waaner rabbits fed different levels of wild sunflower (Tithonia diversifolia) Hons A Grey) leaf – blood meal mixing". International Journal of Agriculture and Rural Development, 4 (1 and 2): 80 – 89.

[15] Orheruata A.M & Akhuomoghogbe P.U (2006). "Hematological and Blood Biochemical Indices in West African Dwarf Goats Vaccinated against Peste de petite ruminants (PPR)". African Journal of Biotecnology, 5(9): 743- 748.

[16] Oyibo, A, Effienokwu, J.U, Shettima, I, Umar, A.Y, Ahmed, S.H, Emmanuel, A.T, & Adamu, A.T. (2020). "Serum Bioshemistry of West African Goats fed some Browse Species supplemented with a Concentrate Diet". Animal and Veterinary Sciences (Special Issue; Promoting Animal and Veterinary Science Research) 8(2): 41 - 44. https://doi.org/10.11648/j.avs.20200802.11.

[17] Sathyamorthy, V., Kamalakannan, V. & Mothea, D.B. (1981). "Influence of dietary raw green gram (PhaseolusaurcusRoxb) and green grain trypsin inhibitors on the activity of certain protein metabolic enzyme in rats". Animal Nutrition Metabolism, 25(5): 333- 340. https://doi.org/10.1159/000176513.

[18] Schalm, O. W, Jaine N. C. & Caroll E.J. (1975). Veterinary Haematology 3rd Ed Lea and Febyal Philadelphia U.S.A. Pp. 22 – 24.

[19] SPSS, (2015). Statistical packages for social sciences. Version 23.0 SPSS Inc. Pp. 16 – 19.