International Journal of Research in Agriculture and Forestry
Volume 3, Issue 4, April 2016, PP 17-22
ISSN 2394-5907 (Print) & ISSN 2394-5915 (Online)

Blood Parameters and Organ Weights of Growing West African Dwarf Goats Fed Diets Containing Graded Levels of Steam Treated Cashew Nut Shell

Ocheja j.O[1], Ayoade J.A[2], Attah S[2], Okwori A.I[2]. Ocheni, j[3] and Oyibo A.[1]

[1]Department of Animal production, kogi state university, Anyigba, Nigeria
[2]Department of Animal Production, University of Agriculture, Makurdi, Nigeria
[3]Department of food Nutrition and Home Science, kogi state University, Anyigba, Nigeria

ABSTRACT

Twenty (20) West African dwarf bucks were used to investigate the effects of diets containing graded levels of cashew nut-shell on Haemotological and serum biochemical profiles as well as organ weights. The Goats were randomly allotted to four (4) treatments of five (5) goats each. The Goats were fed the supplement containing 0%, 10%, 15% and 20% cashew nut shell for T1, T2, T3 and T4 respectively at 100g/goat/ day, and bamboo leaves one (1) hour later at 200g/goat/ day. In the last week of the experiment blood samples were collected from the jugular veins of all the goats used for hematological and serum biochemical analysis. The experiment lasted for 100 days after an adjustment period of fourteen (14) days. Completely randomized experimental design was used data collected were analyzed using a one way analysis of variance, treatment means were separated using least significant difference with the Aid of SPSS (2006) 16th version. All the Hematological parameters tested did not show significant ($p>0.05$).differences. Values for blood sugar, urea, alkaline phosphate and cholesterol, showed significant ($P<0.05$) differences with values for blood sugar deceasing steadily from 44.0 g/dl (T1) to 33.30 g/dl (T4). all the organ weights were not significantly ($P>0.05$) different. All the Hematological and serum biochemical values as well as the organ weights were found to be within the normal range for growing west African dwarf goats It was therefore concluded that cashew nut shell inclusion in supplement diets up to 20% level of inclusion had no adverse effect on blood parameters and organ weights of growing West African dwarf goats. Further research using other species of ruminants such as sheep and cattle was suggested.

Keywords: Blood parameters, organ weights, Diets, Cashew nut Shell

INTRODUCTION

The principal aim of animal production is the production of high quality protein in the form of meat; milk and eggs for human nutrition. The production of these requires adequate feeding in terms of quality and quantity. The provision of adequate nutrition to ruminants has been identified as one of the biggest management problems faced by stock owners in the tropical parts of the world especially during the long dry season. (Lufadeju and Lamidi 1993).

In Nigeria, this problem is very pronounced in the savannah and rain forest zones where small ruminants are tethered to prevent destruction of crop farms. The resultant effect of which is low dry matter intake of forages by animals resulting from high moisture content of the forages when crop residue are no longer available (Lufadeju and Lamidi 1993). Also during the long dry season available herbage are of low quality and crop residue availability often exceed animal requirement so much so that the excess is either burnt or allowed to decompose. For most of the natural grasses and legumes up to 50% of the crude protein content is lost during the dry season (Obioha and Ndukwe 1976). This seasonal variability in the quality and quantity of natural forages therefore results in annual cyclical pattern of live weight gains and losses with incredibly high losses, the slow improvement in crop yield and competition between humans and animals for the available grains and tubers make nutritional requirements at reasonable cost difficult to achieve since a viable livestock industry is dependent on agro products, consequently animals are unable to meet both protein and energy requirements, there is not only weight loss, lowered diseases resistance and death but also seasonal anoestrus, reduced fertility and slow growth rate (Osori, 1976).

Address for correspondence:

Josiaocheja@yahoo.co.uk

Given the above scenario it would be worth while to seek alternative feed materials that are readily available, cheap, safe, and nutritionally adequate and at the same time not in direct use by humans with a view to reducing the cost of animal protein, there by making it more affordable for Nigerians. Babatunde *et al.*(1975) observed that the incorporation of agro by-products into ruminant rations hold tremendous potential for alleviating the short supply and high cost of feeds. One of such agro by-product that hold promise in ruminant nutrition but has not been utilized in ruminant feeding is cashew nut shell.. Cashew nut shell is the by-product of cashew kernel industry. It is the left over after cashew kernels have been removed from the shell. The use of unconventional feed materials also requires that they be tested for safety for animals .This study was therefore designed to evaluate the effects of steam-treated cashew nut shell on the Haematological and serum biochemical profiles as well as organ weights of growing west African dwarf goats

MATERIALS AND METHODS

The feeding trial was carried out at the Sheep and Goats Unit of the Livestock Teaching and Research Farm, Department of Animal Production, Kogi State University, Anyigba (Latitude 7^0 15' and 7^0 29'N of the equator and Longitudes 7^0 11^1 and 7^0 32^1 East of the Greenwich Meridean (Ifatimehin *et al.*, 2009). It is located in the derived Guinea Savannah zone of Nigeria. The annual rainfall ranges between 1400mm – 1500mm with about 6-7 months of rainfall, the ambient temperature ranges from 25^0C to 35^0C with the highest in March and April (Kowal and Knabe 1972) The experimental feed materials were cashew nut shell, bamabara nut offal, maize offal, table salt, rice offal, fish offal meal, wood ash, Bone-meal and Bamboo leaves. The rice offal was collected from Alaide in Benue State while the Bambara nut offal was purchased from market women in Anyigba, Kogi State. The table salt was obtained from Anyigba market. The cashew nut shell (Steam- Treated for 20 minutes) was obtained from the Cashew Kernel Processing Factory, Kogi State University, Anyigba. The cashew nut shell was pounded using a mortar and pestle. All the feed ingredients were mixed together in varying proportions and ground. The Bamboo leaves were harvested from Kogi State University, Campus, Anyigba.

Twenty (20) growing West African dwarf bucks with weight range of 6.15kg to 6.30kg and aged between 7 and 9 months, were sourced from Anyigba and its environs. They were conditioned to stability by feeding them adequately for 1 week. The animals were treated with Ivomec at 0.25ml/goat to control both *endo* and *ecto* parasites. They were also injected with antibiotics (*Oxytetracycline hydrochloride and procaine penicillin*) at 3mls and 2mls per goat) to take care of scouring, nasal and ocular discharges and to provide a good health status. The animals were ear-tagged for identification and were randomly divided into 4 treatments of 5 animals each. The experiment lasted for 100days, after an adjustment period of seven (7) days. Animals in treatments T_1, T_2, T_3, and T_4 were fed with experimental diets containing 0%, 10%, 15 and 20%, levels of inclusion of cashew nut shell respectively at 100g/goat/day. The Bamboo leaves were fed at 200g/goat/day on cut and carry basis. All the animals were given water *ad libitum.* Dry matter intake was calculated from differences between absolute feed served and leftover. Weekly weight gains were taken in the morning before feeding. The following performance data were collected. Daily feed intake (supplement and forage), daily weight gain, Total weight gain and Feed conversion ratio

Table1. *Composition of Experimental diets (% Dm)*

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

Blood samples were collected from all the goats in the last week of the feeding trial, before morning feeding. About 5ml of blood was collected from the jugular vein using needle and syringe. The samples were collected into sample bottles (labeled for each animal) containing Ethylene Diamine Tetra-Acetic acid (EDTA) anticoagulant. The blood samples were analyzed for Packed Cell Volume (PCV), Heamoglobin (HB), Red blood cell (RBC and white blood cell (WBC) counts. as well as Lymphocytes, Granulocytes and monocytes percentages (proportion). Mean corpuscular haemoglobin concentration (MCHC), mean corpuscular haemoglobin (MCH) and mean corpuscular volume (MCV) were calculated as described by kronfield and Mediway (1975). Another sample of the blood was collected into another bottle and labeled accordingly without anticoagulant. After storage for 24 hours in a refrigerator at 10-12^{o}c, blood serum was separated and analyzed for alkaline phosphates, cholesterol, urea creatinine and blood sugar

Samples of experimental diets, steam- treated cashew nut shell, and bamboo leaves were prepared for analysis of their proximate composition. . The protein content of the samples was determined by Kjeldahl method. Ether extract, crude fibre and ash content determination were according to standard procedure (AOAC, 1995). the nitrogen free extract (NFE) was calculated by subtracting the sum of the percentages of crude fibre, ether extracts, crude protein and ash from 100. The fibre component of each experimental diet, cashew nut shell and forage were further analyzed into, cellulose hemicellulose, lignin, Acid detergent fibre (ADF) and Neutral detergent fibre (NDF), (Van Soest *et al.*,1991).

The experimental design was a completely randomized design (CRD). Data were analysed by a one way analysis of variance (ANOVA) and treatment means were compared (separated) (where there where significant differences) using least significant difference (LSD). With the aid of SPSS (2006) Statistical package for social science version 16.0.

RESULTS AND DISSCUSION

Proximate Composition, Fibre Fractions and PH of Experimental Diets

The proximate composition, fibre fractions and ph of experimental diets fed to growing West African dwarf goats are summarized in Table 2. The experimental diets were iso-nitrogenous, with protein content ranging from 18.,20% (T4) to 18.89% (T1). The fibre level for the experimental diets, 16.33% (T1) to16.85% (T4) were all similar. The Ether extract values increased steadily from T1 to T4 with values ranging from 5.05% (T1) to 12.33% (T4) the acidity of the diets increased steadily from T1 (6.82) to 6.10(T4). The crude protein content of about 18% and crude fibre content of about 16% were adequate for growing goats in the tropics (NRC, 1996; Lakpini *et al.*, 2002). The Ether extract content of 5.05% for T1 was about the optimum for ruminant diets. However, 8.75% for T2 to 12.33% for T4 were above recommended levels for ruminant diets These values however suggest high carotene and fat soluble vitamins content (Ambarasu *et al*., 2004). The ash content of 6.71% (T4) to 9.62% (T1) may suggest high mineral content of the experimental diets. The Ph values were all within tolerable range for the rumen environment.

Table2. *Proximate Composition, Fibre Fractions and Ph of Experimental Diets (% DM) fed to Growing West African Dwarf Goats.*

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
Total	**100**	**100**	**100**	**100**
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
* Ph	6.82	6.66	6.52	6.10

** Has no unit*

Feed Intake of Experimental Animals

The feed intake records are present in Table 3,the forage intake ranged from 165.07g (T1) to 176.10 (T3) and were not significantly P>0.0 5) different, values for daily supplement intake and total daily dry matter intake showed significant (P<0.05) difference

Table3. *Feed Intake of Experimental Animals*

Parameters	Treatment				
	T1	T2	T3	T4	SEM
Daily supplement intake (g)	91.54[c]	85.650[a]	67.37[b]	44.65[c]	7.62
daily forage intake (g)	165.07	173.34	176.10	172.10	1.67
total daily dry matter intake (g)	256.61a	258.99a	243.47b	216.75c	2.96

,a,b,c Means on the same row with different superscript differ significantly (P<0.0.5)

SEM= standard error of means

The hematological profile of growing west African dwarf goats fed diets containing graded levels of steam-treated cashew nut shell is presented in Table 4. None of the hematological indices showed significant (p>0.005) difference among the treatment means and the differentials between treatments did not follow any particular trend. The haemoglobine values of 8.60-9.50g/dl fell within the range of 7.0-15g/dl reported by Daramola *et al.*, (2005) for west African dwarf goats. The packed cell volume of 27.60-29.35% fell within the range of 32-45.5% reported by Barneerjee (2005) for west African dwarf goats.

The haemoglobin values 0f 8.60-9.50 g/dl fell within the range of 7.0-15g/dl reported by Daramola *et al.*, (2005) for West African dwarf goats. The packed cell volume of 27.60-29.35% fell within the range of 32-45% reported by Barneerjee (2005) for West African dwarf goats.

The similarity in values for packed cell volume, Hemoglobin and red blood cell count, to those of control may indicate that the animals were not susceptible to anemia related diseases and that the treatments seemed to be capable of supporting high Oxygen carrying capacity in the experimental animals (Fajemisin, 2010). Similarity in white blood cell with the control is an indication that the animals were not fighting against any disease condition. Similarity in the mean corpuscular volume, mean corpuscular hemoglobin and mean corpuscular hemoglobin concentration of the animals on diets containing cashew nut shell with the control implies that the animals were not aneamic.

Table4. *Hematological Profile of Growing West African Dwarf Goats Fed Diets Containing Graded Levels of Steam-Treated Cashew Nut Shell*

Parameters	Treatments				
	T1	T2	T3	T4	SEM
White blood count ($\times 10^3$/µl)	18.20	19.70	21.50	18.90	1.83
Red blood count ($\times 10^3$µl)	1.64	1.57	1.50	1.70	0.17
Packed cell volume (%)	28.50	27.60	29.35	28.30	0.97
Haemoglobin (g/dl)	9.50	9.20	10.45	8.60	0.32
Haematocrit (%)	4.45	4.75	5.15	4.40	0.97
Mean corpuscular volume (fl)	23.60	24.10	24.20	23.20	1.86
Mean corpuscular Haemoglobin (pg)	84.4	80.45	80.90	83.50	12.86
Mean Corpuscular Haemoglobin Concentration.(g/dl)	412.85	395.25	392.05	388.90	0.19
Lymphocytes (%)	60.50	69.35	65.60	61.50	8.30
Granulo cytes (%)	25.35	27.25	27.35	26.35	1.97
Monocytes (%)	14.15	13.40	13.25	12.55	1.05

SEM – Standard Error of means.

Serum Biochemical Profile of Growing West African Dwarf Goats Fed Diets Containing Graded Levels of Steam-Treated Cashew Nut-Shell

The serum biochemical profile of growing west African dwarf goats fed diets containing graded levels of steam-treated cashew nut-shell is presented in Table 5. The creatinine levels showed no significant (p>0.05) difference across treatment means, the urea levels for T2 T3 and T4 were statistically similar and significantly (P<0.05) higher than that of T1. The cholesterol levels for T2, T3 and T4 were statistically similar but significantly (p<0.05) higher than that of T1. The alkaline phosphate levels for

T2, T3 and T4 Were statistically the same but were significantly lower than that of T1,the blood sugar decreased steadily from 44.0 (T1) to 33.30 (T4) with values for T1 and T2 Being similar and significantly ($p<0.05$) higher than those of T3 and T4 which were also similar ($p>0.05$). The creatinine values may indicate that increasing levels of cashew nut shell in the diets had no deleterious effects on the lean tissue mass of the growing goats. The urea values may suggest that the protein quality of diet T1 was higher than those of T2, T3 and T4, Since the blood urea content is commonly considered in ruminants to reflect the protein quality of diets (Wikipedia 2009). The urea levels were however within normal range. The higher cholesterol values for T2, T3 and T4 could be due to the inclusion of cashew nut shell in diets T2, T3 and T4 thus increasing the ether extracts content of the diets. It appears that the inclusion of cashew nut shell led to decrease in blood sugar and alkaline phosphate across the treatments. All the serum biochemical parameters considered fell within normal and safe limits for goats.

Table5. *Serum Biochemical Profile of Growing West African Dwarf Goats fed Diets Containing Graded Levels of Steam-Treated Cashew Nut-Shell*

Parameters	Treatments				
	T1	T2	T3	T4	SEM
Blood sugar(mg/dl)	44.0^{a}	40.10^{a}	33.36^{b}	33.30^{b}	1.67
Creatinine (mmol/l)	20.40	17.17	18.15	17.85	0.58
Urea (mmol/l)	0.99^{b}	1.54^{a}	1.40^{a}	1.45^{a}	0.15
Alkaline phosphate (µ/l)	84.36^{a}	50.50^{b}	51.30^{b}	53.58^{b}	11.95
Cholesterol (mmol/l)	4.65^{b}	6.30^{a}	6.34^{a}	6.02^{a}	0.22

a, b, Treatment means on the same row with different super scripts differ significantly ($p<0.05$).

SEM= Standard Error of means

Organ Weights of Growing West African Dwarf Goats Fed Diets Containing Graded Level of Steam-Treated Cashew Nut Shell

Table6. *Organ Weights of Growing West African Dwarf Goats Fed Diets Containing Graded Level of Steam-Treated Cashew Nut Shell (% of Slaughter Weight)*

Organs	Treatments				
	T1	T2	T3	T4	SEM
Liver	1.66	1.76	1.57	1.67	0.12
Spleen	0.15	0.15	0.16	0.16	**0.06**
Heart	0.62	0.56	0.53	0.58	0.03
Lungs	1.39	1.40	1.34	1.31	0.12
Kidney	0.62	0.56	0.63	0.61	0.04

SEM= Standard Error of means.

The organ weights of growing West African dwarf goats fed diets containing graded level of steam-treated cashew nut shell is presented in Table 6. The weights of the liver, lungs, spleen, kidneys and heart were not significantly ($p>0.05$) different. The values did not follow any definite trend for all the organs. The non significance ($P>0.05$) of the values for all the organs considered, indicates that the inclusion of cashew nut shell in the diets did not significantly ($P>0.05$) influence the weights of all the organs considered. Internal organs such as the liver and heart would vary by enlargement if the diets contained poisonous substances. However since there was no significant differences, it implies that the cashew nut shell was safe for the goats. The kidney on the other hand is an excretory organ. Similarities or non significance in the values of the heart indicates that the kidney was not over burdened by the inclusion of cashew nut shell in the diets, thus the excretory functions of the goats were not impaired. This result ranks with those of Ngi (2012) and Okpanachi (2014) who recorded no significant($p>0.05$) differences with yearling West African Dwarf Goats fed graded levels of sweet orange peel meal based diets and growing West African Dwarf goats fed graded levels of cashew pulp meal based diets in that order.

CONCLUSION AND RECOMMENDATIONS

Steam treated cashew nut shell up to 20% level at inclusion had no adverse effect on Haematological and serum biochemical profile as well as organ weights of growing west African dwarf goats, further research using other species at ruminant such as cattle as sheep is suggested.

REFERENCES

[1] AOAC, (1995) Association of Official Analytical Chemists. Official methods of Analysis 16th edition Washington, D.C.

[2] Ambarasu C., Dutta, N. Sharma, K. and Rawat, M. (2004). Response of goats to partial replacement of dietary protein by a leaf mixture containing *Leucaena leucocephala*, *Morus alba* and *Tectoona grandis*. *Small Ruminants Res.*, 51: 45-56.

[3] Babatunde, G. M, Fetuga, B. L., Oyenuga, V. A. and Ayoade, J. A. (1975). The effects of graded levels of brewers dried grains and maize cobs in diet of pigs on their performance characteristics and carcass quality. *Nig. J of Animal Prod.* 1(2): 119-132.

[4] Baneerjee, G.C (2005). Animal husbandry (8th ed) Bidhanchendra Krishviswavidyalafa pp. 9:-11.

[5] Cassey, B. H. and VanNeikerk, W.A. (1988). The Boer goat. Growth, nutrient requirement carcass and meat quality (II) Boer goat reports Dept of Livestock Science, Faculty of Agriculture University of Pretoria, South Africa Pp 4-5.

[6] Daramola, J.O, Adelofe A.A., Fatiba I.A and Soladoye A.O (2005) Hematological and Biochemical Parameters of West African dwarf Goats. Livestock Research for rural Dev. 17 (8) 20-25.

[7] Fajimisin , A. N Fadiyamu, A. A and Alokan F.A (2010). Nitrogen retension and haematological indices of west African Dwaf rame fed sund dried and fermented rumen digesta, and caged hen dropping diet. Proc. 35 Am. Cenf. Nig. Society for Anim. Prod. 14th – 17th march Univ. of Ibadan, Nigeria Pp. 604-607

[8] Joshi, P.K, Bose M and Harns D (2002) Changes in certain haematological parameters in a Siluroid cat fish *Clarias batraclus* (linn) exposed to cardmium chloride. *Pollution Resources* 21(2) 129 - 131.

[9] Kowal, J. M. and Knabe, D. T. (1972). An Agroclimatological atlas of the Northern States of Nigeria ABU Univ. Press Zaria.

[10] Kronfield, O.W and Mediway, N.C. (1975). Veterinary Clinical pathology. Williams and Williams co. pub Baltimore Pp 81-96.

[11] Lakpini, C. A. M. (2002). Feeds and feeding strategy for small ruminants in various physiological states In: Lakpini CAM, Adamu A.M Ehoche O.W and Gefu O.J. (eds) Manual for training workshop on small ruminant production held at NAPRI, Zaria, Nigeria 13th – 18th Jan. 2002 PP. 40-48.

[12] Ngi, J. (2012). The nutritional potentials of sweet orange (*Citrus sinensis*) fruit peel meal for goat feeding .A Ph. D Thesis Submited to the Department of Animal Production, University of Agriculture, Makurdi ,Nigeria, 175 PP.

[13] NRC, National Research Council, (1996). Nutrient requirements of beef cattle 7th Rev. ed. National Academy Press. Washington, DC

[14] Obioha, F.C. and Ndukwe N. (1976). Changes in Yield, chemical composition of standing and conserved forages during the dry season in East central Nigeria. *Nig. J. Anim. Prod.* 3:105 – 116.

[15] Okpanachi U. (2014). Studies on cashew (*Anacardium occidentale*) pulp meal for feeding West African Dwarf Goats. A PhD thesis submitted to the Department of Animal Nutrition, University of Agriculture Makurdi, Nigeria.166 pp.

[16] Schalm, O.W, Jaine N.C and Caroll E.J (1975) Veterinary Haematology SPSS (2006) Statistical packages for social sciences. Version 16.0 SPSS Inc.

[17] Ukanwoko, A.I and Nmecha, C. (2011) Haematological characteristics of West African dwarf goats fed oil palm Leaf- meal and cassava peel Based diets. In: value Re-orientation in Animal production, A key to National food security and stable economy Adeniji, A..A Olatiniji, E..A and Gana ,E..S (eds) proc. of 36th Ann. Conf. of Nig. Soc. for Anim. Prod. 13th – 16th March University of Abuja, Nigeria. Pp..245-247.

[18] Van Soest, P. J., Robertson, J. B. and Lewis, B. A. (1991). Methods of analysis for dietary neutral detergent fibre and non starch polysaccharides in relation to animal nutrition. *J. Dairy Sci.* 74:3583-3597.

[19] Wikipedia(2009) free encyclopedia. http://en.wikipedia.org/wikiurea.