INFLUENCE OF FEEDING GRADED LEVELS OF CASSAVA PULP AND DRY POULTRY DROPPINGS BASED DIET ON SERUM BIOCHEMICAL INDICES OF WEST AFRICAN DWARF RAMS

[*1]Emerue, P.C. and [2]Akinbola, E.T.

[1]Institute of Agricultural Research and Training, Moor Plantation, Ibadan

[2]Ajayi Crowther University, Oyo

Corresponding author: patolala77@gmail.com: GSM: +2349012042609

ABSTRACT

The study was carried out to assess the serum biochemical indices in rams fed cassava pulp and sun-dried poultry droppings as an alternative energy and protein source. A total of twelve West African Dwarf rams aged 9-12 months were used for the experiment of 70 days feeding trial. Chopped elephant grass (*Pennisetum purpureum*) were used as basal diet and four diets of Cassava pulp and Dry poultry droppings as concentrate supplements-based diets. The four diets **(**T_1 - 0% Cassava pulp and 0% Dry poultry droppings, T_2 - 25% Cassava pulp and 25% Dry poultry droppings, T_3 - 50% Cassava pulp and 50% Dry poultry droppings, and T_4 - 75% Cassava pulp and 75% Dry poultry droppings) were fed to the rams at the rate of 3% of the body weight. The rams were divided into four treatments in a completely randomized design. Data collected were total protein, albumin, globulin, Albumin globulin ratio and many others. Data were analyzed using analysis of variance and the mean were separated using Duncan multiple range test. The serum biochemical indices were within the normal range. This is an indication that there was no deleterious effect of cassava pulp and dried poultry droppings on the serum biochemical profile and even on the health of the animals.

Key words: Serum biochemistry, Cassava pulp, Poultry droppings, Ram, Supplemental diet

Introduction

The level of animal protein consumption has direct influence on the general well-being and health of nations. Additionally, poor nutrition in some countries or communities is almost always associated with a lack of animal proteins in the diet (Ositelu, 1981). Sheep population in Nigeria is estimated to be 33.9 million (FAO, 2010) and which are primarily kept for meat production can bridge the supply-demand gap of animal protein in Nigeria. But effective and efficient sheep production cannot be enhanced with the use of conventional feedstuff such as maize, soybean cake, fish meal as supplement to low quality feed in present day Nigeria owing to their exorbitant cost and erratic supply (Akinmutimi, 2004) and the competition both with humans and monogastric animals (Adama, 2008; Ajayi *et al*., 2008; Ukpabi and Abdu, 2009). It is in this light that non-conventional energy and protein materials of farm and agro-industrial wastes are presently being exploited for livestock production in Nigeria (Ndubueze *et al*., 2006).

Many scientists have reported the possible use of some alternative animal protein like poultry droppings which is a material from farm waste. The chemical composition of poultry dropping, especially the high nitrogen content (Jordaan, 2004; Lanyasunya *et al*., 2006) suggests that feeding it to ruminants would be an excellent way to convert nutrients in the waste into animal's products for human consumption hence, it can be a valuable feed for ruminants. On the other hand, Cassava pulp (CP), which is a by-product of tapioca processing industry is one of agro-industrial wastes that have attracted the interest of ruminant nutritionists. The high fibre content in CP, however, made it more attractive in ruminant ration, it is rich in metabolizable energy and highly degraded in the rumen. This study was therefore designed to determine the serum biochemical profiles of rams fed graded levels of cassava pulp and dried poultry droppings-based diets.

Materials and Method

Experimental site: The experiment was carried out at the Sheep and Goat Unit of the Institute of Agricultural Research and Training, Obafemi Awolowo University, Moor plantation Ibadan.

Preparation of test ingredients: Fresh poultry droppings were obtained from caged layers reared commercially. The poultry droppings were sun-dried for 5-6 hours daily for 3-5 days to a constant weight. As the drying progressed, the lumps were manually crushed to reduce the particle size. The dried droppings were later pounded using pestle and mortar and chopped into 5mm particle size for easy digestibility. Thereafter, it was packed into rice-sacks until needed and used as partial replacement for groundnut haulm. Fresh cassava pulp was also collected from Garri-processing firm located around Ibadan township. The pulps were spread on concrete floor and sun dried for 3 days to

constant weight, after which the pulps were packed into rice sacks and used as partial replacement for corn bran. **Experimental animals and management:** Twelve sheep aged 9-12 months were used for the experiment. The animals were housed in individual pens and were acclimatized for 2 weeks. The animals were then allotted into four treatment groups with three animals per treatment before the commencement of the actual feeding trial. The experimental design was completely randomized design and the study lasted for 70 days.

Preparation of Experimental diet: Two experimental diets were prepared for the study: basal and supplementary diets. A total of 600 g of chopped elephant grass (*Pennisetum purpureum*) were fed as basal diet/ram/day. Four types of supplementary diets were prepared and fed (T1 = 0%CP and 0% DPD, T2 =25%CP and 25% DPD, T3 = 50% CP and 50 % DPD, T4 = 75% and 75% DPD); where CP =Cassava Pulp and DPD = Dried Poultry Droppings. The supplementary diet and basal diet were offered (3% of body weight) at the ratio of 2:3 respectively. The Metabolizable energy was calculated using the formulae of Guevara *et al*. (2008). The gross composition of the supplemental diet is presented in Table 1.

Table 1: Gross composition and calculated nutrients of experimental diets fed to the experimental animals

Ingredients	T_1	T_2	T_3	T_4
Cassava pulp	0.00	12.50	25.00	37.50
Corn bran	50.00	37.50	25.00	12.50
PKC	15.00	15.00	15.00	15.00
Groundnut haulm	15.00	11.25	7.50	3.75
Poultry dropping	0.00	3.75	7.50	11.25
Brewer Dried Grain	16.25	16.25	16.25	16.25
Bone meal	2.00	2.00	2.00	2.00
Limestone	1.00	1.00	1.00	1.00
Salt	0.50	0.50	0.50	0.50
Premix	0.25	0.25	0.25	0.25
Total (Kg)	100	100	100	100
Calculated Nutrients				
Metabolizable Energy (MJ/kg DM)	2181.22	2287.94	2394.73	2501.50
Crude protein (%)	12.49	11.87	11.25	10.63

CP=Cassava pulp; DPD= Dried poultry droppings, T1 = 0%CP and 0% DPD, T2 =25%CP and 25% DPD, T3 = 50% CP and 50 % DPD, T4 = 75% and 75% DPD

Blood collection and evaluation: The sheep were bled individually (2 sheep from each treatment) from the jugular vein puncture according to the standard procedure. This was done in the morning before the sheep were fed for serum biochemical analysis. Blood samples collected were centrifuged at 3500 revolutions per minute (rpm) for 15 mins, to separate the blood cells from the serum. Serum Aspartate Aminotransferase, Serum Alanine Aminotransferase and Alkaline phosphatase were analyzed by specto-photometric linked reaction method (Cheesbrough, 2004). Serum total protein, albumin, globulin and serum minerals was done using the method described by Kohn and Allen (1995).

Statistical analysis: Data collected were subjected to analysis of variance (ANOVA) according to the procedure of Statistical Analysis System (SAS, 1999), and means were separated using Duncan's multiple Range Test of the same package at $P<0.05$.

Results and Discussion: Table 2 shows the serum biochemical parameters of West African dwarf rams fed graded levels of cassava pulp and dried poultry droppings-based diet. The result obtained showed a significant ($P<0.05$) difference in the serum total protein of the animals. The mean ranged values 6.30-7.75g/dl for serum protein examined for the animals in all the dietary treatments were below ranged values (45-51g/dl) reported by Oduguwa *et al*., (2007) for sheep fed high proteineous diets and (35.00 -59.00g/dl) reported by Sowande *et al*., (2008) for sheep fed elephant grass, layer droppings and cassava peels. However, the serum protein values obtained in this study were also within the values (6.3-8.5g/dl) reported for WAD goats and Afec-Awasssi sheep by Daramola *et al*., (2005) and Jawaresh *et al*., (2010). Information regarding nutritional status and malnutrition is often obtained

from total protein (Anurudu and Ewuola, 2019). The mean values for albumin were not significantly (P>0.05) different and ranged from 2.9-3.15g/dl. The values were similar to what was reported (2.8-4.34 g/dl) by Alasa, (2014) in an experiment on West African Dwarf goats. The highest value 3.15 g/dl for albumin was obtained in T_4 rams. This suggests higher clotting ability of blood, hence prevention of haemorrhage. The result of the serum globulin showed significant (P<0.05) difference, T_3 was significantly different from T_1, T_2, and T_4 with the highest value in T_3 (4.05g/dl) and the lowest values in T_1 (3.35g/dl). The values in this study were within the normal range (2.7-4.4g/dl) reported by Merck Manual (2011). Elevation in serum globulin may be due to enhanced antibody secretion in response to an infection. The mean values for creatinine were not significantly (P<0.05) affected by dietary treatments across the treatment groups. The values obtained were within the normal range (1.2-1.9mg/dl) reported by Merck Manual (2011). The result of the serum glucose showed that T_1 (60.00mg/dl) and T_3 (62.00mg/dl) were significantly (P<0.05) higher than T_2 (52.50mg/dl) and T_4 (47.00mg/dl). Blood glucose values in this study were generally within the normal range (40-100mg/d) for sheep reported by Khan (2010). When glucose is lower than the normal range, there is an indication of hypoglycemia while higher levels are indication of hyperglycemia (Olorunnisomo, 2012). The result of the cholesterol and blood urea nitrogen obtained in this study shows no significant (P>0.05) difference. The values fall within the range (0.8-9.7mg/dl) reported for WAD goats by Daramola *et al.* (2005). The values reported in this study are indicative of the fact that the dietary protein of this study was of good quality. The result of sodium (Na) level obtained in this study shows no significant (P>0.05) difference, but the values (141 to 144.5 mEq/l) is higher, compared to the values (129.00 mEq/L) reported by Bhat *et al*., (2011), but falls within the ranges of (135 to 156 mEq/L) reported by Jackson and Cockcroft, (2002) for sheep. and also corroborated the finding of Freedeen and Van Kessel, (1990). The values obtained also falls within the range of 124-146 mEq/L reported for WAD goats by Daramola *et al*., (2005). The marked variation in sodium levels in the treatment groups may have resulted from variable intake of sodium in the diets based on the sodium content of the experimental diets. The potassium (k) value did not significantly (P>0.05) differ and it ranged from 4.40 to 4.45 mEq/L. The values are within the range (3.4 to 6.1 mEq/L) reported by Jackson and Cockcroft (2002) and also similar to the result of Aruwayo *et al*. (2011). The electrolytes observed to be within normal range is an indication that the test ingredient may not interfere with the normal renal function of the animals. Chloride level from the trial was significantly different (P<0.05) among the treatments with T_3 rams having the highest value (104.000 mEq/L) than T_2 and T_1 rams. These values were similar to those reported by Jackson and Cockcroft (2002). Blood calcium levels were not different statistically. The result obtained in phosphorus also showed significant (P>0.05) differences, but values were within the range (5.0-7.3mg/dl) as reported in the Merck Manual (2011). The Serum Aspartate Aminotransferase, Serum Alanine Aminotransferase and Alkaline phosphatase in this trial were significantly (p>0.05) affected by the dietary treatments. Values for AST (21.50 - 25.50 IU/L) obtained in this study were lower than (43-123 IU/L) reported by Bhat *et al*. (2011) as normal values for sheep. This indicated there was no damage to heart muscle, liver, muscle cells and to liver functions. The values of ALT (10.50-12.00IU/L) obtained in this study were also within the normal range value of 7-24IU/L recorded by Bhat *et al.* (2011). The values of ALP (220.00-293.50IU/L) obtained in this study were within the normal range of 42-775 IU/L reported for sheep and goat by Blood *et al*. (2007). This implies that the dietary treatment up to 75% had no adverse effect on bone formation of the experimental animals. Abnormally high serum levels of ALP may indicate bone disease, liver disease or bile obstruction.

Table 2: Serum biochemical indices of rams fed graded levels of cassava pulp and layer poultry droppings

Parameters	T_1	T_2	T_3	T_4	P value
Total Protein (g/dl)	6.30^{b}	6.80^{ab}	7.75^{a}	7.05^{ab}	0.12
Albumin (g/dl)	2.90	3.00	2.95	3.15	0.68
Globulin (g/dl)	3.35^{b}	3.80^{b}	4.05^{a}	3.90^{b}	0.00
A/G (g/dl)	0.87^{a}	0.79^{b}	0.69^{c}	0.82^{ab}	0.00
AST (IU/L)	21.50^{b}	22.00^{b}	25.50^{a}	22.50^{b}	0.00

ALT (IU/L)	10.50^{c}	11.50^{ab}	12.00^{a}	11.00^{bc}	0.02
ALP (IU/L)	220.00^{b}	293.50^{a}	281.50^{a}	247.50^{ab}	0.02
Glucose (mg/dl)	60.00^{a}	52.50^{b}	62.00^{a}	47.00^{b}	0.00
Cholesterol (mg/dl)	65.50	64.00	68.50	64.00	0.18
Triglycerides (mg/dl)	12.05^{ab}	11.45^{b}	12.75^{a}	12.55^{a}	0.02
Creatinine (mg/dl)	1.55	1.35	1.65	1.75	0.26
BUN (mg/dl)	9.50	9.60	9.70	9.85	0.18
Serum minerals					
Calcium (mg/dl)	11.25	11.28	11.85	11.50	0.23
Potassium(mEq/L)	4.40	4.45	4.95	4.50	0.15
Phosphorus (mg/dl)	5.60^{b}	6.25^{ab}	7.15^{a}	6.40^{ab}	0.04
Chlorine (mEq/L)	97.50^{b}	96.50^{b}	104.00^{a}	100.00^{ab}	0.07
Sodium (mEq/L)	144.00	141.00	141.50	144.50	0.83

$^{ab=}$ Means on the same row with different superscripts are significantly ($P<0.05$) different. AST= aspartate amino transferase, ALT= alanine amino transferase, ALP= Alkaline phosphate, Alb/Glo= Albumin globulin ratio, BUN= Blood urea nitrogen, T_1 = 0%CP and 0% DPD, T_2 =25%CP and 25% DPD, T_3 = 50% CP and 50 % DPD, T_4 = 75% and 75% DPD

CONCLUSION:

The result of serum biochemical constituents of the West African Dwarf rams showed no adverse effect on the blood profile and health of the animals. Consequently, cassava pulp and dry poultry droppings could be included for up to 75% in the diet of sheep without any adverse effect.

REFERENCES

Adama, T.Z. 2008. Towards adequate animal protein intake by the year 2020. *Inaugural lecture series 11 Federal University of Technology, Minna, Nigeria*.

Ajayi H.I., Olomu J.M. and Oyedeji J.O. 2008. Potentials of African pear (*Dacryodes edulis*) as a feedstuff for animals. Pp. 15-19 in *Proc. 13th Anim. Sci. Assoc. Nigeria. Zaria, Nigeria.*

Akinmutimi, A.H. 2004**.** Evaluation of Sword bean (*Canavalia gladiata*) as an alternative feed resource for broiler chickens. *Ph D. Thesis.* Michael Okpara Univ., Okpara, Nigeria.

Alasa, M.C. 2014**.** Nutritional assessment of Panicum maximum (Jacq.) ensiled with two cultivars of Lablab purpureus for West African dwarf rams. *Ph. d Thesis*, University of Ibadan, Oyo State, Nigeria.

Anurudu, N.F. and Ewuola, E.O. 2019. Haematological, Serum Protein and Weight Gain of WAD Goats Fed Varied Inclusion Level of Neem (*Azadirachta Indica*) Leaf. Babayemi, O.J., Abu, O. and Ewuola, E.O. (Eds). 587 – 590.

Aruwayo, A. Maigandi, S.A. Malami, B.S. and Daneji, A.I. 2011. Haematological and Biochemical Parameters of Uda Lambs Fed Graded Levels of Alkali -Treated Neem Kernel Cake. *Nigerian Journal of Basic and Applied Science*19 (2), 277-284 http://www.ajol.info/index.php/njbas/index.

Bhat, S. A., Manzoor, R., Mir, Sawlehs, Qadir, Allaie, I., Kham, H.M., Ishraq, H. and Bilal, S. 2011. *IJAVMS Vols issue*, 5:481-487.

Blood, D.C., Studdert, V.P. and Gay, C.C. 2007. Saunders Comprehensive Veterinary Dictionary. 3rd Edn. Elsevier, New York, Pp.: 1964-1968.

Cheesbrough, M. 2004. District Laboratory Practice in tropical Countries. Part 2 University Press Cambridge United Kingdom, 266-342.

Daramola, J.O., Adeloye, A.A., Fatoba, T.A. and Soladoye, A.O. 2005. Haematological and biochemical parameters of West African Dwarf goats. *Livestock Res. Rural Develop*. 17: 7-8.

FAO (2010) Good practices for the feed industry – Implementing the Codex Alimentarius Code of Practice on Good Animal Feeding. Rome. FAO Animal Production and Health Manual 9

Freedeen, A.H. and Van kessel, J.S. 1990. Effect of sudden loss of Ca resorption in mature sheep. Can *J. Anim. Sci.* 70: 884-887.

Jawasreh, K., Awawdeh, F., Ban Ismail, Z., Al-Rewashed O. and Al-majali, A. 2010. Normal haematology and selected serum biochemical values in different genetic lines of Awassi Ewes in Jordan. *Int. J. Vet. Med.,* Vol. 7.

Jordaan, J.D., 2004. The influence of bedding material and collecting period on the feeding value of broiler and layer litter. *M.Sc. Thesis, University of Free State, South Africa*.

Kahn, C. 2010. The Merck veterinary Manual (10th edition). Whitehouse Station, New Jersey, U.S.A. Merck and Co. Inc.

Kohn, R.A. and Allen, M.S. 1995. Enrichment of proteolytic activity relative to nitrogen in preparation from the rumen for invitro studies. *Anim. Feed Sci. and Technol.* 52: 1 -14.

Lanyasunya, T.P., Rong, W.H., Abdulrazak, S.A., Kaburu, P.K., Makori, J.O., Onyago, T.A. and Mwangi, D. M. 2006. Factors limiting use of poultry waste as protein supplement for dairy cattle on small holder farms in Kenya. *Int. J. Poult. Sci*., 5: 75-80. Merck, 2011**.** Merck Sharp and Dohme Corp., a subsidiary of Merck & Co., Inc. Whitehouse Station, NJ, USA.

Ndubueze, A.I., Ukachukwu, S.N., Ahamefule, F.O. and Ibeawuchi, J.A. 2006. Milk yield and composition of grazing white Fulani cows fed poultry waste cassava peel-based diets. *Pakistan J. Nutr.* **5,** 436-440.

Oduguwa, B.O., Jolaosho, A.O., Ayankoso, M.T., 2007. Effect of ensiling on the physical properties, chemical composition and mineral content of Guinea grass and cassava tops silage. *Nig. J. Anim. Prod.* 34: 100-106. Olorunnisomo, O. A., Ewuola, E. O and Lawal, T. T. 2012**.** Intake and Blood metabolites in Red Sokoto Goats fed Elephant Grass and cassava Peel Silage. Journal of Animal Production Advances. 2(9): 420- 428. ISSN: 2251-7677. Ositelu, G.S., 1981**.** Animal Science: Casell's Tropical Agricultural Series Book 3. Cassell Ltd., London, UK, Pages: 105.

Statistical Analysis System 1999: SAS User's guide: SAS Institute Incorporations, Cary North, Carolina. Sowande, O.S., Aina, A.B.J., Oguntona, E.B., Fanimo, A.O., Unaka, Hassan, T.A. and Oseni, M.O. 2008. Performance, blood constituents and mineral balance of West African Dwarf Sheep fed preserved elephant grass, layers droppings and cassava peel diets during dry season. Nig. J. of Animal Prod. 35: 90-102.

Ukpabi, U.H. and Abdu, L.S. 2009**.** Effect of mucuna seed meal on dry matter intake and haematology of lactating African dwarf goats. *Proceedings of the 34th Annual Conference on Nigerian Society of Animal Production.* March 15-18, 2009, Uyo, Nigeria, Pp: 562-564.