

Haematological and Biochemical profiles of West African dwarf goat fed diets containing cassava peels, brewers' spent grain and panicum maximum

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Abstract. Twelve (12) West African dwarf goats were fed for fifty six (56) days intensively with cassava peels meal (CPM), Brewer's spent grain (BSG) using panicum maximum (PM) as basal diet and maize based diet as control. Diet A is 52% maize-based diet while diets B, C and D are diets which replaced the 52% maize with 25% BSG/75% CPM, 50% BSG/50% CPM, 75% BSG/25% CPM respective. Results show that packed cell volume of diet C was not significantly higher ($p>0.05$) than A but significantly higher (<0.05) than D and B. Erythrocyte count of diet C was significantly higher ($p<0.05$) than B but not significantly higher than others. The percentage Neutrophil was significantly lower ($P>0.05$) in diet C than others. Percentage Monocyte of diet C was significantly higher ($p<0.05$) than others. Other parameters such as haemoglobin, red blood cell; white blood cell; Platelet. Lymphocyte, Eosinophil, Basophil, mean corpuscular volume; mean corpuscular haemoglobin; mean corpuscular haemoglobin concentration did not show any significant difference ($p>0.05$) among the diets. Serum biochemical profile results show that total protein (g/dl) did not show any significant difference ($p>0.05$) among the diets. Albumin (g/dl) of diet C was significantly higher ($p<0.05$) than others. The globulin (g/dl) of goats on diet C is significantly lower ($p>0.05$) than that of diet B but not of others. Creatinine (mg/dl) did not show any significant difference ($p>0.05$) between diets A and C but they were significantly higher than others. Calcium (mg/dl) was significantly higher ($p<0.05$) in goats placed on diet C than others. These results indicate that goats placed on these diets most especially diet C. could be used to fatten goat, reduce labour and feed cost associated in ruminant (goats) production.

products, meat is the major form in which goats are consumed in Nigeria (Alikwe *et al* 2011)[2]. The demand for goat meat is very high and it commands high market price than beef (Odeyinka 2000) [3]. They also noted that ruminants are capable of increasing the supply of food for humans by consuming materials that otherwise could contribute little or nothing to feeding people. These include forages from rangelands, plant by-products, and crop residues from which humans are unable to derive any energy. Cassava peel is an important by-product available from the processing of cassava root for food uses and starch and has been used in feeding various classes of livestock (Akinfala and Tewe 2004)[4]. These authors further added that ruminants can be fed on cassava tubers, leaves, peels, and residue obtained after processing cassava for garri, fufu, and starch. The potential of cassava as a grain substitute in livestock feed is yet to be fully explored as only a small portion of world total production is currently being used in compounding non ruminant diet. Brewers' waste grain is a readily available, high volume low cost by-product of brewing (Robertson *et al* 2010)[5] and has been reported to contain cellulose, hemicellulose, lignin, and high crude protein of 23.25% (Russel *et al* 1983).[6] These nutrients cause increased endogenous metabolism as well as high proteolytic activities (Ikurior 1995)[7]. These nutrients aid in utilization of feed for ruminants (Biasaria *et al* 1997)[8]. The utilization of cassava peel and brewers' spent grain has found a place in goat nutrition which not only reduces labour of fetching fodder but also create an outlet for these wastes. This study was therefore carried out to evaluate the effect of dietary inclusion of cassava peel and brewers' spent grain on haematological profile and serum biochemistry of WAD goats.

Index Terms: Haematology, West African dwarf goat, cassava peels, brewers' spent grain.

I INTRODUCTION

The demand for animal protein in Nigeria and other developing countries have been in the increase because of rise in human population. Goats are multipurpose animals producing meat, milk, skin, and hair (French 1990)[1], and out of these

II MATERIALS AND METHODS

A Experimental Site

The experiment was conducted at the goat unit of the Department of Animal Science, Akwa State University, Obio Akpa Campus which is situated between latitudes $4^{\circ}30'$ and $5^{\circ}30'N$ and longitudes $7^{\circ}30'$ and $8^{\circ}00'E$ of The Greenwich meridian (SLUS – AK, 1989)[9]

B Management of experimental animals

Twelve (12) females West African Dwarf goats between the ages of 6-9 months were purchased from small holder farmers in Obio Akpa and used for the experiment that lasted for 56 days. The goats were given long lasting antibiotics (oxytetracycline) and treated against ecto- and endo- parasites using ivermectin before the commencement of the experiment. A week to the arrival of the animals in the farm, the experimental pens were properly washed and fumigated. Thereafter, the cemented floor was covered with wood shavings which served as litter materials and bedding for the goats. Upon the arrival, initial weights of the animals were taken and they were randomly assigned to four treatments with three goats per treatment. Each goat was housed in separate pen equipped with water and feed troughs. Seven days adjustment period was given to allow the animals acclimatize to the new environment. During this period, the experimental diets were offered to them to clear the digestive tract of old feed residues.

C Experimental Diets and Feeding

Cassava peels were collected from processing units in the rural areas. The peels were sundried for 7 days then coarsely ground. Brewers' spent grain (BSG) was obtained from champion brewery Plc, Uyo. The wet grain was pressed using screw press to remove moisture before it was sundried for five (5) days. Diet A which served as control did not contain cassava peel meal (CPM) and BSG but 52% maize in composition. In diets B, C, and D the 52% maize was replaced with 25%CPM/75%BSG, 50%CPM/50%BSG, and 75%CPM/25%BSG respectively. The goats were given 500g of the experimental diets in the morning and chopped forage was served *ad libitum* in the noon in separate feeding trough. Fresh clean water was served daily.

D Chemical Analyses of Experimental Diets

Samples of the experimental diets and forage were analyzed for their proximate composition using standard procedure (AOAC, 2000)[10]

E Data Collection

On the last day of the experiment, blood samples (10ml) were collected for haematological studies from the jugular vein of the goats using needles and syringes and put in sample bottles containing ethylene diamine tetra acetic acid (EDTA) and there after analyzed for packed cell volume (PCV), haemoglobin, erythrocyte count, mean corpuscular haemoglobin concentration, total white blood cell count (eosinophils, neutrophils, lymphocytes, and monocytes).

F. Statistical Analyses

The experimental design used was a completely randomized design (CRD). Data were subjected to a one way analysis of variance. Means with significant differences were separated using Duncan Multiple Range Test (DMRT)

TABLE 1: COMPOSITION OF EXPERITAL DIETS

Ingredients	DIETS			
	A	B	C	D
Maize	52.00	--	-	-
Cassava peel	--	1300	26.00	39.00
BSG	--	39.00	26.00	13.00
Soybean meal	5.00	5.00	5.00	5.00
PKC	34.50	34.50	34.50	34.50
Molasses	5.00	5.00	5.00	5.00
Bone meal	2.50	2.50	2.50	2.50
Salt	1.00	1.00	1.00	1.00
Total	100.00	100.00	100.00	100.00

Diet A= 52% maize; Diet B =25% CPM/75% BSG
Diet C= 50% CPM/50% BSG; Diet D=75% CPM/25%BSG;
CPM = Cassava peel meal; BSG = Brewer's spent grain; PKC= palm kernel cake

III RESULTS AND DISCUSSION

Table 2: Proximate Composition of Experimental Diets

NUTRIENTS	DIETS					
	A	B	C	D	SEM	PM
DM(%)	91.30	92.45	91.88	91.54	1.91	35.46
CP (%)	13.25	15.82	13.72	11.57	1.09	8.89
CF (%)	5.51	10.16 ^{ab}	12.51 ^a	7.81 ^c	0.76	28.91
EE (%)	4.33	4.75	4.14	3.53	0.38	2.94
Ash (%)	7.05	7.65	9.34	6.34	0.75	2.70
NFE(%)	69.86	61.62 ^b	60.29 ^b	70.75 ^a	1.59	46.50
Energy	2630	2101	2327	2554	2.04	859 (kcal/kg)

a, b, c means on the same row with different superscripts are significantly different (P<0.05)

Table 3: Blood profile of goats fed diets containing Cassava Peel Meal, Brewers' Spent Grains, and basal Panicum maximum diets

Parameters	DIETS				SEM	Normal range
	A	B	C	D		
PCV (%)	29.75 ^{ab}	25.00	30.25 ^a	26.75 ^{ab}	1.38	22- 38
Hb (d/gl)	9.08	8.08	9.50	8.53	0.43	8-12
RBC ×						

10 ⁶ ul	18.30 ^a	15.63	19.78 ^a	18.15 ^a	0.64	8- 18
WBC ×						
10 ³ ul	13.30	10.65	11.20	11.65	1.75	4- 13
Platelet ×						
10 ³ ul	0.85	0.72	0.54	0.79	0.41	0.3- 0.6
Neutrophil						
(%)	19.50 ^a	19.25 ^a	12.00 ^b	19.25 ^a	1.34	12- 72
Lymphocyte						
(%)	77.75	77.25	81.70	78.25	1.73	20- 90
Eosinophil						
(%)	1.00	1.00	1.50	0.75	0.57	1- 80
Monocyte						
(%)	1.75 ^b	2.50 ^{ab}	4.50 ^a	1.25 ^b	0.70	0- 40
Basophil						
(%)	0.00	0.00	0.25	0.50	0.19	1- 2.5
MCV (fl)	16.28	16.35	15.40	14.75	0.85	16- 25
MCH(pg)	4.98	5.18	4.85	4.73	0.29	5- 80
<u>MCHC</u>						
(g/dl)	30.45	31.63	31.43	31.95	0.66	30-36

a, b means on the same row with different superscripts are significantly ($p < 0.05$) different. *Normal range values (Radostits *et al.*, 2000)[11].

PVC=packed cell volume; Hb=haemoglobin; RBC=red blood cell;

WBC=white blood cell; MCV=mean corpuscular volume;

MCH=mean corpuscular haemoglobin; MCHC=mean corpuscular

haemoglobin concentration

The effects of dietary inclusion of cassava peels and brewers' spent grain on haematological profile of West African Dwarf goat are shown in Table 3. There were significant differences among the treatments for packed cell volume, erythrocytes count, neutrophils, and monocytes. Packed cell volume values for diet A(29.75%) and diet D(26.75%) were similar ($P > 0.05$) and differed ($P < 0.05$) from other treatments. The range (25.50-29.75%) were within the reference value reported by Radostits *et al* (2000)[11] Haemoglobin values were between 8.08- 9.50g/dl and fell within the reference value indicating that cassava peel and brewers spent grain did not interfere with oxygen transportation. The red blood cell (RBC) value for diets A(18.30×10^6 ul), diet C(19.78×10^6 ul) and diet D(18.15×10^6 ul)

were similar ($P > 0.05$) but differed from diet B(15.63×10^6 ul). However, red blood cell value of goat on diets B, C and D fell within the reference value of $8- 18 \times 10^6$ ul reported by Radostits *et al* (2000)[11] for clinically healthy goats. This indicated that goats were not anaemic or diseased. The white blood cell values ($10.65-13.30 \times 10^3$ ul) were not significantly different ($P > 0.05$) among the treatments. White blood cell value of goats on diets B, C, and D were within the normal range for healthy WAD goats reported by Radostits *et al* (2000). This indicated that goats placed on diets containing cassava peel and brewers' spent grains were not struggling with any anti-nutritional factor in the diets. The little deviation from the normal range shown in diet A(18.30×10^6 ul) could be attributed to error during laboratory analysis of blood. This experiment has shown that a combination of these waste products (cassava peel and brewers spent grain) with a forage (panicum maximun) could be used to fatten goats without any adverse effect, reduce labour and feed cost associated with ruminant (goats) production.

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