



## A Preliminary Survey on The Enzymatic Effects of Roxylene on West Africa Dwarf (Wad) Goat Fed Cassava Peels and Poultry Droppings

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### ABSTRACT

A 112days feed trial on West Africa Dwarf (WAD)goats fed cassava peels (CPM) and poultry droppings (PDM) with varying inclusion levels of enzymes on their growth performance and blood indices.Five dietary treatments levels based on the different percentage body weights per treatment were fed with varying levels of Roxazyme G2® at 4.4g, 4.6g, 4.8g and 5.0g which serves as T2, T3, T4 and T5 respectively per kg of CPM + PDMThe moisture, dry matter, ash, crude fibre, ether extracts, crude protein and Nitrogen free extracts of the diets were 10.76-12.06%, 87.94-90.34%, 8.27-9.25%, 12.68-13.62%, 5.26-5.46%, 14.21-14.95 and 45.69-46.73% respectively.Data collected on the growth parameters and bloodindices of the goats were analysed, while the means were separated with Duncan Multiple Range Test. Results on the general performance of WAD fed poultry dropping with varying inclusion levels showed that T5 have superior mean values on the weight gain, daily weight gain and better FCR. On the blood indices of WAD goats fed enzyme showed increase values on the parameters evaluated at higher inclusion levels. It was concluded that higher inclusion levels of enzymes resulted to a better growth performance with increase immunity to fight infection as observed at higher concentrations on their blood profile.

**Keywords:** blood indices, growth performance, poultry droppings, proximate analysis and WAD goats,

### 1.0 INTRODUCTION

Goat production is a veritable way of alleviating animal protein deficiency in Nigeria (Eyoh and Udoh (2020). It has immense potentials and good attributes which include high growth rate, high efficiency in converting forage to meat, short gestation period, and high prolificacy, relatively low cost of production, high nutritional quality of goat meat which includes low fat, sodium, and cholesterol levels. Also, it has a high protein level of about 20.8% and its consumption is of cultural and religious biases (Okpara *et al*, 2020). Ruminants are important livestock sector in virtually every country in the world, due to their contribution as animal protein to the diets of an average human populace.

The shortage of animal protein particularly in developing countries in Africa (Nigeria inclusive) has necessitated investigation of several novel sources of protein (Obakanurhe and Akpodiete, 2021). This acute shortage of protein had been

attributed to the phenomenal rise in the price of animal feeds which account for about 75-85% of the recurrent production cost in intensive ruminant animal production in Africa (Balehegnet *et al.*, 2020). This has escalated the price of animal product thus making animal protein generallybeyond the reach of the average citizen in the developing countries. With the teaming population, there is an attendant rise in the demand for animal product in recent years but a careful survey of some relevant literatures and policy statement on the supply and consumption of animal protein reveals a growing concern with the widening gap between estimated protein requirement and actual protein consumption in many tropical developing countries including Nigeria (Ajagbe *et al.*, 2020).

However, producers of livestock, particularly ruminants, both at the smallholder and commercial production levels, must look for alternate feed sources without compromising the quality of the feed and the productivity of the animals. Due to the

ongoing study, emphasis has been placed on using inexpensive sources of agricultural-based industrial byproducts and organic waste by several authors as supplementation in animal production (Obakanurhe and Okpara 2016; Irabor *et al.*, 2021; 2022a; 2022b). The uses of cassava peels and poultry droppings in the diets of goats has been identified as an alternative to these expensive feed resources (Ajagbe *et al.*, 2020). According to FAO (2005), numerous cassava plant components, such as the tuber, peels, pulp, etc., can be used to make effective feeds for ruminant livestock as non-structural carbohydrates and fermentable energy sources. There have been the uses of many fruits, vegetables and animal waste that have potentials as a source of high quality feed resources for domestic animals (Obakanurhe and Akpodiete 2021; Irabor *et al.*, 2022a). Hence there are still paucity of the utilization of poultry droppings and the constraint to its utilization

The importance of feed supplementation and enzymatic inclusion in animal production has increased in the last few years (Ravindran 2013). Enzyme inclusion in the diets of ruminant has been encouraging Okpara *et al.*, (2020). According to Obakanurhe and Okpara (2016) blood profile of animals might be influenced by certain factors, one of which is nutrition in which the enzyme assist to break down.

Animal waste like poultry dropping could have effect on haematological parameters of farm animals (Ravindran 2013). This study evaluate the performance of West African Dwarf goat fed with cassava peel meal and poultry dropping meal (CPM+PDM) treated with varying levels of enzyme.

## 2.0 MATERIALS AND METHODS

### 2.1 Experiment Site

The study was conducted at the sheep and goat unit of the teaching and research farm, Department of Animal science, Delta State University, Abraka. Abraka is bordered by Ukwani Local Government Area at the east, Edo State at the west, at the north and south by Ethiope River and Ughelli North, respectively. It is situated on latitudes 5° 46' and 5° 48' north of the equator and longitudes 6° 05' and 6° 08' east of the Greenwich meridian. The area extends over 168.4 km<sup>2</sup> (Olomo and Ajibola,

2006). Abraka is located within the tropical environment. Monthly temperature ranges between 23 and 32°C, while monthly rainfalls range from 25.4 and 457 mm (Efe, 2006).

### 2.2 Preparation of the Experimental Diets

Cassava peels were collected from the school cassava mill. The peels were washed to remove impurities and dried for 3 days under the sun. The dried peels were milled using the hammer mill to achieve cassava peel meal (CPM) which was stored in sacks. Also, poultry droppings were harvested from the poultry unit in the school, sundried for 3 days and milled using hammer mill to achieve 3mm particle sizes. The enzyme Roxazyme is an exogenous fibrolytic enzyme that contains cellulose, xylanase and beta-glucanase and was procured commercially. This was added to the CPM + Poultry droppings meal (PDM) at varying inclusion levels (4.4g, 4.6g, 4.8g and 5.0g) and compounded with per kg of the meal. The diets were pelleted, dried and kept in sacks prior to be fed to the animals.

### 2.3 Proximate Analysis

The experimental diet proximate composition was examined using AOAC (Association of Official Analytical Chemists) procedures (2015). Gas chromatography was used to quantify the synthesis of each individual volatile fatty acid according to Obakanurhe and Akpodiete (2021).

### 2.4 Experimental Animals and Management

Thirty (30) West African Dwarf Goat of both sexes 4 – 6kg live weight at 4 months of age were procured from reputable farmers in within the university community. The animals were housed throughout the experimental period under similar condition. The feeding trial lasted for 12 weeks after seven (7) days of acclimatization period to the experimental diets and the environment. They were treated with ivermectin injection against internal and external parasites (Subcutaneously). Oxytetracycline (long acting antibiotics) and multivitamins (intramuscularly) was also administered.

At the end of the acclimatization period, the goats were assigned to five dietary treatment groups (T1, T2, T3, T4 and T5), six (6) goats per treatment in a

Completely Randomized Design (CRD) and two goats per replicate.

**Table 1. Proximate analysis of experimental diets fed on WAD goats**

Parameter	T1	T2	T3	T4	T5
Moisture	11.15	10.76	11.38	12.06	10.78
Dry Matter	88.85	90.34	88.62	87.94	90.02
Ash	9.25	9.91	8.97	8.41	8.27
Crude fibre	12.68	12.87	13.08	13.42	13.62
Ether extract	5.33	5.46	5.26	5.32	5.40
Crude protein	14.86	14.21	14.40	14.95	14.52
NFE	46.73	45.69	46.60	45.84	46.53

The feed intake was calculated based on the amounts of experimental diets to each treatment offered to and refused by each animal were recorded daily. The experimental animals were weighed on weekly basis throughout the experimental period, and they were weighed early in the morning before experimental diets were offered while the weight changes was imputed.

Body weight of goat was taken at the beginning of the experiment and subsequently on weekly basis. Weekly body weight gain (DBWG) and feed conversion ratio (FCR) were calculated.

Weekly body weight gain = Initial body weight – weekly measured body weight.

In calculating FCR, feed intake per week was divided by weight gain per week.

## 2.7 Collection of Blood Samples

Blood samples were collected using sterile needles and syringes from each goat through the vein and were transferred into sterilized bottles containing Ethylene Diamine Tetra Acetic acid (EDTA). The Red Blood Cell (RBC) counts, total White Blood Cell (WBC) counts, haemoglobin (Hb) concentration and Packed Cell Volume (PCV) parameters were determined. Blood constants (MCH, MCV and MCHC) were also determined.

The linear model equation is;

$$X_{ij} = \mu + T_i + E_{ij}$$

where  $X_{ij}$  = weight measurement of the individual experimental animal  $i$  = effect of treatment 1, 2, 3, 4 and 5

$j$  = effect of replicate 1, 2, 3, 4 and 5  $\mu$  = population mean

The five dietary treatments levels based on different percentage body weights per treatment were fed with varying levels of Roxazyme G2@at4.4g, 4.6g, 4.8g and 5.0g which serves as T2, T3, T4 and T5 respectively per kg of poultry manure.

## 2.6 Growth Parameters

### 3.0 DATA ANALYSIS

The mean values obtained for the determination of various indices in respect of the 5 treatments were subjected to a one-way Analysis of Variance and means were separated using Duncan's new Multiple Range Test (GenStat 2018).

### 4.0 RESULTS

The result of the nutrient composition of the experimental diets showed the ranges of moisture, dry matter ash, crude fibre, ether extracts, crude protein and Nitrogen free extracts were 10.76-12.06%, 87.94-90.34%, 8.27-9.25%, 12.68-13.62%, 5.26-5.46%, 14.21-14.95 and 45.69-46.73% respectively Table 1.

The results on the effect of experimental diet treated with varying levels of enzyme on performance characteristics of West African dwarf goats revealed significant differences across the treatments. However, the highest weight gain (4.0 kg) was recorded on the goats treated with T5 varying level of enzyme while the least (3.31 kg) was recorded in T4. Treatment 5 recorded the highest values on average daily weight gain (44.44 g) and total daily intake (501.70 g).

**Table 2. Performance characteristics of West African dwarf goats fed diets with varying levels of enzyme**

Parameters	T1	T2	T3	T4	T5	SEM
Initial body weight (kg)	8.00	8.20	8.16	7.73	8.27	0.44
Final body weight (kg)	11.35 <sup>b</sup>	11.63 <sup>b</sup>	11.48 <sup>b</sup>	10.83 <sup>c</sup>	12.27 <sup>a</sup>	0.45
Weight gain (kg)	3.35 <sup>bc</sup>	3.45 <sup>b</sup>	3.40 <sup>b</sup>	3.31 <sup>c</sup>	4.00 <sup>a</sup>	0.11

A/DWG (g/d)	37.22 <sup>bc</sup>	38.15 <sup>b</sup>	39.37 <sup>b</sup>	34.52 <sup>c</sup>	44.44 <sup>a</sup>	1.18
Total daily intake (g/d)	514.35 <sup>c</sup>	565.07 <sup>ab</sup>	557.60 <sup>b</sup>	500.07 <sup>d</sup>	501.70 <sup>a</sup>	12.42
FCR	13.87	14.83	13.72	14.74	11.29	0.34

a,b,c means on the same row with different superscripts are significantly ( $P < 0.05$ ) different SEM – Standard Error of mean FCR – Feed Conversion Ratio

### Haematology Parameters of WAD Goat Fed Diets with Varying Levels of Enzyme

The results on haematological response of West Africa Dwarf goat at the end of the experiment showed that Packed Cell Volume (PCV) and Plasma Protein (PP) and haemoglobin (Hb) were significantly ( $P < 0.05$ ) influenced by the treatments. The result indicated that T5 had the highest Packed Cell Volume (PCV) means of 34.71% while the least value 25.15% was recorded on T1. The plasma protein (PP) recorded range from were 5.77 - 7.00%.

On the haemoglobin (Hb) of WAD goat fed T5 had significantly higher value in comparison to the

other groups. The results on blood cell counts revealed that RBCs counts mean values obtained in this study were significantly ( $P < 0.05$ ) influenced by dietary treatments while the WBCs were not influence by the diets. Hence were within the recommended levels for healthy goats.

The mean cell haemoglobin concentration (MCHC), Lymphocyte, Monocyte, Eosinophils, and Neutrophils were influence by the diets. However, significant differences were documented between treatments tested on the blood parameters (MCV MCHC and MCH) of West Africa Dwarf goat.

**Table 3. Haematology parameters of WAD Goat fed diets with varying levels of enzyme Serum biochemistry of West African dwarf goat fed diets with varying levels of enzyme**

Parameters	T1	T2	T3	T4	T5
PCV (%)	25.15 <sup>d</sup> ±0.03	30.30 <sup>c</sup> ±0.11	32.26 <sup>b</sup> ±0.03	33.11 <sup>ab</sup> ±0.72	34.71 <sup>a</sup> ±0.23
PP (%)	5.77 <sup>c</sup> ±0.34	6.33 <sup>ab</sup> ±0.26	6.17 <sup>b</sup> ±0.17	6.47 <sup>ab</sup> ±0.27	7.00 <sup>a</sup> ±0.50
HB(g/dL)	8.53 <sup>c</sup> ±0.23	10.53 <sup>b</sup> ±0.23	11.07 <sup>ab</sup> ±0.47	11.33 <sup>a</sup> ±0.33	11.80 <sup>a</sup> ±0.60
WBC(x10 <sup>3</sup> /μL)	6.45±0.21	6.20±0.36	6.49±0.06	6.36±0.15	6.56±0.58
RBC(x10 <sup>6</sup> /μL)	14.35 <sup>c</sup>	16.57 <sup>ab</sup>	15.60 <sup>b</sup>	14.07 <sup>d</sup>	17.70 <sup>a</sup>
Neutrophils (%)	50.03 <sup>c</sup> ±0.03	56.33 <sup>b</sup> ±0.48	54.33 <sup>b</sup> ±0.82	60.33 <sup>a</sup> ±0.06	60.67 <sup>a</sup> ±0.67
Lymphocyte(%)	40.33±0.21	40.33±0.67	40.67±0.72	36.33±0.15	38.33±0.38
Monocyte(%)	2.03±0.43	2.61±0.22	2.38±0.67	2.67±0.55	1.63±0.35
Eosinophils (%)	2.00 <sup>d</sup> ±0.41	2.48 <sup>c</sup> ±0.53	4.26 <sup>b</sup> ±0.33	2.67 <sup>c</sup> ±0.67	5.33 <sup>a</sup> ±0.33
MCV(fL)	78.77 <sup>e</sup> ±0.33	88.11 <sup>d</sup> ±0.45	94.33 <sup>b</sup> ±0.03	89.33 <sup>c</sup> ±0.55	97.33 <sup>a</sup> ±0.13
MCH(pg)	26.38 <sup>c</sup> ±0.33	30.26 <sup>ab</sup> ±0.33	31.54 <sup>ab</sup> ±0.43	29.05 <sup>b</sup> ±0.65	32.51 <sup>a</sup> ±0.24
MCHC(g/dL)	33.47 <sup>ab</sup> ±0.27	34.37 <sup>a</sup> ±0.07	33.17 <sup>ab</sup> ±0.07	33.40 <sup>ab</sup> ±0.06	32.93 <sup>b</sup> ±0.03

a-b Means within the row with different superscripts are different at  $P < 0.05$ . SEM: Standard error of the mean PVC: Packed cell volume, RBC: Red blood cell counts, WBC: White blood cell counts, Hb: haemoglobin, MCV: Mean corpuscular volume, MCH: Mean corpuscular haemoglobin, MCHC: Mean corpuscular haemoglobin concentration

The serum biochemistry of WAD goat fed dietary treatments showed significant ( $p < 0.05$ ) difference on the total protein, urea, globulin and cholesterol of WAD goat.

On the mean serum, Albumin and Creatine of the WAD goat assessed in this study were not significantly influenced by the varying level of enzyme treatment.

**Table 4. Serum biochemistry of WAD Goat fed pelleted poultry droppings with enzymes**

Parameters	T1	T2	T3	T4	T5
Total Protein(g/dl)	5.09 <sup>c</sup> ±0.45	5.73 <sup>b</sup> ±0.63	6.22 <sup>ab</sup> ±0.39	6.00 <sup>ab</sup> ±0.00	6.81 <sup>a</sup> ±0.60
Creatine(mg/dl)	1.17±0.42	1.58±0.71	0.37±0.32	0.10±0.00	1.41±0.29
Urea(mg/dl)	11.37 <sup>c</sup> ±0.31	12.25 <sup>b</sup> ±0.37	12.60 <sup>b</sup> ±0.20	13.01 <sup>ab</sup> ±0.49	13.99 <sup>a</sup> ±0.51
Globulin(g/dl)	1.68 <sup>c</sup> ±0.23	1.97 <sup>c</sup> ±0.27	3.00 <sup>a</sup> ±0.27	2.70 <sup>b</sup> ±0.10	2.93 <sup>b</sup> ±0.13
Albumin(g/dl)	3.41±0.30	3.76±0.62	3.22±0.00	3.30±0.00	3.88±0.33
Cholesterol(mg/dl)	176.33 <sup>c</sup> ±0.3	186.33 <sup>b</sup> ±0.33	186.67 <sup>b</sup> ±0.67	191.33 <sup>a</sup> ±0.33	195.33 <sup>a</sup> ±0.33

**a-b-c-d Means within the row with different superscripts are different at p< 0.05. SEM: Standard error of the mean**

## 5.0 DISCUSSION

The resultson the proximate analysis on the experimental diets were slightly above that of Ajagbe *et al.* (2020) on dry matter content who reported 89.16 - 89.90% while the crude protein content was higher compared to the values reported by Ajagbe *et al.* (2020) but similar to previous study documented by Yusuf *et al.* (2013) that fed broiler chicken waste and urea based diets on WAD goats whose values were within 10.00 – 16.0%. Also, the present study crude fibre content were significantly ( $P>0.05$ ) different from earlier study reported by Ajagbe *et al.*, (2020). The ash content documented were slightly above the range (5.00 - 20.00%) reported by Bello (2017) that fed finger millet straw supplemented with varied inclusion levels of dried poultry diets on goats. The discrepancies observed could be the species of birds used, age, time of harvest, processing methods and other ecological factors.

The results on the growth performance of WAD goats fed treated diets was similar to report of Ajagbe *et al.*, (2020) that higher inclusion of enzyme resulted to significant weight gain at inclusion progresses. The resulting growth rate recorded in this study corresponds with the feed intake. However, the highest weight gain on the goats treated with T5 and total daily intake value 581.70 g could be attributed to the enzymatic effects on the diet releasing significant quantity of protein to be utilized by the goat. Several authors has conducted various researches on WAD goat fed broiler litter waste and urea based diets (Yusuf *et al.*, 2013), cassava peels treated with nitrogenous supplemented (Ajagbe *et al.*, 2020) and yielded similar results on the weight gain, feed intake and FCR. The slight discrepancies observed could be aligned to the age of goats, breeds of poultry

droppings, diets production and other ecological factors.

On the haematological parameters which are good indicators of the physiological status and a reflection of animal responsiveness to their internal and external environment (Obakanurhe and Okpara 2016), revealed treatment effects on Packed Cell Volume (PCV), Plasma Protein (PP) and haemoglobin (Hb) Table 3. The values recorded on packed cell volume in this study were within the range (21 – 35%) reported by Omotoso *et al.* (2019). In contrast to this, Taiwo and Ogunsanmi (2003) reported slightly higher values of 36.9% and 35.5% for clinically healthy West African dwarf goats. These discrepancies could be the age and feed administered to the goat. The haemoglobin range in this study fell within the range of 8.50 - 11.80g/dL as reported by Omotoso *et al.* (2019) but higher than the values of 5 – 6g/dL documented by Belewu and Ogunsola (2010) for goats fed fungi treated enzyme rations. The red blood cell counts reported were within the range reported by Ibhaze *et al.*, (2021) that fed WAD goat with treated maize cob and maize husk-based diets with mixture of microorganisms.

The result on WBCs and RBCs recorded in this study agrees with Ocheja *et al.*, (2012) who documented similar range of values. It was also observed that the PCV, WBC, RBC, Hb values varies with increased replacement levels of enzymes which showed that the animals would have better defense ability against any infection. However, higher values of WBC has been associated with toxicity of diets or poor detoxification process which lead to increased production of WBC to fight foreign substances in the body, while low value suggest susceptibility to infection (Omotoso *et al.*, 2019). The mean cell haemoglobin concentration (MCHC) indicates that

there were no significant ( $p>0.05$ ) differences among the treatment means. The range of 2.00- 5% obtained on Eosinophils in this study was at variance with 2% reported by Okolo *et al.*, (2012). The Eosinophils values also indicate that there was no allergic reaction imposed by the dietary treatments.

The Total Protein (TP) indicates significant difference between the treatments. However, this was not in constant with the report of Okolo *et al.*, (2012) who reported no significant ( $P<0.05$ ) differences in total protein values for growing WAD goats fed varying levels of cashew nut shell. This disparity might be due to differences in the classes of the goats and levels of diet administered. On the globulin results recorded agrees with separate study of Omotoso *et al.*, (2017) who observed higher globulin values when goats fed with *Panicum maximum* replaced with untreated cocoa pod husk meal. Furthermore, the higher globulin values showed the greater the ability of animal to fight infection since globulin is known to fight infection (Obakanurhe and Okapra 2016, Helen *et al.*, 2020). The Albumin and Creatinine of the animals assessed in this study were not significantly influenced by the varying levels of the enzymes. All the serum parameters evaluated fell within normal values for growing West African dwarf goats.

## 6.0 CONCLUSION

The test diets could be fed to WAD goat up to T5 without any adverse effects since improved performance and better influence on the haematology and serum biochemistry. The feed sources (CPM +PDM) in this study has the potential of high quality feed resources for WAD goats. This study also serves as a guide for commercial livestock farming in the reduction of production cost and the management of poultry waste as feed source for ruminant animal.

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