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BLOOD, CARCASS AND ORGAN MEASUREMENTS AS INFLUENCED BY *ASPERGILLUS NIGER* TREATED CASSAVA WASTE IN THE DIETS OF WEST AFRICAN DWARF GOAT (WAD)

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ABSTRACT

Effects of feeding Aspergillus treated cassava wastes on haematological values, organs and carcass measurements of West African dwarf goats (WAD) were determined.

Twelve West African dwarf goats (weighing between 2.8 and 5.4kg) in a completely randomized design (CRD) model with 56d periods consumed diets A (untreated cassava waste, 40%) and *Aspergillus* treated cassava wastes thus : diets B(20%), C (30%) and D (40%) *ad libituni.* With the exception of the neutrophil and lymphocytes which are significantly different (P<0.05) among treatments (9.25%, 8.20%26.00%, 17.50% and 90.75% 92.00% 74.00% and 97.50% for control diets (A), B , C, and D respectively).Other, haematological indices (Hb, PCV, WBC, MCV MCH, MCHC and EBR) were similar (P>0.05).Carcass weight and dressing percentage evaluated increased (P>0.05) *with Aspergillus* treated cassava wastes and was similar P>0.05) among treatments(1.49% control diet A,2.01% (B),2.69% (C) and 2.45% (D) and 38.71% control diet (A),44.70% (B) 45.03% (C) and 41.11% (D). The kidney weight was not affected (P>0.05) by the fungus *(Aspergillus niger)* and it ranges between 1.12 and 1.24%. The heart weight was 1.58, 1.38, 1.07 and 1.15% for the control (A), diets B, C and D respectively, while the weight of the lungs was numerically greater for D (4.60%) than for diet A (4.02%) .owever, there was no significant difference among treatments A, B, C and D . In conclusion, the inclusion of Aspergillus treated cassava waste in the diet of ruminant animals may not markedly alter the haematological indices or affects the health of goats, carcass and organ weights of West African dwarf goats.

KEY WORDS: *Aspergillus* treated cassava waste, goat, blood, carcass and organ parameters.

INTRODUCTION

The importance of feed in livestock production can be virtualized from the fact that feed account for about 5-75% of p. oducing chicken and 40-60% of sheep and goat production. However, faulty feed and feeding has also been implicated in mortality among livestock, reduced growth rate and product coridemnation.

Goat production in many parts of the tropical environment depend mostly on natural vegetation from waste land which are deficient in protein and other digestible nutrients for most parts of the year *(Ademosun, 1973)* as well as placing the animal on waste agricultural residues such as rice husk, sorghum Stover and cassava waste. The waste which is lignocellulosic in nature is a complex of three polymers thus: cellulose, hemicellulose's and lignin. The three polymers constitute a complex that is nutritionally poor but because of the enormous quantities available, it nevertheless, represents a potentially valuable materials for future biotechnological exploitation *(Eggeling, 1985).*

Substantial attention has been given to the principal enzymes involved in lignocellulose degradation, particularly xylanases and more recently peroxidases. However, some vital enzymes are being produced by *Aspergillus niger (Blair, 1975., Barbesgaard, 1977).* These include cellulose which helps in d grading cellulose while pectinase acts on pectins and amylase is another enzyme produced by *Aspergillus niger.*

Apart from the degrading ability *of Aspergillus niger,* the fungus has been used to detoxify tannin, a naturally occurring plant polyphenolic compounds that have wide ranging effect on animals and microbes *(Waterman and More, 1994 Bhat et al., 1996 and Belewu and Morakinyo, (2001). Aspergillus niger* has also been reported to be capable of degrading a variety of aromatic compounds (Salicylate resorcinol) *(Sallubhai, et al., 1984)*

The ingestion of numerous dietary compounds have measurable impacts on the blood constituents *(Harper et al., 1979 ',Church et al .,1984).* Hence, examination of the blood provide a valuable opportunity to clinically investigate the presence of several metabolites and other blood constituents. This is in line with *W.H.O. (1963)* recommendation on the use of blood and biochemical values in medical nutritional assessment. However, *Belewu and Fagbemi (2001)* reported an increasing feed intake, digestibility and weight gain when West African dwarf goats were fed Aspergillus treated cassava waste diet. Hence, the thrust of this study was to evaluate the effect *of Aspergillus* treated cassava waste on the haematological indices, carcass and organ measurements of West African dwarf goats.

MATERIALS AND METHODS

Organism, Media and Culture conditions

Aspergillus niger was isolated from soil, identified and characterized among other strains and was found to be beneficial and secreting some vital enzymes (cellulose, pectinase, hydrolytic enzymes as well as bioassay of heavy metals *(Singth, 1980).*

Aspergillus niger obtained was grown on potato dextrose agar (PDA). All cultures were performed in petri-dishes and later incubated at 37°C.

The cassava waste was obtained from gari processing centres around Ilorin metropolis, Nigeria. The waste was sun dried, milled and later packed into polypropylene bags ready for sterilization at 121°C, 15Kg/cm^3 and for 15 minutes. After, which it was allowed to cool and then incubated with *Aspergillus niger.*

Inoculation and Incubation

Aspergillus niger was harvested with Tween 80 solution (10ml. 0.01%) and adjusted to 10^7-10^8 spores per ml with sterile water. Each bag (50g) was incubated with 5ml of

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Table 1: Composition of the Experimental Diets

Ingredients %)	Diet A (Control)	Diet B	Diet C	Diet D
Cassava waste	40.00	20.00	10.00	-
Aspergillus treated cassava waste	-	20.00	30.00	40.00
Sorghum Brewer's Grain	15.00	15.00	15.00	15.00
Wheat offals	15.00	15.00	15.00	15.00
Palm kernel cake	28.00	28.00	28.00	28.00
Common salt	1.00	1.00	1.00	1.00
Vitamin-mineral premix *	1.00	1.00	1.00	1.00
Total	100.00	100.00	100.00	100.00
Proximate composition (%)				
Dry matter	94.50	94.00	94.00	95.11
Crude protein	14.39	16.60	16.68	17.95
Crude fibre	11.10	10.20	9.10	8.40
Ether extract	8.00	6.00	6.00	5.50
NFE	60.34	65.10	63.42	64.81
Acid detergent fibre	60.90	47.30	37.80	32.80
Lignin	53.22	48.63	39.11	33.96

* Containing per kg.. Vit A.,100000iu.;Vit D3,1500000m, Vit K3, 300g, Vit B3 250g., Nicotinic acid, 8.00g., Calcium D-Panthothenate, 30g., Vit B6,0.03g., Vit.,B12,800g., Mn l000g., Zn, 4.50g., Cu, 0.02g., Iodine, 0.15g., Co 0.02g,. Selenium, 0.0lg.

Table 2: Effect of Aspergillus treated Cassava waste on the Blood parameters of the Experimental Animals

Haematological indices	Diet A	Diet B	Diet C	Diet D	±SEM
Hb (g/dl)	6.23	6.73	7.33	6.60	0.98NS
PCV (%)	19.25	19.75	20.00	17.00	3.99NS
WBC x10^9/L	20.43	18.75	12.63	11.65	7.52NS
RBCx 10^{12}/L	1.95	1.82	2.58	1.80	0.71NS
MCV(fl)	9853	111.05	83.75	119.50	12.35NS
MCH(g/gL)	42.75	36.75	33.00	51.00	9.1 ONS
MCHG (g/dl)	42.75	34.50	37.00	44.50	4.75NS
Neutrophil (%)	9.25^{bd}	8.00^{bc}	26.00^{a}	17.50^{cd}	4.46*
Lymphocytes (%)	90.75^{a}	92.00^{a}	74.00^{b}	97.50^{a}	14.46*
ESR (mm-hr)	1.00	0.50	1.00	1.50	1.40NS
Aspergillus niger	-ve	-ve	-ve	-ve	

Means in the same row having similar superscript are not significantly different (P>0.05) NS=Not significant (P>0.05)
Hb=Haemogolbin (g/dl)
PCV=Packed cell volume
WBC=White blood cell.

the spore suspension containing 10' spores per ml of the microbes. The inoculated substrate was incubated and in about 7 days the fungus growth was later terminated by oven drying a *70C* for 48 hours.

Preparation of the Experimental Diets

Four experimental diets were formulated (Table 1) in which diet A was the Control (with 40% untreated cassava waste) while diets B, C and D contained graded levels of *Aspergillus* treated cassava waste (20, 30 and 40% respectively). Other ingredients are of similar amount.

Animal and Management

Twelve West African dwarf goats weighing between 2.80 and 5.40kg were treated against ecto and endo-parasites and randomized against the experimental diets in a completely randomized design model for a 56 day period. Feeding and watering were given *ad-libitum*.

Blood collection

Blood was obtained from the jugular vein of the experimental animals fortnightly. The blood was collected in clean sterilized bottle containing anti-coagulant (EDTA). Packed cell volume (PCV) was determined by the microchemotocrit method *and* haemoglobin concentration (Hb) bythecyanomethemoglobin method, red blood cell (RBC) value was determined by Neubarer haemocytometer method.

The mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), mean corpular volume (MCV) value were calculated from the values of PCV, RBC and Hb. The differential WBC counts were obtained by making a differential smear stained with wright strain and the percentage counts taken for lymphocytes and neutrophils. Also, the presence of the fungus in the blood was evaluated fortnightly by plating the blood on potato dextrose agar (PDA) and later examined under the microscope.

Table 3: Carcass evaluation of the experimental animals (Kg)

Physical characteristics	Diet A	Diet B	Diet C	Diet D	±SEM
Live weight at slaughter	3.90	4.39	5.90	5.94	0.75NS
Carcass (kg) weight (kg)	1.49	2.01	2.69	2.45	0.42NS
Filled Gut (kg)	1.05	1.36	1.44	1.84	0.24NS
Empty Gut (kg)	0.36	0.41	0.48	0.58	0.10NS
Weight of digestive content	0.69	0.97	0.96	1.27	0.26NS
Carcass length (cm)	29.24	3221	33.09	39.58	2.92NS
Dressing, percentage (%)	38.71	44.70	45.03	41.11	5.28NS

Treatment means within a row without same superscripts are significantly different (P<0.05)
NS=Not significant (P>0.05).

Table 4: Effects of the experimental diets on the relative organ weights (% carcass weight)

Relative Organs	Diet A	Diet B	Diet C	Diet D	± SEM
Kidney	1.12	1.00	0.85	1.24	0.24NS
Spleen	0.64	0.50	0.45	0.52	0.10NS
Lungs	4.02	3.64	3.38	4.68	0.56NS
Liver	5.14	4.80	437	6.81	0.96NS
Heart	1.58	138	1.07	1.15	0.28NS

Means in the same row with same superscripts are not significantly different (P>0.05).
NS= Not significant (P>0.05).

Carcass and Organs measurements

Before slaughtering the animals were starved for 12 hours and weighed. The animals were bled by cutting the throat, then the head was severed at its articulation with the atlas. The dressed carcass and non carcass (head, feet, digestive tracts etc) were weighed and recorded. The carcass length was measured from the anterior edge of the first rib to the anterior edge of the aitch bone. The dressing percentage was obtained by the weight of the carcass divided by the live-weight before slaughtering and the ratio multiply by 100. The empty body weight is the difference between carcass weight and the weight of the internal organs of the body. The weight of the digestive tract content was computed as the difference between full and empty digestive tract.

The stomach, small intestine and caecum were opened and their content removed under a gentle stream of water, it was then allowed to drain for 10 minutes before w ighing. Water and blood that might have adhere to the liver and kidney was removed using filter paper. The weight of the kidney, lungs, liver, heart and the spleen were recorded using sensitive scale. The kidney fat was also weighed (estimate of overall fatness).

Analyses

The proximate composition of the fungus treated and untreated samples were determined by the methods of A *0. A. C. (1990)* while crude fibre fractions were determined by the method *of Goering and VanSoest (1970).*- All data obtained were subjected to analysis of variance in a completely randomized model and treatment means were separated by the method *of Duncan (1955)* multiple range test.

RESULTS AND DISCUSSION

With the exception of the neutrophil and lymphocytes which showed significant variations (P<0.05) following the feeding of the *Aspergillus* treated cassava waste based diets. Other blood parameters (Hb, PVC, WBC, RBC, MCV, MCH, MCHC and ESR) showed similarities (P>0.05) between the control and the test diets. The value of PVC and RBC were lower than the value reported by *Kanko (1989)* for goat. The difference may be due probably to the specie and strain of animals, age, sex and nutrition. The value of WBC recorded in this study was higher than the value reported by *Dacie and Lewis (1959)* for goat. However, the value fell within the range of 9-32x103/mm reported by *Calhcun and Brown(1975).* The number of leucocytes (WBC) is influenced by diet, age, stress, digestion and parasites etc *{Calhoun and Brown, 1975).* The significant differences in the neutrophil and the lymphocytes could be attributed to its chief function as phagocytes and the ability of lymphocytes to re-circulate which is essential to the functioning of the immune system. Also, there was no indication of the fungus in the blood of the experimental animals due probably to the termination of the fungus growth(oven drying of the inoculated cassava waste at 70^{0}C) before the inclusion in the experimental diets. The border line between healthy and ill-health is indefinite, so it is with haematological values , for the normal and abnormal undoubted overlap. For instance, a value within the recognized normal range may be definitely pathological in a particular subject. The total leucocytes in healthy animals is given as a range that takes into consideration or account the influence of moderate activity *(Calhoun and Brown ,1975).*

The efficiency of the treated cassava waste can be seen in the performance of the goats in terms of carcass weight. The animals with higher weight at slaughter had fat deposition. This confirmed that diet B (20% inclusion level of *Aspergillus* treated cassava waste) and diet C (30% inclusion *of Aspergillus* treated cassava waste) are of high quality which can be recommended as this was explained by *Berge and Qniter field (1996)* that the *ad libitum* feeding of high quality ration would result into fat deposition if all requirements are met. The dressing percentage ranges between 38.71 and 45.03% which was lower than those obtained by *Adu and Brinkman (1980)* when a 3yaer old red Sokoto goats were fed mixture of groundnut cake and guinea corn with grasses. The differences may be due to age and nutrition.

The results of the relative organs weights of the experimental animals (%carcass weight) revealed no significant difference (P>0.05) in organ weight of goats. However, there were slight differences in the values recorded for goats on different diets. There were no significant differences(P>0.05) in the kidney, spleen, lungs, liver and heart weights among the experimental animals This was in line with the report *of Kakade et al. (1965).*

CONCLUSION AND APPLICATION

The results of this trial revealed that the feeding of *Aspergillus* treated cassava waste to West African dwarf goats had no detrimental nutritional effect on haematological indices, carcass characteristics and relative organ measurements of the experimental animals. Hence, the biological method of processing waste agricultural residues seem promising in improving the quality of a low quality by-product for ruminant animal production.

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