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Full Length Research Paper

Effects of *Trichoderma*-treated cassava waste in the diets of West African dwarf goat on blood, reproductive and urinary parameters

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A study was conducted to evaluate effects of *Trichoderma*-treated cassava waste on the haemotology, reproductive and urinary parameters of West African dwarf (WAD) does. Twenty mature WAD does were allotted randomly to one four treatments using a completely randomized design arrangement. Does were individually fed the experimental diets containing 0, 20, 30 and 40% fungus treated cassava waste based diets (A, B, C and D, respectively) during the 56 days experiment. The blood parameters (PCV, Hb, RBC and WBC) of animals fed the tested diet compared with those fed the control diet are similar (p>0.05). Likewise, the pH, urea concentration of the urine were comparable (P>0.05) in does fed the experimental and control diets while the urobilinogen was normal across the diets. Fertility, fecundity and prolificacy rates showed better reproductive performance with diet D compared to that of diets A, B and C. These data indicate that addition of *Trichoderma*-treated cassava waste in the diet of goats had no detrimental effect on the haematological, urinary and reproductive performances of lactating WAD does.

Key words: *Trichoderma*, cassava waste, goats, haematological, urinary and reproductive parameters.

INTRODUCTION

The West African dwarf (WAD) goat, together with other indigenous goats (Sahel, Red Sokoto or Maradi), are the only acknowledged goat in West Africa. In 15 countries of the West Africa humid zone, 38 percent of about 38 million goats are considered to belong to the West Africa dwarf (Christian, 1996).

Despite the population of goats in West Africa in general and Nigeria in particular, the country cannot meet the demand of animal protein per person per day of the total protein intake (FAO, 1965). The low animal protein intake could be attributed to poor quality and quantity of available forage as well as non-availability of feed especially during the dry season. Additionally, there are increases in the price of the conventional feed ingredients available due to the competition between the livestock industry and man.

Preliminary studies indicate that pre-digestion with degrading enzymes make plant cell walls available as a source of energy while providing significant extra amount of protein (fungal protein) and minerals (Jacqueline and Visser, 1996) to the animals. Limitations in energy and protein intake impose a restriction on the microbial population in the rumen, which has specific nutrient requirement for optimal growth (Robinson, 1982). Low quality roughages may not satisfy microbial or host needs; hence increasing the supply of protein to small intestine may be beneficial during pregnancy.

Limited information exists concerning feeding fungal treated diet to lactating does. Hence, the objective of the

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study was to evaluate the effect of *Trichoderma*-treated cassava based diet on hematological, urinary and reproductive status of lactating WAD does.

MATERIALS AND METHODS

Fungal strain and cultivation condition

Trichoderma harzanium was obtained from the International Institute of Tropical Agriculture (IITA) Ibadan, Nigeria. The fungus was maintained on Potato Dextrose Agar (PDA) containing in Petri dishes at ambient temperature.

Substrate preparation, inoculation and incubation

Cassava waste (containing the rinds, pulp plus rind and some smaller tubers) was collected from gari processing centre around Ilorin metropolis, Nigeria. It was sun dried, milled and later autoclaved at 121°C, 15 psi for 15 min so as to destroy any microbes. The content was allowed to cool and later inoculated with the spores of *T. harzanium*.

Each bag (250 g) of sterilized substrate was inoculated with 10 ml of the spore suspension containing 10^7 spores per ml. The inoculated substrates were later incubated at ambient temperature. On the 10^{th} day the substrate was fully covered by the fungus. The substrate was then oven dried at 70°C in a forced air dried laboratory oven for 24 h so as to terminate the fungus growth as well as prevent the protein from denaturing.

Animal and management

Twenty does aged between 2 and 3 years and weighing between 15 and 23 kg used for the experiment were treated against ecto and endo-parasites using IVOMEC while L.A oxytetracycline injection was administered to protect the animals against cold and other related disorders.

Oestrus synchronization

Each does was given orally, two tablets of Janova once daily for two successive days and it was repeated after 10 days in case no oestrus or weak oestrus was observed (each capsule containing Pippali 50 mg, Sunthi 50 mg, Indrararuni 500 mg, Marich 50 mg excipients 9.5). All animals were hand mated.

A matured aproned buck was used to detect oestrus (heat). Oestrus detection was carried out twice daily (am and pm) for 3 successive days post synchronization with the aid of vasectomised buck. Animals that show oestrus were again given Janova tablets and later mated with aspermatic buck until the end of oestrus period. Animals that did not show any signs of heat were again checked between 17 and 25 days and then bred if they showed any heat. Animals were assumed to have being pregnant after 30 days of non-return period.

Experimental diets

The does were randomized against the experimental diets. Animals were fed the experimental diets consisting of diet A with 40% of untreated cassava waste while diets B. C and D were having *Trichoderma*-treated cassava waste in the proportion of 20, 30 and 40%, respectively. Other ingredients were of fixed amount in all the diets (Table 1) Watering and feeding were given *ad-libitum*. Blood and urine parameters Blood samples were taken from the jugular vein of the experimental animals fortnightly into EDTA bottles and gently mixed for haemotological parameters determination. The erythrocytes and leucocytes were determined by Wootton (1964) method (using hemocytometer), packed cell volume (PCV) was measured by Wintrobe tube to ensure complete packing because of the small size of caprine erythrocytes (Jain, 1993) Hemoglobin concentration was estimated by Hb kit (Drabken, 1949).

Early morning urine sample was collected for the determination of various parameters; leucocyte, nitrite, pH, blood, ketone, bilirubin, sugar, urea and urobilinogen. While the following reproductive parameters were calculated according to Charring et al (1992); fertility rate, fecundity rate, prolificacy rate, kidding rate and litter size.

Chemical analysis

Samples of treated and untreated diets were subjected to proximate analysis using the method of A0AC (1990).

Statistical analysis

All data were subjected to a completely randomized design model according to Steel and Torrie (1980). While differences between means were assessed using Duncan (1955) multiple range test.

RESULTS AND DISCUSSION

The experimental diets were well accepted and no nutritional problem was observed during the experimental period. The examination of the haemotological parameters is recommended by WHO (1963) which indicated that blood evaluation is a good way of assessing the health status of animals as it play a vital roles in the physiological, nutritional and pathological status of the organism. The WBC (white blood cells) and its precussors; lymphocytes. eosinophill and neutrophills, increased from diets A to D as the inclusion level of fungus treated cassava waste increased in the diet of the experimental animals (Table 2). However, the values fell within the normal level reported for goat (Jain and Kaneko, 1986). The increasing values are indications of the defense mechanism of the experimental animals used in this study. The value of RBC (red blood cell) obtained fell within the normal range for animals of similar age group which is an indication that the diets are beneficial to the animals. Abnormalities of RBC may be due to diarrhoea, ulcer, bleeding, neoplasma blocking and parasites. However, none of these was observed in this study. There was an increasing PCV (pack cell volume) for the fungus treated cassava waste based diets. This shows that the diets are adequate in protein (Lloyd, 1982). However, the PCV values also fell within the normal range of between 22 - 38% (Kaneko, 1989). Haemoglobin functions as the carrier of oxygen. The value of haemoglobin reported here agreed with the value reported elsewhere.

Apart from urea level of the urine which showed significant variations, other parameters (leucocytes, nitrite, pH, blood ketone, bilirubin, sugar and urobilinogen) were una-

Table 1. Composition of the experimental diets (%).

DIETS				
Ingredients (%)	**A**	**B**	**C**	**D**
Untreated cassava waste	40	20	10	----
Fungus treated cassava waste	---	20	30	40
Sorghum dried brewers grain	15	15	15	15
Wheat Offal	15	15	15	15
Palm kernel cake	28	28	28	28
Salt	1	1	1	1
Vitamin – mineral premix	1	1	1	1
Total (kg)	100.00	100.00	100.00	100.00
Chemical Composition (%)				
Dry matter	89.35	91.15	92.15	90.85
Crude Protein	12.47	16.37	18.72	23.36
Crude Fibre	11.84	9.53	8.82	7.48
Ether extract	7.72	6.25	6.23	6.49
Ash	8.63	6.65	7.70	6.62

Table 2. Influence of experimental diet on blood parameters

Parameters	**DIETS**				
	A	**B**	**C**	**D**	**+SEM**
Packed cell volume (%)	24.25	28.13	30.75	35.75	3.42
Haemoglobin	8.09	9.31	10.32	11.23	1.12
Red blood cell	6.18	8.50	12.83	13.31	0.64
White blood cell (ml)	4000	4200	4500	5000	10.53
Lymphocyte (ml)	2000	2500	2550	2800	6.41
Neutrophil (ml)	1200	1500	1530	1600	3.22
Eosinophil (ml)	8.50^{a}	2.15^{b}	7.60^{a}	3.90^{b}	1.19

Table 3. Influence of the experimental diets on Urinary parameters.

Parameters	**DIETS**				
	A	**B**	**C**	**D**	**+SEM**
Leucocyte	----	----	----	----	----
Nitrite	----	----	----	----	----
PH	8.10	8.2	8.3	8.2	0.05
Blood	----	----	----	----	----
Ketone	----	----	----	----	----
Bilirubin	----	----	----	----	----
Sugar	----	----	----	----	----
Urea	22.22^{a}	25.62^{b}	24.68^{b}	32.73^{c}	1.56*
Urobilinogen	Normal	Normal	Normal	Normal	

ffected by the diet. They were found to be normal (Table 3). The total and relative excretion of urea is primarily a function of nitrogen intake (Topps, 1966). The highest level of urea recorded for the fungus treated diet D is an indication that the diet has increased percentage of protein. The enhancement of such protein could probably be due to the additional of fungal protein produced during pre-digestion of cassava waste by *T. harzanium*.

Table 4. Influence of the experimental diets on the reproductive parameters.

Parameters	DIETS			
	A	B	C	D
Fertility rate (%)	33.50	33.30	33.20	66.70
Fecundity rate (%)	100	100	100	100
Prolificacy rate (%)	165	165	150	
Kidding rate (%)	100	100	100	100
Av. Wt of kids (kg)	1.30	1.40		

The fertility, kidding and fecundity rates were highest in does fed diet D compared to diets A, B and C. The prolificacy rate (%) was better in diet D followed by B, C and A in that order. The prolificacy rate obtained in the fungus treated diet was similar to the report of Muna et al. (1998). The kidding rate was found to be 100% while weight of kids was highest with diet D (1.45 kg) than other diets (Table 4).

In conclusion, supplementations of lactating does with *Trichoderma*-treated cassava waste significantly improved does nutritional status. The improved nutritional status was presumably related to a more desirable ruminal environment for microbial growth and increased protein reaching the small intestine of the experimental animals.

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