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THEME: SECURING ANIMAL AGRICULTURE AMIDST GLOBAL CHALLENGES

BLOOD INDICES OF WEST AFRICAN DWARF GOATS FED GRADED LEVELS OF BROILER LITTER

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ABSTRACT

A study was conducted to investigate effects of broiler litter (BL) on blood parameters of West Africa Dwarf (WAD) goats fed complete diets. Five diets were formulated using BL to replace 40 % composition of cottonseed cake (CSC) at 0, 25, 50, 75 and 100 % thus each level of replacement served as a treatment. Thirty WAD bucks with average weight of 10.57±0.42 kg were randomly allotted to the five treatments in a randomized complete block design (RCBD), the animals were blocked on weight basis. Rate of blood urea and blood glucose concentration were studied at 0, 3, 6, 9 and 12 hours post feeding. Blood collected at 0 h was used for haematology and serum biochemistry study. The results revealed that serum biochemistry [except Ts protein (g/L), P<0.05] and haematological parameters were statistically similar (p>0.05) across the inclusion levels of broiler litter. Blood glucose (mMol/L) concentrations were highest in WAD bucks on treatment diets with highest concentration observed at 3 h post feeding. However, blood urea (mMol/L) levels were highest at 6 h post feeding with peak values observed at 50 % replacement level. It was concluded that replacing CSC with BL in the diet of WAD bucks did not alter haematological and serum biochemical concentration from normal values.

Keywords: West African Dwarf goats, Blood indices, Poultry waste, Blood glucose, Blood urea.

INTRODUCTION

Poultry litter is an important waste product that is considered in feeding livestock. The chemical composition of poultry excreta, most especially the high nitrogen content, can be converted by ruminants into proteins for human consumption. However, despite the assumed potential risk of feeding animal waste to livestock, no scientific evidence shows that animal wastes pose any health risk, provided the waste is properly processed (FAO,1980). These alternative feed ingredients which can be sourced from environment are refer to as non-conventional feed stuffs. Examples include municipal waste, domestic refuse, animal excreta, rumen content, tannery waste and other products (Boda, 1990). High cost of feeding livestock is currently a major source of concern in livestock production. About 60 – 80% of recurrent expenditure goes to feeding in an intensive animal production system (Onifade, 1993). In view of the above facts, the current study was design to evaluate haematological indices and serum biochemical parameters of WAD bucks fed graded levels of broiler litter.

METHODOLOGY

Study area and experimental design

The experiment was conducted at the Teaching and Research Farm, Faculty of Agriculture, Kafanchan Campus, Kaduna State University. Thirty (30) growing WAD bucks with average weight of 10.57 kg (10.57±0.42 kg) were randomly allotted to five (5) treatments in a randomized complete block design (RCBD), and each treatment was made up of six (6) replicates.

Experimental diets and blood collection

Maize, cottonseed cake, cowpea husk, sorghum spikelet, bone meal, limestone and common salt were used to formulate control diet. Broiler litter was then used to replaced 40% CSC composition in the control diet at 0 (T1), 25 (T2), 50 (T3), 75 (T4) and 100 (T5). Blood samples were collected from each animal during last day of the experiment. In order to monitor concentration of blood glucose and urea nitrogen, blood samples were collected at an interval of three (3) hours between 7:00am to7:00pm. The serum samples were stored at -20 °C for biochemical and haematological studies.

Statistical analysis

Data collected blood constituents were subjected to general linear model (GLM) of Statistical Analysis System (SAS, 2011). Means were separated using Duncan Multiple Range Test (DMRT) (Duncan, 1955).

RESULTS AND DISCUSSION

Haematological profile of WAD bucks fed graded levels of broiler litter diets

The results of the haematological values of West African Dwarf bucks is shown in Table 1. The values of blood parameters in all the treatments fall within normal range, with the exception of total red blood cells (TRBC) which is slightly below the normal value (8 – 18 x 10^{12}/L), the reason might be due to an underlying haemoparasitic infection or poor nutrition prior to the commencement of the experimental diet. Swenson (1990) reported that nutritional status of animal can affect their red blood cell (RBC) count. The total white blood cell (TWBC) counts were within the normal values of 4 – 13 x 10^9 /L for goats (Jain, 1986), which implies that the animals are healthy (Frandsen and Spurgeon,1992). In goats, like other ruminants there are more lymphocytes than Neutrophils in circulation (Olusanya et al, 1976). However, the values obtained in this study fall within the broad range recorded for Red Sokoto goats (Tambuwal et al, 2002), thus suggestive of a developed immune system in the WAD goats with such number of immune cells to offer good health. Absence of Basophils in this study was in agreement with many authors (Frandsen and Spurgeon (1992), Swenson (1990), Coles (1986) who reported that absence of basophils in blood is an indication of disease-free condition.

Serum biochemical profile of WAD bucks fed graded levels of broiler litter diets

The results of the serum biochemistry obtained from fifteen West African Dwarf bucks is shown in Table 2. A high concentration of blood urea has been attributed to excessive tissue protein catabolism linked to protein deficiency (Oduye and Adadevoh, 1976). However, BUN levels were within the normal values (12.6 – 25.8mg/dl) which suggest that the kidneys and liver were functioning well since BUN levels provide information as regards to renal physiology (Ostfeld et al 2010), with the exception of control (0% BL) which is slightly above normal value (26 mg/dl). The rate at which urea enters blood plasma differed across all the levels of CSC replacement with BL (Fig. 2). At 6 h post feeding, all treatments showed peak BUN concentration in the plasma. The finding corroborated previous report that, in goats, urea enters into plasma at the rate of 4-80 µmol/min per $kg^{0.75}$ body weight (Harmeyer & Martens, 1980). The rate observed at higher levels of BL was an evidence that BL contains high uric acid concentration (Liang et al., 2011) which is quickly degraded in the rumen to ammonia, thus excess ammonia that is not absorbed via rumen walls or utilize by rumen microbes is subsequently converted to urea by the liver (Huntington & Archibeque, 2000). Blood urea is then either recycled via saliva or excreted in the urine, nonetheless, urea is secreted via milk (Guliński et al., 2016). Similarly, the concentration of blood glucose (Fig. 1) was at peak concentration 3 h post feeding in all the treatments except the control (T1). The concentration of blood glucose in the treatment groups was an evidence that BL based diets produced propionic acid in the rumen similar to control diet. The range of blood glucose (2.1-4.52mMol/L) observed in the study was higher than 40.1-56.0 mg/dl (2.23-3.11mMol/L) reported for WAD goats fed dried cassava leaves plus guinea grass as basal feed (Daramola et al., 2005). Nevertheless, the high blood glucose level observed in this study were similar to the record of WAD goats fed groundnut haulms and cowpea husk supplemented with brewers' dried grain (Babale et al., 2019).

CONCLUSION

The parameters obtained in this study for haematological and serum biochemistry were within the normal values, therefore, broiler litter can replace part or whole cottonseed cake in the diet of goats without having any deleterious effect on animal health.

RECOMMENDATION

Based on the findings of this study, it was recommended that broiler litter be use to replace cottonseed cake in the diet of ruminant animals.

Table 1: Haematological values of West African Dwarf bucks fed cottonseed cake diet replaced with broiler litter

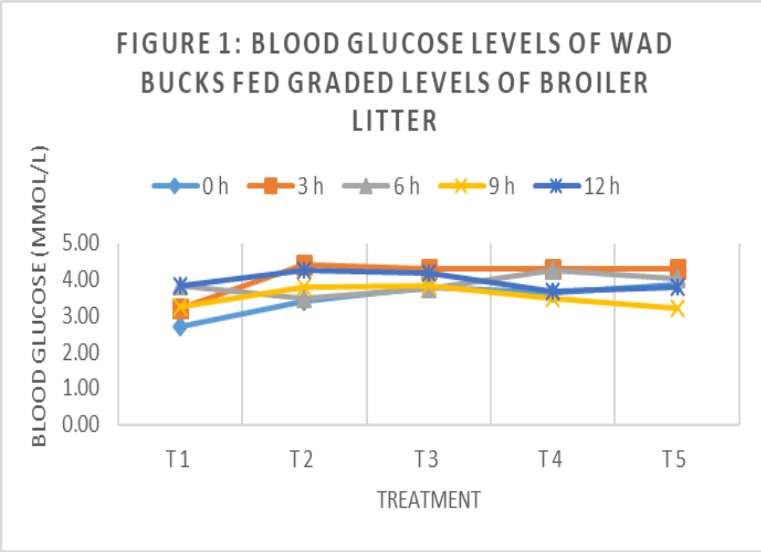
	replacement levels of CSC with BL						
Parameter	0%	25%	50%	75%	100%	SEM	p-value
PCV (%)	32.33	36	31	37	34.67	2.69	0.398
Haemoglobin (g/L)	10.73	11.97	10.3	12.3	11.53	0.9	0.401
Total protein (g/L)	6.67	6.8	5.87	6.2	6.4	0.54	0.713
TWBC (x 10^9/L)	11.13	10.63	10.67	6.6	8	1.04	0.136
TRBC (x 10^12/L)	5.57	6.03	4.93	6.07	5.9	0.46	0.399
Neutrophils (%)	35.67	37.67	33	33.67	36.33	4.93	0.197
Lymphocytes (%)	58.67	59.33	64.67	62.33	62	5.57	0.903
Monocytes (%)	4.33	1	0.33	3.33	0.33	1.31	0.302
Eosinophils (%)	0	0.67	1	0	1.33	0.53	0.718
Basophils (%)	0	0	0	0	0	0	-
Band (%)	1.33	1.33	1	0.67	0	0.78	0.785
MCV (fL)	58.4	59.53	63.2	61	58.8	1.53	0.512
MCH (pg)	19.37	19.83	21.03	20.27	19.57	0.49	0.473
MCHC (g/L)	33.17	33.23	33.23	33.23	33.23	0.05	0.839

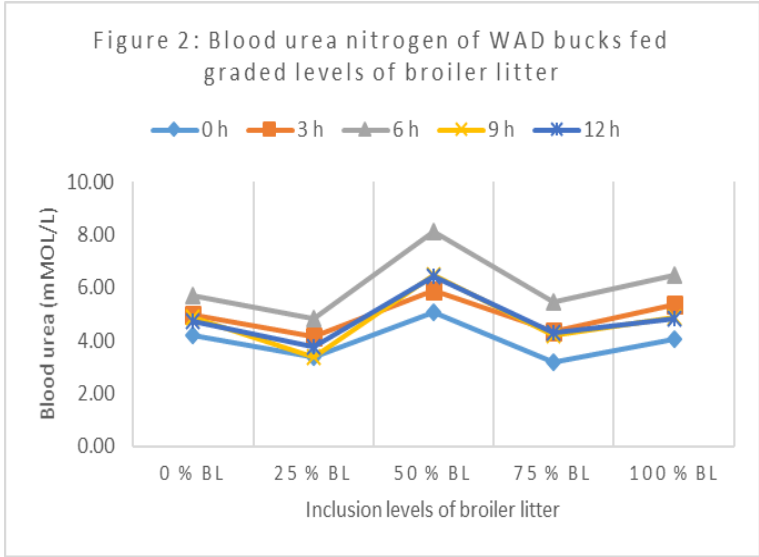
PCV= packed cell volume, TWBC= total white blood cells, TRBC= total red blood cells, MCV= Mean corpuscular value, MCH= Mean corpuscular haemoglobin, MCHC= Mean corpuscular haemoglobin concentration.

Table 2: Serum biochemistry of West African Dwarf bucks fed cottonseed cake diet replaced with broiler litter

	Replacement levels of CSC with BL						
Parameter	0%	25%	50%	75%	100%	SEM	p-value
Glucose (mg/dl)	63.04	65.85	66.97	68.08	69.67	4.01	0.556
albumin (g/L)	21	27.67	31.33	28	32.33	4.57	0.485
Ts protein (g/L)	63.33^{ab}	73.33^{a}	64^{ab}	62^{b}	66.33^{ab}	3.25	0.032
BUN (mg/dl)	18.33	20.08	21.73	22.67	23.72	4.05	0.471
Creatine (mg/dl)	1.63	1	1.53	1.33	1.8	0.26	0.193
Cholesterol (mg/dl)	1.73	1.77	1.17	1.7	1.67	0.32	0.791
ALT (IU/L)	18.33	19.67	15.67	21.33	20.67	5.6	0.947
AST (IU/L)	62.67	70	46.33	48.33	90.67	13.49	0.21
ALP (IU/L)	17	18.67	16	20.33	25	6.32	0.894

Ts protein= thymidylate synthase protein, BUN= blood urea nitrogen, ALT= Alanine Aminotransferase, AST= Aspartate Aminotransferase, ALP= alkaline phosphate level. Superscripts ^{ab} were different ($p<0.05$) across treatments.





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