FUDMA Journal of Sciences (FJS)
ISSN online: 2616-1370
ISSN print: 2645 - 2944
Vol. 8 No. 6, December, (Special Issue) 2024, pp 27 - 31
DOI: https://doi.org/10.33003/fjs-2024-0806-3019

EFFECTS OF VARYING LEVELS OF UREA SUPPLEMENTATIONS ON HAEMATO-BIOCHEMICAL INDICES OF YANKASA RAMS FED ENSILED CRUSHED GROUNDNUT SHELL, AFRICAN LOCUST BEAN PULP AND POULTRY LITTER

***[1]Yakubu, A. K., [2]Dumbari, M. K. and [3]Mabu, I. M.**

[1]Department of Animal Science, Modibbo Adama University Yola
[2]Department of Agricultural Education, Umar Suleiman Collage of Edcation, Gashua Yobe State
[3]Desert Research Monitoring and Control Centre, Yobe State University Damaturu.

*Corresponding authors' email: yakubukirfiahmed@gmail.com Phone: +2348036780390

ABSTRACT

A study was carried out to assess the effects of varying levels of urea supplementations on haemato-biochemical indices of growing Yankasa rams fed ensiled crushed groundnut shell, African locust bean pulp and poultry litter. The study was carried out at Abubakar Tafawa Balewa University Teaching and Research Farm, Bauchi. Twenty (20) growing Yankasa rams were fed five supplemental diets plus a basal diet. A complete randomized design (CRD) was use to allocate the treatment with each treatment replicated four times. Groundnut shell (GNS) and African locust bean pulp (ALBP) were ensiled with poultry litter as basal diet, Maize bran (MB), cotton seed cake (CSC), groundnut cake (GNC), groundnut haulms (GNH) and urea were used as supplements at various proportions. The basal diet and water were offered *ad libitum*, three hundred grams (300g) of the supplements were offered before the basal diet to each animal first thing in the morning. Blood samples were collected from ten rams (two animals per treatment), the animals were properly restrained and 5mls of blood was collected through the Jugular veins using syringe and needles, to analyse for various parameters. The results showed that Haematological parameters affected were packed cell volume (PCV) and red blood cell (RBC) at ($P<0.05$) level of significance, while alanine aminotransferase (ALT) and creatinine were also affected ($P<0.05$) by dietary treatments. It was concluded that ensiled crushed groundnut shell, African locust bean pulp and poultry litter fed to Yankasa rams with various supplementations has significant effects on PCV, and RBC however, they did not affect the other haematological and biochemical parameters of the animals, and parameters were within the normal recommended values. It was recommended that ensiled crushed GNS, ALBP and poultry litter with various supplementations be fed to growing Yankasa rams for optimum production.

Keywords: Groundnut shell, African locust bean pulp, Yankasa ram, Haemato-biochemical indices

INTRODUCTION

Ruminants like sheep and goats plays a significant role in the livestock sector in Nigeria (Lakpini, 2002). But their production is finite by inadequate and high cost of feeds (Lamidi and Ologbose, 2014), which is more persistent during dry season when grasses are matured and be of more fibrous and low in crude protein content (Oni *et al.*, 2010). This is the reason why non-conventional energy and protein of farms and agricultural waste origin are currently being utilised for livestock production in Nigeria (Okonkwo *et al.*, 2008). Several authors (Yakubu *et al.*, 2017; Salisu *et al.*, 2018; Abdullahi *et al.*, 2019) have search for the use of cheaper agro-industrial by-products and waste materials to be used at different levels of inclusions in small ruminant diets to know how they are utilised it in of growth and production, and also to point out the one that is most suitable one in nutrition, and year-round availability.

African locust bean pulp (*Parkia biglobosa*) is a yellow substance that when it is riped, it tastes sweet, this indicates the content of sugar in it, thus an energy source. The yellow pulp contains beta carotene an indicator of vitamin A that is known to increase appetite and performance in terms of growth in livestock (Gernah, 2007; Yakubu *et al.*, 2017). Poultry litter is a waste from poultry farms that is hazardous due to lack of means of disposal, when it is not use as fertilizer (Lanyasunya *et al.*, 2006). The potentially of poultry litter is well known, for its higher nitrogen content and numerous organic substance (fertilizer). The nutritional concentration of poultry litter waste can varie, depending on a variety of some factors (Tasistro *et al.*, 2004). The aim of the study is to investigate the effects of varying level of urea supplementations on the blood profiles of Yankasa rams.

MATERIALS AND METHODS

Experimental site

The experiment was carried out at the Abubakar Tafawa Balewa University Bauchi Teaching and Research farm, Bauchi. Bauchi State occupies a land area of about 49,119km^2 (18,965sq mi). The average annual rainfall in Bauchi ranges from 700mm in the north to 1300mm in the south western part of the state. Typically, the rain starts in April and ends in October. Minimal temperature of 22^{0}C is in December/January while maximum temperature of 40^{0}C is around March/April (BSOW 2018).

Experimental animals and their management

Twenty (20) growing Yankasa rams of 12-15 months of age with an initial weight of 20±1 were purchased from livestock Markets (Durun) in Bauchi State. The rams were quarantined, dewormed with *albendazole* given orally and also injected with Ivermectin against ectoparasite. The rams were group fed and managed for 2-weeks adaptation period before the commencement of the experiment.

Experimental design and feeding procedure

The study was conducted in a completely randomised design (CRD) of five treatments with four replications according to (Steel &Torrie 1980). Crushed groundnut shell (CGNS), African locust bean pulp (ALBP) and Poultry litter (PL) were mixed in a ratio of (50kg CGNS, 30kg ALBP and 20kg PL). Hundred (100) litres of water was sprinkled on the mixture of

(50kg CGNS, 30kg ALBP and 20kg PL). The mixture was ensiled for 21 days in a 300 litre capacity water plastic container as silo according to the methods described by (Wilhelm, 1999; Yakubu *et al*., 2017). The ensiled material was sun dried to obtain optimum dry matter which was fed as a basal diet.

The supplements used were Maize bran (MB), groundnut haulms (GNH), cotton seed cake (CSC), groundnut cake (GNC) and urea as shown in Table 1. The basal diet was given *ad libitum* to each animal while three hundred grams of the supplements were given to each animal in the morning before the basal diet. Water was also offered *ad-libitum.* After 14 days of adaptation period, the amount of feed (both basal and supplement) by each animal was recorded.

Table 1: Gross Composition of Basal and Supplemental Diets

Basal diet	Supplements				
	A	**B**	**C**	**D**	**E**
CGNS/ALBP/PL (50:30:20)	MB + GNC (70:30)	MB +UREA (96:4)	MB (100)	MB + GNH (50:50)	MB +CSC (50:50)

CGNS/ALBP= crushed groundnut shell/African locust bean pulp/poultry litter, MB= maize bran, CSC= cotton seed cake, GNC= groundnut cake, GNH= groundnut haulms.

Data collection

Blood samples were collected as in the last week of the experiments. The blood samples were obtained from the jugular vein early morning before feeding as described by Coles (1986). About 7ml of the blood sample was obtained from 2 animals in each treatment. 3ml of the blood obtained was transferred into a sample bottle containing EDTA for the determination of haemoglobin (Hb), packed cell volume (PVC), erythrocyte (RBC) and leucocyte (WBC) according to the methods described by Yakubu *et al.* (2017). Calculation of the erythrocyte indices including mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) were derived from the values obtained from red blood cells (RBC).

MCV (fl) = PCV (%)/RBC (mm^3) × 10/1

MCH (pg) = Hb (g/dl)/RBC (mm^3)

MCHC (%) = Hb (g/dl)/PCV (%)

The remaining 4ml was poured into a plain bottle and allowed to stand for about 2 hours at room temperature, which allows for coagulation to occur. The plain bottle was then used to centrifuge at 4000RP/M for 5 minutes to separate the serum. The serum was used to analyse for albumin, total protein (TP), glucose (GLU), blood urea nitrogen (BUN), Aspartate amino transferase (AST) alanine amino transferase (ALT), alkaline phosphate (ALP) according to the methods described by (Aljameel *et al.*, 2017).

Chemical composition of the basal and supplemental diets

Chemical composition of the experimental diets was determined as described by AOAC, (2005).

Data analysis

Data generated from the study were subjected to analysis of variance (ANOVA) using SPSS version 20. Where differences exist, Duncan's Multiple Range Test were used to separate the means.

RESULTS AND DISCUSSION

The results on chemical composition is shown in Table 2. The basal dry matter content was 79.08% while dry matter content of the supplements ranged from 92.08% in treatment E to 90.44% in treatment C. Basal crude protein (CP) content was 6.071% compare to the CP in the supplements which ranged from 20.91% in treatment D to 11.67% in treatment A. Crude fibre (CF) contents in the supplements ranged from 11.53% in treatment B to 13.13% in treatment E, basal CF was 12.54%. Basal organic matter content was 69.35% and those in the various supplements ranged from 69.35% in treatment A to 88.39% in treatment E. The Ash content in the basal diet was 9.73% compare to the Ash contents in the various supplements which ranged from 3.16% in treatment D to 5.13% in treatment A. The basal NDF and ADF contents were 24.23% and 17.30% while in the supplements ranged from 44.50% to 51.70 % NDF and 31.32% to 48.30% ADF.

Table 2: Chemical Composition of Ensiled Crushed Groundnut Shell, African Locust Bean Pulp and Poultry Litter with Supplementations (%)

Components	Basal Diet	Treatments				
		A	**B**	**C**	**D**	**E**
DM	79.08	90.98	91.76	90.44	90.52	92.08
CP	6.07	11.67	20.91	18.18	17.27	17.17
CF	12.54	12.48	11.53	12.82	11.40	13.13
OM	69.35	85.85	87.02	87.01	87.36	88.39
ASH	9.73	5.13	4.74	3.43	3.16	3.69
EE	1.70	2.44	4.60	5.90	2.94	4.45
NDF	24.23	51.70	47.80	45.90	46.50	44.50
ADF	17.30	48.30	40.70	33.01	40.70	31.32

DM= Dry matter, CP= crude protein, CF= crude fibre, OM= Organic matter, EE= Ether extract, NDF= Neutral detergent fibre, ADF= Acid detergent fibre. A (MB+GNC); B (MB+Urea); C (MB); D (MB+GNH); E (MB+CSC) Basal diet= (CGNS/ALBP/PL)

Table 3 showed the haematological parameters of the growing Yankasa rams. Haemoglobin Concentration (HB) of blood was similar for animals across all the treatments, the values were 12.16g/dl, 11.62g/dl, 10.69g/dl, 10.22g/dl and 10.13g/dl in treatment A, E, B, D and C respectively. Packed cell volume (PCV) and red blood cell (RBC) were significantly different ($P<0.05$) across the treatments, PCV values in treatment E (32.28%), treatment D (29.24%) and treatment C (29.21%)were higher than those in treatment B (27.16%) followed by treatment A (25.06%). Highest value ($6.54x10^{12}$/L) for RBC was recorded in treatment A, followed by treatment C (($6.32x10^{12}$/L), treatment E ($5.94x10^{12}$/L) and

treatment D ($5.44x10^{12}$/L) while the lowest value ($4.50x10^{12}$/L) was recorded in treatment B. There were no significant (P>0.05) differences in terms of white blood cell (WBC), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC). WBC values ranged from $8.58x10^{12}$/L in treatment A to $11.45x10^{12}$/L in treatment B.

Table 3: Haematological Parameters of Growing Yankasa Rams Fed Ensiled Crushed Groundnut Shell, African Locust Bean Pulp and Poultry Litter with Various Supplementations

Parameters	Treatments					SEM	Ref. values
	A	B	C	D	E		
HB (g/dl)	12.16	10.69	10.13	10.22	11.62	1.84	8-16
PCV (%)	25.06^{b}	27.16^{ab}	29.21^{ab}	29.24^{ab}	32.28^{a}	1.43	24-45
RBC ($x10^{12}$/l)	6.54^{a}	4.50^{b}	6.32^{ab}	5.44^{ab}	5.94^{ab}	0.41	8.9-9.3
WBC ($x10^{12}$/l)	8.58	11.45	11.16	9.33	9.91	1.49	4-12
MCV (FI)	29.22	33.20	34.73	35.94	30.75	5.36	23-48
MCH (pg)	11.01	12.81	9.88	11.34	11.84	1.10	8-12
MCHC (%)	33.03	30.71	30.15	32.76	35.23	2.50	31-34

^{abcd}, means within the same row with different superscript are significantly different* (P<0.05)
HB = haemoglobin, PCV = packed cell volume, RBC = red blood cell, WBC = white blood cell, MCV= mean corpuscular volume, MCH= mean corpuscular haemoglobin, MCHC= mean corpuscular haemoglobin concentration, Ref values= reference values, SEM= standard error mean.
Source of Reference values: RAR= Research Animal Resource. (2009). A (MB+GNC); B (MB+Urea); C (MB); D (MB+GNH); E (MB+CSC)

The results on serum biochemical parameters of growing Yankasa rams were presented in Table 4. Blood urea nitrogen (BUN), total protein (TP), glucose and albumin were not significantly different across the treatments, BUN values ranges from 7.30mmol/l in treatment E to 10.61Mmol/l in treatment B. TP values recorded were 6.00g/dl, 6.33g/dl, 6.46g/dl, 6.59g/dl and 7.36g/dl in treatments A, E, C, B and D respectively. Albumin values ranged from 3.09g/dl in treatment C to 3.75g/dl in treatment A. Values for glucose were 6.01mol/l, 6.83mol/l, 7.01mol/l, 7.18mol/l and 7.82mol/l in treatment B, A, E, D and C. Aspartate aminotransferase (AST) and creatinine were not statistically different across the treatments. AST values ranged from 126.50IU/L in treatment B to 132.97IU/l in treatment D. There was significant difference (P<0.05) between the treatments in term of alanine aminotransferase (ALT), highest value (14.47IU/L) was recorded in treatment B while the lowest value (9.89IU/L) was recorded in treatment E.

Table 4: Serum Biochemical Parameters of Growing Yankasa Rams Fed Ensiled Crushed Groundnut Shell, African Locust Bean Pulp and Poutry litter with Supplementation

Parameters	Treatments					SEM	Ref. values
	A	B	C	D	E		
BUN (Mmol/L)	7.75	10.61	8.53	7.79	7.30	0.79	3.0-10
TP (g/dl)	6.00	6.59	6.46	7.36	6.33	0.51	5.9-7.8
Glucose (Mol/L)	6.83	6.01	7.82	7.18	7.01	1.43	2.4-4.5
Albumin (g/dl)	3.75	3.30	3.09	3.34	3.12	0.37	2.7-3.7
AST (IU/L)	129.96	126.50	132.01	132.97	130.10	2.58	60-280
ALT (IU/L)	11.91^{ab}	14.47^{a}	12.50^{ab}	12.69^{ab}	9.89^{b}	0.87	14-43
Creatinine (Mmol/L)	1.36^{c}	2.11^{a}	1.98^{bc}	1.34^{c}	2.47^{a}	0.47	1.2-1.9

^{abc}, means within the same row with different superscript are significantly different *(P<0.05)
BUN= Blood Urea Nitrogen, AST= aspartate aminotransferase, ALT= alanine aminotransferase, TP= total protein SEM= standard error mean, NS= not significant, LOS= level of significance.
Source of Reference Values: Radostits *et al*. (2000).
A (MB+GNC); B (MB+Urea); C (MB); D (MB+GNH); E (MB+CSC)

The PCV values (25.06 to 32.28%) in the present study were higher than the values (15.50 to 23.00%) reported by (Abdullahi *et al*., 2019) when Yankasa rams fed Miaze cobs ensiled with *Senna obtusifolia*. And (21.35 to 25.00%) reported by Ukanwoko *et al*. (2020). But were comparable with the PCV values (26.27 to 30.02%) by (Alabi & Ososanya, 2017) when the author fed ensiled maize forage and *Mucuna puriens foliage* to West African dwarf rams. This is due to the ability of the diets to meet up the recommended crude protein (CP) requirements of the animals, and as results furnish the animals with all the requirements that are need to produce the animal with the normal range of the parameters (Alabi & Ososanya, 2017). The values (10.13 to 12.16g/dl) haemoglobin (Hb) Concentration were higher than (9.11 to 9.87g/dl) by Alabi and Ososanya (2017). RBC values (4.50 to $6.54x10^{12}$/l) in the present study were lower than (11.02 to $11.87x10^{12}$/l) reported by Alabi and Ososanya (2017). But higher than (3.93 to $4.01x10^{12}$/l) by (Mubi *et al*., 2015). When fed Growing Yankasa sheep with diets containing cotton seed cake and maize offal. White Blood Cells (WBC) concentration were similar for animals in all the treatment, the values (8.58 to $11.45x10^{12}$/L) were higher that (4.5 to $6.86x10^{9}$/l) and (4.00 to $6.18x10^{9}$/l) reported by Mubi *et al*. (2015); Mohammed *et al*. (2020) when the later fed Balami rams *Brachiaria decumbens* as basal diets with different protein supplements.The MCV values (29.22 to 34.73Fl) in this study were in conformity with (31.80 to 33.35fl) obtained by Abdullahi *et al*. (2019) when Yankasa rams were fed Maize cob ensiled with *Senna obtusifolia.* While the MCH values (9.88 to 11.8pg) were slightly similar with (10.85 to 12.85%) by Abdullahi *et al*. (2019). But MCHC values

(336.00 to 405.00%) by Abdullahi *et al*. (2019) were higher than the (30.15 to 35.23%) recorded in this experiment.
Blood urea nitrogen (BUN), total protein (TP), glucose and albumin were not affected by dietary treatments. BUN values (7.30 to 10.61Mmol/l) in this study were higher than the values (5.20 to 5.55mmol/l) by Aruwayo *et al*. (2009) but lower than the values (16.28 to 17.42mmol/l) observed by (Alabi & Ososanya 2017). This could be as a result of the inclusion level of urea in the supplementations. The serum glucose in the present study (6.01 to 7.82mol/l) were higher than the values (5.15 to 5.82mol/l) reported by Yakubu *et al*. (2017), and (3.98 to 5.08) by (Millam *et al*., 2020). This shows the positive effects of the basal diets that was offered ad lib to the animals which contain high level of African locust bean pulp a substance that has 63% carbohydrates mainly glocuse. Total protein values (6.00 to 7.36g/dl) observed in this study were higher than (3.45 to 4.15g/dl) reported by Mohammed *et al*. (2020), and lower than (93.00 to 129.25g/dl) obtained by (Millam *et al*., 2020). Albumin did not differ among the treatment means and the values (3.09 to 3.75g/dl) in the present experiment fell within the normal range (2.7 to 3.7g/dl) for small ruminants reported by Radostits *et al*. (2000). Creatinine values (1.34 to 2.47mg/dl) in the present study were higher than (0.70 to 0.93mg/dl) by Garba and Halliru, (2018), when the author fed Yankasa rams complete diets containing rice straw. The AST in this present work was not varied between treatment means, the values (126.50 to 132.97IU/L) were in conformity with the values (121.67 to 152.00IU/l) by Garba and Halliru (2018). ALT values (9.89 to 14.47IU/L)) recorded in this trial were comparable with the values (11.00 to 15.00UI/L) reported by (Wada *et al.* 2014).

CONCLUSION

It was concluded that ensiled crushed groundnut shell, African locust bean pulp and poultry litter when fed to Yankasa rams with various supplementations has a significant effect on PCV and RBC values and did not affect other haemato- biochemical parameters, and all the other parameters were within the normal recommended values. It was recommended that ensiled crushed GNS, ALBP and poultry litter with various supplementations be fed to growing Yankasa rams for optimum production.

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