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HAEMATOLOGICAL AND SERUM BIOCHEMICAL PARAMETERS OF YANKASA EWES FED VARYING LEVELS OF LOCALAND INDUSTRIAL SUPPLEMENTED PREMIX

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A B S T R A C T

The experiment was designed to evaluate the haematological and serum biochemical parameters of Yankasa ewe fed varying levels of local and industrial supplemented premix. The experimental design used was Complete Randomized Design (CRD), whereby twenty-five (25) Yankasa ewes were randomly allocated to five (5) treatment groups. Dietary premix of both local and industrial was administered to the animals at five (5) inclusion levels (0 as a control, local and industrial 25:75, 50:50, 75:25 and 100 % local), the feed offered and left over were recorded daily.At the beginning of the growth studies, ewes were weighed and were subsequently weighed weekly. Blood samples were collected for haematological and serum biochemistry study, three (3) Yankasa ewes were randomly picked per treatment and bled through the jugular vein and 5 ml of blood samples per each was collected out of which 3 ml were transferred into a plastic tube containing Ethylene Diamine Tetra Acetic acid (EDTA) for haematological studies; while the remaining 2 ml were emptied into another vial free of EDTA used for serum biochemical studies. All data generated in this study were subjected to Analysis of Variance (ANOVA) using the General Linear Model (GLM) procedure of SAS (2008). The results of this study shows that significant differences were not observed between the treatments in all the parameters for haematological study and the values of most

K E Y W O R D S

Haematological,Biochemistry, Yankasa, Ewes and Premix.

parameters measured were within the normal range. All serum biochemical parameters final values are observed to be within the normal range,with the exception of creatinine final values which shows that Yankasa ewes fed with local and industrial differs significantly from those fed 0 % premix (control). It can therefore be concluded that inclusion of both local and industrial premix at 50-100 % into the diet of Yankasa ewes, does not have any negative effect on the health of the animals as values of all the haematological and serum biochemistry parameters are within the normal value.	

INTRODUCTION

Haematological components, which consist of red blood cells, white blood cells or leucocytes, mean corpuscular volume, mean corpuscular haemoglobin and mean corpuscular haemoglobin concentration are valuable in monitoring feed toxicity especially with feed constituents that affect the blood as well as the health status of farm animals (Oyawoye and Ogunkunle, 2004). Blood and serum parameters are useful for obtaining insights on the metabolic and health status of the animals, they are also responsible for various body functions, impairment of functions induced structural and physiological abnormalities, as well as the reflection of the current environmental conditions including nutritional management (Al-Fartosi et al., 2010). The haematological tests have been widely used for the diagnosis of various diseases and nutritional status of animal and information gained from these parameters usually used for the substantiation of the physical appearance and validation of changes in medical history which usually stand as the excellent basis for animal medical judgement (Zaitsev et al., 2020).

The correct interpretation of the parameters is necessary and should be comparable with reference values appropriate for the region and the population in the area where the animals are being kept in order to metabolic status of sheep. Although, these parameters could also be influenced by several factors, such as sex, breed, age, stress, diet, level of milk production, handling, climate, physiological; they could establish their relevance in the health and performances of the animals. In addition, these parameters are also used for determining the extent of tissue and organ damage and the response of defence mechanism of the animals which aid in the diagnosing different types of ailments (Dhama et al., 2019).

The serum biochemical parameters including glucose, triglycerides, total protein, calcium, phosphorus, and immunoglobulins have been reported as suitable biomarkers for determining the effect of periodic energy restriction on growth performance and meat quality in sheep (Song et al, 2018). Furthermore, as indicators of sheeps' response to environmental changes and chemical contamination from the environment, increased serum biochemical including Ca, Mg, urea, Total protein, glucose, AST, ALT, ALP, cholesterol, bilirubin, and triglycerides; and reduced haematological parameters have been reported (Kovacik et al., 2017). Laboratory tests on the blood are vital tools that help detect any deviation from normal in the animal body (Ogunbajo, Alemede, Adama and Abdullahi, 2009). Serum biochemical components are the reflection of the blood metabolic outcomes in an animal (Amle et al., 2014). This study was designed to determine the haematological and serum biochemical parameters of Yankasa ewes fed varying levels of local and industrial supplemented premix.

MATERIALS AND METHODS

Experimental area

The research was conducted at the Teaching and Research Farm of University of Abuja. Abuja is the capital city of Nigeria located in the centre of the country; the area is geographically located on latitude 8.9810404o, longitude 7.176289o and elevation of 491 m (Euromonitor, 2010). The rainy season begin from April and ends in October, the day time temperatures range between 28 °C - 30 °C, while the night temperature range 22 °C - 23 °C. In the dry season, day time temperatures goes up to 40 °C, while the night temperatures could reduce to 12 °C (World Meteorological Organization, 2013). The study was between October, 2018 to September, 2019.

Experimental Animals and their Management

Twenty five Yankasa ewes aged between 6 and 7 months, with average live weight 10 kg were used for the study. The ewes were purchased from the local markets across the six Area Councils of the Federal Capital Territory. Namely:- Gwagwalada market, Dei-dei market, Kwali market, Abaji market, Rubochi market, Kuje market, Bwari market and Karshi market. Upon arrival of the twenty five Yankasa ewes, the animals were quarantine for two weeks during which period they were treated against ecto- and endo- parasites using Ivermetin® as a dewormer, with a broad spectrum antihelmintic (Albendazole®), and also an injectable antibiotic oxytetracycline to prevent infections and boost the animals to withstand the experimental rigours. The sheep were also vaccinated against Peste de Petis Ruminantes (PPR) vaccine injected intramuscularly, this is relevant to provide immunity against Peste de Petis Ruminantes (PPR) which is a common disease of sheep in the study area. After the acclimatization period, the sheep were housed individually in concrete floored pens measuring 1.2 m2 they were all tagged and screened to ensure that they were not pregnant while stool and blood were also collected for baseline analyses.

Feed formulation and inclusion of the premix

The basal diet was prepared using locally sourced feed ingredients including maize offal, Brewer's Dried Grains (BDG), Cassava peel, Cowpea husk, Salt, were mixed with industrially produced and locally prepared premix at below proportion. (Table 1). The feed ingredients were all purchased from Gwagwalada main market in Abuja. Five (5) % of the lambs body weight basal feed were given on daily basis throughout the period of study. Dietary premix of both local and industrial was administered to the animals at four (5) inclusion levels (0 as a control, local and industrial 25:75, 50:50, 75:25 and 100 % local) with clean water provided ad-libitum in the morning, in a confined environment; the feed offered and left over were recorded daily. The sheep were weighed at the beginning of the study and were weighed weekly.

Industrial compounded premix for ewes

The industrial compounded premix was purchased from a commercial animal feed company named Agri-dom Agricultural Freedom located at 20/22, Kolawole Shonibare Street, Ajao Estate Lagos State, Nigeria. The premix contained a mix of minerals, vitamins and other chemicals essential for sheep (Table 2).

Locally prepared premix was formulated by mixing the ingredients in the following proportions
Dehydrated greens powder- 100 g,

Roasted flaxseed powder - 100 g,
Roasted cumin seed powder - 50 g,
Sprouted and dried fenugreek seed powder- 50 g.
These were mixed well stored under refrigeration in airtight Polyethylene terephthalate (PET) containers and used for further studies.
Preparation of locally prepared premix
The greens were cleaned and washed in tap water. The edible portion was again rinsed in glass distilled water and oven dried at 60 OC for 8 hours. The dried leaves were powered using a mixer and stored in clear PET (polyethylene terephthalate) containers. Flaxseeds and cumin seeds were cleaned and roasted at low flame for 5 minutes and then powdered using a mixer. Fenugreek seeds were soaked in water for 5 hours and water was drained from seeds. Seeds were placed over a wet cloth in a germinating chamber with humidity control at room temperature (28 OC) and allowed to germinate for 3 days in dark condition. The sprouted fenugreek seeds were dried in an oven at 60 OC for 10 hours, powdered and stored. Wheat was cleaned and milled into flour, and stored for later use. (Table 3).

Experimental Design

The design of the experiment used was Complete Randomized Design (CRD), whereby twenty-five (25) Yankasa lambs were randomly allocated to five (5) treatment groups comprising of five animals per treatment. The animals were randomized by their weights and placed into their groups fed basal diets, and 5 levels of industrially and locally compounded premix.

T1: Yankasa ewes fed with 0 % premix per 100 % of the experimental feed which served as the control.
T2: Yankasa ewes fed with 25 % local and 75 % of industrial premix, per 100 % of the experimental diet.
T3: Yankasa ewes fed with 50 % local and 50 % of industrial premix 100 % of the experimental diet.
T4: Yankasa ewes fed with 75 % local and 25 % of industrial premix per 100 % of the experimental diet.
T5: Yankasa ewes fed with 100 % of local premix per 100 % of the experimental diet.

DATA COLLECTED

Blood collection

Three (3) Yankasa ewes were randomly picked per treatment and bled through the jugular vein and 5 ml of blood samples per each was collected out of which 3 ml were transferred into a plastic tube containing Ethylene Diamine Tetra Acetic acid (EDTA) for hematological studies; while the remaining 2 ml were emptied into another vial free of EDTA used for serum biochemical studies, these analyses were carried out following the procedures of Ajagbonna et al. (1999); Uko et al. (2000); Ahamefule et al. (2008).

Haemtological parameters observed

The haematological parameters of the blood investigated includes the white blood cell, lymphocyte cell count, granulocyte, monocytes, red blood cell, haemoglobin, packed cell volume, mean corpuscular volume, mean corpuscular haemoglobin, and mean corpuscular haemoglobin

concentrations which were determined according to the method of Ajagbonna et al. (1999); Uko et al. (2000) and Ahamefule et al. (2008).

Serum biochemical parameters observed

The serum biochemical parameters investigated includes the urea, sodium, potassium, chloride, Bicarbonate creatinine, serum glutamate oxaloacetate transaminase, serum glutamic pyruvate transaminase, alkaline phosphatase, total protein and albumin which were determined according to the guidelines of Ajagbonna et al. (1999); Uko et al. (2000); Ahamefule et al. (2008).

DATA ANALYSIS

All data generated for this study were subjected to Analysis of Variance (ANOVA) using the General Linear Model (GLM) procedure of SAS (2008). Means were separated using Least Significant Difference (LSD) test of the same package.

RESULTS AND DISCUSSION

Table 4 gives summary of the haematological parameters of Yankasa ewes fed varying levels of local and industrial premix supplemented diets with the initial values for all the parameters measured found to be below the normal range, except in Mean Corpuscular Volume (MCV) and Mean Corpuscular Haemoglobin Concentration (MCHC). Significant differences were not observed between the treatments in all the parameters. Similarly, the final values for all the parameters measured were found to be within the normal range. The Haematological parameters which shows that most of the parameters measured where within the normal range could mean that local premix and industrial premix in the diet of Yankasa ewes does not have any negative effect on the health of the animal. This is in agreement with the studies of Akinmoladun, Sabi & Adedayo, 2018b ; Ladipo & Akinfemi, 2014 when animals are fed non-conventional feeds containing high levels of antinutritional compounds, and for an extended period, their growth rate, health status and disease resistance are negatively affected. The results obtained for haemoglobin in this study were 8.27-13.03 g/dl and they are within the normal range of 9.0-15.0 g/dl reported for small ruminants by (Merck Manual, 2012), this agrees with Fasae et al. (2014) who stated that increased haemoglobin (Hb) level with increased supplementation of maize cob with forage legumes.

Table 5 summarizes results of the serum biochemistry parameters of Yankasa ewes fed varying levels of local and industrial premix supplemented diets. All serum biochemical parameters final values are observed to be within the normal range. Serum biochemical characteristics of the blood parameters for Yankasa ewes measured in this study revealed that creatinine final values, shows that Yankasa ewes fed with supplemented local and industrial premix differs significantly from those fed 0 % premix (control). Creatinine values of 1.37-1.57 (mg/dL) for this study fall below the normal range of 3.2–6.2 mol/µl reported by Pampari (2003). ALT, AST and ALP values are triggered by the presence of toxic substance in a feed (Iyayi, 1994; Alagbe et al., 2020). Mean globulin values in this study are higher than that reported by Abubakar et al. (2016) in Yankasa ram blood analysis but slightly lower than that reported by Kaneko et al. (2008) for healthy sheep. The differences in the total protein level may be attributable to differential diet intake and environment. Other studies revealed that serum protein may be used as an indirect measurement of the dietary protein quality (Alikwe et al., 2010; Garba and Halliru, 2019). This result is consistent with the report of Taiwo and Ogunsanmi (2003) on clinically

healthy sheep in Ibadan,| similar observation was recorded by Njidda et al. (2014) on the serum biochemical indices of sheep in Semi-arid environment of northern Nigeria. Urea levels were influenced by feeding different levels of premix, the values obtained in this study is in consonance with the reports of Musa et al. (2016) on the Serum chemistry of Uda rams with graded levels of Xylopia aethiopica (Ethiopian Pepper). The values reported is an indication that the integrity of the kidney and liver were not compromised.

CONCLUSION

It is concluded on this study that inclusion of both local and industrial premix at 25-75 % into the diet of Yankasa ewes, does not have any negative effect on the health of the animals as values of all the haematological and serum biochemistry parameters are within the normal values.

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Table 1: Composition and proximate analysis of the basal experimental diets fed the Yankasa lambs

Parameters	T1	T2	T3	T4	T5
Maize offal (kg)	25.00	25.00	25.00	25.00	25.00
BDG (kg)	32.00	32.00	32.00	32.00	32.00
Cassava peel (kg)	19.50	19.50	19.50	19.50	19.50
Cowpea husk (kg)	23.00	23.00	23.00	23.00	23.00
Salt (kg)	0.50	0.50	0.50	0.50	0.50
Premix (kg)	0.00	0.25	0.50	0.75	1.00
Proximate Analysis					
Dry matter (%)	96.72	96.19	95.67	96.02	95.69
Crude protein (%)	14.40	14.50	14.44	14.65	14.10
Crude fibre (%)	11.63	12.49	11.98	12.11	11.63
Ash (%)	8.72	10.90	12.08	13.60	14.24
Ether extract (%)	3.41	4.11	4.71	3.92	3.98
Nitrogen Free Extract (%)	28.48	38.36	28.53	28.95	29.61
Metabolizable Energy (kcal/kg)	1822.78	1879.47	1932.37	1890.43	1898.00

Table 2: Vitamins and minerals composition of the industrial premix minimum analysis for ewes per 2.5 kg

Nutrients	Unit	Quantity
Vitamin A	IU	30,000,000
Vitamin D3	IU	6,000,000
Vitamin E	IU	30,000
Vitamin K	Mg	2,000
Vitamin B2	Mg	3,000
Vitamin C	Mg	30
Niacin	Mg	40,000
Pantothenic Acid	Mg	12,000
Vitamin B6	Mg	1,500
Vitamin B12	Mg	10,000
Folic Acid	Mg	1,000
Biotin	Mg	400
Choline chloride	Mg	300,000
Cobalt	Mg	200
Copper	Mg	1,200
Iodine	Mg	20,000
Iron	Mg	40,000
Manganese	Mg	100,000
Selenium	Mg	150
Zinc	Mg	30,000
Antioxidant	Mg	1,250

Table 3: Vitamins and minerals composition of the raw ingredients locally prepared ass premix for ewes per 100 g

Constituents	Cauliflower	Flaxseed	Cumin seed	Fenugreek seed	Wheat flour	Premix
Moisture (g)	6.32	3.40	5.14	5.80	7.92	4.05
Fat (g)	1.28	40.25	12.60	6.74	1.62	21.66
Protein (g)	5.64	22.52	16.24	27.10	12.02	16.37
Ash (g)	16.00	3.55	8.80	3.25	1.09	8.33
Soluble fiber (g)	12.40	10.80	8.20	8.00	1.60	10.43
Insoluble fiber (g)	32.60	15.00	32.20	26.40	4.60	25.63
Calcium (mg)	682.0	205.5	1029.5	191.0	45.0	583.5
Iron (mg)	39.00	2.66	13.16	6.60	6.50	27.66
Total carotene (mg)	49.526	0.256	0.566	0.177	0.109	44.670
β- carotene (mg)	17.278	ND	ND	ND	ND	17.765
Polyphenols (mg)	425.0	1462.5	562.5	475.0	137.5	873.0
Tannins (mg)	1230.0	590.0	1300.0	1200.0	80.0	1070.0
Total oxalates (mg)	ND	Traces	Traces	7.30	7.33	ND
Soluble oxalates (mg)	ND	ND	ND	2.00	2.00	ND

ND: Not Detected

Table 4: Haematological parameter of Yakasa ewes fed varying levels of premix supplemented diet

Parameters		T1	T2	T3	T4	T5	SEM	P-values	Normal-Range
WBC($X10^3$/ul)	Initial	3.70	3.73	6.37	2.07	2.30	0.56	0.0089	
	Final	10.31	11.22	11.20	11.67	11.79	1.33	0.186	4-12
	Difference	6.61	7.49	4.83	9.6	9.49			
RBC($X10^6$/ul)	Initial	1.66	2.64	1.75	5.80	2.41	0.513	0.290	
	Final	9.89	6.35	7.26	10.83	9.90	0.689	0.181	9–15
	Difference	8.23	3.71	5.51	5.03	7.49			
Hb (g/dl)	Initial	6.13	4.90	6.90	7.70	6.63	0.505	0.554	
	Final	10.27	8.63	9.27	11.30	10.03	0.361	0.163	9–15
	Difference	4.14	3.73	2.37	3.6	3.4			
PCV (%)	Initial	6.87$_b$	9.73$_b$	8.13$_b$	20.30$_a$	9.73$_b$	1.597	0.024	
	Final	34.50	23.67	29.93	38.53	35.07	2.222	0.265	27–45
	Difference	27.63	13.94	21.8	18.23	25.34			
MCV (fl)	Initial	33.18	30.30	36.50	35.33	34.53	1.874	0.381	
	Final	34.13	39.70	44.43	38.96	37.84	1.461	0.178	28–40
	Difference	0.95	9.4	7.93	3.63	3.31			
MCH (pg)	Initial	7.97	8.03	7.70	7.17	7.60	6.181	0.590	
	Final	10.40	11.20	11.63	11.90	12.00	2.381	0.572	8.0 - 12
	Difference	2.43	3.17	3.93	4.73	4.4			
MCHC (g/dl)	Initial	32.13	34.07	35.27	32.13	30.33	11.662	0.608	
	Final	36.23	42.43	42.70	43.09	44.03	4.214	0.643	30–48
	Difference	4.1	8.36	7.43	10.96	13.7			

Table 5: Serum biochemical parameter of Yankasa ewes fed varying levels of premix supplemented diet

Parameter		T1	T2	T3	T4	T5	SEM	P values	Normal Range
ALP (iu/L)	Initial	118.00	113.67	109.33	148.33	149.00	8.487	0.532	
	Final	274.67	362.33	174.67	365.00	360.67	28.16	0.178	93-387
	Difference	156.67	248.66	65.34	216.67	211.67			
AST (iu/L)	Initial	46.33	49.00	40.33	38.67	48.67	1.841	0.251	
	Final	88.67^{a}	76.67^{ab}	47.00 ^{b}	83.67 ^{a}	95.33 ^{a}	5.607	0.043	55.1-147.7
	Difference	42.34	27.67	6.67	45	46.66			
ALT (iu/L)	Initial	18.33	18.00	12.30	18.67	13.67	3.368	0.980	
	Final	20.00^{ab}	25.00 ^{a}	16.67 ^{b}	23.33^{ab}	17.67^{ab}	1.195	0.028	10.4-38.4
	Difference	1.67	7	4.37	4.66	4			
Total protein (g/dL)	Initial	55.67	62.33	54.00	65.33	57.33	1.711	0.198	
	Final	86.67	83.67	58.33	70.67	76.67	4.791	0.383	60.0-79.0
	Difference	31	21.34	4.33	5.34	19.34			
Albumin (g/dL)	Initial	20.33	20.00	21.33	22.00	21.08	0.855	0.388	
	Final	24.67	25.00	29.67	26.33	24.33	1.384	0.780	24.0–30.0
	Difference	4.34	5	8.34	4.33	3.25			
Urea (mmol/L)	Initial	3.33	2.77	2.10	2.50	2.73	1.376	0.546	
	Final	3.03	2.80	2.80	2.67	2.87	0.184	0.890	2.1-8.5
	Difference	-0.3	0.03	0.70	0.17	0.14			
Creatinine (mg/dL)	Initial	1.26	1.22	1.00	1.33	1.00	0.810	0.128	
	Final	1.67^{b}	1.33^{a}	1.33 ^{a}	1.37^{a}	1.07^{a}	0.114	0.014	1.2 -1.9
	Difference	0.41	0.11	0.33	0.04	0.07			
Glucose (mg/dL)	Initial	67.10	73.10	60.10	63.10	65.00	9.56	0.435	
	Final	67.20	74.70	60.22	63.50	65.30	1.39	0.163	50.00-80.0
	Difference	0.10	1.60	0.12	0.40	0.30			
Globulin (g/dL)	Initial	29.33	33.13	32.04	32.32	33.00	1.703	0.217	
	Final	32.08	58.67	48.67	48.34	52.33	3.765		29.8-69.8
	Difference	2.75	20.34	16.63	16.02	19.33			