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Haematological and Biochemical Profile of Growing Yankasa Rams Fed Sorghum Stover Supplemented with Graded Levels of Dried Poultry Droppings Based Diets

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Abstract: This study was designed to determine the haematological and biochemical profiles of growing Yankasa rams fed sorghum stover supplemented with Sun-Dried Poultry Droppings diets (SDPD). Poultry dropping is a good source of protein supplement. Its high nitrogen content suggests feeding it to ruminant would be an excellent avenue to convert nutrients in the waste into animal products. But a major challenge for it utilization is the danger of pathogenic organisms. Sun-drying of the droppings can render the waste free of pathogens. Thirty growing Yankasa rams aged 9-12 months, weighing 11.5-15.5 kg were randomly divided into five groups (3 in each) and assigned to five experimental diets T_1-T_5 which contained 0, 20, 40, 60 and 80% SDPD. Blood samples were analyzed for haematological and biochemical parameters. Results showed that White Blood Cell (WBC), Haemoglobin (Hb) and Packed Cell Volume (PCV) were significantly influenced by Dried Poultry Droppings based diets (DPD). Their values were WBC, 10.6, 12.9, 9.5, 7.0 and 10.7 L^{-1}, Hb, 8.6, 9.3, 8.6, 8.4 and 9.7 g dL^{-1} and PCV, 22.9, 29.4, 27.1, 23.6 and 21.5%, respectively. Additionally, urea, sodium and total protein were significantly influenced by treatment diet. Their values were urea, 6.1, 6.3, 6.8, 6.9 and 8.1 mg dL^{-1}, sodium, 102.9, 128.8, 129.2, 130.7 and 130.7 mmol L^{-1}. total protein, 6.3, 6.5, 7.1, 7.2 and 7.1 g dL^{-1}. Most haematological and biochemical values obtained were within the normal range for sheep. SDPS diet can satisfactorily supplement sorghum stover without any deleterious effect on the blood chemistry and haematological profile of growing Yankasa rams.

Key words: Haematological, biochemical, blood profile, growing Yankasa rams, dried poultry droppings, sorghum stover

INTRODUCTION

The level of animal protein consumption has direct influence on the general well-being and health of nations. Additionally, poor nutrition in some countries or communities is almost always associated with a lack of animal proteins in the diet (Ositelu, 1981). In Nigeria, protein consumption is below 67 g recommended by the World Health Organization (WHO) (Akintola *et al*., 1999). There is therefore the need to increase the protein intake to a level which compares to that of the developed nations (Okereke *et al*., 2005), sheep population in Nigeria which is estimated to be 33.9 million (FAO, 2008) and which are primarily kept for meat production can bridge the supply-demand of animal protein gap in Nigeria. But effective and efficient sheep production cannot be enhanced with the use of conventional feedstuff such as maize, soybean cake, fish meal as supplement to low quality feed in present day Nigeria owing to their exorbitant cost, erratic supply (Akinmutimi, 2004) and the competition both with humans and monogastric animals (Adama, 2008; Ajayi *et al*., 2008; Ukpabi and Abdu, 2009). It is in this light that non-conventional energy and protein materials of farm and agro-industrial wastes are presently being exploited for livestock production in Nigeria (Ndubueze *et al*., 2006; Okonkwo *et al*., 2008), such feed resources should be cheap, have high nutritive value, non-toxic, readily available, should have low or no demand by both human and other livestock species and without industrial usage (Egbo *et al*., 2001; Amaefule, 2002; Ndubueze *et al*., 2006).

Poultry droppings are one of such protein materials of farm wastes. Poultry droppings is an agricultural waste from poultry farms in the rural, sub-urban and industrial settlements which often constitute health hazard due to inadequate means of disposal, especially when not utilized as fertilizer. The chemical composition of poultry dropping, especially the high nitrogen content (Jordaan, 2004; Lanyasunya *et al*., 2006) suggests that feeding it to ruminants would be an excellent way to convert nutrients in the waste into animal's products for human consumption; hence it can be a valuable feed for ruminants.

A major obstacle in offering poultry droppings to ruminants is the danger of pathogenic organisms. Research work (Kayongo *et al*., 1992; Jakhmola *et al*.,

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1988) has shown that poultry waste can be rendered free of pathogens by autoclaving, fumigation and dry heat alone or in combination with formaldehyde. Other methods of processing include ensiling (Kayongo *et al*., 1992; Kim *et al*., 2000; Ko *et al*., 2001; Weinberg *et al*., 2003); deep stacking (Kayongo *et al*., 1992, Hopkins and Poore, 2001; Ahmed and Talib, 2008; Elemam *et al*., 2009; 2010) Oven-drying (Saleh *et al*., 2002) and sun-drying (Kayongo *et al*., 1992; Okeudo and Adegbola, 1993; Abdul *et al*., 2008; Mubi *et al*., 2008).

This study was therefore designed to determine the haematological and biochemical profiles of growing Yankasa rams fed sorghum stover supplemented with sun-dried poultry droppings based diets.

MATERIALS AND METHODS

Location of experimental site: The experiment was carried out at the Department of Animal Production, Teaching and Research Farm of the School of Agriculture and Agricultural Technology, Federal University of Technology, Main Campus, Gidan-Kwano Minna. Niger is located within latitudes 09°31^{1}and 09°42^1 North and longitudes 06°29^1 and 06°41^1 East with an altitude of 260 meters (853 ft) above sea level. It is bounded by River Niger running the North-West Flank down to the South Western part of the state. It falls within the Southern Guinea Savannah agro-ecological zone of the country (NSADP, 1995) as was cited by Shiawoya *et al*. (2001) and Lanko (2005). The town experiences mean monthly temperature of 30.5°C with the highest in the month of March and the lowest in August, 22°C-30°C. The raining season lasts for a period of five months on the average with annual average rainfall of 1400 mm in the month of July and August. Relative humidity ranged between 60 and 75% (Danwake, 1999). The experiment was conducted between the months of February-May 2011.

Experimental animals and their management: Thirty Yankasa rams aged 9-12 months and weighing 11.5-15.5 kg was used for the experiment. The rams were sourced from Mariga and Beji local markets in Niger State. The animals were housed in individual pens with corrugated iron roof and a concrete floor. Wood shavings were used as bedding materials to protect the animals from dampness and cold and were changed on weekly basis. The animals were treated against ectoparasites, using ivermectin injection, were dewormed with Albendazole Bolus to take care of endo parasites and also injected intra-muscularly with Oxytetracyline-long acting broad spectrum antibiotic as a precautionary measure against bacterial infections. The animals were later allotted into five treatment groups and fed for a pre-treatment period of two weeks to enable them adapt to the experimental diets and the environment before the commencement of the actual experiment. Salt-licks were provided throughout the period of the experiment. And water was provided *Ad libitum*. Feed offered and feed refused were recorded for each animal in each group daily while animal weights were taken on a weekly basis, using a spring balance. Average daily feed intake and average daily weight gain were calculated over the 106 day experimental period. Feed conversion ratio was also calculated for each treatment from feed intake and weight gain. The animals were under feedlot management.

Processing of poultry droppings: Fresh poultry droppings were obtained from caged layers reared commercially at Abu-Turab poultry farm in Minna. The poultry droppings were sun-dried for 5-6 h daily for 3-5 days to ensure pathogenic microbial safety. The product was therefore pounded using pestle and mortal and used as feed.

Experimental Diets: Two experimental diets were prepared for the study: basal and supplementary diets. A total of 600 g of chopped sorghum stover were fed as basal diet/ram/day. Five types of supplementary diets were prepared and fed. The supplements consist of the following; Maize Bran (MB) alone (100%), Maize Bran (MB)+Dried Poultry Droppings (MB+DPD) (80:20), Maize Bran (MB)+dried poultry manure (MB+DPD) (60:40), Maize Bran (MB+DPD) (40:60), Maize Bran (MB)+dried poultry manure (MB+DPD) (20:80). The basal and supplementary diets were offered at the rate of 3 and 2% of body weight, respectively. The proximate composition of the supplemental diet is presented in Table 1.

Diet Formulation: Two experimental diets were prepared for the study: basal and supplementary diets. A total of 600 g of chopped sorghum stover were fed as basal diet/ram/day. Five types of supplementary diets were prepared and fed. The supplements consist of the following; Maize Bran (MB) alone (100%), Maize Bran (MB)+Dried Poultry Droppings (MB+DPD) (80:20), Maize Bran (MB)+dried poultry manure (MB+DPD)

Table 1: Proximate composition (DM Basis%) of supplementary diets fed to yankasa rams

Composition	T_1	T_2	T_3	T_4	T_5
Dry matter	84.20	88.60	92.20	85.80	92.80
Crude protein	7.00	13.13	13.60	14.00	15.40
Crude fibre	3.20	6.70	9.30	12.50	8.00
Ash	5.50	12.00	12.50	16.50	25.00
Ether extract	5.00	20.00	12.50	12.50	17.50
Nitrogen free extract	63.50	36.77	44.30	30.30	26.90
Energy (kcal g^{-1})	2.27	2.53	2.81	3.90	4.23

(60:40), Maize Bran (MB+DPD) (40:60), maize bran (MB)+dried poultry manure (MB+DPD) (20:80). The basal and supplementary diets were offered at the rate of 3 and 2% of body weight, respectively.

Experimental Design: The experimental design was Complete Randomised Design. The rams were randomly assigned to five treatments (T_1-T_5) comprising of three replicates with two animals per replicate. Treatment one(T_1) were rams fed 0% Dried Poultry Droppings (DPD), T_2 were fed with 20% DPM, T_3 were fed with 40% DPD, T_4 were fed with 60% DPM and T_5 were fed with 80% DPD. Feeding trial lasted for 106 days.

Blood sampling: Three rams were randomly selected from each treatment for these studies. Blood samples were collected on a weekly basis and for a period of four weeks. A 5 mL of blood was collected via the jugular vein of each of the animals. Three milliliter was emptied into a vial containing Ethylene Diamine Tetra Acetic Acid (EDTA) for haematological study. The bottles were immediately capped and the content mixed gently for about a minute by repeated inversion or rocking. The remaining 2 mL was emptied into another vial free of Ethylene Diamine Tetra Acetic acid (EDTA) for biochemical studies according to Ajagbonna *et al*. (1999) and Uko *et al*. (2000). Both samples were analysed immediately after collection in Haematological and Biochemical laboratories of Minna General Hospital. Biochemical constituents of the serum samples include urea (Tietz, 1976) as was cited by Ukpabi and Abdu (2009) sodium and potassium was determined using a flame photometer (Corning model 400; Corning Scientific limited, England), chloride and bicarbonate values were determined as described by Toro and Ackermann (1975) as was cited by Taiwo and Ogunsanmi (2003) and creatinine Heinegard and Tiderstrom (1973) as was cited by Diagnostics (2001). The activity of the enzymes alanine transaminase (ALT) and Aspartate transaminase (AST) was measured using the method of Reitman and Frankel (1957) as was cited by Taiwo and Ogunsanmi (2003). Alkaline phosphate (ALP) was by the method of Roy (1970) as was cited by Ikhimioya and Imasuen (2007), total protein and Albumin were determined using commercially available diagnostic kits (Randox Test kits). Haematological values (e.g., packed cell volume, red blood cell, white blood cells, haemoglobin, platelets etc.,) of the blood samples were measured and calculated as described by Magyar (2005) using electronic Haematology Analyser.

PARAMETERS DETERMINED

Haematological: This includes white blood cell, lymphocyte, cell count, granulocyte, lymphocyte, monocyte%, red blood cell, haemoglobin, packed cell volume, mean corpuscular volume, mean corpuscular hemoglobin and mean corpuscular hemoglobin and mean corpuscular hemoglobin concentration. Haematological parameters were analysed according to the method of Ajagbonna *et al.* (1999), Uko *et al.* (2000), Magyar (2005) and Ahamefule *et al.* (2008).

Biochemical: This includes urea, sodium, potassium, chloride, bicarbonate creatinine, serum glutamate oxaloacetate transaminase, serum glutamic pyruvate transaminase, alkaline phosphatase, total protein and albumin. Biochemical parameters were analyzed according to the method of Ajagbonna *et al.* (1999), Uko *et al.* (2000) and Ahamefule *et al.* (2008).

Statistical Analysis: Data generated in 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

Haematological parameters of growing yankasa rams fed sorghum stover supplemented with graded levels of dried poultry droppings: White blood cell count differ significantly ($p<0.05$) between T_2 (12.9) and T_4 (7.0). However, these values were within the range of 3.2-15.80 and 6.8-20.1% reported for Afec-Awassi sheep and West African dwarf goats by Jawasreh *et al*. (2010) and Daramola *et al.* (2005). The values obtained in this study were an indication that there were no microbial infection or presence of foreign bodies or antigens Ahamefule *et al.* (2008) or parasites in the circulatory system of the experimental animals.

Table 2 shows significant differences ($p<0.05$) existed between T_5 (9.7) and T_4 (8.4) for haemoglobin level. The values reported in this study were within the range 7-15 and 8.15-10.75 g dL^{-1} reported for West African Dwarf goats and WAD sheep by Daramola *et al.* (2005) and Akinyemi *et al*. (2010), respectively. The implication of the values obtained in this study is that the dietary proteins were of high quality as reported by Abu *et al*. (1998). There was significant ($p<0.05$) differences between T_2 (29.4) and T_1 (22.9) for Packed Cell Volume (PCV). Packed cell volume values of this work falls within the range of 21-35 and 20.10 and 48.00% reported for WAD goats and Afec-Awassi sheep by Daramola *et al.* (2005) and Jawasreh *et al.* (2010). The values obtained in this study suggest that there were no presence of toxic factor (such as haemagglutinin) which had adverse effect on blood formation as reported by Oyawoye and Ogunkunle (1998).

Biochemical parameters of growing Yankasa Rams fed sorghum stover supplemented with graded levels of dried Poultry droppings: The increase in dried poultry manure levels increases the values of urea in the biochemical profile. Hence, there was significant differences ($p<0.05$) between T_5 (8.1) and T_1 (6.1) (Table 3). However, the values falls within the range of 0.8-9.7 reported for WAD goats by Daramola *et al.* (2005). The values reported in this study are indicative of the fact that the dietary protein of this study was of good quality as reported by Roy (1970).

Similarly, sodium concentration followed the same trend as urea. Significant ($p<0.05$) difference existed between T_4, T_5 (130.7) and T_1 (102.9), respectively. The values obtained also falls within the range of 124-146 mmol L^{-1} reported for WAD goats by Daramola *et al.* (2005) except T_1 which value was lower than the range reported. It is thought the marked variation in sodium levels in the treatment groups may have resulted from variable intake of sodium in these diets based on the sodium content of the experimental diets.

Serum Glutamic Oxaloacetate Transaminase (SGOT) values reported in this study falls within the range 12-38 mg mL^{-1} reported for WAD goats by Daramola *et al.* (2005).Higher levels of values above normal range signals necrosis and *Myocar-dial* sp. infarction which are indicators of poor quality protein of diet fed (Fasina *et al.*, 1999). The implication of the values obtained in this study suggests that the dietary proteins fed are of good quality.

Alkaline phosphatase values reported in this study were within the range 30.73-79.18 IU/I reported for WAD goats by Ikhimioya and Imasuen (2007). Values that falls within the range reported suggest high quality protein in the diet fed as reported by Akinmutimi (2004).

There was significant difference in the serum total protein of the studied animals. The lowest values was observed in T_1 (6.3) and highest value was reported in T_4 (7.2) respectively. However, these values were within the range of 6.3-8.5 and 5.0-12.3 (g dL^{-1}) reported for WAD goats and Afec-Awassi sheep by Daramola *et al.* (2005) and Jawasreh *et al.* (2010), respectively.

Table 2: Haematological parameters of growing Yankasa rams fed sorghum stover supplemented with graded levels of dried poultry droppings

	Treatments						
Parameters	T_1	T_2	T_3	T_4	T_5	LSD	LS
White blood cell (L^{-1})	10.6^{ab}	12.9^{a}	9.5^{ab}	7.0^{b}	10.7^{ab}	3.9	*
Lymphocyte (L^{-1})	3.6^{b}	8.1^{a}	3.0^{b}	2.2^{b}	4.3^{b}	3.1	*
Medium cell count (L^{-1})	1.7^{ab}	2.2^{a}	1.2^{b}	1.2^{b}	1.8^{ab}	0.8	*
Granulocyte (L^{-1})	5.3	4.4	4.4	4.1	4.5	1.4	NS
Lymphocyte (%)	35.7	68.6	34.7	57.9	61.7	55.1	NS
Monocyte (%)	16.8^{a}	16.6^{a}	13.6^{b}	15.6^{ab}	15.8^{ab}	2.5	*
Granulocyte (%)	47.5^{ab}	47.5^{ab}	51.8^{a}	51.5^{a}	47.5^{ab}	9.8	*
Red blood cell (L^{-1})	7.2^{b}	9.9^{a}	9.1^{a}	7.2^{b}	6.4^{b}	1.7	*
Haemoglobin (g dL^{-1})	8.6^{b}	9.3^{ba}	8.6^{b}	8.4^{b}	9.7^{a}	0.9	*
Packed cell vol. (%)	22.9^{d}	29.4^{a}	27.1^{b}	23.6^{c}	21.5^{e}	3.0	*
Mcv (fl)	33.2^{ab}	29.8^{c}	30.3^{bc}	33.7^{a}	33.9^{a}	4.2	*
Mch (pg)	13.9^{ab}	9.3^{c}	9.9^{bc}	12.6^{bc}	17.7^{a}	8.4	*
Mchc (g dL^{-1})	40.3^{ab}	31.5^{c}	32.5^{bc}	37.3^{bc}	48.3^{a}	0.0	*

abc: Mean values with the same letters along the row are not significantly different ($p<0.05$), LS: Level of Significance, * = Significant difference ($p<0.05$) NS: not significant ($p>0.05$), LSD: Least significant difference, MCV: Mean Corpuscular Volume, MCH: Mean Corpuscular Hemoglobin, MCHC: Mean Corpuscular Hemoglobin Concentration

Table 3: Biochemical profile of growing Yankasa rams fed sorghum stover supplemented with graded levels of dried poultry droppings

	Treatments						
Parameters	T_1	T_2	T_3	T_4	T_5	LSD	LS
Urea (mg dL^{-1})	6.1^{b}	6.3^{b}	6.8^{b}	6.9^{b}	8.1^{a}	0.9	*
Sodium (mmol L^{-1})	102.9^{b}	128.8^{a}	129.2^{a}	130.7^{a}	130.7^{a}	2.6	*
Potassium (mmol L^{-1})	3.9	3.9	4.0	4.2	4.2	0.4	NS
Chloride (g dL^{-1})	101.2	101.2	101.4	101.2	100.8	1.0	NS
Bicarbonate (g dL^{-1})	22.6	22.3	22.3	22.6	22.5	1.1	NS
Creatinine (mg dL^{-1})	1.1	1.9	1.1	1.9	1.2	1.7	NS
SGOT (mg mL^{-1})	27.3	19.6	17.2	19.8	21.3	15.2	NS
SGPT (mg mL^{-1})	30.8	29.6	22.j1	23.9	31.5	15.2	NS
ALP (mg mL^{-1})	41.9	42.3	43.9	48.3	45.9	7.9	NS
Total protein (g dL^{-1})	6.3^{c}	6.5^{bc}	7.1^{ab}	7.2^{a}	7.1^{ab}	0.7	*
Albumin (g dL^{-1})	3.8^{ab}	3.6^{b}	3.7^{b}	4.1^{a}	3.5^{b}	0.4	*

abc: Mean values with the same letters along the row are not significantly different ($p<0.05$), LS: Level of Significance, * = Significant difference ($p<0.05$), NS: Not significant ($p>0.05$), LSD: Least significant difference, SGOT: Serum Glutamate Oxaloacetate Transaminase, SGPT: Serum Glutamic Pyruvate Transaminase, ALP: Alkaline Phosphatases

The implication of this result is that highest increase in total protein in the sera of the experimental animals in T_4 would suggest that protein synthesis was efficient.

CONCLUSION

Based on the result of this present study most haematological and biochemical values obtained were within the normal range reported for sheep. Therefore sun-dried poultry dropping based diets at up to 80% inclusion level can satisfactorily supplement sorghum stover without any deleterious effect on the blood chemistry and haematological profile of growing Yankasa rams.

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