Haematological and Serum Biochemical Profile of Growing Yankasa Ram Lambs Fed Diets Containing Graded Levels of Sesame Residue

Y. Garba, and E. A. Adeola

Abstract — An experiment was carried out to test the effect of Sesame residue (SR) inclusion in the diets of growing Yankasa ram lambs on haematological and serum biochemical parameters. Twelve (12) Yankasa ram lambs with initial body weight of 20.08±3.08kg were allotted to three dietary treatments containing 0, 20 and 30% SR (A, B and C). A completely randomized design was used for the study which lasted twelve (12) weeks. The haemetology results revealed that the white blood cells (12.85-16.85 109/L), red blood cells (1.49-2.04 1012/L), haemoglobin, mean corpuscular haemoglobin concentration (MCHC), mean corpuscular haemoglobin (MCH) (39.85-48.00 pg), mean corpuscular volume (MCV) and lymphocytes differed significantly (P<0.05) among the treatments. Lambs fed 30% SR had the highest MCV, MCH, MCHC and lymphocyte values. Serum biochemical analysis results revealed that lambs fed 20% and 30% SR had higher alkaline phosphatase, total protein and globulin values than lambs fed 0%SR. However, SR inclusion in the diets did not affect calcium and phosphorus levels of the lambs. In conclusion, including sesame residue at 30% in the diets of growing Yankasa ram lambs had no observable adverse effect on haematological and serum biochemical parameters.

Index Terms — Haematology, Lamb, Serum Biochemistry, Sesame residue.

I. INTRODUCTION

Scarcity of forage resources during the dry season in semi-arid Nigeria poses an enormous challenge to small ruminant fattening programme in the region. Most ruminant farmers, usually smallholder in scale, rely solely on low-quality forages and crop residues in feeding their animals [1]. Some countries utilize sesame hulls (SH) for livestock feeding. However, published results examining the effect of dietary SH on farm animals' performance are very limited [2], [3].

Conducting blood analysis on animals after feeding trials is a readily available and quick means for evaluating clinical and nutritional status [4]. Animal scientists monitor and assess the nutritional and health status of animals by carrying out haematology and blood chemistry, which give reliable results [5]. Hence, this experiment was carried out to test the effects of including sesame residue in the diets of growing Yankasa ram lambs on blood metabolites.

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II. MATERIALS AND METHODS

A. Animal Care

The experimental procedure was certified by the Bayero University, Kano, Animal research ethics committee and was carried out in line with standard procedures.

B. Experimental Site

The experiment was carried out on the Experimental Farm of the Centre for Dryland Agriculture, Bayero University, Kano (GPS Coordinates: N11°86.155', E8°98.955'). Kano has two distinct seasons: Wet season which occur between May and September, and dry season which occur between October and April. The annual rainfall of the city ranges from 787 to 960 mm while the mean daily temperature varies between 30 °C to 33 °C [6].

C. Management of Animals

Twelve (12) growing Yankasa ram lambs with initial body weight (BW) of 20.08 ± 3.08 kg were used in the experiment. The lambs were purchased from Rimin-gado livestock market, Kano state. The lambs were drenched against internal parasites using Albendazole, which is a broad spectrum anthelmintic, at 1ml per 50 kg body weight. The lambs were ear-tagged and allocated to the three experimental treatments.

D. Experimental Design and Diets

A Completely Randomized Design (CRD) was used for the study where twelve ram lambs served as experimental units with each lamb serving as a replicate for the three treatment groups. Three experimental diets containing 0% (control diet), 20%, and 30% inclusion levels of sesame residues were prepared and designated them as A, B and C (Table 1). The feed ingredients used were sesame residue, wheat offal, cowpea husk, cottonseed cake, rice mill waste, groundnut hay, salt and limestone, h purchased all the feed ingredients from Abuja livestock feed market in Kano.

E. Blood Sampling

Blood samples with or without anti-coagulant Ethylenediaminetetraacetic acid (EDTA) were obtained from the jugular vein of two lambs per treatment at the 63rd day of the study in the morning using a 5-ml syringe. Blood samples collected with EDTA were used for haematological analyses, while those collected without anti-coagulant were allowed to clot and the serum was separated by centrifugation for biochemical analyses.

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TABLE 1: GROSS COMPOSITION (%) OF EXPERIMENTAL DIETS CONTAINING GRADED LEVELS OF SESAME RESIDUE FED TO GROWING YANKASA RAM

| | LAMBS | | |
|-----------------------|--------|---------|---------|
| Feed Ingredients | A (0%) | B (20%) | C (30%) |
| Sesame residue | 0 | 20 | 30 |
| Groundnut hay | 20 | 20 | 20 |
| Wheat offal | 30 | 15 | 10 |
| Cowpea husk | 14 | 14 | 14 |
| Cotton seed cake | 20 | 10 | 5 |
| Rice mill waste | 15 | 20 | 20 |
| Common salt | 0.5 | 0.5 | 0.5 |
| Limestone | 0.5 | 0.5 | 0.5 |
| Total | 100 | 100 | 100 |
| Calculated CP (%) | 15.45 | 15.46 | 15.56 |
| Calculated E(kcal/kg) | 2560 | 2680 | 2750 |

A = 0% sesame residue (control), B = 20% sesame residue, C = 30%sesame residue, CP= crude protein, E = energy.

F. Analytical Techniques

Haematocrit, red blood cell, haemoglobin, white blood cell, and lymphocytes were measured according to Coles [7]. The mean corpuscular haemoglobin concentration (MCHC), mean corpuscular haemoglobin (MCH), and mean corpuscular volume (MCV) were calculated as described by [8]. Alkaline phosphatase (ALP), aspartate aminotransferase (AST), and alanine aminotransferase (ALT) were determined using the spectrophotometric method [9]. Serum total protein (TP) was estimated using the Biuret method [10] while albumin (ALB) was determined according to Bromo Cresol green (BCG) method [11].

G. Statistical Analysis

All data were subjected to Analysis of Variance (ANOVA) using general linear model procedure in JMP [12] at 5% significance level (P < 0.05).

III. RESULTS AND DISCUSSION

The haematological responses of the growing Yankasa ram lambs fed diets containing graded levels of sesame residue are shown in Table 2. The results showed that all the parameters haematological investigated differed significantly (P<0.05) among the experimental treatments. The red blood cells values (1.49-2.77 1012/L) obtained in the present study were lower than the range (9–11 x 106 µl) recommended by Campbell et al [13] for sheep. However, the haemoglobin values obtained in this study (7.00– 8.80 g/dl) were close to the standard range of 8-16 g/dl for sheep [14]. This revealed that oxygen and carbon dioxide carrying capacity of the lambs were in excellent condition. The high-quality protein of the experimental diets could have contributed to the haemoglobin values recorded in this study [15].

The values obtained for white blood cell of the lambs (12.85-30.80 g/dl) were within the reference range of 9-31x103/mm3 [16] for healthy sheep. Decreased white blood cell below the normal range show allergic conditions, anaphylactic shock [17] and certain parasitism or presence of a foreign body in circulating system [18]. Haematocrit values recorded from the experiment (24.50%, 25.85% and 23.25%) differed significantly (P<0.05). This showed that inclusion of sesame residue in the diets of lambs had an influence on their haematocrit level. However, the values obtained indicated that the dietary treatments met the nutritional requirements of the lambs [19]. The values recorded in this study were comparable to the values (21.1– 29.4%) reported by Bello and Tsado [15]. Lymphocytes values dietary increased across treatments. Lymphocytes value (56.60-64.20%) obtained in this study were within the reference range of 40-70% [14] for healthy sheep. Mean corpuscular haemoglobin and mean corpuscular haemoglobin concentration are indicators of blood level conditions [20]. The higher values obtained in this study revealed that the experimental lambs were not anaemic.

The result of the serum biochemical parameters of growing Yankasa ram lambs fed diets containing graded levels of sesame residue is presented in Table 3. The values of total protein (TP), alkaline phosphatase (ALP), aspartate aminotransferase (AST) and globulin differed significantly (P<0.05) among dietary treatments. The values obtained for TP of the lambs ranged from 77.50 g/L to 86.50 g/L. The values were highest in lambs fed 20% SR, while the lowest values were obtained from lambs placed on the control diet. However, the TP values were within the normal range for sheep [21]. The high TP values indicated an efficient protein synthesis [15]. ALP values recorded from the experiment ranged from 15.50 μ/L to 18.50 μ/L. ALP values increased with an increasing level of sesame residue in the diets of the lambs. The significantly (P<0.05) different ALP values could be as a result of varying dietary phosphorus in the feed or its utilization as affected by phytate content of sesame residue. The globulin values of lambs fed diet containing sesame residue were significantly higher than the control group. The values obtained ranged from 36.50 to 54.50 g/L which were similar to the values (3.95–4.95 g/dl) reported by Garba and Abubakar [22]. The values obtained in this study implied good immune response of the lambs which might be due to normal water phase proteins and/or immunoglobins levels [23]

The values of phosphorus and calcium among dietary treatments did not differ significantly, and this showed that including sesame residue had no influence on the serum biochemical parameters. The albumin values obtained in this study (35-41 g/L) were higher than the range of 29-33 g/L reported by Njidda et al [24]. The total protein and albumin are indicators of the total protein reserve in an animal body [25]. Also, albumin concentration is an indicator of liver function [26]. The result obtained in this study suggested that sesame residue did not affect the functioning of the liver negatively, since albumin is synthesized mainly by the liver. The creatinine values obtained in this study (111.50-113.00 µmol/L) were also higher than 87.50-100.00 mmol/l reported by Garba and Abubakar [22]. Inefficient metabolism of amino acid and protein increases creatinine level, and could result to cardiac defect and renal malfunction [27]. However, the urea values obtained in this study (11.50–12.15 mmol/L) were within the range of 8– 20 mg/dl reported by Banerjee [28]. The values recorded in this study implied that the dietary treatments supplied sufficient protein to the lambs [19]. The ALT values obtained in this study (4.50-6.50 μ /L) were higher than 32.00IU/L reported by Njidda et al [24].

TABLE 2: HAEMATOLOGICAL RESPONSES OF GROWING YANKASA RAM LAMBS FED DIETS CONTAINING GRADED LEVELS OF SESAME RESIDUE

| PARAMETERS | TREATMENTS | | | - SEM |
|---|----------------------|--------------------|---------------------|-------|
| | A (0%) | B (20%) | C (30%) | SEM |
| White Blood Cell (10 ⁹ /L) | 16.85 ^b | 30.80^{a} | 12.85° | 0.24 |
| Red Blood Cell (10 ¹² /L) | 2.04^{ab} | 2.77 ^a | 1.49° | 0.14 |
| Haematocrit (%) | 24.50 ^{ab} | 25.85 ^a | 23.25 ^b | 1.12 |
| Haemoglobin (g/dl) | 7.95 ^a | 8.80^{a} | 7.00^{b} | 0.14 |
| Mean Corpuscular Volume (fl) | 104.05 ^{ab} | 101.00^{b} | 105.80 ^a | 0.52 |
| Mean Corpuscular Haemoglobin (pg) Mean Corpuscular Haemoglobin | 39.85 ^b | 35.70° | 48.00^{a} | 0.27 |
| Concentration (g/dl) | 39.95 ^b | 35.90° | 45.50 ^a | 0.12 |
| Lymphocyte (%) | 56.60 ^b | 58.50 ^b | 64.20 ^a | 0.41 |

a, b, c, means in the same row with different superscripts are significantly different (P<0.05).

TABLE 3: SERUM BIOCHEMICAL PARAMETERS OF GROWING YANKASA RAM LAMBS FED DIETS CONTAINING GRADED LEVELS OF SESAME RESIDUE

| PARAMETERS — | | SEM | | |
|----------------------------------|---------------------|---------------------|---------------------|------|
| | A (0%) | B (20%) | C (30%) | SEM |
| Creatinine (µmol/L) | 111.50 ^b | 117.50 ^a | 113.00 ^b | 1.58 |
| Urea (mmol/L) | 11.85 ^b | 11.50° | 12.15 ^a | 0.12 |
| Alkaline Phosphatase (μ/L) | 15.50^{b} | 17.50 ^{ab} | 18.50 ^a | 0.50 |
| Alanine Aminotransferase (µ/L) | 4.50^{b} | 6.50^{a} | 5.50^{b} | 0.50 |
| Aspartate Aminotransferase (µ/L) | $10.50^{\rm b}$ | 9.50^{b} | 13.50 ^a | 0.50 |
| Calcium (mmol/L) | 1.95 | 2.10 | 2.30 | 0.21 |
| Phosphorus (mmol/L) | 1.03 | 0.93 | 1.15 | 0.11 |
| Total Protein (g/L) | 77.50° | 89.50^{a} | 86.50^{b} | 0.50 |
| Albumin (g/L) | 41.00^{a} | 35.00^{b} | 40.00^{a} | 1.15 |
| Globulin (g/L) | 36.50 ^b | 54.50^{a} | 46.50 ^a | 1.50 |

a, b, c, means in the same row with different superscripts are significantly different (P<0.05).

IV. CONCLUSION

In conclusion, white blood cells and red blood cells decreased by 58 and 46 % respectively in lambs fed 30 % inclusion of sesame residue relative to those offered 20 % inclusion level. The normal functioning of the lambs was not impaired by the inclusion levels of the dietary treatments.

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A=0% sesame residue (control), B=20% sesame residue, C=30% sesame residue, SEM = Standard Error of Mean.

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