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## Hematological and Biochemical Profile of Red Sokoto Goats Fed Pigeon Pea (*Cajanus cajan*) Husk

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**Abstract**
The study was conducted to evaluate the effect of feeding pigeon pea husk on the hematological and biochemical profile of Red Sokoto bucks. The pigeon pea husk was sourced locally and milled with a crushing machine to enable homogenous mixing with other ingredients which were packaged and stored in jute bags until it was used. Four Red Sokotogoats of about 11-12 months of age with average live weights of 13.50 kg were used for the study in a latin square arrangement. Blood was collected from the jugular vein into two different test tubes (one containing EDTA and the other without) and taken to the laboratory for hematological and biochemical analysis. The result for hematological parameters was significantly ($p<0.05$) influence by inclusion level which increased with level of inclusion (20%, 40% and 60%) and decreasing at 80%. Most of the biochemical parameters were affected ($p<0.05$) by inclusion level but were within the normal range with a few slightly above and below the normal range. It can be concluded that pigeon pea husk can be utilized as feed for Red Sokotogoats up to 60 % level of inclusion without affecting the hematological and biochemical parameters.

**Keywords**: Hematology, biochemical, Red Sokoto goats, pigeon pea husk.

### Introduction

In recent times ruminant nutritionist are directing their research towards harnessing and enhancing the utilization of agro-industrial by-product and crop residue especially leguminous crop residue like cowpea husk, soya bean straw, pigeon pea pod husk etcas an alternative source of cheap, nutritionally adequate and has no or minimal deleterious effect on the animal. The limited scientific information on the blood profile of Red Sokoto goats fed pigeon pea husk called for this study.

Various functions of blood are carried out by the individual and collective actions of its constituents–the hematological and biochemical components. Hematological parameter is an important and reliable medium used to monitor and evaluate health and nutritional status of animals (Gupta *et al.,* 2007). Blood metabolites are widely used in nutritional evaluation and survey of animal feed and have been reported to have a measurable effect on blood components (Opara *et al*., 2006). Hematological constituents reflect the physiological responsiveness of the animal to its internal and external environment, which include feed and feeding.

The significance of determining hematological and biochemical indices of domestic animals is well documented (Opara *et al*., 2006). Nutrition, age, sex, genetics, stress and transportation are known to affect hematological and biochemical parameters observed between tropical and temperate animals.

Therefore, the objective of the study was to determine the effect of feeding pigeon pea husk on the hematological and biochemical profile of Red Sokotogoats.

### Materials and Methods

The experiment was conducted in the Department of Animal Science teaching and research Farm, Ahmadu Bello University Zaria, Kaduna State. The experimental material Pigeon pea (*Cajanus cajan*) husk was locally sourced, milled and stored in jute bags until it was used. Four Red Sokotogoats of about 11-12 months of age with average live weights of 13.50 kg in a Latin square arrangement were used for the study which lasted for 12 weeks. The animals were kept individually in a 127cm x 71cm metabolic crate with a height of 135cm which has a provision for feed, drinker and pans for urine and faecal collection.

The experimental diets consisted of maize offal, cottonseed cake, bone meal and common salt. Four iso-nitrogenous diets were formulated to contain 15%CP with pigeon pea at inclusion levels of 20, 40, 60 and

80% (Table 1).The adjustment period of the animals to the experimental diets and the metabolic crates prior to the commencement of the experiment was 14 days. The pens and crates were properly disinfected using Morigald® before the commencement of the study. The animals were vaccinated against PPR and prophylactically treated with against internal and external parasites by subcutaneous injection of Ivomec® at the manufacturer's recommended rate, and a broad-spectrum antibiotic (Oxytetracycline L.A) was administered intramuscularly at the rate of 1ml/10kg body weight. The goats were also dewormed using sambezole at the manufacturer's recommended dose. Fresh and clean drinking water was provided to the animals' daily *ad libitum* while the experimental diets were fed at 3% body weight. Two sets of blood samples were taken from the animals via jugular venipuncture using a 10ml syringe fitted with a needle after a growth study. Ten ml blood sample was collected into labeled sterile bottles containing EDTA as an anticoagulant for the determination of hematological parameters. Blood samples for serum analysis were collected into EDTA free bottles, allowed to coagulate at room temperature. The supernatant was then harvested and stored in a freezer for subsequent biochemical analysis. The samples were analyzed at the Department of Hematology, Ahmadu Bello University while proximate composition of feed samples weredone in the Biochemistry Laboratory, Department of Animal Science, Ahmadu Bello University Zaria, using the procedure described by AOAC (2001).
Data collected from this study were subjected to statistical analysis (SAS, 2002) significant means werecompared using DMRT.

Table 1. Ingredients composition of experimental diet

| | Inclusion level of pigeon pea husk(%) | | | |
|---|---|---|---|---|
| Ingredients | 20 | 40 | 60 | 80 |
| Maize offal | 12.99 | 25.98 | 38.97 | 51.96 |
| Cotton seed cake | 6.41 | 12.82 | 19.23 | 25.64 |
| Bone meal | 3.00 | 3.00 | 3.00 | 3.00 |
| Common salt | 0.30 | 0.30 | 0.30 | 0.30 |
| Pigeon pea husk | 80 | 60 | 40 | 20 |
| Total | 100 | 100 | 100 | 100 |

**Results and Discussion**

Table 2 shows the proximate composition of the experimental feed and pigeon pea husk with the dry matter (DM) ranging from 93.28 to 94.50% of the diet, while the pigeon pea husk had a dry matter of 96.70%. The crude protein level in the diets increases as the level of *Cajanus cajan* husk inclusion level increases from 13.94% in 20% inclusion to 14.60% CP in 60% inclusion and then decline. The dietary crude fibre ranges from 10.41% in 20% inclusion to 12.56% in 80% inclusion level of pigeon pea husk in the experimental diets.

Table 2: Proximate composition of experimental diet and pigeon pea husk.

| | Inclusion level of pigeon pea(%) | | | | |
|---|---|---|---|---|---|
| Parameters | 20 | 40 | 60 | 80 | Pigeon Pea Husk |
| Dry matter | 93.28 | 94.18 | 94.50 | 94.11 | 96.70 |
| Crude protein | 13.94 | 14.06 | 14.60 | 14.48 | 19.80 |
| Crude fibre | 10.41 | 10.42 | 10.60 | 12.56 | 23.20 |
| Ether extract | 4.36 | 4.28 | 3.96 | 4.04 | 7.30 |
| Ash | 8.63 | 8.50 | 8.94 | 8.69 | 6.00 |
| Nitrogen free extract | 61.79 | 62.61 | 62.08 | 60.23 | 43.70 |

The result for hematological parameters for Red Sokoto goats fed concentrate containing pigeon pea husk is shown on Table 3. Treatment diets influenced all parameters investigated. Red blood cells (RBC) were significantly affected by dietary treatments. The result for RBC was within the normal range except for 60% level of inclusion which was above the normal range of 4.4-5.7 x $10^{12}$/L. The hematological parameters showed the same pattern increasing with the level of inclusion and attending peak at 60% then declining at 80%. This could

be attributed to the animals been young and apparently healthy. The findings of this study agreed with the findings of Tambuwal *et al*. (20027) in Red Sokoto goats.

Table 3. Hematological parameters of Red Sokoto goats fed diet containing pigeon pea husk

| | Inclusion levels of pigeon pea husk (%) | | | | |
|---|---|---|---|---|---|
| Parameters | 20 | 40 | 60 | 80 | SEM |
| Red blood cell ($10^{12}$/L) | 4.80$^{b}$ | 5.30$^{b}$ | 6.0$^{a}$ | 5.50$^{a}$ | 1.03 |
| White blood cell ($10^{12}$/L) | 5.20$^{d}$ | 8.40$^{c}$ | 15.00$^{a}$ | 9.10$^{b}$ | 1.28 |
| Haemoglobin (g/L) | 11.00$^{b}$ | 11.60$^{a}$ | 11.30$^{b}$ | 9.60$^{c}$ | 0.30 |
| Neutrophil (%) | 27.00$^{c}$ | 36.00$^{b}$ | 43.00$^{a}$ | 26.00$^{c}$ | 2.25 |
| Lymphocyte (%) | 70.00$^{a}$ | 64.00$^{b}$ | 50.00$^{c}$ | 68.00$^{a}$ | 9.02 |
| Monocyte (%) | 3.00$^{a}$ | 3.00$^{a}$ | 3.00$^{a}$ | 2.00$^{b}$ | 0.43 |
| Packed cell volume (%) | 33.00$^{a}$ | 32.00$^{b}$ | 34.00$^{a}$ | 29.00$^{c}$ | 0.10 |

$^{abcd}$ Means within the same row with different superscripts are significantly different ($p<0.05$)

Table 4 shows the effect of level of inclusion of pigeon pea husk on blood biochemical parameters of Red Sokoto goats. The values for total protein significantly ($p<0.05$) influence by inclusion level ranging from 6.43g/L to 8.00g/L and increased with inclusion level. The values for total protein in this study were greater than those reported by Njidda *et al*. (2014) for Balami and Uda breeds of sheep and Yashim*et al*. (2017) for Yankasa rams but are within the normal range for total protein (2.5-8.0g/dl). This could be attributed to the fact that the goats were healthy and pigeon pea husk had no deleterious effect on the animals. The result for serum glucose showed a significant difference ($p<0.05$) ranging from 2.2 Mmol/L to 4.0Mmol/L. When glucose is lower than the normal range, it is an indication of hypoglycemia while higher levels are an indication of hyperglycemia (Yashim *et al*., 2017). The values for creatinine were stable for 20%, 40% and 60% but significantly ($p<0.05$)decreased at 80% level of inclusion. High creatinine is indicative of poor protein and amino acid metabolism that can lead to impaired renal function and cardiac infection (Gray and Howath, 1980). Increased creatinine has been associated with tannin toxicosis in cattle consuming tannin-rich oak fodder (Garg*et al*., 1992). The normal range of creatinine may be attributed to a maintained balance between its generation and excretion by the kidneys.

Table 4. Serum biochemical parameters of Red Sokoto goats fed diet containing pigeon pea husk

| | Inclusion levels of pigeon pea husk (%) | | | | |
|---|---|---|---|---|---|
| Parameters | 20 | 40 | 60 | 80 | SEM |
| Total Protein (g/dL) | 6.43$^{b}$ | 7.21$^{b}$ | 7.40$^{a}$ | 8.00$^{a}$ | 0.79 |
| Total cholesterol l(mmol/L) | 7.00$^{a}$ | 5.00$^{c}$ | 6.20$^{b}$ | 7.50$^{a}$ | 0.77 |
| Sodium (mmol/L) | 147.00$^{a}$ | 141.00$^{b}$ | 147.00$^{a}$ | 148.00$^{a}$ | 9.85 |
| Potassium (mmol/L) | 5.00$^{a}$ | 4.00$^{b}$ | 3.70$^{b}$ | 2.50$^{c}$ | 0.3 |
| Chloride (mmol/L) | 111.00$^{a}$ | 110.00$^{a}$ | 107.00$^{a}$ | 98.00$^{b}$ | 8.28 |
| Serum glucose (mmol/L) | 2.90$^{c}$ | 4.00$^{a}$ | 2.20$^{d}$ | 3.90$^{b}$ | 3.02 |
| Bicarbonate (mmol/L) | 24.00$^{b}$ | 19.00$^{c}$ | 24.00$^{b}$ | 29.00$^{a}$ | 1.86 |
| Creatinine (umol/L$^{4}$) | 59.03$^{a}$ | 59.02$^{a}$ | 59.00$^{a}$ | 47.00$^{b}$ | 3.65 |
| Albumin (g/L) | 37.00$^{a}$ | 30.00$^{b}$ | 29.00$^{b}$ | 38.00$^{a}$ | 1.91 |
| Urea (mmol/L | 3.90$^{a}$ | 3.50$^{b}$ | 4.00$^{a}$ | 3.00$^{c}$ | 0.20 |

$^{abcd}$ Means within the same row with different superscripts are significantly different ($p<0.05$)

**Conclusion**

It can be concluded that feeding pigeon pea husk in the diet of Red Sokoto bucks had little or no negative effect on the hematological and biochemical parameters as only a few was below and above the normal range.

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