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# Growth Rate, Physiological Parameters, Haematological Indices and Nutrient Utilization in West African Dwarf Sheep Fed *Cajanus Cajan*-Based Feed Blocks as Supplements

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***Abstract:*** **Twenty-four (24) yearling West African Dwarf sheep were used as animal model to assess the growth rate, physiological parameters, haematological indices and nutrient utilization as influenced by the dietary treatments. The sheep were randomly assigned to three (3) treatments viz, *Cajanuscajan*-urea feed blocks (CUFB), *Cajanuscajan*-poultry manure feed blocks (CPFB) and the control (basal diet of *Panicum* + cassava peels). Each treatment consists of four (4) replicates of two animals each. The mean body length gain, mean height at wither gain, mean heart girth gain and scrotal circumference gain of sheep fed supplemental feed blocks were significantly (p<0.05) higher than sheep fed only the basal diet. The average daily gains of sheep fed supplemental CUFB and CPFB were significantly (p<0.05) higher than the sheep fed Panicum + Cassava peels diet only. At 0730h and 1730h, the physiological parameters studied were better in the sheep fed the experimental feed blocks than in sheep fed the basal diet only. All haematological indices determined were significantly higher (p<0.05) in sheep fed supplemental feed blocks than the counterparts in control diet. The values obtained in nutrient utilization, the proportion of energy due to protein, crude fats and soluble carbohydrates; and the percent digestible nutrients showed that the animals fed the experimental feed blocks had better rumen functioning and growth performance than their counterparts fed the *Panicum* + Cassava peels diet only. From the results of this study, it can be said that the feeding of feed blocks as feed supplements to sheep enhance better growth performance, better physiolo-gical comfort, proper rumen functioning and health status than when fed with basal diet of *Panicum*+ Cassava peels only.**

*Keywords:* **Feed blocks, Physiology, Performance, Nutrient Utilization, Haematology.**

## 1. INTRODUCTION

Livestock production plays an important role in Nigerian economy contributing about 9.8% of the gross domestic product (GDP) of the country (Oni *et al*., 2013). Livestock production is plagued with many problems which include the prevalence of pests and diseases, lack of good management systems, low productivity and lack of good quality feed for the animals all year round and many others. Ruminant production has always been faced with the problem of feeding during the extended dry season in the tropical region, this is because the forages that are available as feed during this period are dried and relatively low in protein and energy that is required by the animals resulting in low productivity and low income for the farmers. There is therefore need to find alternative means of supplementing ruminant feeds during the extended dry season.

Sheep productivity had been hampered due to the deterioration of rangelands and shortage of green forages, resulting from the priority for cultivation of land for human food and cash crops. The shortage of feed grain, which could be as a result of human consumption, is another factor responsible for the reduction in sheep productivity. However, there has been a considerable increase in the available quantity of crop residues in recent years mainly due to the expansion in food crop production as a result of increase in human population. These residues contribute about 45% of total feed resources available for ruminants. There are constraints to the use of these crop residues in ruminant feeding due to their low energy (35% - 45%) and protein content (3–4%) (Oni *et al*.,2008). These crop residues are usually farm wastes which can be unhygienic to humans when not properly disposed and there is no competition between humans and animals for these crop residues.

The incorporation of these crop residues as one of the ingredients for ruminant feed has been helpful in the maintenance of environmental hygiene and recycle them into animal feeds will improve livestock production at low cost and also maintaining a clean and healthy environment (Ademosun, 1993).

Feed blocks made from crop residue such as *Cajanuscajan* husk, urea, agro-industrial by-products such as molasses, cement (quick lime) and other ingredients will enhance better performance of livestock animals (ruminants), as urea and molasses supply protein and energy respectively, which are the major constraints to the use of crop residues in ruminant feeding.

Reports in literatures had shown that feed blocks manufactured from urea and agro-industrial by-products can be used as supplements for improving the productivity of sheep which are dependent on low quality roughage as their main diet. (Sansoucy*et al.,* 1988; Leng*et al.,* 1991; Hadjipanayiotou*et al.,* 1993b; Aye, 2012).

## 2. Materials and Methods

*Study Area:*

The research work was carried out at the small ruminants unit of the Teaching and Research Farm of the Ekiti State University Ado-Ekiti, Ekiti –State, Nigeria.

*Preparation of experimental feed blocks:*

*Cajanuscajan* husks were collected from a pigeon pea processing unit at Igbemo-Ekiti in Ekiti State and sun-dried for one week to reduce its moisture content. The husks were then milled into a powdery form using a milling machine and stored in a jute bag and kept in a well ventilated area. Other ingredients used for the feed blocks such as molasses, was purchased from Divine Farm at Ikire, Osun State, urea, cement and salt were purchased from an open market in Ekiti State. Poultry manure was collected in fresh condition without maggots from the battery cage system of the poultry section of the University Teaching and Research Farm and sun dried to reduce its moisture and milled into powdery form using a milling machine. Two feed blocks were produced viz;

*Cajanus*+ Urea-Molasses Feed Blocks (CUFB) and *Cajanus* + Poultry Manure-Molasses Feed Blocks (CPFB)

Table 1. The ingredient composition of the experimental feed blocks.

| Ingredients | CUMNB (%) | CPMNB (%) |
|---|---|---|
| *Cajanuscajan* | 30 | 30 |
| Urea Poultry manure | 10 - | -10 |
| Cement | 15 | 15 |
| Salt | 5 | 5 |
| Molasses | 40 | 40 |
| Total | 100 | 100 |

Cement in powdery form was first mixed with water at a ratio of (w/w) 50 parts of cement to 100 parts of water. Cajanus residues, urea/poultry manure, salt (NaCl) and molasses were added and the cement mixture was added last. These components were thoroughly mixed manually. About 2kg of the mixture was poured into cellophane-lined plastic mould measuring 14cm x 10cm x 5cm. The cellophane paper was used to facilitate the removal of the feed block when formed for drying. The blocks were put on a table tops and air-dried. The blocks were allowed to dry gradually for about seven (7) days; the blocks were packed and stored in a well-dried environment because of the hygroscopic nature of the blocks ( Amici and Finzi, 1995; Aye, 2007).

*Experimental animals and management:* Twenty-four yearling West African dwarf sheep were purchased from an open market in Otun-Ekiti, Ekiti State. Prior to the arrival of the animals, pens were cleaned and disinfected with Izal, bedding materials, feeders and drinkers were also provided. On arrival, the animals were given anti-stress (glucose) and the animals were quarantined for 4 weeks, during which routine treatment developed at NAPRI (1984) and modified by Aye (2007) was applied.

At the end of quarantine, animals were randomly assigned to three treatments, four replicates per treatment and two animals per replicate. In assigning the animals to treatment, efforts were made to ensure that all groups were balanced using the age and weight range method (Devendra and McLeroy, 1988; Adebowale *et al*., 1992). The experimental design used was the completely Randomized Design (CRD) as diet was the only varying factor in the experiment.

*Data collection:*

*Growth rate:* Weight of individual animal was measured at the onset of the trial and subsequently on weekly basis. Linear body measurements were also recor-ded once a week. Feed of known weight was offered and residual weight taken daily to determine feed intake of animals. The average daily gain and feed intake were evaluated to obtain the feed conversion ratio.

*Physiological parameters:*

*Respiratory rate:-* Independent counts of the respiratory movements were made using stop watch (Kelly, 1980). This was done twice in a day, once in a week.

*Pulse rate:-*Pulse rate was taken from the femoral artery using stop watch to count the movements ( Pagot, 1992; Aye, 2007). This was also done once in a week.

*Rectal Temperature:-* This was done using a digital thermometer. The thermometer was inserted into the rectum for one minute as described by Kelly, (1980).

*Nutrient utilization:-* This was carried out by transferring sheep into wooden metabolic cages fitted with facilities for the collection of urine and faeces for the balance studies. The animals were weighed and each ram was placed in an individual metabolic cage for 21 days. The animals were acclimatized for 14 days and faeces and urine were collected for 7 days.

The urine and faeces were collected on daily basis and weighed. 10 aliquot samples of the faeces collected were sun-dried to reduce moisture, milled and preserved in air tight polythene bag prior to analysis. Feed was given on daily basis and the leftover was weighed to determine the feed intake of each animal.

*Chemical analysis:-* Samples of experimental diets were collected during the experiment for the dry matter and proximate determinations. The samples were weighed and dried in an oven at 105$^{o}$C to constant weight. The dried samples were weighed and ground to pass through a 2mm sieve. The milled experimental diets and faecal samples were analyzed for moisture, ash, ether extract and crude fibre according to the methods of the Association of Official Analytical Chemists (AOAC) (1995) while nitrogen content of feed, faeces and urine were determined by the micro- Kjeldahl method (AOAC, 1990) and percentage nitrogen was converted to crude protein by multiplying by 6.25. The nitrogen free extract was determined by difference. Gross energy of the feed was determined with adiabatic bomb calorimeter.

*Statistical analysis:-* All data collected were subjected to one-way analysis of variance (ANOVA) method and follow-up test was done using the Fisher's least significant difference. (Steel and Torrie, 1980).

## 3. Results

### *Diet composition:*

Table 2 shows the nutrient composition of the guinea grass, cassava peels and the *Cajanuscajan*-based feed blocks. The guinea grass (*Panicum maximum)* contained 94.34g100g$^{-1}$ dry matter (DM), 6.57g 100g$^{-1}$Ash, 3.31g 100g$^{-1}$ ether extract (EE), 25.21g 100g$^{-1}$crude fibre (CF), 10.69g 100g$^{-1}$ crude protein (CP), 52.30g 100g$^{-1}$ nitrogen free extract (NFE) and 25.39 MJ Kg$^{-1}$ gross energy while the cassava peels contained 94.54g 100g$^{-1}$ DM, 6.89g 100g$^{-1}$ Ash, 6.90 g 100g$^{-1}$ EE, 7.12g 100g$^{-1}$ CF, 10.94g 100g$^{-1}$ CP, 62.67g 100g$^{-1}$ NFE and 15.99MJ Kg$^{-1}$ gross energy. The proximate composition of the *Cajanuscajan* –based feed blocks showed that the dry matter value was 77.16g 100g$^{-1}$ in CUFB and 77.19g 100g$^{-1}$ in CPFB. The Ash values ranged from 24.30g 100g$^{-1}$ in CPFB to 26.00g 100g$^{-1}$ in CUFB, ether extract values were 0.22g 100g$^{-1}$ in CUFB and 0.53g 100g$^{-1}$ in CPFB. The crude fibre values varied from 9.17g 100g$^{-1}$ in CPFB to 12.05g 100g$^{-1}$ CF in CUFB. The crude protein values were 22.84 g 100g$^{-1}$ in CUFB and 19.98 g 100g$^{-1}$ CP in CPFB and 16.05g 100g$^{-1}$ and 23.21g 100g$^{-1}$ Nitrogen free extract (NFE) in CUFB and CPFB respectively. The gross energy values were also 12.97 MJ Kg$^{-1}$ and 12.48 MJ Kg$^{-1}$ in CUFB and CPFB respectively.

Table 2. Nutrient Composition of experimental diets fed to WAD sheep (g 100g$^{-1}$)

| Nutrients | Guinea Grass | Cassava peels | CUFB | CPFB |
|---|---|---|---|---|
| Dry matter | 94.34 | 94.54 | 77.16 | 77.19 |
| Ash | 6.57 | 6.89 | 26 | 24.3 |
| Ether extract | 3.31 | 6.9 | 0.22 | 0.53 |
| Crude protein | 10.69 | 10.94 | 22.84 | 19.98 |
| Crude fibre | 25.21 | 7.12 | 12.05 | 9.17 |
| NFE | 52.3 | 62.67 | 16.05 | 23.21 |
| G.E (MJ kg$^{-1}$) | 25.39 | 15.99 | 12.97 | 12.48 |

CUFB—*Cajanuscajan*-urea feed blocks, GE— Gross energy, CPFB—*Cajanuscajan*- poultry Manure feed blocks

### *Body weight gains:*

Table 3 shows the effect of treatments on live weight gain of West African dwarf sheep fed Cajanus-based feed blocks. The overall weight gains were 1.10±0.4kg, 2.73±0.53kg, 2.83±1.61kg, and average daily weight gain (ADG) were 13±0.14g, 34±0.01g, 35±0.02g for sheep fed control, CPFB and CUFB respectively.

Table 3. Body weight changes of West African Dwarf (WAD) sheep (kg)

| Parameters | Control | CPMNB | CUMNB |
|---|---|---|---|
| Initial weight | 11.30±1.53 | 11.40±2.08 | 11.50±1.53 |
| Final weight | 12.20±1.21$^{b}$ | 13.95±1.93$^{a}$ | 14.13±0.72$^{a}$ |
| Overall weight gain | 1.10±0.41$^{b}$ | 2.73±0.53$^{a}$ | 2.83±1.61$^{a}$ |
| Av daily weight gain (g) | 13±0.14$^{b}$ | 34±0.01$^{a}$ | 35±0.02$^{a}$ |

a,b, values with differing superscripts in the same row differs significantly (P<0.05)

### *Linear body measurements:*

Table 4 shows the effect of Cajanus- based feed blocks on the linear body measurements of West African Dwarf Sheep. The body length gains were 0.96±0.53cm, 1.56±1.9cm, 2.53±0.37cm for control, CPFB, CUFB respectively. The heart girth gains were 1.86±2.20cm, 3.54±1.46cm, 3.55±0.76cm, height at wither gain were 0.56±0.48cm, 2.07±2.05, 1.24±0.83cm while Scrotal circumference gains were 0.31±0.64cm, 1.30±0.32cm, 1.07±0.77cm for sheep fed control, CPFB, and CUFB respectively.

Table 4. Linear body measurements of West African Dwarf sheep (cm)

| Parameters | Control | CPMNB | CUMNB |
|---|---|---|---|
| Body length gain | 0.96±0.53$^{c}$ | 1.56±1.19$^{b}$ | 2.53±0.37$^{a}$ |
| Height at wither gain | 0.56±0.48$^{c}$ | 2.07±2.05$^{a}$ | 1.24±0.83$^{b}$ |
| Heart girth gain | 1.86±2.20$^{b}$ | 3.54±1.46$^{a}$ | 3.55±0.79$^{a}$ |
| Scrotal circumference gain | 0.31±0.64$^{b}$ | 1.30±0.32$^{a}$ | 1.70±0.77$^{a}$ |

a,b,c, values with differing superscripts in the same row differs significantly (P<0.05)

### *Physiological parameters:*

Table 5 shows the mean respiratory rate of West African Dwarf sheep fed the experimental diets. The mean respiratory rate values at 0730h and 1730h were higher in the animals fed control diet (34.63±4.66 and 34.23±4.48) than in the supplemental feed blocks (26.40±2.87 and 24.90±3.69 for CUFB and 31.03±0.61 and 31.10±0.52 for CPFB). The respiratory rate of animals in the control diet was significantly higher than their counterparts in CUFB and CPFB (P<0.05).

Table 6 shows the mean pulse rate of West African Dwarf sheep fed the experimental diets. At 0730h, the control had the highest value of 74.25±4.17, followed by CPFB, 67.18±3.19 and the least value was in CUFB, 67.00±3.27. At 0730h, the pulse rate of animals in control group was significant difference (P<0.05) from pulse rates of animals fed supplemental CUFB, and CPFB. At 1730h, there was no significant difference in treatment means (P>0.05).

Table 7 shows the rectal temperature of WAD sheep fed the experimental diets. At 0730h, the temperature was lowest in CUFB (37.78±0.82) and highest in the control (38.88±0.29). At 1730h the temperature was lowest in CUFB (37.28±0.56) and highest in the control (38.88±0.29). At 0730h, there was significant difference in the rectal temperature of the control and CUFB but no significant difference in the control and CPFB (P>0.05). At 1730h the rectal temperatures were not significantly different (P>0.05).

Table 5. Mean respiratory rate of West African dwarf sheep fed experimental feed blocks.

| Time | Control | CUFB | CPFB |
|---|---|---|---|
| Morning | 34.63±4.66[a] | 26.40±2.87 [b] | 31.03±0.61 [ab] |
| Evening | 34.23±4.48 [a] | 24.90±3.69 [b] | 31.10±0.52 [a] |

a, b values with different superscripts in the same row differ significantly (P<0.05)

Table 6. Mean pulse rate of West African dwarf sheep fed experimental feed blocks

| Time | Control | CUFB | CPFB |
|---|---|---|---|
| Morning | 74.25±4.17[a] | 67.00±3.27 [b] | 67.18±3.19[b] |
| Evening | 74.78±0.63 [a] | 73.10±4.72 [a] | 73.35±3.39 [a] |

a, b values with different superscripts in the same row differ significantly (P<0.05)

Table 7. Mean rectal temperature of West Africa dwarf sheep fed experimental feed blocks ($^oC$)

| Time | Control | CUMNB | CPMNB |
|---|---|---|---|
| Morning | 38.88±0.29[a] | 37.78±0.82 [b] | 38.38±0.21[bc] |
| Evening | 38.88±0.09[a] | 37.28±0.56 [b] | 38.35±0.13 [a] |

a, b,c values with different superscripts in the same row differ significantly (P<0.05)

*Haematological parameters:*

Table 8 presents the haematological parameters of West African Dwarf sheep fed Panicum-cassava peels ration supplemented with Cajanus- based feed blocks. The packed cell volume (PCV) of sheep fed supplemental feed blocks ranged from 20.75 in control to 23.75 in CPFB. The red blood cell was highest (567.50) in sheep fed CPFB and lowest in sheep fed control diet (222.35) and the sheep fed CUFB had 460.85. The white blood varied from 99.75 in sheep fed control diet to166.65 in sheep fed CPFB. The haemoglobin counts were 6.95, 7.95, 7.90 for control, CPFB and CUFB respectively. The erythrocyte sedimentation rate values were 1.90, 3.85 and 2.75 for sheep fed control, CPFB and CUFB respectively. The lymphocyte values varied from 56.70 in control diet to 61.35 in supplemental CPFB while the neutrophil varied from 29.65 in control to 60.40 in CUFB. The monocytes was highest (6.60) in sheep fed supplemental CPFB and lowest (5.35) in sheep fed control diet and was 5.75 for sheep fed supplemental CUFB. The eosinophils value was highest in CUFB (3.00) and the least value recorded in the control diet (1.60). The basinophil values varied from 0.90 in control to 1.40 in CPFB while the mean corpuscular haemoglobin concentration (MCHC) were 33.32, 33.40 and 33.50 for sheep fed control diet, supplemental CPFB and CUFB. The mean corpuscular haemoglobin and mean corpuscular volume were highest in CPFB with values 3.22, 0.94 and lowest in the control treatment with values 1.90 and 0.55 respectively.

Table 8. Haematological indices of WAD sheep fed experimental feed blocks

| Haematological indices | control | CPFB | CUFB |
|---|---|---|---|
| Packed cell volume | 20.75 | 23.75 | 23.60 |
| Red blood cell | 222.35 | 567.50 | 460.85 |
| White blood cell | 99.75 | 166.65 | 201.50 |
| Haemoglobin count | 6.95 | 7.95 | 7.90 |
| Erythroocyte sedimentation rate | 1.90 | 3.85 | 2.75 |
| Lymphocyte | 56.70 | 61.35 | 60.40 |
| Neutrophils | 29.65 | 33.10 | 60.40 |
| Monocytes | 5.35 | 6.60 | 5.75 |
| Eosinophils | 1.60 | 2.25 | 3.00 |
| Basinophils | 0.90 | 1.40 | 1.35 |
| MCHC | 33.32 | 33.40 | 33.50 |
| MCH | 1.90 | 3.22 | 2.05 |
| MCV | 0.55 | 0.94 | 0.55 |

*Digestibility studies:*

Table 9 shows the energy values as contributed by protein, crude fat and soluble carbohydrates in the *Cajanus*-based feed blocks. The proportion of total energy due to protein (PEP) varied from 58.01% in CUFB to 45.06% in CPFB, the proportion of the total energy due to crude fat (PEF) were 1.22% in CUFB and 2.60% in CPFB and the proportion of total energy due to soluble carbohydrates (PEC) were 40.77% in CUFB and 52.34% in CPFB. The utilizable energy due to protein (UEDP) were 401.60 and 452.33 in CUFB and CPFB respectively.

Table 10 shows the effect of treatments on the digestibility coefficient values of West African Dwarf Sheep fed *Cajanus*-based feed blocks. The dry matter (DM) value was highest in supplemental CPFB (85.09%), followed by supplemental CUFB (84.94%) and the control treatment (76.82%). The Ash values were 72.03% for CPFB, 68.93% for CUFB and 55.28% for the control. The Ether extract (EE) value was highest in CPFB (59.50%), followed by CUFB (53.79%) and the least value was in control (52.50%). The crude fibre (CF) values were 91.81% in CPFB, 89.07% in CUFB and 80.05% for the control. However, the crude protein value was highest in supplemental CUFB (81.63%), followed by CPFB (79.48%) and the control treatment had 74.71%. The Nitrogen free extract (NFE) value was highest in CPFB (91.95%), followed by CUFB (91.03%) and the control treatment was 88.13%.

Table 11 shows the percent digestible nutrient values of the feeds. The dry matter values of CUFB and CPFB were approximately the same (49.65%) while the DM of the control was 48.51%. The Ash values were 7.36% for CUFB, 7.05% for CPFB and 3.25% for the control. The Ether extract (EE) value was highest for the control (2.68%), followed by CPFB (2.00%) and CUFB (1.95%). The crude fibre (CF) value was also highest in the control (8.47%) and lowest in CPFB (7.74%). The crude protein

(CP) value was highest in CUFB (8.30%) and lowest in the control (5.67%). The Nitrogen free extract (NFE) values were 30.14%, 25.79% and 24.45% for the control, CPFB and CUFB respectively.

Table 9. Energy Values as Contributed by Protein, Soluble Carbohydrate and Crude Fat.

| Parameter | CUMNB | CPMNB |
|---|---|---|
| Total energy | 669.34 | 753.88 |
| [a]Proportion of total energy due to protein (%) | 58.01 | 45.06 |
| [b]Proportion of total energy due to fat (%) | 1.22 | 2.6 |
| [c]Proportion of total energy due to carbohydrate (%) | 40.77 | 52.34 |
| [d]Utilizable energy due to protein (%) | 401.6 | 452.33 |

[a]PEP; [b]PEF; [c]PEC; [d]UEDP
UEDP= 60% of Total Energy

Table 10.Digestibility Coefficient of West African Dwarf Sheep (%)

| Nutrients | Control | CUFB | CPFB |
|---|---|---|---|
| Dry Matter | 76.82[b] | 84.94[a] | 85.06[a] |
| Ash | 55.28[c] | 68.93[b] | 72.03[a] |
| Ether Extract | 52.50[b] | 53.79[b] | 59.50[a] |
| Crude protein | 74.71[c] | 81.63[a] | 79.48[b] |
| Crude Fibre | 80.05[b] | 89.07[a] | 91.81[a] |
| Nitrogen Free Extract | 88.13[b] | 91.03[a] | 91.95[a] |

a, b,c values with different superscripts in the same row differ significantly (P<0.05)

Table 11.Percent Digestible Nutrients of West African Dwarf Sheep

| Nutrients | Control | CUMNB | CPMNB |
|---|---|---|---|
| Dry Matter | 48.52 | 49.65 | 49.65 |
| Ash | 3.52[b] | 7.36[a] | 7.05[a] |
| Ether Extract | 2.68 | 1.95 | 2 |
| Crude protein | 5.67[b] | 8.30[a] | 7.77[a] |
| Crude Fibre | 8.47 | 8.28 | 7.74 |
| Nitrogen Free Extract | 30.14[a] | 24.45[b] | 25.79[b] |

a, b, values with different superscripts in the same row differ significantly (P<0.05)

## 4. Discussion

The values obtained for the proximate analysis of guinea grass did not conform to the values obtained by Umunna (1982) for wilted *Panicum maximum.* In his study, the values obtained were 16.14g $100g^{-1}$ crude protein, 35.2g $100g^{-1}$ crude fibre, 7.24g $100g^{-1}$ Ash and 5.32g $100g^{-1}$ Ether extract whereas the values obtained in this study were 10.69g $100g^{-1}$ crude protein, 25.21g $100g^{-1}$ crude fibre 6.57g $100g^{-1}$ Ash and 3.31g $100g^{-1}$ Ether extract.

The DM value of 94.54g $100g^{-1}$ for cassava peels in this study was slightly above the range of 86.50g to 94.50g reported by Adegbola and Asaolu (1986). The crude fibre values of 7.12g $100g^{-1}$ was lower or does not fall within the range of 10-31g $100g^{-1}$ crude fibre reported by Devendra (1997) and Adegbola and Asaolu (1986). The Ash value of 6.89g $100g^{-1}$ was higher than 3.93g $100g^{-1}$ ash value reported by Oyenuga (1973). The crude protein value of 10.94g $100g^{-1}$ was higher than the value obtained by Oyenuga (1973). The differences obtained in these values compared to those of other researchers may be due to the stage at which the plant was harvested and the processing methods adopted.

The proximate composition of the feed blocks shows that the CUFB had the highest crude protein (CP) value of 22.84g $100g^{-1}$ compared to 19.98g $100g^{-1}$ CP obtained in CPFB. This may be due to the presence of urea which contains about 46% Nitrogen.

From the results above, it was observed that the physiological parameters examined had higher values in the animals fed the control diet only than the animals supplemented with the experimental feed blocks. This indicates that the WAD sheep fed the experimental feed blocks were not as thermally stressed as the animals fed the control diet. Also the respiratory and pulse rates of the animals fed the experimental feed blocks were better than those fed the control diets only. The animals fed the experimental feed blocks were physiologically stable than those fed the basal diets.

The nutrient utilization was also better in the animals supplemented with the experimental feed blocks. This study shows that the sheep fed *Cajanuscajan* Urea- based feed blocks and *Cajanuscajan* poultry manure- based feed blocks had better performance than those fed control diet of Panicum-cassava peels ration only. This study shed light on the fact that feed blocks made from Non-protein nitrogen such as urea, poultry manure and agro-allied by-products can be used as a supplement for improving the productivity of sheep which are dependent on low quality roughage as their main diet(GeorgeKunju, 1986; Sanso-ucy*et al.*,1988; Leng*et al.*, 1991; Hadjipannayiotou*et al.*,1993b). This study further demonstrates the advantages of using the feed blocks as a supplement to increase growth rates of sheep under confinement management system. The improvement in the weight gain among sheep fed supplemental feed blocks may be due to the fact that, non-protein-nitrogen (Urea and poultry manure) were properly hydrolysed in the rumen (Habib *et al.*, 1991). More so, *Cajanuscajan* is 25% crude protein and has a good balance of all amino acids except methionine and cystine (Faris*et al.*, 1987). Thus sheep fed supplemental feed blocks had better growth performance than sheep fed Panicum-Cassava peel only.

The morphostructural parameters such as heart girth gain, height at wither gain, body length gain, scrotal circumference gain of sheep fed Panicum-cassava peels ration supplemented with fed blocks were higher than those sheep fed Panicum-cassava peels only. The results of this study is in line with other studies reported that feed blocks improved heart girth, height at wither, body weight and body length of sheep on low quality forages as their main diet ( Habib *et al*., 1991; Hendratno*et al*., 1991; Hadjipanayiotou*et al*., 1993b)

Sheep fed supplemental feed blocks had higher values of haematological parameters than sheep fed Panicum-cassava peel ration only. This study shows that the blood indices were improved. Thus the health status of animals fed *Cajanuscajan*-based feed blocks was better than animals fed Panicum-cassava peels ration only.

## 5. Conclusion

This study illustrates that sheep fed experimental feed blocks had better growth performance and health status than those fed control diet of Panicum-cassava peels only. It means that the supplemental feed blocks contain essential nutrients which will be needed by the sheep during extended dry season when the Panicum-cassava peel ration will be scarce and low in quality.

Generally, this study therefore revealed that West African sheep raised in confinement system of management could benefit from Cajanuscajan-based feed blocks when given to them as supplement.

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