Available online at www.elixirpublishers.com (Elixir International Journal)

Applied Zoology

Elixir Appl. Zoology 66 (2014) 20258-20263

ISSN: 2229-712X

Nutrient Digestibility and Haematological Indices of West African Dwarf Goats Fed Cnidosculus Aconitifolius Multinutrient Blocks As Supplement

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ARTICLE INFO

Article history:

Received: 7 May 2013;

Received in revised form:

19 December 2013;

Accepted: 28 December 2013;

Keywords

Haematology,

Digestibility,

Indices,

Nutrient,

Supplements.

ABSTRACT

The study involves twenty-four (12) yearling West African Dwarf Goats. The goats were assigned randomly to three treatments viz: Cnidoscolus-Poultry Manure-Multinutrient Blocks (CPMNB), Cnidoscolus-Urea-Multinutrient Blocks (CUMNB) and control consisting of Panicum maximum and cassava peels. Each treatment consists of eight goats as replicates. They were adequately fed and provided with fresh and clean water. The hematological parameters and nutrient digestibility as influenced by the three treatments were evaluated. The Packed Cell Volume (PCV) value for goats fed the experimental multinutrient blocks ranged from 25.25 ± 1.25% in CUMNB to 20.25 ± 2.25% in CPMNB and that of the control diet was 19.90 ± 1.59%. The red blood cell varied from 545 ± 116.0x10^6 mm^{-1} in CUMNB to 335 ± 64.0 x 10^6 mm^{-1} in CPMNB with control having the value 222.58 ±25.61 x$10^6$$mm^{-1}$. The White Blood Cell (WBC) was highest in CUMNB (263.5 ± 1.65 x 10^3 mm^{-1}), followed by CPMNB (151.5 ± 10.8 x10^3 mm-^{1}) while the least value was recorded in the goat fed control diet (137.9 ± 2. 75 x$10^3$$mm^{-1}$). The haemoglobin concentration (HBC) was lowest in goats fed the control diet (5.92 ± 0.18g 100 mm^{-1}). The Monocytes (%) value for CUMNB was the highest (6.4 ± 0.6), followed by CPMNB (5.0 ± 0.00) and the control treatment has the least value (4.90 ± 0.42) The Eosinophils (%) values varied from 2.0 ± 0.25 in CUMNB to 1.83 ± 0.17 in control treatment. The goats fed control diet showed the least values for the haemological variables. The percent digestible nutrient and coefficient of digestibility in the feed showed that goats fed supplemental Cnidoscolus-based multinutrient blocks had better nutrient utilization. Thus better rumen digestion and haematological performance than goats fed diet of Panicum- cassava peels ration.

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Introduction

Goats have been hampered over the years primarily by the non-availability of good quality and quantity of feed (Onwuka, 1999). This is so for ruminant animals during dry season months when little forage available is low in quantity causing occasional weight losses, low birth weight, lowered resistance diseases and reduced animal performance (Onwuka *et al*., 1992).

Furthermore, the limited supply of raw materials for the livestock feed industry has resulted in a continuous increase in the cost of production, causing phenomenal rise in the unit cost of production of livestock (Onwuka *et al*., 1992). The shortage of good quality feed needed to sustain livestock growth especially during dry season months has been a perennial problem which can be reduced or eliminated by finding alternative source of protein and energy concentrate mixture given to animal.

In many under developed countries, malnutrition has been identified as the single most important public health problem (Adeyeye and Afolabi, 2004). The nutritional requirement of the human body reflects the nutritional intake necessary to maintain optimum body function to meet the body's daily energy needs (F.A.O, 1999). Malnutrition which is defined as inadequate nutrition is been interpreted as under – nutrition or over-nutrition. The etiology of malnutrition includes factors such as poor food availability in good quality and quantity and preparation, recurrent infections etc. Consequently, the indices of nutritional disease and malnutrition are on the increase (F.A.O., 1999). The recommended total protein intake for normal growth and development in human is 85.99g per person per day, out of which approximately 39g should be from animal origin but an average Nigerian consumes about 33g (Adegbola 2002). This therefore calls for an increase in livestock production in order to improve the nutritional status of Nigerians through provision of high quality animal products such as meat, milk and eggs.

This therefore calls for a reasonable level of feed supplementation in small ruminant e.g. goats with particular emphasis on the energy, protein and minerals. Multinutrient blocks which is an alternative feed resource has been advocated as a panacea to protein and energy deficiencies in ruminant especially during dry season (Aye, 2005; Aye 2012), Multinutrient block provides primarily the needs of the rumen micro organism, it is a rich source of fermentable nitrogen, minerals, vitamins, amino acids and peptide.

Mulnutrient blocks can be made from farm wastes such as *Cnidoscolus aconitifolious* leave residues, molasses, urea, cement and salt (Hassoun and Ba, 1991). Molasses and urea, which are components of multinutrient blocks, are known to respectively contain available energy and nitrogen and are used in feeding ruminant (Preston and Leng, 1990). Pickstock (1985)reported that in times of drought, when energy and protein reserves of animals fall to dangerously low levels, molasses – urea mixtures fed in amount of up to 2kg a day, helped to satisfy both energy and protein needs for

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maintenance of ruminant. These will upgrade the energy and ammonia levels in the ruminant's rumen (Mancini *et al*., 1997).

The significance of determining hematological and biochemical indices of domestic animals has been well documented (Tambuwal *et al*., 2002; Orheruata and Aikhuomobhogbe, 2006). There is a great variation in the hematological and biochemical parameters as observed between breeds of goats (Meyer and Harvey, 1998). Normal blood values are defined as those of clinically healthy animals which are kept under normal housing conditions and fed balance ration. Meyer and Harvey (1998) noted that the ingestion of numerous dietary components have measurable effect on blood constituent.

This study is designed to evaluate nutrient utilization and hematological parameters of West African Dwarf goats fed *Cnidoscoous aconitifolious* – based multinutrient blocks.

Materials and Methods

Study Area: The experiment was carried out at the Small Ruminant unit of Teaching and Research Farms of the Ekiti State University, Ado Ekiti, Ekiti State.

The pens used were cleaned and disinfected with germicide, cleaning of feeder and water troughs were carried out before the arrival of the animals.

Procurement of the West African Dwarf (WAD) Goats: Twenty-four yearling WAD goats were purchased from the Otun market in Ekiti State of Nigeria. They were quarantined for 4 weeks during which routine treatment develop at NAPRI (1984) and modified by Aye (1998) was applied.

Experimental layout and Animal management: The pen was partitioned into twenty-four equi-dimensional unit with plants. The goats were weighed into their experimental units, efforts were made to ensure that all the treatments were balanced in body weight. The design of the experiment was a completely randomized designed. The animals were randomly assigned to three treatments and each treatment has four goats as replicates. The goats were fed basal diet consist of cassava peels and *Panicum maximum* and experimental multinutrient blocks.

The treatments were as follows;

Treatment 1- *Panicum maximum* + Cassava peels supplemented with *Cnidoscolus*–Poultry manure – based multi-nutrient blocks (CPMNB)

Treatment 2 - *Panicum maximum* + Cassava peels supplemented with *Cnidoscolus*-Urea-based multi-nutrient blocks (CUMNB).

Treatment 3 - *Panicum maximum* +Cassava peels only

Fresh cassava peels were obtained from gari-processing factory in Iworoko-Ekiti, the fresh cassava peels were sun-dried for about 5-7 days depending on weather condition.

Guinea grass was harvested 1m from the base of the plant with sickle. The stems and leaves were still succulent and had not lignified. It was chopped into small pieces with a cutlass so as to prevent wastage by the animals; the grass was wilted for about 2 days to prevent scouring in animals.

Leaves of *Cnidoscolus aconitifolius* were harvested in fresh condition from various locations in Ekiti State (Iworoko-Ekiti and Emure-Ekiti) and Ondo State (Akure).

The harvested leaves were pulped with leaf pulping machine, followed by processing with a screw-press as described by Fellow (1987) and modified by Aye (2007). The fibrous residues were thereafter separated from the leaf juice by filtering through Muslin cloth followed by pressing with screw press as described for gari making (Aletor, 1993). The fibrous residues were then pulverized and spread in the sun to dry. The dried fibrous residues were ground with laboratory hammer mill and kept in airtight container prior to its use.

Preparation of Multinutrient Blocks :Two multinutrient blocks were produced as described by Aye (2012).The components were thoroughly mixed manually, cement was first mixed with water at the rate of (50/100) (w/w). *Cnidoscolus* residues, molasses, urea or poultry manure, salt was added in that order and the cement was added last. The mixture was poured into a cellophane-lined plastic mould. The cellophane paper was used to facilitate the removal of multinutrient blocks when formed. The molded multinutrient blocks were air dried under shade for about 7 days.

Feeding Trial: The feeding trial lasted for 12 weeks, when animals were fed on basal diets containing cassava peels and *Panicum maximum* supplemented with *Cnidoscolus*-based multi-nutrient blocks. The goats were adapted for 10 days to the experimental diets before actual data collection commenced. Measurements of haematological indices were done at the start and fortnightly.

Blood Collection: Blood was collected from the jugular vein of the goats at the start and fortnightly for analysis of blood indices. The blood was collected into a vial containing Ethylenediaminetetral acetic acid (EDTA), which prevents coagulation by complexing Ca^{2+}. The vials were immediately capped and content rocked gently for about a minute by repeated inversion.

Packed Cell Volume (Haematocrit): Packed cell volume (PCV) was determined by spinning about 7µ1 of each blood sample in heparinised capillary tubes in a haematocrit centrifuge for about 5 minutes. The PCV was then read on haemotocrit readers as described by Benson *et al*. (1989) and Jain (1993).

Erythrocyte (Red blood count): Red blood count was determined using haemocytometer method as described by Lamb (1981). The blood sample collected in each replicate was diluted at a ratio of 1:200 and RBC were obtained using the pre-relationship Red Blood Cell/µL=Number of cell counted X 5X 200.

Haemoglobin estimation : The haemoglobin content in the blood of each goat was estimated using Cyanomethaemoglobin method. 0.02ml of blood from each goat was expelled into 4ml Drabkins solution. The mixture was allowed to stand for 5 minutes for full colour development. Also, standard hemoglobin was prepared by diluting blood of known haemoglobin concentration as in the test sample. The test samples and standard were read on the colourimeter at 624 manometers using green filter.

Samples haemoglobin concentration was obtained using this relationship sample haemoglobin

$$= \frac{\text{Reading of test}}{\text{Reading of Standard}} \times \text{Standard Haemoglobin Conc. (g/100ml)}$$

Haemoglobin indices also measured were erythrocyte sedimentation rate (ESR) Lymphocytes, Neutrophils, Monocytes, Eosinphils and Basophils.

Nutrient Utilization: This was carried out by transferring goats into wooden metabolic cage fitted with facilities to separately collect urine and faeces. Each goat was allocated individual metabolic cage for 14 days. The quantity of feed offered, feed refusal, faeces and urine were determined for 7 days after 7 days of adjustment to the cages.

Collection of Urine 20cm^3 of 10% concentrated H_2SO_4 was added to each bowl, which was used to collect the urine of animals to prevent Nitrogen loss, bacteria growth infestation. The volume of urine was measured and recorded daily each morning. 10% of the urine collected from each animal was poured into a well-labeled urine collection bottle and stored in a refrigerator prior to laboratory analysis.

Collection of Faeces The faeces were collected from individual animal. 10% of the feaces collected daily over the 7-day period were bulked and weighed and used for moisture determination. The remaining feaces were oven dried at 70^0C for 36 hours, milled and stored in air tight bottles.

Analytical Procedures: Samples of feeds and faeces were ground in a hammer mill to pass a 1mm mesh sieve for their proximate compositions according to the procedure described by AOAC (2005). Nitrogen contents of feed, faeces and urine were determined by the micro-kjeldahl technique using the Markham's distillation apparatus. Results obtained were used for the calculation of digestibility of nutrients and Nitrogen balance for the experimental animals. Gross energy of feed was measured by bomb calorimetry using benzoic acid as a standard (26437j/g).

Statistical Analysis: Data obtained were subjected to one-way analysis of variance using ANOVA procedure of Minitab Statistical Package (Minitab USA) version 10.2. Means were separated using Duncan's Multiple Range Test (Duncan, 1955).

Results And Discussion

Diet Composition

Table 1 shows the proximate analysis of the *Cnidoscolus* residue, cassava peels, guinea grass and multinutrient blocks.

The *Cnidoscolus* residue contained 94.54 $\pm$ 0.02g 100g^{-1} dry matter (DM), 15.54 $\pm$ 0.01g 100g^{-1} Ash, 12.85 $\pm$ 0.01g 100g^{-1} Ether extract (EE), 7.54 $\pm$ 0.01g 100g^{-1} Crude Fibre (CF), 25.77± 1.14g 100g^{-1} Crude Protein(CP), 32.93 $\pm$ 1.15g 100g^{-1} Nitrogen Free Extract (NFE) and 14.71MJ kg^{-1} Gross Energy (GE) while cassava peels contained 94.54 $\pm$ 0.01g 100g^{-1} dry matter (DM), 6.89 $\pm$ 0.01g 100g^{-1} Ash, 6.90$\pm$ 0.37g 100g^{-1} Ether extract (EE), 7.12$\pm$ 0.01g 100g^{-1} Crude Fibre (CF), 10.94$\pm$0.01g 100g^{-1} Crude Protein (CP), 62.67$\pm$ 0.41g100g^{-1}Nitrogen Free Extract (NFE) and 15.59MJ kg^{-1} Gross Energy (GE).

The *Panicum maximum* contained 91.47$\pm$ 0.01g 100g^{-1} Dry Matter (DM), 7.21 $\pm$ 0.01g 100g^{-1} Ash, 5.32 $\pm$ 0.01g 100g^{-1} Ether extract (EE), 35.21± 0.03g 100g^{-1} Crude fibre, 16.14±0.45g 100g^{-1} Crude protein, 36.09$\pm$0.20g 100g^{-1} Nitrogen Free Extract and 12.00MJ kg^{-1} Gross Energy (GE).

The proximate composition of the experimental feed blocks were 69.93g 100g^{-1} and 67.15g 100g^{-1} dry matter (DM) in *Cnidoscolus* poultry manure Multinutrient block (CPMNB) and *Cnidoscolus* urea multinutrient block (CUMNB) respectively , 23.24 g 100g^{-1} Ash in CPMNB and 22.81g 100g^{-1} in CUMNB, 0.72 and 0.10g 100g^{-1} Ether Extract (EE) in CPMNB and CUMNB respectively, Crude fibre were 5.51 and 3.51g 100g^{-1} in CPMNB and CUMNB, Crude protein varied from 31.7g 100g^{-1} in CPMNB to 34.83g 100g^{-1} in CUMNB, Nitrogen free extract ranged from 35.73g 100g^{-1} in CUMNB to 38.56 g100g^{-1} in CPMNB and Gross Energy were 15.74 and 16.33 MJ kg^{-1} in CUMNB and CPMNB respectively.

Table 2 shows the energy values as contributed by protein, fat and carbohydrate in the *Cnidoscolus*-based multinutrient blocks. The proportion of total energy due to protein (PEP) ranged from 70.72% in CPMNB to 90.33% in CUMNB. Proportion of total energy due to fat varied from 0.51% in CUMNB to 3.47% in CPMNB. Proportion of total energy due to carbohydrate (PEC) varied from 9.10% in CUMNB to 25.81% in CPMNB. Utilizable energy due to protein is higher in CPMNB (461.11) than CUMNB (437.05)

Table 3 presents the haematological parameters as influenced by the three treatments.

The packed cell volume (PCV) value for goats fed the experimental multinutrient blocks ranged from 20.25±2.25% in CPMNB to 25.25±1.25% in CUMNB compared to PCV value of 19.90$\pm$1.59% in the control diet. The red blood cell varied from 8.45±1.16X10^{6}mm^{-1} in CUMNB to 9.35±0.40X10^{6}mm^{-1} in CPMNB with control treatment having the value 6.22±0.67X10^{6}mm^{-1}. The white blood cell (WBC) was highest in the control treatment (13.9$\pm$1.05X10^{3}mm^{-1}), followed by CPMNB (11.5$\pm$1.08X10^{3}mm^{-1}) while the least value was recorded in the goats fed CUMNB (10.5$\pm$1.05X10^{3}mm^{-1}). The haemoglobin concentration (HBC) was lowest in goats fed the control diet (5.92$\pm$0.18g 100mm^{-1}), and the highest value recorded was in goats fed CUMNB (8.8$\pm$0.89g 100mm^{-1}). The Erythrocyte sedimentation rate (mm/hr) varied between 1.33$\pm$0.34 in goats fed the control diet and 3.41±0.1 in goats fed supplemental CPMNB. The mean corpuscular volume (MCV) µm-3 was highest in goats fed supplement of CUMNB (28.9$\pm$0.08) and lowest in goat fed the control diet (24.6$\pm$0.6). The mean corpuscular Haemoglobin (MCH) (pg) was highest in goats fed supplemental CUMNB (2.66 $\pm$ 0.15) and lowest in goat fed the control diet (1.6 $\pm$ 0.55). The lymphocyte values were 63.0 $\pm$ 2.0%, 65.66 $\pm$ 1.34% and 60.25 $\pm$ 1.25% for CPMNB, CUMNB and control treatment respectively. Neutrophils (%) value for CUMNB was 29.25 $\pm$ 3.25, CPMNB was 28.25 $\pm$ 2.67 and that of the control treatment was 25.25 $\pm$ 1.75. The Monocytes (%) value for CUMNB was the highest (6.41 $\pm$ 0.6), followed by CPMNB (6.01 $\pm$ 0.00) and the control treatment has the least value (4.90 $\pm$ 0.42).

The Eosinophils and Basophils (%) values of the multinutrient blocks and control treatments were not significantly different ($P<0.05$).

The goats fed control diet showed the least values for the haematological variables. Thus the blood profiles of the goats were influenced by the dietary treatments.

Table 4 presents the digestibility coefficient of nutrients of West African Dwarf (WAD) goats fed Panicum-Cassava peels ration supplemented with or without *Cnidoscolus aconitifolius* – based multinutrient blocks

Variation observed among the treatments reveal that all the nutrients measured were significantly ($P<0.05$) influenced by the treatments. The coefficient of digestibility of dry matter (68.66%), crude protein (70.58%), crude fibre (76.46%), ether extract (52.78%) and nitrogen free extract (71.99%) of the goats on the control ration were consistently lower($P<0.05$) than those fed the Cnidoscolus – based multinutrient blocks supplemented rations (85.09-85.36% DM), (75.17-82.41% CP), (91.67-92.21% CF), (53.25-60.20% EE) and (91.88-92.87% NFE). Within the multinutrient blocks supplemented rations goats on CPMNB had higher coefficient of digestibility of all nutrients determined.

Table 5 presents the percent of digestible nutrients in the feed. The dry matter (DM) values was highest in CUMNB (42.24%), followed by CPMNB (42.05%) and the control treatment had the least value (33.99%). The Ether extract values were 1.25%, 1.41% and 1.07% for CPMNB, CUMNB and control treatment respectively. The % digestible crude fibre (CF) values was highest in CUMNB (6.72%), followed by CPMNB (6.32%) and the least value was obtained in control treatment (6.18%). The crude protein (CP) values were 4.26%, 7.73% and 4.21% for CPMNB, CUMNB and control treatment respectively. The Nitrogen Free Extract (NFE) values varied from 21.9 in control treatment to 27.34 in CPMNB. The % digestible crude protein, crude fibre, ether extract and nitrogen free extracts of the goats on the control ration were significantly (P<0.05) lower than those fed on multinutrient blocks supplemented rations. Within the feed blocks supplemented rations, goats on CUMNB had higher % digestible crude protein, dry matter, ether extract and crude fibre than those on supplemental CPMNB. Goats on CPMNB had higher % digestible nitrogen free extract.

Discussion

The proximate composition of *Panicum maximum* obtained in this study was at variance with the result obtained by Ogunsola (2005). The value recorded for crude protein was 6.72g100g-1, which is lower than 16.14g $100g^{-1}$ obtained in this study. Also the Ash and Ether extract values obtained in this study were at variance with the result reported by Ogunsola (2005). However, crude fibre value obtained in this study agreed with what has been reported in literature (Ogunsola ,2005; Aye, 2007).

The cassava peels used this study has dry matter value of $94.54g100g^{-1}$ which is within the range of 86.5g $100g^{-1}$ to 94.54g $100g^{-1}$ as reported by Adegbola (1980), Aye and Adegun(2010). The Ash content of 6.89g $100g^{-1}$ was higher in compares to the value $5.95g100g^{-1}$ obtained by Adegun *et al*. (2011). The crude protein value of $10.94g100g^{-1}$ was higher than the value of $5.30g100g^{-1}$ reported in literature (Adegun *et al*.,2011). The value of crude fibre $10.94g100g^{-1}$ fell within the range of 10 - $31g100g^{-1}$ reported in literature (Devendra, 1977; Adegbola, 2002; Adegun et al., 2011).

The differences in these values obtained from this study with those of other workers might be due to the stage harvesting of the plant and processing methods adopted.

Cnidoscolus-urea multinutrient blocks had higher crude protein value of $34.83g100g^{-1}$ compared to *Cnidoscolus*-poultry manure multinutrient block and this may be due to the presence of urea with a very high content of nitrogen.

Report from literature showed blood indices are important for the assessment of the nutritive component of a given ration (Aletor and Egberongbe, 1992; Agbede and Aletor, 2003).

The white blood cell (WBC) was significantly higher (P<0.05) in the control group than in animals fed the MNBs, but all the other haematological indices were significantly (P<0.05) higher with supplemental diets. WBC obtained in animals fed supplemental MNBs were within normal range of $4.0\text{-}12.0X10^3$ mm^{-1} for goats (Byanet *et al*., 2008). The neutrophil counts, PCV, RBC and other calculated haematological values were within normal range for goats (Jain, 1993; Ikhimoya and Imasuen, 2007). It has been reported that haematological indices give insight into the production potential and help to monitor and evaluate incidence of diseases in animals (Karesh and Cook, 1985; Orheruata and Aikhuomobhogbe, 2006).

This tends to show that the feeding of the multinutrient blocks did not have adverse effect on the health status of animals. Therefore, the inclusion of urea or poultry manure at 10% in these block packages further confirmed the earlier report of Habib *et al*. (1991) that urea at this level will not pose any health hazard on the animals.

The significant higher nutrient digestibility in goats fed *Cnidoscolus*- based multinutrient blocks as observed in this study over the control treatment group was due to the non-protein nitrogen used in the Multinutrient Blocks which appears to favour proper functioning of rumen microorganisms. This result shows that the West African Dwarf Goats fed supplemental

Conclusion

This study demonstrates that goats fed *Cnidoscolus*–Based Multinutrient Block had better performance than those fed control diet of *Panicum*-cassava peels only. This shows that the multinutrient blocks have enhanced performance of the goat by efficiently improving rumen fermentation digestion, this providing a better balance of nutrient to the animals for absorption. Further, this study clearly demonstrates that multinutrient blocks feeding is a useful strategy in overcoming dry season weight losses or rather poor performance in goats fed cut and carry fodder. The haematological studies showed that the multinutrient blocks were not detrimental to animal health and well-being and therefore could be used to supplement *Panicum*-cassava peels in goats feeding.

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Table 1. Proximate Analysis of *Cnidoscolus* Residues, Cassava peels, Gunea grass and Experimental Multinutrient Blocks

Composition	*Cnidoscolus* residues	Cassava peel	Guinea grass	CPMNB	CUMNB
Dry matter	94.54 ± 0.02	94.54 ± 0.01	91.47 ± 0.01	69.93	67.15
Ash	15.54 ± 0.001	6.89 ± 0.01	7.21 ± 0.01	23.24	22.81
Ether Extract	12.85 ± 0.01	6.90 ± 0.37	5.32 ± 0.01	0.72	0.1
Crude fibre	7.54 ± 0.01	7.12 ± 0.01	35.21 ± 0.02	5.51	3.51
Crude protein	25.77 ± 1.14	10.94 ± 0.01	16.14 ± 0.45	31.97	34.83
Nitrogen Free Extract	32.93 ± 1.15	62.67 ± 0.41	36.09 ± 0.20	38.56	35.73
Gross Energy ($MJkg^{-1}$	14.71	15.99	12.00	16.33	15.74

CPMNB – *Cnidoscolus* + Poultry Manure Multinutrient Block
CUMNB – *Cnidoscolus* + Urea Multinutrient Block
Control – *Panicum maximum* + Cassava Peel

Table 2. Energy Values as Contributed by Protein, Fat, Carbohydrate in the *Cnidoscolus*-Based Multinutrient Blocks

Parameters	CPMNB	CUMNB
Total Energy	768.52	728.42
[a]Proportion of Energy due to Protein	70.72	90.33
[b]Proportion of Energy due to Fat	3.47	0.51
[c]Proportion of Energy due to Carbohydrate	25.81	9.10
[d]Utilizable Energy due to Protein	461.11	437.05

[a]PEP, [b]PEF [c]PEC [d]UEDP
CPMNB – *Cnidoscolus* + Poultry Manure Multinutrient Block
CUMNB – *Cnidoscolus* + Urea Multinutrient Block

Table 3. Haematological Variables of West African Dwarf Goat Fed *Cnidoscolus aconitifolius* –Based Multinutrient Block

Parameters	*CPMNB*	CUMNB	Control
Packed Cell Volume (%)	20.25 ± 2.25	25.25 ± 1.25	19.90 ± 1.59
Red blood cell ($x10^6 mm^{-1}$)	9.35 ± 0.40	8.45 ± 1.16	6.22 ± 0.67
White Blood Cell ($x10^3 mm^{-1}$)	11.5 ± 1.08	10.5 ± 1.05	13.9 ± 1.05
Haemoglobin Conc. ($g\ 100mm^{-1}$)	7.1 ± 0.39	8.8 ± 0.89	5.92 ± 0.18
Erythrocyte Sedimentation Rate ($mmhr^{-1}$)	3.41 ± 0.1	3.33± 0.39	1.33 ± 0.34
Mean Corpuscular Haemoglobin Con. (%)	31.65 ± 1.64	34.85 ± 4.29	20.75 ± 3.37
Mean Corpuscular Haemoglobin (pg)	1.91 ± 0.33	2.66 ± 0.15	1.6 ± 0.55
Mean Corpuscular Volume (μm^{-3})	26.0 ± 1.14	28.9 ± 0.08	24.6 ± 0.6
Lymphocyte (%)	63.0 ± 2.0	65.66 ± 1.34	60.25 ± 1.25
Neutrophils (%)	28.66 ± 2.67	29.25 ± 3.25	25.25 ± 1.75
Monocytes (%)	6.01 ± 0.00	6.41 ± 0.6	4.90 ± 0.42
Eosinophils (%)	2.0 ± 0.00	2.0 ± 0.25	1.83 ± 0.17
Basophils (%)	1.08 ± 0.41	1.08 ± 0.09	1.0 ± 0.00

CPMNB – *Cnidoscolus* + Poultry Manure Multinutrient Block
CUMNB – *Cnidoscolus* + Urea Multinutrient Block
Control – *Panicum maximum* + Cassava Peel

Table 4. Digestibility Coefficient Values of West African Dwarf Goat Fed *Cnidoscolus aconitifolius* –Based Multinutrient Block

Nutrients	CPMNB	CUMNB	Control
Dry Matter	85.36	85.09	68.66
Ash	79.10	71.20	59.21
Ether Extract	60.20	53.25	52.78
Crude Fibre	92.21	91.67	76.46
Crude Protein	82.41	75.17	70.58
Nitrogen Free Extract	92.87	91.88	71.99

CPMNB – *Cnidoscolus* + Poultry Manure Multinutrient Block
CUMNB – *Cnidoscolus* + Urea Multinutrient Block
Control – *Panicum maximum* + Cassava Peel

Table 5. Percent Digestible Nutrient in the Feed

Nutrients	CPMNB	CUMNB	Control
Dry Matter	42.05	42.24	33.99
Ash	5.9	5.01	2.07
Ether Extract	1.25	1.41	1.07
Crude Fibre	6.32	6.72	6.18
Crude Protein	4.26	7.73	4.21
Nitrogen Free Extract	27.34	22.10	21.9

CPMNB – *Cnidoscolus* + Poultry Manure Multinutrient Block
CUMNB – *Cnidoscolus* + Urea Multinutrient Block
Control – *Panicum maximum* + Cassava Peel

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