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# Evaluation of Bye-Products of Carcass of West African Dwarf Goats Fed Diets Containing Graded Levels of Steam-Treated Cashew Nut Shell

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**Abstract:** Twenty (20) growing west African dwarf goats were confined and fed concentrate diets containing 0% (T1), 10% (T2), 15% (T3) and 20% (T4) steam-treated cashew nut shell at 100g/goat/day to determine the effect of cashew nut shell on by-products of the goats` carcass, the experiment lasted for 100days after an adjustment period of 14 days, the goats were served water ad Libitum. Fresh bamboo leaves were fed at 300g/goat/day 2 hours before the concentrate. At the end of the feeding trial three (3) goats from each treatment were slaughtered, dressed and the respective by-products to be determined were cut off, weighed and converted to percentage of slaughter weight the experimental design was a completely randomized design data obtained were subjected to one-way analysis of variance (ANOVA) and significant treatment means were separated using Least Significant Difference (LSD) option of SPSS version 16 of 2006 edition. Samples of browse species and the supplement diets were analyzed for their proximate composition using standard procedure (AOAC, 1995). Daily supplement intake and total daily dry matter intake values ranged from 4461g($T_4$)-91.54g($T_1$) and 216.75($T_4$)-258.99g($T_2$) and were significantly $p>0.05$ different. Daily forage intake values ranged from 165.07($T_1$)-176.10($T_3$) were not significantly ($p>0.05$) different. The weight for the full gut, empty gut, gut content, hooves and blood were not significantly (p, 0.05) different. However abdominal fat weight ranged from 0.17%-0.24% and showed significant ($p<0.05$)different. It was concluded that cashew nut shell up to 20% level of inclusion had no significant effect on nearly all the bye-products of west African dwarf goats. It was therefore recommended that further research should use higher levels of inclusion of cashew nut shell as well as using other species of ruminant such as sheep and cattle.

**Keywords:** Evaluation, Feed Intake, By-products, Abdominal Fat, West African Dwarf Goats, Steam-treated Cashew Nutshell

## 1. Introduction

During the dry season the natural pastures and crop residue available for ruminants after crop harvest are usually fibrous and devoid of most essential nutrients including protein, energy, minerals and vitamins which are required for increased rumen microbial fermentation and improved performance [9]. Inadequate feeding is a major setback to ruminant's livestock production Nigeria. This has often led to low milk and meal production, high mortality of young stock and low growth rate [8]. Most crop residues have generally been identified to have low nitrogen content; low intake and poor digestion. Similarly, the problems of livestock production in developing countries are becoming more critical with population explosion as well as inconsistency in government policy formulation and implementation [14]. Good quality feeds needed to sustain ruminant growth during the long dry season has been a major challenge to the industry in developing countries. [1]

The Nigerian population growth rate of 2.3 % puts a lot of pressure on the Nigerian Livestock sub sector which annual growth rate of 1.6 % glaringly trails behind the population

growth [4]. The above scenario is not appropriate for Nigeria; a country with a population of over 150 million people and with a per capita animal protein intake of 10 g/person/day as against the 35 g/person/day recommended by [5]. This leaves a clear deficit of 25 g. Intensive livestock production as well as systematic research into improved breeding and feeding techniques have been suggested by various researchers [1, 12]. The demand for animal protein is increasing as a result of increased human population and economic growth [14]. The challenge in the millennium is to sustain the livestock industry amidst food shortage so as to boost protein intake worldwide [9].

The down turn in the Nigerian economy with its attendant unemployment, calls for diversification of the revenue base of the economy, this has also encouraged the waste to wealth phenomenon, as regard the livestock industry, its means that carcass by-products that were hither to discarded can now be put to use by way of assembling them for sale, processing and value addition. Such bye- products include horns, hoofs, fat, rumen content, hair, feathers, bones, bloods etc. The above calls for proper evaluation of bye-products of carcass of livestock. The aim of this work therefore was to determine the weights of some bye-products of goat carcass fed diets containing graded levels of stem-treated cashew nut shell.

# 2. Materials and Methods

### *2.1. Experimental Site and Housing Facilities*

The feeding trial was carried out at the Sheep and Goats Unit of the Livestock Teaching and Research Farm, Department of Animal Production, Kogi State University, Anyigba (Latitude $7^0$ $15^{1,}$ and $7^0$ 29'N of the equator and Longitudes $7^0$ $11^1$ and $7^0$ $32^1$ East of the Greenwich Meridian[6]. It is located in the derived Savannah zone of Nigeria. The annual rainfall ranges between 1400mm-1500mm with about 6-7 months of rainfall. The ambient temperature ranges from 25 $^0$C to 35 $^0$C with the highest in March and April.

### *2.2. Experimental Feed Materials and Preparation*

The experimental feed materials were cashew nut shell, Bamabaranut offal, maize offal, table salt, rice offal, fish offal meal, wood ash, bone-meal and bamboo leaves. The rice offal was collected from Alaide in Benue State while the Bambara nut offal was purchased from market women in Anyigba, Kogi State. The table salt was obtained from Anyigba market. The cashew nut shell (Steam Treated for 20 minutes) was obtained from the Cashew Kernel Processing Factory, Kogi State University, Anyigba. The cashew nut shell was pounded using a mortar and pestle. All the feed ingredients were mixed together in varying proportions and ground. The bamboo leaves were harvested from Kogi State University, Campus, Anyigba.

Twenty [20] growing West African dwarf bucks with weight range of 6.15 kg to 6.30 kg and aged between 7 and 9 months, were sourced from Anyigba and its environs. They were conditioned to stability by feeding them adequately for 1 week. The animals were treated with Ivomec at 0.25 mL/goat to control both *endo* and *ecto* parasites. They were also injected with antibiotics (*Oxytetracycline hydrochloride and procaine penicillin*) at 3 mL and 2 mL per goat) to take care of scouring, nasal and ocular discharges and to provide a good health status. The animals were ear-tagged for identification and were randomly divided into 4 treatments of 5 animals each. The experiment lasted for 100days, after an adjustment period of seven [7] days. Animals in treatments $T_1$, $T_2$, $T_3$, and $T_4$ were fed with experimental diets containing 0, 10, 15 and 20 %, levels of inclusion of cashew nut shell respectively at 100 g/goat/day. The Bamboo leaves were fed at200 g/goat/day on cut and carry basis. All the animals were given water *adlibitum*. Dry matter intake was calculated from differences between absolute feed served and leftover. Weekly weight gains were taken in the morning before feeding. The following performance data were collected. Daily feed intake (supplement and forage), daily weight gain, Total weight gain and Feed conversion ratio. At the end of the feeding trial, three [3] animals were sacrificed, and the respective bye-products to be assessed were cut off weighed and converted to percentage of slaughter weight.

### *2.3. Chemical Analysis*

Samples of experimental diets, steam- treated cashew nut shell and bamboo leaves (after drying in an oven) were prepared for analysis of their proximate composition. The protein content of the samples was determined by Kjeldahl method. Ether extract, crude fibre and ash content determination were according to standard procedure [3]. The nitrogen free extract (NFE) was calculated by subtracting the sum of the percentages of crude fibre, ether extracts, crude protein and ash from 100. The fibre component of each experimental diet, cashew nut shell and forage were further analyzed into, cellulose hemicellulose, lignin, Acid detergent fibre (ADF) and Neutral detergent fibre (NDF), [15].

### *2.4. Experimental Design and Statistical Analysis*

The experimental design was a completely randomized design (CRD). Data were analysed by a one way analysis of variance (ANOVA) and treatment means were compared (separated) (where there were significant differences) using least significant difference (LSD). With the aid of [16]Statistical package for social science version 16.0.

# 3. Results and Discussion

***Table 1.*** *Composition of Experimental Diets (% DM).*

| Ingredients | Composition/Treatments | | | |
|---|---|---|---|---|
| | T1 | T2 | T3 | T4 |
| Cashew nut shell | 0 | 10 | 15 | 20 |
| Maize offal | 20 | 15 | 13 | 10 |
| Bambara nut offal | 52 | 52 | 52 | 52 |
| Fish offal meal | 5.0 | 5.0 | 5.0 | 5.0 |
| Rice offal | 18 | 13 | 10 | 8.0 |
| Wood ash | 2.0 | 2.0 | 2.0 | 2.0 |

| Ingredients | Composition/Treatments | | | |
|---|---|---|---|---|
| | T1 | T2 | T3 | T4 |
| Table salt | 1.0 | 1.0 | 1.0 | 1.0 |
| Bone meal | 2.0 | 2.0 | 2.0 | 2.0 |
| Total | 100 | 100 | 100 | 100 |
| Calculated nutrient content (% DM) | | | | |
| Nutrients | | | | |
| Crude protein | 18.70 | 18.15 | 18.09 | 18.01 |
| Crude fibre | 16.31 | 16.32 | 16.46 | 16.83 |
| ME (Kcal/kgDM) | 3000 | 3050 | 3095 | 3132 |

### *3.1. Promimate Composition, Fibre Fractions and pH of Experimental Diets*

The proximate composition, fibre fractions. And pH of experimental diets fed to growing West.

African Dwarf goats are summarized in Table 2. The ph value range of 6.10-6.82 weresuitable for the rumen of the animals. The protein levels of the feed 18.20 (T4)- 18.89 (T1) were all similar and within recommended levels for growing west African Warf goals in the tropics [7]. The ether extracts value of 5.05% for T1 was within recommended levels for goats diets but 8.75%(T2)-(2.33%(T4) were however above optimum levels [2].

***Table 2.*** *Proximate Composition and Fibre Fractions of Experimental Diets (% DM).*

| Nutrients | Treatments | | | |
|---|---|---|---|---|
| | T1 | T2 | T3 | T4 |
| Crude protein | 18.89 | 18.44 | 18.39 | 18.20 |
| Crude fibre | 16.33 | 16.58 | 16.62 | 16.85 |
| Nitrogen free extracts | 50.11 | 44.93 | 46.95 | 45.91 |
| Ether extracts | 5.05 | 8.75 | 10.64 | 12.33 |
| Ash | 9.62 | 8.30 | 7.40 | 6.71 |
| Dry matter | 93.35 | 94.99 | 95.57 | 91.75 |
| Acid Detergent fibre | 16.54 | 17.82 | 17.82 | 17.08 |
| Neutral Detergent fibre | 30.51 | 30.29 | 29.36 | 29.67 |
| Cellulose | 10.43 | 10.83 | 10.50 | 10.20 |
| Hemicellulose | 13.97 | 12.47 | 12.28 | 12.59 |
| Lignin | 6.11 | 6.79 | 6.58 | 6.88 |

### *3.2. Feed Intake of Experimental Goats*

The feed intake of experimental goats is summarized In Table 3, the daily forage intake ranged from 165.07g ($T_1$) to 176.10 ($T_3$) and were not significantly ($p>0.5$) different, values for daily supplement intake and total daily dry matter intake values were 44.61g($T_4$)-91.54g($T_1$) and 216.75($T_4$) - 258.99g($T_2$) and were significantly ($p<0.05$) different.

***Table 3.*** *Feed intake of experimental goats.*

| Parameter | Treatments | | | | |
|---|---|---|---|---|---|
| | T1 | T2 | T3 | T4 | SEM |
| Daily supplement intake (g) | 91.54[a] | 85.650[a] | 67.37[b] | 44.65[c] | 7.65 |
| Daily forage intake (g) | 165.07 | 173.34 | 176.10 | 172.10 | 1.67 |
| Total dry matter intake (g) | 256.61[a] | 258.99[a] | 243.47[b] | 216.75[c] | 2.96 |

### *3.3. Weights of by-Products of Growing West African Dwarf Goats Fed Bamboo Leaf and Supplementary Diets Containing Graded Levels of Steam-Treated Cashew Nut Shell*

Theweights of by- products of growing West African dwarf goats fed diets containing graded levels of steam-treated cashew nut shell was presented in Table 4. The weights of the full gut, empty gut, gut content, hooves and blood were not statistically different ($P>0.05$) among the treatments. However abdominal fat weight increased from $T_1$ (0.17 %) to $T_3$ (0.24 %) with the weights for $T_2$, $T_3$ and $T_4$ being significantly ($P<0.05$) higher than that of $T_1$.

The higher ether extract content of diets $T_2$, $T_3$ and $T_4$ and hence higher ether extract intakes by the goats in those treatments may have been responsible for the higher abdominal fat content compared to that of $T_1$. The value of 0.17 % ($T_1$) to 0.24 % ($T_1$) obtained for abdominal fat in this study were lower than 0.51 % - 1.82 % obtained for West Africa Dwarf Goat [1]. The full gut values of 23.99 % ($T_3$) to 26.50 % ($T_1$) were within the range of 18.94 to 27.21 % reported for West African dwarf goat [1]. These discrepanciescould be due to differences in the diets fed as well as the feed intakeThe non-significance of the values for full gut, empty gut, gut content, hooves and blood suggestthat they were not affected by the inclusion of steam-treated cashew nut shell in the diets, non-significance in the full gut empty gut and gut contents for west African dwarf goats fed sun-dried yellow cashew pulp based diets, was also reported [10, 11] However, obtained significant differences in weights of all the internal organs except lungs, liver and spleen, when he fed *Panicum maximum* supplemented concentrate containing Bambara nut meal to west African dwarf goats [13] reported significant differences for all the by-products evaluated when they fed cassava peel meal based diets supplemented with African yam bean concentrate. To West African dwarf goats. These discrepancies could be due to differences in the diets fed to the goats.

***Table 4.*** *Weights of By- products of Growing West African Dwarf Goats fed Bamboo Leaf and Supplementary Diets Containing Graded levels of Steam-Treated Cashew nut shell (% of Slaughter Weight).*

| Treatments | | | | | |
|---|---|---|---|---|---|
| | $T_1$ | $T_2$ | $T_3$ | $T_4$ | SEM |
| Parameters | (0 % CNS) | (10 % CNS) | (15 % CNS) | (20 % CNS) | |
| Full gut | 26.50 | 26.13 | 23.99 | 24.15 | 1.01 |
| Empty gut | 7.31 | 7.22 | 6.62 | 7.06 | 0.25 |
| Gut content | 19.19 | 18.91 | 17.37 | 17.09 | 0.87 |
| Weight of hooves | 0.20 | 0.19 | 0.18 | 0.19 | 0.02 |
| Blood weight | 3.10 | 2.94 | 2.91 | 3.08 | 0.15 |
| Abdominal fat | 0.17[b] | 0.22[ab] | 0.24[a] | 0.23[a] | 0.01 |

a, b = Means on the same row with different superscripts differ significantly ($P<0.05$).
SEM = standard Error of the Means.

# 4. Conclusion

The diets fed to the experimental goats were adequate in terms of nutrients.

The control ($T_1$) diet was most palatable for the experimental goats, hence the highest feed intake, while 14 was the least palatable. The total intake of the bamboo leaves were similar for all the equipments.

Only the abdominal fat weight was significantly responsive to the dietary treatment the weights for the full gut, empty gut, gut content, hooves and blood were not significantly affected by the dietary treatments.

# 5. Recommendations

Further studies should be carried out using higher levels of inclusion of steam- treated cashew nut shell. Aswell as using other classes of ruminants such as sheep and cattle. Evaluation of by-products of livestock should be encouraged since animal by-products are very useful.

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