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# Performance of Wad Goats Fed *Panicum maximum* Basal Diets with Different Protein Supplements

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**Abstract:** An experiment was conducted to compare the performance of WAD goats fed *Panicum maximum* basal diet and concentrate supplements of Palm Kernel Cake (PKC), Soya Bean Meal (SBM), Cotton Seed Cake (CSC) and Brewers Dried Grain (BDG). 12 animals were randomized into four groups to represent four treatments and each treatment has three replicates. Each animal represents a replicate. The experiment lasted 10 weeks and followed by three weeks metabolic trial. During the experiment, feed intake, weight gain and digestibility of nutrients were estimated while feed conversion ratio and protein efficiency ratio were calculated. The results obtained placed animals on SBM on top ($p<0.05$) in all the parameters estimated. This was followed by animals on CSC while animals on BDG had the least performance. The Dry Matter Intake (DMI) and the Crude Protein Intake (CPI) increased from 486.50 and 60.46 in BDG to 546.72 and 91.56 $gd^{-1}$ in SBM, respectively. Digestibility of Dry Matter (DM) and Crude Protein (CP) increased from 57.90 and 71.80 in BDG and PKC respectively to 70.02 and 86.74% in SBM. The weight gain and protein efficiency ratio increased from 19.83 and 0.33in BDG to 33.36 and 0.37 in SBM, respectively while feed conversion ratio reduced from 24.53 in BDG to 16.39 in SBM. It was therefore, concluded from the experiment that WAD goats utilized SBM better than CSC, PKC and BDG.

**Key words:** Soya bean meal, cotton seed cake, palm kernel cake, brewers dried grain, WAD goats performance

## INTRODUCTION

Nutrition is perhaps the most important consideration in livestock management. Inadequate supply of feed in quantity and quality is responsible for the low productivity of animals in the tropics[1]. The ruminant specie in Nigeria depends entirely on natural pastures for their feed[2]. This source is only adequate for their survival and little production during the wet season but inadequate during the dry season. This has resulted in the characterized limitation posed by non-availability of all-year-round feed resources due to prolong dry season[3,4]. It was therefore admitted that ruminant animals could not meet their maintenance nutrient requirements on grass alone[5]. This is especially so during the dry season. It is not uncommon to see an animal gaining weight during the raining season and the same animal losing weight during subsequent drying season[6,2]. Many animals even died of starvation during prolonged dry season[7]. While a crude protein content of 12-15% can be obtained in wet season, it can decline to below five percent in the dry season for some grasses. Absence of supplementary feed during this period could result in declining weight, low milk yield and retarded growth of the young ones and in severe cases death. However, judicious utilization of feed supplements will help to overcome these problems and enhance productivity. There was an improvement in feed intake, digestibility of nutrients and weight gain when concentrate supplements were fed to WAD sheep[8]; Yankasa sheep[9,10]; WAD goats[11,12] and lactating does[12]. This experiment was therefore designed to compare the performance of WAD goats fed *Panicum maximum* basal diet and four different protein supplements namely: palm kernel cake, soya bean meal, cotton seed cake and brewers dried grain.

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## MATERIALS AND METHODS

The experiment was carried out at the small ruminant experimental unit of the College of Animal Science and Livestock Production, University of Agriculture, Abeokuta Teaching and Research Farm. TwelveWest African Dwarf (WAD) goats of about nine to ten months of age, weighing six to eight kilograms were purchased at the villages around Abeokuta and adapted to the experimental farm for a period of 21 days. During the period of adaptation, animals were vaccinated against PPR, dewormed and treated against ecto parasites.

Animals were randomized into four groups of three animals per group. Animals were balanced for weight during the grouping. Each group of animals was allocated to a treatment. Animals were housed individually and each animal represents a replicate to have three replicates for each treatment. The basal diet was wilted *Panicum maximum*. Palm Kernel Cake (PKC) was used as protein supplement for animals under treatment one; Soya Bean Meal (SBM) for treatment two; Cotton Seed Cake (CSC): treatment three and Brewers Dry Grain (BDG) for treatment four. Grass forage was served at nine o'clock in the morning while concentrates were served at one o'clock in the afternoon. Feeds refusals were estimated the following morning. Daily feed intake and weekly weight gain were also estimated. Feed conversion ratio and protein efficiency ratio were calculated. The trial lasted ten weeks. Animals were then moved to metabolic crates for a period of 21 days. The first seven days served as adaptation period while the last 14 days served as data collection period. Faecal output was estimated during this period. Proximate analysis was carried out on the basal diet, protein supplements and the feaces by the method of AOAC[12]. The results obtained were used to calculate nutrient digestibility. Data generated were arranged in a completely randomized design and analyzed by one-way analysis of variance (ANOVA) and significant means were separated using Duncan's multiple range test Duncan[10].

## RESULTS AND DISCUSSION

As shown in Table 1, the dry matter content for the protein supplements ranged between 88.60 and 90.85% while that of the wilted *Panicum maximum* was 35.21%. The crude protein content for soya bean meal (SBM) was the highest (41.46%) while the lowest (18.25%) was recorded for palm kernel cake (PKC). However, the crude protein for *Panicum maximum* was 10.52%. Ether extract obtained for PKC was high 9.82% and this could have been due to poor efficiency of oil extraction. However, lowest ether extracts (2.78%) was obtained in *Panicum maximum*. Ash content of BDG (8.52%) was the highest while 4.47% obtained for PKC was the lowest. Highest crude fibre content of 25.21% was obtained in *Panicum maximum*, followed by BDG 15.52 while the lowest value of 6.53 was obtained for SBM. Values obtained for nitrogen free extract was between the range of 41.60% (SBM) and 55.14% (PKC).

Table 1: Proximate composition of the experimental diets fed to WAD goats

| | Treatments | | | | |
|---|---|---|---|---|---|
| Parameters | PKC | SBM | CSC | BDG | *P. maximum* |
| Dry matter | 88.86 | 90.12 | 90.85 | 90.00 | 35.21 |
| Crude protein | 18.23 | 41.46 | 25.05 | 19.17 | 10.52 |
| Ether extract | 9.82 | 3.51 | 4.32 | 6.51 | 2.78 |
| Ash | 4.47 | 6.90 | 6.21 | 8.52 | 7.00 |
| Crude fibre | 12.34 | 6.53 | 10.52 | 15.25 | 25.21 |
| Nitrogen free extract | 55.14 | 41.60 | 53.90 | 50.55 | 54.49 |

Table 2 shows the DM and other nutrients intake of WAD goats fed *Panicum maximum* and protein supplements. The dry matter intake (DMI) obtained for grass ranged from (379.19 $gd^{-1}$) for goats on BDG supplement to 436.68 $gd^{-1}$ for goats on SBM while total DMI ranged between 485.53 $gd^{-1}$ for goats on CSC and 546.72 $gd^{-1}$ in animals on SBM. Dry matter intake from grass as well as total dry matter intake for animals on SBM and PKC were significantly higher ($p<0.05$) than dry matter intakes for animal on BDG. However, values obtained from the consumption of supplements ranged between 104.50 and 107.31 g and were not significantly different from each other, the Crude protein intake from grass was between 39.89 and 45.94 $gd^{-1}$ and was not significantly different from each other. However protein intake from supplement as well as total crude protein intake was highest ($p<0.05$) for the animals on SBM, followed by intake of animals on Cotton Seed Cake (CSC) and least for those on PKC. This intake values must have been influenced by the protein contents of the protein supplements because SBM had the highest crude protein while PKC has the least (Table 1). The crude fibre intake from grass as well as total crude fibre intake was not significantly influenced by the treatment. However

Table 2: Nutrients intakes of the WAD goats fed *Panicum maximum* with protein supplements

| | Treatments | | | |
|---|---|---|---|---|
| Parameters | PKC | SBM | CSC | BDG |
| DMI from grass | 428.51$^{a}$±10.65 | 436.68$^{a}$±8.43 | 399.05$^{ab}$±14.25 | 379.19$^{b}$±7.01 |
| DMI from concentrate | 105.20±8.68 | 110.04±6.40 | 104.50±6.50 | 107.31±3.14 |
| Total DMI | 533.71$^{a}$±12.12 | 546.72$^{a}$±11.32 | 485.53$^{b}$±8.75 | 486.50$^{b}$±8.25 |
| CPI from grass | 45.08±2.28 | 45.94±1.31 | 41.98±151 | 39.89 ±0.53 |
| CPI from concentrate | 19.18$^{c}$±1.95 | 45.63$^{a}$±2.42 | 26.17$^{b}$±0.18 | 20.57$^{c}$±0.60 |
| Total CPI | 64.26$^{b}$±2.53 | 91.56$^{a}$±2.45 | 68.15$^{b}$±1.05 | 60.46$^{c}$±1.38 |
| CFI from grass | 108.03±5.41 | 110.09±3.10 | 100.60±6.19 | 95.59±2.06 |
| CFI from concentrate | 12.98$^{ab}$±1.33 | 7.19$^{c}$±0.56 | 10.99$^{bc}$±0.41 | 16.36$^{a}$±0.48 |
| Total CFI | 121.01±5.60 | 117.28±3.12 | 111.59±2.03 | 111.95±.89 |
| NFEI from grass | 233.50±10.23 | 237.95±6.01 | 217.44±6.75 | 206.62±5.50 |
| NFEI from concentrate | 58.00±5.24 | 45.78±2.85 | 56.74±3.42 | 54.25±1.78 |
| Total NFEI | 291.50±12.07 | 283.73±7.50 | 274.69±4.69 | 260.87±4.00 |

DMI, CPI, CFI and NFEI represent dry matter intake, crude protein intake, crude fibre intake and nitrogen free extract intake a, b, c = means in the same row with different superscripts differ significantly ($p<0.05$)

Table 3: Digestibility co efficients of nutrients and performance of animals on supplemented diets

| | Treatments | | | |
|---|---|---|---|---|
| Parameters | PKC | SBM | CSC | BDG |
| Dry matter | 59.30$^{bc}$±2.41 | 70.02$^{a}$±2.03 | 63.10$^{b}$±1.53 | 57.90$^{c}$±1.85 |
| Crude protein | 71.80$^{b}$±1.60 | 86.74$^{a}$±1.21 | 75.50$^{b}$±1.15 | 71.95$^{b}$±0.52 |
| Crude fibre | 75.32$^{bc}$±2.40 | 80.01$^{a}$±1.93 | 73.90$^{b}$±1.73 | 69.00$^{b}$±1.37 |
| Ash | 42.84±3.60 | 48.33±1.73 | 45.31±2.42 | 43.41±2.01 |
| Ether extract | 41.35±3.53 | 49.33±4.04 | 46.72±2.17 | 40.60±2.55 |
| Nitrogen free extract | 56.30$^{c}$±3.08 | 79.03$^{a}$±2.32 | 66.71$^{b}$±3.26 | 62.80$^{b}$±2.81 |
| Initial weight of the animal | 6.77±0.48 | 6.73±0.42 | 6.60±0.34 | 6.40±0.40 |
| Final weight of the animal | 8.31$^{b}$ ±0.15 | 9.07$^{a}$±0.21 | 8.32$^{b}$±0.18 | 7.79$^{b}$±0.11 |
| Weight gain | 22.02$^{bc}$±2.59 | 33.36$^{a}$±1.36 | 24.57$^{b}$±1.03 | 19.83$^{c}$± 1.60 |
| Feed conversion ratio | 24.24$^{a}$±1.02 | 16.39$^{b}$±1.32 | 19.68$^{a}$±2.03 | 24.53$^{a}$±1.90 |
| Protein efficiency ratio | 0.34$^{c}$±0.04 | 0.37$^{a}$±0.01 | 0.36$^{b}$±0.02 | 0.33$^{d}$±0.03 |

a, b, c, d = means in the same row with different superscripts differ significantly ($p<0.05$)

highest crude fibre intake from supplement ($p<0.05$) was recorded for animals on BDG and PKC while the lowest was recorded for animals on SBM. Nitrogen free extract intakes from grass, concentrate as well as total nitrogen free extract intake were not significantly different ($p>0.05$) from each other. Protein supplementation brings about increase in the protein content of the feed and this eventually lead to increase in protein intake. Increase in protein intake will enhance the intake of other nutrients until another factor becomes limiting and this informs the increased intake results obtained by the following researchers: Abubakar[2,5,9,13,14]. In this experiment, Protein intake for animals on SBM was the highest and this must have enhanced DMI. Low feed intake in animals on BDG could be as a result of the fibre content of BDG.

As shown in Table 3 digestibility of nutriets were high in all the treatments. This could be as a result of adequate protein content in each of the treatments as a result of protein supplementation. Results from Abubakar[2,5,9,13,14] research works showed that protein supplementation enhanced digestibility. However, dry matter digestibility was the best ($p<0.05$) in animals on SBM while it was worst for animal on BDG. Animals on SBM digested crude protein, crude fibre and nitrogen free extracts better ($p<0.05$) than animal on other concentrates. However, digestion of the above-mentioned parameters were not significantly different for animals on CSC, PKC and DBG. Digestibility of ether extract and ash were not significantly different ($p>0.05$) for animals on all concentrate supplements administered in this experiment. Better digestibility in animals on SBM could be as a result of higher crude protein intake.

Weight gain was highest ($p<0.05$) in animals placed on SBM. This could have been due to highest protein intake obtained from it. It was followed by animals on CSC while animals on BDG has the lowest weight gain. Feed conversion ratio was significantly lower in animals on SBM. This indicates better efficiency of converting feed to flesh. Animals on SBM utilized feed better than other animals. Protein efficiency ratio was also best for animals

on SBM while it was worst for animals on BDG. Better efficiency of digestion in animals on SBM could explain the better weight gain, better protein efficiency and better rate of conversion of feed to flesh. Animals on SBM performed best in the experiment. Another factor that could also be considered in this experiment is the quality of the protein. Soya bean contained a high quality protein. The quality of the protein is comparable to that of animal protein and has been described as the best protein source in vegetable kingdom[14]. Animals on CSC were next in term of performance. This could also be due to its high protein content. The work of Abubakar[2] supports the fact that CSC supplementation translates into good performance. However the worst performance was recorded for animals on BDG. Its high crude fibre content and its relatively low protein content could have caused this. Soya bean has a number of antinutritional factors such as trypsin inhibitor, hemaglutinins, lipoxygenase enzyme, lectins, phytic acid goitrogen, uraese and genistein[15] and cotton, gossypol[16]. Most of this antinutritional factors are heat labile[16,3] and would have been destroyed during processing. The complex processes of rumination and the microbial population of the rumen will efficiently handle any residue from such antinutritional factors. This could explain why they did not have negative influence on the performance of animals on them.

## CONCLUSION

It can be concluded from this experiment that soya bean meal enhanced performance of WAD goats better than CSC, PKC and BDG. Higher crude protein content seems to stimulate better weight gain and feed utilization, however feed with high fibre content reduces performance of animals on it.

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