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PERFORMANCE OF WEST AFRICAN DWARF (WAD) GOATS FED *PANICUM MAXIMUM* BASAL DIET WITH DIFFERENT SOURCES OF PROTEIN SUPPLEMENTS

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ABSTRACT

An experiment was conducted to compare the performance of West African Dwarf 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). Twelve animals were randomized into four groups to represent four treatments and each animal was a replicate. Feeding trial lasted 13 weeks including 3-week metabolic trial. Data included feed intake, weight gain and digestibility of nutrients, feed conversion and protein efficiency ratios. Optimal performance was obtained for animals on SBM (P<0.05). This was followed by animals on CSC while animals on BDG had the least. The total dry matter intake (DM1) and crude protein intake (CPI) increased from 485.53 for goats in CSC and 60.46 for animals in BDG to 546.72 and 91.56gd^{-1} in SBM respectively. Digestibility of dry matter (DM) and crude protein (CP) increased from 57.90 and 71.80 for goats in BDG and PKC supplements respectively to 70.02 and 86.74% for those in SBM The weight gain and protein efficiency ratio increased from 19.83 and 0.33 for BDG to 33.36gM and 0.37 for SBM feed supplement respectively, while feed conversion ratio declined from 24.53 for BDG based supplement to 16.39 for goats in SBM supplements. It was therefore, concluded that WAD goats utilized SBM better than CSC, PKC and BDG as supplements to *P. maximum* basal diet

Key words: Brewers dried grain, cottonseed cake, palm kernel cake, soya bean meal, performance, goats.

INTRODUCTION

Adequate nutrition is the most important item in livestock management. Inadequate supply of feed in quantity and quality could account for low productivity of live-stock in the tropics (Peters, 1988). The Ruminants in Nigeria depends entirely on natural pastures for their feed (Abubakar *et al.,* 1998). This source is adequate for maintenance and little production during the wet season but inadequate during the dry season. Hence pastures are not avail-able throughout the year (Oladotun *et al*., 2003; Odeyinka and Okunade, 2005). It is therefore imminent that ruminant livestock could not meet their nutrient requirements for maintenance on natural grass alone (Adegbola, 1985) throughout the year. Thus an animal could gain weight during the raining season and just to lose weight during subsequent drying season (Pagot, 1992; Abubakar *et al.*, 1998). Some ani-mals could even die of starvation during prolonged dry season (Tarawali *et al.*, 1993). While a dietary 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 live weight, low milk yield and retarded growth of the young ones and in severe cases, death.

Improvement in feed intake, digestibility of nutrients and weight gain were reported when concentrate supplements were fed to WAD sheep (Taiwo *et al.*, 1995); Yankasa sheep (Alokan 1998; Fasae *et al.*, 2005); WAD goats (Adejumo, 1998; Arigbede *et al.*, 2005) and lactating does (Abubakar *et al.*, I 998). This experiment was therefore designed to compare the performance of WAD goats fed basal diet *Panicum maximum* and four individual supplements which were palm kernel cake, soya bean meal, cotton seed cake and brewers dried grain.

MATERIALS AND METHODS

Experimental site

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.

Animals and their management

Twelve West African dwarf (WAD) goats, aged 9 -10 months and weighing 6-8kg were purchased at the villages in Abeokuta neighbourhood. They were adapted to the experimental farm for 21 days. During the said period, animals were vaccinated against PPR, and treated against endo and ecto parasites. The animals were divided into four groups of three animals per group, duly balanced for weight. Each group of animals was allocated to a treatment. Animals were housed in individual pens so that each animal represented a replicate to give three replicates per treatment. The basal diet was wilted *Panicum maximum* supplement with palm kernel cake (PKC) (treatment 1), soya bean meal (SBM) (treatment 2) cotton seed cake (CSC) (treatment 3) and brewers dried grains (treatment 4). Grass forage (1kg) and concentrate supplement at 009 h and 013h respectively.

Data collection

Feed refusal for each animal was weighed at 008h to estimate intake. The goats were weighed once a week to determine their weight gain. The experiment lasted for 10 weeks. Feed conversion and protein efficiency ratios were calculated. Animals were then moved at week 7 of the experiment to individual metabolic crate for 21 days. The first seven days served as adaptation period while the last 14 days involved total collection of faeces daily. Aliquots (10%) portion of the faeces were taken to the laboratory dried, ground and bulked for each animal till required for chemical analysis. Samples of basal grass and supplements were weighed, dried and analyzed for their proximate composition (A. O. A. C., 1990). Nutrient digestibility coefficient values were determined.

Statistical analysis

Data obtained were laid out in a completely randomized design and analyzed with one-way analysis of variance (SAS, 1999) while significant means separated with Duncan's Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

Dry matter content for the protein supplements ranged from 88.86 and 90.85% while that of the wilted *Panicum maximum* was 35.21% (Table 1). The crude protein content for soya bean meal (SBM) was the highest (41.46%) while the lowest (18.23%) was recorded for palm kernel cake (PKC). However, the crude protein for *Panicum maximum* was 9.52%. Ether extract obtained for PKC was high 9.82% and this could have been due to the efficiency of oil extraction. However, lowest value extracts (2.78%) was obtained for *Panicum maximum*.

Table 2 shows the summary of the performance characteristics of WAD goats fed *Panicurn maximum* and different sources of protein supplements. The dry matter intake (DMI) obtained (gd^{-1}) for grass ranged from 379.2 for goats on treatment 4 to 436.7% for animals on treatment 2. Variations in total DMI values were significant ($p<0.05$). Difference in DMI from basal diet were not appreciable ($p>0.05$). Dry matter intakes of animals on diets 1 and 2 were similar but higher than the values recorded for goats on diets 3 and 4 ($p<0.05$). It means that SBM and PKC were consumed as supplements to the same extent. The gossypol that tends to limit voluntary DMI for CSC did not influence intake from BDG supplements as the two values were similar (Table 2). However as total crude protein intake was highest ($P<0.05$) for the animals on treatment 2, followed by intake of animals on treatment 3 and least for those on treatment 1. These intake values could have been influenced by the protein in the supplements because SBM recorded the highest crude protein while PKC has the least (Table 1). Concentrate supplementation brings about increase in the dietary protein and this accounted for the observed increase in protein intake. This trend also accounted for enhanced voluntary DMI as reported elsewhere (Abubakar *et al*., 1998; Adejumo, 1998; Alokan, 1998; Arigbede *et al*., 2005; Fasae *et al*., 2005). Apparently low DMI for animals on treatment 4 could be due to the high fibre content of BDG (Table 1). Variations in digestibility of DM, CP, CF and NFE were significant ($p<0.05$) except as ($p>0.05$) table 2. This could be due to adequacy of dietary protein as a result of supplementation. Results (Abubakar *et al*., 1998; Adejumo, 1998; Alokan, 1998; Arigbede *et al*., 2005; Fasae *et al*., 2005) showed that protein supplementation enhanced digestibility. However, DM digestibility was the best ($p<0.05$) for animals on SBM while it was least for goats on BDG supplement. Animals on SBM supplement digested CP, CF and NFE better ($p<0.05$) than those on other protein supplements. However, digestions of CP, CF and NFE were similar for animals maintained on CSC, PKC and BDG as supplements.

Higher weight gain was recorded ($p<0.05$) for animals placed on SBM. This could have been due to the highest protein content intake obtained for SBM. It was followed by animals on CSC while animals on BDG had the lowest weight gain. Feed per gain was significantly lower for animals on SBM. This suggests better efficiency of converting feed to flesh. Animals on SBM supplements utilized feed better than others. Protein efficiency ratio was also best for animals on SBM while it was least for animals on BDG. Better efficiency of digestion in animals on SBM could also be account for the weight gains and enhanced protein efficiency. Another factor that could also be considered in this experiment is the quality of the protein.

Soya bean contains a high quality protein which is believed to be comparable to animal protein and it is described as the best protein source in vegetable kingdom (Okagbare and Akpodiete, 2006). Animals on CSC were next in term of performance. Evidence (Abubakar *et al*., 1998) supports the fact that CSC supplementation could translate into enhanced good performance in ruminant production. However, the least performance was recorded for animals on BDG. Its high crude fibre content and its relatively low protein content could have accounted for this observation. Soya bean has a number of antinutritional factors such as trypsin inhibitor, hemuglutinins, lipoxygenase enzyme, lectins, phytic acid goitrogen, uraese and genistein (McDonald *et al*., 1995) and cotton, gossypol (Church and Pond, 1988). Most of these antinutritional factors are heat liable (Church and Pond, 1998; Okagbare and Akpodiete, 2006) and would have been destroyed during processing. The complex processes of rumination and the microbial population of the rumen could cope with any residue from such antinutritional factors. This could explain why they did not have negative influence on the performance of goats in this study.

CONCLUSION

It can be concluded from this study that SBM as supplement enhanced performance of WAD goats better than any of CSC, PKC and BDG. Higher crude protein content of supplement seems to enhance weight gain and feed utilization.

Table 1: Proximate composition (g/100g.DM) of the experimental diets fed to WAD goats

	Treatments				
Parameter	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	9.52
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 Ex-	55.14	41.60	53.90	50.55	54.49

PKC = Palm kernel cake
SBM = Soya bean meal
CSC = Cotton seed cake
BDG = Brewer's dried grain

Table 2: Performance characteristics of WAD goats fed basal grass P. maximum with concentrate supplements

	Treatments			
	1	2	3	4
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
Supplement	105.20±8.68	110.04±6.40	104.50±6.50	107.31±3.14
Total (g/day)	533.71^{a}±12.12	546.72^{a}±11.32	485.53^{b}±8.75	486.50^{b}±8.25
CP intake (g/day) grass	45.08±2.28	45.94±1.31	41.98±1.51	39.89±0.53
From concentrate	19.18^{c} ± 1.95	45.63^{a}±2.42	26.17^{b}±0.18	20.57^{c}±0.60
Total	64.26^{b}±2.53	91.56^{a}±2.45	68.15^{b}±1.05	60.46^{c}±1.38
Initial weight of the animal (kg)	6.77±0.48	6.73±0.42	6.60±0.34	6.40±0.40
Final weight of the animal (kg)	8.31^{b}±0.15	9.07^{a}±0.21	8.32^{b}±0.18	7.79^{b}±0.11
Weight gain (g)	22.02^{bc}±2.59	33.36^{a}±1.36	24.57^{b}±1.03	19.83^{c}±1.60
Feed/gain	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

Table 3: Digestibility coefficients (%) of nutrients for goats fed *P. maximum* with concentrate supplement

	Treatments			
Parameter	PKC	SBM	CSC	BDG
Dry matter	9.30b^{c} ±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

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