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Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

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Nutrient Intake and Digestibility of West African Dwarf Bucks Fed Poultry Waste-Cassava Peels Based Diets

A.I. Ukanwoko and J.A. Ibeawuchi
Department of Animal Production and Livestock Management,
College of Animal Science and Animal Production, Michael Okpara University of Agriculture, Umudike,
P.M.B. 7267, Umuahia, Abia State, Nigeria

Abstract: The effect of feeding poultry waste-cassava peel based diets on the nutrient intake and digestibility were evaluated using four West African Dwarf (WAD) bucks. The animals were confined individually in metabolism cages and offered the treatment diets (A-D) in a 4 x 4 Latin Square Design. The diets were formulated from poultry waste, cassava peel, palm kernel cake, molasses, bone meal and common salt. The percent compositions of Dried Poultry Waste (DPW) and cassava peel in the diets were 0, 56.5; 10, 53.5; 20, 43.5 and 30, 33.5% respectively. Each animal received each diet for 24 days. Daily feed intake was determined. Urine and faecal samples were taken and analyzed. The dry matter intake, nitrogen intake, N-balance and absorbed -N increased as the percentage of dried poultry waste in the diets increased. The faecal -N values differed significantly ($p<0.05$). The digestibility coefficients of crude fibre, nitrogen-free-extract and energy were significantly ($p<0.05$) different among experimental animals. All the diets promoted positive N-balance.

Key words: Dried poultry waste, dried cassava peels, daily feed intake, total nitrogen intake, N-balance

INTRODUCTION

Protein inadequacy in the diets of most people in a developing country like Nigeria has been a major concern to animal scientists. The current level of consumption of meat and animal protein is estimated at 8g per caput per day (FAO, 1985; Ndubuisi, 1992). The average daily consumption of 54 grams of protein with 6.5 grams from animal sources fall below the recommended daily protein intake of 86 grams and 34 grams of animal protein (Ejiofor, 1998). The low nitrogen content of dry season fodder usually confer severe nutritional stress on ruminants. The dry season results in a rapid decline in the quality of forages leading to low forage intake and digestibility with resultant poor animal performance. It has been reported (Adegbola, 2002) that poor quality roughages fed to ruminants without supplementation during the dry season caused considerable weight losses and finally the death of the animal. The prices of the conventional sources of protein in livestock ration have risen exorbitantly (Akinmutimi, 2004) and this has necessitated the search for cheap alternative feed materials by animal nutritionists that can meet nutritional requirement of farm animals. Again these alternative feed materials should not be in high demand by humans and should be cheap (Amaefule, 2002). Poultry waste is a rich source of nitrogen (Jordaan, 2004; Lanyasunya *et al.*, 2006). Except for research purposes, its use in practical goat production in Nigeria is still not commonplace (Belewu and Adeneye, 1996). Cassava peel is on the other hand rich in metabolizable energy and very well degraded in the rumen (Smith, 1988). This study is therefore aimed at evaluating the nutrient intake and digestibility of West African Dwarf bucks fed poultry waste -cassava peel based diets.

MATERIALS AND METHODS

Dried poultry waste/cassava peel: The poultry waste was collected from caged layers reared at the Michael Okpara University of Agriculture, Umudike. The wet poultry waste was sun-dried for 3-5 days to realize a moisture content of 10-12%. The dried waste was milled and bagged as Dried Poultry Waste (DPW).
Cassava peels from 12-14 month old plants were collected fresh from the commercial “Garri” processing unit of the National Root Crop Research Institute (NRCRI) Umudike. The fresh cassava peels were sun dried for 3-5days to 10-12% moisture level, milled and use as Dried Cassava Peel (DCP).

Digestibility studies: Four West African Dwarf bucks weighing between 13.0 kg and 15.0 kg were selected from the Goat Unit of the livestock farm on the basis of body weight. Each animal received one of the four diets (Table 1) In a 4 x 4 Latin square design. The diets A, B, C and D were formulated from palm kernel cake, molasses, bone meal and common salt and contained 0, 56.5; 10, 53.5; 20, 43.5 and 30, 33.5 DPW and DCP respectively. Each animal was confined in a metabolism cage and the four diets fed consecutively to each animal in 4 phases. Each phase lasted for 24 days during which time each animal received 1 kg of an assigned

Table 1: Feed constituents and proximate composition of DCP and DPW

Ingredients %	A	B	C	D
DCP	56.5	53.5	43.5	33.5
DPW	0.0	10.0	20.0	30.0
Palm Kernel Cake	35.0	28.0	28.0	28.0
Molasses	5.0	5.0	5.0	5.0
Bone Meal	2.5	2.5	2.5	2.5
Common Salt	1.0	1.0	1.0	1.0
Total	100	100	100	100
Constituents (%)	**DCP**	**DPW**		
Dry Matter	90.20	93.00		
Crude Protein	3.25	26.60		
Crude Fibre	30.30	16.50		
Ether Extract	0.07	3.10		
Ash	5.50	27.00		
NFE	66.47	25.10		
Energy (MJ/kgDM)	1.82	1.01		

DCP = Dried Cassava Peel, DPW = Dried Poultry Waste (battery cage), NFE = Nitrogen-Free-Extract

ration per day. Feed intake was determined as the difference between daily feed offered and refusal. Drinking water was provided *ad libitum* to the animals. Urine was collected using a bucket containing 5 ml of concentrated sulphuric acid. Urine volumes were measured immediately after collection and 10% of the daily output saved. The daily samples of urine for each animal were bulked and stored in a freezer at $0^{o}C$ until required for analysis. Faeces were dried at constant weight in forced draught oven at $70^{o}C$ for 48 h. Daily faeces were bulked for each animal in the different periods. The dried faeces were hammer milled and stored in a dessicator until required for analysis.

Chemical analysis: The proximate analysis of the faecal samples were carried out. The samples were analyzed for dry matter, crude protein, crude fibre, ether extract, ash and nitrogen-free-extract according to A.O.A.C. (1990). Also analyzed was the urine samples to determine the percentage of nitrogen voided in the urine. Faecal energy was estimates using the following regression equation (MAFF, 1975)

$$ME\ (MJ/KgDM) = 0.0226CP + 0.0407EE + 0.0192CF + 0.0177NFE.$$

Where CP = Crude Protein, EE = Ether Extract, CF = Crude Fibre, NFE = Nitrogen-Free-Extract

Statistical analysis: The data obtained from the digestibility studies were subjected to analysis of variance (ANOVA) according to Steel and Torrie (1980). Differences between means were determined using Duncan's Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

The proximate composition of the feedstuff is shown in Table 1. The proximate values obtained for DCP and DPW were higher than the values reported for these nutrients by Asaolu (1988) and Nambi *et al.* (1991) but comparable to values reported by Ahamefule (2005) and Ibeawuchi and Ahamefule (2006) for similar products.

In Table 2, the dry matter percent of DPW based diets (B, C, D) compared favourably with the control -A. The CP (%) content of diet A was slightly above the critical level of 7% for ruminants (Lanyasunya *et al.*, 2006) and improved from B-D just as DPW inclusion levels increased. This agreed with the fact that adding DPW to concentrate formulations increased the CP of ruminant rations earlier reported by Alhassan (1985) and Ahamefule *et al.* (2001). Except for diet B, CF values decreased with increasing levels of DPW. This could be expected since the DPW was low in CF (16.50%) as compared to that of cassava peels (30.30%). The energy content tended to decrease with increasing levels of DPW in the diets. This is probably due to the high ash content of the DPW.

Table 2: Proximate composition of the experimental diets

	Diets				
Nutrients	A	B	C	D	SEM
Dry Matter (%)	62.15	62.06	70.83	72.24	1.80
Organic matter (%)	37.85	37.31	29.17	27.76	1.15
Crude protein (%)	7.55	8.97	9.63	9.74	0.43
Crude fibre (%)	18.76[a]	19.78[a]	14.41[b]	12.20[b]	0.39
Ether extract (%)	0.90	1.28	1.09	0.99	0.06
Ash (%)	23.75[b]	24.75[b]	32.25[a]	35.50[a]	0.95
Nitrogen-free-extract(%)	11.19	7.29	13.45	14.56	0.18
ME (MJ/kgDM)	0.77	0.76	0.76	0.75	0.03

[ab]Means in the same row with different superscripts differ significantly ($p<0.05$), SEM = Standard error of means

Table 3: Apparent digestibility coefficient (%) of WAD goats fed poultry waste-cassava peel based diets

	Diets				
Parameters	A	B	C	D	SEM
Dry matter (%)	64.46	63.60	58.95	58.43	0.92
Crude protein (%)	56.59	51.59	51.61	50.08	1.37
Crude fibre (%)	60.27[a]	59.59[a]	51.27[b]	49.96[b]	0.25
Ether extract (%)	82.87	79.57	80.28	86.41	1.08
N–free-extract (%)	87.55[a]	88.16[a]	68.43[b]	74.03[b]	0.61
Energy (%)	75.52[a]	69.77[b]	67.35[b]	63.58[c]	0.69

[abc]means on the same row with different superscripts differ significantly ($p<0.05$), SEM = standard error of means

Table 3 shows the digestibility coefficients of WAD goats fed poultry waste -cassava peel based diets. The means percentage dry matter digestibility value tended to be higher in diet A and started decreasing as the proportion of DPW in the diets increased. This is in line with Adu and Lakpini (1983) and Okorie *et al.* (1981) who reported that the digestibility of dry matter decreased as the proportion of DPW in the diets increased. The digestibility of crude protein followed the same trend as the dry matter digestibility. The crude fiber digestibility decreased with increasing level of DPW. This is in line with the percentage of crude fibre in the experimental

Table 4: Nitrogen balance and utilization of WAD goats for dried poultry waste-cassava peel based diets

Parameters	Diets A	B	C	D	SEM
Mean Body weight (kg)	19.75	20.50	17.80	18.75	0.20
Mean Body weight ($Wkg^{0.75}$)	9.37	9.63	8.67	9.01	0.30
Dry matter intake (g/day)	310.03	291.55	305.89	313.42	2.61
Dry matter intake (g/day/$Wkg^{0.75}$)	60.78	56.78	59.64	64.99	2.19
Total nitrogen intake (g/day)	6.04	7.12	7.92	8.41	0.18
Faecal-N (g/day)	2.72^{c}	3.40^{b}	3.83^{a}	4.03^{a}	0.15
Urinary-N (g/day)	1.75	1.72	1.59	1.95	0.03
N-balance (g/day)	1.57	2.00	2.50	2.43	0.13
Absorbed-N (g/day)	3.32	3.72	4.09	4.38	1.01
Nitrogen balance (g/day/$wkg^{0.75}$)	0.31	0.39	0.48	0.46	0.02
Nitrogen Absorbed (g/day/$wkg^{0.75}$)	0.63	0.71	0.78	0.84	0.06
Apparent nitrogen digestibility (%)	56.59	51.59	51.59	50.84	1.39

[abc]means on the same row with different superscripts differ significantly ($p<0.05$), SEM = standard error of means

diets where diet A with the highest crude fibre percentage tended to have the highest crude fibre digestibility percentage. The N- free-extract digestibility values were 87.55, 88.16, 68.43 and 74.03% respectively for diets A, B, C and D. These values were significantly ($p<0.05$) different. The energy digestibility values were significantly ($p<0.05$) different and increased as the energy contents of the diets tended to decline (Table 2). This agrees with McDonald *et al.* (1995) who reported that energy digestibility is negatively correlated with energy intake.

The nitrogen balance and utilization by West African Dwarf goats are summarized in Table 4. The mean values (g/day) for dry matter intake tended to increase with increasing levels of poultry waste in the diets. This is in agreement with the reports of Alhassan (1985) and Ahamefule *et al.* (2001). The faecal nitrogen values were significantly ($p<0.05$) different. When nitrogen balance was expressed on metabolic weight basis, the result showed no significant ($p>0.05$) difference. These values show that the animals were all in positive nitrogen balance. Diet A gave the highest apparent nitrogen digestibility. This could probably be attributed to high rumen degradability of cassava peels (Smith, 1988; Ffoules *et al.*, 1978).

Conclusively, cassava peel and poultry waste could be effectively harnessed to provide cheap and sustainable feed for ruminants. Animal protein intake could be improved by the incorporation of poultry waste in concentrate diet for WAD goats in particular and ruminants in general.

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