Growth performance, nutrient intake and digestibility of goats fed melon husk and palm oil slurry at 30% inclusion level

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Abstract

A 126- day study was conducted to determine growth, nutrient intake and digestibility of West African Dwarf (WAD) goats fed melon husk (MH) and palm oil slurry (POS) as replacement for maize offal at 30% in concentrate diets. Sixteen goats weighing 6.5 – 7.0kg were randomly assigned to 4 dietary treatments at 4 replicates of each. Dietary treatments included control (Diet 1): 0% MH 0% POS; Diet 2: 30% MH 0% POS; Diet 3: 0% MH 30% POS; and Diet 4: 30% MH 30% POS; supplemented with Panicum maximum (grass). Data collected were statistically analysed and results showed that animals on control Diet (Diet 1) had the highest (P<0.05) average daily weight gain of 31.57g/day, and a corresponding highest (P<0.05) feed intake of 365. 97g/day and best feed conversion ratio of 11.59. Animals fed Diet 3 had lowest (P<0.05) average daily weight gain of 19.42g/day, with corresponding lowest (P<0.05) dry matter intake of 334.94g/day and poor feed conversion ratio of 17.24, respectively. Variations in dry matter, organic matter and crude fibre (CF) intake were significant (P<0.05). Crude protein (CP) intake decreased progressively from diet 1 to 4, but not significantly (P > 0.05). CF intake was highest in diet 4 (124.6g) and lowest in diet 1(64.72g). Ether extract (52.80g), Ash (21.48g), Neutral detergent fibre (222.88g), and lignin (60.64g) were highest in diet 4. Dry matter digestibility was highest in animals on diet 2 (86.31%) and lowest in those on diet 4 (72.28%). It was evident that goats could be fed MH and POS at the inclusion levels adopted in this study except at 30% POS inclusion level at which growth was poorest.

Keywords: Growth Performance, Nutrient Intake, Digestibility of Goats, Fed Melon Husk and Palm Oil Slurry

Introduction

Feeding accounts for nearly 70% of production cost in livestock enterprise, and has necessitated the need to search for alternative feed resources which are cheaper and of no dietary importance to man. Fetuga and Tewe (1985) categorized them as by-products. However, Alhassan (1985) also categorized these alternative feedstuffs into two. One is agro-industrial by-products, which are the residues from food manufacturing industries while the other is called crop residues and animal excreta, which could constitute farm wastes.

Cattle, sheep and goat population, estimated to be 58.11 million (FAO, 1997) contributes about 30% of the total meat consumed in Nigeria. They are sources of meat which helps to provide animal protein that is indispensable to a balanced human diet (Alimi, 1987). Goat meat also enjoys wide acceptability among the different socio-cultural groups because there is a lack of taboo against goat meat (Peacock, 1996). In the tropics, cattle, sheep and goat depend on crop residues which are extremely important feed resources for ruminant

Table 1: Ingredient composition of experimental diets

Ingredients	30% inclusion levels			
	1	2	3	4
Maize offal	44.50	31.15	31.15	17.80
Melon husk	-	13.35	-	13.35
Palm oil slurry	-	-	13.35	13.35
GNC	4.50	4.50	4.50	4.50
Wheat offal	30.00	30.00	30.00	30.00
PKC	19.00	19.00	19.00	19.00
Bone meal	1.50	1.50	1.50	1.50
Salt	0.50	0.50	0.50	0.50
Total	**100.00**	**100.00**	**100.00**	**100.00**
Calculated analysis				
Crude protein (%)	15.99	15.68	15.77	15.45
Crude fibre (%)	9.93	12.40	10.05	12.52
Ether extract (%)	3.70	5.84	5.69	7.83
Calcium (%)	1.03	1.15	1.14	1.27
Phosphorus (%)	0.52	0.55	0.57	0.59
M. E. (KJ/g)	2.31	2.31	2.24	2.24

MH = Melon husk; POS = Palm oil slurry; Diet 1 = 0% MH; 0% POS; Diet 2 = 30% MH; 0% POS; Diet 3 = 0% MH; 30% POS; Diet 4 = 30 % MH; 30% POS;

livestock especially in the dry season (Jackson, 1981). They reproduce very fast with tropical breeds producing twins and they are considered superior to other ruminant species in its utilization of poor quality, high fibre forages (Howe *et al.*, 1988 and Dominique *et al.*, 1991). They serve mainly as supplement to cash and food crop production, attracting a low labour input and low priority in comparison to traditional arable and cash crop farming (Oyenuga, 1967).

It has been suggested that emphasis should be placed on ruminant animal production that is capable of utilizing feed of low quality efficiently, converting them to high quality animal products.

Since the emphasis on the use of alternative feedstuff is to source for lesser known feeding stuff that can reduce the cost of production, this study was conducted to evaluate Melon husk (MH) and Palm oil slurry (POS) as alternative feed stuff incorporated as feed ingredients in goat fattening programme.

Materials and Methods

The feeding experiment was conducted at the small ruminant experimental unit of the Teaching and Research Farms, University of Agriculture, Abeokuta, and lasted for a period of 120 days.

Melon husks and palm oil slurry obtained from a farm were spread on a cemented floor for proper sun drying for a period of 30 days. The sun dried feed ingredients were later bagged and taken to the feed mill for milling.

Sixteen West African dwarf goats weighing between 6.5 7.0g were quarantined for 75 days (Goats were adjusted from extensive management to semi intensive and finally

Table 2: Performance indices of West African Dwarf goats fed experimental diets.

Parameters	30% inclusion levels				
	1	2	3	4	SEM
Average initial weight (kg)	6.70	6.40	7.80	6.17	0.33
Average final weight (kg)	10.50	9.00	10.13	9.17	0.38
Average daily weight gain (g/day)	31.57^{a}	21.66^{c}	19.42^{d}	25.0^{bc}	2.48
Average daily feed intake (g/day)	365.97^{a}	344.75^{b}	334.94^{c}	335.76^{c}	11.38
Average daily water intake (g/day)	453.14	575.86	501.95	481.67	32.94
Feed conversion ratio	11.59	15.91	17.24	13.43	1.56
Mortality	-	0.33	-	-	0.83

$^{a, b, c, d}$ means along the same row with different superscripts are significantly (P<0.05) different. SEM: Standard Error of Means.

Diet 1 = 0% MH; 0% POS; Diet 2 = 30% MH; 0% POS; Diet 3 = 0% MH; 30% POS; Diet 4 = 30 % MH; 30% POS;

MH = Melon husk, POS = Palm oil slurry.

to intensive management system) during which they were treated against ectoparasites by bathing them with Asuntol® and also against endoparasites by injecting them subcutaneously with Kepromec at the rate of 0.2ml/10kg body weight. Oxytetracycline (LA) antibiotic was also administered to them to help enhance their body resistance against infections such as respiratory, urinary tract infection, pneumonia etc. They were vaccinated against PPR (*Peste des Petit Ruminant*) with tissue cultured Rinderpest vaccine. During the period of quarantine, they were maintained on *Panicum maximum* (grass), concentrate diet and water was giving *ad libitum*.

After quarantine, the goats were transferred into individual experimental pens which had been disinfected with Morigad® solution. Experimental animals were divided into four treatment groups (each group having four animals per treatment) and each treatment balanced for body weight.

Diet 1 (control) which had maize offal as the main energy source contained 0% MH, 0% POS; Diet 2 contained 30% MH, 0%

Table 3: Nutrient intake (g/day) of West African dwarf goats fed experimental diets.

Parameters (g/day)	30% inclusion levels				
	1	2	3	4	SEM
Dry matter	311.46^{c}	355.57^{a}	343.06^{b}	358.41^{a}	8.59
Organic matter	312.57^{b}	320.02^{a}	311.04^{b}	324.84^{a}	1.90
Crude protein	50.77	49.82	47.52	44.23	1.95
Crude fibre	64.72^{c}	110.41^{b}	96.12^{c}	124.16^{a}	6.95
Ether extract	29.33	35.57	42.94	52.80	0.69
Ash	14.40	11.60	16.58	21.48	1.23
Neutral detergent fibre	183.70	205.92	164.0	222.88	6.57
Acid detergent fibre	111.61	113.72	105.73	120.48	3.74
Lignin	47.69	55.38	51.52	60.64	1.93

$^{a, b, c}$ Means along the same row with different superscripts are significantly (P<0.05) different SEM: Standard Error of Means

MH = Melon husk, POS = Palm oil slurry

Diet 1 = 0% MH; 0% POS; Diet 2 = 30% MH; 0% POS; Diet 3 = 0% MH; 30% POS; Diet 4 = 30 % MH; 30% POS

Table 4: Apparent nutrient digestibility (%) of the experimental diets fed to West African dwarf goats

Parameters (%)	30 % inclusion levels				
	1	2	3	4	SEM
Dry matter	84.54[a]	86.31[a]	78.74[b]	72.28[c]	1.70
Organic matter	86.64[a]	73.32[c]	79.86[b]	73.27[c]	1.75
Crude protein	76.36[a]	73.32[a]	64.28[b]	59.32[b]	2.25
Crude fibre	71.35[c]	76.36[b]	73.35[c]	81.32[a]	3.68
Ether extract	88.63[b]	87.21[b]	95.14[a]	75.75[c]	1.68
Ash	51.67[c]	38.15[d]	69.52[b]	95.06[a]	2.38
Neutral detergent fibre	75.13[b]	85.13[a]	84.57[a]	86.17[a]	1.39
Acid detergent fibre	78.15[ab]	78.89[ab]	66.45[b]	82.03[a]	2.02
Lignin	63.66[d]	75.82[b]	66.25[c]	78.21[a]	2.02

[a, b, c]: Means along the same row with different superscripts are significantly (P<0.05) different
SEM: Standard Error of Means
Diet 1 = 0% MH; 0% POS; Diet 2 = 30% MH; 0% POS; Diet 3 = 0% MH; 30% POS;
Diet 4 = 30 % MH; 30% POS;
MH = Melon husk, POS = Palm oil slurry.

OP; Diet 3 contained 0% MH, 30% OPS; while Diet 4 contained 30% MH, 30% OPS as shown in Table 1.

Feed intake, water intake and average body weight gain were all measured. At the end of each feeding trial, three goats from each dietary treatment were randomly selected and transferred into individual metabolic cage that had been previously disinfected with Morigad® solution to kill pathogenic micro-organisms.

The goats were given specific quantity of feed each for seven (7) days out of which the first three (3) days were for acclimatization. Total faecal collection per animal was weighed and then oven dried daily through out the period. Ten percent of the total faeces collected was thoroughly mixed and kept for chemical analysis.

Urine samples were collected daily per animal into urine bottles that had been washed with Tetraoxosulphate (VI) acid (10% H_2SO_4) to preserve the urine nitrogen and then weighed. All urine collected daily per animal was measured in volume and 25% of total sample taken were stored for chemical analysis. Both the urine and faecal samples were later analyzed to facilitate calculation for digestibility.

Chemical analyses

The proximate composition of feed, faecal samples and urine samples were determined using A.O.A.C, (1990) method of analysis. Fibre fractions such as Neutral detergent fibre (NDF), Acid detergent fibre (ADF) and Lignin (L) were also determined using Van Soest *et al.* (1991) method of analysis.

Statistical analyses

All the data generated in this study were subjected to one way analysis of variance in a completely randomized design using the statistical package (SPSS, 1999) while significant differences were separated using Duncan Multiple Range Test within the same package.

Results

The results on performance indices of West African Dwarf goats fed the experimental diet shown in Table 2 shows significant (P<0.05) differences in daily weight gain,

daily feed intake and water intake. Animals on diet 1had the values of 27.83g for daily weight gain, 403.33g for feed intake and 524.81g for water intake. The best feed conversion ratio of 14.49 was also recorded for animals on diet 1.However; animals on diet 3 were comparatively the lowest with daily weight gain of 17.17g, feed intake of 290.05g, water intake of 463.06g and the poorest feed conversion ratio of 16.90.

Significant ($P<0.05$) variations in dry matter, organic matter and crude fibre intake are shown in Table 3. CP intake decreased across the dietary treatments. Goats on diet 1 had the highest daily CP intake of 50.77 g while diet 4 had the lowest value of 44.23g. CF intake was highest in diet 4 (124.6g) and lowest in diet 1(64.72g). EE (52.80), Ash (21.48g), NDF (222.88g), and Lignin (60.64g) were highest in diet 4.

Differences in apparent nutrient digestibility were significant ($P<0.05$) as presented in Table 4. Dry matter digestibility was highest for animals on diet 2 (86.31%) and lowest for those on diet 4 (72.28%) while crude protein digestibility decreased across the treatments. Crude fibre digestibility did not follow any particular pattern, however, digestibility was highest in animals on diet 4 (81.32%) and lowest in animals on diets 1(71.35%). Apparent nutrient digestibility of ether extract was highest in animals on Diet 3 (95.14%) but lowest in animals on Diet 4 (75.75%). Ash digestibility was lowest for animals on diet 2 (38.15%) while animals on diet 4 had the highest Ash content value of 95.06%.

Discussion

Feed intake was observed to be highest in goats on the control diet 1, which may have contributed to the animals highest daily weight gain. This shows a better utilization of the feed by goats on this diet having also had the best feed conversion ratio when compared with goats on other diets as shown in table 1. This may be attributed to the low dietary CF and high dietary CP content which is believed to stimulate feed intake (Huston, *et al.*, 1988). Diet 4 which had the highest dietary CF content was better utilized by the goats for higher average daily weight gain and feed intake than animals on diet 3. This might have been influenced by the capability of the animals to utilise fibrous feed materials due to it's possession of a complex stomach, in which feed materials entering the rumen are rapidly colonized with bacteria and fungi which helps to facilitate the ready uptake by micro flora of the products released by enzymatic activity (Annison *et al.*, 2002). Taste related attribute known as palatability, whereby beyond nutritional composition, animals tends to consume more of palatable diet (Obioha, 1985; Ibeawuchi *et al.*, 2002), may have been another contributing factor.

Average daily water intake appeared to be higher with diets containing higher CF as observed. The observation of Fomukong (1997) agrees with the result of this study that dry matter intake was directly proportional to water intake in Yankasa sheep.

DM intake was observed not to be directly proportional to the percentage apparent digestibility as shown in tables 3 and 4. Animals on diets 1 and 2 having had the highest apparent digestibility might be attributed to the diet's low CF, NDF and Lignin intake. Although NDF and ADF digestibility were observed to be high in animals on diet 4, it did not give digestibility value proportional to its nutrient intake when compared with other diets. This finding is in agreement with the report of Kraiem *et al.* (1997) and Merchen *et al.* (1986) that both NDF and ADF

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