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CASSAVA-POULTRY DROPPING BLOCK: A FEED SUPPLEMENT FOR WEST AFRICAN DWARF SHEEP

M.A. Belewu* and A.A. Akinleye
Ruminant Nutrition and Dairy Science Laboratory, Department of Animal Production, University of Ilorin, Kwara State, Nigeria.

Target Audience: Local farmers, Livestock Researchers and Animal Nutritionists

ABSTRACT

Feed blocks containing 45% of molasses (A) or cassava wastes (rind, peels, small tubers and some pulp) in substitution of 60(B), 80(C) or 100%(D) of molasses were offered as supplement to 16 West African dwarf sheep (16±2.5kg initial, BW) fed *ad libitum* on *Panicum maximum* hay during a 10- week period. Feed intake, digestibility and growth performance were studied in a completely randomized experimental design. All the urea and 40% of the palm kernel meal contained in the control molasses block (10 and 25%) were also replaced by caged layer droppings and shea butter cake in the cassava containing blocks (B, C and D). Each block was replicated twice with two animals per replicate. DM intake averaged 92, 228, 230 and 235g/d for animals on blocks containing 0, 60, 80 and 100% cassava wastes. The energy intake rose ($p<0.05$) with cassava substitution and was similar among cassava based blocks. The apparent digestibility of DM increased ($p<0.05$) from 54 to 67% while the apparent digestibility of CP was greater ($p<0.05$) for blocks B-D than for A (78, 84, 77 and 67% respectively). Mean body weight changes average –10, 57. 1, 60.5 and 87.2g/d for sheep fed blocks, A,B,C and D respectively, while the feed: gain ratio was highest for block D. Physical evaluation of blocks B, C and D compared favourably with block A while cost analysis revealed that block D was the most profitable as regards cost of the feed per Kg weight gain.

The results emphasized the need to substitute cassava wastes, caged layer droppings and shea butter cake for molasses and urea respectively in a situation where availability and method of utilization of molasses and urea are of vital consideration.

Key words: Cassava wastes, Caged layer droppings, West African Dwarf sheep, Digestibility, growth rate

DESCRIPTION OF PROBLEM

The shortage of good quality feed needed to sustain livestock growth especially during the dry season has been a perennial problem. The problem could be solved by using unconventional sources of protein and energy in the concentrate mixture

*** Author for correspondence**

given to animals. Examples of such feed-stuff include cassava wastes. poultry dropping and shea-butter cake.

Information on the utilization of cassava wastes (rinds. small tubers. some pulp) as energy source in livestock nutrition is well elucidated in literature. (1.2.3). Caged layer droppings contain useful nutrients (such as NPN. ammonia. Urea and allantoin) and can equally supply non-protein nitrogen. The crude protein content of caged layer droppings varied from 25-28% (4) and can be utilized at a level comparable to that of conventional protein feedstuff. One problem hindering the use of caged layer dropping in livestock ration is (its high content) of ammonia that may impair smell or palatability. However. ammonia is a vital source of nitrogen in caged layer droppings (5). A variety of methods have been used to prevent or eliminate the noxious gas. These include frequent removal of wastes. ventilation techniques. submerging wastes under water. both aerobically and anaerobically. physical treatment with chemicals. principally. lime. super-phosphate. enzymes and masking elements (4). Fontenot and Jurubescu (5) suggested that mixing of broiler litter with condensed tannins (6) helps in binding the ammonia while the ammonia in turn deactivates the condenses tannin (6). A very good source of tannin in Nigeria is the shea-butter cake. It contains fat. crude fibre. crude protein (7). Tannin is a excellent carrier of ammonia source. the association provides nitrogen to complement the easily fermentable carbohydrate supplied by cassava wastes.

As at present. work done on feed block in Nigeria was limited only to its proximate composition and substitution. the present study aims to evaluate the physical and nutritional (feed intake and digestibility) characteristics of Cassava-Poultry dropping blocks as dry season survival feed for West African dwarf sheep.

MATERIALS AND METHOD

Feed Blocks

Three feed blocks containing cassava wastes and caged layer dropping were compared with a control block made up of molasses. palm kernel meal and urea (Block A). Cassava wastes were incorporated by replacing 60 (Block B). 80 (Block C) or 100% of molasses (Block D). while poultry droppings together with a small proportion of shea-butter cake replaced the urea and 40% of the palm kernel meal as shown in Table 1. Blocks were manufactured a described in the following four stages.

(a) Preparation of component

Cassava wastes (rind. peels. small tubers and some pulp) was collected from the Gari processing centers around Ilorin. Kwara State. Nigeria. It was sun-dried for 1 week and later milled. Caged layer droppings was collected daily from the poultry house and mixed thoroughly with shea-butter cake which had been previously spread underneath the cage so as to prevent the volatilization of ammonia present in the fresh droppings.

(b) Mixing

The order of mixing was as described by Sansoucy (8). Except the control block (A). other blocks (B. C. and D) were prepared by mixing shea butter cake with poultry droppings while other ingredients were added by sprinkling lightly and uniformly over it in the ratio indicated in Table 1. The control block (A) was prepared by weighing the molasses first while other ingredients were added as shown in Table 1. Cement. which has been pre-wetted with water.

was added and mixed thoroughly as a binder to accelerate hardening. Proper mixing and stirring of the ingredients were ensured for homogeneity by using a modified concrete mixer.

Table 1: Composition of feed blocks for West African dwarf sheep

Blocks	A	B	C	D
% of molasses replaced by cassava wastes	0	60	80	100
Ingredients				
Molasses	45	18	9	-
Urea	10	-	-	-
Cassava wastes	-	27	36	45
Shea butter cake	-	2	2	2
Caged layer dropping	-	23	23	23
Palm Kernel meal	25	15	15	15
Vitamin premix*	1	1	1	1
Cement	15	10	10	10
Salt	4	4	4	4
Total	100	100	100	100

* Containing per Kg Vit. A, 10,000iu; Vit D3. 1500,000iu; Vit E. 300iu; Vit K3. 300g; VitB2. 250g; Nicotic acid, 8.00g; Calcium D-Panthothenate. 30g; Vit.B6. 0.03g; Vit. B12. 800mg; Mn. 10,000g; Fe. 5.00g; Zn. 4.50g; Cu. 0.20g; Iodine. 0.15g; Co. 0.02g and selenium. 0.01g.

(c) Moulding:

Wooden moulds similar to those described by Sansoucy (8) but measuring 1.5×1.0m were used. The mixture was well compresed by hand in the modified moulds lined with cellophane while a density of 1.25 was maintained (8). The mass was cut the next morning with a spade into blocks of size 25cm × 15cm × 20cm (7500 cm^3).

(d) Drying:

The pastes in the wooden moulds were sun-dried for between 7 and 28 days during which the blocks were turned for proper drying. The locks were well dried and later removed from the wooden moulds while hardness of the blocks were tested by using penetrometer.

Animals And Management

A total of sixteen West African dwarf sheep (16±2.5kg mean body weight` were used in an experiment replicated twice with 2 animals per replicate. The sixteen sheep kept in individual pens (1.8×1.0×1.2m) were randomly assigned to four groups and each group offered one of the four feed blocks (A,B,C and D) as supplement to a basal diet of chopped (8-15cm) *Panicum maximum* hay fed *ad libitum*. Each block was sawed to a size of 600g weight and offered to the animals per day separately but simultaneously to the hay for a 10 week period. Intake was calculated by weighing the orts from each pen every morning before fresh blocks were offered. The animals were weighed at the start of the experiment and at weekly intervals. Blood samples were collected from each animal into sterilized containers twice weekly, before and at hourly intervals during feeding to study the urea nitrogen content of the blood. About 5mls of whole blood collected into 10ml plastic test tube was allowed to clot and spun at 2000rpm for 5 minutes. The supernatant was removed with the help of a Pasteurpipette and transferred into bijou bottle. which was covered and taken to the laboratory for urea-N determination.

At the end of the growth study. animal were moved to metabolic creates provided with faeces and urine collection trays. Faeces was collected for 7 days period after an adjustment to the diets for 14 days. Faeces were collected before the morning feeding and dried at 80^0C for 24 hours. The dried faeces for each animal was bulked and milled to pass through a 1mm sieve.

The nutrient intake and digestibility for the blocks and hay was partitioned by the equation of Crampton and Lloyd (9).

Chemical Analysis

Dry matter and proximate composition of the blocks. hay and orts were analysed by A.O.A.C. (10) method while acid detergent fibre (ADF). neutral detergent fibre (NDF) and lignin were determined by the analytical procedure of Goering and Van-Soest (11). The NPN content of the ingredients (urea and caged layer droppings) was used in the calculation of the NPN content of each block. The urea nitrogen content of the blood was determined by the method of Conway (12).

Statistical Analysis

Data were analysed using completely randomized design model while treatment means were separated using the multiple range test of Duncan (13). Correlation and covariance analyses were used for some interrelationships.

RESULTS AND DISCUSSION

Physical Characteristics Of The Blocks

The colour of the moulded blocks varied from dark brown to whitish brown as the molasses were replaced by cassava waste. The hardness of the blocks was enhanced by the addition of palm kernel meal. cement and salt (8) and the block was ready for transportation within three weeks after drying due probably to the season of manufacturing (early dry season). Blocks made from only cassava waste and caged layer droppings were recorded to have lower penetromater value of resistance 3.6kg/cm^2 compared to 5.6kg/cm^2 of the molasses-urea block (A). The weight of the block after drying varied and the loss in weight could be due to the presence of various ingredients used. Water retention. however. increased with cassava wastes substitution. The keeping quality of the block was examined by wrapping in a cellophane paper and kept in a cardboard box or small cardboard box alone. However. the sample wrapped in cellophane paper and kept in s cardboard box gave the best result and could be stored up to one year without moulding.

Nutritional Quality

The proximate composition and fibre fraction of the blocks are shown in Table 2. The non-protein content (4.6%) of the cassava. Poultry droppings blocks compared with the molasses-urea blocks suggests that shea-butter cake in the diet was able to trap the ammonia from the poultry droppings avoiding nitrogen losses. The energy density of the blocks increased linearly as molasses was replaced by cassava wastes.

Table 2: Proximate composition and physical characteristics of blocks and *Panicum maximum* hay

Nutrients	BLOCKS A	B	C	D	P. maximum
DM (%)	92.6	65.4	56.4	57.2	92.8
% of DM					
Crude Protein	36.5	17.6	17.3	14.5	6.1
Crude fibre	10.3	15.3	20.4	23.5	32.2
Ether extract	1.6	3.1	4.4	5.2	1.7
Nitrogen free Extract	19.4	43.0	36.5	32.8	48.8
Gross Energy (M.cal/kg Dm[a])	3.5	3.8	3.8	3.7	3.9
NPN (calculated)	4.6	4.6	4.6	4.6	
ADF	18.1	24.5	25.3	25.8	35.1
NDF	20.5	28.7	30.1	31.6	66.7
Cellulose	10.4	14.1	15.5	16.5	28.4
Lignin	4.1	6.2	6.99	7.7	5.7
Hemicellulose	2.5	4.3	4.8	5.8	31.5
Holocellulose	12.9	98	10.7	10.8	59.9
Physical characteristics of block					
Color	Dark brown	Chocolate brown	Light brown	Whitish brown	
Hardness (Kg/cm^2)	5.6	4.2	4.0	3.6	
Drying time (days)	7	28	24	21	
Storability (years)	1	1	1	1	
Density	1.25	1.25	1.25	1.25	
Cost of block Kg (US$)	0.27	0.13	0.11	0.08	

[a]Calculated from the proximate composition.

Table 3 shows the growth rate and nutrient intake of the blocks, hay and total ration by the experimental animals. There was no palatability problem although dry matter intake increased (P>0.05) similarly by cassava-poultry dropping supplementation. The increased consumption could be due probably to the lower blocks hardness. The consumption of to hay due to the blocks which are similar (P>0.05) could partty be due to the associative effect of the ration (since the dropping contained UGF, uric acid and amino acids) which supplies nutrients required by the rumen microbes for effective activity (14). The total protein and digestible protein intake of the blocks is adequate for animals of this age (15).

Table 3: Growth rate and nutrient intake of blocks and hay by West African dwarf Sheep

	BLOCKS					
Parameters (g/d)	A	B	C	D	±SE	Levels of significance
Weight gained (g/d)	-10^a	57.1^b	60.5^b	87.3^c	±4.9*	P<0.05
Dry matter intake						
Blocks	92.6^a	228.2^b	230.1^b	235.3^c	±0.07*±	P<0.01
Hay	595.8	484.4	623.6	623.6	36.8N±	P>0.05
Total	688.4	712.6	853.7	858.7	38.1NS	P>0.05
Crude protein intake						
Blocks	33.8	40.1	39.8	34.2	±3.9NS	P>0.05
Hay	36.5	29.7	38.2	38.2	±3.3NS	P>0.05
Total	70.3	69.8	78.0	72.4	±2.5NS	P>0.05
Feed gain	-	12.5^b	14.1^b	9.8c	±1.8	

A.b.c: Means in a row with no common superscript differ (P<0.05) significantly.
NS. Not significant

Comparison of block intake in this study with the literature in which molasses-urea block was fed indicate that block intake in this study agrees with recommendation of Sansoucy (8) for sheep of this age. However, the block imtake recorded in this study was higher than 18g/lab/day reported by (16) when 20% urea was included in the block. Animals on block A had live-weight losses (g/day) while supplementation with cassava containing block allowed significant (P<0.05) weight gains. The best response was for animal on block D. This block was also more efficiently utilized than the rest as suggested by the feed: gain ration.

The consumption of blocks was determined by covariance analysis. The consumption response curve for the different groups receiving block A. B. C and D showed a common slope in all cases while the regression equation of adjusted means for blocks A. B. C and D are given below:

Block A: $Y = -0.025x+1.90$ ($r^2 = 35$)
Block B: $Y = 0.025x+9.41$ ($r^2 = 38$)
Block C: $Y = -0.025x+2.44$ ($r^2 = 40$)
Block D: $Y = -0.025x+9.17$ ($r^2 = 45$)

Such commonality of slope revealed variation in the intercept and the adjusted means that resulted in significant differences (p<0.05) among the blocks consumed.

The r^2 value (%) for each of the fitted regression were 35. 38. 40 and 45 respectively. They appeared to be good predictor of the consumption. Of the rate of change in the consumption due to the blocks. that for block D was a maximum.

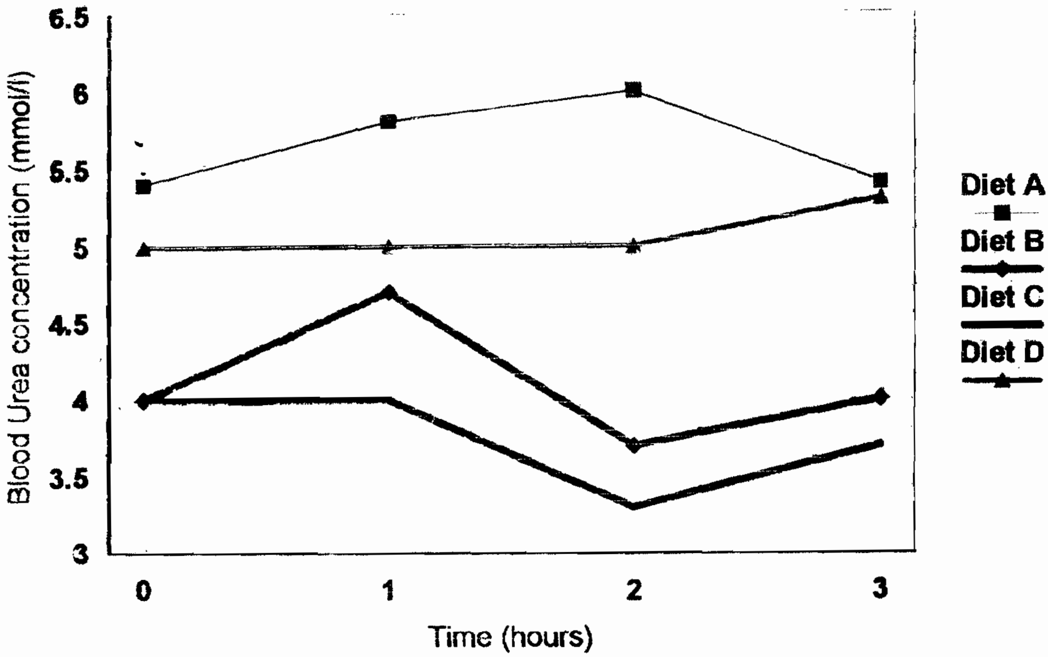
The digestibility of hay dry matter and other parameters increased from 74.8-86.9% when an average of 196g/d of block dry matter was consumed. Apparent digestibility of all constituents was increased (P<0.05) by treatment: whereas. digestibility of all constituents of hay did not differ from that of control (Table 4). Cassava-poultry dropping supplementation increased dry matter digestibility over control diet. but differences between cassava containing blocks (B-D) were small. Apparent digestibility of crude protein showed a consistent change with poultry droppings and low crude protein digestibility was recorded for block A. The poor digestibility of this could probably be due to the absence of sulphur containing amino-acids which are needed by the microbes in the reticulo-rumen to help in converting NPN into microbial protein (4).

Table 4: Digestibility of the experimental diets

Parameters (%)	BLOCKS (% Cassava waste) A	B	C	D	±SE	Levels of significance
Dry matter						
Blocks	53.9	58.5	66.7	60.9	±3.3NS	P>0.05
Hay	76.9	86.9	74.8	80.6	±4.3NS	P>0.05
Total	64.1a	76.3b	82.0b	75.2b	±4.9**	P<0.01
Crude protein						
Blocks	66.8a	78.1b	83.6b	76.8b	±0.07**	P<0.05
Hay	12.1	37.2	28.2	37.6	±36.8NS	P>0.05
Total	39.7	38.8	52.3	84.9	±38.1NS	P>0.05
Crude fiber						
Blocks hay	10.2	30.7	20.1	25.9	±2.1	P>0.05
Hay	47.9	58.7	48.5	61.1	±2.9NS	P>0.05
Total	88.4	522	61.0	50.4	±4.8*	P<0.05
Ether extract						
Blocks	65.5a	73.1a	73.8a	55.3b	±3.8*	P<0.05
Hay	65.3	66.6	62.2	67.7	±3.2NS	P>0.05
Total	85.6	70.2	64.8	59.6	±4.7NS	

Means within a row with no common superscript differ: (*P<0.05: **P<0.05).NS. Not significant.

Average blood urea concentration are shown in Fig.1. The increased blood-urea concentration in block A suggests higher losses of ammonia from the rumen when urea instead of poultry droppings was used as N source. This agrees with the reports of Dinning *et al.* (17) and Repp *et al.* (18) that the administration of NPN compound to ruminant gives an increased blood-urea concentration and it may be possible to use its concentration as guide in assessing the value of a protein to a ruminant (19). Feed cost of gain (US feed/kg) was 1.90. 1.54 and 1.18 for blocks B. C and D respectively while that of A was poor. The relative cost of the cassava containing blocks was on average 71.7% over the control. Saving on cost of



Blood Urea concentration (mmol/l) in Sheep at hourly intervals

feed per kg of gain with block D was even cheaper than the production cost reported by Onwuka and Olatunji (20). The total gain revenue was highest for block D (US $12.2) followed by C (8.5) and B (8.0) while losses was reported for A

CONCLUSION AND APPLICATION

1. Based on these results, it is concluded that the use of cassava-poultry dropping blocks (as supplement to local roughages) will have great application where livestock farming is the major agricultural activity and where livestock economy is constrained by prolonged dry season.
2. Maintenance of livestock, improved digestibility and better animal performance is possible by feeding cassava-poultry droppings since none of the ingredient is consumed by man.

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