THE MAIZE REPLACEMENT VALUE OF FERMENTED CASSAVA PEELS (*MANIHOT UTILISSMA* POHL) IN RATIONS FOR SHEEP

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12 female and 12 castrate male sheep were allocated to ration. containing dried fermented cassava peels at 0,20, 40 and 60% over a 6 month period to determine the optimum level at which maize could be replaced without any effect on digestibility of rations and liveweight performance. Carcass-and economic characteristics were determined.

40 and 60% fermented cassava peels significantly depressed digestibility of dry matter, crude protein, crude fibre and TDN, feed intake, body weight gain, efficiency of food utilization, pluck and head weights but had no significant effect on the weights of liver and hides. Increases in fermented cassava peels in test rations produced greater economic benefits. Fermented cassava peels had a fattening effect on sheep.

Key words: Cassava, sheep, maize replacement

Inadequate supply and prohibitive prices of cereal grains particularly corn have led animal nutritionists to search for cheaper alternative sources of energy to feed livestock. In recent times, cassava or tapioca meal has been extensively used as a replacement ingredient to corn (Adeyanju 1979; Job 1975; Obioho 1975; Phillips 1974; Temperton et al 1941; Tewe 1975). Cassava is widely recognised as a cheap source of food energy on the basis of some agronomic and economic advantages which the crop enjoys over grain crops. These include high dry matter and energy yields/hectare, low production cost and relatively low susceptibility to insect and pest attacks (Oyenuga 1968).

During the preparation of cassava tubers for human consumption, a considerable amount of the peel' broken tubers and leaves is discarded. Little research effort has been directed to the possibility of using these wastes as feeding-stuff for ruminants. in the tropics. The objective of this study was to determine the optimum level to which cassava peels could be incorporated in rations for sheep.

Materials and Methods

Recently, Texaco Agro-Industrial (Nigeria) Ltd. established a cassava processing industry at Opeji, Abeokuta, Nigeria. A large quantity of cassava peels, broken tubers and leaves are daily discarded as waste. The peels and broken tubers are mechanically fermented, dried, ground and bagged as livestock feeds, by a process quite similar to the traditional one described by Adeyanju (1979). The leaves are cut, chopped, ground, sun-dried and bagged. Both the dried fermented peels and the dried leaves obtained from the above mentioned industry were used for mixing the experimental rations.

Twenty four 12-week old West African Dwarf sheep comprising of 12 castrate males and 12 female lambs with an average initial body weight of 14.92 kg were divided into four groups of six according to sex and body weight. The experimental rations (Table 1) were allotted randomly to the four groups of growing sheep which were fed ad libitum for a period of 180 days, during which all animals had free access to water.

Table 1:

Composition of experimental diets (air-dry basis)

	Levels of fermented cassava peels (%) [1]			
	0	20	40	60
Ingredients (%)				
Maize	60.0	40.0	20.0	0.0
Fermented cassava peels	0.0	20.0	40.0	60.0
Groundnut cake	10.0	10.0	10.0	10.0
Brewers' dried grains	20.0	20.0	20.0	20.0
Dried cassava leaves [2]	4.0	4.0	4.0	4.0
Dicalcium phosphate	3.0	3.0	3.0	3.0
Bone meal	2.0	2.0	2.0	2.0
Salt	0.5	0.5	0.5	0.5
Vitamins and minerals [3]	0.5	0.5	0.5	0.5
Total	100.0	100.0	100.0	100.0

[1] Contained on air-dry basis 82.4% dry matter (DM), 6.8% crude protein (CP), 10.5% crude fibre (CF), 0.7% ether extract (EE), 7.9% ash, 74.1% nitrogen free extract (NFE), 53.8 mg/kg Free HCN and 122.2 mg/kg Total HCN (all as %DM),

[2] Contained 92.3% DM, 24.6% CP, 19.7% CF, 10.7% EE, 16.8% ash and 28.2% NFE, (all as %DM),

[3] Obtained from Pfizer Livestock Feeds Co., Lagos, Nigeria

Spraying weekly with acaricide against tick infestation, and deworming with thiabendazole every three months were part of the management procedures practised during the six month experimental period. Records of group feed intake and individual body weight changes were kept on a weekly basis. During the last three weeks, two castrate males were withdrawn from each treatment group and placed in metabolism cages for a digestibility study. They were each offered daily 90% of the average daily feed intake of their respective treatment groups in the week prior to the metabolism trial, and given free access to water. Any refused feed was weighed daily before the days rations was put in the feeder. After initial adjustment of 14 days days in the metabolism cages, faeces were collected daily from each animal for 7 days. The faecal samples were pooled into a three day and a four day composite sample for chemical analysis. Samples of the refused feed, experimental rations and faeces drawn from the composite samples of each, were then analysed for chemical composition.

At the end of the study, the castrate males from each group were starved for 24 hours but water was provided. They were then weighed individually to obtain the final body weight and then slaughtered for carcass evaluation. Prevailing market prices for feed ingredients and of goats were used to calculate feed costs and estimate gross income.

Analytical procedure: The AOAC method was used for the determination of the chemical composition of the experimental diets. All data were subjected to analysis of variance and significant mean differences were tested by the Duncan's New Multiple Range Test (Steel and Torrie 1960).

Results and Discussion

Digestibility of experimental rations: The chemical composition of the rations is shown in Table 2.

Table 2:
Chemical composition of experimental diets

Feed component	Levels of fermented cassava peels (%)			
	0	20	40	60
Dry matter (%)	88.2	89.5	90.2	87.5
Compositon of DM (%)				
Crude protein	17.2	16.6	16.2	15.8
Ether extract	4.4	4.4	4.4	3.8
Crude fibre	6.2	7.5	7.5	10.6
Ash	5.6	5.5	5.5	6.7
Nitrogen-free extracts	66.6	66.0	64.3	63.0

Digestibility (Table 3) shows a consistent decrease in terms of dry matter, crude protein, crude fibre, nitrogen-free extract (NFE) and total digestible nutrients (TDN) as cassava peels in the ration increase. Rations containing 40% peels and above were significantly ($P< 0.05$) inferior to others as indicated by the digestibility coefficients obtained for the crude protein, crude fibre and TDN. The digestibility coefficients obtained in this study were much higher than those obtained by Fawole (1980). Perhaps the inclusion of cassava leaves in this study might have improved the digestibility of the peels. Eggum (1970) and Oyenuga (1968) observed that cassava leaves are well relished by all classes of livestock in Nigeria, form a valuable source of livestock feeding stuff and are capable of serving as a protein supplement for ruminants.

Table 3:
Digestibility of the experimental diets (%)

Feed components	Levels of fermented cassava peels (%)			
	0	20	40	60
Dry matter	83.6 a	80.3 a	75.5 b	64.3 c
Crude protein	89.2 a	82.5 b	68.1 c	62.3 d
Crude fibre	70.2 a	62.1 b	53.3 c	50.3 c
Ether extract	88.5	89.2	87.2	87.1
Nitrogen-free extract	90.2 a	90.5 a	86.5 ab	75.5 b
Total digestible nutrients	83.7 a	82.7 a	75.0 b	66.1 b

a,b,c. Different letters in the same row are significantly different ($P < 0.05$).

Growth response: The observation on the performance of the animals, (Table 4) show that feed intake was depressed significantly ($P < 0.05$) in diets containing 40 and 60%

Table 4:
Growth, feed intake and economic perfomance of sheep fed fermented cassava peels diets

Parameters	Levels of fermented cassava peels (%)			
	0	20	40	60
No. of sheep	6	6	6	6
Initial body weight, kg	14.9	14.6	15.0	15.2
Final body weight, kg	26.9 a	25.4 a	21.9 b	20.7 b
Body weight gain, kg	12.0 a	10.8 a	6.9 bc	5.5 c
Feed intake, kg	89.2 a	83.6 ab	75.2 b	64.7 c
Feed/kg body weight gain, kg	7.42 b	7.77 b	10.94 a	11.80 a
Total feed cost (₦)[1]	19.62 a	14.20 b	10.53 c	7.11 d
Gross revenue (₦)	40.32 a	38.04 ab	34.28 bc	31.65 c
Revenue less feed cost (N)	20.70 b	23.84 ab	23.75 ab	24.54 a
Returns index [2]	100	115	115	119

[1] Naira, the Nigerian currency in which ₦1.00 = $US 1.74
[2] Taking the revenue less feed cost for the control diet as 100
a,b,c : different letters within the same row are significantly different ($P < 0.05$).

fermented cassava peels but non significantly in the 20% diet when compared with control ration (0% cassava peels) There was also a similar depression in the final body weight and average body weight gain. The 20% diet was utilized to the same extent as the control diet and both were significantly better (P< 0.05) than the other levels.

Although the utilization of the cassava peels might have been improved by the inclusion of the leaves, the general depression in growth rate, feed intake and utilization particularly on levels 4()% and 60% have been reported by other workers (Adeyanju and Pido 1978; Fawole 1980; Penuliar, 1940; Sowardi et al 1975). Adeyanju and Pido (1978) working with broilers reported that increasing levels of cassava peel resulted in reduced feed intake, poor feed efficiency and slower growth rate when compared with corn,and similar observations have been made in growing chicks (Fawole, 1980) and pigs (Penuliar 1940). In heifers fed rations supplemented with cassava meal (Sowardi et al 1975), rumen ammonia levels and weight gains were lower when compared with those fed corn supplemented rations, The reduced growth rate might also be due to reduced feed intake, poor digestibility and decreased efficiency of feed utilization as the level of fermented cassava peel increased.

Economic performance: Significant reduction (P< 0.05) in cost/kg feed was observed as the level of fermented cassava peels increased in diets (Table 4). It was also observed that gross revenue decreased significantly (P< 0.05) while revenue less feed cost and return index increased with increase in the inclusion of cassava peels in rations. The 60% level produced significantly (P< 0.05) the highest revenue less feed cost and return index. However there were no significant differences between the values obtained for the control and 20% level. Although there was a decline in the estimated gross revenue, due to depression in growth rate as cassava peels in rations increase, increases in return index indicate greater profitability or economic benefit with increase in the corn replacement level of cassava peels. Similar economic benefit in reduced feeding cost from feeding cassava refuse meal and fermented cassava peels diets have also been reported by Adeyanju and Pido, (1978) and Tabayoyong, (1935).

Carcass and organs characteristics: Carcass and organs characteristics (Table 5) indicate non-significant differences in carcass length and dressing out percentages. In contrast, hides, kidney plus pelvic fat and heart became significantly heavier (P< 0.05) as cassava peels in diets increase. The peels have no significant effect on the liver but the control diet produced significantly (P<0.05) larger head and pluck than the test diets. Vogt (1966) noted that hearts from chickens fed diets containing more than 20% fermented cassava meal were significantly larger than those fed the control diet. This study has shown that cassava peels have a fattening effect on sheep. Adeyanju and Pido (1978) made the same observation when cassava peel-based rations were fed to broilers.

Finally, although this study has shown that cassava peels could replace corn W/W up to 60% in rations for sheep with increases in economic benefit, the best level seems to lie between 20% and 40% levels. A further study is still required to highlight the extent to which cassava leaves have improved the efficiency of utilization of the cassava peel-based diets.

Table 5:
Carcass and organ characteristics of sheep fed fermented cassava diets

Carcass characteristics	Levels of fermented cassava peels (%) 0	20	40	60
Slaughter weight, kg	23.4	23.8	23.4	23.2
Carcass length, cm	78.0	77.1	73.6	71.2
Dressing out %	47.6	48.1	45.2	45.3
[1]Hides	10.5 ab	9.2 a	11.2 b	11.0 b
[1]Liver	1.68	1.74	1.73	1.89
[1]Kidney and pelvic fat	1.82 a	1.86 a	2.03 b	2.16 b
[1]Pluck	5.22 a	4.64 b	4.69 b	4.32 b
[1]Head	9.08	7.92 abc	8.20 ab	7.40 c
[1]Heart	0.42	0.51 b	0.62 a	0.60 a

[1] Calculated as % of empty body weight

a,b,c.Different letters within the same row are significantly different ($P < 0.05$).

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