The Effect of Soaked Cassava Peels on Weanling Rabbits

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Abstract

The effects of using milled sun-dried cassava peels soaked in water to substitute maize in the diet of mixed breed (Californian x Dutch) weanling rabbits averaging 831 g in body weight were examined in an 8 - week experiment. One of four portions of fresh cassava peels was sun-dried immediately after collection while one of each of the remaining 3 was soaked in basin of water for 1, 3, and 5 hrs before sun-drying. Each portion of the milled peels replaced maize in control diet (MD) at 20% level to give diets UD, S_1D, S_3D and S_5D, respectively. Soaking of peels stimulated a progressive reduction in HCN from 24 to 10.33 mg/kg CPM. Daily BWG, feed intake, FCR and water intake per rabbit were not significantly affected ($p > 0.05$) by water-soaking cassava peels. Dressing percentage and relative weights of heart, liver, kidney, stomach, intestine and caecum were also not significantly different ($p > 0.05$) among treatments. The performance of the S_1D fed rabbit was comparatively better than for the control group, while in terms of economics of production all the cassava peel meal diets proved to be more cost effective than the maize-based diet. Cassava peel meal based diets were more cost effective than the control diet.

Key Words: Rabbits, water-soaked cassava peels, performance, carcass quality.

Introduction

ie inadequacy in food supply in Africa ıds to be more serious with protein ficiency when compared to the ilability of calories. Shortage of oteins, particularly those of animal origin is prevalent in most African countries and it is estimated that on average 10% animal protein is consumed per head compared to a recommended intake of 35g (FAO, 1986). Emphasis is being placed on proteins of animal origin (meat, milk, egg and fish) because of its higher biological value than that of plant or cereal origin. The success of animal production requires adequate supplies of feed. The use of grass for feeding livestock when direct human needs have not been met raises economic and moral questions. Therefore the search for alternatives to grains in rabbit and other livestock species has been intensified.

Cassava (*Manihot utilissama*) one of the most productive tropical crops has been widely recognised as a cheap caloric source (Sonaiya and Omole, 1977; Tewe and Egbunike, 1988). The peel obtained from it is about 10-20% of the root and is available all year round in Nigeria with an annual yield of approximately 4 million metric tonnes during the processing of cassava roots (Hahn and Keyser, 1985). The utilization of this peel in livestock feeding would therefore help to solve the problem of its disposal as a waste product and also to reduce the cost of livestock production. Some limitations are associated with the utilisation of cassava products and by-products by farm animals, one of such is the presence of hydrocyanic acid (HCN). Hydrocyanic acid is responsible for chronic toxicity when inadequately processed cassava products are consumed by humans and livestock for prolonged periods. Therefore processing procedures must aim at reducing cyanide. The present study is part of on-going research efforts aimed at (i) evolving simple and cheap but effective cassava peel processing methods and (ii) determining safe level of dietary inclusion of cassava peel meal obtained from sun-dried water-soaked peels, from effect on growth when fed to weanling rabbits.

Materials and Methods

Fresh cassava peels sufficient to last for the duration of feeding trial were collected from one of the cassava processing cottage industry in Makurdi. They were divided into four equal portions. One portion was sun-dried immediately whereas each of the remaining three were soaked in basin of water for 1, 3 and 5 hrs before they were ground into cassava peel meal (CPM). Each CPM was substituted for maize in the control diet (MD) on weight basis at 20% level. The CPM based diets obtained from the peels and immediately sun-dried and peels soaked for 1,3 and 5 hrs before sun-drying were designated UD, S_1D, S_3D and S_5D, respectively (**Table 1**). Seven weeks old mixed breed rabbits (California x Dutch) with an

Table 1. Composition of experimental diets (%)

INGREDIENTS	MD	UD	S_1D	S_3D	S_5D
Maize	36.00	16.00	16.00	16.00	16.00
CPM	-	20.00	20.00	20.00	20.00
Full-fat soybean meal	29.00	32.00	32.00	32.00	32.00
Rice Bran	31.95	28.95	28.95	28.95	28.95
Bone Meal	2.50	0.30	2.50	2.50	2.50
Salt	0.30	2.50	0.30	0.30	0.30
Vitamin-mineral premix[1]	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00

[1]Vitamin- mineral premix supplied the following per kg diet: Vit A 2mg, Riboflavin 12 IU, Vit B, 48mg, lysine 24mg, methionine 50mg, chloride 600mg, manganese 120mg, iron 180 mg, copper 10mg, iodine 2.2mg, selenium 0.2mg, antioxidant 250mg.

average weight of 831g obtained from a reputable rabbit breeder were used for the study. The experimental animals were housed in outdoor hutches in the University of Agriculture, Makurdi Research farm because of the harsh weather conditions in the experimental environment. Rabbits were weighed individually and randomly distributed among the five diet groups such that 15 rabbits were in replicates in dietary treatment. The feeding trial lasted for 8 weeks after a 2-week preliminary feeding trial. Provision of feed and water was *ad libitum*. Rabbits were singly weighed at the beginning of the trial and thereafter weekly just before serving fresh feed and water in the morning to determine their live body weight (LBW). A weekly record of feed intake and feed conversion ratio (FCR) of individual rabbit was kept. Daily water intake per animal was determined, taking into consideration the evaporative loss. The economic implication of using the CPM based diets was evaluated. Representative samples of CPM and diets were analysed for their chemical constituents using the method of Association of Official Analytical Chemists (A.O.A.C.,1984). At the termination of the experiment, rabbits were fasted overnight and the pre-slaughter weight taken. They were thereafter bled and dressed. The dressing percentage was calculated while the weights of major organs and some components of the gastro-intestinal tract were taken using a sensitive weighing balance. Data collected were subjected to analyses of variance (Steel and Torrie, 1980).

Table 2. Proximate composition of CPM and experimental diets (% dry matter)

NUTRIENTS	CPM			
	U	S_1	S_3	S_5
Dry matter (DM)	86.30	86.36	86.57	86.60
Crude protein (CP)	6.30	6.54	6.65	6.70
Crude fibre (CF)	20.22	20.15	20.10	19.98
Ether extract (EE)	2.32	2.32	2.31	2.31
Ash	6.77	6.25	6.19	6.12
Nitrogen -free extract (NFE)	64.39	64.74	64.75	64.89
HCN (mg/kg)	24.80	20.96	19.18	11.33
Metabolisable energy (ME) (Kcal/kg DM)	3346.90	3370.06	3373.40	3380.15

	EXPERIMENTAL DIETS				
	MD	UD	S_1D	S_3D	S_5D
Dry matter (MD)	89.63	89.35	89.42	89.28	89.21
Crude protein (CP)	18.74	17.97	18.07	18.20	18.34
Crude fibre (CF)	19.10	19.36	19.30	19.26	19.28
Ether extract (EE)	2.32	2.35	2.33	2.35	2.34
Ash	5.19	5.61	5.44	5.25	5.16
Nitrogen-free extract (NFE)	54.65	54.71	54.86	54.94	54.88
HCN (mg/kg)	0.45	5.19	4.50	4.17	2.65
Metabolisable energy (ME) (Kcal/kg DM)	3403.12	3219.20	3388.94	3398.57	3400.71

*CPM: U = Cassava peels sun-dried without soaking,
S_1 = Cassava peels soaked for 1hr before sun-drying
S_3 = Cassava peels soaked for 3hrs before sun-drying
S_5 = Cassava peels soaked for 5 hrs before sun-drying

Results and Discussion

The cassava peel processing techniques adopted in this study had only marginal effects on the chemical constituents of Cassava Peel Meal (CPM) (**Table 2**). Crude fibre, ash and Hydrocyanic acid (HCN) fractions decreased while Dry Matter (DM), crude Protein (CP), Nitrogen-free extent (NFE) and metabolisable energy increased with duration of soaking. Ether extract (EE) content of CPM were similar regardless of the length of soaking. Bacterial fermentation during soaking can explain increases recorded in respect of CP. A similar observation was made by Eruvbetine and Adegboyega (1996). As the soaking duration increased, there was a progressive reduction in HCN. Fermentation is regarded as a major process in cyanide elimination (Westby, 1994). The HCN of CPM used in this study which ranged from 11.33 to 24.00 mg/kg was much lower than 45-150 mg/kg reported by Tewe *et al* (1976). The experimental diets showed that while metabolisable energy were on the higher side of the nutrient requirement range for growing rabbit (Aduku, 1988; 1977; Omole, 1982), CP and FE were in between. The higher metabolisable energy values in this trial may be an advantage according to Famunyan and Meffeje (1987) who had reported that this will help to avoid inadequate nutrient intake which may result from scattering of ration not pelleted. The HCN Contact of the compounded diets further decreased in the same sequence observed in CPM because of dilution effect.

Data on performance characteristics of the experimental rabbits are presented in **table 3**. The daily live body weight, body weight gain, feed intake FCR and water intake per rabbit varied among the dietary treatments. Average body weight gain (BWG) did not show any significant (P>0.05) treatment variation. The S_1D-fed rabbits showed a numerical value of (14.0g) followed by the MD-fed rabbits (13.69g). The least was 12.05g for S_5D group. This observation shows that the maize-based control diet (MD) and the CPM based diets did not differ much in terms of their nutritive quality and ability to promote growth. Eshiett *et al* (1979) reported BWG of 18.25g per day when cassava root meal was incorporated at 30 percent level of the diets of fryer. However a similar weight gain range was reported for cockerels fed CPM diets (Aina, 1990) as in this study. There were no significant differences (P>0.05) between the feec intake in all the treatments. Rabbits fed MD diet consumed slightly more than those on CPM diets. However, the mean daily feed intake recorded for the experimental treatments were higher than a mean of 51 g reported for growing rabbits fed CPM (Ngodigha and Mepba, 1992). While feed intake decreased with longer duration of soaking, metabolisable energy of CPM diets had an upward trend with length of soaking peels and this may perhaps explain the decreased feed intake. Feed conversion to body weight by rabbit was

Table 3. Production performance of rabbits on experimental diets

Parameters	MD	UD	S_1D	S_3D	S_5D	Statistical sign
Performance						
Mean initial live weight (g)	833.0±16.67	830.0±17.22	833.0±16.00	830.0±13.57	830.0±13.57	NS
Mean final live weight (g)	1600.0±28.0	1528.0±15.9	1617.0±33.3	1530.0±28.9	1505.0±25.0	NS
Mean BWG (g/day)	13.69±2.00	12.50±2.68	14.0±2.61	12.50±1.39	12.5±1.23	NS
Mean feed intake (g/day)	64.29±2.43	60.42±4.27	62.44±4.36	62.20±2.75	58.33±3.04	NS
Mean FCR	4.70±1.22	4.83±1.59	4.46±1.67	5.00±1.98	4.84±2.47	NS
Mean water intake (ml/day)	406.91±20.36	454.10±19.36	388.09±23.34	381.19±23.05	438.43±20.4	NS
Mortality	0	0	0	0	0	
Carcass characteristics						
Pre-slaughter LBW(g)	1525.00±15.0	1450.00±25.0	1590.00±15.0	1450.00±20.0	1410.00±25.0	NS
Dressing percentage (%)	59.34±5.12	61.11±3.15	62.87±2.10	57.93±5.43	58.02±4.25	NS
Heart (%LBW)	0.26±0.02	0.32±0.01	0.31±0.01	0.28±0.02	0.26±0.01	NS
Liver (%LBW)	2.30±0.37	2.96±0.05	2.83±0.09	2.41±0.20	2.73±0.60	NS
Kidney (%LBW)	0.50±0.06	0.67±0.10	0.59±0.07	0.56±0.05	0.64±0.10	NS
Stomach (%LBW)	4.26±0.13	4.24±0.09	4.72±0.11	3.79±0.07	4.44±0.10	NS
Intestine (%LBW)	8.20±0.11	6.30±0.15	6.00±0.18	5.17±0.14	5.46±0.12	NS
Caecum (%LBW)	6.23±0.40	7.78±0.25	8.18±0.15	7.24±0.35	7.51±0.50	NS

Table 4. Cost analysis of feeding rabbits with diets formulated with CPM (US$)

Parameters	MD	UD	S_1D	S_3D	S_5D
Cost of diet/kg	0.17	0.11	0.11	0.11	0.11
Mean feed intake (g/day)	64.29	60.42	62.44	62.20	58.33
Cost of feed intake (g/day)	0.011	0.007	0.007	0.007	0.006
Mean BWG (g/day)	13.69	12.50	14.00	12.50	12.05
Cost of feed/BWG	0.080	0.053	0.048	0.055	0.053
Cost of feed kg BWG	0.80	0.53	0.48	0.55	0.53

not significantly different (P>0.05) irrespective of the diet group. FCR value which were within a range of 4.46-5.00 was best for S_1D group. This is not unexpected since the amount of HCN, an anti-nutritional factor, present in the diets was small (0.45-519 mg/kg). This is by far lower than the safety level of 20 to 30mg/kg recommended by Oyenuga, (1968). It is believed that soaking and sun-drying of cassava peels have caused a significant reduction in the HCN concentration in CPM. This cyanide was not a limiting factor in the utilisation of dietary nutrients in this study. The effects of diets on water consumption of rabbits was not significant (P>0.05). This is in line with the finding of Agunbiade *et al* (1999) even though higher water intake level was recorded in the present study as a result of the hot experimental environment. There was no loss of rabbit throughout the trial. This can be interpreted to mean that rabbits were able to tolerate inclusion of CPM obtained from peels immediately sun-dried or soaked in water over a period ranging from 1 - 5 hrs before sun-drying. The effects of dietary treatments and carcass characteristics of rabbit are shown in **Table 3**. The results showed that none of the carcass traits evaluated: dressing percentage and relative weights of heart, liver, kidney, stomach, intestine and caecum was significantly affected (p>0.05) by treatments. This agrees with the report of Agunbiade and Bello (1997). The organs of experimental rabbits were not abnormal. It appears as if both maize and CPM based diets had similar effects on these carcass traits.

The cost analysis of using CPM to replace maize in rabbit diet is presented in **Table 4**. Rabbit production as a business has the primary objective of making profit. In this study, the costs of experimental diet that would yield a BWG of 1kg was \$0.80 (MD), \$0.53 (UD)), \$0.48 (S_1D), \$0.55 (S_3D) and \$0.53 (S_5D). Diet S_1D proved to be the most cost effective compared with either the control which was the least cost effective diet or any of the CPM based formulation.

Conclusion

In conclusion, the results obtained have clearly demonstrated that cassava peels processed as in this study is a good substitute for maize at 20% level in the diets of weanling rabbits. The growth performance of the S_1D fee rabbits was better than for the control group while in terms of economics of production, all the CPM diets proved to be better than the control.

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