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Effect of Ripe Plantain Peel (*Musa* cv) on Growth and Carcass Performance of Growing Rabbits

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ABSTRAK

*Percubaan memakan telah dilakukan dengan mengguna 48 ekor arnab penyapih New Zealand White × Flemish Giant bagi menentukan nilai penggantian jagung kepada kulit pisang masak (*Musa *cv) dalam pemakanan arnab penyapih. Kulit pisang masak telah diguna untuk menggantikan jagung pada 0, 33, 66 dan 100% dalam amalan pemakanan penyapih. Hitung panjang pertambahan harian dan makanan/berat menurun ($P<0.05$) pada 100% paras penggantian. Bahan kering, protein mentah dan koefisian ketercernaan tenaga adalah bererti ($P<0.05$) menurun oleh kandungan kulit pisang masak di dalam pemakanan. Bagaimanapun, kandungan kulit pisang masak tidak mempunyai kesan bererti terhadap hitung panjang pengambilan makanan dan ketercernaan serat mentah. Peratus campuran, berat bahagian perut dan berat dada juga menurun ($0<0.05$) oleh 100% paras penggantian kulit pisang masak, manakala kandungan kulit pisang masak dalam permakanan meningkatkan ($P<0.05$) berat visera.*

ABSTRACT

A feeding trial was conducted using 48 New Zealand White x Flemish Giant weaner rabbits to determine the replacement value of ripe plantain peel for maize in weaner rabbit diets. Ripe plantain peel was used to replace maize at 0, 33, 66 and 100% in a practical weaner diet. Average daily gain and feed/gain were depressed ($P<0.05$) at the 100% replacement level. Dry matter, crude protein and energy digestibility coefficient were significantly ($P<0.05$) depressed by inclusion of ripe plantain peel in the diet. However, the inclusion of ripe plantain peel had no significant effect on average feed intake and crude fibre digestibility. Dressing percentage, lumbar region weight and breast weight were also depressed ($P<0.05$) by the 100% replacement level of ripe plantain peel, while inclusion of ripe plantain peel in the diet increased ($P<0.05$) the viscera weight.

INTRODUCTION

Over 60% of the world's plantain is produced and consumed in West and Central Africa (IITA 1987). Plantain (*Musa* cvs) is a popular Nigerian staple food from which various dishes are prepared and peel is generated in large quantities. In most cases its disposal constitutes a problem. Olayide *et al.* (1972) estimated the annual production of plantain products in Nigeria at almost 1.5 million metric tons.

Dairo *et al.* (1987) reported the possibility of using plantain peel as a source of energy. The proximate analysis of peel compares favourably with maize except in crude fibre and ether extract (Ketiku 1973). Peel also contains higher levels of minerals such as calcium, iron and phosphorus. Dairo *et al.* (1987) have shown that plantain peel can constitute as much as 5% of a layer diet.

Conscious of the need to identify and evaluate new cheap sources of feed ingredients, the potential of ripe plantain peel was investigated as a source of energy in

TABLE 1
Chemical composition and energy value of dried ripe plantain peel (%)

Crude protein	9.83
Crude fibre	5.63
Ether extract	14.23
Ash	13.16
Calcium	0.96
Phosphorus	0.32
Energy (ME) (MJ)	13.96

rabbit rations. This study was designed to evaluate the replacement value of ripe plantain peel for maize in rations for growing rabbits.

MATERIALS AND METHODS

Diets

Plantain peel collected from a plantain chip factory in Lagos 24 hours after peeling was sun-dried for 5 days and ground in a hammer mill. Samples of dried plantain peel (DPP) meal were analysed for proximate chemical composition (AOAC 1990). Based on the results of the chemical analysis (Table 1), 4 experimental diets were formulated with plantain peel meal replacing maize at 0, 33, 66 and 100%, respectively. Table 2 shows the composition of the diets.

Animals

Forty-eight 6-week-old weaner rabbits (New Zealand White × Flemish Giant), with a mean weight of 0.58 ± 0.05 kg, were randomly assigned to the 4 dietary treatments on the basis of initial weight and sex, with 12 rabbits per treatment. Each treatment was replicated 4 times with each replicate group of 3 rabbits housed in a hutch of 180 × 45 cm. Feed and water were freely available. Rabbit weight and feed consumption were recorded weekly. Proximate analysis of the treatment diets was determined following methods of AOAC (1990). Energy was determined with a ballistic bomb calorimeter in which benzoic acid was used as standard. Mineral analyses were made by the methods of

TABLE 2
Formulation and chemical composition of dried plantain peel (DPP)

	% Replacement level of DPP in diets			
	0	33	66	100
Formulation				
Maize	300	200	100	–
Dried plantain peel	–	100	200	300
Full-fat soyabean	150	150	150	150
Palm kernel cake	100	100	100	100
Dried brewer's grain	430	430	430	430
Bone meal	12.5	12.5	12.5	12.5
Oyster shell	2.5	2.5	2.5	2.5
Salt	2.5	2.5	2.5	2.5
*Premix	2.5	2.5	2.5	2.5
Chemical analysis (fresh weight basis)				
Dry matter	906.0	865.0	900.0	898.0
Crude protein	178.6	180.0	180.6	181.4
Ether extract	79.6	84.6	99.4	110.2
Crude fibre	123.6	130.5	129.5	139.5
Gross energy (MJ/kg^{-1})	16.6	16.6	16.3	16.2

TABLE 3
Digestibility coefficients of ripe plantain peel-supplemented diets (%)

	Plantain peel replacement level (%)				Significance	SEM
	0	33	66	100		
Dry matter	89.12	86.51	84.35	79.48	*	0.11
Crude protein	80.10	79.16	78.79	76.10	*	0.06
Crude fibre	59.46	58.86	59.12	58.14		0.04
Energy	81.53	80.82	79.67	77.11	*	0.02

Grueling (1966). The animals were fed for 7 days before collection of faecal material for a digestibility trial. Digestibility coefficients for dry matter, crude protein, crude fibre and energy were determined for each diet (Table 3). The experiment lasted for 8 weeks. At the end of the trial, 4 animals per treatment were weighed, slaughtered and their viscera removed. The weight of liver, heart, kidneys and cut parts was determined.

Statistical Analysis

Data collected were subjected to analysis of variance as outlined by Snedecor and Cochran (1978). When analyses of variance indicated a significance for treatment effects, specific differences between means were detected by Duncan multiple range test (Duncan 1955).

RESULTS AND DICUSSION

The chemical composition of dried plantain peel compares favourably with maize except in crude fibre and ether extract (Ketiku 1973). Peel is higher in Ca and P.

Performance data are given in Table 4. Feed consumption did not differ significantly ($P > 0.05$) between dietary treatments. Feed consumption increased slightly with level of ripe DPP in the diet. This slight increase could have resulted from the higher crude fibre, lower caloric density (Beynen 1988) and probably better palatability of the ripe DPP as a result of its simple sugars (Ketiku 1973). Beynen (1988) observed that high caloric density diets result in decreased feed intake by rabbits.

Average daily liveweight gain (ADG) was significantly ($P < 0.05$) lower for rabbits fed the diet containing 100% replace-

TABLE 4
Effect of dried ripe plantain peel on rabbit performance

	Plantain peel (%)				SEM[1]
	0	33	66	100	
Initial liveweight (kg)	0.58	0.59	0.58	0.58	0.01
Final liveweight (kg)	1.39	1.48	1.39	1.20	0.04
Body weight changes (g)	850[a]	890[a]	810[a]	690[b]	10.40
Daily weight gain (g)	15.18[a]	15.89[a]	14.46[a]	12.32[b]	0.11
Feed/gain	4.08b	3.95b	4.37b	5.31a	0.11
Feed cost (N/kg feed)	9.73	9.13	8.53	7.93	–
Feed cost savings (%)	–	6.17	12.33	18.50	–

[1] Standard error of the means

a,b,: Means on the same row not followed by the same letter are significantly different ($P < 0.05$)

TABLE 5
Carcass yield (% liveweight) of rabbits fed different levels of ripe plantain peel

	Replacement level of plantain peel (%)				SEM
	0	33	66	100	
Liveweight (g)	1100	1050	1200	1000	0.94
Dressing (%)	68.18[a]	61.90[ba]	63.33[a]	55.00[b]	0.05
Viscera weight	22.73[b]	30.00[a]	29.17[a]	35.00[a]	0.85
Lumbar region weight	9.09[a]	8.00[a]	7.50[a]	5.00[b]	0.10
Head	9.09	10.00	8.33	10.00	0.77
Hind limbs	16.36[a]	13.00[b]	12.10[b]	12.00[b]	0.65
Fore limbs	9.09[a]	8.00[a]	6.67[b]	8.00[a]	0.11
Breast	4.55[a]	4.00[a]	3.92[a]	3.00[b]	0.22
Liver	3.28	3.1	3.01	2.79	0.03
Kidney	0.80	0.75	0.73	0.70	0.02
Heart	1.09	0.78	0.92	0.76	0.04

a,b: Means on the same row not followed by the same letter are significantly different ($P < 0.05$)

ment level of ripe DPP (Table 5). Differences between the 0, 33 and 66% replacement levels of DPP were, however, non-significant ($P > 0.05$). The ADG values were generally lower than normal values, but conformed with the general trend in developing countries (Cheeke 1986; Aduku *et al.* 1988; Alawa *et al.* 1989; Balogun and Etukude 1991).

The best feed conversion efficiency (FCE) was recorded with the 33% replacement level of ripe DPP. The 100% ripe DPP significantly ($P < 0.05$) reduced the efficiency of feed conversion despite the consumption of more food by rabbits on this diet. This suggests that the diet was less adequate in nutrient content and quality. This is in agreement with the ADG results.

Rabbits fed on the 0% replacement level of ripe DPP had higher ($P < 0.05$) DM, crude protein and energy digestibility coefficients than rabbits fed on the diets containing ripe DPP. Digestibility coefficient decreased with increased level of ripe DPP in the diet. Digestibility of protein has been shown to be adversely affected by the presence of crude fibre (Sauer *et al.* 1980) and tannin (Clandinin and Heard 1968).

Dressing percentage, lumbar region weight and breast weight were significantly reduced by 100% replacement level of ripe DPP in the diet, while DPP in the diet increases ($P < 0.05$) the viscera weight. The average dressing percentage was similar to values reported by Rao *et al.* (1977) for rabbits at 12 and 16 weeks of age. No significant difference ($P < 0.05$) existed in the weights of the various organs.

Feed cost analysis of the diets showed feed cost savings of 6.17, 12.33 and 18.50%, respectively, for 33, 66 and 100% replacement levels.

CONCLUSION

The results of this study suggest that ripe DPP can replace up to 66% of maize (20% ripe DPP inclusion) in diets for weaner rabbits without significantly affecting their performance.

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