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UTILIZATION OF SUN-DRIED, FERMENTED AND ENSILED CASSAVA PEEL MEAL-BASED DIETS BY WEANER RABBITS

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ABSTRACT

Twenty four New Zealand x Chichilla weaner bucks aged between 7 and 8 weeks and averaging 0.90 ± 0.12 kg body weight were used in a feeding trial to evaluate the performance of rabbits fed diets containing sun-dried, ensiled and fermented cassava peels. The animals were randomly divided into 4 groups of 6 animals each and fed four experimental diets (A, B, C, D) randomly assigned in a completely randomized design. Diet A, the control, was a 16% crude protein (CP) weaner ration compounded from maize, maize offals, soya bean meal, blood meal, vitamin/mineral premix and common salt. Diets B, C, and D were also 16% CP weaner rations in which 10% maize were replaced with sun-dried, ensiled and fermented cassava peels respectively. The energy contents (Kcal DE/Kg DM) of the respective diets were 2456, 2460, 2487 and 2513. Average daily feed intake, average daily gain and feed conversion ratio were assessed. Carcass characteristics were also evaluated. Results showed that dietary treatments did not influence ($P>0.05$) average daily feed intake and average daily gain in rabbits. Feed conversion ratio also did not differ ($P>0.05$) among treatments. Carcass characteristics however differed significantly ($P<0.05$) for thigh and stomach weights. The values (g) were 11.40, 9.30; 9.78, 10.38; 9.41, 5.22 and 7.04, 7.95 for rabbits fed diets A, B, C and D respectively.

INTRODUCTION

In Nigeria today, low animal protein intake has been attributed to the decline in animal production (Ibeawuchi *et al.*, 2000) which has resulted mainly from high cost of production. The escalating demand for the limited livestock products has led to hike in prices thereby placing animal protein beyond the reach of the average Nigerian. In recent times, a case has been made for rabbit production (Onumuyi *et al.*, 2001) as a realistic approach to counter the animal protein deficit in the diet of Nigerians. Much of this view is buttressed by the prolific nature of the micro livestock occasioned by its short gestation period and generation interval (Fielding, 1991)..

Rabbit production in Nigeria is adversely affected by inadequate feed supply, among other factors. The competition between man and livestock for conventional feedstuffs has constituted a major constraint, more so when feed constitutes about 70% of the total cost of producing rabbit intensively (Ogunfowara, 1984). This therefore has necessitated the need to explore alternative feed resources that are rarely edible by man but which can meet the nutritional requirements of rabbits, with little or no processing. Recently, research efforts are directed towards the full realization of the potentials of agricultural waste products such as cassava peels in rabbit nutrition (Agunbiade *et al.*, 1999; 2001; Ijaiya, 2001).

Cassava is a staple crop grown readily in southeastern Nigeria. The peel which constitute about 20% of the tuber (Hahn and Chukwuma, 1986), is rich in energy (3.03 Mcal/kg DM) but low in protein (2-3% CP) contents (Alhassan, 1985). It contains cyanogenic glycosides, linamarin and lotaustralin, which are easily converted to hydrogen cyanide (HCN). This product is toxic to farm animals, especially ruminants, but can easily be detoxified by sun-drying (Ahamefule *et al.*, 2000), ensiling (Asaolu, 1988) and fermentation (Ijaiya, 2001).

Cassava peel is produced in large quantities in Nigeria but very poorly harnessed for livestock production. It is most often discarded as waste. Since energy constitutes a major proportion of the monogastric diet, it is thought that a reasonable portion of the energy need of rabbits could easily be met by substituting cassava peels for conventional energy sources. This would reduce cost of production. Efforts therefore were made in this study to evaluate the performance of weaner rabbits fed sun-dried, ensiled and fermented cassava peel based diets.

MATERIALS AND METHODS

Experimental site

This study was conducted at Livestock section of the Teaching and Research Farm of Michael Okpara University of Agriculture, Umudike. Umudike is located in Abia state of Nigeria in latitude 05°, 281 North, longitude 07°, 31' East and at an altitude of 122m above sea level. It falls within the rain forest zone of West Africa characterized by long duration of rainfall (7 - 9 months) and short period of dry season. Average rainfall is 2169 Mm in 148-155 rain days while average ambient temperature is 26 °C with maximum and minimum of 32° and 22 °C respectively. Relative humidity ranges from 50-95%.

Animals and management

Twenty four New Zealand White x Chinchilla weaner bucks averaging 0.9 kg (0.85 -0.95 kg) in body weight and aged between 7 - 8 weeks were randomly divided into 4 groups of 6 animals per group. Each animal was housed individually in a standard hutch in a three-tier cage of dimension 120 cm x 150 cm x 120 cm (Length x Width x Height). Each hutch was provided with a feeder and waterer. Two weeks prior to the study, each rabbit was dewormed and treated against external parasites.

Processing of Cassava peels

Cassava peels (variety TMS 30555) from 12 14-month old plants were collected fresh from the commercial 'Garri' processing unit of the National Root Crop Research Institute (NRCRI), Umudike and divided into three lots. The first lot was sun-dried as described in Ahamefule *et al.* (2000). The second lot was ensiled following the procedure of Asaolu (1988), while the third lot was fermented as in Ijaiya (2001). The ensiled and fermented lots were air-dried for 5 days and as in the sun-dried lot, milled, bagged and incorporated in the feed as either sun-dried cassava peel meal (SCPM), ensiled cassava peel meal (ECPM) or fermented cassava peel meal (FCPM). The proximate composition of the processed cassava peel forms are presented in Table 1.

Table 1. Proximate compositions of processed cassava peels (DM Basis)

Constituents (%)	SCPM	ECPM	FCPM
Dry matter	82.20	92.50	91.35
Crude protein	4.38	4.85	4.15
Crude fibre	15.70	13.64	10.20
Ether extract	1.08	0.94	1.10
Nitrogen free extract	59.04	68.80	63.47
Ash	5.00	4.27	3.43
Gross energy (MI/kg DM)	1.98	1.88	1.92

SCPM = Sun-dried cassava peel ECPM = Ensiled cassava peel
FCPM = Fermented cassava peel

Table 2. Feed constituents and proximate compositions of experimental diets

Ingredients (g/kg)	A	B	C	D
Maize	400	300	300	300
Maize offal	300	300	300	300
SCPM	-	100	-	-
ECPM	-	-	100	-
FCPM	-	-	-	100
Soya bean meal	250	245	245	245
Blood meal	15	20	20	20
Oyster shell	10	10	10	10
Bone meal	20	20	20	20
Salt	2.5	2.5	2.5	2.5
Vitamin/Mineral premix	2.5	2.5	2.5	2.5
Total	1000	1000	1000	1000
Analysed contents (%)				
Dry matter	94.85	93.40	93.50	94.06
Crude protein	16.18	16.10	16.20	16.08
Crude fibre	11.03	11.16	11.13	11.19
Ether extract	3.98	2.10	2.09	2.05
Nitrogen free extract	56.54	57.94	55.48	58.82
Ash	7.12	6.10	8.60	5.92
Energy (Kcal DE/Kg DM)	2456	2460	2487	2513

Riboflavin, 9.0 mg; Biotin, 0.25; Pantothenic acid, 11.0 mg; Vit. K3, 3.0 mg; B2, 2.5 mg; B6, 0.3 mg; B12, 8.0 mg; Nicotinic acid, 8.0 mg; Fe, 5.0 mg; Mn, 10.0 mg; Zn, 4.5 mg; Co, 0.2 mg; Se, 0.01 mg.

Experimental diets/design

Four diets A, B, C and D were formulated from maize, maize offals, soya bean meal, blood meal, oyster shell, bone meal, vitamin/mineral premix and common salt (Table 2). Ten percent of maize in diet A (the control) was replaced in diets B, C, and D with sun-dried ensiled and fermented cassava peel meal respectively. The diets were roughly iso-caloric and iso-nitrogenous (Table 2).

The twenty-four New Zealand White x Chinchilla weaner bucks were randomly divided into 4 groups of 6 animals per group. Each animal constituted a replicate and was housed separately in a hutch. The 4 animal groups were then assigned the test diets in a completely randomized resign. Each animal received an assigned diet for 60 days. Weekly weights were taken and daily feed consumption recorded. Average daily feed intake average daily gain and feed conversion ratio were also determined for each animal.

Carcass evaluation

At the end of the 60-day feeding trial, three rabbits from each treatment group were randomly selected and subjected to carcass evaluation as in Agunbiade *et al.* (2000). The prominent body parts were separately weighed while the internal organs were also weighed and both expressed as percent of the dressed weight.

Feed/Statistical analysis

The proximate components of the processed cassava peels and the experimental diets were determined using AOAC (1990) methods. Data obtained in this study were subjected to analysis of variance procedure applicable to a rompletely randomized experiment (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

The proximate components of the processed cassava peels used in this study are shown in Table 1. The values obtained for dry matter (DM), crude protein (CP), crude fibre (CF), ether extract (BE), nitrogen free extract. (NFB) and ash are comparable to what has been earlier reported for sun-dried (Ahamefule *et al.*, 2000), ensiled (Obioha, 1977) and fermented (Ijaiya, 2001) cassava peels.

Table 2 shows the proximate composition of the experimental diets. The DM percent values of diets B (93.40), C (93.50) and D (96.04) also compared favourably with that of diet A (94.85). Similarly, the CP, CF and the digestible energy of the diets fell within the recommended range (12-17% CP; 10-20% CF; 2390-2500 Kcal DE) for optimum performance and growth in rabbits (Aduku and Olukosi, 1990). The dietary fat or EE also fell within normal range (20-25%) and this according to Onwudike and Omole (1983) enhances palatability, ensures satiety and reduces dustiness in feed.

The performance of rabbits fed diets containing different processed cassava peels are summarized in Table 3. Dietary treatments did not influence ($P>0.05$) average daily feed intake among treatment groups. The average daily feed intake of the cassava peel based diets (B, C, D) ranged from 70.86 - 74.73g/day which was higher than the range of 58.22 - 69.29 g/day reported by Agunbiade *et al.* (2001) for rabbits fed similar diets. This relative intake is probably associated with variations in the energy content of diets used in both trials. The diets used by Agunbiade *et al.* (2001) were higher in digestible energy (2554 - 2628 Kcal DE/Kg) than those of the present study (2456 - 2513 Kcal DE/Kg). Rabbits are

Known to adjust feed intake to differences in dietary energy levels (Lebas, 1975; Scholant, 1985), they generally consume more of low energy diets to satisfy basic energy requirements for metabolic and physiological functions. Average daily gain (g/d) did not differ (P>0.05) among treatment groups, the values ranged from 15.77

Table 3. Performance of rabbits fed diets containing processed cassava peels

Parameter	A	B	C	D	SEM
Mean Initial weight (g)	867.14	883.20	934.51	917.3 5	25. 00^{ns}
Mean final weight (g)	2000.19	1916.29	1880.62	1880.43	41.00^{ns}
ADFI (g)	64.90	70.86	74.73	74.07	3.15^{ns}
ADG (g)	18.89	17.22	15.77	16.05	1.25^{ns}
Feed conversion ratio	3.44	4.11 4.73	4.61 0.50^{ns}		

ADFI = Average daily feed intake
ADG = Average daily gain
SEM = Standard error of the mean
NS -Non-significant (P>0.05)

in diet C to 18.89 in the control diet A.This observation compared favourably with the range of values reported (11.82-19.82 g/day) by Agunbiade *et al.* (2001) for cassava peel based diets. Dietary treatments did not have any effect (P>0.05) on feed conversion ratio. Agunbiade *et al.* (2001) also recorded similar observation.

Save for thigh and stomach weights, other carcass measurements were not affected (P>0.05) by dietary treatments (Table 4). This observation is at variance with the findings of Agunbiade *et al.* (1999) who reported non-significant effect in carcass characteristics in rabbits fed diets containing cassava peels. In this study, thigh weight/development was significantly (P<0.05) highest for the control group. The significantly (P<0.05) large stomach/size also recorded for animals fed the control diet suggest that their relatively large stomach size may have imparted positively on feed retention time which may have influenced the best overall average daily gain and thigh weight recorded for the group. This relative edge the control animals had over rabbits fed diets B, C, and D may be completely be annulled if the duration of study were perhaps extended to 90 days. This would give ample time for rabbits to fully adjust to the cassava peel based diets. Meanwhile, the dressed percentage range of 52.5-56.3 obtained for rabbits in this study compared well with the values of 50% (Ijaiya, 2000) and 55 - 57% (Aduku and Olukosi, 1990) reported for rabbits.

In conclusion, 10% of sun-dried, ensiled or fermented cassava peels can conveniently replace equal amount of maize in rabbit diet without any adverse effect on gut functions and growth.

Table 4. Carcass composition of rabbits fed cassava peel based diets

Characteristics	A	B	C	D	SEM
Mean live weight (g)	2000.19	1916.29	1880.62	1880.63	5.00^{ns}
Mean dressed weight (g)	1050.17	1080.27	1010.54	1000.59	8.50^{ns}
Dressed weight (%)	52.50	56.30	53.72	53.19	1.35^{ns}
Head+	8.73	9.13	9.13	9.08	0.2^{ns}
Skin+	9.87	11.28	10.79	10.25	0.10^{ns}
Feet+	225	222	2.05	2.27	0.10^{ns}
Heart+	0.47	0.39	0.44	0.46	0.05^{ns}
Liver+	4.46	4.36	4.85	5.52	0.40^{ns}
Kidney+	0.42	0.48	0.44	0.46	0.04^{ns}
Lung and Trachea+	1.24	1.16	1.32	1.49	0.15^{ns}
Thigh+	11.24^{a}	9.90^{c}	9.78^{a}	10.38^{b}	0.12*
Loin+	30.95	31.78	32.34	33.00	0.70^{ns}
Spleen+	0.07	0.04	0.04	0.08	0.02^{ns}
Stomach+	9.41^{a}	522^{c}	7.04^{b}	7.95^{b}	0.40*
Intestine+	22.99	19.23	20.93	21.47	1.50^{ns}
Shoulder+	6.40	6.85	7.31	7.15	0.41^{ns}

a, b Means on the same row with different superscripts are significantly different (P<0.05).
NS = Not significant (P>0.05); * = Significant (P<0.05)
+ = percent values of dressed weight.

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