

Carcass characteristics of weaner rabbits fed concentrate diets with graded levels of yam peel meal

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Target Audience: Feed millers, Nutritionists, Farmers

Abstract

An eight-week feeding trial was conducted to determine the use of yam peel meal as a source of energy in concentrate diets for feeding rabbits. Thirty cross breed weaner rabbits were randomly allotted to three treatment groups in a Complete Randomized Design arrangement. Each treatment was replicated three times with two rabbits per replicate. Five experimental diets were formulated with varying levels (0%, 5%, 10%, 20% and 30%) yam peel meal. The diets were designated as T₁, T₂, T₃, T₄, and T₅ respectively. Each of the diets were offered ad-libitum to the respective groups of rabbits. Carcass analysis was done at the end of eight-week trial. The results showed significant ($P < 0.005$) differences on evisceration weight, carcass weight, the weights of the hind limb, loin and the neck. There was no dietary influence on the other carcass parameters measured. On the organs and the guts, significant ($P < 0.005$) dietary influence were observed on the weights of the heart, large intestine and on abdominal fat. There was no any dietary effect on all the remaining parameters measured. This is an indication that rabbits can tolerate yam peel meal at level of inclusion up to 30%. It can be concluded that yam peel meal could be included in diets for weaner rabbits without any serious adverse effect on carcass traits.

Key words: Carcass traits; Yam peel meal; Concentrate; weaner rabbits.

Description of Problem

Rabbits (*Oryctolagus cuniculus*) descended from wild rabbits found in the Mediterranean Countries and was introduced into England in the late Eleventh to early Twelfth Century. The Nigerian wild hares which are mostly grayish brown in colour are still very common. According to [1] in early 1960's United States Department of Agriculture (USDA) was involved in introducing more rabbits to Western States of Nigeria and between 1988 and 1989, Directorate of Food, Road and Rural Infrastructure (DFRI) was involved in

encouraging importation of exotic rabbit breeds. In Nigeria, after the Biafra war, rabbits were used in some parts of the country to produce meat quickly, to help in the nutrition of those that had loss their crops and animals [2].

Rabbits known in Nigeria in local languages as Zomo (Hausa), Ewi (Ibo), and Ehoru (Yoruba). They are found in many different continents and climatic zones and it has been estimated by the World's Statistics at 709 million, about 50 and 30 percentage of this figure is in Africa and Nigeria respectively [3]. They serve as a flexible financial reserve for

rural population as well play other socio-cultural roles in the customs and traditions of many Nigerian societies [4]. The prolific nature of rabbits coupled with its short gestation period and generation interval, makes it the animal of choice for multiplication and a short way of increasing animal protein intake [5]. Domestic rabbits are ubiquitous, providing protein, fibre, research models, and companionship. The extent to which these benefits could be harness will depend on how well the nutrition and other management practices can be put in place to ensure optimum performance. This however, requires careful management and balancing of diets [5]. Yam peel meal have been widely and successfully used as nonconventional energy source for livestock. It has the capacity to yield the same output as conventional feeds perhaps at cheaper cost. Hence, it could partially or completely replace maize in conventional diets. The nutritional value of Yam peel meal is another important consideration for its use as a feed ingredient. *Ratundata* peels are rich in amino acid [6]. Yam peels as described by [7] to contain 12.70% CP, 6.30% CF and gross energy/kcal/g of 2.98. The use of Yam peel meal for animal feed will help in reducing the competition between man and animal for the less available grains and will harness the efficient and effective use of yam peel waste. Yam peel is readily available in all the part of Nigeria with little or no cost. Its constitutes environmental hazard where it is not properly utilized. There is paucity of information on utilization of yam peel in the diets of rabbits, hence the feeding trial was conducted to use the yam peel meal as a source of energy in concentrate diets for feeding weaner rabbits.

Materials and Methods

Experimental Site

This study was conducted at the Rabbitry Section of Dagwom Farm, National Veterinary Research Institute Vom. Vom is located in Jos-

South Local Government Area of Plateau State. The site lies on latitude 8° 43N and longitude 8° 46E with an altitude of 1293.2m above Sea level. Jos-South Local government area is made up of Four Districts; Vwang, Du, Gyel and Kuru. The Local government has a population of 650,835 with an average land area of 103km² [8].

Processing of yam peels

Yam peels were collected fresh from Kitchens and restaurants in Vom and Bukuru town. The peels were dehydrated by sun drying for 7 days to reduce enzymatic and microbial reactions that can lead to spoilage and nutrient leaching. The sun drying was also aimed at enhancing crispness and to reduce antinutritional factors that may be present in the yam peels. The dried peels were then milled in a hammer mill to form yam peel meal.

Chemical Analysis of Yam Peel Meal

Samples of Yam Peel Meal (YPM) and the experimental diets were collected and analysed for proximate analysis according to [9] at the Central Laboratory of Quality Assurance Unit of Grand Cereals Limited Jos. Table 1 shows the proximate composition of YPM.

Feed formulation and plan of experiment

Yam peel meal was included at 0, 5, 10, 20 and 30% level of inclusions to form 5 dietary treatments designated T1, T2, T3, T4 and T5 respectively in a completely randomised design. The inclusion of the yam peel meal indicated that T1 0% yam peel meal is the control diet., T2 contained 5% yam peel meal, T3 contained 10% yam peel meal, T4 contained 20% yam peel meal and T5 contained 30% yam peel meal. At the beginning of the studies, the rabbits were assigned on equal weight bases to the dietary treatments. Three rabbits were randomly

assigned to the 5 dietary treatments. A three-day adaptation period was allowed for the rabbits to acclimatized with the cages and feed, followed by quantitative collection of total droppings at 24 hourly intervals. The experimental diets and water were provided *ad libitum*. Close monitoring was given to check spillage of feed from the troughs. The daily feed fed to each group was weighed daily in the morning to determine feed intake during the trial. The droppings for each of the 3-day collection period per group were rid off extraneous materials weighed fresh, oven dried at 105°C for 72hrs to content weigh before they were bulked and finely ground to obtained homogenous sample.

Proximate Analysis

Standard analytical methods were used to determine the dry matter (DM), Crude Protein (CP), Ether Extract (EE), Crude Fibre (CF), Ash and Nitrogen Free Extra (NFE) of yam peels and compounded feed.

Experimental Animals and management

A total of thirty (30) cross bred rabbits (chinchilla and New Zealand white) of mixed sex and age ranging from 2-3 weeks were purchased from rabbit section of Dagwom farm National Veterinary Research Institute Vom and used for the experiment. They were randomly allotted to five dietary treatments of three replicate each with three (2) rabbits per replicate. The rabbits were housed in cages measuring (width 35cm width x 40cm length x 45cm height). The experimental diets and clean drinking water were provided *ad-libitum* throughout the experimental period of eight (8) weeks.

Parameter Evaluation

Carcass analysis

At the end of the eight-week feeding trial, one rabbit per replicate was randomly selected, weighed and then starved overnight (12 hr) but

water was provided. The fasted weight was recorded in the morning before slaughter. They were then slaughtered, dressed and weighed individually. Carcass trait was carried out as described by [10]. The animals were thoroughly bled by hanging head down through the hind legs on nail. Furs were removed by roasting to get the dressed weight. Then the carcass was dissected and the internal organs evacuated (to get the eviscerated weight). The carcass was then dissembled into wholesale cuts as described by [11] and each primal part (thighs, ribs, neck, forelimbs, hind limbs and back and loin) was weighed using a digital scale. The organ weights (lungs, stomach, heart, kidney, liver and intestine) were also taken. The cut-up parts and organs weight recorded were expressed as percentage of the dressed weight.

Organs and other visceral components

The organs and other visceral components such as lungs, liver, kidneys, heart, intestine, caecum, and abdominal fat were removed from individual carcasses in all the treatment groups and weighed using electronic sensitive scale and were expressed as percentage (%) of the slaughter weight.

Statistical Analysis

All data collected were subjected to analysis of variance (ANOVA) in the SPSS version 20.0. Significant differences among treatment means were compared using Least Significant Difference (LSD).

Results and Discursion

The results of the proximate composition of yam peel and nutrient composition of experimental diets are presented on Table 1. The yam peel had protein value of 9.83%, fat 1.16% calcium 0.60%, moisture 18.94%, Ash 9.06%, crude fibre 8.68% and metabolizable energy (ME) of 2280 kcal/kg. the values reported here were similar to [5]. The crude

protein, crude fibre, and ash in the diets ranges from 16.07 to 17.16, 8.88 to 9.36, 9.72 to 12.83 respectively. The value of the crude protein is in line with the recommended level of 18% for growing rabbits reared in Tropical Countries as reported [12]. This is an indication that the diets can support growth and development. The crude fibre values of 8.88 to 9.36% obtained in this study were below the values of 7.78 % reported by [5]. However, it met the level of 9% recommended [13] for normal growth and for reduction of enteritis. Calcium, moisture, ash values of 0.60 to 2.72, 9.06 to 12.83, and 9.06 to 12.83% were similar to those reported [14].

The results obtained in this study showed that, dietary treatments affected ($P < 0.05$) the evisceration weight, carcass weight, the weights of the hind limbs, loin and neck. The other parameters measured for the carcass were not influence by dietary treatments. This implies that the diets had no adverse effect on the carcass traits of rabbits. It is believed that, if there are any major effects of anti-nutritional factors, organs like liver and heart should be significantly affected [15]. There was significant ($P < 0.05$) dietary influence on the weight of the heart. This could be as a result of residual antinutritional factor in the yam peel meal. The results however, did not reveal any effect on the weights of the spleen, kidney, liver and lungs. The variation in the values of these parameters among the treatments may

have occurred due to chance, this means, even though the figures are different, they were statistically the same.

The result on caecum, gall bladder, stomach and small intestine were not significantly different across the treatments. The large intestine of the rabbits in treatment 4 was larger than those of treatments 1, 2, 3 and 5, this might be as a result of high fibre content of the diet. However, with respect to abdominal fats, treatments 1, 3 and 4 were statistically the same, have significantly ($P < 0.05$) different, with rabbits in treatment 2 and 5. Also treatment 2 and 5 were significantly different. The yam peels are energy source in the diet, thus, any excess glucose therein is converted into fats thereby increasing the weights of the rabbits. The results obtained in the study agreed with the finding of [16].

The results of the study imply that dietary treatments 1, 2, and 4 with 0%, 5% and 20% levels of yam peel meal respectively show superior weights on the rabbits especially on the eviscerated and carcass weights. Similarly, the treatments (1, 2 and 4) had shown positive influence with respect to the liver, kidney, spleen and the lungs. This indicated that, yam peel meals are safe as rabbits feeding material and could be to weaners without any serious negative effects on these important organs of metabolism.

Table 1: Nutrient Composition (%) of Experimental Diets

	Diets					*Yam peels
	T1 (0%)	T2 (5%)	T3 (10%)	T4 (20%)	T5 (30%)	
Protein	16.66	16.07	16.81	17.16	16.24	9.83
Fat	5.74	4.81	4.23	3.60	3.47	1.16
Calcium	1.39	2.44	2.30	2.72	1.64	0.60
Moisture	13.48	13.00	12.39	14.17	13.82	18.94
Ash	10.84	11.06	9.72	12.83	10.88	9.06
Crude fibre	9.28	9.10	8.59	8.88	9.36	8.68
ME(kcal/kg)	2640	2604	2662	2442	2499	2280

NB. * = Proximate composition

Table 2: Ingredients and Calculated analysis of rabbits Diets Containing Yam Peel meal

Ingredients`	Diets				
	T1 (0%)	T2 (5%)	T3 (10%)	T4 (20%)	T5 (30%)
Maize	40.0	39.5	39.5	35.0	30.0
Soybean	18.0	18.5	19.0	19.0	19.0
Maize offal	12.0	8.0	6.0	3.0	0.0
Rice offal	16.0	16.5	16.5	16.0	15.0
Wheat offal	10.0	8.5	5.0	3.0	2.0
Yam peel meal	0.0	5.0	10.0	20.0	30.0
Bone meal	2.5	2.5	2.5	2.5	2.5
Limestone	1.0	1.0	1.0	1.0	1.0
Salt	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25
Total	100	100	100	100	100
Calculated analysis					
CP (%)	15.58	15.65	15.62	15.63	15.74
CF (%)	9.02	9.09	9.06	9.28	9.35
ME (Kcal/kg)	2519.40	2524.91	2528.18	2542.58	2526.53

*To provide the following per kg of feed: Vit. A, 10,000IU; Vit B1, 075g; Biotin, 0.05g; Folic acid 1g; Chlorine chloride 250g; Copper, 8g; Manganese, 64g; Iron 32g; Zn 40g; Iodine 0.6g; Flavomycin 100g; Spiramycin 5g;3-nitre 50g; DL -methionine, 50g; Selenium, 0.6g; Lysine 120g; BHT, 5g; E = Enzyme; P = Probiotic.

Table 3: Carcass, Organs and Guts Characteristics of Rabbits fed Yam Peel Meal

Parameters	Diets					SEM
	T1 (0%)	T2 (5%)	T3 (10%)	T4 (20%)	T5 (30%)	
Carcass						
Fasted Wt	1364.67	1327.00	1277.33	1358.67	1166.33	1471.73 ^{NS}
Singed Wt	1268.67	1193.33	1167.67	1234.00	1062.00	1432.00 ^{NS}
Evisc. Wt.	839.00 ^a	844.67 ^a	755.33 ^b	867.69 ^c	652.00 ^a	937.00 [*]
Carcass Wt	662.67 ^a	751.33 ^b	586.00 ^c	680.37 ^a	490.00 ^c	704.80 [*]
Bled Weight	1334.00	1301.33	1148.33	1341.33	1134.00	1443.50 ^{NS}
Fore limbs	106.67	104.00	132.67	116.33	90.33	640.27 ^{NS}
Hind limbs	196.00	187.67	171.33	194.33	135.67	400.27 [*]
Ribs	123.00	118.00	116.33	134.33	95.33	461.00 ^{NS}
Loin	232.33 ^a	231.67 ^a	196.67 ^b	260.33 ^c	165.33 ^a	106.33 [*]
Neck	31.67 ^a	25.67 ^b	30.00 ^a	37.33 ^c	30.33 ^a	21.07 [*]
Organs						
Heart	3.67 ^a	5.00 ^b	3.00 ^a	3.00 ^a	2.67 ^a	0.53 [*]
Spleen	1.33	1.00	1.00	1.00	1.00	0.67 ^{NS}
Kidney	8.00	9.00	7.33	7.00	7.00	3.67 ^{NS}
Liver	43.67	44.00	38.33	38.00	35.33	46.80 ^{NS}
Lungs	9.07	9.67	8.33	8.00	6.33	55.47 ^{NS}
Guts						
Caecum	47.00	49.00	47.67	50.00	52.00	8.267 ^{NS}
Small intestine	27.56	29.00	13.83	16.54	18.62	32.02 ^{NS}
Large intestine	37.67 ^a	35.67 ^a	34.00 ^a	40.33 ^b	32.00 ^a	20.00 [*]
Abdominal fat	18.00 ^a	14.67 ^a	15.67 ^a	18.00 ^a	2.67 ^b	43.60 [*]

NB: SEM = Standard error mean, NS = Not significant, * = Significant (P<0.005).

Means with different superscript are significantly different.

Conclusion and Application

1. It could be concluded that yam peel meal could be efficiently utilized and tolerated by weaner rabbits up to 30% inclusion level without any deleterious effects on carcass characteristics.

References

1. Aduku, A. O. and Olukosi, J. O. (1990). Rabbit Management in the Tropics: Production, Processing, Utilization, Marketing, Economics. Research and Future Prospects, Living Block Series, Abuja.
2. Denis Fielding (1991) The Tropical Agriculturalist – Rabbits. Macmillan Pub.Limited, Malaysia pp. 12-29.
3. Lukefahr, S.D., (1990). Rabbit project manual. A Heifer project international publication, 43-47.
4. Akinmutimi, A. H., & Osuagwu, C. C. (2008). Response of Weaner Rabbits Fed Graded Levelsof Sweet Potato Meal in Place of Maize-Based Diet,. *Pakistan Journal of Nutrition*. 7(5), 705–709
5. Uchewa, E. N.; Orogwu, C. E.; &Nwakpu, P. E. (2014). Effect of Yam Peel Meal (YPM) Replacement for Maize on the Growth Performance and Carcass Traits of Weaner Rabbits *International Journal of Agriculture Innovations and Research*, 2(4 PG-536-541), 536–541.
6. Eka, O. U., (1985). The Chemical Composition of Yam Tubers. In: Advances in Yam Research; The Biochemistry and Technology of Yam Tubers. Osujin Ged. Pub. By Biochemical Society of Nigeria in Collaboration with ASUTECH, Enugu. Pp. 51 – 75.
7. Akinmutimi, A. H. and Onen, G. E., (2008). The response of broiler finisher birds fed graded levels of yam peels meal in place of maize -based diets. *International Journal of Poultry Science*, 7: 474-479.
8. National Population Commission (NPC) [Nigeria]. 2009. Final result of 2006 Census. Official Gazette of 2nd February,2009. Abuja, Nigeria: National Population Commission.
9. AOAC, (2000). Official method of Analysis 15thEdn., Association of official Analysis Chemists (AOAC), Washington DC., USA.
10. Blasco A., ouhayoun, J and Masoero, G. (1993). Harmonization of criteria and terminology in rabbit meat research. *World Rabbit Science*. 1 (1): 3-10.
11. Akinmutimi,A.H and Anakebe O.C. (2008). Performance of weaner rabbits fed graded levels of yam and sweet potato in place of maize base diets. *Pakistan Journal of Nutrition*. 7 (5): 700-704.
12. Martina,C. and Daminan, F. (1983). Supplementation of diet low in protein with lysine and methionine for fattening young rabbits. *WorldAnimal Review Series*.
13. Lebas, F., Coudert, P., Ronyier, R. and Rochambeau, H.D (1986). The rabbit Husbandry, Health and Production, AHPP series No. 21, FAO, Rome, Italy.
14. (Maertens, L. (1992). Rabbit nutrition and feeding: a review of some recent development. *Journal of Applied Rabbit Research* 15:889-890.
15. Akinmutimi; A.H.;Ewa, E.U., Ojewola, G.S. Okoye, F.C.; Abasiekong, S. F, 2004. Effect of replacing soybean meal with lima bean meal on finishing broiler chicken. *Global J. Agric. Sci.*, 3 (1): 1-4
16. Blasco A., ouhayoun, J and Masoero, G. (1993). Harmonization of criteria and terminology in rabbit meat research. *World Rabbit Science*. 1 (1): 3-10.