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RESPONSE OF WEANER RABBITS FED GRADED LEVELS OF BAMBARA GROUNDNUT (*VIGNA SUBTERRANEAN (L) VERDC*) OFFAL DIETS

[a]Ironkwe M.O. & [b]Amaefule K.U.
[a]Department of Animal Science and Fisheries, Faculty of Agriculture, University of Port Harcourt, PMB 5323, Choba Port Harcourt
[b]Department of Animal Nutrition and Forage Science, College of Agriculture PMB 7267, Umudike, Abia State.

ABSTRACT
This study was conducted with sixty weaner rabbits to determine their response to graded levels of raw bambara groundnut offal diets. The five weeks old rabbits were randomly assigned to five treatment groups in a completely randomized design (CRD) experiment. The treatment groups designated 1,2,3,4 and 5 had six rabbits per treatment. Each treatment was replicated two times with three animals each. The inclusion level of bambara groundnut offal in the diet were 0, 5, 10, 15 and 20% respectively. Parameters measured in the eight week old experiment included final live weight, weight gain, feed and protein intake, feed conversion ratio, protein efficiency, feed cost and carcass quality. Result of the experiment showed significant ($P<0.05$) differences in almost all the parameters rabbits fed 15% bambara groundnut offal seems to be the best, had numerically higher daily weight gain (25.10g), final live weight (2.18kg), better feed conversion of 3.26, protein efficiency ratio 3. 43 and lowest cost per kg live weight gain (₦100) than rabbits fed other graded levels.

KEYWORDS: Bambara groundnut, offal, Response, Weaner rabbit,

INTRODUCTION

Rabbit has been identified as a source of animal protein (Amaefule *et al*., 2004). Rabbit is a cheap source of low cholesterol white meat that takes very reduced cost to produce, (Luke Fahr and Cheeke), 1991. The rising cost of feeding farm animals occasioned by the rising cost of cereal grain, maize to be precise have caused many farmers to resort to rabbit production to bridge the wide gap between demand and supply of animal protein, (Cheeke, 1987). Rabbits are highly prolific animals with short gestation period and can thrieve well on cheaper and available alternative feeds such as bambara groundnut offal diet. (Emenalom and Udedibie, 1998). These attributes have positively projected the production of rabbit. Rabbit has small body size, which makes it suitable for backyard rearing and freely accepted for consumption by any family. The availability of animal feed is one of the greatest constraints of the livestock industry in Nigeria (Tewe, 1997). There is also the stiff competition between human beings in Nigeria and monogastric animals for available conventional feeds stuffs like maize, soybean and groundnut cake (GNC) (Agunbiade, *et al*., 2001). This has resulted in high cost and at times, poor quality of feed sold to farmers (Iheukwumere, *et al*., 2002). There is therefore need, to source for alternative energy and protein sources that have no direct use by man, and which also has no immediate industrial use. Bambara groundnut offal satisfy these qualities and has been found a good protein source.

Bambara groundnut is grown mainly in Enugu, Ebonyi and other Middle Belt areas of Nigeria. The seeds are milled to obtain "Okpa" that is human food. The offal (waste from seed milling is available throughout the year and very cheap. Bambara groundnut offal, a by-product food is discarded after obtaining the flour. It could constitute environmental hazard if no use is found for it. The objective of this study was to determine the response of weaner rabbits to diets containing graded levels of raw Bambara groundnut offal.

MATERIAL AND METHODS

The study was carried out in the Rabbit Unit of the University of Port Harcourt Teaching and Research Farm. Port Harcourt lies between latitude 6 and 8^0 South and longitude 9 and 6^0 West and situated in the Southern boundary of the humid zone. Mean annual rainfall in the area is 5500mm, lasting from March to October. Mean daily temperature during the wet season is 24^0c with mean relative humidity of 96%. The dry season lasts from November to February with mean daily temperature ranging from 25 to 32^0c and mean relative humidity of 15-35^0c. Bambara groundnut offal purchased from Enugu while other feed stuffs and rabbits were bought from local markets in Port Harcourt.

Housing

The rabbits were housed in a 3-tier rabbit cage which had a total of 5 hutches, of 12 rabbits per hutch. The cages which were located inside the rabbit building equipped with good ventilation through windows finished with wire gauze. Each hutch unit (100cmx40cmx 40cm), accommodated two rabbits, partitioned with wood and wire mesh and fitted with aluminum drinkers and feeders (15cmx10cmx 10cm).

Management of Experimental Animals

Sixty weaner rabbits of mixed sexes were used. They were a hybrid of Chinchilla x New Zealand White. Two rabbits were housed in a hutch unit. The rabbits were fed the experimental diet (Table 1) and feed and water were

given ad libitum during the experimental period. Equal quantities of supplemental forages (Centrosema Pubescence, Aspilia Africana and Panicum maximum) were also provided (Amaefule *et al*., 2005). The rabbits were given coccidiostat and dewormed before the start of the experiment.

Experimental Diets

Five experimental diets were formulated using graded levels of raw bambara groundnut offal. The inclusion levels were 0, 5, 10, 15 and 20% in treatment 1,2,3,4 and 5 respectively. The bambara groundnut offal replaced part of maize in the diet as shown in Table 1. The diets were fortified with bone meal, vitamin premix and salt.

Experimental Design and Data Collection

The experimental design was a completely randomized design (CRD) with model:

$$Yij = \mu + Ti + eij$$

Where:

Yij	=	General observation
μ	=	Overall mean
Ti	=	Treatment effect
eij	=	Experimental error

The rabbits were fed ad libitum and any left-over was recorded. The rabbits were weighed at the start of the experiment and subsequently on a weekly basis. Parameters measured were weight gain, feed intake, feed conversion ratio, protein intake and protein efficiency ratio. Weight gain was calculated by subtracting initial live weight from final live weight, feed intake was determined by dividing the daily feed consumed by the rabbits. Weighing of rabbits was on individual basis and took place in the morning (8.00-9.00am) each week. Feed conversion ratio was determined by dividing feed intake by weight gain. Protein efficiency ratio was calculated as weight gain divided by protein intake while cost per kg weight gain was calculated as feed conversion ratio (FCR) x cost/1kg feed.

Chemical and Data Analysis

The proximate composition of the diets was determined according to methods of AOAC (1990). The data collected were subjected to analysis of variance (ANOVA) as described by Steel and Torrie (1980). Differences between treatment means were separated using Duncan multiple Range Test (Duncan, 1955). Data in percentage were subjected to Arcsine transformation before ANOVA.

RESULTS AND DISCUSSION

The percentage composition of the diets of graded levels of raw bambara groundnut offal (BGO) is shown in Table 1 while the proximate composition of bambara groundnut offal (BGO) diets composed of graded levels of raw Bambara groundnut offal are shown in Table 2. It has Crude Protein (CP) of 19.22%, which is numerically higher than a crude protein of 17.70% reported by Amaefule and Osuagwu (2005). The dry matter, crude fibre, ether extract and crude ash contents were also numerically lower than those reported by Ani and Okafor (2004). These differences in proximate composition could be attributed to differences in variety and processing (extent of sieving to obtain the flour for human consumption). The crude fibre composition of the BGO diets were considered normal, reason being that rabbits could tolerate crude fibre to a certain extent. The performance of weaner rabbits to different levels of bambara groundnut offal diet is presented in Table 3. There were no significant ($P>0.05$) difference in final live weight, daily weight gain, daily feed intake, feed conversion ratio and cost per kg weight gain. However, there were significant ($P<0.05$) differences in protein intake, protein efficiency ratio and total feed cost. Rabbits fed 20% BGO diet had a significantly ($P<0.05$) higher protein intake than the rabbits fed other diets. Protein intake was similar among rabbits fed control and 5% BGO diet, and also similar among those fed 10% and 15% BGO diets. Rabbits fed control (0% BGO) diet had a significantly ($P<0.05$) higher protein intake than those fed 10 and 15% BGO diets. These differences in protein intake among the rabbits fed the graded levels of BGO diets could be due to differences in the crude protein content of the diet (Table 2) and could be related to the pattern of feed intake by the rabbits as shown in Table 3. Total feed cost significantly ($P<0.05$) decreased with increase in inclusion level of BGO in the rabbit diets. The reduction in feed cost is expected to increase the farmer's income and profit from rabbit produced using BGO diets. The results of this experiment agrees with that obtained by Amaefule and Osuagwu (2005) with pullets fed graded levels of raw bambara groundnut offal diets which stated that the inclusion significantly ($P<0.05$) reduces the feed cost. The carcass and organ characteristics of rabbits fed graded levels of raw bambara groundnut offal diets are shown in Table 4. There was no significant ($P<0.05$) difference among the rabbits fed the control (0% BGO) and bambara groundnut offal diets in percent dressed weight, heart, kidney, liver, spleen and tail. This suggests that the anti-nutritional factors that the raw bambara groundnut offal contained was well tolerated and handled by the rabbits. However, rabbits fed 20% BGO diets had a significantly ($P<0.05$) bigger head then those fed 15% BGO diets and also a significantly bigger intestine (small + large intestine) than those fed the control diet. The differences in the weight of head and intestine among the rabbits fed control and BGO diets could be due to individual differences inherent among the rabbits.

CONCLUSION

The result of this study has shown that BGO is a valuable feed ingredient for rabbits, which could be fed at 15% inclusion level in rabbit's diet to enhance daily weight gain, final live weight and reduced cost of production.

TABLE 1: Percentage Composition of the Diets of Graded Levels of Raw Bambara Groundnut Oil

Feed stuff	0%	5%	10%	15%	20%
Bambara offal	0	5	10	15	20
Fish meal	2.00	2.00	2.00	2.00	2.00
Maize offal	54.50	49.50	44.50	39.50	34.50
Soybean meal	10.00	10.00	10.00	10.00	10.00
Wheat offal	10.00	10.00	10.00	10.00	10.00
Palm kernel meal	20.00	20.00	20.00	20.00	20.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Vitamin premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Total (%)	100	100	100	100	100

Premix supplied A 200000 IU, Vit.D_3 400000 IU, Vit.E 8.00g, Vit. K_3 0.40g, Vit. B_{12} 0.32g, Vit.B_2 0.96g, Vit.6 0.56g, Vit.C 2400mg, Vit. B_{12} 400g, Folic acid 0.16g, Biotin 8.00mg, Choline 48.00g, Ca pantothionate 1.60g, Mn. 16.00mg, Fe 8.00mg, Zinc 7.20g, Copper 0.32g, Iodine 0.25mg.

TABLE 2: Proximate Composition of Diets Composed of Graded Levels of Raw Bambara Groundnut Offal (BGO)

Composition	0%	5%	10%	15%	20%	BGO
Dry matter (%)	90.90	90.18	91.34	90.24	89.78	86.10
Crude protein (%)	15.63	15.40	13.64	13.65	17.23	19.22
Crude fibre (%)	9.30	9.95	9.75	10.15	10.30	5.40
Esther extract (%)	2.55	2.70	3.85	3.70	2.25	2.36
Crude ash (%)	8.85	9.95	9.65	9.60	8.75	2.00
Nitrogen free extract (%)	54.57	52.18	54.45	53.14	51.25	57.12

BGO = Bambara groundnut offal

TABLE 3: Performance of Weaner Rabbits fed Graded of Raw Bambara Groundnut Offal Diets

Parameter	0%	5%	10%	15%	20%	SEM
Initial live weight (g)	89.50	102.08	91.67	108.33	100.40	9.21
Final live weight (kg)	0.78	0.82	0.93	1.18	0.93	0.13
Daily weight gain (g)	12.39	12.76	14.99	19.16	14.72	2.26
Daily feed intake (g)	48.64	49.17	46.28	48.15	50.32	2.57
PCR	3.93	4.26	3.14	2.56	3.85	1.93
Protein intake (g)	7.60^{b}	7.58	6.30^{c}	6.57^{c}	8.68^{a}	1.23
PER	1.63^{b}	1.68^{b}	2.37^{ab}	2.92^{a}	1.67^{a}	2.86
Cost/kg weight gain (N)	128.16	135.53	96.95	76.55	111.64	18.50
Total feed cost (N)	1109.51^{a}	1082.56^{b}	1050.26^{c}	1017.96^{d}	985.58^{c}	-

a, b, means in a row with different superscripts are significantly.

TABLE 4: Carcass and organ characteristics of weaner Rabbits Fed Graded Levels of Raw Bambara Groundnut Offal Diet

Parameters	0%	5%	10%	15%	20%	SEM
Dressed weight(%)	42.50	40.98	41.27	47.62	38.98	3.22
Heart (%)	6.63	5.93	4.35	6.37	4.42	1.08
Kidney (%)	7.77	8.38	7.56	6.63	7.56	6.47
Liver (%)	13.95	14.06	14.45	13.91	14.38	3.01
Spleen (%)	2.28	2.68	2.55	1.57	2.29	1.12
Head (%)	32.03^{ab}	33.66^{a}	29.41^{ab}	22.95^{b}	36.89^{a}	3.54
Tail (%)	7.49	8.44	7.71	8.79	8.37	2.66
Intestine (%)	37.13^{b}	54.24^{a}	52.65^{a}	42.69^{ab}	51.46^{a}	4.15

a, b means in a row with different superscripts are significantly different (P<0.05). SEM = Standard Error of Mean.

REFERENCES

Agunbiade, J.A., Osilalu, A.A. and Adeyemi, O.A. (2001) Performance response of growing rabbits fed difference sources and levels of dietary fibre. *Trop. J. Anim. Sci*., 4(1):77-84.

Amaefule, K.U., Nwaokoro, C.C. and Iheukwumere, F.C. (2004) The effect of feeding graded levels of raw pigeon pea (*Cajanus Cajan*) meal on the performance, nutrient retention and carcass characteristics of weaner rabbits. Nigerian *Journal of Anim. Prod*., 31:194-199.

Ani, A.O. and Okafor, I.C. (2004) Nutritional evaluation of raw Bambara Waste (*Vigna subterranean (L) Verdc*) for weaner rabbits. Proc. 29th Ann. Conf. Nig. Soc. For Anim. Prod.(NSAP), Pp.183-186.

Cheeke, P.R. (1987) Rabbit feeding and nutrition, Academic press Inc. Orlando, Florida, U.S.A.

Emenalom, O.O. and Udedibie, A.B.I. (1998) Effect of dietary raw, cooked and toasted Mucuna preriens seed (*Velvet bean*) on the performance of finisher broiler. *Nigerian Journal of Animal Production*. 25(2):115-119.

Iheukwumere, F.C., Onyekwere, M., Nwoche, G. and Saulawa, L.A. (2002) Evaluation of growth performance, blood mineral profile and carcass characteristics of weaner rabbits fed rice milling waste. *Journal Sustainable Tropical Agric. Res.* 4:61-66.

Luke Fahr, S.D. and Cheeke P.R. (1991) Rabbit project development. Strategies in subsistence farming system. 2. Research application, World Review. 69:26-35.

Lister, D. (1996) The meat, we eat. Notions of quality for today or tomorrow. 2. The appeal and organoleptic properties of meat, Outlook on Agriculture. 25(4) 263-266.

Tewe, O.O. (1997) Sustainability and development paradigms from Nigeria's livestock industry. And inaugural lecture delivered at the University of Ibadan, Ibadan, 1997. 1-42.