Performance of the African giant rat (*Cricetomys gambianus* Waterhouse) on commercial rations and varying dietary protein levels

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Performance of the African giant rat *(Cricetomys gambianus* Waterhouse*)* on commercial rations and varying dietary protein levels

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Summary

The growth performance of 24 weanling giant rats was studied in 2 experiments of 30 weeks duration with commercial livestock rations and graded levels of protein. Daily average liveweight gain was 5·1-7·3 g, food consumption 26·9-36·3 g on 6 diets. Food intake, growth rate and food efficiency ratio were very similar using the different commercial diets. Growth performance improved as the dietary protein level was raised from 10 to 13%, but a further increase to 16% did not result in greater growth. The commercial pig ration and the experimental diet containing 13% dietary protein level were found to give satisfactory growth, and are recommended for studies with these animals.

In the forest zone of West Africa, rodents form a significant portion of animal protein consumed, especially by people in rural areas (Clottey, 1969; Asibey, 1970; Ajayi, 1973). The African giant rat (*Cricetomys gambianus* Waterhouse) is a rodent which is highly favoured and consequently overhunted in this part of Africa. A program of domestication of the giant rat started at University of Ibadan in 1972. Studies were conducted principally on the biology of this species and an examination of its merits and demerits as a producer of meat was undertaken. Several generations have been bred in captivity and they are now completely docile and have adapted to foodstuffs which are locally available. Males have an average weight of about 1·5 kg while females weigh up to 1·0 kg. They attain puberty at 20-23 weeks and females exhibit an oestrous cycle of 4 days. Females reproduce 5-6 times a year with a litter size of 1-5 (Ajayi, 1974). However, as far as is known there is no published information on the dietary protein requirements of these animals. The structure of the gastrointestinal tract of the giant rat shows that it is monogastric since it bears no resemblance to all the well-known herbivores or the ruminant animals with their enlarged caeca or complex stomachs (Ajayi, 1974).

Experimental procedure

2 experiments were conducted on giant rats to evaluate the growth performance on 3 different commercial livestock rations and 3 graded levels of protein.

Studies on commercial rations

12 female weanling rats averaging 24·8 g in weight, were selected from the domesticated stock. They were randomly alloted to 3 treatment groups. The experimental ratios consisted of commercial food for poultry, pigs and rabbits. The gross compositions of the diets (except that of the rabbit diet which was not available) are presented in Table 1. Each rat was kept in a separate metal cage and offered food and water ad libitum. Data was collected for 24 weeks on food consumption and growth rate.

Studies on varying dietary protein levels

3 weaner diets (A, B, C) were formulated containing 10, 13 and 16% of calculated crude protein respectively. Procedure for this study was as in the 1st experiment except that 12 male rats were used.

Weanling male rats weighed 21·8 g on average. Estimation of dry matter, crude protein, ether extract and crude fibre contents of 3 diets were

Table 1. Gross composition (%) of experimental diets for the giant rat

Ingredient	*Poultry ration**	*Pig ration**	*Rat weaner diets*		
			A	*B*	*C*
Maize	51·3	59·0	90·2	85·8	81·5
Groundnut meal	31·3	26·0	1·7	4·8	7·8
Fish meal	5·6	–	–	–	–
Rice bran	2·1	–	2·5	2·5	2·5
Blood meal	–	5·0	0·6	2·0	3·2
Dried yeast	2·6	–	–	–	–
Brewer's grains	–	2·5	–	–	–
Molasses	–	2·0	–	–	–
Palm oil	–	2·5	2·0	2·0	2·0
Luru	3·1	–	–	–	–
Oyster shells	2·1	0·75	–	–	–
Bone meal	1·6	1·75	2·5	2·5	2·5
Vit-mineral†	–	–	0·5	0·5	0·5
Salt (NaCl)	0·3	0·5	–	–	–
	100	100	100	100	100

*The calculated approximate crude protein content of the poultry and pig rations was 25·6 and 24·0% respectively.

†'Agricare mix' (a Pfizer product) was added in a proportion of 1 tin (2.5 Kg)/ton food. This supplied some vitamins, minerals and antibiotics.

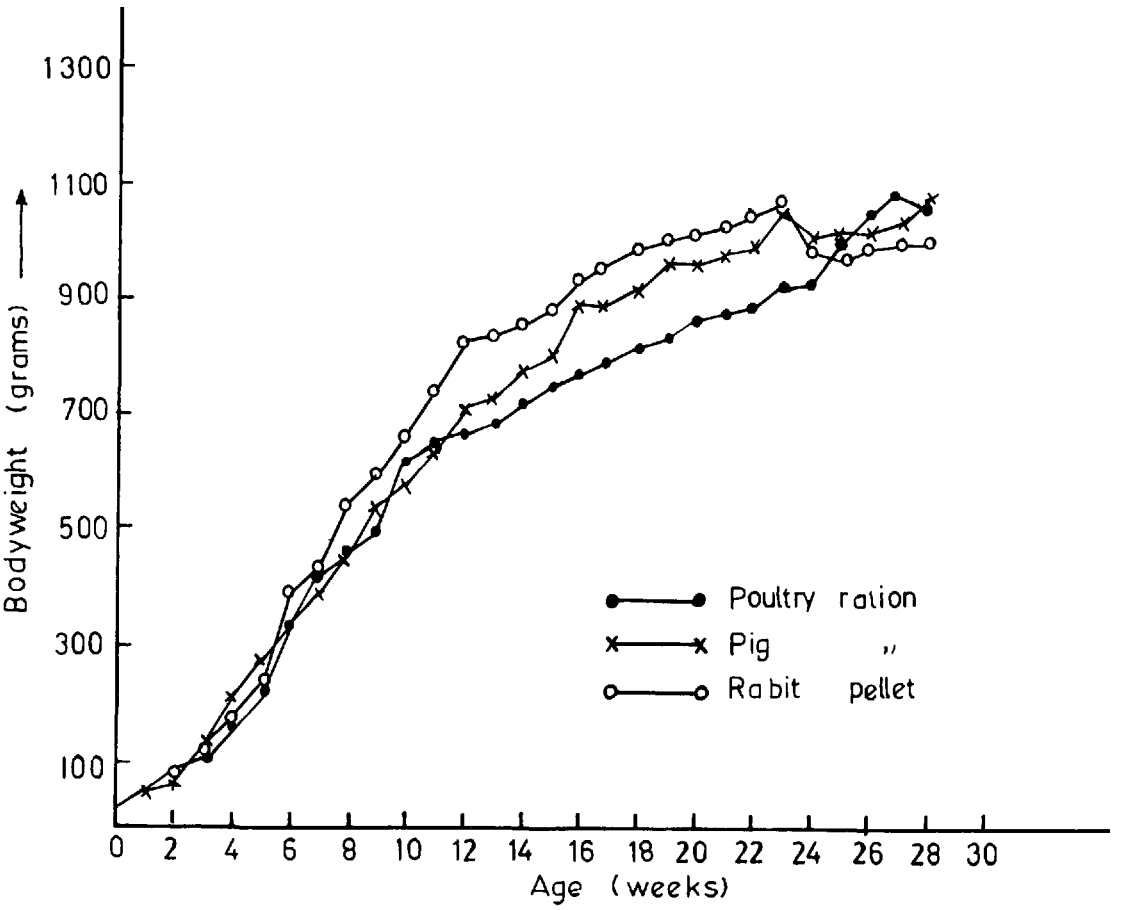

Fig. 1. Growth curve for African giant rat on different commercial diets.

carried out using the methods of AOAC (1970). The results are shown in Table 2.

Data collected were subjected to variance analysis (Snedecor & Cochran, 1970).

Results

The performance of female rats on the 3 commercial livestock foods are shown in Table 2 and Fig. 1. Growth performance data of giant rats fed on different protein levels are also shown in Table 3 and Fig. 2.

Table 2. Nutrient composition (%) of 3 rat weaner diets, A, B and C, fed to male giant rats

	A	*B*	*C*
Dry matter	89·0	87·6	87·6
Crude Protein (N × 6·25)	9·8	12·9	15·5
Crude fibre	1·9	1·5	2·7
Ether extract	3·1	2·4	2·7

Discussion

The performance of female rats on the 3 commercial livestock foods shows that the daily food intake was not significantly different between treatment groups,

Table 3. Performance of giant rats on different commercial livestock rations and graded levels of protein

	Poultry (mash)	*Pig (meal)*	*Rabbit (pellets)*	*A*	*B*	*C*
Daily food intake (g)	26·9 ± 3·2	29·5 ± 2·4	32·4 ± 0·9	30·9 ± 2·2	36·3 ± 1·2	32·4 ± 2·3
Daily weight gain (g)	5·1 ± 1·0	5·7 ± 0·4	5·6 ± 0	6·0 ± 0·09	7·2 ± 0·2	7·3 ± 0·6
Food:gain ratio	5·3 ± 0·15	5·2 ± 0·4	6·0 ± 0·6	5·2 ± 0·32	5·1 ± 0·17	4·5 ± 4·4
Protein efficiency ratio	...	...	...	2·0 ± 0·12a	1·5 ± 0·04b	1·4 ± 0·15b

a, b Values without a common superscript in horizontal rows are significantly different ($P < 0·05$)

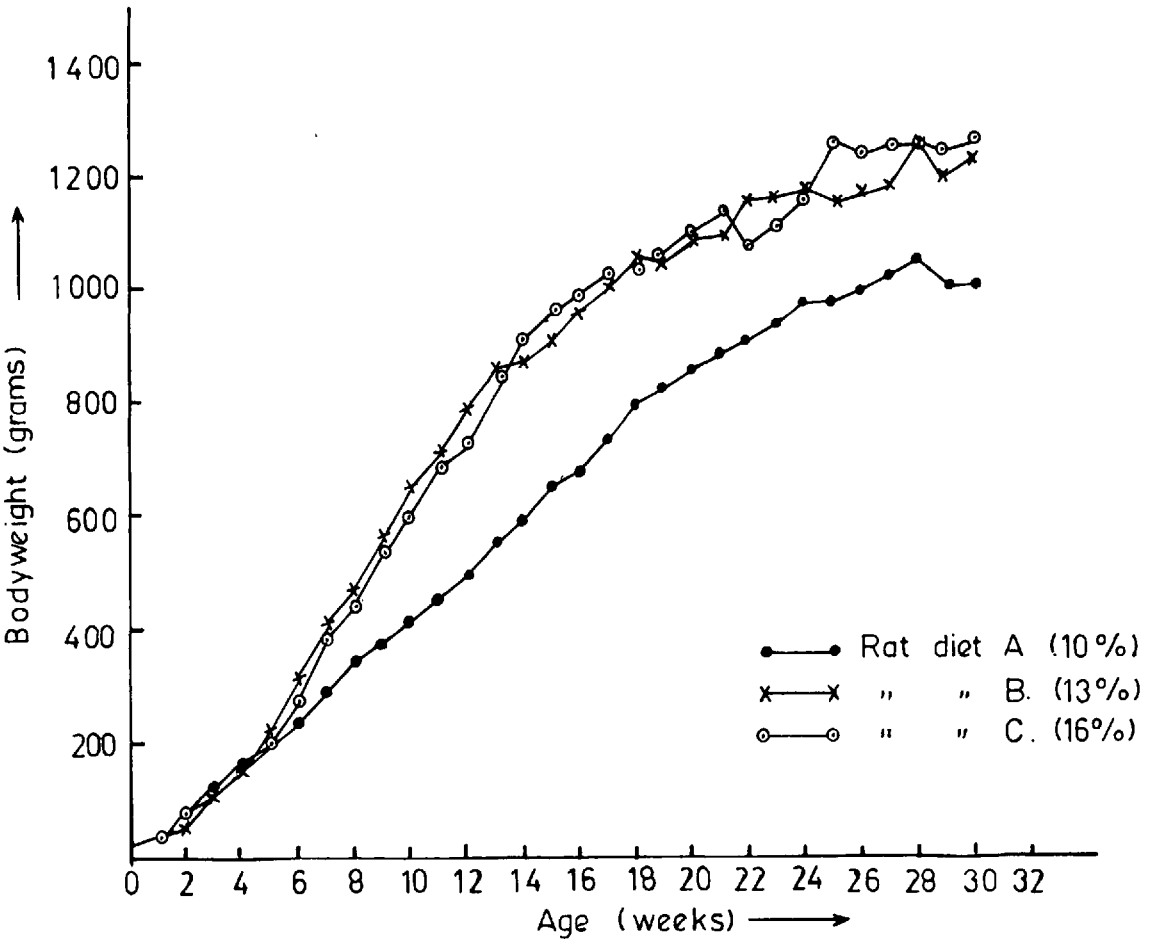

Fig. 2. Growth curve for African giant rat on different levels of protein.

although animals on rabbit pellets consumed slightly more food. Daily weight gain was least on the poultry ration. Indeed, the growth curve of the giant rats shown in Fig. 1 indicates that after about 10 weeks, bodyweight gains on the pig and rabbit diets surpassed those of rats on the poultry ration. Food:gain ratio was highest on the rabbit pellets. This was however not statistically significant ($P>0{\cdot}05$).

These results agree with observations in pigs (Pond & Maner, 1974) that, contrary to early beliefs, pelleting did not result in increased food intake. Generally, there was either no change in food intake or a very minor reduction in total food consumed. Pooling all observations in this study it appears that the giant rat can be raised on the locally available commercial rations.

The performance of giant rats fed on different protein levels shows that food intake and growth rate were not significantly ($P>0{\cdot}05$) higher on the 13 and 16% protein diets. Growth curves for the 30 week study period (Fig. 2) also show that bodyweights were similar for all treatment groups until the 6th week, after which there was a consistently higher bodyweight gain on diets B and C. Food per gram gain was least on diet C, while the protein efficiency ratio was significantly ($P<0{\cdot}05$) highest on the 10% protein diet.

The results indicate that there is an improvement in performance of giant rats with increase in protein level from 10 to 13%. This is in consonance with observations on other species like the pig, where increasing protein levels have an appreciable effect on performance (Fetuga, Babatunde & Oyenuga, 1975). The protein levels for optimum performance, however, differ in different species. Growth rate and food efficiency in pigs improved as dietary protein levels were raised from 10 to 20% (Fetuga *et al.*,

1975). Optimum production was obtained in rabbits at 15 – 18% crude protein in air-dried diets, depending mainly on breed and stage of development (Smith, Donefer & Mathieu, 1960; NRC, 1966) while a level of 20% crude protein has been recommended for optimum growth performance of the albino rat (NRC, 1972). The maximum growth rate of the African giant rat from this study appears to be considerably less than that of the white rat, the rabbit and the pig.

The lower crude protein requirement places this species at an economic advantage as protein is one of the most important and costly ingredients in livestock rations. Further investigations on varying protein levels and correlation of performance with amino acid content of the diets would be necessary in order to ascertain the crude protein and amino acid requirements.

General observations from the studies on the giant rat show the possibility of developing this species for use in nutritional and clinical experiments in which the albino rat is currently being used alone or in comparison with other larger monogastrics. The weight at weaning is lower than that of the white rat, being 21·8 g in males and 24·8 g in females compared with 45 g and 44 g respectively in the albino rat. The weight at maturity (average 225 days) is about 1500 g for males and 1000 g for females (Ajayi, 1974), compared with a mature weight of 550 and 325 g in male and female albino rats respectively at an average of about 350 days (NRC, 1972). The advantages of early maturity and higher mature bodyweight in the giant rat are worth noting. A 20 month study on the reproductive performance was reported by Ajayi (1974). The giant rats were raised on palm fruits—their favourite food item in the wild. Data obtained from 27 births showed that the female breeding age ranged from 20-24 weeks. Gestation was 27-36 days. The sex ratio was 1·2 ♂: 1♀, weaning age 23-26 days, and litter size varied between 1 and 5, with 4 the most common. The lower litter size, as compared to 8-9 (NRC, 1972) in the albino rat, might be a limitation for some types of experiments.

In conclusion, it appeared from this study that the giant rat could be developed as a counterpart to the white rat in nutritional, pharmacological and clinical studies, and confirms also that it may prove to be an economic source of meat for human consumption.

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