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Short Communication

GROWTH PERFORMANCE AND NUTRIENT DIGESTIBILITY OF GUINEA PIGS (*Cavia porcellus*) FED TWO LEVELS OF PROTEIN AND ENERGY

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ABSTRACT

A twelve weeks trial was conducted to evaluate the growth performance and nutrient digestibility by guinea pigs fed two different levels of protein and energy. A total of 24 weaned guinea pigs with an average weight of 241.75 g of both sexes were used for the study. The guinea pigs were randomly allotted to two treatment diets in three replicates each. Each replicate had four animals. Two experimental diets were formulated and fed to the animals. Diet 1 had low protein content (16 % CP) and a high energy value (3189.18 Kcal/Kg), while diet 2 had high protein content (22 % CP) and a low energy value (2864.81). Parameters measured were: feed intake, body weight, body weight gain, feed conversion ratio (FCR) and the degree of nutrient utilization by the animals. Results revealed that there were significant differences ($p<0.05$) in the mean feed intake, body weight and FCR by guinea pigs fed the two treatment diets. Dry matter (DM), crude protein (CP), ether extract (EE), ash and Nitrogen free extract (NFE) digestibility were not significantly ($p>0.05$) affected by the treatment diets. It was concluded that growth performance and nutrient digestibility of guinea pigs is affected by different levels of protein and energy diets fed to them.

Keywords: Guinea pig, growth performance, nutrient digestibility, protein and energy.
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INTRODUCTION

More than 60 animal species contribute to man's daily need for food, shelter and energy. Of this diverse genetic resource, the domestic species of cattle, sheep, goat, pig and rabbit play important role in livestock production throughout the World. The reason for this may be due to the evolution of human culture and the changing attitudes of hominids to animals, man's migratory movement, the availability of natural resources for animal husbandry and the presence of socio-economic factors favouring improvement of particular ecological zones (FAO, 1981). The species mentioned above have however not really met expectations with regard to the provision of needed protein of animal origin, hence the yawning protein deficit in the diets of most Nigerians. The importance of unconventional animal species (small and largely disregarded animals) to livestock development and their role in improving the diet of the very poor is gaining recognition. The commercial

exploitation of this class of animals is justified by the fact that they are well adapted to harsh environment and can utilize natural resources that the larger (conventional) animals cannot. Integrating them into modified or intensified production systems will enable more efficient recycling of nutrients in the ecological chain. Besides, most of the smaller animals are easy to feed, require limited space and management skill, easily handled and hence can easily be raised by landless and resource poor individuals both in the rural and urban areas of the country. The guinea pig (*Cavia porcellus*) a member of the cavidae family is one of such *micro livestock* that can play an active role in bridging the protein gap inherent in the diet of most Nigerians. The guinea pig originated in the mountains and grassland of the altiplano region of South America and was domesticated around 5,000 BC (Morales, 1995). In the Andean culture, it was used for religious ceremonies and traditional medicines (D'Erchia *et al.*, 1996; Alderton, 1999). It has become socially acceptable for consumption in West Africa (Morales, 1995). Nuwanyakpa *et al.* (1997) opined that the guinea pig is a more profitable source of food and income than many traditional livestock such as pig and cattle. It can therefore be a source of meat in developing economies to alleviate protein deficiency. In West Africa, much of the work on the guinea pig has been done in Cameroon (Ngoupayou, 1992; Ngoupayou *et al.*, 1997). Productivity of monogastric farm animals is affected by the level of nutrients in their diet and their ability to digest and hence assimilate such nutrients. Numbela and Valencia (2003) in their study of the guinea pig in South America had reported that feed intake of guinea pigs is affected by the energy level of the diet. It is therefore possible that protein content of the diet might also exert some effect on feed intake and possibly, nutrient digestibility. There is scarcity of information pertaining to productive studies undertaken on the guinea pig in Nigeria. The objective of this study therefore is to evaluate the response of guinea pigs to two different dietary levels of protein and energy.

MATERIALS AND METHODS

The study was carried out at the Teaching and Research Farm of the Department of Animal Production, Federal University of Technology, Minna Gidan Kwanu campus. Minna is located at an altitude of 1475m above sea level, latitude 9° 31′ and 9° 45′ North and longitude 6° 31′ and 6° 45′ East of the Equator. It lies within the southern guinea savannah agro-ecological zone of Nigeria. It is characterized by two distinct climate; dry season (November-April) and rainy season (May-October). The annual rainfall and mean temperature range are: 1,100-1300mm and 38-42°C respectively (NSADP, 1995). The relative humidity as of the time of the experiment was 65%.

Animals used for the study were obtained from Shakwatu village along Minna Gwada road and Kagara along Tegina Birnin Gwari Kaduna road. The twenty four animals were randomly allotted to two dietary treatments each with three replicates of four animals. The animals were housed in pens each measuring 60 cm x 65 cm x 60 cm. The hutches were washed and disinfected with Dettol© before stocking with the animals. Feeders and drinkers were provided in each pen. Antibiotics and coccidiostat were administered before the commencement of the study as prophylactic treatment against bacteria and coccidiosis infections. Two treatment diets were formulated (Table

1) and fed to the animals through out the duration of the study. Water and feed were given *ad libitum* throughout the study period. Feed was given in the morning and in the afternoon at an interval of eight hours. This is to avoid feed wastage.

Parameters measured were feed intake, body weight, body weight gain and FCR. Three guinea pigs were selected per treatment by the eleventh week of the study and used to evaluate the feed quality. The guinea pigs were acclimatized in wooden digestibility cages for a period of five days. Faeces were collected over a 24 hours period for three consecutive days. The droppings were weighed using sensitive electric scale and oven-dried for 24 hours at 100°C. The oven-dried samples were pooled together and a representative sample was taken for chemical analysis. The nutrient composition of the experimental diets as well as that of the faeces collected were analyzed for DM, CP, EE, ash and NFE by the method of AOAC (1990). Nutrient digestibility was computed as:

$$\% \text{ Nutrient digestibility} = \frac{\text{nutrient in feed} - \text{nutrient in faeces}}{\text{nutrient in feed}} \times 100$$

Table 1: Composition of experimental diets (%)

Ingredients	Diet 1	Diet 2
Maize	68.86	52.29
Soya bean meal	16.09	32.16
Maize bran	6.50	10.00
Fish meal	3.00	3.00
Bone meal	1.80	1.80
Salt	0.10	0.10
Lysine	0.20	0.20
Methionine	0.20	0.20
Premix	0.25	0.25
Palm oil	3.00	0.00
Total	100	100
% CP	16.00	22.00
Energy (Kcal/Kg)	3187.18	2864.81

Data obtained from the study were subjected to statistical analysis (t-test) using Minitab statistical package (Minitab, 2003). Significant level was set at $p<0.05$.

RESULTS

The result of the proximate composition of the experimental diets is shown in Table 2. It shows that DM and NFE were high in diet 1 while diet 2 had a higher level of CP, CF and ash. The EE content of the two diets were however similar.

Table 3 represents a summary of the performance of guinea pigs fed different levels of protein and energy. Guinea pigs fed diet 2 consumed more feed compared to those fed diet 1. They also had better body weight, but lower body weight gain and feed conversion ratio. The feed intake, body weight and feed conversion ratio were significantly ($p<0.05$) affected by the intake of different levels of protein and energy.

Table 4 shows the degree of apparent nutrient digestibility by guinea pigs fed different protein and energy levels. All the indices evaluated were not significantly ($p>0.05$) affected by the treatment diets.

Table 2: Pvroximate composition of experimental diets (%)

Parameter	Diet 1	Diet 2
DM	92.21	91.58
CP	16.05	22.00
CF	5.41	7.95
Ash	2.23	2.95
EE	27.77	27.77
NFE	40.75	30.92

Table 3: Performance of guinea pigs fed different levels of protein and energy

Parameter	Diet 1	Diet 2	Significance
Feed intake (g)	103.21±5.78^{b}	115.80±6.70^{a}	*
Body weight (g)	349.60±18.58^{b}	353.98±16.75^{a}	*
Body weight gain (g)	17.53±2.71	17.22±2.30	ns
FCR	0.16±0.03^{a}	0.18±0.03^{b}	*

a,b: means denoted by different superscripts are significantly ($p<0.05$) different
ns: not significant ($p>0.05$)

Table 4: Apparent nutrient digestibility by guinea pigs fed different levels of protein and energy (%)

Parameter	Diet 1	Diet 2	Significance
DM	94.50	95.67	ns
CP	94.28	95.36	ns
CF	81.90	92.17	ns
Ash	97.31	97.30	ns
EE	83.68	83.80	ns
NFE	93.30	94.43	ns

ns: not significant ($p>0.05$)

DISCUSSION

The better feed consumption by guinea pigs fed diet 2 might be as a result of the lower energy content of the diet. This might be as a result of an attempt by the animals fed the diet to meet their dietary requirement for energy. Jurgens (2002) and Numbela and Valencia (2003) had reported that feed intake by animals on diets containing low energy concentration tend to be high whereas that of animals fed high energy tend to be low.

Guinea pigs fed diet 2 were also significantly ($p<0.05$) heavier than those fed diet 1. This might be attributed to the high amount of protein in the diet fed to them. This led to better muscle build up. Besides, the same group of guinea pigs consumed more feed which translated to better body weight. Gillespie (1997) reported that protein is very important for body tissue growth and development. Kirkpinar and Oguzi (1995) also reported that increasing dietary protein concentration resulted in faster growth in poultry birds. This seems to be applicable also to the guinea pig. Guinea pigs fed diet 1 had better ($p<0.05$) FCR compared to those fed diet 2. This might be as a result of the greater proportion of energy in the diet fed to them.

The fact that all the indices evaluated (with regard to nutrient digestibility) were not significantly ($p>0.05$) affected by the treatment diets means that guinea pigs have a very efficient digestive mechanism. This is because even though the diets fed the animals in this study differ in terms of protein and energy contents, the animals were still able to digest the nutrients to the same degree. It could also mean that the ingredients used in formulating the diets are highly digestible by the animals.

CONCLUSION

The results show that guinea pigs are affected by dietary levels of protein and energy as evidenced by the difference in feed intake and final body weight of the animals. It is recommended therefore that guinea pigs be fed high protein diets and a correspondingly adequate energy level for optimal performance.

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