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Effects of Graded Crude Protein Diet on Haematological Indices and Body Weight of African Giant Rat (*Cricetomys gambianus*)

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ABSTRACT

The domestication of the African giant rat (AGRs) (*Cricetomys gambianus*) to compliment the inadequate animal protein supplies in Nigeria and its potential to serve as a model for biomedical research is yet to be fully exploited. This study determines the effects of varied crude protein (CP) diet on haematological indices and body weight of AGRs. Blood samples were obtained from the orbital sinus of 30 apparently healthy adult male and female AGRs. The AGR's were kept in captivity and divided into 6 rats per group (A, B, C, D and E). Group A served as control group. The groups were fed with graded levels of crude protein (CP) of (E) 9.83%, (D) 14.79%, (A) 21.21%, (C) 23.93% and (B) 27.84%. Each chloroform pre-anaesthetized AGRs were weighed at days 0 and 14, 28, 42 and 56, while blood samples were collected at days 28 and 56. The samples were each analyzed for erythrocyte and leucocyte parameters and platelet counts by standard methods. All data collected were subjected to analysis of variance and student t-test. At 28 days post-feeding, AGRs fed with 27.84% CP showed no significant elevations in erythrocyte and leucocyte values compared with control values (21.21% CP). However, at 56 days post-feeding, RBC, Hb, PCV, total WBC, eosinophil, lymphocyte and monocyte counts were significantly lowered in the group fed with 27.84% CP. No significant differences in body weights were observed in rats that were fed 27.84%, 21.21%, 14.8% and 9.8% crude protein diets for 28 and 56 days. This study shows improved body weight with 27.84% CP compared with other crude protein percentage used while 14.79% CP had the best haematological parameters when compared with other crude protein groups.

Keywords: African giant rats; Crude protein; Haematology; Weight

INTRODUCTION

The African giant rat (AGR) (*Cricetomys gambianus*, Waterhouse) is a large wild rodent with adult mean body weight ranging from 0.86-1.13 kg (Oyewale*et al.*, 1998). Also known as the Gambian pouched rat, it is native to Africa, belonging to the class *Rodentia*, and is a representative of the *Muridae* family (Cooper, 2008). In local Nigerian parlance, they are called *Ewi* in Igbo language, *Burugu* in Hausa and *Okete* in Yoruba. The African giant rat is widely distributed in Nigeria, but more abundant in the savannah regions of the country (Ajayi and Tewe, 1983). The rat is believed to be a highly intelligent mammal with the ability to use varieties of materials like soil, stones, soiled bedding as a plug to the main entrance of its hole during the day to protect itself from intruders and predators (Ajayi, 1974). Phenotypically, the African giant rat is distinguished from other giant rats by its very long tail with a distinguishing white tip. Also, it gets its distinctive name from its elastic bag-like mouth cavity that can only be compared to a marsupial pouch (Ajayi *et al.*, 1978). African giant rat can be domesticated and be raised or reared as a potential source of income and also to provide an important means of animal protein for both rural and urban dwellers. Much information about this animal such as feeding, watering, reproductive characteristic and behaviour needs to be unveiled. Basically, in the wild, reports have it that this animal fed on forages including *Pennisetum purpureum* (elephant grass), *Panicum maximum* (guinea grass), *Saccharum spp* (sugar cane); herbaceous legumes like *Stylosanthes spp* (stylo) and *Pueraria phaseoloides* (tropical kudzu) (Marani,2018). Ajayi and Tewe, (1980) reported that elephant grass was the most consumed grass by cane rats in their study. However, some of these gramineous species especially the *Pennisetum purpureum* (elephant grass) and *Panicum maximum* (guinea grass) are found to have low protein and vitamin levels and usually result to high wastage of the feed, which makes feed supplementation a necessity in captivity (Ntiamoah-Baidu,1998; Scharage and Yewadan, 1999).

Several feed rations attempts have been made to determine the most optimum feed for the AGRs in captivity. For instance, Ajayi and Tewe (1983) reported that feeding of the African giant rats with commercial pig ration improves the growth performance when the protein level was raised from 10 to 13 %. Cooper (2008) also reported that African giant rat requires more protein than the other laboratory rats.

The blood has been described as the most important and reliable medium for assessing the health status of animals (Oduye, 1976; Anosa, 1983). Haematological indices reflect the physiological responsiveness of the animal to its internal and external environment, which includes quality and quantity of feed, feeding regime and other management practices (Esonu *et al.*, 2001). Animal nutritionists agree that feed ingredients, including unconventional feedstuffs, affect nimal physiology (Emenalom and Udedibie, 1998). H aematological parameters are also valuable in monitoring toxicity especially with feed constituents that affect the process of erythropoiesis (Oyawoye and Ogunkunle, 1998). Addass *et al.* (2012) Addass *et al*., (2012) reported on influence of dietary component on haematological parameters as well as (Aya *et al*., 2013) who reported on effects of consumption of processed feeds on the haematological values of animals. Specifically, dietary content affects the blood profile of healthy animals (Odunsi *et al.,* 1999; Yeong, 1999; Iheukwumere and Herbert, 2002; Kurtoglu *et al.,* 2005). Correlation between diet, feed intake and final weight gain has also been previously described in broiler chicken to be one of the determinants of the final weight gain (Adegbenjo *et al.*, 2015)

Domestication of this animal species will require appropriate formulation of a nutritional diet which, will supports optimum growth and reproductive capacity of the animal. For successful domestication of African giant rat, there is a need for proper feeding, together with adequate provision of health and management measures. Haematologi cal indices and weight changes will be good indicators for the assessment of the suitability and correspondent benefit of an experimental diet on a wild species of animal such as African giant rat. The baseline or reference data provided by this study will be an invaluable guide in the management and treatment of African giant rat both in the wild, and in captivity.

MATERIALS AND METHODS

Experimental Site

The study was carried out at the African giant rats Research Unit in the Department of Veterinary Physiology and Biochemistry, University of Ibadan, Nigeria. (Latitude 7° 23′ 8.19"N and Longitude 3°54′ 59.99"E). Average temperature of 26.5°C and mean annual rainfall of 1311mm existed during the experimental period (Google Earth, 2012).

Ethical Statement

The protocol was approved by the Animal Care and research Ethics Committee (ACUREC) of the University of Ibadan, Ibadan, Nigeria with approval reference number UI-ACUREC/App/12/2016/04.

Experimental Animal and Management

Thirty apparently healthy adult wild African giant rats (*Cricetomys gambianus*, Waterhouse) of both sexes were purchased from a local market in Ibadan, Nigeria. They were each housed in a separate cage in the animal house of the Department of Veterinary Physiology and Biochemistry, University of Ibadan, Nigeria. The rats were fed on a commercially available diet of pelletized grower feed (15% crude protein; 7% fat; 10% crude fibre; 1.0% calcium; 0.35% phosphorus; 2,550 kcal/kg metabolizable energy, Vital Feeds Limited, Jos, Nigeria). The feeds and water were provided *ad libitum*. Feeding was also supplemented with palm kernel fruits and yam peelings. The rats were placed on Neomycin-Oxytetracycline HCL® (Neimeth Inter.Pharm Plc, Lagos) and dewormed with piperazine hydrochloride (Wormazine®) (Alfasan International BV344AB Woerden, Holland) at 1g/l of water 2 weeks before the commencement of the study.

Experimental Design

Effects of Graded Crude Protein in Diets

Five semi - purified diets were formulated with graded protein levels of group A (21.21%, n=6; control), group B (27.84%, n=6) and group C (23.93%, n=6), group D (14.79%, n=6) and group E (9.83%, n=6) according to Cooper (2008). Each diet was fed to the different rat groups for 56 days. Each rat was weighed before the commencement of the study and fed at 5gm/100gm body weight. Again, the rats were sampled and weighed after acclimatization at day 0 and 14, 28, 42 and 56 days post-feeding. Blood samples were collected from the retro-orbital venous plexus of each rat after chloroform anaesthesia, into bottles containing ethylene diamine tetra acetic acid (EDTA) (2 mg/ml of blood) for haematological analysis. Some of the AGRs died during the course of the experiment.

Proximate Analysis

Dry matter (DM) was determined by drying at 80°C for 48 h; ash was measured in a muffle furnace at 510°C for 18 h. Crude protein of samples was determined by the Kjeldahl method and the ether extract by a Soxhlet apparatus. Other analysis was carried out according to the methods outlined by the Association of Official Analytical Chemists (DeVries, 2004). We took group A with crude protein of 21.21% as our standard (control) based on the recommendation by Cooper (2008) who recommended 20% crude protein as minimum requirement for African giant rats.

Haematological Analysis

The whole blood samples (from EDTA bottles) were used to determine haematological measurements. Packed cell volume (PCV), Haemoglobin (HB), and Red blood cell (RBC) were determined using Wintrobes microhaematocrit, colorimetry- cyanomethaemoglobin method and improved Neubauer haemocytometer respectively. WBC was determined with a Wintrobes haematocrit tube according to the method of Schalm *et al.* (1975). The WBC differentials counts were carried out on blood smears stained with May-

Grunwald-Giemsa stain. Mean corpuscular haemoglobin concentration (MCHC) and mean corpuscular haemoglobin (MCH) were computed according to Jain (1986).

Determination of Body Weight

Body weights of African giant rats were taken at the beginning of the experiment and at every two weeks until day 56 of the study. Body weight gain/loss was recorded as the difference between the initial day 0 and final body weight day 56 for each group of the crude protein diet (A-E). Mathematically body weight gain was calculated as: Body weight gain (g) = final weight–initial weight. Percentage weight gain was calculated as: weight gain/loss (g) ÷ initial weight × 100.

Statistical Analysis

The data were expressed as mean ± SEM. One- way ANOVA was used for the test of significance between groups that were more than two, and Tukey's post-hoc test was used to compare means of all samples using Graphpad Prism, version 4.00, April, 2003 Statistical Software Chicago, IL, USA. Student's t test was also used to compare two sample means where applicable. $p < 0.05$ was considered significant. (www.graphpad.com).

RESULTS

Table 1 shows gross composition (%) of varied crude protein experimental diets (A-E) for the African giant rats. The feed ingredients used were maize, soya meal, palm kernel cake, wheat offal, fish meal (72%) and Daram Vitamix® premix (at 2.5 kg/ton of feed).

Table 2 shows proximate analysis of chemical composition (%) of the graded experimental diets (A-E) for the giant rats. The feed compositions based on proximate analysis are crude protein, dry matter, ash, crude fiber, crude fat, moisture content and carbohydrate. Group B feed had the highest crude protein (27.84%) while group E had the least crude protein (9.83%).

The Erythrocyte parameters of the remaining 27AGRs after losing 3 out of 30 AGRs 28 days post - feeding with graded crude protein diets are shown in Table 3. No significant differences in the values of PCV, RBC, Hb, MCV, MCH and MCHC were apparent 28 days post – feeding between the rat groups that received 21.21%, 27.84%, 23.93%, 14.79% and 9.83% crude protein diets.

Table 4 shows the leucocytes parameters of the AGRs after 28 days feeding trial. Like the erythrocyte parameters, no significant differences in the values of the total and differential WBC and platelet counts were seen with the rat groups fed with 21.21%, 27.84%, 23.93%, 14.79% and 9.83% crude protein diets.

The erythrocytic indices values of 22 remaining AGRs after losing 8AGRs at 56 days after consuming the graded crude protein diet are shown in Table 5. The result showed that the PCV, RBC and Hb values in the rats fed 27.84% crude protein were each significantly lower ($p < 0.05$) compared to the corresponding values in the control rats. The levels of PCV, RBC and Hb in the rats fed 23.93%, 14.79% or 9.83% crude protein however did not differ significantly ($p > 0.05$) from the values in the control rats (fed 21.21% crude protein) while there was no significant difference ($p > 0.05$) from the control value (fed 21.21% crude protein) and between treatment groups in the MCV, MCH and MCHC in rats fed 27.84%, 23.93%, 14.79% or 9.83% crude protein diets.

Table 6 shows the leucocyte parameters at 56 days post feeding. The total WBC and lymphocyte count in rats fed 27.84% and 23.93% crude protein for 56 days were each significantly lower ($p < 0.05$) than the value in the control rats which received 21.21% crude protein for the same duration. Similarly, the eosinophil count in rats fed 27.84% was significantly lower ($p < 0.05$) than the corresponding value in the control rats. The monocyte count in rats fed 27.84%, 23.93%, 14.79% and 9.83% were each significantly lower ($p < 0.05$) than the corresponding value in the control rats while there were no significant difference ($p > 0.05$) from the control value (fed 21.21% crude protein) and between other treatment groups in the neutrophil, basophil and platelet counts in rats fed 27.84%, 23.93%, 14.79% or 9.83% crude protein diets after 56 days.

Table 7 shows the body weights of giant rats fed graded crude protein diets for 0, 14, 28, 42 and 56 days. There were no statistically significant differences in body weights in rats that received 21.21%, 27.84%, 23.93%, 14.79% and 9.83% crude protein diets for the entire period of the study.

Marginal weight gain or loss during the 8 weeks study period was also calculated as shown in Table 8. Comparison between day 0 and day 56 average body weight of the African giant rats showed marginal weight gain in group B-E, the marginal weight loss (-4.57%) was seen in group A (21.21%) crude protein diet. Highest percentage weight gain (31.87%) was recorded in group C (23.93 %) crude protein diet.

DISCUSSION

In the effort of various researchers to unravel the feeding requirements of the AGR towards their domestication, there has been conflicting reports on the crude protein requirement in African giant rats. Ajayi and Tewe (1978) showed that there was an improvement in the growth performance of giant rats with increase in dietary protein level from 10% to 13% while Cooper (2008) recommended 20% crude protein as minimum requirement for African giant rats. Findings from this present study revealed two out of the five feed groups analyzed (groups D&E) agreed with (Ajayi and Tewe, 1978) and other three groups of feed agreed with Cooper (2008) recommendation of 20% crude protein as the three groups have more than 20% crude protein. This implies that 9 – 14% crude protein in the diet is adequate for improved weight gain in the AGR, although, high protein diet of about 23.93% CP showed the highest weight gain. Therefore, other factors may be responsible for this weight gain.

Hematological parameters are important indicators of the physiological and pathological status for both humans and animals (Adeneye *et al.*, 2006).

Table 1: Gross Composition (%) of Experimental Diets for African Giant Rats

Ingredients	A (Control)	B	C	D	E
Maize	62	50	43	76	81
Soya Meal	22	33	38	9	1
Palm Kernel Cake	5	8	3	3	3
Wheat Offal	5	4	3	9	14
Fish Meal (72%)	5	8	12	4	-
Grower Premix	1	1	1	1	1
Total	100	100	100	100	100

Daram Vitamix^{R}(Daram Nig.Ltd) was added in a proportion of 2.5 kg/ton of feed. This provides additional vitamins and minerals.

Table 2: Chemical Composition (%) of Experimental Diets for African Giant Rats

Composition (%)	A (Control)	B	C	D	E
Crude Protein	21.21	27.84	23.93	14.79	9.83
Dry Matter	90.82	91.38	91.59	90.96	90.87
Ash	6.41	6.56	6.49	6.33	6.28
Crude Fibre	4.13	3.97	4.35	4.46	4.54
Crude Fat	3.62	8.19	3.65	3.72	3.68
Moisture Content	9.98	8.19	8.63	9.05	9.13
Carbohydrate	55.45	49.70	52.95	61.67	66.55

Table 3: Erythrocyte Values of Adult African Giant Rats (*Cricetomys gambianus)* 28 days Post Feeding with Graded Crude Protein Diets

Crude Protein (CP) Diet	(n)	PCV (%)	RBC (10^6/µL)	Hb (g/dL)	MCV (fL)	MCH (pg)	MCHC (g/dL)
(A) Control (21.21 % CP)	6	47.83±1.28	9.24 ± 0.60	16.17±0.40	54.10±2.12	17.76±2.13	33.82±0.45
(B) 27.84% CP	5	44.60±1.38	8.22 ± 0.30	14.60±0.54	54.36±0.98	17.39±0.67	32.72±0.54
(C) 23.93% CP	4	46.50±1.73	9.07 ± 0.92	15.50±0.57	52.37±3.01	17.46±1.03	33.34±0.65
(D) 14.79% CP	6	46.83±1.25	8.40 ± 0.44	16.17±0.71	56.11±1.43	19.32±0.57	34.45±0.78
(E) 9.83% CP	6	46.33±1.95	8.94 ± 0.65	15.50±0.89	52.41±1.64	17.45±0.47	32.61±0.95

$p < 0.05$ was considered significant.

It can also be used to establish the extent of negative effect of foreign compounds, including grains and food products, on the blood of the albino rats as described by (Odeyemi *et al.*, 2009). In this study, varied crude protein diets did not have a significant influence on erythrocyte values and indices such as PCV, Hb concentration, RBC count, MCV, MCHC and MCH 28 days post-feeding while significant difference was observed 56 days post-feeding in PCV, Hb concentration and RBC count. However, high crude protein diet of up to 27.84% is not useful in terms of improvement in haematological parameters. These improved values of PCV, RBC and Hb indicate a haematinic and blood enhancer potential of the graded crude protein pelleted feed. This increase in PCV, Hb and RBC may possibly be as a result of the level of the ash content of the feed samples. The minerals contain in the ash including iron (Fe) and Copper (Cu) plays important roles in haemoglobin synthesis. The higher values of RBC and associated parameters are suggestive of polycythemia (American Diabetes Association, 2000). This is similar to the report of Aderemi (2004) that haematological traits, especially, PCV and Hb were correlated with the nutritional status of the animal. Also, Afolabi *et al.* (2010) observed that nutrition had significant effect on haematological values like PCV, Hb and RBC. Togun *et al.* (2007) reported that increase in PCV coupled with the marginal increase in RBC is indicative of more efficient erythropoiesis in experimental rabbits. Ahmed *et al.* (1994) observed that MCHC values decrease with increase in the level of protein, which is contrary to our findings in which no significant difference was observed 28 and 56 days post-feeding.

This may be due to differences in crude protein composition in the two studies. In a manner that is similar to that of the erythrocyte indices 28 days post-feeding, varied crude protein diets did not have a significant influence on leucocytes values and platelet count until 56 days post-feeding in which total WBC, eosinophils, lymphocyte and monocytes values displayed significant difference across the treatment groups

Table 4: Leucocyte Values of Adult African Giant Rats (*Cricetomys gambianus)* 28 days Post Feeding with Graded Crude Protein Diets.

Crude protein (CP) diet	(n)	Total WBC ($x10^3/\mu L$)	Neutrophils ($x10^3/\mu L$)	Basophils ($x10^3/\mu L$)	Eosinophils ($x10^3/\mu L$)	Lymphocytes ($x10^3/\mu L$)	Monocytes ($x10^3/\mu L$)	Platelets ($x10^3/\mu L$)
(A) 21.21% CP	6	8.81 ± 0.39	5.68 ± 0.19	0.00 ± 0.00	0.08 ± 0.03	2.83 ± 0.27	0.14 ± 0.03	692.00 ± 44.64
(B) 27.84% CP	5	7.94 ±0.23	4.95 ± 0.38	0.00 ± 0.00	0.16 ± 0.0	3.08 ± 0.46	0.12 ±0.03	667.80 ± 56.03
(C) 23.93% CP	4	7.90 ± 0.34	4.92 ± 0.26	0.08 ± 0.04	0.00 ± 0.00	2.88 ± 0.19	0.10 ± 0.02	589.50 ±38.47
(D) 14.79% CP	6	8.88 ± 0.72	6.31 ± 0.90	0.00 ± 0.00	0.12 ± 0.02	2.66 ± 0.21	0.14 ± 0.03	700.67 ± 34.59
(E) 9.83% CP	6	9.78 ± 0.99	6.63 ± 0.76	0.00 ± 0.00	0.14 ± 0.06	2.85 ± 0.19	0.13 ± 0.04	687.33 ± 69.20

Values are means ± SEM; n= Number of animals. $p < 0.05$ was considered significant

Table 5: Variations in Erythrocyte Values of Adult African Giant Rats (*Cricetomys gambianus)* 56 days Post Feeding with Graded Crude Protein Diets.

Crude protein (CP) diet	(n)	PCV (%)	RBC ($10^6/\mu L$)	Hb (g/dL)	MCV (fL)	MCH (pg)	MCHC (g/dL)
(A) (21.21% CP	4	50.50±0.46^a	9.86 ±0.12^a	17.25±0.34^a	51.32±0.93	17.51±0.37	34.15±0.52
(B) 27.84% CP	5	44.80±1.34^b	8.03 ± 0.16^b	15.20±0.52^b	55.82±1.77	18.92±0.56	33.91±0.45
(C)23.93% CP	4	48.50±1.06^a	10.30 ± 0.85^a	16.50±0.35^a	47.56±2.90	16.18±0.99	34.00±0.00
(D) 14.79% CP	4	49.25±0.74 ^{a}	9.30 ± 0.73^a	17.00±0.35^a	58.80±5.81	18.90±2.00	34.53±0.78
(E) 9.83% CP	5	48.00±1.24 ^{a}	9.23 ± 0.36^a	16.60±0.42^a	52.32±1.19	18.10±0.46	34.59±0.21

Mean values with different superscript letters in the same column are significantly different ($p < 0.05$).

Table 6: Leucocyte Values of Adult African Giant Rats (*Cricetomys gambianus)* 56 days Post Feeding with Graded Crude Protein Diets.

Crude protein (CP) diet	(n)	Total WBC ($x10^3/\mu L$)	Neutrophils ($x10^3/\mu L$)	Basophils ($x10^3/\mu L$)	Eosinophils ($x10^3/\mu L$)	Lymphocyte ($x10^3/\mu L$)	Monocytes ($x10^3/\mu L$)	Platelets ($x10^3/\mu L$)
(A) 21.21% CP	4	9.07 ± 0.18^a	5.78 ± 0.28	0.09 ± 0.02	0.09 ± 0.05^a	3.21 ± 0.17^a	0.18 ± 0.09^a	619.50 ±25.50
(B) 27.84% CP	5	7.78 ± 0.23^b	5.54 ± 0.18	0.00 ± 0.00	0.07 ± 0.03^b	2.22±0.13^b	0.08 ± 0.04^b	699.00 ±46.74
(C) 23.93% CP	4	7.78 ± 0.08^b	5.53 ± 0.28	0.00 ± 0.00	0.00 ± 0.00	2.14 ± 0.27^b	0.16 ± 0.01^c	627.50 ±18.79
(D) 14.79% CP	4	8.67 ± 0.59^a	5.43 ±0.25	0.00 ± 0.00	0.11 ± 0.05^c	3.16 ±0.34	0.14 ± 0.03^d	690.00 ±33.58
(E) 9.83% CP	5	9.25 ± 0.63^a	5.75 ± 0.42	0.07 ± 0.02	0.11 ± 0.05^c	3.42 ±0.26^a	0.16 ± 0.01^e	753.80 ±58.94

Values are means ± SEM; n = Number of animals; Percentage leucocyte values in parentheses. Mean values with different superscript letters in the same column are significantly different ($p < 0.05$).

Table 7: Body Weights (g) of Wild Adult African Giant Rats Fed on Graded Crude Proteins (g)

Crude protein (CP) diet	Days Post-Feeding				
	0	14	28	42	56
(A) 21.21% CP	860.67±68.26	877.67±51.25	835.00±33.86	800.00±50.78	821.33±83.77
(B) 27.84% CP	826.67±120.65	933.33±123.84	906.80±124.73	888.60±121.00	840.20±111.16
(C) 23.93% CP	617.50±90.78	673.20±76.20	788.00±89.64	837.33±90.58	814.33±123.98
(D) 14.79% CP	846.67±62.56	850.00±62.58	893.33±60.25	889.60±64.12	957.50±47.84
(E) 9.83% CP	723.33±84.29	746.67±67.72	793.50±83.80	850.60±77.91	862.60±69.66

Values are means ± SEM; Feeding= 5g of feed per 100g body weight of African giant rat. $p < 0.05$ was considered significant

Table 8: Average Body Weight gain/loss in (g) of Per African Giant Rat Fed on Graded Crude Proteins (g) Group A-E.

Graded Crude Protein (CP) Diet	Weight (g) Day 0	Weight (g) Day 56	Weight gain/loss (g)	% Weight gain/loss
(A) 21.21% CP	860.67±68.26	821.33±83.77	-39.34	-4.57
(B) 27.84% CP	826.67±120.65	840.20±111.16	13.53	1.64
(C) 23.93% CP	617.50±90.78	814.33±123.98	196.83	31.87
(D) 14.79% CP	846.67±62.56	957.50±47.84	110.83	13.09
(E) 9.83% CP	723.33±84.29	862.60±69.66	139.27	19.25

Values are means ± SEM; Feeding= 5g of feed per 100g body weight of African giant rat. $p < 0.05$ was considered significant

In a manner that is similar to that of the erythrocyte indices 28 days post-feeding, varied crude protein diets did not have a significant influence on leucocytes values and platelet count until 56 days post-feeding in which total WBC, eosinophils, lymphocyte and monocytes values displayed significant difference across the treatment groups. Olafedehan *et al.* (2010) in their study on the effect of residual cyanide in processed cassava peel meal on haematological indices of growing rabbits observed that with the exception of neutrophil and eosinophil, other haematological parameters were significantly affected by the dietary treatments and this is similar to our findings. White blood cells (WBC) are important in defending the body against infection (Aboderin and Oyetayo, 2006).The white blood cell count however cannot give a definite or specific information but the result of a differential white blood cell count (Neutrophils, Eosinophils, Monocyte, Lymphocytes and Basophils) narrows down to give specific information about infections, toxicity allergy and immuno-suppression and poisoning (Aboderin and Oyetayo, 2006)

The significant difference in values of white blood cells observed in this study agrees with the findings of Lawrence-Azua *et al.* (2013) on the haematological indices of growing rabbits fed enzyme supplemented cocoa bean shell. After feeding four dietary treatments formulated to contain 0%, 10%, 20% and 30% of cocoa bean shell as a replacement for maize.

Summarily, this study showed that most of the haematological parameters of African giant rats (AGRs) are altered by dietary protein levels. This might be a factor to consider in management decisions and health status assessment. In addition, the variation in the hematological parameters of giant rats as a result of varied crude protein diets in this study can be effectively utilized as indices in the evaluation of protein requirement of the captive African giant rats, which can lead to commercial production of cheaper feeds for its domestication

The performance of African giant rats fed on graded crude protein shows improved weight gain in the entire groups from the beginning to the end of the study. Though, weight loss was observed in the control group (A) which may be due to some other factors. Combined observations from this study indicate that the giant rat can be raised on the locally available commercial rations. Reduction in the weight of some rats at the early stage or even during the period of the study may be due to different feed intake by the rats which may be associated with variation in crude protein level in all diet groups. Though, there was no significant difference ($p>0.05$) in the daily weight gain in all the groups, but all groups apart from the control group recorded higher numerical values. This may be related to acclimatization to captivity environment that the rats were not previously used to. The result of weight gain as recorded in this study agrees with the reports of Ademola *et al.* (2004) who reported no significant difference ($p >0.05$) in average live weight, feed intake and feed conversion ratio of broiler chickens fed herbal supplements

Conclusion

The findings of this study showed that African giant rats can survive on pelleted feed with improved weight gain, haematological indices and liveability. Further studies should be carried out on alternative domestication methods such as semi–intensive and combined feeds.

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Conflict of interest:

The authors declare that they do not have any conflict of interest.

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Authors' contributions

OSO and OIA performed the experiment, JOO supervised the project, SCO wrote the manuscript draft.

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