INTERNATIONAL JOURNAL OF SCIENCE AND NATURE
© 2004 - 2011 Society for Science and Nature (SFSN). All rights reserved
www.scienceandnature.org

PERFORMANCE AND CARCASS CHARACTERISTICS OF AFRICAN GIANT LAND SNAIL (*ARCHACHATINA MARGINATA*)

Ugwuowo, L.C. and Ani, A.O.
Department of Animal Science. University of Nigeria Nsukka, Nigeria.

ABSTRACT
An experiment was conducted to study the effects of Soyabean meal and groundnut cake at varying levels on the performance and the carcass characteristics of the African giants land snail (*Archachatina marginata*). Four diets were formulated from each of the proteins such that each was included at 16%, 18%, 20% and 22% of the diets. A 2 x 4 factorial arrangement in CRD was used with eight treatments. Each treatment was replicated thrice with four snails per replicate. The trial lasted for 90 days. The protein source main effects were significant ($P<0.05$) in average daily feed intake, percentage shell weight and percentage edible weight of the snails fed the experimental diets.The protein levels main effect were also significant ($P<0.05$) in protein efficiency ratio, percentage shell weight, percentage edible weight and percentage visceral weight. The interactions between protein sources and protein levels were also significant ($P<0.05$) in final body weight, protein efficiency ratio, percentage shell weight, percentage edible weight and percentage visceral weight of the snails fed the treatment diets.There was no mortality.The growth performance show that soybean based diets were better than groundnut cake based diets and that soyabean should be included at 22% for an optimum growth of snails.

KEYWORDS: escargot, groundnut, nutrient quality, soyabean, snail shell

INTRODUCTION

Heliculture, which is the process of farming or raising snails, has become very important in recent times because of increased animal protein shortage in Nigeria. Also, the availability of some edible snails in Nigeria, their popularity and acceptability nationwide, the potential for export, including the emerging technologies for their production have largely contributed towards the present renewed interest in snail farming (Amusan and Omidiji 1998). Ebenebe (2000) pointed out that it is high time we looked inward and integrate into our farming system some non-conventional meat sources like snails. This will go a long way in reducing the problem of protein malnutrition, which is real in most developing countries of the world. These countries are mostly located in the warm humid tropics where the level of animal protein intake represents about one-tenth of the level of intake in the advanced countries (Esonu 2001). Kehinde *et al* (2002) reported that the protein consumption in Nigeria is below 67g recommended by the World Health Organisation.

Snail farming can conveniently be done in our back yards. This is due to the fact that snail farming is environmentally friendly and can be done with little skill (Akinnusi 1998; N.R.C 1991). The faecal matters neither smell nor make the environment filthy in any way. Snails are also good converter of vegetable protein to useful animal protein (Obi *et al* 2001). They provide a very cheap source of high quality animal protein for human consumption. Snail farming is also a high profit-yielding venture and requires little capital when compared to other forms of animal farming. Thousands of land Snails can be raised in a small land space if intensively managed and there is always less need for vaccination and therapeutic drugs. Predators, parasites, and disease can easily be prevented through proper housing, management, and sanitation. These comparative advantages over other live stocks should be used as an edge to increase snail production.

Snail meat competes favourably with poultry egg and flesh in essential amino acids and digestible protein (Imevbore 1991). It is essentially rich in lysine, leucine, isoleucine, phenylalanine, arginine and tryptophan and contains high level of iron, calcium and phosphorus (Dada *et al* 1999). The galacton present in its abdominal gland serves as a medicinal substance of high immunological value, which cures tuberculosis, ulcer, asthma and circulatory disorders. Okonkwo *et al* (2000) also pointed out that snail meat is useful in the treatment of some human diseases like anaemia, hypertension, asthma, etc. while its shell can be used in the production of buttons, rings and other jewelry. It is unequivocally clear that the importance of improving snail production cannot be overemphasized.

Success in snail production involves among other things proper nutrition. Nutrients such as energy, protein and minerals should always be provided. According to Olomu (1995), protein functions mainly in tissue growth, Carbohydrate (in nitrogen-free extract) provides the necessary energy for metabolic activities, while calcium functions in shell growth (Akinnusi 1998). Stievenart (1992), Omole *et al* (2000) and (Ejidike 2001) pointed out the need to use complete balanced feeds in snail production. Feed formulated to meet the snails specific nutritional requirement has the effect of enhancing the growth performance of snails. Their maturity and attainment of market weight can equally be attained within a shorter time. The use of different protein feed ingredients is of immense value towards this achievement. The most expensive component of supplemental animal feed is protein. Therefore, the investigation of diet protein level requirement of *Archachatina marginata* is important

using different protein sources. The study was aimed at evaluating the response, in terms of growth performance and nutrient utilization of *Archachatina marginata* fed different crude protein diets from different protein sources.

MATERIALS AND METHODS

The experiment was conducted at the Snail Unit of the Department of Animal Science Research Farm, University of Nigeria, Nsukka. Nsukka lies within longitude 6^{o} 45^{1}E and 7^{o}E and latitude 7^{o} 12.5^{1}N (Ofomata 1975) and on the altitude 447m above sea level. The climate of the study area is typically tropical, with relative humidity ranging from 65 – 80% and mean daily temperature of 26.8^{o}C (Agbagha *et al* 2000). The rainy season is between April – October and dry season between November – March with annual rainfall range of 1680 – 1700mm (Breinholt *et al* 1981).

Soybean meal and groundnut cake were the test protein ingredients used to formulate the experimental diets. Other feed ingredients included in the experimental diets were maize, brewer's dried grain, fish meal, oyster shell and vitamin premix. All the feed ingredients were purchased from Chidera Poultry Services Nsukka. African giant land snails (*Archachatina marginata*) were used in the experiment. The young snails were purchased from New Benin market and were used for the study which lasted for three months(90 days). Soybean meal and groundnut cake, the main protein sources were used to compound eight experimental diets. Each of the protein sources was used to formulate four diets containing 16%, 18%, 20% and 22% crude protein, respectively. Table 1 below shows the experimental diets.

Each 2.5 kg of Premix contains Vit.A 10,000,000i.u,Vit D3 2000000i.u,Vit E 20000i.u,Vit. K 2250mg, Thiamine B1 1750, Riboflavine B2 5000mg, Pyridozine B6 2750mg, Niacin 27500mg, Pantothenic acid 7500mg,Vit. B12 15mg, Folic acid 7500mg, Biotin H2 50mg,Choline chloride 400gr,Cobalt 200mgr, Copper 5gr, Iodine1.2gr, Iron 20gr, Manganese 80gr, Selenium 200mg,Zinc 50gr, Antioxidant 125gr. Recommended inclusion is 2.5 kg per ton of feed.

TABLE 1. Percentage Composition of the experimental diets

Treatments /Ingredients	1	2	3	4	5	6	7	8
Maize	55.8	54.0	52.0	49.0	56.0	51.6	49.0	42.9
Brewers dried grain	23.2	18.0	13.0	8.00	23.0	21.8	17.6	18.4
Soybean meal	12.0	19.0	26.0	34.0				
Groundnut cake					12.0	17.6	24.4	29.7
Fishmeal	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Bone meal	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Oyster shell	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Vitamin premix	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Total	100	100	100	100	100	100	100	100
Crude protein	16.1	18.0	20.0	22.0	16.0	18.0	20.0	22.0
Energy(MJ/KGM.E)	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4

Experimental Design

Each of the two protein sources was used to formulate diets at four crude protein levels (16, 18, 20 and 22%). Each of the eight treatments was replicated three times with four snails per replicate. A 2x4 factorial in completely randomized design was used for the experiment. The snails were housed in plastic baskets measuring 30cm in length and 13cm in width. The baskets were properly perforated for easy movement of air, in and out of the basket. The baskets were also filled to 5cm depth with loamy soil exposed to sun light to get rid of harmful soil microorganism. The soil was moistened regularly to keep favourable humidity for snail growth. Feed and water were given to the snails *ad libitum*. The feed was moistened before supply to allow for easy ingestion and to prevent respiratory difficulty that can be caused by dusty feed.

Fresh feed that was free from mould was given to the snails every day. Left over feed was removed from the feeding trough. Clean water was also supplied to them. The plastic trays used for feed and water supply were cleaned and washed each day before placing feed or water. Their faeces were scooped out of the basket to prevent microbial infestation. The body weights of the snails were measured on the first day and subsequent weights were taken every week until the end of the experiment. The weights were measured with a sensitive weighing balance. The total feed consumed by each replicate was calculated every week from the daily measurement using a sensitive weighing balance. The shell length and shell width of the snails were measured with vernier caliper on weekly basis. The snails were weighed before slaughter. The weights of the edible, visceral and shell portion were measured after the slaughter. The measurements were done with sensitive weighing balance. The snails were monitored on daily basis to detect and isolate sick and dead ones. Deaths were recorded, and mortality percent calculated. Experimental diets were analysed for their proximate components according to A.O.A.C(1990). All the data collected were subjected to analysis of variance (ANOVA) using SAS(1995). Separation of significant means were done using Duncan's New Multiple Range Test Duncan(1955).

RESULTS AND DISCUSSION

Experimental Diets

Table 2 shows the proximate composition of the experimental diets. The dry matter content of the diets are similar. The crude fibre content of the diets decreased as the crude protein increased in soyabean based diets and in groundnut cake based diets. Ether-extract, ash and nitrogen free-extract were similar in all the diets while

crude protein increased by two in both the soybean and groundnut cake based diets.

TABLE 2. Proximate composition of the experimental diets

	S1	S2	S3	S4	G1	G2	G3	G4
Dry matter	89.9	89.9	89.9	90.5	91.0	90.2	89.9	89.9
Crude fiber	4.94	4.61	4.31	4.04	5.16	5.10	5.08	5.01
Ether-extract	3.40	2.65	3.20	3.25	2.60	2.70	3.85	3.10
Crude protein	16.0	18.1	20.0	22.0	16.1	18.0	20.1	22.1
Ash	5.00	5.00	5.00	5.00	5.20	5.00	5.40	5.00
Nitrogen- free extract	60.5	59.7	57.4	55.7	61.9	59.4	55.6	54.8

Growth Performance of Snails

Snails consumed more (P<0.05) of the soyabean based diets than the groundnut cake based diets. The greater feed intake by those snails fed soyabean based diets than groundnut cake based diets can be attributed to the greater palatability of the diets due to soyabean meal. Snails fed soyabean based diets produced more percentage edible weight than those fed groundnut cake based diets. On the contrary, the percentage shell weight of the slaughtered snails that consumed groundnut cake based diets were higher (P<0.05) than those that consumed soyabean based diets. The higher percentage edible weight can be explained by the fact that the snails consumed more of the soyabean based diets than the groundnut cake based diets. Also, it is a known fact that soyabean has better amino acid profile (that is, it is of higher protein quality) than groundnut. The lower percentage shell weight obtained in the snails that consumed soyabean based diets is also traceable to the quality issues raised above. It follows that because the soyabean based diets is of better amino acid profile, more of the protein were directed towards tissue growth as opposed to shell build up.

The values of relative edible carcass weight, shell weight and visceral weight obtained in this experiment are comparable with the earlier reports by (Amusan and Omidiji 1998). The range of values in average daily weight gain obtained in this study compare favourably with those obtained by (Adu *et al* 2002), (Ejidjke 2004) and (Ejidike 2001) who recorded average daily weight gains of 0.30 – 0.64g/snail/day, 0.63 – 1.06g/snail/day and 0.4-0.6g/snail/day respectively.

TABLE 3. The Initial body weight of snails fed varying levels of soyabean and groundnut cake based diets (g)

C.P diets(%)	SBM	GNC	MEAN
16	75.4	70.6	73.0
18	58.6	73.2	65.9
20	67.8	76.2	72.0
22	57.1	71.5	64.3
MEAN	64.7	72.9	

SEM for protein source = 2.25ns. crude protein level = 3.18ns. PS x PL = 4.49ns

TABLE 4. The final body weight of snails fed varying levels of soyabean and groundnut cake based diets. (g)

C.P diets(%)	SBM	GNC	MEAN
16	133^{ab}	114^{c}	123
18	118^{bc}	133^{ab}	125
20	130^{ab}	127^{abc}	129
22	120^{abc}	135^{a}	127
MEAN	125	127	

SEM for protein source = 2.29ns. crude protein level = 3.29ns. PS x PL = 4.59*

TABLE 5. Average daily weight gain of snails fed varying crude protein levels of soyabean and groundnut cake based diets. (g)

C.P diets(%)	SBM	GNC	MEAN
16	.640	.480	.560
18	.660	.660	.660
20	.690	.560	.660
22	.700	.700	.700
MEAN	.670	.600	

SEM for protein source = 0.044ns. crude protein levels = 0.06ns.PS x PL = 0.088ns

Protein efficiency ratio decreased as the crude protein levels increased. The protein efficiency ratio of snails fed 16% crude protein was the highest (P<0.05) followed by the protein efficiency ratio of snails fed 18% crude protein while the protein efficiency ratio of snails fed 22% crude protein was the lowest. The protein efficiency ratio of snails fed 18% crude protein was similar to those fed 20% crude protein but significantly higher (P<0.05) to that of 22% crude protein. This suggests that beyond 16% inclusion, there may be wastage of protein. The percentage shell weight of snails fed 16% crude protein and 18% crude protein are similar but higher than those snails fed 20% crude protein while snails fed 22% crude protein gave the lowest value. The percentage shell weight also suggests that lower crude protein level encourages higher shell build up. It means that the absorbed nutrients are first channeled towards shell formation in preference to edible body build up. The 22% crude protein level appears to have provided enough for both shell development and edible weight build up.

TABLE 6. Average daily feed intake of snails fed varying levels of soyabean and groundnut cake based diets (g)

C.P diets(%)	SBM	GNC	MEAN
16	12.8	0.96	1.12
18	1.30	0.94	1.12
20	1.32	1.10	1.21
22	1.42	1.14	1.28
MEAN	1.33[a]	1.04[b]	

SEM for protein source =0.082*. crude protein levels = 0.12ns. PS x PL =0.163ns

The percentage visceral weight of snails fed 16% crude protein was significantly higher than those fed 18%, 20% and 22% which were themselves similar. This means that 16% crude protein also encourages more build up of visceral while 22% crude protein encouraged more percentage edible weight than 20%, 18% and 16%. The protein efficiency ratio values as obtained in this experiment ranged from 1.48-3.69 and are higher than the protein efficiency ratio of between 0.23 – 0.29 obtained by (Ejidike 2004) in a feeding trial with *Archachatina* ***marginata*** fed diets containing different crude protein levels. This shows that the diets used in this experiment were converted to flesh more than the ones used by (Ejidike 2004). The feed conversion ratio value of 1.02 reported by (Ejidike 2004) for *Archachatina marginata* hatchlings fed 25% crude protein diet is also lower than the feed conversion ratio values of between 2.01 – 2.37 as obtained in this experiment.

TABLE 7. Feed conversion ratio of snails fed varying levels of soyabean and groundnut cake based diets

C.P diets(%)	SBM	GNC	MEAN
16	2.50	2.24	2.37
18	2.06	1.96	2.01
20	2.14	2.06	2.10
22	1.17	2.28	2.23
MEAN	2.22	2.14	

SEM for protein source = 0.14ns. crude protein levels = 1.98ns. PS x PL = 0.28ns

TABLE 8. Protein efficiency ratio of snails fed varying levels soyabean and groundnut cake based diets

C.P diets(%)	SBM	GNC	MEAN
16	3.78[a]	3.59[a]	3.69[a]
18	2.43[bc]	2.79[ab]	2.61[b]
20	1.99[bc]	1.94[bc]	1.97[bc]
22	1.38[c]	1.58[c]	1.48[c]
MEAN	2.40	2.48	

SEM for protein source = 0.18ns. crude protein level = 0.06*. PS x PL = 0.35*

TABLE 9. Total shell length gain of snails fed varying crude protein levels of soyabean and groundnut cake based diets (cm).

C.P diets(%)	SBM	GNC	MEAN
16	1.42	1.42	1.42
18	1.31	1.25	1.28
20	1.35	0.87	1.11
22	1.20	1.14	1.17

MEAN	1.32	1.17

SEM for protein source = 0.15ns. crude protein level = 0.055ns.PS x PL=0.27ns

TABLE 10. Total shell width gain of snails fed varying crude protein levels of soyabean and groundnut cake based diets (cm)

C.P diets(%)	SBM	GNC	MEAN
16	0.340	0.270	0.310
18	0.250	0.280	0.270
20	0.270	0.260	0.270
22	0.230	0.340	0.290
MEAN	0.270	0.290	

SEM for protein source = 0.039ns. crude protein level =0.208ns. PS x PL =0.49ns

The final weight of snails fed 22% crude protein from groundnut cake was higher than that of snails fed 16% groundnut diets and 18% groundnut. However it was similar to those fed 18% and 20% CP diet and those fed 16%, 18%, 20% and 22% soyabean based diet. Apart from the final weight of snails fed 16% crude protein from soyabean, the final weight of all the other levels in soyabean based diets are similer to their corresponding levels in groundnut cake based diets. The protein efficiency ratio of snails fed 16% crude protein from soyabean and 16% crude protein from groundnut cake are similar to the protein efficiency ratio of snails fed 18% crude protein from groundnut cake but higher than all other ones. Each of the crude protein level in protein efficiency ratio is similar to the corresponding crude protein level in the other protein source. The percentage shell weight of snails fed 18% groundnut diet is similar to those fed diets of 16% from soyabean but higher than every other one while soyabean diet at 22% produced the lowest. The percentage edible weight of snails fed 22% crude protein from soyabean gave the best because it is higher than any other followed by those snails fed 20% soyabean diet, while 16% soyabean diet, 16% groundnut cake based diet and 18% groundnut diet produced the poorest percentage edible weight. Interaction is best on soyabean based diets at 22% crude protein because of the highest value of percentage edible weight which it produced. The percentage edible weight showed increasing edible weight as crude protein increases The lowest protein value produced the lowest percentage visceral weight of the snails fed the experimental diets..

TABLE 11. Cost of feed/kg weight gain of snails fed varying levels of soyabean and groundnut cake based diets. (N)

C.P diets(%)	SBM	GNC	MEAN
16	200	170	185
18	174	148	161
20	186	158	172
22	187	175	181
MEAN	187	163	

SEM for protein source = 11.19ns crude protein levels =15.83ns. PS x PL =18.61ns

TABLE 12. Percentage shell weight of slaughtered snails fed varying levels of soyabean and groundnut cake based diets

C.P diets(%)	SBM		GNC		MEAN
16	20.7	(27.1^{ab})	19.6	(26.3^{bc})	20.2 ($26.6^{a)}$
18	19.8	(26.4^{bc})	21.8	(27.8^{a})	20.8 ($27.1^{a)}$
20	17.2	(24.5^{d})	20.4	(26.9^{bc})	18.8 ($25.7^{a)}$
22	16.1	(23.6^{e})	18.6	(26.0^{c})	17.3 ($24.8^{c)}$
MEAN	18.4	($25.4^{b)}$	20.1	($26.7^{a)}$	

SEM for protein source = 0.14*. crude protein level = 0.19*. PS x PL = 0.22*

TABLE 13. Percentage edible weight of slaughtered snails fed varying levels of soyabean and groundnut cake based diets.

C.P diets(%)	SBM		GNC		MEAN
16	52.8	(46.6^{e})	52.3	(46.3^{bc})	52.5($46.5^{c)}$
18	54.2	(47.5^{d})	52.8	(46.4^{e})	53.5($46.9^{c)}$

20	55.6	(48.3 ^{bc})	54.6	(47.7^{cd})	55.1(48.0$^{b)}$
22	58.2	(49.7^{a})	56.6	(48.8^{b})	57.4(49.3$^{a)}$
MEAN	55.2	(48.0$^{a)}$	54.1	(47.3$^{b)}$	

SEM for protein source = 0.12*. crude protein level = 0.17*. PS x PL = 0.18*

TABLE 14. Percentage visceral weight of slaughtered snails fed varying levels of soyabean and groundnut cake based diets

C.P diets(%)	SBM		GNC		MEAN
16	26.5	(31.0^{bc})	28.1	(32.0^{a})	27.3(31.5$^{a)}$
18	25.9	(30.6^{bcd})	25.5	(30.4^{cd})	25.7(30.4$^{b)}$
20	27.2	(31.4^{ab})	24.97	(30.0^{d})	26.1(30.7$^{b)}$
22	25.8	(30.5^{cd})	24.8	(29.8^{d})	25.3(30.2$^{b)}$
MEAN	26.3	(30.9)	25.8	(30.5)	

SEM for protein source = 0.14ns. crude protein level = 0.18*. PS x PL = 0.24*

CONCLUSSION

Soyabean meal is therefore the best alternative source of protein when compared with groundnut cake. The inclusion of these protein sources at 22% should be considered most appropriate since the most important edible portion of the snail increased as the crude protein level increased in both soyabean and groundnut cake based diets.

REFERENCES

Adu O.A, A.O. Ojurongbe and A.J Omole (2002) Performance and Carcas Analysis of Giant land Snails (*Archachatina marginata*) fed supplementary diets. Proc. 27th Ann. Conf. Nig. Soc. For Anin. Product (NSAP), March 17-21¸2002. Fed Univer. of Tech. Akure, Nigeria.

Agbagha, F. M., Ezema F.U. and Omeke, B.C.O. (2000) Studies of Management Effects on Fertility of Purbred and Crossbred Exotic Gilts in Two Breeding Farms at Nsukka. Nigeria Journal of Animal Production. 28(1)Pg 20.

Akinnusi O. (1998) Introduction to snail Farming. Omega Science publisher, Tinuoso House, Lagos, Nigeria.

Akinnusi. O. (1998) Life History studies of Archachatina marginata (Swainson). Proceedings: Silver anniversary conference of NSAP/WASAP Inaugural Conference held in Abeokuta Ogun Sate. Nigeria 21 Oct-26th March 1998: 403-404.

Amusan J.A and Omidiji M.O (1998) Edible land snails. A technical guide to snail farming in the tropic. Verify Printers Ibadan 19-22.

AOAC (1990) Association of Official Analytical Chemist, Official Methods, 13th Edition, Washington DC.

Breinholt,K.A, Gowen,F.A and Nwosu C.C (1981) Influence of Environmental and Animal Factors on Day and Night Grazing Activity of Imported Holstein Freisian Cows in the Humid Lowland Tropics of Nigeria. Trop. Journal of Animal Produc.6:4.

Dada, S.A.O, ABU, A.O Okeowo, T.A Badmus, O.R (1999) A.J. Biomed. Resi 2: 2 (103-108).

Duncan D.B (1955) New Multiple Range and Multiple F-tests. Biometrics. 11: 1-42.

Ebenebe, C.I, (2000) Mini Livestock Production in Nigeria. The present and future Proceedings of 5th Annual Conference

Ejidike B.N (2004) Growth Performance and Nutrient Utilization of African

Giant Land Snail (*Archachatina marginata*) Hatchlings fed Different

Protein diets. Food ,Agriculture and Environment Vol. 2(1) 160-162.

Ejidike B.N. (2001) Comparative effect of supplemental and complete diets on the performance of African giant land snail (*Archachatina Maginata).* Proceedings of the Nigeria Society for Animal Production, volume 26, 151, -153.

Esonu, B.O, (2001) Comparative Evaluation of Raw and Urea Toasted velvet Beam (Mucuna Pruriens) for Broiler chicks. Nig. J. Anim. Productions 28 (1): 40-41.

Imevbore E.A (1990) Management techniques in rearing African giant land snail Archachatina marginata. PhD Thesis, University of Ibadan, Nigeria.

Kehinde, A.S, Adebayo,O, Usman,J.M and Meduna A.J (2002) Effect of the incorporation of Carica Papaya Leaf and Fruit in the Raion of Archachatina marginata on the growth Performance characteristics. NSAP Proceeding, March 17-21, (2002) Pp319-320.

NRC (1991) Micro-live Stock. Little- known snail Animals with a promising economic future. National Academy Press Washington D.C

Obi O.O, O.I Ayodeji, F.O Adetoro and F.I Ogundola (2001) An Assessment of Bacterial and Fungal loads in snails (*A. Marginata*) procured from Different locations within Ibadan metropolis Proc. 26th Annual NSAP Conf. Vol. 26, 2000).

Ofomata, G.E.K. (1975) Nigeria in Maps. Eastern States, Ethiope Publishing Co. Ltd. Benin.

Okonkwo, A.G; L.J Isaac; I. Nkanga and O.O Usoro, (2000) Effect of various feeding regimes on the performance of snails (*Archachatina marginata*). Book of Proc. 25th Annual NSAP Conference 19-23, March 2000. Umudike. Pp 314-315.

Olomu, J. M. (1995) Monogastric Animal Nutrition. Principles and Practice. A Jachem Pub. Nig.

Omole A.J Tewe, O.O, Makinde G.O, Adetoro F.O, Saka J.O and Ogundola I. (2000) Preliminary studies on the response of growing snails (Archachatina marginata) to compounded feed as a supplementary ration. Tropical Animal Production Investigation, 3: 35-40.

Rebecca T and Sheldon C. (2004) References section. U.S Department of Agriculture, Agricultural Research service. National Agricultural library Beltville, Maryland 70705-2351.

SAS (1995) Users Guide. Statistical Analysis System Institute Inc. Cary, N.C

Steivenart, C. (1992) Observation on shell lip formation and reproduction in the giant African snail (*Archachatina maginata*) Snail Farming Research, 4: 20-29.