Performance Characteristics of Growing Snails (*Archachatina marginata*) Fed Varying Dietary Levels of Kola Testa.

Prof. Rasheed A. Hamzat[1,2*] and Prof. Oyebiodun G. Longe[1]

[1]Department of Animal Science, University of Ibadan, Ibadan, Nigeria.
[2] Department of Animal Production & Health, Federal University Dutsin-Ma, Katsina State, Nigeria.

E-mail: rahamzat6nov@yahoo.com*
Telephone: *+2348129236840*

ABSTRACT

A total of one hundred and eighty (180) growing snails *(Archachatina marginata),* with a weight average of 90 – 110g were, randomly assigned to four dietary treatments in a completely randomized design. The control diet A, containing 22%CP: 2400kcal/kg ME had no DKT while the remaining three diets designated B, C and D had kola testa included in them at 15%, 30% and 45% respectively. Each treatment group of 45 growing snails was replicated thrice. The snails were fed and watered *ad-libitum* throughout the experimental period which lasted 150 days. Data collected included feed intake, weight gain, carcass quality, shell thickness, shell width, and shell aperture. Data generated were analyzed statistically using the ANOVA available in SAS. The overall performance of the snails and the cost-benefit ratio revealed that the replacement of 30% maize with kola testa resulted in optimal output in the growing snails. The present study is aimed at assessing the performance of growing snails, fed varying dietary inclusions of kola.

(Keywords: kola testa; feed resource; growing snails, shell quality)

INTRODUCTION

The growing demand for maize in the last few years, for both human and livestock consumption has pushed its market price to alarming height that has directly affected the production cost of farm animals, particularly the non–ruminants (FAO, 2011; Hamzat *et al*., 2013). This has invariably escalated the market prices of livestock products out of reach of the common man. There is therefore an urgent need for alternative ingredient to replace maize in livestock feeds to reduce the current breaking pressure on the commodity. The high price of maize has also made it unaffordable to a good proportion of the population who depends on it as a staple food (Sobamiwa, 1993). The success of snail farming practice requires knowledge of harnessing agricultural products and byproducts, such as kola testa, in formulating snail feeds for optimum yield. Kola testa (*Cola nitida* strain) is a by-product of kolanut and has some prospects, which suggests its value as a livestock ingredient. Kolanut from which it is extracted is indigenous to Nigeria. Kola testa is available in large quantities and can be collected and processed cheaply to an acceptable and palatable form for animals. It does not form part of human food and so eliminates competition between man and animals. The present study is aimed at assessing the performance of growing snails, fed varying dietary inclusions of kola testa.

MATERIALS AND METHODS

Animals and Diets

A total of one hundred and eighty (180) growing snails *(Archachatina marginata),* with a weight average of 90 – ll0g were, randomly assigned to four dietary treatments in a completely randomized design. The control diet A containing 22%CP: 2400kcal/kg ME had no DKT while the remaining three diets designated B, C and D had kola testa included in them at 15%, 30%, and 45%, respectively (Table 1). Each treatment group of 45 snails was further subdivided into three replicates of 15 snails each and kept in separate wooden cages measuring 0.5 x 0.5 x 0.5m^3. Sandy loamy soil and kola leaves were used as the bedding and mulching materials on the floor of the pens respectively. The soil and the mulch were changed once every month throughout the experimental period by removing the snails in each compartment and evacuating

and disposing the spent soil and mulch. The snails were numbered for identification and weighed individually at the beginning of the trial and weekly thereafter. The snails were fed and watered *ad-libitum* throughout the experimental period which lasted 150 days. Data collected included feed intake, weight gain, shell thickness, shell width, and shell aperture. Data on feed consumption was recorded daily while others were taken weekly.

Table 1: Gross Composition of Experimental Diets.

Treatments				
Ingredients	**0%DKT**	**15%DKT**	**30%DKT**	**45% DKT**
Maize	27.00	22.95	18.90	14.85
Kola Testa	-	4.05	8.10	12.15
Soyabean Meal	35.00	35.00	35.00	35.00
Brewers Dried Grain	9.75	9.75	9.75	9.75
Palm Kernel Cake	16.00	16.00	16.00	16.00
Bone Meal	7.40	7.40	7.40	7.40
Oyster Shell	4.30	4.30	4.30	4.30
Vit. Min. Mix.	0.25	0.25	0.25	0.25
Salt	0.30	0.30	0.30	0.30
Total	100	100	100	100
Calculated Analysis				
Crude Protein (%)	21.927	22.057	22.188	22.317
Energy (kcal/kg)	2413.23	2383.50	2353.73	2324.05
Crude Fiber (%)	6.685	7.186	7.686	8.187
Calcium (%)	4.373	4.378	4.383	4.388
Phosphorus	1.386	1.389	1.393	1.396

DKT-Dried Kola Testa

Thoroughly mixed and dried representative samples of the four (4) experimental diet were ground and milled in a hammer and stored at room temperature until analyzed for proximate composition by the AOAC 1990 methods. Data generated were analyzed statistically using the ANOVA available in SAS (1995). At the end of the feeding trial, 36 snails were randomly selected from each of the four treatments for carcass evaluation. The snails were starved overnight and their weights were taken. Striking iron rod on the shell carefully killed them. The shells of the snails were removed. The individual parts - the shell, visceral and fleshes were then separately weighed using an electronic weighing balance. The weights obtained were recorded. The parameters calculated were dressing percentage, which is the ratio of the foot to live weight in percent, shell to live weight percent and visceral to live weight percent.

RESULTS AND DISCUSSION

The proximate composition of experimental diets is shown in Table 2. The difference in the test diets appeared in the crude protein, ether extract, crude fiber and ash contents, which increased with increasing level of kola testa.

Table 2: Chemical Composition of Experimental Diets Fed to Growing Snails.

Treatment / Nutrient %	**0%DKT**	**15%DKT**	**30%DKT**	**45% DKT**
Dry Matter	87.56	90.57	90.71	90.61
Crude Protein	1.68	21.88	21.96	22.01
Ether Extract	3.67	3.73	3.79	4.11
Crude Fiber	5.41	5.67	5.73	5.91
Ash	7.87	7.91	7.98	8.11
NFE	61.37	60.81	59.94	58.86
Energy (kcal/kg)	3.498	3.425	3.399	3.286

DKT-Dried Kola Testa

The results obtained for mean weekly feed intake presented in Table 3 showed that there were significant differences ($P < 0.05$) among the treatment means. The weight gain of experimental snails (Table 3) was significantly affected by the dietary treatments ($P < 0.05$). The Duncan Multiple Range Test showed that snails on 30% DKT diet had the highest mean weight gain of 105.459g while the least mean weight gain of 83.584g was observed in 45% DKT diet.

The mean shell width increment showed significant differences ($P<0.05$) among the treatment means. It was observed that the least mean shell width increment of 2.392cm was obtained in 0% DKT while the highest value of 2.899cm was recorded in 15% DKT diet. The mean shell length increment showed no significant differences ($P > 0.05$) among the treatment means. The best feed to gain ratio of 6.152 was obtained in 15% DKT diet which was not significantly different ($P > 0.05$) from the 30% DKT diet (6.429) but was significantly better than 0% DKT (7.191) and 45% DKT (8.11) diets.

Dry matter and crude protein digestibilities were significantly ($P < 0.05$) higher in both the control and 15% DKT than on 30% and 45% DKT. The Ash, crude fibre and NFE values followed the same trend.

Table 3: Performance Characteristics of Snails Fed Graded Levels of Kola Testa Diets.

Treatments					
Parameters	**0% DKT**	**15% DKT**	**30% DKT**	**45% DKT**	**SEM**
Average weekly feed intake (g/s)	30.438c	32.068b	33.905a	33.905a	0.687
Initial weight	101.18a	102.39a	102.39a	109.51a	0.731
Final weight	186.638b	206.646a	207.549a	185.094c	1.002
Mean weight gain (g/s)	84.658c	104.256a	105.459a	83.584b	1.134
Mean shell width increment (cm/s)	2.392c	2.899a	2.812a	2.619b	0.557
Mean-shell-thickness incre.(mm/s)	1.226a	1.021bc	1.103b	0.936c	1.071
Mean shell aperture increment (cm/s)	2.911bc	3.214b	3.112b	3.458'	0.151
Mean shell length increment (cm/s)	5.474a	5.721a	5.454a	5.565a	0.573
Feed conversion ratio (Feed/Gain)	7.191b	6.15	6.429c	8.11a	0.946
Carcass Analysis					
No. of snails	36	36	36	36	36
Mean Liveweight (g/s)	197.66a	200.13a	199.79a	202.41a	0.110
Foot weight (edible portion) (g)	93.147b	95.63a	95.41a	95.07a	0.210
Viscerals (g)	47.592b	49.42a	49.79a	49.83a	0.041
Shell weight (g)	49.945c	50.52b	51.63a	51.57a	0.431
Dressing (%)	47.16a	47.675a	47.322a	47.167a	0.011
Shell/Liveweight (%)	25.268b	25.244b	25.842a	25.478a	0.212
Visceral/Liveweight (%)	24.07ab	24.69a	24.92a	24.62a	0.114

abc: Means on the same row with different letters are significantly different ($P < 0.05$).

Foot weight was not significantly different ($P > 0.05$) in snails on 15%DKT, 30%DKT and 45%DKT diets. The least value was on 0%DKT fed snails. The value of the shell weight and shell/live weight percent were significantly different ($P < 0.05$) among the treatment means. These values increase with increasing level of KOT. However, there were no significant differences ($P > 0.05$) among the treatments in the dressing percentages and visceral/live weight percent of the snails.

The energy/protein levels of 2400kcal/kgME and 22%CP used in formulating the diets (Table 1) used in this trial represent the combination reported to result in optimum performance of snails (Hamzat, 2004). The higher levels of replacement of DKT for maize in the diets were used, since the snails at this growth stage would have a more developed digestive system. Sobamiwa (1993) reported that the ability of birds in utilizing fibrous ingredients increased with age. It is assumed that it would be the same for snails.

The control diet, having no dried kola testa had the lowest amount of crude fiber and ash, whereas the 45% DKT replacement diet had the highest amount of these nutrients, while the DKT replacement diets had lower levels. This is as a result of the higher contents of these nutrients in kola testa than in maize.

It was reported that farm wastes, are relatively cheaper than whole grains. However, the energy contents of these wastes are low compared to whole grains (Sobamiwa, 1993). Since the diets were not made isocaloric, it is not surprising that the DKT diets have lower levels of metabolizable energy than the control diet.

The high feed intake recorded for 30% and 45% DKT diets could be due to the palatable nature DKT, resulting from the presence of sugar and polyphenolic compounds as reported by Hamzat (2004). A sharp drop in weight gain beyond 30% replacement for maize suggests the optimum level advisable for use of kola testa in diet formulation for growing snails. This age group of snails showed a better tolerance of the testa that permitted higher levels of inclusion than for snailets.

The high values of foot weight (Edible portion) is a reflection of the high feed conversion ratio observed in 15%DKT and 30%DKT. The heaviest shell recorded in 30% and 45%DKT diets is a reflection of their high ash values, which contributed to shell growth. The results emanating from the present study revealed that the replacement value of DKT for maize in

growing African giant land snail (*Archachatina marginata*) is optimum at 30%.

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REFERENCES

1. AOAC. 1990. *Association of Official Analytical Chemists 15th ed.* Analytical System Institute Inc.: Washington, DC.

2. Food and Agricultural Organization (FAO). 2011. "Successes and Failures with Animal Nutrition Practices and Technologies in Developing Countries". *Proceedings of the FAO Electronic Conference*. 1 – 30 September 2010. FAO: Rome, Italy.

3. Hamzat, R.A. 2004. "Utilization of Kola Testa (*Cola nitida*, Ventenat, Schoott et Endlicher) as a Feed Resource for African Giant Land Snail (*Archachatina marginata*) in Southwestern Nigeria". Ph.D. Thesis. University of Ibadan: Ibadan, Nigeria.

4. Hamzat, R.A., M. Olumide, and A.O. Akinsoyinu. 2013. "Egg Quality Characteristics of Laying Hens Fed Raw, Fermented and Enzyme-Treated Cocoa Bean Shell-Based Diets". International Poultry Scientific Forum (IPSF) held at the Georgia World Congress Centre: Atlanta, GA. 28th January and 1st February, 2013.

5. SAS Institute 1999. *SAS START Users Guide ® Statistical Version 9 Edition* SAS Institute Inc., Cary, NC.

6. Sobamiwa, O. 1993. "Influence of Dietary Fibre on the Performance, Nutrient Retention and Carcass Characteristics of Broilers". *NECTR Livestock Newsletter*. 4(2): 6 - 9.

ABOUT THE AUTHORS

Rasheed A. Hanzat, is a Professor at the Department of Animal Production & Health, Federal University, Dutsin-Ma, Katsina State, Nigeria.

Professor Oyebiodun Grace Longe, is an Agricultural Biochemist and Nutritionist at the Department of Animal Science, University of Ibadan, Nigeria.

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