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RESEARCH ARTICLE

Effects of Dietary Intake of *Garcinia kola* Seed Meal (GKSM) on the Internal Organs of Juvenile Rabbits

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ABSTRACT

Effects of dietary intake of *Garcinia kola* seed meal (GKSM) on internal organs (kidney, heart and liver) of juvenile rabbits. Four growers' diets were made such that diet T_0 (control) contained no GKSM while diets $T_{2.5}$, $T_{5.0}$ and $T_{7.5}$ contained 2.5, 5.0 and 7.5% GKSM, respectively. Each diet was fed to a group of 9 growing rabbits for 56 days, using completely randomized design. Each group was further subdivided into three replicates of 3 rabbits each. At the end of the feeding trial, 4 rabbits were randomly selected from each treatment, weighed, slaughtered, skinned and eviscerated. The internal organs were weighed and taken to the laboratory for histological examined. Results showed oedema with tissue stromal proliferation of the liver, glomeruli atrophy with marked cellularity within the tuft and stroma proliferation of the kidney and a normal heart. There were no treatment effects (P>0.05) on the dressed weight and those of the liver, kidney and heart expressed as percent of live weight.

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INTRODUCTION

Knowledge of the effect of a particular plant, its seeds, leaves or extract on the organs of rabbits will help to know the possibilities of adding such items in livestock feeds for improving productivity. It has therefore become necessary to investigate the reactions of the organs of rabbits to dietary intake of specific feed ingredients, leaves or seeds of plants for possibilities of incorporating them in their diets for improving their performance. This is very important especially now, when alternative feedstuffs with both nutritional and medicinal properties are gradually gaining acceptance and value in poultry and livestock industry. Earlier studies at our station have shown that leaves from *Alchornia cordifolio* (Udedibie and Opara, 1998) and *Azadirchta indica* (Esonu *et al*., 2005; Obikaonu, 2009) could be of value in poultry diets. Wekhe and Njoku (2000) reported an increase in size of the gonads by ingestion of pulverized *Alchornia cordifolio* by broilers. An enlargement of the testes and atrophy of the ovaries were also observed in broilers fed *Mansonia altissimo* (Wekhe, 2000). Similarly, Ogbamgba and Wekhe (2007) reported an enlargement and hyperemia of the testes, severe congestion of the ovaries and venous congestion of the liver of laying hens fed *Mansonia altissimo* bark meal. Braide and Grill (1990) also reported some histological alterations in the liver, kidney and duodenum of rats fed diets containing 10% (w/w) dry powdered bitter kola for six weeks. Recent studies by Esiegwu *et al*. (2013) showed histological alterations in the liver, kidney and gizzard of laying hens fed diet containing 5% *Garcinia kola* seed meal, contrary to the report by Uko *et al*. (2001) that there were no histological alterations of the liver and kidney of rat fed water extracts of *Garcinia kola.* That is an indication that prolonged feeding of *Garcinia kola* seed meal would be detrimental to health and productivity of laying hens.

The study herein reported was designed to study the reaction of the internal organs (liver, kidney and heart) of grower rabbits to dietary inclusion of *Garcinia kola* seed meal.

MATERIALS AND METHODS

Source and processing of *Garcinia kola seeds*

The *Garcinia kola* seeds used in the study were bought from Omuma market in Oru East Local Government Area of Imo State, Nigeria. The seeds were cut into small pieces and sun-dried until they became crispy. They were then milled in a hammer mill with 2mm sieve to produce *Garcinia kola* seed meal. Samples of the seed meal were subjected to proximate and mineral analysis according to AOAC (1990).

Experimental diets

The *Garcinia kola* seed meal was used to make four grower rabbit diets at inclusion levels of 0, 2.5, 5.0 and 7.5% designated as T_0, $T_{2.5}$, $T_{5.0}$ and $T_{7.5}$, respectively. The ingredient and nutrient compositions of the diets are shown in Table 1.

Experimental rabbits and design

Thirty-six eight weeks old grower rabbits of mixed breeds were randomly divided into four groups of nine (9) rabbits each and each group randomly assigned to one of the four treatment diets, using completely randomized design (CRD). Each group was further sub-divided into three replicates of three (3) rabbits each. The rabbits were individually housed in 0.7m x 1.0m hutches. Feed and water were supplied *ad libitum* in separate earthen troughs. The trial lasted for 8 weeks (56 days).

Ingredients and nutrient composition of the experimental diets are presented in Table 1.

Table 1: Ingredient and nutrient composition of the experimental diets

	Dietary levels of GKSM			
Ingredients (%)	0.00	2.50	5.00	7.50
Maize	47.00	44.50	42.00	39.50
GKSM	0.00	2.50	5.00	7.50
Soya bean meal	9.00	9.00	9.00	9.00
Fishmeal	2.00	2.00	2.50	2.50
Blood meal	1.00	1.50	1.50	1.50
Wheat offal	26.00	25.50	25.00	2.00
Palm kernel cake	11.00	11.00	11.00	11.00
Bone meal	3.00	3.00	3.00	3.00
Common salt	0.25	0.25	0.25	0.25
Vit./Tm premix*	0.25	0.25	0.25	0.25
L-lysine	0.25	0.25	0.25	0.25
L-methionine	0.25	0.25	0.25	0.25
Calculated Chemical Composition (% of DM)				
Cp	16.31	16.25	16.28	16.20
CF	5.71	6.15	6.60	7.05
EE	4.47	4.61	4.74	4.88
Ash	3.72	3.72	3.71	3.70
NFE	69.79	69.37	68.96	68.53
Ca	1.24	1.24	1.24	1.24
P	1.12	1.11	1.10	1.09
Lysine	1.03	1.03	1.02	1.01
Methionine,	0.55	0.54	0.54	0.53
ME (Mcal/kg)	2.54	2.53	2.54	2.54

*To provide the following per kilogram of diet: Vit. A, 10,000 iu; Vit. D_3, 2000 iu; Vit. E, 5 iu; Vit. K, 2 mg; riboflavin, 4.20 mg; Vit. B_{12}, 0.01 mg; panthotenic acid, 5 mg; nicotinic acid, 20 mg; folic acid, 0.5 mg; choline, 36mg; Mg, 56 mg; Fe, 20 mg; Cu, 10 mg; Zn, 50 mg; Co, 125 mg.

Data Collection and Analysis

At the end of the 56 days feeding trial, four rabbits were randomly selected from each treatment, weighed, slaughtered, skinned and eviscerated. The dressed weights and the weights of the internal organs (liver, kidney and heart) as well as that of the abdominal fat were recorded and expressed as percentage of live-weight. Data collected were subjected to analysis of variance (Snedecor and Cochran, 1978) and where analysis of variance indicated significant treatment effects, means were compared using Duncan's New Multiple Range Test as Outlined by Obi (1990).

Histological studies

Histological studies were carried out according to Baker *et al.* (1989), outlined as follows. Excised organs were fixed in 10% formal saline for 24 h and dehydrated in ascending grades of alcohol (70, 80 and 90% absolute) and de-alcoholized in xylene for 30 min. The tissues were impregnated in molten paraffin wax and subsequently embedded using disposable plastic embedding moulds. The embedded tissues were sectioned with haematoxylin and eosin (H/E) staining procedure. The sections were examined under the microscope (DM 500 leica binocular microscope) and observations noted. The examined slides were photo-micrographed with lica DM 500 binocular microscope with photomicrographic accessories.

RESULTS AND DISCUSSION

Carcass and Internal Organ Weights

There were no treatment effects ($P>0.05$) on the dressed weights and the weights of the livers, kidneys and hearts of the rabbits (Table 2). However, *Garcinia kola* seed meal tended to reduce abdominal fat in the rabbits with the effect becoming significant at 7.5% dietary level ($P<0.05$). The results were in agreement with the earlier results reported by Uko *et al*. (2001) that water extract from *Garcinia kola* fed to rats did not significantly influence their organ weights.. Braide (1989) also reported no treatment effect on organs of rats fed dry powdered seeds of *Garcinia kola*

Histopathological Observation

The histopathological observations on the organs are shown on Table 3 and Plates 1 to 12. The heart was normal (Plates 1, 2, 3 and 4). The normal appearance of the heart suggests that the dietary levels of *Garcinia kola* were not toxic to the heart. If the dietary levels were toxic to the heart, there could have been a change in its architecture. The proliferation of tissue stroma with oedema of the liver suggests that at 5.0% and 7.5% dietary levels, *Garcinia kola* seed meal had an inflammatory effect on the liver cells (Plates 9, 10, 11, and 12). Glomerulli atrophy and tissue stromal proliferation within the kidney cells suggests a partial dysfunction of some of the cells and a corresponding inflammatory reaction to enable it cope with the amount of work it had to do to detoxify the anti-nutritional factors present in *Garcinia kola* (Plates 5, 6, 7 and 8). These findings suggest that at higher dietary levels of 5.0% and above, *Garcinia kola* induces a deleterious or destructive effect on the kidney and liver cells. This result corroborates with the findings of Braide and Grill (1990) and Esiegwu *et al.* (2013) that dried powdered *Garcinia kola* seed meal caused some histological alterations in the kidney and liver of rats and laying hens, respectively.

Conclusion and Recommendation

The study has shown that at dietary levels of 5.0% and above, *Garcinia kola*seed meal causes damages (histological alterations) in the kidney and liver of rabbits. It has no effect on the weights of the internal organs but severely reduced abdominal fat at 7.5% dietary level.

Table 2: Dressing percent and organ weights

Parameters	Dietary levels of GKSM				
	T_0	$T_{2.5}$	$T_{5.0}$	$T_{7.5}$	SEM
Live weight (g)	1482.53	1400.36	1420.24	1437.52	42.78
Dressed weight (g)	705.68	677.64	728.42	709.92	12.41
Dressed weight (% Lw)	50.37	48.41	2.27	49.30	0.96
Liver (% Lw)	2.24	2.54	2.44	2.31	0.06
Heart (% Lw)	0.26	0.27	0.25	0.30	0.01
Kidney (% Lw)	0.58	0.64	0.56	0.55	0.02
Abdominal fat (% Lw)	2.01[a]	1.38[a]	1.29[a]	0.60[b]	0.27

[ab]Means within a row with different superscripts are significantly (P<0.05) different.

Table 3: Histopathological observations on the internal organs of rabbits fed graded dietary levels of *Garcinia kola* seed meal

Internal organs	Dietary levels of GKSM			
	T_0	$T_{2.5}$	$T_{5.0}$	$T_{7.5}$
Liver	Normal	No observable histologic changes	Moderate oedema with tissue stroma proliferation	Mild oedema with tissuestroma proliferation
Kidney	Normal	No observable histologic changes	Glomeruli atrophy with marked cellularity within the tuft, tissue stromal proliferation.	Glomeruli atrophy with marked cellularity within the tuft, stromal proliferation, scanty stromal in some areas with cystically dilated spaces. Also observed as chicken wire appearance.
Heart	Normal	No observable histologic changes	No observable histologic changes	No observable histologic changes

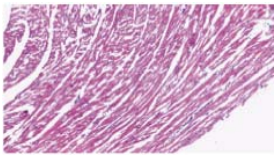

Plate 1: Heart (T_0). Normal

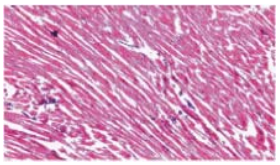

Plate 2: Heart ($T_{2.5}$). Normal

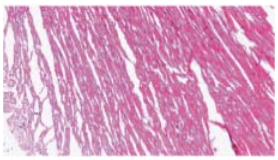

Plate 3: Heart ($T_{5\cdot0}$). Normal

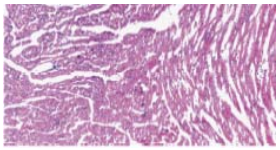

Plate 4: Heart ($T_{7.5}$). Normal

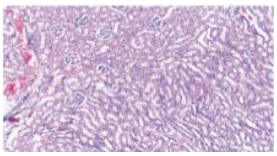

Plate 5: Kidney (T_0). Normal

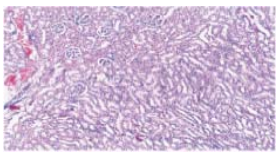

Plate 6: Kidney ($T_{2.5}$). Normal

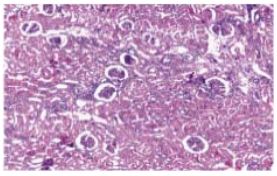

Plate 7: Kidney ($T_{5.0}$). Not normal

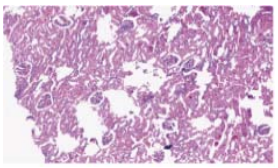

Plate 8: Kidney ($T_{7.5}$). Not normal

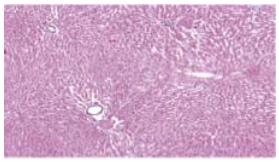

Plate 9: Liver (T_0). Normal

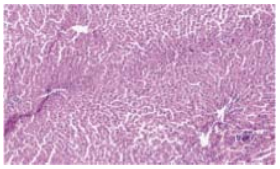

Plate 10: Liver ($T_{2.5}$). Not normal

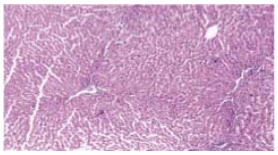

Plate 11: Liver ($T_{5.0}$). Not normal

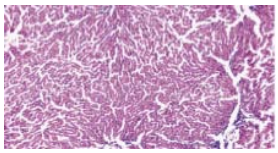

Plate 12: Liver ($T_{7.5}$). Not normal

It is therefore recommended that the use of *Garcinia kola* as feed ingredient and/or additive for grower rabbits be restricted to levels below 5.0%. This is so because prolonged feeding of the meal at levels of 5.0% and above can lead to not only a drop in performance but also to high mortality due to organ failure.

REFERENCES

Adaramoye OA, VO Nwaneri, KC Anyanwu, EO Farombi and GO Emerole, 2005. Possible anti-atherogenic effect of kolaviron (a *Garcinia kola* seed extract) in hypercholesterolaemic rats. Clin Experim Pharmacol Physiol, 32: 40- 46.

Baker FJ, RE Silverton and CJ Palister, 1989. Introduction to Medical Laboratory Technology, Bounty Press Ltd, pp: 148.

Braide VB, 1993. Anti-inflammatory effect of kolaviron, a biflavonoid extract of *Garcinia kola*. Fitoterapea, LXIV: 433-436.

Braide VB and V Grill, 1990. Histological alterations by a diet containing seeds of *Garcinia kola*. Effect on liver, kidney and intestine in the rats. Gegenbaurs Morphol Lab, 136: 95-101.

Esiegwu AC, GE Enyenihi, OO Emenalom, IC Okoli and ABI Udedibie, 2013. Organ reaction of laying hens to dietary intake of *Garcinia Kola* seed meal. Inter J Agri Rural Dev, 16: 1580-1587.

Esiegwu AC and ABI Udedibie, 2009. Growth performance of and anti-microbial activities in broilers fed supplementary bitter kola (*Garcinia kola*). Anim Prod Res Adv, 5: 20-24.

Esonu BO, OO Emenalom, ABI Udedibie, GA Anyanwu, U Madu and AO Inyang, 2005. Evaluation of neem (*Azadirchtaindica*) leaf meal on performance, carcass characteristics and egg quality of laying hens. Inter J Agri Rural Devel, 6: 208-212.

Obikaonu BO, 2009. Production performance of and anticoccidial effects in deep litter-managed chickens fed neem leaf meal. PhD Thesis, Fed. University of Technology, Owerri-Nigeria.

Ogbamgba KO and SN Wekhe, 2007. Organ reaction to intake of *Mansoniaaltissima* in laying hens and cocks. Niger J Anim Prod, 34: 54-62.

Snedecor GW and WG Cochran, 1978. *Statistical Methods.* The lowa State Univ. Press, Ames-lowa, 6thedn.

Udedibie ABI and CC Opara, 1998. Response of growing broilers and laying hens to the dietary inclusion of leaf meal from *Alchorniacordifolia*. Anim Fd Sci Tech, 71: 157-164.

Uko OJ, A Usman and AM Ataja, 2001. Some biological activities of *Garcinia kola* in growing rats. Vet Archiv, 71: 287-297.

Wekhe SN, 2000. Response of broilers to administration of graded levels of *MansoniaAttissima*. Delta Agric, 7: 15-21.

Wekhe SN and CO Njoku, 2000. Preliminary investigations of the effect of *AlchorniaCordifolio*on weight gain and organ size in broilers. Proceedings of the 5th Annual Conference of Animal Science Association of Nigeria, held at Port Harcourt-Nigeria on September 19th-21st, 2000.