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Perfomance and Egg Quality Parameters of Laying Hens Fed Different Dietary Inclusion Levels of Bitter Kola (*Garcinia kola*)

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Abstract: The effects of different inclusion levels of *Garcinia kola* on performance and egg quality parameters of layers were investigated for 8 weeks. A total of 40 Issa brown point-of-lay birds at 20 weeks of age were assigned randomly into 5 treatments, 1, 2, 3, 4, 5 with 8 birds/treatment and 4 birds/replicate. Birds on each treatment were fed different diets containing *Garcinia kola* at 0 g/1000 g, 10 g/1000 g, 20 g/1000 g, 40 g/1000 g and 80 g/1000 g/kg weight of feed. The control diets did not contain Gracinia kola. The trial lasted for 8 weeks. There were no significant differences ($p>0.05$) in egg weight, yolk weight, yolk index, yolk length, yolk colour, yolk albumen ratio, shell weight, shell thickness and Haugh unit of the eggs. There were significant differences ($p<0.05$) in performances, albumen weight and yolk height. This study showed that *Garcinia kola* did not pose any deleterious effects to the birds even at 80 g/1000 g/kg inclusion level but performance and egg quality were best at 10 g/1000 g/kg of dietary inclusion.

Key words: *Garcinia kola* (Bitter cola), performance, egg equality parameters, laying hens

INTRODUCTION

Garcinia kola is found distributed in the forest zone of Sierra Leone, Ghana, Cameroon and other West African countries, particularly in Nigeria it is common in south western region and Edo States (Eka, 1971). It contains, a lot of valuable constituents that can be utilized by human beings and animal alike. Medically, it can be used to treat various diseases such as throat infection and it improves digestibility when chewed in small pieces before any meal (Kafaru, 1998). It can also, be used to treat liver infection and also as poison antidote (Iwu *et al*., 1987). *G. kola* is also used in naming and marriage ceremonies and community meetings, where it is served to visitors as a mark of honour (Akinloye *et al*., 2000). Over the year, egg production is most useful tool for evaluating the performances of laying birds. The modern commercial hybrid is capable of producing from 240-300 eggs per bird weighing on the average 58 g. Local chicken can also lay between 50-60 eggs of about 40 g/bird/year (Lamrode *et al*., 1981). Apart from large scale and uncontrolled individual consumption of *G. kola* little information is available on its use in commercial laying birds.

The purpose of this study therefore, is to investigate the effect different inclusion levels of *Garcinia kola* on Egg quality parameters in laying hens.

MATERIALS AND METHODS

Preparation of bitter kola (*Garcinia kola*): The seeds of bitter kola were purchased from local market at Oja-Igbo in Ogbomoso. The dark brown seed coats were removed carefully and the seeds were cut into smaller pieces and dried in an oven at 60°C for 2 days. The dried pieces were crushed and ground into powdery form using electric grinder as described by Akinloye *et al*. (2000).

Experimental animals: A total of forty point of lay birds at 20 weeks old (Issa brown) were housed in layer house II of Ladoke Akintola University of Technology, Teaching and Research farm. The birds were purchased from NABEST Food Farms, Ikoyi road Ogbomoso. They were allowed to acclimatize for 8 weeks and randomly allocated into 5 treatment groups of 8 and replicated twice with 4 birds/replicate. All the replicate had approximately equal initial live weight.

On arrival the birds were fed with conventional layer mash from Animal Care Services Consult Nigeria limited with 16.5% CP, 2500 kcal ME, 35% fat and 6.5% CF for 8 weeks after which the experiment diets with different dietary inclusion levels of 10, 20, 40 and 80 g of *G. kola*/kg feed of the feds were fed to the treatment groups 2, 3, 4 and 5, respectively. Treatment 1 wad fed on the control

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diet with zero inclusion level of *G. kola*. The experiment lasted 8 weeks the composition of different diet appears in Table 1. The following parameters were measure on the layers:

Body weight: was measured by weighting by the birds at the commencement one of the experiment and at the terminal stage by making use of Salter (butcher) scale machine, model 253 of sensitivity 0.05 kg.

Hen-Day-Production (HDP): Eggs were collected once a day as 2.00 pm the hen day production was then calculated by formula as described by Jordan (1990).

Egg characteristics: Eggs were collected from each replicate on daily basis and these were pooled. At the end of each week all the egg were weighed for each replicates and 2 eggs were randomly selected from each groups and subjected to the following measurements: Egg weight, yolk weight albumen weight, shell weight, shell thickness, yolk height, yolk length, yolk colour, yolk-albumen ratio (Y:A), yolk index and Haugh unit.

Table 1: Gross composition of experimental diets (Layers)

	Diets				
Ingredients	A	B	C	D	E
Maize	35.000	35.000	35.000	34.000	32.000
Groundnut Cake	12.000	11.000	11.000	11.000	10.000
Soyabean Meal	9.000	9.000	9.000	9.000	9.000
Palm Kernel Cake	15.000	15.000	14.000	13.000	12.000
Corn Bran	15.000	15.000	15.000	15.000	15.000
F/m Oyster shell	1.200	1.20	1.200	1.200	1.200
Oyster shell	8.000	8.000	8.000	8.000	8.000
Bone meal	4.000	4.000	4.000	4.000	4.000
Lysine	0.150	0.150	0.150	0.150	0.150
Methionine	0.200	0.200	0.200	0.200	0.200
Bitter cola	-	1.000	2.000	4.000	8.000
Premix	0.250	0.250	0.250	0.250	0.250
Salt	0.200	0.200	0.200	0.200	0.200
Total	100.000	100.000	100.000	100.000	100.000
Crude Protein (%)	17.890	17.440	17.260	17.060	16.800
ME (ME Kcal kg^{-1})	2497.270	2470.870	2475.520	2453.770	2453.020
Crude Fibre (%)	5.347	5.287	5.177	5.057	4.937

Statistical analysis: All data collected were subjected to analysis of variance (Steel and Torrie, 1980) and differences in means were separated using Duncan Multiple Range Test as package by SAS (1991).

RESULTS

The results of effect of different levels of *Garcinia kola* on performance and egg quality parameters are shown in Table 2.

Of all the performance characteristics significant treatment differences were obtained only in the end day production ($p<0.05$). Specifically layers on T_1 (control) with no *G. kola* had the lowest end day production figure of 5.13% significantly lower from than the figures for layers on T_2, T_4 and T_5 ($p<0.05$) but not significantly lower than the value for layers on T_3 ($p<0.05$). layers on T_2 and T_5 had the best HDP figures. The general trend in HDP figures was $T_2>T_5>T_4>T_3>T_1$. There were no significant differences in other performance characteristics such as average initial and average weights $p<0.05$.

Among the egg quality characteristics only the albumen weight showed significant treatment difference ($p<0.05$) layers on T_5 had the lowest albumen weight of 34.52 g, significantly lower than the weight for layers on T_3 and T_4 ($p<0.05$) but not significantly lower than for those on T_1 and T_2 ($p<0.05$). The trend in albumen weight was $T_3>T_4>T_2>T_1>T_5$ there were no significant differences also in the albumen weight for T_1, T_2 T_3 and T_4 ($p>0.05$).There were no significant treatment difference also in other egg quality parameters including mean egg

Table 2: Performance characteristic and egg quality parameters of layers fed diets containing different levels of *Garcinia kola*

Parameter	T_1 (Control)	T_2	T_3	T_4	T_5	SEM	Significance
Hen day production (HDP %)	51.13^a	62.31^b	54.56^b	59.44^b	60.94^b	13.80	*
Average initial body weight (kg)	1.51	1.48	1.53	1.56	1.62	0.11	ns
Average final body weight (kg)	1.63	1.58	1.62	1.58	1.59	0.11	ns
Egg weight (g)	60.76	59.90	60.06	59.11	58.36	3.15	ns
Yolk weight (g)	15.14^{ab}	14.81	14.75	14.65	14.78	9.39	ns
Albumen weight (g)	35.91^{ab}	36.11^{ab}	37.29^b	36.61^b	34.52^a	85.10	*
Yolk Albumen	0.42	0.41	0.40	0.40	0.40		ns
Shell weight (g)	6.51	6.42	6.39	6.45	6.17	1.57	ns
Shell thickness (mm)	0.45	0.46	0.45	0.45	0.46	0.04	ns
Yolk height (cm)	1.51	1.50	1.53	1.58	1.58	0.09	ns
Yolk length (cm)	4.10	4.12	4.20	4.11	4.11	0.11	ns
Yolk index	0.37	0.36	0.37	0.38	0.38		ns
Haugh unit	87.02	83.63	86.69	83.73	84.55	6.80	ns
Yolk colour	6.40	7.10	6.70	6.80	6.80	1.39	ns

a,b: Means on the same rows followed by the same superscripts letter are not, significantly different ($p>0.05$). ns = Not significant ($p>0.05$), * = Significant ($p<0.05$) difference

weight, yolk weight, height, length index and colour, Huagh unit, shell weight an thickness ($p>0.05$). There were also no definite trend in the responses of the egg quality parameters measured to dietary levels of inclusion of *G. kola*.

DISCUSSION

The egg quality parameters of laying hens fed different inclusion levels of *G. kola* were shown in Table 2 variability among laying birds with different inclusion level of *G. kola* for egg weight was small. The values ranged between 58.36 and 60.76 g. significant differences were not observed in shell weight and thickness ($p>0.05$) this showed that kola and not negatively interface with calcium metabolism and because of the similarity egg weight across the groups. North and Bell (1990) observed that as egg get larger, the shell becomes thinner to cover the larger contents. Yolk weight. Yolk length, yolk index and yolk colour were not significantly influenced ($p>0.05$) by different inclusion levels of *G. kola*. Yolk index of other treatment groups compared favourably well with the control. The values ranged between 0.36 and 0.38 which were below the value obtained by Durunna *et al.* (2005) and Ademola *et al.* (2004). The low yolk index cold indicate the ability of the egg to spread easily to the consumer. The yolk colour and Haugh units were similar among the groups. Yolk colour score fell slightly above the values. The Haugh unit of 72 and above is regarded as an indicator of freshness in eggs (Durruna *et al.*, 2005). The result obtained indicated values above 72 this was similar to those recorded by Eziesh *et al.* (2001) but higher than those recorded by Ademola *et al.* (2004). There were no consistent pattern in the values obtained for albumen weight and yolk haugh. Group 3 birds showed the highest values which was not significantly different ($p>0.05$) from groups 1 and 4 while groups 5 had the lowest valve which was not significantly different ($p>0.05$) from groups 1 and 2 similar report was given. Yolk albumen ratio was not significantly influenced ($p>0.05$). This showed that the cholesterol levels is minimized. Abdullahi *et al.* (2003) established a possible increase in cholesterol level as yolk and largest yolk albumen ratio increased while Campo (1955) reported that eggs with heaviest yolks and largest yolk: Albumen ratios might be expected to contain the highest amount dietary cholesterol and coronary heart disease. Also, the substantial amount of unsaturated fatty acids contained in *G. kola* (Essien *et al.*, 1995) might have accounted for this.

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