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The Use of Bitter Kola (*Garcinia kola*) Dry Seed Powder as a Natural Growth Promoting Agent in Broiler Chicks

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Abstract: The effect of dried seed powered of bitter (*Garcinia kola*) on weekly feed intake, body weight gain, feed efficiency and carcass characteristics of broiler chicks of Anak strain were studied. Broiler chicks were assigned to 5 treatment groups of 40 birds each per group Replicated twice with 20 birds per replicate. They were fed diets containing 0, 2.5, 5, 7.5 and 10 g/100 g dry seed powder of *G. kola*. There were significant treatment differences ($p<0.05$), in feed intake, body weight gain and feed efficiency. Feed efficiency was highest in 0, 2.5 g/100 g and lowest in 5 and 7.5 g/100 g inclusion levels. There was no mortality throughout the trial in any of the treatment groups.

Key words: Bitter cola (*G. kola*), growth promoter, broiler chicks

INTRODUCTION

The bitter kola (*Garcinia kola*) belongs to the family of plants called Guttiferae, the genus is known as Garcinia. It is a perennial crop growing in the wild forest, distributed throughout West and Central Africa and can attain a height of 35-40 m (Iwu, 1993). *G. kola* is also found distributed in the forest zone of sierra Leone, Ghana, Cameroon and other West African Countries, particularly in Nigeria it is common in the South Western States and Edo state of Nigeria (Eka, 1971). It contains a lot of valuable constituents that can be utilized by human beings and animals alike. Medicinal uses of bitter cola (*Garcinia kola*) include, as a purgative and anti-parasite. The seeds are used in the treatment of bronchitis and throat infections. They are also used to prevent and relieve colic, head or chest cold and cough. Also, the plant is used for the treatment of liver disorders and as a chewing stick (Iwu, 1993).

The inclusion of antibiotics in livestock ration has been discourage. This is because of the residual effect in livestock products and development of resistant strains of micro-organisms to drug theraphy (Oyekunle and Owonikoko, 2002).

The search for alternative substances to antibiotics in livestock feeds leads to the investigation of whether *Garcinia kola* could be used as growth promoter because of its medicinal properties. The present report investigated the possible use of *Garcinia kola* as growth promoter in broiler chickens.

MATERIALS AND METHODS

Preparation of materials: Enough quantity of fresh Gacinia kola (Bitter cola) seeds were purchased from a local market in Ogbomoso town, Oyo State Nigeria. They were cut into thin slices and air dried to a constant weight for several days and then ground into a powdery form.

Experimental animals and diet: Seeds of *G. kola* were purchased from local market in Ogbomoso 200 broiler chicks of Anak strain were purchased from Zartech farms, Ibadan. They were randomly divided into 5 equal treatments groups of 40 which were further subdivided into two replicates of 20 per replicate, birds put in a replicate and subjected to 5 different diets. In each replicate had approximately equal initial live weight.

Five experimental diets were prepared as follows: Diet 1 served as the control, containing no *G. kola* seed powder. Diets 2, 3, 4 and 5 contained 2.5, 5.0, 7.5 and 10% of *G. kola* powder respectively added (Table 1). They were assigned to each of the 5 treatment groups and fed *ad libitum* to the birds. All animals were housed under identical conditions of temperature and humidity. Water was made available add-libitum and necessary vaccinations and medications were administered when necessary. The experiment lasted 4 weeks.

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Table 1: Show gross composition of the test diets of broilers starter (0-4wks)

	Treatments				
Ingredients	1	2	3	4	5
Maize	47.54	46.04	45.04	45.04	44.54
GNC	6.00	6.00	6.00	6.00	6.00
Soyabean meal	25.71	25.71	25.71	24.21	23.71
Fish (72%)	5.00	5.00	5.00	5.00	5.00
Wheat offal	10.50	9.50	8.00	8.00	7.50
Oyster shell	1.50	1.50	1.50	1.50	1.50
Bone meal	3.00	3.00	3.00	3.00	3.00
Salt	0.20	0.20	0.20	0.20	0.20
Methionine	0.10	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10	0.10
Premix	0.35	0.35	0.35	0.35	0.35
G. kola	-	2.5 g/100 g feed	5.0 g/100 g feed	7.5 g/100 g feed	10.0 g/100 g feed
Total	100.00	100.00	100.00	100.00	100.00
DM%	84.45	82.68	80.02	78.67	75.50
CP%	23.00	23.30	22.96	22.76	21.09
ME (Kcal kg^{-1})	2824.44	2754.22	2691.84	2624.94	2558.52
CF%	3.86	3.76	3.62	3.52	3.32

ME = Metabolizable Energy, DM = Dry Matter, CP = Crude Protein, CF = Crude Fibre

Sample collection: The average initial weight of the birds was taken on arrival and the body weight gain were taken on weekly basis, on the same day of each week, bird on each replicate were usually weighted together and the value divided by the number of birds to get the average weight of birds from which the average initial weight was subtracted to give the average body weight gained in grammes.

Average quantity of feed consumed per bird per week was recorded for each treatment by subtracting the leftover from quantity of feed measured per diet per week.

Other parameters measured were the feed efficiency, feed conversion ratio. All data collected were subjected to one way analysis of variance (Steel and Torrie, 1980) and significantly different treatment means were compared using Duncan (1995) multiple range test. Compared with normal range source (Miturka and Rawnnsely, 1977).

RESULTS AND DISCUSSION

The progressive variation between dietary treatment with respect to percentage crude protein and crude fire was caused by the differences in the levels of inclusion *G. kola* in the different diets.

Performance characteristics: Table 2-4 show the average treatment means for the feed in take, weight gained and feed efficiency respectively of the broilers fed the different levels of *G. kola* for the starter period, broilers on T_3 and T_4 had the highest feed intake, significantly higher than the intake for broilers on other treatments ($p<0.05$) while broilers on T_1 (control) had the lowest feed in take, significantly lower than the intake by broilers on all other diets ($p<0.05$). the trend was $T_3>T_4>T_2>T_5>T_1$. The progressive increase in the feed intake showed the ability of the birds to tolerate the levels of bitterness but depressed the intake at the highest level of inclusion (10%).

In Table 3 for weight gains, broilers on T_5 gained the highest weight of 242.67%, significantly more than the gains for broilers on T_2, T_3 and T_4 ($p<0.05$) but not significantly different from the gain for broilers ($p>0.05$). The poorest gainers were broilers on T_2. The trend in weight gain was $T_5>T_1>T_3>T_4>T_2$ despite the lower fed intake of broilers on T_5, the average weekly body weight gain was highest and comparable to the control (T_1). This shows that the quantity consumed was better utilized and this may be due to the antibacterial or growth promoting tendency of *G. kola*.

Also, Noboru (2001) reported anti-adipogenic effect of *G. kola* extract, which inhibits the accumulation of lipid droplets in fat cells, which was attributed to the low levels of other extract.

Table 4 shows the efficiency data for the broilers on the various levels of *G. kola*. Broilers on T_5 and T_2 had the lowest efficiency figures of 0.95, significantly lower than those on T_3 and T_4 ($p<0.05$) but not significantly lower that the figure of 0.97 for broilers on T_1. The trend in feed efficiency. Figures was $T_5 = T_2<T_3<T_3<T_4$. This shows that the inclusion of *G. kola* enhanced better feed utilization as such favoured muscle deposition.

Haematological characteristics: Table 5 shows the haematological parameters of broilers starters fed different levels of *G. kola*. Packed Cell Volume (PCV) Haemoglobin

Table 2: Average weekly feed intake (g bird^{-1})

	Feed intake						
Age in weeks	T_1	T_2	T_3	T_4	T_5	SEM	Significance
1	132.32	127.50	127.25	126.25	102.50	2.30	ns
2	266.92	260.00	276.67	266.75	280.00	2.78	ns
3	220.55	252.50	276.32	250.50	257.50	2.50	ns
4	161.32	262.50	276.30	308.80	262.50	1.92	ns
Total	781.11	902.50	953.64	956.30	882.50	9.23	
Mean	195.28^{c}	225.63^{b}	238.41^{a}	238.08^{a}	220.63^{b}	2.31	*

a.b.c, Means in the same row not followed by the same superscripts are significantly ($p<0.05$) different, *Significant difference ($p<0.05$)

Table 3: Average weekly body weight gain (g bird^{-1})

	Feed intake						
Age in weeks	T_1	T_2	T_3	T_4	T_5	SEM	Significance
Initial weight	40.00	40.00	40.00	40.00	42.50	0.02	ns
1	42.40	112.43	109.25	107.50	102.50	1.11	ns
2	106.58	236.96	226.32	225.00	224.99	2.47	ns
3	236.96	297.53	226.49	278.75	278.75	0.01	
4	327.23	281.25	347.52	231.31	364.44	0.02	ns
Total	938.98	928.17	909.58	842.56	970.68	3.36	ns
Mean	234.75^{c}	134.75^{b}	227.40^{b}	210.64^{a}	242.67^{a}	0.91	

a,b,c, Means in the same row not followed by the same superscript are significantly ($p<0.05$) different, * Significant difference ($p<0.05$)

Table 4: Average feed efficiency ratio of broilers starters fed different levels of *G. kola*

	Feed intake						
Age in weeks	T_1	T_2	T_3	T_4	T_5	SEM	Significance
1	1.25	1.11	1.17	1.18	1.00	0.03	ns
2	1.13	1.16	1.21	1.19	1.16	0.02	ns
3	0.82	0.85	0.96	0.90	0.93	0.01	ns
4	0.68	0.69	0.76	0.87	0.72	0.02	ns
Total	1.88	3.81	4.10	1.14	3.81	0.08	
Mean	0.97^{ab}	0.95^{a}	1.03^{b}	1.04^{b}	0.95^{a}	0.02	

a,b: Means in the same row not followed by the same superscript are significantly ($p<0.05$) different, * Significant differences ($p<0.05$)

Table 5: Haematological parameters of broiler starters fed different levels of dried *G. kola* powders

	Feed intake						
Parameters	T_1	T_2	T_3	T_4	T_5	Literature values (Mitruka, 1977)	Significance
PVC%	25^{b}	28^{a}	21^{c}	27^{a}	20^{b}	29.9	*
Hb (g dl)	8.1^{b}	9.0^{a}	8.5^{b}	8.3^{a}	7.0^{c}	9.8	*
Rbc ($\times 10^6$ m^{-2})	3.8^{b}	3.5^{a}	3.7^{b}	4.0^{a}	3.8^{b}	2.70	*
WBC ($\times 10^3$ m^{-2})	38.4^{c}	80.0^{a}	60.0b	62.0^{b}	30.0^{c}	18.9	*
Differential WBC							
Lymphocytes ($\times 10^3$ m^{-2})	53^{c}	67^{a}	60^{b}	50^{c}	6.1^{b}	12.1-64.2	*
Monocytes	1.8^{b}	3^{a}	2^{b}	2^{b}	2^{b}	0.08-0.42	*
Eosnophils	5^{c}	6^{b}	7^{a}	5^{c}	5^{c}	1.37-7.25	*
Neutrophils	30^{b}	34^{c}	38^{c}	30^{b}	30^{b}	4.57-24.2	*

a,b,c Means in the same row not followed by the same letter superscripts are significantly different ($p<0.05$), *Significance difference ($p<0.05$)

(Hb), Red Blood Cell (RBC), White Blood Cells (WBC) and differential cant clymphocytes, monocytes, eosinophils and neutrophils) showed significant differences ($p<0.05$) among the treatments values obtained for RBC, WBC. Monocytes and neutrophils were above the literature values. Especially, the WBC and its differentials identified the active ingredient in the *G. kola* as foreign substance and in an attempt to cope with it might have excited the levelsabove the literature values cited by Frandson (1981). The effect of the phytochemical constituent (flavanoids) of *G. kola* on the serum level of testosterone of albino rats had been reported by Braide *et al.* (2003).

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