

The Effect of Graded Dietary Level Inclusion of Bitter Kola on Internal Organs and Carcass Weight of Broiler Chicken

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Abstract

The effect of bitter kola (*Garcinia kola*, Heckel) on internal body organs (liver, heart, spleen, gizzard, and gall bladder) and carcass weight characteristics of broilers chickens were studied. Birds were feed *ad libitum* with graded levels of dietary bitter kola inclusion in basal diet at T₁ (control), T₂ (5 g/kg feed), T₃ (10 g/kg feed), T₄ (15 g/kg feed) respectively using a Completely Randomized Design (CRD), with 36 birds/treatment and 12 birds/replicate. Result showed bitter kola inclusion in all treatment levels significantly affected ($P < 0.05$) carcass weight, liver, heart, spleen and gizzard expressed as percent of live weight, hence increasing their digestive ability. The higher levels of bitter kola inclusion should be tested with relation to its role in gut health, immunomodulatory action and other functions.

Keywords: Bitter Kola; Internal Organs; Carcass Weight; Broiler Chicken

Introduction

Information on the use of any plant, seed, leaves or its extract as a feed additive and its effect on animal production and health will guide the inclusion of such additive in feed for livestock feeding and alternative improvement. There is a necessity to source for alternative feedstuff, antibiotics growth promoters, phytobiotics with nutritional and pharmacological properties especially now when these plants are gaining acceptance and value in animal production sector. This has occurred especially in the European Union, where antibiotic has been banned completely from use as additive in livestock feeds since 2006, because of a suspected risk of generating microbiota with increase resistance to the antibiotic used for therapy in human and animals [1,2]. According to Mazi, *et al.* [3] bitter kola (*Garcinia kola*, Heckel) was reported to contain a 70.31% which was observed to be the most abundant biological content, moisture content of 9.28%, crude protein of 11.27%, ether extract/fat of 1.03%, total titratable acidity of 0.617%, crude fiber of 3.94%, ash of 4.17%, calcium, potassium, iron, magnesium, sodium, phosphorus, vitamins A, C, E, B1, B2, B3 and phyto-chemical properties of tannin (0.347%), hydrogen cyanide (1.347 mg/kg), phytic acid (0.550%), sterol (0.093%), flavonoid (2.130%), phenol (0.163%), alkaloid (0.433%), caffeine (0.607%) oxalate (0.433%) and trypsin inhibitor (2.737 Tu/g). Report from Ekene and Earnest [4] shows that the seeds of bitter kola is traditionally used by African medical herbalists because of its anti-parasitic, anti-inflammatory, anti-viral and antimicrobial properties for the treatment of bronchitis, throat infections, colic, head or chest colds, coughs, eye pressure, diarrhoea, tuberculosis, improve lung function, impotence, knee osteoarthritis, liver disorders and scientific preliminary study research of the plant in the 1990s showed signs that it may benefit ebola victims by slowing down multiplication of the virus and also in animal studies, *Garcinia kola* increases the activities of the enzymes lactate dehydrogenase and glucose -6- phosphate dehydrogenase necessary for digestion ([www.wikipedia.com/Garcinia kola](http://www.wikipedia.com/Garcinia_kola)). Earlier studies of Adedeji, *et al.* [5] have shown the importance of bitter kola as a feedstuff in broilers performance.

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The study herein was carried out to evaluate the effect of dietary inclusion level of bitter kola on carcass weight and internal body organs of commercial broiler strain chicken.

Materials and Methods

Experimental location or site

The experiment was carried out at the poultry production section of Teaching and Research farm of the Rivers State University of Science and Technology, Nkpolu Oroworukwo, Port Harcourt.

Rivers State is bounded on the South by the Atlantic Ocean, to the North by Imo, Abia and Anambra States, to the West by Bayelsa and Delta States and to the East by Akwa Ibom State. It lies between longitude 6° 50'E and latitude 4° 45'N (Google Earth, 2018).

Source and processing of materials

The fresh bitter kola seeds were purchased from a local market (Oil mill) Rumuchorlu in Obio/Akpor Local Government Area of Rivers State- Nigeria. Bitter kola seeds were sliced, air dried and grounded into powdered form.

Experimental birds and diets

The breed used for this experiment was of Anak Strain sourced from Zartech Hatchery in Oyo State. One hundred and forty-four (144) unsexed day-old broiler chicks were allocated randomly to four treatments with three replications, each treatment had thirty six (36) birds with twelve (12) birds in each replicate distributed into twelve (12) pens and well tagged according to treatment. Treatment 1 served as control diet with 0g bitter kola/kg of feed while treatments 1, 2 and 3 had 5g/kg, 10g/kg and 15 g/kg of feed respectively as diet inclusions.

The chicks were brooded on deep litter using 200 watt bulbs and kerosene stoves. Water and feed were administered *ad-libitum* during the study. Routine vaccinations and medications were strictly adhered to in the course of the study, standard sanitary management was also adhered to.

Data collection and analysis

At the end of experiment, 3 birds were randomly selected from each treatment were weighed, slaughtered, eviscerated and subjected to carcass and internal body organ evaluation. The data collected were subjected to Analysis of Variance (ANOVA) [6] and the differences between treatment means where they existed were separated using Duncan's New Multiple Range Test [7].

Result and Discussion

The effect of Bitter kola (*Garcinia kola*, Heckel) on the organ and dressed weights are depicted in table 1 and 2. The organs evaluated were liver, heart, spleen, gizzard and gall bladder. All the organs and dressed weights evaluated in this study excepting that of the gall bladder were significantly ($P < 0.05$) different at the various levels of dietary inclusion. The mean dressed weight was highest in T_4 (15 g/kg) and least in T_1 (control). The dressed weights ranged from 2.05 kg - 2.25 kg in the control and the treated group of birds. The highest mean gizzard, heart, liver, spleen weights were recorded in T_4 and this was also reflected in the mean total weight gain and the dressed weight of birds. The result obtained in this study was in contrast with the studies carried out by Uko., *et al.* [8] on albino rats administered water extract from bitter kola were there was no significant influence of bitter kola on internal organ weights. Esiegwu., *et al.* [9] also reported no treatment effect of dietary bitter kola seed meal on internal organs and dressed weight in juvenile rabbits.

Parameters	Treatments				
	T ₁ (control)	T ₂ (5 g/kg)	T ₃ (10 g/kg)	T ₄ (15 g/kg)	SEM
Dressed weight (kg)	2.05 ^c	2.15 ^b	2.15 ^b	2.25 ^a	0.08
Liver (g)	28.50 ^b	25.00 ^b	49.50 ^{ab}	63.50 ^a	6.48
Heart (g)	8.50 ^b	9.00 ^b	13.00 ^a	13.50 ^a	1.15
Spleen (g)	1.00 ^b	1.00 ^b	2.50 ^a	2.50 ^a	0.31
Gizzard (g)	28.00 ^b	28.50 ^b	42.50 ^a	49.00 ^a	4.34
Gall bladder (g)	0.50	1.00	1.00	1.50	0.42

Table 1: The effects of Bitter kola (*Garcinia kola*, Heckel) on the dressed and organ weights of broiler chickens.

abc: Means within a row with different superscripts differs significantly at ($P < 0.05$).

SEM: Standard Error Mean.

Parameters	Treatments				
	T ₁ (control)	T ₂ (5 g/kg)	T ₃ (10 g/kg)	T ₄ (15 g/kg)	SEM
Dressed weight (kg)	2.05 ^c	2.15 ^b	2.15 ^b	2.25 ^a	0.08
Liver	1.37	1.16	2.30	2.82	
Heart	0.41	0.42	0.60	0.60	
Spleen	0.05	0.05	0.12	0.11	
Gizzard	1.37	1.33	1.98	2.18	
Gall bladder	0.02	0.05	0.05	0.07	

Table 2: The effect of bitter kola (*Garcinia kola*, Heckel) on organ weights of broiler chicken expressed as percentage (%) of dressed weights.

abc: Means within a row with different superscripts differs significantly at ($P < 0.05$).

SEM: Standard Error Mean.

Conclusion and Recommendation

Although in African bitter kola (*Garcinia kola*, Heckel) is used for different traditional medical uses it is not consumed as a stable food or feedstuff, birds showed increase dressed weight and internal body organs except for gall bladder from 5 - 15 g/kg. it is therefore recommended that the use of bitter kola as feed additive be restricted to 15 g/kg and further studies be carried out on the histological examination of bitter kola inclusion as feed additive.

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