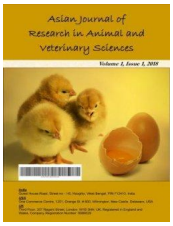

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Effects of Feeding Roasted *Canarium schweinfurthii* Seed Meal on Performance and Carcass Characteristics of Broiler Chicken

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Authors' contributions

This work was carried out in collaboration among all authors. Author OVA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors DOO, ODO, AAB and MJM managed the analyses of the study and read through the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Aims: The study was conducted to determine the performance and carcass characteristics of broiler chickens fed diet with roasted *Canarium schweinfurthii* (atili) seed meal.
Materials and Methods: One hundred and twenty (120) two weeks old chicks were randomly allotted to four dietary treatments containing 0% (control) T1, 2.5% (T2), 5% (T3), and 7.5% (T4) of roasted *Canarium* seed meal (RCSM) respectively, in a completely randomized design. Thirty birds per treatment with three replicate of ten birds each for six weeks. The parameters measured were

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performance indices (initial and final weight, weight gain, feed intake, and feed conversion ratio {FCR} was calculated). The carcass parameter include live weight, bled weight, carcass weight, breast weight, thigh weight, drumstick weight, wings weight, neck weight, back weight, spleen weight, gizzard weight, liver weight, heart weight and lungs weight. The abdominal fat weight was removed, weighted and grossly examined for any pathological changes. Data were analyzed using descriptive statistic and ANOVA at $\alpha_{0.05}$.

Results: There was a significant variation in final weight, weight gain and feed conversion ratio. There was no significant difference in the live weight, bled weight, carcass weight, breast weight, thigh weight, drumstick weight, wings weight, neck weight, back weight, spleen weight, gizzard weight, liver weight, heart weight, lungs weight and abdominal fat weight of the birds for all the treatments.

Conclusion: It can be concluded that roasted *Canarium schweifurthii* (atili) seed meal inclusion in the diets of broiler chicken at 5% has no negative effect on the performance and carcass characteristics.

Keywords: Canarium schweinfurthii; roasted; broiler chicken; performance; carcass characteristics.

1. INTRODUCTION

In poultry production, feed accounts for the largest single cost, making up approximately 60-80% of the total cost. [1]. Poultry industries in Nigeria are constantly experiencing shortage of feed resources and where these resources are available there are higher demands by man which make them too expensive to feed livestock. A possible way to reduce poultry feed costs is finding alternatives to conventional protein and energy sources that are inexpensive, efficient and locally available. Hence, various researches on sourcing alternative feed materials or non-conventional feed resources. Non-conventional feedstuffs refer to all those feed resources that have not been traditionally used in animal feeding or are not used commercially in the production of rations for livestock [2]. There is therefore need to research into the use of non-conventional feed resources. Example of such seed used in this study is *Canarium schweinfurthii,* it belongs to the family *Burseraceae* and the genus *Canarium* [3,4]. *Canarium schweinfurthii are* common in Bauchi, Southern Kaduna, Niger, Oyo and Plateau States of Nigeria [5]. The fruit contains a hard fluted stone in which is a seed, inside the seed are edible and oily nuts [6]. *Canarium* seed contains natural flavors, high fat content, pigments, moisture, nutritionally valuable minerals, vitamins and naturally occurring antioxidants [7]. The seed also contained appreciable amount of nutritionally valuable minerals such as calcium, potassium, magnesium, sodium, phosphorous, iron, zinc and copper while glutamic and aspartic acids dominated the amino acid profile also appreciable amount of essential amino acids which was more than fifty percent of total amino acid contents [8]. Obame et al. [9] noted that the fruit has considerable nutritional value that makes it a useful supplement to both human food and animal feed. Therefore the need to study effects of feeding roasted *Canarium schweinfurthii seed* meal on performance and carcass characteristics of broiler chicken.

2. MATERIALS AND METHODS

2.1 Experimental Birds and Their Management

In a completely randomize design a total of 120 unsexed two weeks broiler chicks was used for the study. The chicks were randomly distributed into four dietary treatments containing 0% (control), 2.5%, 5% and 7.5% (Treatment 1 to 4, respectively) of roasted *Canarium schweinfurthii* seed meal (RCSM) which was roasted at 120^{o}C for one hour, with each treatment having three replicates of ten birds each. The feed was presented in mash form and water was provided *ad libitum.* The feed was formulated to meet the [10] requirement for broiler chickens. The birds were raised on deep litter system with standard management and hygiene maintained, the recommended vaccines for broilers were administered accordingly. The parameters measured include the performance indices (initial and final weights, weight gain, feed intake and feed conversion ratio {FCR} was calculated) and the carcass characteristics (live weight, bled weight, carcass weight, breast weight, thigh weight, drumstick weight, wings weight, neck weight, back weight, spleen weight, gizzard weight, liver weight, heart weight, lungs weight and abdominal fat weight). At the end of the six

weeks feeding trials, two birds from each replicate were randomly selected, fasted for sixteen hours and slaughtered by severing the throat with the aid of sharp knife. The birds were allowed to bleed for five minutes and defeathered manually by immersing in warm water. Determination of carcass characteristics was done according to the method described by Oluyemi et al. [11]; plucked and eviscerated to determine the dressed weight and weight of the carcass components (thighs, drumstick, breast, back, wings, and neck, internal organs were; heart, lung, liver, gizzard, spleen, abdominal fat) were measured. Carcass, organs, and gut were weighed with the aid of laboratory electronic scale (ACCULAB).

The cut parts were expressed as percentage of live weight. The dressing percentage was calculated as a ratio of dress weight to live weight multiplied by hundred:

(Dressing percentage X 100)

2.2 Statistical Analysis

Data obtained from the experiment were analysed using the statistical analysis of variance (ANOVA) procedure of [12] and significant level of p=0.05 was used. The treatment means were compared using the New Duncan multiple range test of the same software.

3. RESULTS AND DISCUSSION

In Table 2, it was observed that final weight, weight gain and feed intake increased significantly ($p<0.05$) across the treatments. The final weight values ranges from T4 to T1 (1637.3, 1679.9,1768, and 1868.9) increasing across the treatments. The average weight gains increases from T1 to T4 (262.6, 245.0, 230.7 and 224.1) and the average feed intake T1 (962.0), T2 (960.0), T3 (870.0) and T4 (730.0) respectively. There was no significant variation ($p>0.05$) in the feed conversion ratio across the treatments (T2 with value 3.92, while T3 is 3.77, T1 is 3.69, and T4 is 3.26, respectively). The final weight value was observed to reduce as the test ingredient value inclusion increases, also the average feed intake was also observed to follow this same pattern but a variation was observed in the feed conversion ratio; T4 with the highest value of the test ingredient had the lowest value 3.26. The RCSM contains natural flavors, high fat content, pigments, moisture, nutritionally valuable minerals, vitamins and naturally occurring antioxidants [7] which may be responsible for the proper utilization of the consumed feed. The average weight gain and final weight of the broiler chickens were not significantly different between T1 and T2, while T2 and T3 were also not significantly different. Hence, the RCSM can be included in broiler diet at all stage because the seed contained appreciable amount of nutritionally valuable minerals such as calcium, potassium, magnesium, sodium, phosphorous, iron, zinc and copper while glutamic and aspartic acids dominated the amino acid profile also appreciable amount of essential amino acids which was more than fifty percent of total amino acid contents [8,13].

The results on carcass characteristics of broiler finisher fed graded levels of RCSM are presented in Table 3. The results of carcass characteristics of broilers fed graded level of RCSM revealed the live weight of the birds fed with T2 (1.83±0.02 kg) whiles the birds fed with T1 (1.78±0.03), T3 (1.76±0.06), and T4 (1.68±0.03) but there was no significant difference ($P>0.05$). The bled weight of the birds fed with T2 is 1.70±0.10 kg while those fed withT1 is1.68±0.03, T3 is 1.65±0.05 and T4 is 1.55±0.05 but there was no significant difference across the treatments ($P>0.05$). The carcass weight of the birds fed with T2 is 1.30±0.01 while the birds fed withT1 is 1.25±0.05, T3 (1.18±0.03), and T4 (1.13±0.03) but there was no significant difference ($P>0.05$). The breast weight of birds fed with T3 is 0.38±0.02 while the birds feed T1 (0.35±0.05), T2 (0.28±0.02), and T4 (0.29±0.02), respectively but there was no significant difference ($P>0.05$).The results of thigh weight were also not significant ($P>0.05$) across the treatments, T1 (0.18±0.03) and T4 (0.18±0.03), T2 (0.16±0.01) and T3 (0.16±0.01), respectively. The drumstick weight of the birds fed with T3 (0.15±0.02), T2 (0.15±0.01) and T1 (0.15±0.01) had similar weight while birds fed T4 (0.14±0.01), respectively. The wings weight of the birds fed with T4 (0.15±0.01) while the birds fed with T3 (0.13±0.03), T1 (0.13±0.03) and T2 (0.12±0.01), respectively with no significant variation ($P>0.05$). The neck weight of the bird fed with T4 (1.00±0.02), T3 (1.00±0.01) had similar weight likewise birds in T1 (0.95±0.05) and T2 (0.90±0.10) had no significant difference ($P>0.05$). The back weight of the birds fed with 5% (0.19±0.01) while the birds with 7.5% (0.18±0.02), 2.5% (0.16±0.01) and 0% (0.14±0.02), respectively, with no significant difference ($P>0.05$). The organ weight of spleen

fed with 7.5% (3.00±0.10) and the birds with 5% (2.00±0.10), and 2.5% (2.00±0.10) had similar weight while the birds with 0% (1.50±0.50), respectively. The organ weight of gizzard fed with 5% (43.50±4.50) while the birds with 7.5% (42.50±1.50), 2.5% (40.00±1.00) and 0% (31.00±2.00), respectively, but had no significant difference (P>0.05). The organ weight of liver fed with 7.5% (43.00±4.00) while the birds with 3.5% (33.50±1.50), 0% (33.50±0.50) and 5% (33.00±6.00), respectively, had no significant difference (P>0.05). The organ weight of heart fed with 7.5% (11.00±2.00) while the birds with 5% (9.50±1.50), 2.5% (9.50±1.50) are similar, and 0% (9.00±1.00) had no significant difference (P>0.05). The organ weight of lungs fed with 0% (13.50±1.50), 5% (10.50±1.50), 2.5% (9.50±0.50) and 7.5% (8.50±0.50), respectively with no significant difference (P>0.05). The organ weight of abdominal fat fed with 0% is18.50±12.50 while the birds with 7.5% (12.00±6.00), 2.5% (12.00±5.00) and 5% (11.50±3.50), with no significant difference (P>0.05) respectively.

Table 1. Composition of the experimental diet

Ingredient	0%	2.5%	5%	7.5%
Maize	59.00	57.39	57.39	55.00
Soybean cake	19.00	18.50	16.00	15.89
Groundnut cake	19.39	19.00	19.00	19.00
RCSM	0	2.50	5.00	7.50
Bone meal	2.00	2.00	2.00	2.00
Methionine	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10
Premix*	0.16	0.16	0.16	0.16
Salt	0.25	0.25	0.25	0.25
Total	100	100	100	100
Calculated nutrient analysis				
CP%	22.61	22.06	21.04	20.75
ME Kcal/Kg	3023.14	2944.76	2877.04	2793.03
Calcium	0.79	0.79	0.78	0.78
Average phosphorus	0.50	0.49	0.48	0.48
Lysine	0.09	1.07	1.00	0.99
Methionine	0.42	0.42	0.40	0.40
Fibre	3.38	3.30	3.14	3.08

*CP=crude protein, ME = Metabolisable energy *Composition of premix per kg of diet: vitamin A:(12,000,000 i.u) ; vitamin D3 (2,500,000 i.u) ; vitamin E (30,000 mg); vitamin K3 (2,000 mg); vitamin B1 (2250 mg); vitamin B2 (6000 mg); vitamin B6 (4,500 mg); vitamin B12 (15 mcg); niacin (40,000 mg); pantothenic acid (15,000 mg); folic acid (1,500 mg); biotin (50 mcg); choline chloride (300,000 mcg); manganese (80,000 mg); zinc (50,000 mg); iron (20,000 mg); copper (5,000 mg); iodine (1,000 mg); selenium (200 mg); cobalt (500 mg); antioxidant (125,000 mg)*

Table 2. Growth performance of broiler chickens fed graded levels of roasted *Canarium schweifurthii (atili seed)* meal

Parameters	T 1	T 2	T 3	T 4	SEM
Initial weight (g)/bird	293.3	298.3	295.7	292.7	17.85
Final weight (g)/bird	1868.9^{a}	1768.3^{ab}	1679.9^{bc}	1637.3^{c}	59.38
Average weight gain (g)/bird/week	262.6^{a}	245.0^{ab}	230.7^{bc}	224.1^{c}	15.64
Average Feed intake (g)/bird	968.0^{a}	960.0^{a}	870.0^{b}	730.0^{c}	47.08
Feed Conversion Ratio	3.69	3.92	3.77	3.26	0.36

^{abc} Means on the same row with different superscripts are significantly different (p<0.05)

Table 3. Growth performance of broiler chickens fed graded levels of roasted *Canarium schweifurthii* seed meal

Parameters	T1	T2	T3	T4
Live weight (kg)	1.830.02	1.78 0.03	1.760.06	1.680.03
Carcass weight (kg)	1.700.10	1.68 0.03	1.650.05	1.550.05
Carcass Component % of live weight				
Dressing %	1.30±0.01	1.250.05	1.18±0.03	1.13±0.03
Breast(kg)	0.28±0.02	0.350.05	0.38±0.02	0.29±0.02
Thigh(kg)	0.16±0.01	0.180.03	0.16±0.01	0.18±0.03
Drumstick(kg)	0.15±0.01	0.150.01	0.15±0.02	0.14±0.01
Wings(kg)	0.12±0.01	0.130.03	0.13±0.03	1.15±0.01
Neck(kg)	0.90±0.10	0.950.05	1.00±0.10	1.00±0.20
Back(kg)	0.16±0.01	0.14±0.02	0.19±0.01	0.18±0.02
Internal organs giblet				
Spleen(g)	2.00±1.10	1.50±0.50	2.00±0.10	3.00±0.10
Gizzard(g)	40.00±1.00	31.00±2.00	43.50±4.50	42.50±1.50
Liver(g)	33.50±1.50	33.50±0.50	33.00±6.00	34.00±4.00
Heart(g)	9.00±1.00	9.50±1.50	9.50±1.50	11.00±2.00
Lungs(g)	9.50±1.50	13.50±1.50	10.50±1.50	8.50±0.50
Abdominal fat(g)	12.00±5.00	18.50±12.5	11.50±3.50	12.00±6.00

4. CONCLUSION

Roasted *Canarium schweinfurthii* (Atili) seed meal inclusion in the diet of broilers at 5% had the most preferred carcass characteristics without effect on performance of the birds and the carcass characteristics were not significantly different across the treatments. The seeds are readily available and of no value to man, hence can serve as a cheap non-conventional feed ingredient in the diets of broiler chickens.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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