



UTILIZATION OF ATILI (*Canarium schweinfurthii*) LEAF MEAL AT DIFFERENT LEVELS IN THE DIETS OF BROILER CHICKENS AT VOM, PLATEAU STATE

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ABSTRACT

The study was carried out to investigate the use of Atili leaf meal in the diets of broiler chickens. One hundred and fifty (150) broiler chicks were used in the study for a period of six weeks in a completely randomised design (CRD). The experimental diets consisted of five (5) inclusion level of Atili leaf meal (0.00%, 2.00%, 4.00%, 6.00% and 8.00%) designated as T1, T2, T3, T4 and T5 respectively. Growth parameters measured during the study include initial weight, final weight, weight gain, feed intake, the Feed conversion ratio and the cost of production. The carcass characteristics across the treatments was evaluated and the parameters measured include live weight, bled weight, defeathered, eviscerated and carcass weight. Dressing percentage internal organ and primal cuts were also calculated. The results obtained showed that the control treatment had the highest final weight 2786.67(g) while the treatment with 2.00% atili leaf meal had the lowest final weight of 2273.33(g). The weight gained was also observed to be higher in the control with no atili leaf meal and lowest in treatment 2. The Feed conversion ratio (FCR) was high in treatments 2 and treatment 5 while T1 had the lowest FCR. Also, the cost of production was observed to be highest in T1 compared to other treatments. But T1 was observed to have the highest mortality while T2 to T5 had no mortality all through the period of the experiment. The carcass results showed that there were significant ($P<0.05$) variations in the live weight, bled and defeathered weight, eviscerated and carcass weight. The dressing percentage was also significantly ($P<0.05$) influenced, the back weight, liver, intestine, back weight, the thigh and drum stick were also not significantly ($P<0.05$) affected by the treatments. Based on the result of this study, it can be concluded that Atili leaf meal can be used in the diets of broiler chickens as source of nutrients and for prophylactics thereby reducing the cost of production.

Keyword: *Canarium schweinfurthii*, growth performance, Carcass, cost of production, leaf meal

INTRODUCTION

Broiler production is a quick source of income due to their short production period and can solve the problem of protein deficiency in human diets but the major problem with its mass production recently is availability of feed Adelowo *et al.* (2019). The cost of producing feed is on the increase due to the shortage of feed ingredients which is partly caused by the insecurity of life on the farmland, also Farmer-Herder clash which is a monster ravaging food production in the Country. This have compelled researchers to direct their attention to alternative means of supplementing the various ingredients not available or shortage of nutrients. The use of



leguminous trees and shrubs has been suggested to be a viable alternative source of proteins, vitamins and minerals for poultry feeding (Ayoade *et al.*, 2017). Broiler is a young chicken, usually 6-8 weeks of age, of either sex, with tender meat, soft, palatable, smooth textured skin and flexible breastbone cartilage. Broiler production is currently oriented for parts marketing, and no longer to whole carcasses, which led to the development of birds with higher lean tissue yield and lower fat content (Buteri, 2003). Nworgu (2007) observed that plant leaves are commonly processed into leaf meals for use as poultry feed. Examples of the leaf meals which have been widely used in feeding non-ruminant animals include *Leucaena leucocephala*, *Gliricidia sepium*, *Sesbania sesban* and *Manihot esculenta* (Gadzirayi *et al.*, 2012). *Canarium schweinfurthii* is one of those plants usually used by indigenous people of Plateau state for its nutritional value; it belongs to the family Burseraceae. A perennial plant found in Africa referred to as black olive, African olive, black elemi (Adelowo *et al.*, 2019). *Canarium schweinfurthii* (Atili) trees are rich in phenolic substances having significant biological properties, the most important of which is oleuropein. Oleuropein is the heterosidic ester of elenolic acid and hydroxytyrosol (Mujić *et al.*, 2011). The most important natural source of this compound is the Atili leaf (Govaris *et al.*, 2010). Studies on *Canarium schweinfurthii* (Atili) leaf demonstrated that it includes some medical compounds having antihypertensive, antiatherogenic, cardioprotective, hypocholesterolemic, hypoglycemic, antimicrobial, antiviral, antitumor, anti-inflammatory and antioxidant properties (Mujić *et al.*, 2010; Bahsi *et al.*, 2016). This study evaluates the effect of inclusion of atili (*Canarium schweinfurthii*) leaf meal in the diets of broiler chickens for their growth performance.

MATERIALS AND METHODS

Experimental Site and Management of the Birds

The study was carried out at the Teaching and Research farm of the Federal College of Animal Health and Production Technology Vom, Plateau State, Northern Guinea Savannah Zone of Nigeria. The area lies geographically at latitude 9° 44 North and longitude 8° 45 East of the equator. The area is situated at a high of 1285 meters above sea level. Average rainfall (annually) ranges between 1300-1500mm. raining peak are in July and August with daily temperature ranging from 17-28°C and a relative humidity varying from 14-74%. Largely because of its altitude and constant wind, Vom has remarkable cool climate. During December and January, the night may be extremely cold. Knowledge about peculiar climate and associated factors in target animal production will help the rat farmers harness relevant knowledge for effective management and production (N.P.C, 2006). One hundred and fifty unsexed broiler chicks were purchased from a reputable farm, vaccine was given to the birds. The chicks were divided into 5 treatments of 30 birds each in a completely randomized design (CRD), each treatment was further divided into 3 replicates of 10 birds. The experimental diets atili leaf meal with inclusion level of 0%, 2%, 4%, 6% and 8% respectively. The T1 is the control with 0%, T2 with 2%, T3 with 4%, T4 with 6% and T5 with 8% inclusion level of atili (*Canarium schweinfurthii*) leaf meal. The diets was formulated to meet the nutritional requirements standard of broiler chickens. Water was given to the birds *ad libitum*, the management practices was maintained such as feeding regime, vaccination and drugs administration. The duration of the study was six (6) weeks.

The parameters measured include the initial weight, weight gain, feed intake, final weight and the feed conversion ratio and cost of production was calculated. The carcass, internal and external offals parameters were also measured across the treatments, parameters measured include live weight, bled weight, defeathered, eviscerated and carcass weight, the dressing percentage was calculated, internal organ and primal cuts, the live weight, bled and



defeathered weight eviscerated and carcass weight, weight, liver , intestine and back weight, the thigh and drum stick. All the weight was measured using a weighting balance scale.

Feed was given daily across the Treatments and left over was measured daily to calculate the feed intake per day. The diets was formulated to meet the nutrition requirements of poultry as shown in Table 1 and 2.

Data Analysis

Data obtained were subjected to analysis of variance using the SPSS software package version 26 2020, and means were also separated using Duncan multiple range test of the same software. The Phytochemical properties was carried out using the methods of AOAC (2000).

Table 1: Composition of Experimental Diets for Broiler Starter

INGREDIENTS	0.00% (T1)	2.00% (T2)	4.00% (T3)	6.00% (T4)	8.00% (T5)
Maize	50.00	50.00	50.00	48.00	48.00
Wheat Ofals	9.10	8.10	6.10	6.10	5.10
Soyabean meal	18.00	17.00	17.00	17.00	17.00
Groundnut Cake	18.00	18.00	18.00	18.00	17.00
Fish meal	1.00	1.00	1.00	1.00	1.00
Atili Leaf meal	0.00	2.00	4.00	6.00	8.00
Bone meal	3.00	3.00	3.00	3.00	3.00
*Broiler Premix	0.25	0.25	0.25	0.25	0.25
Methionine	0.20	0.20	0.20	0.20	0.20
Lysine	0.20	0.20	0.20	0.20	0.20
Salt	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
CALCULATED NUTRIENTS'					
Energy (Kcal/kg)	2863.57	2837.87	2820.47	2772.77	2747.27
Crude protein (%)	22.48	22.23	22.22	22.37	22.10
Calcium (%)	1.27	1.26	1.26	1.26	1.26
Available Phosphorus %	0.76	0.74	0.72	0.71	0.70
Lysine (%)	1.21	1.18	1.16	1.16	1.14
Methionine (%)	0.52	0.52	0.52	0.52	0.51
Fibre (%)	3.85	3.70	3.53	3.47	3.36



Table 2: Composition of Experimental Diets for Broiler Finisher

INGREDIENTS	0.00% (T1)	2.00% (T2)	4.00% (T3)	6.00% (T4)	8.00% (T5)
Maize	47.00	47.00	45.00	45.00	45.00
Wheat ofals	15.05	17.05	18.05	16.05	14.05
Soyabean meal	17.00	15.00	14.00	14.00	14.00
Groundnut cake	17.00	15.00	15.00	15.00	15.00
Limestone	1.00	1.00	1.00	1.00	1.00
Atili Leaf Meal	0.00	2.00	4.00	6.00	8.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Finisher premix	0.25	0.25	0.25	0.25	0.25
Methionine	0.20	0.20	0.20	0.20	0.20
Lysine	0.25	0.25	0.25	0.25	0.25
Salt	0.30	0.30	0.30	0.30	0.30
Total	100.00	100.00	100.00	100.00	100.00
Energy (Kcal/kg)	2788.94	2739.34	2683.04	2665.64	2648.24
Crude protein (%)	21.64	20.60	20.60	20.49	20.49
Calcium (%)	1.19	1.18	1.19	1.18	1.18
Available Phosphorus %	0.64	0.65	0.65	0.64	0.61
Lysine (%)	1.15	1.07	1.07	1.03	1.02
Methionine (%)	0.51	0.49	0.49	0.48	0.48
Fibre (%)	4.17	4.11	4.09	3.92	3.75

Table 3: Phytochemical properties of Atili (*Canarium schweinfurthii*) leaf

Phytochemical(s)	Presence
Tannins	++
Phlobatannins	-
Flavonoids	+++
Phenols	+
Carbohydrate	+++
Steroids	+
Anthraquinones	-
Alkaloids	+++
Saponins	+++

+ = low, ++ = medium, +++ =high, - = absent

Table 4: Proximate Analysis of Atili (*Canarium schweinfurthii*) leaf

Nutrients	%
Crude Protein (%)	18.00
Energy ME/Kcal	2720.54
Calcium (%)	0.99
Phosphorus (%)	0.68
Lysine (%)	1.06
Methionine (%)	0.55
Crude Fibre (%)	3.00

The cost of production is high in the control pen of the experiment when compared with other treatments, these can encourage the farmers in the rural areas where the trees are grown to include the leaves in the diets of the broiler chickens for better growth performance of the birds.



Table 5: Price implication for each treatment and ingredients purchased.

	T1	T2	T3	T4	T5
Cost of production (₦)/tons	33732.0	33027.5	32917.5	32917.5	33102.5

RESULTS AND DISCUSSIONS

Table 6 presented the result of growth performance of broiler chicken fed graded levels of atili leaf meal. From the result, it was observed that the birds in the control diets gain more weight compared to the other treatments with the atili leaf meal but the control were not active but had higher numbers of mortality which was statistically significant compared with birds on the treatments given the test ingredients. Atili leaf meal can serve as prophylactics for the birds due to the presence of medical contents as revealed from the study of (Mujić *et al.*, 2010; Bahsi *et al.*, 2016). These contents will help to boost immunity in the bird and prevent the outbreak of diseases according to Mujić *et al.*, (2011) *Canarium schweinfurthii* (Atili) trees are rich in phenolic substances having significant biological properties, the most important of which is oleuropein. Oleuropein is the heterosidic ester of elenolic acid and hydroxytyrosol (Mujić *et al.*, 2011) which are effective in building the immunity in the birds. The leaf of this plant is the most natural source of this compound as revealed by the report of Govaris *et al.*, (2010) all of which help the broiler chickens to build immunity against any infection. Studies on *Canarium schweinfurthii* (Atili) leaf also demonstrated that it has some medicinal compounds having antihypertensive, antiatherogenic, cardioprotective, hypocholesterolemic, hypoglycemic, antimicrobial, antiviral, antitumor, anti-inflammatory and antioxidant properties (Mujić *et al.*, 2010; Bahsi *et al.*, 2016).

Table 6: Growth performance of broiler chickens fed diets containing graded levels of Atili (*Canarium schweinfurthii*) leaf meal

Parameter	Level of <i>Canarium schweinfurthii</i> (%)					SEM
	0.00% (T1)	2.00% (T2)	4.00% (T3)	6.00% (T4)	8.00% (T5)	
Av. initial weight (g)/bird	218.00	218.00	218.33	218.00	218.00	0.03 ^{NS}
Av. final weight (g)/bird	2786.67 ^a	2273.33 ^b	2423.33 ^b	2386.67 ^b	2320.00 ^b	61.12 [*]
Av. Daily feed intake(g)/bird	125.40	132.74	128.10	123.41	132.38	1.62 ^{NS}
Av. Daily weight gain(g)/bird	61.25 ^a	48.94 ^b	52.56 ^b	51.25 ^b	50.14 ^b	1.86 [*]
F.C.R.	2.06 ^b	2.72 ^a	2.43 ^{ab}	2.43 ^{ab}	2.64 ^a	1.47 [*]
Mortality	5.00 ^a	1.00 ^b	1.00 ^b	0.00 ^c	0.00 ^c	2.20 [*]

AV: Average, SEM: Standard error means, FCR: Feed conversion ratio

Result of the effect of inclusion levels of atili leaf meal on carcass performance of broiler is presented in Table 7. The live weight value ranges from 2305.45kg (T1), 2099.60g, (T2) 2015.50g, (T3) 2479.43g (T4) to 2091.60g (T5) respectively. There was significant difference in the values across the treatments. The bled weight was also significantly ($P \leq 0.05$) difference across the treatments with T2 (97.59g) having the highest value while T4 (92.96g) has the lowest value. Defeathered weight was significantly ($P \leq 0.05$) different between the treatment with T2 (93.38g) having the highest value while T4 (90.21g) has the lowest value. The eviscerated weight value ranges from 81.51g (T2) to 69.91g (T4) there was significant ($P \leq 0.05$) difference in the value across the treatment. The dressing percentage value ranges from 70.15g T2 to 69.98g (T4). There was significant difference in the value across the



treatment. The result was in agreement with the result of Adejuyigbe et al. (2023), who used inclusion of *Stylosanthes hamata* leaf meal which did not affect the carcass characteristics of the chickens. Similar to our results, Hien *et al.* (2017) also reported that there was no significant ($P \leq 0.05$) effect of forage inclusion in the diet of broilers on the carcass weight, liver weight and abdominal fat weight when compared with the control. Changjun *et al.* (2004) also reported similarity in carcass yield of broiler chickens fed a diet containing *Stylosanthes* leaf meal at 6% inclusion levels for starting and finishing broilers in China. This similarity could result from nutrient sufficiency of the diet and hence adequate nutrient availability, which led to a comparable performance across the treatment, irrespective of inclusion levels.

Table 7: Effect of inclusion levels of Atili (*Canarium schweinfurthii*) leaf meal on carcass performance of broiler chickens

Parameters (%)	0.00% (T1)	2.00% (T2)	4.00% (T3)	6.00% (T4)	8.00% (T5)	SEM
Live weight	2305.45 ^{ab}	2099.60 ^b	2015.50 ^b	2479.43 ^a	2091.60 ^b	50.72*
Bled weight	96.53	97.59	96.92	92.96	96.23	1.75 ^{NS}
Defeathered weight	92.27	93.38	92.25	90.21	92.01	0.67 ^{NS}
Eviscerated weight	81.60 ^a	81.51 ^a	82.14 ^a	69.91 ^b	81.14 ^a	1.56*
Dressed weight	70.42	70.15	66.57	69.98	68.64	0.73 ^{NS}

^{abc} – means within the treatments having different superscript differs significantly

SEM- standard error mean

Table 8 shows the effect of inclusion levels of Atili (*Canarium schweinfurthii*) leaf meal on internal and external offals of broiler chickens. The head weight value ranges from 2.35g (T2) to 2.25g (T4). There was significant difference in the value across the treatment. The neck weight also has significant difference across the treatment with T2 (5.13g) having the highest value while T4 (4.47g) has the lowest value. The shank weight value ranges from 3.90g (T2) to 3.77g (T4) there was significant difference in the value across the treatment. The Heart weight has no significant difference across the treatment with T2 (0.51g) having the lowest value while (T2) (0.52g) having the highest value. The full Gizzard weight value ranges from 3.33g (T2) to 2.57g (T4). There was significant difference in the value across the treatment. The Liver weight has significant different across the treatment with (T2) 1.85g having the lowest value while (T4) 1.91g having the highest value. The Intestinal weight value ranges from 5.52g (T2) to 4.67g (T4) There was significant difference in the values across the treatment. Onunkwo et al. (2015) evaluated the effects of *Moringa oleifera* leaf meal on growth performance and carcass characteristics of boiler chicks the results obtained was in agreement with the results in this study. There results obtained was also in line with the report of Torun *et al.* (2018) who shows that there was significant difference in organ weights (wings, shank, drumsticks, kidney, liver, and gizzard) and some cut parts between the experimental and control groups. Similar findings also observed by Talha et al. (2012) and Divya *et al.* (2014).

Table 8: Effect of inclusion levels of Atili (*Canarium schweinfurthii*) leaf meal on internal and external offals of broiler chickens

Parameters (%)	0.00% (T1)	2.00% (T2)	4.00% (T3)	6.00% (T4)	8.00% (T5)	SEM
Head	2.27 ^b	2.35 ^{ab}	2.63 ^a	2.25 ^b	2.65 ^a	0.05*
Neck	5.01	5.13	4.77	4.47	5.00	0.13 ^{NS}
Shank	3.80	3.90	4.16	3.77	4.20	0.09 ^{NS}
Liver weight	1.74	1.85	1.88	1.91	1.83	0.04 ^{NS}
Heart weight	0.49	0.51	0.52	0.52	0.52	0.01 ^{NS}
Spleen weight	0.11 ^a	0.14 ^a	0.13 ^a	0.07 ^b	0.12 ^a	0.006*
Bile weight	0.17 ^a	0.13 ^{abc}	0.15 ^{ab}	0.13 ^{bc}	0.09 ^c	0.007*
Gizzard weight	2.98 ^{ab}	3.33 ^a	3.24 ^a	2.57 ^b	3.42 ^{ab}	0.09*
Empty gizzard	1.97 ^b	2.20 ^{ab}	2.15 ^{ab}	1.94 ^b	2.38 ^a	0.06*
Intestine weight	4.55	5.52	5.78	4.67	5.41	0.19 ^{NS}

^{abc} – means within the treatments having different superscript differs significantly.

SEM- standard error mean

Table 9 shows effect of inclusion levels of Atili (*Canarium schweinfurthii*) leaf meal on primal cuts of broiler chickens. The thigh weight value ranges from 12.04g (T2) to 11.02g (T4) there was significant difference in the value across the treatment. The drumstick weight value ranges from 10.81g (T2) to 8.27g (T4) T2 having the highest value while T4 having the highest value while T4 having the lowest value. The back weight was significantly different across the treatment with T2 (13.93g) having the lowest value while T4 (14.49g) having the highest value. The result was in agreement with the result of Adejuyigbe et al. (2023), who used inclusion of *Stylosanthes hamata* leaf meal which did not affect the carcass characteristics of the chickens. Similar to our results, Hien *et al.* (2017) also reported that there was no significant ($P \leq 0.05$) effect of forage inclusion in the diet of broilers when compared with the control.

Table 9: Effect of inclusion levels of Atili (*Canarium schweinfurthii*) leaf meal on primal cuts of broiler chickens

Parameters (%)	0.00% (T1)	2.00% (T2)	4.00% (T3)	6.00% (T4)	8.00% (T5)	SEM
Thigh	11.33	12.04	11.73	11.02	12.42	0.23 ^{NS}
Drumstick	10.63 ^a	10.81 ^a	10.49 ^a	8.27 ^b	9.74 ^a	0.24*
Back	13.26	13.93	13.79	14.49	13.30	0.21 ^{NS}
Breast	25.74	24.72	23.29	25.25	23.63	0.62 ^{NS}
Wings	8.08 ^b	7.82 ^b	9.20 ^a	7.93 ^b	8.29 ^{ab}	0.17*

^{abc} – means within the treatments having different superscript differs significantly.

SEM- standard error mean

CONCLUSION AND RECOMMENDATION

Since Atili leaf are considered waste and are mostly discarded, making feed with Atili (*Canarium schweinfurthii*) leaf will reduce the cost of feeding birds, and for medicinal purpose because birds fed with Atili leaf meal were more active with reduced mortality. Atili (*Canarium Scheinfurtii*) leaf meal can therefore be included in the diets of broilers without affecting the carcass weight, farmers can include Atili leaf meal up to 6 % in the diets of broiler chickens. Due to higher carcass characteristics and lesser offals weight.



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