

PHYTO-ADDITIVES EFFECTS OF *Artocarpus* LEAF MEALS ON CARCASS CHARACTERISTICS OF BROILER CHICKENS

*Fatoki, H.O, Ojebiyi, O.O., Fasina, F. B., Olawale, S. O., Adegbenro, E. O. and Tewogbade, A. B.

Department of Animal Nutrition and Biotechnology,
Ladoke Akintola University of Technology, P.M.B 4000, Ogbomoso, Oyo State, Nigeria.

*Email of corresponding Author: bialatoki@gmail.com

Abstract

The global ban on antibiotic growth promoters in poultry feed, driven by antimicrobial resistance concerns, has accelerated the adoption of phyto-additives. While these plant-based additives may naturally enhance poultry health, there is insufficient information regarding their precise impact on carcass yield. Two hundred and fifty two (252) Arbor Acre a-day-old broiler chickens were used to study the phyto-additive effect of breadnut and breadfruit leaves on their growth performance at 6weeks. The birds were weighed and distributed into seven (7) treatments of thirty-six (36) birds each, with four (4) replicates each involving two (2) different leaves of breadnut (*Artocarpus camansi*) and breadfruit (*Artocarpus altilis*) at three (3) supplementation levels (Basal diet with 3, 6, 9g breadnut leaf meal and Basal diet with 3, 6, 9g breadfruit leaf meal per kg of feed) in a 2 by 3 factorial arrangement with a control. The data collected on carcass characteristics were analyzed using one way analysis of variance. Results shows that Treatment 4 (9g breadnut leaf meal per kg of feed) had higher ($p<0.05$) relative eviscerated and relative carcass weight value (80.05 and 74.21% respectively) while T1 had lowest relative eviscerated and relative carcass weight value (73.63 and 67.22% respectively). Relative breast meat weight and thigh weight (25.49 and 12.21% respectively) was ($p<0.05$) higher in broiler chicken fed 9g breadnt leaf meal (T4) supplementation. It can be concluded that dietary supplementation of 9g breadnut leaf meal per kg of diet improve the relative eviscerated weight, carcass weight and breast meat weight of broiler chickens without the use of synthetic antibiotics.

Keywords: Breadnut leaf meal, Breadfruit leaf meal, Carcass characteristics, Arbor Acre

DESCRIPTION OF PROBLEM

Broiler chicken is one of the fastest growing sources of meat in the world which is mostly consumed by humans [1]. In broiler production, carcass characteristics are the important economic parameter [2]. The rapid intensification of broiler production, combined with consumer concerns and regulatory bans on antibiotic growth promoters, has accelerated the search for viable antibiotic alternatives that enhance carcass yield and meat quality [2].

Admassu and Kebede, [3] suggested that in order to obtain high-quality meat to meet the consumers' demands, the best strategy is the utilization of plant-derived supplements as additives because of the presence of bioactive compounds with antioxidant potential. Generally, the most abundant antioxidants in plants are phenolic compounds and vitamins, which play a crucial role in counteracting lipid oxidation in meat. Consumer satisfaction is often achieved if meat has a soft texture [4]. The main components of meat that play an important role in the level of tenderness are connective tissue, muscle fibres, and fat tissue [5]. Less connective tissue in meat confers a soft texture on it. With higher levels

of marbling fat or intramuscular fat, the texture of meat becomes tenderer. The presence of intramuscular fat in muscle loosens the muscle fibre bonds, thus providing opportunities for meat protein to bind water [6].

Breadnut (*Artocarpus camansi*) and breadfruit (*Artocarpus altilis*) are versatile plant because all parts can be used as medicinal plants. The leaves of *Artocarpus* contain various natural antioxidants, such as flavonoids, carotenoids, hydrocyanic acid, acetylcholine, tannins, riboflavins, saponins, phenols, quercetin, kaempferol, potassium, and Vitamins A, E, and C [7]. The antioxidant status of feed is associated with meat quality [8]. Therefore, the objective of the present study was to assess the phytoadditive effects of breadfruit (*Artocarpus altilis*) and breadnut (*Artocarpus camansi*) leaf meals on carcass characteristics of broiler chickens.

MATERIALS AND METHODS

Experimental site: The experiment was carried out at the Poultry and Research Unit, Teaching and Research Farm of the Ladoke Akintola University of Technology, Ogbomoso, Nigeria. Ogbomoso is situated in the derived savanna zone of southwest of

Nigeria and lies on Latitude 8° 8' 31.7940" North of the equator and Longitude 4° 14' 42.6696" East of the Greenwich Meridian [18].

Phyto-additives used: The test ingredients used Breadnut (*Artocarpus camansi*) and Breadfruit (*Artocarpus altilis*) leaves were harvested at Abede Area of Ogbomoso where they were found in relative abundance. The leaves were air dried under shed until constant weight was attained and ground to form leaf meals of about 0.05mm particle size using domestic kitchen blender (Silver Crest). The leaf meals were included in the feed as follows:

Diet 1: Basal diet (Control diet), Diet 2: Basal diet + 3g of breadnut leaf meal/kg of feed, Diet 3: Basal diet + 6g of breadnut leaf meal/kg of feed, Diet 4: Basal diet + 9g of breadnut leaf meal/kg of feed, Diet 5: Basal diet + 3g of breadfruit leaf meal/kg of feed, Diet 6: Basal diet + 6g of breadfruit leaf meal/kg of feed, Diet 7: Basal diet + 9g of breadfruit leaf meal/kg of feed

Experimental Animals and Management: Two hundred and fifty-two (252) one-day-old *Arbor Acre* Strain of broiler chicks were used for the experiment. The birds were weighed at the commencement of the experiment and randomly distributed into seven (7) treatments of four (4) replicates each after weight balancing. Each replicate had nine (9) birds to make a total of thirty six (36) birds per treatment. Each replicate was housed in a pen measuring 122cm x 90cm x 90cm in dimension. The birds were offered adequate feed and clean water *ad-libitum* on daily basis throughout the experiment that lasted for six (6) weeks. The birds were weighed on weekly bases to determine weight gain and the left overs were adequately monitored for the calculation of feed intake.

Formulation of Experimental Diets

Seven experimental diets were formulated and the gross composition of the experimental diet is presented in Table 1 and Table 2

Table 1: Composition of Experimental diets for broiler starters (g/100kg)

Ingredients (kg)	Diet 1	Diet 2	Diet 3	Diet 4	Diet 5	Diet 6	Diet 7
*Fixed ingredients							
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Breadfruit leaf meal	-	0.003	0.006	0.009	-	-	-
Breadnut leaf meal	-	-	-	-	0.003	0.006	0.009
Nutrient Analysis							
Crude Protein (%)	22.13	22.69	23.25	23.82	22.79	23.45	24.07
Ether Extract (%)	3.67	3.72	3.79	3.85	3.78	3.81	3.85
Crude Fibre (%)	3.61	3.69	3.19	3.20	3.64	3.69	3.72
ME (Kcal/kg)	3065.18	3065.18	3065.18	3065.18	3065.18	3065.18	3065.18
Phosphorus (%)	1.20	1.24	1.26	1.29	1.26	1.27	1.29
Calcium (%)	1.09	1.1	1.12	1.14	1.13	1.14	1.16
Lysine (%)	1.34	1.34	1.34	1.34	1.34	1.34	1.34
Methionine (%)	0.54	0.54	0.54	0.54	0.54	0.54	0.54

*Premix- Vitamin A (IU) 1250000, Vitamin D3 (IU) 2500000, Vitamin E (Mg) 40000, Vitamin K3 (Mg) 2000, Vitamin B1(Mg) 3000, Vitamin B2 (Mg) 5500, Niacin (Mg) 55000, Calcium Pantothenate (Mg) 11500, Vitamin B6 (Mg) 5000, Vitamin B12 (Mg) 25, Choline chloride(Mg) 5000000, Folic acid(Mg) 1000, Biotin (Mg) 80, Manganese (Mg) 120000, Iron (Mg) 100000, Zinc (Mg) 80,000, Copper (Mg) 8500, Iodine (Mg) 1500, Cobalt (Mg) 300, Selenium (Mg) 120, Antioxidant (Mg) 120.000

*Fixed ingredient (Maize: 54.00, Fish meal: 3.00, Soybean meal: 32.00, Soybean oil: 2.00, Wheat offal: 5.00, Limestone: 1.00, DCP: 2.20, Salt: 0.25, *Premix: 0.25Lysine 0.25, Methionine: 0.25%, DCP: Di-calciumphosphate, ME: Metabolizable Energy

Data Collection

Carcass Characteristics

On the 42nd day of the experiment, two birds per replicate with weight similar to the average of the group were selected for carcass analysis. Feed was withdrawn from the selected birds for 12 hours but water was served before weighing and afterwards

slaughtered by severing the carotid artery and the jugular vein. The slaughtered birds were allowed to bleed completely for about 10mins and defeathered manually without immersing in hot water to avoid shrinkage of internal organs. The head and shanks was removed and weighed before the birds were eviscerated and organs were removed from the carcass. The dressed weights were recorded and the

dressing percentages were estimated by dividing the dressed weight of carcasses by their respective live weights and multiply by 100. The weights of cut-up

parts (wings, neck, thigh, breast and back) were measured using an electronic scale and the values were expressed as percentage of the live weight [9].

Table 2: Gross Composition of Experimental diets for broiler finisher diet

Ingredients	T1	Breadnut T2	Leaf T3	T4	Breadfruit T5	Leaf T6	T7
*Fixed ingredients							
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Breadnut leaf meal	-	0.003	0.006	0.009	-	-	-
Breadnut leaf meal	-	-	-	-	0.003	0.006	0.009
Nutrient analysis							
Crude Protein (%)	18.05	18.05	18.05	18.05	18.05	18.05	18.05
Ether Extract (%)	3.42	3.42	3.42	3.42	3.42	3.42	3.42
Crude Fibre (%)	3.42	3.42	3.42	3.42	3.42	3.42	3.42
M.E (Kcal/kg)	3070.10	3070.10	3070.10	3070.10	3070.10	3070.10	3070.10
Phosphorus (%)	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Calcium (%)	2.47	2.47	2.47	2.47	2.47	2.47	2.47
Lysine (%)	2.29	2.29	2.29	2.29	2.29	2.29	2.29
Methionine (%)	0.56	0.56	0.56	0.56	0.56	0.56	0.56

*Premix- Vitamin A (IU) 1250000, Vitamin D3 (IU) 2500000, Vitamin E (Mg) 40000, Vitamin K3 (Mg) 2000, Vitamin B1(Mg) 3000, Vitamin B2 (Mg) 5500, Niacin (Mg) 55000, Calcium Pantothenate (Mg) 11500, Vitamin B6 (Mg) 5000, Vitamin B12 (Mg) 25, Choline chloride(Mg) 5000000, Folic acid(Mg) 1000, Biotin (Mg) 80, Manganese (Mg) 120000, Iron (Mg) 100000, Zinc (Mg) 80,000, Copper (Mg) 8500, Iodine (Mg) 1500, Cobalt (Mg) 300, Selenium (Mg) 120, Antioxidant (Mg) 120.000

*Fixed ingredient (Maize: 57.00, Fish meal: 2.50, Soybean meal: 25.00, Soybean oil: 3.00, Wheat offal: 4.60, Limestone: 3.00, DCP:2.00, Salt: 0.25, *Premix: 0.25Lysine 0.25, Methionine: 0.25%, M.E: Metabolizable Energy.

RESULTS AND DISCUSSION

The effect of breadnut and breadfruit leaf meal on relative carcass characteristics of broiler chickens is presented in Table 3. The main effect of the phyto-additives on relative carcass characteristics of broiler chickens is presented in Table 3. The live weight was significantly ($P<0.05$) higher (2141g) in broiler chickens fed 9g breadfruit leaf meal (T7) which is similar to the live weight of broiler chickens on T1, T4 and T6 (2064.75g, 2008.75g and 2025.75g respectively), while broiler chickens on T3 had lower live weight (1889.75g) which is similar to live weight of broiler chickens on T2 and T5 (1979.50g and 1950.75g). This is in agreement with the earlier reports of [11] and [10] that phytogenic feed additives improve performance of livestock and poultry. The highest live weight obtained in this study (2141.00g) in T7 which is similar to live weight obtained in T1, T4 and T6 (2064.75, 2008.75 and 2025.75g respectively) was higher than the weight (1450.00g) reported by [21] who fed the broiler chickens *Azadiracta indica*, *Guerra*

senegalensis and *Commiphora kerstingi* as phyto additives.

The relative bled weight, eviscerated weight, carcass weight, head, neck, breast and thigh were significantly ($p<0.05$) affected by dietary treatments. The relative eviscerated and carcass weight was significantly ($p<0.05$) higher (80.05 and 74.21% respectively) in T4 broiler chickens fed 9% breadnut leaf meal inclusion level but lower (73.63 and 67.22% respectively) in broiler chicken on control diet (T1). The increase in the carcass yield of the broiler chicken was also observed by [20] who reported increase in carcass yield of broilers when fed with *Eruca sativa* supplemented diet. The relative carcass characteristics of broiler chickens fed breadnut and breadfruit leaf meal were significantly affected by the phytogenic leaf meal. This result corroborate the findings of [19] on *Trigonella foenum graecum*, [12] on *Allium sativum* and [13] on aqueous extract of *Zingiber officinale*. Similar observations were made by [14]; [15] and [16] on relative carcass characteristics of broiler chickens fed fenugreek, garlic and black pepper supplemented diet. Relative head and neck weights

are significantly ($p < 0.05$) higher (3.16 and 5.07% respectively) in broiler chicken fed 6% breadfruit leaf meal inclusion level. Breast weight and thigh weight (25.49 and 12.21% respectively) was significantly higher ($p < 0.05$) in broiler chicken fed 9% breadnut leaf meal (T4) supplementation level

but breast meat lowest value (22.17%) was obtained in T7. This result corroborate the findings of [17] who reported that the breast yield was significantly higher in broiler chickens that received 100 ppm of mixture of cloves and cinnamon as phyto-additives in comparison to the broiler chickens on control diet.

Table 3: Relative Carcass Characteristics and Dressed Percentage of Broiler Chickens Fed With or Without Breadnut Leaf and Breadfruit Leaf Meal as Additives

Parameters	T1	T2	T3	T4	T5	T6	T7	SEM	P-value
Live weight (g)	2064.75 ^a	1979.50 ^b	1889.75 ^b	2008.75 ^a	1950.75 ^b	2025.75 ^a	2141.00 ^a	0.02	0.04
(% of live weight)									
Bled weight (%)	95.56 ^b	95.16 ^b	95.72 ^b	96.33 ^a	96.42 ^a	95.85 ^b	90.91 ^c	1.60	0.05
De-feathered weight (%)	92.48	91.47	87.43	92.63	92.46	92.52	87.29	2.05	0.25
Eviscerated weight (%)	73.63 ^c	78.02 ^b	76.69 ^b	80.05 ^a	78.41 ^b	77.33 ^b	73.99 ^c	1.93	0.03
Carcass weight (%)	67.22 ^c	71.33 ^b	70.03 ^b	74.21 ^a	71.80 ^b	69.66 ^b	68.52 ^c	1.84	0.01
Head (%)	2.39 ^b	2.40 ^b	2.46 ^b	2.34 ^b	2.60 ^a	3.16 ^a	2.25 ^c	0.21	0.02
Neck (%)	3.97 ^c	4.77 ^b	4.16 ^b	4.35 ^b	4.18 ^b	5.07 ^a	4.46 ^b	0.27	0.02
Wing (%)	7.49	8.36	8.49	8.04	8.28	8.09	7.57	0.30	0.18
Back (%)	11.77	11.93	12.61	12.36	11.78	11.08	12.59	0.77	0.79
Breast (%)	22.50 ^c	24.12 ^b	23.52 ^b	25.49 ^a	25.18 ^a	23.52 ^b	22.17 ^c	0.90	0.02
Thigh (%)	11.55 ^b	11.67 ^b	11.18 ^c	12.21 ^a	11.35 ^b	11.28 ^b	11.32 ^b	0.30	0.04
Drum stick (%)	9.79	10.18	10.21	10.79	10.75	10.08	9.58	0.45	0.45

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

SEM= Standard error of mean T1= Control, T2= 3g breadnut leaf meal, T3= 6g breadnut leaf meal, T4= 9g breadnut leaf meal, T5= 3g breadfruit leaf meal, T6= 6g breadfruit leaf meal, T7= 9g breadfruit leaf meal

Conclusion and Application

It can be concluded that dietary supplementation with breadnut and breadfruit leaf meal as phyto-additives improve carcass characteristics of broiler chickens particularly, the supplementation of 9g breadnut leaf meal per kg of diet without the use of synthetic antibiotics.

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