Journal of Applied Life Sciences International

24(7): 10-16, 2021; Article no.JALSI.76728
ISSN: 2394-1103

Performance and Carcass Characteristics of Broiler Birds Fed Graded Levels of Kapok (*Bombax costatum*)

H. B. Usman [a], K. M. Aljameel [a*], B. M. Musa [b], I. Bata [b] and S. Ibrahim [b]

[a] Department of Animal Science, Federal University Dutsin-Ma, Nigeria.
[b] Department of Animal Science, Usmanu Danfodiyo University, Sokoto, Nigeria.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JALSI/2021/v24i730247
Editor(s):
(1) J. Rodolfo Rendón Villalobos, National Polytechnic Institute, México.
Reviewers:
(1) Sayara Bista, Nepal Academy of Science and Technology (NAST), Nepal.
(2) Radmila Markovic, University of Belgrade, Serbia.
Complete Peer review History: https://www.sdiarticle4.com/review-history/76728

Original Research Article

Received 28 August 2021
Accepted 08 November 2021
Published 11 November 2021

ABSTRACT

The study was conducted in poultry production unit of the Teaching and Research farm in the Department of Animal Science, Faculty of Agriculture, Usmanu Danfodiyo University to investigate the effect of graded levels of kapok seed meal on broiler bird's performance. A total of 288 broiler chickens were being used. The broiler chickens randomly divided into four treatments groups (four experimental diets) T_1 (control), T_2 (0.5kg/100kg), T_3 (1Kg/100kg) and T_4 (1.5kg/100Kg). At the termination of the experiment (day 56), two birds from each pen (replicate) having representative weights for the group (6 birds per Treatment) were selected. The selected birds were bled, dressed and eviscerated. At starter phase the result shows no significant difference ($P>0.05$) between the treatments with regards to final body weight and average daily weight gain, birds in treatment 4 had higher ($P<0.05$) feed conversion ratio (FCR) compared to the other treatments. The result shows significant difference ($P<0.05$) between the treatments across all the parameters measured except FCR. Birds fed treatment 4 record higher values ($P<0.05$) of all the parameters measured compared to treatment 1 at finisher phase. The result on carcass shows significant difference ($P<0.05$) in terms of liver, lung, spleen and crop. Birds in treatment 2 have lower ($P<0.05$) liver compared to the other treatments. Higher ($P<0.05$) crop weight are recorded for birds in treatment 1 compared to the other treatments. The study concludes that ingredients of kapok (*Bombax costatum*) in poultry diet significantly ($p<0.05$) improved performance of broiler birds at starter and finisher phase at rate of 0.5kg/100kg inclusion of fed.

**Corresponding author: E-mail: muhdkjameel@gmail.com;*

Keywords: Broiler birds; kopok meal; performance; carcass.

1. INTRODUCTION

The feeding factor for poultry should satisfy physiological needs as much as possible, which directly depends on its usefulness [1]. Negative external technological factors lead to a decrease in productive indicators for growing poultry. The following types of stress factors can be distinguished: temperature, light effects, noise and chemical effects, drug use, feed change, transport effect, technological, biological and experimental factors, mental (rank). Under stress, the adaptation of poultry is due to its use of organic acids, betaine and other natural antioxidants, and therefore, the possibility of providing additional poultry rations with a set of important nutrients can be considered as one of the main elements for successfully combating stress factors [2]. The bird's body is completely deprived of protection from stress factors. The use of antibiotics as feed additives has been a hallmark of modern animal husbandry; however, this widespread practice is not without criticism [3]. Concerns were raised that the use of antibiotics as therapeutics and for growth promotion could lead to a problem of increasing resistance in bacteria of human and animal origin, particularly regarding resistance in gram-negative bacteria (*Salmonella* spp. and *Escherichia coli*).

In Nigerian poultry farms, it is a common practice to add antibiotics in drinking water at the time of vaccinations. Antibiotics are also added in self formulated and commercial feeds. Antibiotics are also given as medications in prevention and control instances. Most farmers administer antibiotics at the time of vaccination without scientific knowledge of the effects on the immune response. Database on the effects of such practices on the immune system is scarce, and more authenticated studies are needed to investigate the impact of Antibiotics on the immune system at the time of vaccination [4].

The role of medicinal plants in disease prevention or control has been attributed to the antioxidant properties of their constituents, usually associated with a wide range of amphipathic molecules that are broadly referred to as polyphenolic compounds. There is a growing interest in the development and evaluation of natural antioxidants from medicinal plant materials in the food industry and the field of preventive health care. Among those herbs, one promising species is *Bombax costatum*. Several valuable reviews of the ethno botanical uses of Bombax costatum leaves are available. It has been found to be a good source of polyphenols and antioxidants. Phytochemicals such as vanillin, omega fatty acids, carotenoids, ascorbates, tocopherols, beta-sitosterol, moringine, kaempferol, and quercetin have been reported in its flowers, roots, fruits, and seeds. The leaves, in particular, have been found to contain phenolics and flavonoids; these compounds have various biological activities, including antioxidant, anticarcinogenic, immunomodulatory, antidiabetic, antiatherogenic, and hepatoprotective functions and the regulation of thyroid status.

2. MATERIALS AND METHODS

2.1 The Study Area

The study was carried out at the poultry production unit of the Teaching and Research farm in the Department of Animal Science, Faculty of Agriculture, Usmanu Danfodiyo University, Sokoto. Sokoto is located between latitudes 12^{O} and 13^{O} N, Longitudes 4^{O} and 6^{O} E in the northern part of Nigeria and lies at an altitude of 350 m above the sea level [5].

2.2 Experimental Design

2.2.1 Animals

A total of 288 apparently healthy broiler chickens were used in this study. The chickens were divided randomly into 4 treatments groups, (72 birds per treatment) each group divided for sub-group consist of (12 birds) and replicated for 6 times.

2.2.2 The experimental diets

The cloves buds powder was used as additives in this experiment. The kapok meal was used as additives in four (4) graded levels of 0, 0.5, 1 and 1.5kg/100kg to fed inclusion and very well mixed.

2.2.3 Experimental birds and their management

The boiler chickens for this study were obtained from reputable farm in Nigeria at age of one day. The birds were transported to Sokoto under the cool hours of the evening through the night and

arrived in the morning hours. The poultry house was cleaned, washed and disinfected before a week prior to arrival of the birds. The birds were raised on deep litter in tropical house type, with open side walls and concrete floor. Litter materials (wood shavings and old newspaper were spread on the floor, feeding trays and small drinkers were used for the first 0-2 weeks (Starter phase), while conical feeders and plastic containers with wire guard were used at final phase. Feed was given to the birds *ad libitum* on tray feeders for the first 10 days and the tray feeders were replaced with small conical feeders at second week of their age for proper feed management and efficiency. Fresh water was given to the birds every morning in small drinkers. Their health care was ensured by giving them routine vaccination and medication as at when due, proper sanitation and hygiene was ensured. The floor spacing was maintained at (4/9 ft) per replicate [6].

2.2.4 Experimental diet formulation

Maize, wheat offal, bone meal, Fish meal and salt were obtained from Sokoto central market. Soya bean meal, Groundnut cake, limestone and micro ingredients such as Premix, Lysine, and Methionine were sourced from a vendor called Alkanchi farm ltd in the Sokoto Metropolis. The kopak seed was obtained from Achida village ground into powder form.

Feed ingredients that were used for this experiment, such as Maize, Groundnut cake (GNC), Soya bean meal and Bone meal required crushing so that the particle size would suit the group of birds the feed are to be meant for. Feed ingredients that were in powdery form were weighed and mixed with the crushed ones. The feed compounding was done on a clean concrete floor, and thoroughly mixed with shovel to a uniform mix the feed compounding was done according to the formulation in Table 1.

2.3 Data Collection

Daily feed intake= Feed given (g or kg) – Feed leftover (g or kg)

Calculated as:

Average feed intake (AFI).
Average feed intake per/day

Body Weight (BW)= Current/Final weight – Initial/previous weight

Body Weight Gain (BWG)= Current/Final weight – Initial/previous weight

Calculated as:

Body Weight Gain
Body Weight Gain per day

Table 1.Gross, calculated and analyzed chemical composition of experimental starter and finisher diets

Ingredient (kg)	Starter	Finisher
Maize	50.0	55.5
Soya beans meal	21.5	14.5
Groundnut cake	15.5	12.0
Wheat offal	8.0	11.0
Limestone	2.0	4.0
Bone meal	2.0	4.0
Premix	0.25	0.25
Salt	0.25	0.25
Methionine	0.25	0.25
Lysine	0.25	0.25
Total	100kg	100kg
Calculated Chemical Composition		
Crude protein (%)	23	19.05
Energy (kcal/kg)	2986	3352
Methionine (kg)	0.36	0.41
Lysine (kg)	1.0	0.9
Calcium (kg)	0.8	0.8
Phosphorus (av)	0.45	0.45
Fibre (%) (max)	6%	6

The feed conversion ratio was obtained by dividing weight gain by the feed intake, this could be expressed using formula below:

$$\text{FCR} = \frac{\text{feed intake}}{\text{weight gain}}$$

Mortality was recorded as it occurred on daily basis.

2.4 Carcass Evaluation

At the termination of the experiment (day 56), two birds from each pen having representative weights for the group (6 birds per Treatment) were selected. The selected birds were bled, dressed and eviscerated. Prime cuts and organs were separated and weighed individually and were expressed as percentages of carcass and live weight respectively.

2.5 Data Analysis

Analysis of variance (ANOVA) of SPSS software 2017 version was used to compare the means of parameters of study the result were expressed in the form of means ± standard error. The difference between the means of the parameters under study were consider statically significant when the *P* value less than 0.05 (P<0.05).

3. RESULTS AND DISCUSSION

3.1 Performance of Broiler Birds Graded Levels of Kapok at Starter Phase

The result on the general performance of experimental birds at starter phase is shown in Table 2. The result shows no significant measured except FCR. Birds fed treatment 4 record higher values (P<0.05) of all the parameters measured compared to treatment 1. There is no significant difference (P>0.05) between birds in treatment 1 and 3 in all the parameters measures, so also between treatment 4 and 2. Treatments 1 and 2 are significantly (P>0.05) similar in respect of final body weight, weight gain and average daily weight gain components.Total feed intake was significantly influenced by dietary treatments. The quantity of feed consumed in this study did not agree with the report of Afolayan *et al.* [8] apart from birds fed diets with T3 whose consumption was comparable with the findings of these authors. The improvement in the growth performance due to kapok supplementation to difference (P>0.05) between the treatments with regards to final body weight and average daily weight gain, birds in treatment 4 had higher (P<0.05) FCR compared to the other treatments. Feed intake is also higher (P<0.05) for birds in treatment 4 compared to birds in treatment 3, there is no significant difference in terms of feed intake between birds in treatments 1, 2 and 4 so also between treatment 3 and those in treatments 1 and 2.Birds on T4 diets consumed significantly higher feed (4902.3g) while those on T2 with 3152.0g consumed significantly low feed. These values were much higher than 1215g obtained for broilers at week 4 by Dafwang [7] and the range of 1005.06 – 1143.09g reported by Afolayan *et al*. [8]. Average daily feed intake followed the same trend with the T4 group consuming significantly higher feed while birds on diets with T2 consume significantly the least feed.Feed conversion ratio were significantly (p<0.05) influenced by dietary treatments. Diets T1, T2 and T3 which resulted in a ration that is better utilized than the other ration by the birds given their low feed conversion ratio values of 1.38, 1.35 and 1.28 respectively. According to Etuk and Udedibie [9]; Akinmutimi [10]; Amaefule and Onwudike [11]; Ani and Okeke [12]; Esonu *et al*. [13] the most important factor influencing the performance of poultry birds is the quality of the feed offered to the birds.

3.2 Performance of Broiler Birds Graded Levels of Kapok at Finisher Phase

The result on the general performance of experimental birds at finisher phase is shown in Table 3. The result shows significant difference (P<0.05) between the treatments across all the parameters

broilers' diets can be partly attributed to improving the ecology and function of the digestive tract of chickens. This inconsistency in the reviewed results can be attributed to the different qualities of feed, breeder and age of the broilers, statistical design, doses of turmeric and the sanitary and environmental conditions.

3.2.1 Carcass characteristics of broiler birds fed graded levels of kapok meal

The result shows significant difference (P<0.05) in terms of liver, lung, spleen and crop. Birds in treatment 2 have lower (P<0.05) liver compared to the other treatments. Higher (P<0.05) crop weight are recorded for birds in treatment 1 compared to the other treatments. Birds in

Table 2. General performance of broiler birds graded levels of kapok meal at starter phase

Parameters	Treatment 1	Treatment 2	Treatment 3	Treatment 4	SEM
Total Feed Intake	3924.8^{ab}	3924.8^{ab}	3512^{b}	4902.3^{a}	237.59
Average Feed Intake per bird	8.01^{ab}	8.01^{ab}	7.17^{b}	10.00^{a}	0.48
Final Body Weight	4495.7	4575.9	4368.3	5026.2	314.28
Body Weight Gain	2764.1	2858.9	2767.6	3200.0	174.71
Average daily weight Gain per bird	5.64	5.84	5.65	6.53	0.36
Feed Conversion Ratio	1.38^{b}	1.35^{b}	1.28^{b}	1.63^{a}	0.04

a,b,c= Mean with different superscript across the row are significantly different (P<0.05)

Table 3. General performance of broiler birds fed graded levels of kapok meal at finisher phase

Parameters	Treatment 1	Treatment 2	Treatment 3	Treatment 4	SEM
Total Feed Intake	7768.3^{b}	8741.7^{a}	8216.7^{ab}	8610.0^{a}	144.35
Average daily Feed Intake per bird	15.98^{b}	17.84^{a}	16.89^{ab}	17.57^{a}	0.30
Final Body Weight	14578.9^{b}	15395.1^{ab}	14908.1^{b}	16890.1^{a}	320.72
Body Weight Gain	8160.1^{b}	8719.8^{ab}	8248.6^{b}	9412.5^{a}	190.01
Average daily weight Gain per bird	16.76^{b}	17.80^{ab}	16.98^{b}	19.21^{a}	0.39
Feed Conversion Ratio	0.97	1.05	1.02	0.94	0.03

a,b,c= Mean with different superscript across the row are significantly different (P<0.05)

Table 4. Result of carcass characteristics of broiler birds fed graded levels of kapok meal

Parameter	Treatment 1	Treatment 2	Treatment 3	Treatment 4	SEM
Live weight (g)	1752.46^{b}	1974.44^{a}	1773.61^{b}	1772.4^{b}	31.06
Dressed weight (g)	1270.44^{b}	1381.11^{a}	1162.85^{c}	1175.87^{bc}	25.28
Dressing percentage	72.49^{a}	69.99^{ab}	65.56^{b}	66.34^{b}	1.64
Breast (g)	603.40^{ab}	653.80^{b}	538.50^{c}	561.75^{bc}	12.82
Back(g)	149.42^{ab}	156.36^{a}	139.07^{b}	150.35^{ab}	2.75
Thighs(g)	216.48^{b}	238.14^{a}	205.83^{b}	204.52^{b}	4.51
Drumsticks (g)	182.51^{ab}	197.76^{a}	175.19^{b}	170.21^{b}	3.45
Wings(g)	147.86^{ab}	157.88^{a}	138.81^{b}	137.59^{b}	2.76
Liver(g)	53.17^{a}	50.53^{ab}	44.76^{b}	47.40^{ab}	1.20
Heart(g)	10.09	10.32	10.47	9.93	0.22
Spleen(g)	2.88^{b}	3.56^{a}	2.76^{bc}	2.23^{c}	0.14
Crop(g)	11.69	11.84	11.27	11.54	0.75
Intestine(g)	51.57	50.53	50.76	51.40	1.20
Abdominal fat (g)	12.47	11.51	10.76	11.42	0.71
Lungs(g)	10.15^{b}	11.27^{b}	12.87^{ab}	13.78^{a}	0.34

a,b,c=Means with different superscript across the row are significantly different (P<0.05)

treatments 3 and 4 have higher lung weight compared to those in treatments 1 and 2. Higher live weight and carcass weight are recorded in treatment 2 compared to the other treatment while dressing percentage is higher in treatment 1 (P<0.05), Breast, drumsticks, back and wings were higher in treatments 2 (P<0.05). Birds in treatment 2 have carcass yield. Tegegne and Asrat [14] argued high carcass yield suggests more nutrient bioavailability for anabolic process than other diets since the true muscle development is an accumulation of protein. The lower weight of carcass parts of T3, and T4 may be due to less deposition of protein. This might be attributed to the presence of kapok which might limit dietary intake. The difference in dressing percentage of the current study among treatments is in close agreement with the study by Maigualema and Gernat [15] who found significant differences (p>0.05) in dressing percentage by using garlic by- product meal as feed ingredient for broilers. Tegene and Asrat [14] that revealed heavier slaughter weight might be attributed to higher feed intake. It is also indicated that the birds grow more quickly and efficiently [16].

The abdominal fat in the present work are higher in T4 which indicates that the chicks were still growing and actively building muscle tissues and did not yet start to accumulate fat.

4. CONCLUSION

The study concludes that ingredients of kapok (*Bombax costatum*) in poultry diet significantly (p<0.05) improved performance of broiler birds at starter and finisher phase at rate of 0.5kg/100kg inclusion of fed.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Pashtetsky V, Ostapchuk R, Il'yazov R, Zubochenko D, Kuevda T. Use of antioxidants in poultry farming (review) IOP Conf. Series: Earth and Environmental Science. 2019;341:012042. IOP Publishing doi:10.1088/1755-1315/341/1/012042
2. Fisinin VI, Kavtarashvili AS. Heat stress in poultry. II. Methods and techniques for prevention and alleviation (review) Agricultural Biology [in Russian – Sel'skokhozyaistvennaya Biologiya] 2015; 50(4):431–443. DOI:10.15389/agrobiology. 2015.4.431eng
3. Butaye P, Devriese LA, Haesebrouck F. Antimicrobial growth promoters used in animal feed: effects of less well known antibiotics on gram-positive bacteria. Clinical microbiology reviews. 2003;16(2): 175–188. DOI:10.1128/cmr.16.2.175-188.2003
4. Khalifa HH, Khalil MH, Younes TM, Abdel-Tawab F. Evaluation of some managerial manipulation to alleviate the effect of heat

stress on broiler chickens. In: Proc. 15th Int. Congr. Biometeorol. 2009;117.
5. Mamman AB, Oyebanji JO, Peter SW. A people United, a future assured survey of state. Vol. 1(112). Gabumo publishing co. Ltd. Calabar, Nigeria;2000.
6. Oluyemi JA, Roberts SA. Poultry production in warm wet climates. 2nd edition spectrum book ltd, Ibadan, Nigeria. 2000;244.
7. Dafwang II. Meat eggs and milk from Farm Waste Exploration in Animal Nutrition Research and Extension. An inaugural Lecture. University of organized lectures committee, Vice chancellor's Office, Ahmadu Bello University, Zaria;2006.
8. Afolayan SB, Dafwang II, Tegbe TSB, Sekoni A, Jegede JO. Performance of broiler chickens fed maize based diets substituted with graded levels of sweet potato meal. Nigeria Journal of Animal Production. 2014;41(1):50-59.
9. Etuk EB, Udedibie ABI. Effect of cooked pigeon pea (*Cajanus cajan*) seed meal on the performance of broiler chicks. J. Agric. Social Res. 2003;3(1):1-12.
10. Akinmutimi AH. Effect of processing on metaboliszability of energy content of Sword beans (*Canavalia gladiata*) using broiler chicks (starter phase). Proceedings of the 28th Annual Conf. of the Nig. Soc. for Anim. Prod. (NSAP), Ibadan, Nigeria. 2003;194-196.
11. Amaefule KU, Onwudike OC. Comparative evaluation of the processing methods for pigeon pea seeds (Cajanus cajan) as protein source for broilers. East African Agricultural and Forestry Journal. 2003;68(3-4):191-196.
Available:https://www.ajol.info/index.php/eaafj/article/view/1796
12. Ani AO, Okeke GC. The substitution of pigeon pea (*Cajanus cajan*) seed meal for soybean meal in broiler finisher rations. Proc.8th Annual Conference of Anim. Sci. Ass. Of Nig. (ASAN), Univ. of Tech. Minna, Nigeria. 2003;10-12.
13. Esonu BO, Ihenkwumere FC, Iwuji TC, Akamu N, Nwugo OH. Evaluation of *microdermispuberula*leaf meal as an ingredient in broiler starter diets. Nig. J. Anim. Prod. 2003;(30):3-8.
14. Tegene N, Asrat T. Effects of feeding different levels of cooked and sun dried fish offal on carcass traits of growing Rhode Island Red chicks. Trop Anim Health Prod. 2010;42(1):45-54.
15. Maigualema MA, Gernat AG. The Effect of Feeding Elevated Levels of Tilapia (*Oreochromus niloticus*) By-product Meal on Broiler Performance and Carcass Characteristics International Journal of Poultry Science. 2003;2(3).
16. Usman HB, Aljameel KM. Performance of broiler birds fed graded levels of clove *(Syzgium aromaticum* (L.) buds powder in semi-aridregion, Nigeria. Journal of Animal Science and Veterinary Medicine. 2021;6(1):45-67.
ISSN: 2536-7099
Available:https://doi.org/10.31248/JASVM2021.292https://integrityresjoumals.org/journal/JASVM

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle4.com/review-history/76728