AJBS Asian Journal of Biological Sciences

OPEN ACCESS

Response of Starter Broiler Birds Administered with *Costus afer* Extract

[1]Azodo Lilian, [1]Uzoma Chinenye, [1]Nduka Christiana, [1]Olabode Adeyemi David and [2]Okelola Olufemi Emmanuel

[1]Federal College of Agriculture, Ishiagu, Ebonyi, Nigeria

[2]Federal College of Fisheries and Marine Technology, Victoria Island, Lagos, Nigeria

ABSTRACT

Background and Objective: Extracts of plant leaves, stems and roots are now been used in poultry production as growth promotants and additives. This is a result of the negative impact created by synthetic ones over the decades. Thus, the focus of this research work is to determine the response of starter broiler birds administered with *Costus afer* extract. **Materials and Methods:** A total number of one hundred and twenty (120) 7-day old 'Abor acre' broiler chicks were divided into four groups of 30 birds each. Each group was replicated three times with 10 birds per replicate. The birds were randomly assigned to 0, 5, 10 and 15 mL of homogenous *Costus afer* leaf and stem extracts per liter of drinking water in a completely randomized design (CRD) experiment. The groups were labeled with T_1 (control), T_2, T_3 and T_4, respectively. Proximate analysis of the commercial feed and *Costus afer* leaf and stem were carried out. The birds were managed under the same experimental conditions for 56 days. Data collected were subjected to Analysis of Variance (ANOVA) and significantly different means were separated according to the method of Duncan's multiple range test at a 5% significant level. **Results:** Results obtained showed that superior ($p<0.05$) values for final body weight, body weight gain and feed conversion ratio were obtained in treatment 4 with values of 753.33 g, 641.33 g and 1.71 g, respectively. Serum mineral had values that were not significantly ($p<0.05$) influenced by calcium, phosphorus, sodium and chloride, while potassium had values that differed ($p<0.05$) across the treatment group with the highest ($p<0.05$) value of 4.14 meq/L in treatment 4, while the lowest value of 3.25 meq/L was seen in treatment 3. **Conclusion:** It can be concluded that the extract of *Costus afer* can be given to broiler starter birds up to the level of 15 mL/L of water which can lead to better growth and development as observed in treatments administered with the extract, with the best performance seen in treatment 4.

KEYWORDS

Response, serum electrolyte, *Costus afer*, broiler birds, administered, extracts

INTRODUCTION

The use of phytogenic feed additives has been adopted either as leaf meal or aqueous extract to improve broiler production. Natural feed additives over the years have gained increasing interest as an alternative means of feeding strategy to antibiotic and or inorganic growth promoters. This has occurred especially in the European Union, where antibiotics have been banned completely from use as additives in livestock

ISSN: 1996-3351 (Print)
https://doi.org/10.3923/ajbs.2025.633.637

Received: 29 Jan. 2025
Accepted: 22 Feb. 2025
Published: 30 Sep. 2025

feeds since 2006, because of the suspected risk of generating microbiota with increased resistance to the antibiotic used for therapy in humans and animals[1]. The use of leaf extracts in livestock production, especially the poultry sector has gained tremendous accolades, because it is potent, cheaper and constitute no health issue they are often used to nurture the gap between production and food safety in most cases. Most leaf extracts usually contain minerals, vitamins, amino acids and other nutrients as subsidiary nutrient[2,3]. On account of this potential, the World Health Organization has recognized the implicit part of phytogenics in humans and livestock and approved its use in the Alma Mata Declaration of Health for all in the year 2000. Leaf extracts equally fall within the scope of the European Union Regulation 1831/2003 and do not need any authorization to be included in poultry and livestock nutrition[4]. Furthermore, water intake is double the feed consumption of birds even when they are sick they continue to drink although feed, intake may cease. Substance intake via drinking water is therefore higher and faster than feed, addition of materials to water is also easier than to feed.

Different research has shown that *Costus afer* a member of the Zingiberaceae family is a tall perennial herbaceous, unbranched creeping plant (up to 4m) and is commonly found in West African countries like Nigeria, Ghana and Cameroun. It is primarily known as 'ginger lily' or 'bush cane', '*Okpete'* by Igbos, *'Kakizawa'* by Hausas, *'Tete-egun'* by Yorubas and *'Mberitem'* in Efik[5]. *C. afer* is mostly used indigenously, because of its nutrient and therapeutic constituents. This entails the use of some of the plant parts in food preparation[6]. The proximate composition of different parts of *C. afer* shows the presence of macro- and micronutrients. The leaves and stems are rich in essential nutrients such as carbohydrates, crude protein, fat, ash, moisture and a good source of fiber. Different authors have reported the presence of substantial Levels of multivitamins in the leaves[7]. The phytochemical examination of some parts of this plant shows the presence of alkaloids, phenols, saponins, triterpenes, tannins and glycosides in different solvents[8]. These phytochemicals and nutritional compositions may justify the nutraceutical use of the plant. Different studies on the chemical identification and isolation of bioactive compounds from *C. afer* have been reported and this has brought about clarification of structures from various parts of the plant[9]. For instance, rhizome contains steroidal saponins such as dioscin, paryphyllin C, aferoside B and aferoside C. Kaempferol-3-O-R-L-rhamnopyranoside, which is a flavonoid glycoside, has also been detected from the aerial part of the plant[9]. Thus, this research seeks to find the response of starter broiler birds administered with *Costus afer* extract.

MATERIALS AND METHODS

Study area: This research was conducted at the Teaching and Research Farm of the Department of Animal Science, Faculty of Agriculture, Chukwuemeka Odumegwu Ojukwu University (COOU), Igbariam, Anambra State of Nigeria. The research work lasted from April, 2022 to June, 2022

Sample collection and extraction: The bush cane leaves and stemware were washed to remove debris and spread out on a mat for 4 hours to drain properly under room temperature. The leaves and stems were also air-dried in a well-ventilated and clean room, this was to avoid the loss of some important components when exposed to sunlight especially vitamin C. Thereafter, they were ground into a few fine particles using a simple hammer mill. An extract was made from the ground leaves and stem by hand squeezing with cloth. The extract was sieved and stored in a plastic container and refrigerated until needed for use.

Research protocol: A total number of one hundred and twenty 7-day-old Abor acre broiler chicks were divided into four groups of 30 birds each. Each group was replicated three times with 10 birds per replicate. The birds were randomly assigned to 0, 5, 10 and 15 mL of homogenous CALSE per liter of drinking water in a completely randomized design (CRD) experiment. The groups were labelled T_1 (control), T_2, T_3 and T_4 respectively. Commercial feed and *Costus afer* leaf and stem extracts were offered *ad libitum* and the birds were managed under the same experimental conditions for 56 days. The nutrient

Table 1: Nutrient composition of experimental diet

Parameter	Starter	Finisher
Metabolizable energy (Kcal/kg)	3161.00	3202.00
Crude protein (%)	16.15	18.02
Ash/mineral (%)	4.79	6.63
Moisture (%)	6.93	7.08
Dry matter (%)	93.07	92.93

Table 2: Growth response of starter broiler birds

	Level of *Costus afer* leaves and stem extract (mL)				
Parameter (g)	T_1 (0)	T_2 (5)	T_3 (10)	T_4 (15)	SEM
Initial weight	102.00	102.00	112.00	102.00	0.00
Final weight	620.00^{b}	642.67^{b}	679.33^{b}	753.33^{a}	17.26
Body weight gain	508.00^{b}	530.67^{b}	567.00^{b}	641.33^{a}	17.25
Daily weight gain	24.19^{b}	25.26^{b}	26.99^{b}	30.54^{a}	0.82
Total feed intake	1269.33^{a}	1111.00^{ab}	1089.00^{b}	1091.67^{b}	31.57
Daily feed intake	60.46^{a}	52.90^{ab}	51.86^{b}	51.98^{b}	1.50
Feed conversion ratio	2.50^{a}	2.10^{b}	1.92^{bc}	1.71^{c}	0.094

^{ab}Means with different superscripts within a row are significantly different ($p<0.05$) and SEM: Standard Errors of Mean

composition of the experimental diet is obtained in Table 1. At the end of the feeding trial, blood samples (4 mL) were collected from two birds per replicate on the last day of the study through a marginal wing web vein using the sterilized syringe.

Measurement of parameters: The assessment of hematological parameters and serum biochemical indices was done[10]. The 2 mL was collected from the marginal wing web vein of the birds into a labeled sterile universal bottle containing 1.0 mg/mlethyldiaminetetracetic acid (EDTA) for hematological analysis. Another 2 mL was collected into the anti-coagulant-free bottle. The blood sample was allowed to clot at room temperature and the serum was separated by centrifuging within three hours of collection. Serum biochemical and hematological parameters were measured[11], respectively. Mean cell hemoglobin (MCH), Mean Cell Volume (MCV) and mean cell hemoglobin concentrations (MCHC) were thereafter calculated.

Statistical analysis: Data collected were subjected to Analysis of Variance (ANOVA) and significantly different means were separated according to the method of Duncan's multiple range test at 5% significant

Ethical consideration: There was no issue of concern regarding human rights or animal rights in the course of the research work, as there was total compliance with rules and regulations guiding the use of products relating to animals and avoidance of any zoonotic transfer.

RESULTS AND DISCUSSION

Results of the response of starter broiler birds to *Costus afer* extract were presented in Table 2. Results showed that final weight was superior in treatment 4 with a value of 753.33 g while the least value of 620.00 g was obtained in treatment 1, which did not differ from the values of 642.67 g and 679.33 g observed in treatments 2 and 3. This was similar to the previous report of Olabode *et al.*[12] where they observed increased final weight when herbal leaves and *Costus afer* were added to the diets of starter broilers. The steady increase in final weight values across the treatment groups could be a result of proper absorption of bio-nutrients from the plant extract and the activities of phytochemicals in the plants which greatly influenced growth hormones in the bird's system. The effect of the extract on total feed intake showed significance with treatment 1 having the highest value of 1269.33 g, which was followed by 1111.00 g observed in treatment 2. The lowest value of 1089.00 g was seen in treatment 3, which was similar to that of 1091.67 g in treatment 4. The declining rate of intake by the birds at this stage of growth could be a result of taste and odor. Also, the fiber level of the test ingredient in a liquid form might have a staggering effect. This was ascertained by work carried out by Mishael *et al.*[13] where they obtained

Table 3: Effect of *Costus afer* extract on serum mineral compositions of broiler starter

	Level of *Costus afer* leaves and stem extract (mL)				
Parameter (g)	T_1 (0)	T_2 (5)	T_3 (10)	T_4 (15)	SEM
Calcium (mg/dL)	9.02	9.31	9.15	8.69	0.18
Phosphorus (mg/dL)	10.85	10.01	10.37	9.81	0.30
Sodium (meq/L)	136.87	131.57	135.48	135.95	1.90
Chloride (meq/L)	97.73	99.18	102.18	101.29	1.29
Potassium (meq/L)	3.31^{b}	3.38^{ab}	3.25^{b}	4.14^{a}	0.15

[ab]Means with different superscripts within a row are significantly different ($p<0.05$) and SEM: Standard Errors of Mean

declining feed consumption from the control when starter birds were fed graded levels of processed black plum leaf meal. Values reported for feed conversion ratio in this study were best in treatment 4, with a value of 1.71, while the least performed treatment was represented in treatment 1 with 2.50. Treatments 2 and 3 had values of 2.10 and 1.92, respectively. This showed that the feed efficiency of the birds was enhanced by the inclusion of extract into their water. This served the duo effect of both enhancing feed utilization and at the same time helping in eradicating parasitic microbes which in turn would have competed with the beneficial microbes thus reducing their feed efficiency.

Data obtained for serum electrolytes were not significantly affected in calcium, phosphorus, sodium and chloride, where the values showed similarities across the treatment group, but were significantly in the value obtained for potassium. Calcium had a value of 9.02 mg/dL in treatment 1 which was not significantly different from the values of 9.31 mg/dL, 9.15 mg/dL and 8.69 mg/dL obtained in treatments 2, 3 and 4. The effect of the extract on phosphorus had similar values of 10.85 mg/dL, 10.01 mg/dL, 10.37 mg/dL and 9.81 mg/dL corresponding to treatments 1, 2, 3 and 4. A superior value of 4.14 meq/L was seen in treatment 4, which varies from the value of 3.31 meq/L obtained in treatments 1 and 2, while the lowest value of 3.25 meq/L was obtained in treatment 3. This was similar to the report of Nwokocha *et al.*[14] where they observed significantly higher values of potassium when *Costus afer* was administered in broiler birds shown in Table 3.

This implies that the *Costus afer* extract can be administered successfully in the water of starter broiler birds with better performance, even up to the level of 15 mL/L of drinking.

Based on the results obtained from this study, it is recommended that Costus *afer* extract be included in the drinking water of starter broiler birds to enhance performance and promote better body development. Additionally, its use can be extended to the drinking water of other poultry birds to assess potential benefits. Furthermore, the level of *Costus afer* extract should be slightly increased to evaluate its effectiveness in improving performance across both broilers and other poultry species. Another method of processing should be employed in the treatment of Costus afer to aqueous form

CONCLUSION

It can be concluded that the administration of *Costus afer* extract in the drinking water of starter broilers is possible with better results obtained in treatment 4. Thus, the *Costus afer* extract can serve as a good natural feed additive in broiler birds with little or no restriction. This was so, because of the steady increase in the final body weight and a better feed conversion ratio as the level of Costus afer extract increased across the treatment groups as seen in treatment 4.

SIGNIFICANCE STATEMENT

The core purpose of the study focuses on the usage of liquid herbal substances (*Costus afer* extract) on the performance (in terms of growth parameters) and serum electrolytes of broiler birds at the starter phase. The study revealed the fact that *Costus afer* in aqueous form has the ability and potential to create

a dynamic in the system of the birds leading to enhanced growth in size, while also contributing to the enhanced development of the serum cations and anions which are determinants of basic elements in the blood of the birds.

REFERENCES

1. Windisch, W., K. Schedle, C. Plitzner and A. Kroismayr, 2008. Use of phytogenic products as feed additives for swine and poultry. J. Anim. Sci., 86: E140-E148.
2. Ibrahim, N., N.F.S.M. Niza, M.M.M. Rodi, A.J. Zakaria, Z. Ismail and K.S. Mohd, 2016. Chemical and biological analyses of Malaysian stingless bee propolis extracts. Malays. J. Anal. Sci., 20: 413-422.
3. Alagbe, J.O., M.D. Shittu and E.A. Ojo, 2020. Prospect of leaf extracts on the performance and blood profile of monogastric-A review. Int. J. Integr. Educ., 3: 122-127.
4. Huyghebaert, G., R. Ducatelle and F. van Immerseel, 2011. An update on alternatives to antimicrobial growth promoters for broilers. Vet. J., 187: 182-188.
5. Anaga, A.O., C.J. Njoku, E.S. Ekejiuba, M.N. Esiaka and I.U. Asuzu, 2004. Investigations of the methanolic leaf extract of *Costus afer*. Ker for pharmacological activities *in vitro* and *in vivo*. Phytomedicine, 11: 242-248.
6. Anyasor, G.N., K.O. Ogunwenmo, O.A. Oyelana and B.E. Akpofunure, 2010. Phytochemical constituents and antioxidant activities of aqueous and methanol stem extracts of *Costus afer* Ker Gawl. (Costaceae). Afr. J. Biotechnol., 9: 4880-4884.
7. Ekpe, I.P., E.O. Udosen and D. Amaechi, 2018. Evaluation of some vitamins and macro-nutrients composition of ethanolic extract of *Tecoma stans* and *Costus afer* leaves. Int. J. Biochem. Res. Rev., Vol. 23. 10.9734/IJBCRR/2018/44554.
8. Akpan, M.M., C.S. Odeomena, C.N. Nwachukwu and B. Danladi, 2012. Antimicrobial assessment of ethanolic extract of *Costus afer* leaves. Asian J. Plant Sci. Res., 2: 335-341.
9. Anyasor, G.N., F.D. Onajobi, O. Osilesi and O. Adebawo, 2014. Proximate composition, mineral content and *in vitro* antioxidant activity of leaf and stem of *Costus afer* (ginger lily). J. Intercult. Ethnopharmacol., 3: 128-134.
10. Jiwuba, P.C., I.P. Ogbuewu and K. Nwachukwuguru, 2018. Performance and economy of production of broilers fed Siam weed (*Chromolaena odorata*) leaf meal (SWLM). Trop. Anim. Health Prod., 50: 1305-1311.
11. Uchewa, E.N., W. Amaduruonye, D.N. Onunkwo and H.A. Njoku, 2018. Performance of broiler chickens fed bush marigold (*Aspilia Africana*) leaf extract. Niger. J. Anim. Sci., 20: 223-228.
12. Olabode, A.D., L. Azodo, O.E. Okelola, N.A. Olorunfumilola and P. Onyishi, 2022. Growth response and cost benefit analysis of starter broiler birds fed supplemental levels of black plum leaf meal (A case study in Ishiagu, Ivo Local Government Area of Ebonyi State). Int. J. Environ. Agric. Res., 8: 38-41.
13. Mishael, A., O.A. David, N. Christiana and O. Noah, 2024. Effect of black plum leaf meal on the growth performance characteristics, cost benefit evaluation and serum biochemical indices of finisher broiler birds. Curr. Res. Poult. Sci., 14: 10-15.
14. Nwokocha, J.V., N.J. Nwokocha, O. Ogbuji, C.I. Ukpabi and M.S. Egere, 2013. Studies on the effect of the combination of *Boerhavia diffusa* and *Costus afer* leaf extracts on the haematological parameters of broiler chickens. Int. J. Acad. Res. Progressive Educ. Dev., 2: 135-145.