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Growth performance, carcass and economics of raising broiler chickens fed *Gongronema latifolia* leaf warm water extract as feed supplement

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ABSTRACT

The study determined the influence of *Gongronema latifolia* leaf meal (GLLE) extract on performance, carcass, and economics of producing broiler chickens. Structured in a completely randomized design with 192 brooded chicks allotted to six treatments. Each had thirty-two birds, four replicates, and eight birds per replicate. No supplement in treatment 1; treatment 2 was supplemented with Vitalyte Extra, while diets 3, 4, 5, and 6 had GLLE as 25, 50, 75, and 100 mL/L. Vitalyte Extra was given (5g per litre) once a week. Total weight gain, average weekly weight gain, weekly feed intake, total feed intake, and feed conversion ratio were significantly ($P<0.05$) affected. Birds fed with 50 mL/L had significantly higher values for final weight, total weight (per bird), and average weekly weight. Birds on 100 mL/L were significantly higher in weekly and total feed intake. Feed conversion ratio, bled, and eviscerated weights were significantly better in diet 4, while defeathered weight was highest in diet 2. The cost and returns revealed that revenue and gross profit were better in treatment 4. Conclusively, results revealed that the test ingredient of 50 mL/L enhanced better growth and economics of broilers, suggesting that the test ingredient could serve as a whole or partial replacement for Vitalyte Extra.

Key words: Birds, highest, significantly, treatments, weekly, weight.

INTRODUCTION

The development of a non-conventional feeding approach holds the key to revolution in the poultry industry (Iwegbu et al., 2023). Competition between humans and animals for conventional feed ingredients, coupled with scarcity, has impeded the expansion of the industry in many countries of the world. The developmental stride of any nation cannot be complete without full attention to animal agriculture (livestock production) and adequate nutrient intake of the citizenry. The health status of the populace, to a large extent, is dependent on the quality and quantity of food nutrients obtained from both animal and crop agriculture. The ever-

increasing population of Nigeria, and most countries, has created a great vacuum between the protein requirement and the actual amount of protein consumed by individuals. Successive governments have made efforts at bridging the yearning gap (FAO, 2020). These attempts have not yielded the required result due to deliberate conventional approaches in livestock management and feeding. Poultry production holds a great advantage in mitigating or bridging the gap between the level of body protein requirement and the amount consumed if required attention is given to the industry by evolving a non-conventional feeding approach. To buttress

this, Adebambo (2000) and Igene and Iwegbu (2022) noted that of all the possible animals capable of bridging the gap, only poultry has the immediate potential to produce results in the shortest possible time based on its population in Nigeria, which is currently put at about 200 million (Worldometer, 2022), the nature of its meat in regard to health, and its prolificacy.

One of the local plants that have not been fully examined and utilized for animal feed compilation and feeding is *Gongronema latifolia*. It is important and fundamental to know the important nutritive and medicinal values of these herbaceous plants within us for the benefit of humanity. This could save man the stress, time, and cost of searching for expensive methods of animal feed compilation and feeding when we are surrounded by free gifts of nature (herbaceous plants). The plant belongs to the family of plants known as "Asclepiadaceae" and it is widespread in the tropical rainforest of West African countries. Its vegetable is widely accepted as human food supplement across West African countries. It is called "Utazi" in Igbosland, "Arokeke" by the Yorubas, and "Utasi" by the Efiks and Ibibios. *Gongronema latifolia* could be consumed fresh, cooked, or dried and applied as a powdery spice. In any way it is eaten, it carries a moderately bitter taste that contributes tremendously to its flavour. Nneoyi-Egbe et al. (2024) averred that the plant has a stimulating tonic effect on the digestive system, enhances the flow of bile, and stimulates appetite for food and other activities of the pancreas. Local poultry farmers could use it for the treatment of common respiratory diseases (Nneoyi-Egbe et al. 2024). Okochi et al. (2024) reported that *Gongronema latifolium* fruit contains superior nutritional and antioxidant properties surpassing the leaf. Development of the potential indigenous plants as sources of animal feedstuff might not only decrease dependency on the industry for expensive imported feed ingredients but also relatively reduce the production cost, thereby leading to the growers' economic efficiency.

MATERIALS AND METHOD

Experimental Site

This research work was done at the Poultry Department of the Teaching and Research Farm of Ambrose Alli University, Ekpoma, Edo State, Nigeria. The farm is situated in the Esan West Local Government Area, Edo State. The Council Area has the following weather characteristics: rainfall (annual) of about 1000-2000 mm; relative humidity of 75% and mean temperature of 32°C.

Experimental animals

Two hundred and twenty (220) day-old broiler chicks were gotten (purchased) from a hatchery in Ibadan, Oyo State, Nigeria. They were brooded for three weeks and

housed in a deep litter system with wood shavings serving as litter material. Before the arrival of the experimental birds, the house was cleaned, washed and disinfected with antiseptics. The brooder house was allowed to dry for one week and was covered with black polythene. Feeding and drinking materials were strategically located in the brooding house. Electric bulbs for light and heat supply were placed at designated locations. The heat sources were gradually withdrawn or reduced to avoid heat stress. Also, the surroundings were thoroughly cleaned to ward off dangerous snakes and other predators. The experimental animals had free access to feed, water, and *Gongronema latifolia* leaf extracts continuously while Vitalyte Extra was given once a week and 5 g per litre of drinking water according to the manufacturer's recommendation.

Design, Experimental Ingredients, and Sources

The experiment was structured in a Complete Randomized Design (CRD). One hundred and ninety-two (192) of the brooded broiler chicks were randomly allocated to six experimental treatment diets, with each treatment having thirty-two (32) birds, four (4) replicates, and eight (8) birds per replicate. Fresh leaves of *Gongronema latifolia* were sourced from the open market in Ekpoma, Edo State, Nigeria. They were properly rinsed with clean water to ensure complete removal of dirt and sand. The rinsed leaves were air-dried at room temperature 25-27°C for 10 days. The dried leaves were milled into powder to pass through a 0.5mm sieve and thereafter dissolved in warm water (40°C) at the rate of 1 kg in 5 litres. After filtering, the supernatant was stored in the refrigerator maintained at 5°C and was administered daily as *Gongronema latifolia* leaf extract. Table 1 presents the proximate composition of the test ingredient at three levels: leaf meal (LM), cold water extract (CWE), and warm water extract (WWE). Table 2 shows the level of composition of oral administration of Vitalyte Extra and *Gongronema latifolia* leaf meal extract. Conventional commercial broiler feed was purchased from an animal feed store in Ekpoma. The broiler starter feed had 22% crude protein and 3100 kcal/kg and was fed to the animals for three weeks, after which finisher mash, which was composed of 18% crude protein and 3000 kcal/kg, was given for the remaining four weeks of the feeding trial, making a total duration of seven weeks.

Performance Study

Performance such as weekly feed intake, weekly weight gain, and feed conversion ratio were estimated. Weekly feed intake was determined by measuring the quantity of feed supplied and subtracting the remnant at the end of the week. The weekly weight gain was determined by the difference between the weight at the beginning of the week and the weight at the end of the week.

Table 1. Nutrient composition of *Gongronema latifolia* leaf meal, cold and warm water extracts.

Ingredients	Nutrients (%)					
	M.C	Ash	C.P	Fat	C.F	N.E.F
L.M	11.54	9.26	17.84	4.15	42.56	14.65
C.W.E	21.27	8.78	16.72	3.80	20.30	29.13
W.W.E	19.40	5.88	12.48	2.66	20.25	39.33
Mean	17.40	7.97	15.68	3.54	27.70	27.70
S.D	4.14	2.23	2.31	0.63	10.51	10.13

*M.C=moisture content, C.P=crude protein, C.F=crude fibre, N.F.E=nitrogen free extract, L.M=leaf meal, C.W.E=cold water extract (25-27°C) and W.W.E=warm water extract (40°C). Iwegbu and Igene (2022).

Table 2. Oral Administration of Experimental Extracts.

Dietary Treatments	Experimental extracts
1	Water (W) only
2	Vitalyte (5g/l) and Water
3	GLLE (25ml/l) and Water
4	GLLE (50ml/l) and Water
5	GLLE (75ml/l) and Water
6	GLLE (100ml/l) and Water

*GLLE: *Gongronema latifolia* leaf extract.

Feed Conversion Ratio was determined as: $\frac{\text{Feed intake (g)}}{\text{Weight gain (g)}}$

Carcass Study

At the terminus of the experiment, all the experimental birds were fasted throughout the night, and eight (8) birds were selected from each treatment (2/replicate) and weighed. After that, they were slaughtered, bled, plucked, and eviscerated. Prior to plucking, the birds were dipped in hot water of about 76-84°C for sixty seconds. The carcass, cut parts, and organ weights, such as intestinal, gizzard, heart, and liver weights, were taken.

Cost-Benefit Analysis of the Broiler Chickens

The prices of the feed ingredients at the time of the experiment were used to estimate the cost-benefit analysis of the production, namely, cost of feed per kg (#), cost of feed per weight gain (#), total production cost per bird (#), total revenue per bird (#), and total profit per bird (#).

Statistical Analysis

Values generated were subjected to a one-way analysis of variance (ANOVA), and treatment means that had

significant differences were compared using Duncan's Multiple Range Test as given by Steel and Torrie (1990) with the aid of the SAS (1999) package.

RESULT AND DISCUSSION

Table 3 represents the performance of the broiler chickens as influenced by the administration of *Gongronema latifolia* leaf extract. Results of this research revealed that the performance characteristics of broiler chickens fed the treatment diets varied significantly ($P < 0.05$) in final weight gain, average total weight gain, average weekly weight gain, average weekly feed intake, total feed intake, and feed conversion ratio. The range of values (2822.70-3067.30g) for final weight gain obtained across the dietary treatment groups suggested that the inclusion of *Gongronema latifolia* leaf extract in the broiler diet was quite beneficial. This result is in tandem with the findings of Nneoyi-Egbe et al. (2024). They observed comparable numerical values for final weight gain, average total weight gain, average weekly weight gain, average weekly feed intake, and total feed intake, but they differ slightly on the feed conversion ratio. Okafor (2005) and Kubmarawa et al. (2007) reported that *Gongronema latifolia* was one of the cheapest and most

Table 3. Growth performance of broiler chickens as Influenced by the treatment diets.

Parameters	Dietary Treatments						SEM
	T ₁ Water	T ₂ Vitalyte Extra	T ₃ 25 mL/L GLLE	T ₄ 50 mL/L GLLE	T ₅ 75 mL/L GLLE	T ₆ 100 mL/L GLLE	
Ave. initial wt/bird (g)	283.01	283.31	281.41	279.05	279.01	281.00	
Final live wt/bird (g)	2822.50 ^e	3018.90 ^b	2829.30 ^c	3067.30 ^a	2826.70 ^d	2822.70 ^e	0.25
Ave. total wt/bird (g)	2539.49 ^e	2735.59 ^b	2547.89 ^c	2788.25 ^a	2547.69 ^c	2541.70 ^d	0.36
Ave weekly wt/bird (g)	362.80 ^c	391.01 ^b	364.08 ^c	398.33 ^a	364.05 ^c	363.10 ^c	0.63
Ave weekly feed intake/bird (g)	999.46 ^f	1009.99 ^d	1002.18 ^e	1011.34 ^c	1017.23 ^b	1018.54 ^a	0.41
Ave total feed intake/bird (kg)	7.01 ^f	7.07 ^d	7.02 ^e	7.08 ^c	7.12 ^b	7.13 ^a	0.43
Feed conversion ratio	2.80 ^b	2.58 ^c	2.80 ^b	2.54 ^d	2.80 ^b	2.81 ^a	0.24

*GLLE = *Gongronema latifolia* leaf extract; Ave = Average; g = gram; wt = weight; kg = kilogram Means in the same row with different superscripts are significantly (P<0.05) different.

available sources of important proteins, vitamins, minerals, and essential amino acids that can boost the physiological status of birds and promote their growth. The average total weight gain and average weekly weight gain in this study were best in the 50 mL/L GLLE, and the birds were superior to those offered Vitalyte Extract (control). The inclusion of 50 mL/L GLLE might have imparted better gut and overall health status, more efficient nutrient utilization, normal development, and better growth response of the experimental birds. This corroborates the report of Okafor (2005) that the inclusion of this ingredient in broiler feed was beneficial. The trend observed in average weekly feed intake suggested that birds on treatments 5 and 6 with 75 and 100 mL/L GLLE were better feed consumers compared to birds in other treatments. But ironically, this higher feed intake did not translate into more weight gain, putting up the suggestion that GLLE inclusion should be barred at 50 mL/L. This implies that the response of the experimental birds to GLLE inclusion became less dose dependent from 75 mL/L inclusion. The response of broilers to *Gongronema latifolium* leaf extract inclusion became less dose dependent at the finisher phase, signifying an age related response to the effects of the ingredient. Agbo et al. (2009) noted that the protein level of *Gongronema latifolium* leaves fed to birds was relatively high and may be implicated for significantly higher dressed weight. Attia et al. (2017a) reported significant improvement in the overall performance parameters (body weight, feed intake, and feed conversion ratio) of broilers at the administration of 200 and 1000 ppm of blended plant extracts. Ironically, Attia et al. (2017b) also reported no significant difference in growth performance, feed intake, and feed conversion ratio on the tested different plant extracts. They noted in their report that a plant extract blend derived from oregano, chamomile, fennel, and fenugreek helps increase nutrient digestibility of broilers. It may therefore be inferred from the above that plants

(extracts) impart differently on the performance of broilers. Again, the present results further corroborate the existing body of knowledge on the positive effect of *Gongronema latifolia*.

Carcass yield is an indication of the quality and utilization of the ration (Iwegbu and Igene, 2022). The protein, vitamin, and mineral levels of the test ingredient were relatively high. This may have led to significantly higher live, bled, defeathered, and eviscerated weights of broiler chickens in treatment 4 with 50 mL/L GLLE. At this level (50 mL/L) of administration, the birds were generally superior when compared with the control (Vitalyte Extra) treatment in the growth weights recorded. Carcass traits were significantly (P<0.05) affected by the dietary treatments, as showed in Table 4. The values for the average live weight were 2.82, 3.03, 2.83, 3.07, 2.83, and 2.82 kg/chicken for treatments 1, 2, 3, 4, 5, and 6, in that order. Bled weight was highest in treatments 1, 2, and 4, with the following values: 98.23, 98.34, and 98.37 (as % live weight), and reduced in treatments 3, 5, and 6. The result on carcass qualities confirms the report of Bamgbose and Niba (1998) on the quality and level of amino acids/protein in the test ingredient.

Cost-benefit analyses of broiler chickens fed the experimental diets are shown in Table 5. The least cost (₦140.14) of feed per kg was obtained in broiler chickens in treatment 1, which had zero supplement, followed by treatment 3 (₦140.30) with 25 mL/L GLLE, treatment 2 (₦141.00) with Vitalyte Extra, treatment 4 (₦141.14) with 50 mL/L GLLE, treatment 5 (₦141.74) with 75 mL/L GLLE, and the highest (₦141.86) in broiler chickens placed on 100 mL/L GLLE (treatment 6). The total cost of feed consumed per bird was highest in broiler chickens fed 100 mL/L GLLE (₦1,011.46), followed by treatment 5 (₦1,009.18), treatment 4 (₦999.27), treatment 2 (₦996.87), treatment 3 (₦984.91), and least in treatment 1 (₦982.38). The average cost of feed per kg of live-weight gain per bird was highest (₦398.63) in treatment

Table 4. Some carcass traits of broiler chickens as Influenced by the dietary treatments.

Parameters	Dietary Treatments						SEM
	T ₁ Water	T ₂ Vitalyte Extra	T ₃ 25 ml/l GLLE	T ₄ 50 ml/l GLLE	T ₅ 75 ml/l GLLE	T ₆ 100 ml/l GLLE	
Live weight /bird (kg)	2.82 ^b	3.02 ^a	2.83 ^b	3.07 ^a	2.83 ^b	2.82 ^b	0.15
Bled weight /bird as % live weight	98.23 ^a	98.34 ^a	97.17 ^{ab}	98.37 ^a	97.17 ^{ab}	97.52 ^{ab}	1.98
Defeathered weight /bird as % live weight	96.05 ^c	98.01 ^a	95.41 ^d	97.10 ^b	95.41 ^d	95.74 ^d	2.70
Eviscerated weight /bird as % live weight	88.65 ^c	92.20 ^{ab}	93.64 ^a	91.21 ^b	88.34 ^c	88.65 ^c	3.37

Means in the same row with different superscripts are significantly ($P < 0.05$) different.

Table 5. Economics (cost/benefit) of producing broiler chickens as influenced by the treatment diets.

Parameters	Dietary Treatments					
	T ₁ Water	T ₂ Vitalyte Extra	T ₃ 25 ml/l GLLE	T ₄ 50 ml/l GLLE	T ₅ 75 ml/l GLLE	T ₆ 100 ml/l GLLE
Ave. initial wt/bird (g)	283.01	283.31	281.41	279.00	279.01	281.00
Ave. final wt/bird (g)	2,822.50	3,018.62	2,829.30	3,067.30	2,826.70	2822.70
Ave. total wt/gain/bird (g)	2,539.49	2,735.59	2,547.89	2,788.30	2,547.69	2,541.70
Total feed consumed /bird (kg)	7.01	7.07	7.02	7.08	7.12	7.13
Cost of feed/kg (₦)	140.14	141.00	140.30	141.14	141.74	141.86
Total cost of feed consumed /bird (₦)	982.38	996.87	984.91	999.27	1009.18	1011.46
Ave. cost of feed/kg live wt gain/bird (₦)	392.39	363.78	392.84	358.50	396.87	398.63
Revenue/total live wt gain/bird (₦)	2,539.5	2,735.6	2,547.9	2,788.3	2,547.7	2541.7
Gross profit/bird (₦)	1,557.12	1,738.73	1,562.99	1,789.03	1,538.52	1530.24

*Ave = average; wt = weight; g = gram; kg = kilogram; ₦ = naira.

6, which had 100 mL/L GLLE supplement. It was followed by broilers placed on 75 mL/L GLLE (₦396.87), treatment 3 (₦392.84), treatment 1 (₦392.39), Vitalyte Extra (₦363.78), and least in broiler chickens fed 50 mL/L GLLE with ₦358.50. Revenue per total live weight gain per bird was highest in treatment 4 (₦2,788.3), followed by treatment 2 (₦2,735.6). Others were treatments 3, 5, 6, and 1, with the following monetary values: ₦2,547.9, ₦2,547.7, ₦2,541.7, and ₦2,539.5, respectively. This depicts that the least revenue was recorded in treatment 1. Gross profit was however, least in broiler chickens fed 100 mL/L GLLE with an income level of ₦1,530.24, followed by chickens placed on diets containing 75 mL/L GLLE (₦1,538.52), zero supplements (₦1,557.12), 25 mL/L GLLE (₦1,562.99), and Vitalyte Extra (₦1,738.73), and highest in birds maintained on 50 mL/L GLLE with

₦1,789.03.

CONCLUSION

The test ingredient could be effectively used to replace Vitalyte Extra, as the birds placed on 50 mL/L proved to be better in growth performance and profit returns compared to the control dietary treatment. The results of this research support the recommendation that *Gongronema latifolia* leaf meal extract inclusion in broiler diet be barred at 50 mL/L.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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