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Growth performance and carcass characteristics of broiler chickens on administration of *Ocimum gratissimum* (scent leaf) leaf extract

***Egbeyale, L. T., Adeleye, O. O., Adegoke A. V., Ayoola, A. A., Oluitan, C. and Ogunsakin, J. I.**

Department of Animal Production and Health, Federal University of Agriculture, Abeokuta P.M.B. 2240, Abeokuta, Nigeria.

Corresponding Author: **egbeyalelt@funaab.edu.ng* ***Phone Number:*** +2348060743664

Target audience: *Poultry farmers*

Abstract

The study assessed the effect of Ocimum gratissimum leaf extract on growth performance and carcass characteristics of broiler chickens. One hundred and ninety-five day-old Arbor acre strain of broiler chickens were randomly divided into five groups. The groups were; control, extract from two levels of fresh (200 and 400 g) and air-dried (40 and 80 g) of ocimum leaves were blended with six litre of water. Data collected on growth performance and carcass evaluation were subjected to One-way Analysis of Variance. Feed intake and feed conversion ratio were significantly (P<0.05) influenced among all the measured growth parameters at starter phase but none of the parameters was significantly (P<0.05) different across the groups. The highest dressing percentage was obtained from the chickens on air-dried Ocimum gratissimum leaf extract while the least values were obtained from those on 400 g of fresh Ocimum gratissimum leaf extract. The same trend was observed in the proportion of breast while proventiculus was biggest among the group on 80 g of air-dried Ocimum gratissimum leaf extract. The study concluded that use of either fresh or air-dried equivalent O. gratissimum leaf extract as alternative to synthetic antibiotics should be promoted to prevent residual effect of antibiotics in the muscle of poultry meat on the health of the consumer.

Key words: *Ocimum, Broiler chicken, Leaf extract, Performance*

Description of Problem

The geometric increase in the human population and low intake of protein in developing country especially Nigeria has been a great challenge. Therefore, there is urgent need to ameliorate this problem for healthy living of the citizens. One of the ways to solve this challenge is to increase animal production with mindset of producing quality protein at cheaper cost. Poultry production especially broiler chicken production is one of the fastest ways of making animal protein available because of its fast-growing potential. Most poultry farmers depend mostly on the administration of synthetic drugs to prevent or control disease. These drugs often release some chemical residues in their carcasses which when consumed can cause health risks to the consumers of any product (meat or egg) from such chicken. Synthetic drugs are seen to have a longer duration of breakdown compared to organic drugs because of the sophisticated components of the drugs. Synthetic drugs are known to combat the health challenge of sick birds but then the health condition of the consumer has to be of high priority and consideration. These drugs

are even used by the chicken up to the point of sale, which makes the residue of the drugs reactive on the consumers. These have led to a global campaign by many nations against continual use of these synthetic drugs to protect the health of their people, and enhance promotion of organically produced poultry products.

The poultry industry is battling with substitutes for synthetic drugs due to its effect on the chickens and even the health conditions of the final consumers. Herbs and spices and a host of other plant derivatives used in animal feeding are referred to as phytogenics [1]. Some of these useful herbs and spices have been reported to influence feed conversion ratio in chicken [2, 3] and improve performance of broiler chicken [4]. Some examples of these herbs and spices include; ginger, *Allium cepa* (onion), *Piper nigrum* (black pepper), *Allium sativum* (garlic), *Ocimum gratissimum*.

Ocimum gratissimum commonly referred to as "scent leaf" is a herbaceous perennial grass. It is pan tropical and widely naturalized in many regions. In Nigeria, basil leaf is found throughout the year, although its yield in dry season is lower compared to rain season. Some chemical compounds and active ingredients present in this plant that makes it possesses strong antimicrobial properties are eugenol, cinamate, camphor and thymol [5]. Many researches had been done on the use of the leaf meal of the plant in the diet of chicken production [6, 7]. Utilization of *O. gratissimum* as a replacement for antibiotics on performance of broiler chicken starting from day-old has not been widely exploited. Hence, the objective of this project is to evaluate the growth performance and carcass characteristics of broiler chicken administered with fresh *Ocimum gratissimum* leaf extract.

Materials and Methods

Experimental site: The experiment was carried out at the Poultry unit of Teaching and Research farm of the College of Animal Science and Livestock Production, Federal University of Agriculture Abeokuta, Ogun State. Abeokuta geographical coordinates: 7º 9' 0" North, 3° 21' 0" East [8].

Preparation of the extracts: the extraction methods were two: the fresh and air-dried leaf extracts. The fresh leaf extraction was prepared as follow; 200 and 400 g of fresh leaves was blended with six litre of water respectively. The procedure for the extraction of air-dried leaf extract is as follows; fresh leaves of the plant were harvested and spread in a room for air-drying. Air-drying method was adopted to prevent loss of volatile oils when spread under direct sunlight. The air-dried leaves were milled and dissolved in water at 40 and 80g per six litre of water respectively to have equivalent proportion with fresh leaf extraction. The solutions were stirred every 30 minutes for 3 hours and allowed to stand 24 hours. After the 24 hours, the solution was sieved to get extract.

Management of experimental birds

A total of one hundred and ninety-five ((195) day old chicks of arbor acre strain of broiler chickens were purchase from a reputable hatchery. The birds were randomly divided into five experimental groups. Each group was further sub-divided to three replicates of thirteen chicks per each. The groups were: control (use of synthetic antibiotics), extracts from 200 g fresh leaf, 400 g of fresh leaf, 40 g of air-dried leaf and 80 g of aid-dried leaf respectively. The extract was served to the birds at the rate of one-third of daily water intake throughout the experimental period expect a day prior and the day of vaccination. Water was served immediately the birds in each replicate

finished the served extract. Brooding of chicks lasted for two weeks in individual pen with the use of charcoal pots and electrical bulbs as heat source and lightings. Synthetic antibiotic (enrofloxacin) was used for the birds in the control group. Commercial broiler starter diet was supplied for the first four weeks of the study while commercial broiler finisher diet was used for the last three week. Feed and water were also supplied *ad-libitum.* The experiment lasted for seven weeks.

Data collection: Growth performance indices (feed intake, weight gain) were taken weekly while feed conversion ratio was calculated by dividing feed intake by weight gain.

Carcass characteristics: On the last day of the experiment, two broiler chickens of average weight from each replicate were selected and starved overnight without feed, so as to reduce the gastro-intestinal tract content of the animal. The birds were weighed and slaughtered and the viscera organs were eviscerated. The live weight, carcass weight, dressing weight and the cut parts and viscera organs (liver, kidney, heart, lung,) were expressed as the percentage of live weight of each bird.

Statistical Analysis: Data obtained were subjected to one-way Analysis of Variance in a Completely Randomized Design, using [9]. Significant means were compared using Duncan's Multiple Range Test of the software package.

Table 1. Effect of *Ocimum gratissimum* leaf extract on growth performance of broiler chickens at starter phase

		Fresh leaf (g)		Air-dried (g)		
Parameters	Antibiotics	200	400	40	80	SEM
Initial weight (g)	38.56	38.54	38.67	38.59	38.08	0.11
Final weight (g)	965.38	999.28	933.42	961.54	1005.13	15.89
Daily weight gain (g)	33.10	34.31	31.96	32.96	34.54	0.56
Daily feed intake (g)	57.53^{b}	59.96^{ab}	65.13^{ab}	64.18^{ab}	65.92^{a}	1.23
Feed Conversion Ratio	1.74^{b}	1.75^{b}	2.05^{a}	1.95^{ab}	1.91^{ab}	0.04
Daily water intake (ml)	117.89	126.02	121.55	124.39	129.19	2.12

$^{a,b;}$ Means with different superscripts along the same row are significantly ($P<0.05$) different

Results and Discussion

The effect of *Ocimum gratissimum* leaf extract on growth performance of broiler chickens at starter phase is presented in Table 1. Feed intake and feed conversion ratio were significantly ($P<0.05$) influenced among all the measured parameters. Feed intake showed that the highest value was obtained from birds on 80 g air-dried *Ocimum gratissimum* leaf extract while the least value was from birds on antibiotics. However, the remaining three groups had similar values which were significantly similar to their counterparts on antibiotics and 80 g air-dried *Ocimum gratissimum* leaf extract. The findings of [10] indicated that dietary supplementation of broiler diet with a combination of herbal plant extract and acidifier resulted in enhanced maintenance and function of the small intestine and improved broiler performance. The increase in the feed intake could also be explained from the fact that *Ocimum gratissimum* leaf is rich in minerals and vitamins [11] which also stirred the appetite of the birds. *Ocimum gratissimum* could be used for flavouring and seasoning of food and as such could improve the palatability of food. The scent from the *O. gratissimum*, which are mainly eugenol methyl cinnamate, camphor and

thymol [12], might be the reason for the increased appetite of the birds. The poorest feed conversion ratio was recorded from birds on 400g of fresh *Ocimum gratissimum* leaf extract while the best value was obtained from birds on antibiotics and their counterparts on 200 g fresh *Ocimum gratissimum* leaf extract. The birds on air-dried *Ocimum gratissimum* leaf extract had similar feed conversion ratio which were also similar to other groups. The similarities in the FCR values obtained in all the groups except the birds on 400 g of fresh leaf extract of ocimum showed that phytobiotics have potentials to improve feed efficiency in broiler production and this could be attributed to its antimicrobial properties especially in promoting beneficial strains of bacteria. This is reflected in the similar live weight obtained in all the groups. The similarity in water intakes of the birds in the present study was not in line with the report of [13] that basil reduced water intake and attributed it to substances in the basil, such as camphor, thymol, and methyl cinnamate, impacted the taste of water; resultantly water intake reduced [14]. The variations in their finding with this present result could be attributed to the part of basil used. The authors used basil seed powder while leaf extract was used in this present study. It has been reported that the process of water metabolism in birds, which defines the water requirement and the level of intake in a broiler chick, is a multifaceted phenomenon [15]. This is because both internal and external reactivity of water intake in birds is a stimulus governed by many factors, among which is the level of concentration of bio-chemical substances in water. Such substances in water can affect the thirst bud of the animals. The thirst bud of animal, which is responsible for water consumption, can easily be altered by the quantity of chemical substance in water [16].

Table 2: Effect of *Ocimum gratissimum* leaf extract on growth performance at finisher phase

		Fresh leaf (g)		Air-dried leaf (g)		
Parameters	Antibiotics	200	400	40	80	SEM
Initial weight (g)	965.38	999.28	933.42	961.54	1005.13	15.89
Final weight (g)	2177.78	2322.05	2271.84	2274.15	2303.85	33.69
Weight gain per day (g)	57.73	62.98	63.73	62.50	61.84	1.66
Feed intake per day (g)	171.18	173.26	172.88	184.67	186.45	2.78
Feed Conversion Ratio	3.00	2.77	2.72	2.96	3.03	0.07
Daily water intake (ml/day)	354.40	403.18	397.77	377.71	375.47	9.07

Growth response of broiler chicken to *Ocimum gratissimum* leaf extract at finisher phase is presented in Table 2. It was shown that none of the parameters measured was significantly ($P>0.05$) different across the groups. This result at finisher phase is in agreement with the findings of [17] who reported non- significant influence of herbal plants on weight gain and FCR of finishing broilers. However, this result is not in consonance with that of [18] who reported significantly higher body weight gain and better FCR for broilers on *Ocimum gratissimum* leaf extract. The variation could be attributed to the fact that this study commenced from day-old while the latter authors only worked on finishing broilers. Results of research on the application of phytogenics in nutrition of broiler chickens are not completely consistent. The

assumption is that differences in results are consequences of numerous factors which include type and part of plant used and their physical properties, age of the plant, time of harvest, preparation method of phytogenic additive and compatibility with other dietary components. Another factor is the birds themselves which could be the quality of chickens, their health status and environmental conditions of the pen, then it can be established that positive effect of phytogenics or phytobiotics can be influenced by a lot of factors.

Table 3: Carcass characteristics of broiler chicken on *Ocimum gratissimum* leaf extract at finisher phase

		Fresh leaf (g)		Air-dried (g)		
Parameters	Antibiotics	200	400	40	80	SEM
*Live body weight (g)	2141.67	2358.33	2166.67	2133.33	2141.67	
Eviscerated weight (g)	1675.67^{b}	1856.33^{a}	1693.17^{b}	1722.17^{b}	1767.17^{b}	28.90
Dressed weight (g)	1431.83^{b}	1591.00^{a}	1430.83^{b}	1497.83^{b}	1507.33^{b}	27.18
Dressing percentage (%)	66.84^{ab}	67.43^{ab}	65.89^{b}	70.18^{a}	70.29^{a}	0.61
Primal parts (% of live body weight)						
Wings	8.15	7.59	8.21	7.81	8.19	0.09
Breast	24.33^{ab}	24.61^{ab}	22.42^{b}	26.67^{a}	25.65^{a}	0.51
Back	11.78	11.73	12.09	12.08	12.14	0.15
Thigh	11.04	11.13	11.03	11.32	11.51	0.10
Drumstick	10.94	10.92	10.83	10.46	11.21	0.12
Organs (% of live body weight)						
Heart	0.43	0.38	0.37	0.33	0.39	0.02
Lungs	0.77	0.52	0.62	0.47	0.78	0.06
Spleen	0.06	0.05	0.06	0.06	0.07	0.01
Liver	1.64	1.45	1.78	1.65	1.39	0.08
Abdominal fat	0.44	0.63	0.99	0.63	0.64	0.10
Gizzard	1.81	1.82	1.92	1.78	1.81	0.03
Proventiculus	0.42^{ab}	0.34^{b}	0.46^{ab}	0.41^{ab}	0.47^{a}	0.02
GIT	5.65	4.62	5.85	5.37	3.88	0.23
Caeca	0.65	0.50	0.61	0.59	0.63	0.03

$^{a,b;}$ Means with different superscripts along the same row are significantly ($P<0.05$) different
*live body weight was used as covariate

The results on carcass characteristics of the chickens on oral administration of *Ocimum gratissimum* leaf extract presented in Table 3 revealed that dressed weight, dressing percentage, breast and proventiculus were significantly ($P<0.05$) influenced. The highest dressing percentage was obtained from the chickens on air-dried *Ocimum gratissimum* leaf extract while the least value was obtained from those on 400 g of fresh *Ocimum gratissimum* leaf extract. The same trend was observed in the proportion of breast while proventiculus was biggest among the group on 80 g of air-dried *Ocimum gratissimum* leaf extract. Amounts of phytoconstituents in the different concentrations and methods of extractions of the extract could be suggested to be responsible for the change in the carcass yield of broilers [19]. The significant differences observed in dressed percentage is similar to the report of [20] but not in agreement with the findings of [21] who reported similar values in birds of both

control and treated groups. The variation in the reports could be attributed to the mode of administration of the *Ocimum gratissium*. The former researchers used leaf meal while extract of the leaf was used in this present study. Therefore, this suggests that the activities of the chemical constituents in the extract are faster than leaf meal. The similarity in the internal organs suggests the support of the extract to the normal functioning of the birds' internal organs. It has been reported that the decrease or increase in the relative weights of the internal organs of the animals has been reported as a possible response of their internal organs to toxins in their diets [22]. The improved slaughtered weight, dressed weight, and dressing percentage recorded in the birds on oral administration on *O. gratissimum leaf extract* agreed with the previous reports that supplementation of the broiler chicken diets with phytochemicals improved the carcass weight and dressing percentage [23, 24]. This proposes that the phytogenic supplements used in this study have bioactive compounds that can modulate animal metabolism in a similar pattern with β-adrenergic agonist compound [24].

Conclusion and Applications

1. Oral administration of both fresh and air-dried *Ocimum gratissimum* increased water intake of broiler chickens at starter phase.
2. Broiler chicks on fresh *Ocimum gratissimum* leaf extract at 200mg and those on antibiotics had best feed conversion ratio.
3. Birds on *Ocimum gratissimum* leaf extract had similar growth performance with their counterparts on antibiotics at finisher phase.
4. Best dressing percentage was obtained from chickens on air-dried *Ocimum gratissimum* leaf extract.
5. The use of *Ocimum gratissimum* leaf extract as an alternative to synthetic antibiotics can be adopted by poultry farmers since the usage did not pose any threat to health of broiler chickens.

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