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ORIGINAL ARTICLE

Growth Performance, Gut Histology and Anti-Coccidial Effect of Aqueous Blends of Scent Leaf, Ginger and Garlic in Broiler Chicken

Phebe O Okusanya[1], Olamilekan O Akinlade[1], Theophilus A Jarikre[2*], Micheal A Ockiya[3].

[1]Department of Agricultural Technology, Federal Polytechnic Ilaro, [2]Department Of Veterinary Pathology, Faculty Of Veterinary Medicine, University of Ibadan, Nigeria, [3]Department of Animal Science, Niger - Delta University. *Corresponding author: Email: get2theo@yahoo.com; Tel No: +2348062602408

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ABSTRACT

This study was carried out to know the effects of scent leaf, ginger and garlic aqueous blend on the growth performance and intestinal coccidial oocysts in starter broiler chicken. One hundred and twenty (Cobb 500) broiler chicks were allotted to four treatments of thirty birds each and denoted as T1, T2, T3, and T4. The treatments were further subdivided into replicates of (10) birds each. Chicken on Treatment one (T1) received synthetic drugs, when necessary, in their drinking water while others were given aqueous blends of scent leaf (SLAE), garlic (GIAE), and ginger (GAAE) in their drinking water at 50ml/litre, respectively. Variations were observed among the treatments, in final body weight, feed conversion ratio, and coccidial oocysts count (FBW, FCR, and COC). Birds given GAAE in their drinking water had better FCR (2.31) than SLAE (2.48), GIAE (2.55) and control (3.02). The oocyst count observed from the treatments varied significantly. The initial oocyst count reveals the presence of coccidial oocyst in the feaces of the chicken across the treatments. A significant reduction was observed in the oocyst count weekly across the groups but remained higher in the control group until the anti-coccidial drug was administered. Treatment 4 (50 mL/Lit GAAE) shows no egg count (NEC) from the second week. This study concluded that 50 milliliters of; SLAE, GIAE, and GAAE added to one liter of drinking water can be employed as anti-coccidials and growth boosters in the production of broiler chickens.

Key words: Aqueous blend, Broiler, Herbs, Intestinal Morphometry, Poultry.

INTRODUCTION

The benefits that broiler production has brought to nations' progress cannot be overstated. They are an inexpensive source of animal protein, mature in 5-8 weeks, and cost significantly less than other sources of animal protein (Bosun et al., 2012). Compared to other domestic animals, thirty percent of the protein consumed by humans is derived from about 50 billion chickens bred each year for meat (Aduku, 2004). However, the threat of diseases, including avian coccidiosis

has limited the potential of this industry (Aduku, 2004).

Diseases result in an annual global loss of over $2.4 billion (US dollars) in the industry (due to poor growth, low chicken price and cost incurred on medication) thereby reducing farmer's income, causing an increase in the unit price of chicken and cost of protein for developing countries (Chapman, 2014). For the past 50 years, the livestock industry has adopted the use of antibiotic growth promoters (AGPs) (Torun et al., 2018). People are starting to realize how dangerous it is to overuse these AGPs and how it can harm both the environment and people (Akinlade et al., 2020; Muaz et al., 2018; Torun et al., 2018).

The use of plants and extracts from their seed, bark, root, and leaf in animal husbandry is gaining popularity worldwide. Scientifically, plant extracts have been adjudged as a viable method of preventing and treating illnesses as well as boosting the growth of chickens (Djkalia, et al., 2011). According to a report (Zhang *et al*., 2009), several medicinal plants have been found to contain useful phytochemicals that can promote the well-being of livestock. Among these are Moringa, Neem, Bitter leaf, Gallic, Scent leaf, teak leaves and Ginger. Large amounts of these plants can be found all over the tropical regions of Africa (Akinlade et al., 2020). When they are properly used, their phytochemicals can provide the needed animal growth factors that are less toxic and pose no threat to human well-being. Therefore, this study was conducted to determine the impact of an aqueous blend of scent leaf, ginger, and garlic on the intestinal coccidial oocysts and growth performance in beginning broiler chickens.

MATERIALS AND METHODS

Experimental site

The experiment was conducted at the Poultry Unit of the Department of Agricultural Technology, Federal Polytechnic, Ilaro, Ogun state Nigeria. Ilaro is situated in Yewa South Local Government area at longitude 2°47′24″E and 3°6′48″E and latitude 6°37′46″N and 6°55′42″.

Preparation of Experimental Aqueous blend.

Fresh scent leaf, ginger, and garlic we purchased at the Sayedero market in Ilaro. They were rinsed to get rid of sand and debris and drained. A "Pyramid® PM-B999" blender was used to blend the scent leaf at a ratio of 100 g to 1000 mL with water. To obtain a scent leaf aqueous blend (SLAE), the mixture was filtered through a muslin cloth (Okhale, Bolaji, and Bello-Onaghise, 2019). One hundred grams each of Ginger and garlic were sliced into tiny bits and blended for two to three minutes with 1000 millilitres of water (Kumari, et al., 2014). The mixture was then sieved through a Muslin cloth, and the filtrate (called GIAE for Ginger and GAAE for Gallic), was refrigerated and utilized for the experiment. Fresh extracts were prepared at Five (5) days apart (Okhale, Bolaji, and Bello-Onaghise, 2019).

Experimental animal and management

The 120 broiler chicks (Cobb 500) used for the experiment were sourced from a reputable Hatchery in Ibadan. They were housed in the brooding pen for seven days,to become used to the surroundings, after which they were randomly allotted into four (4) treatments (Akinlade and Okusanya, 2020). The treatments (T) were subdivided into three replicates of ten (10) birds each. The birds were fed a commercial broiler meal, standard vaccination for broiler chicken were administered and the control treatment received an anticoccidial medication while the other treatments received the assigned herbal blends.

T1 serves as the control, T2: 50 mL of SLAE, T3: 50 mL of GIAEand T4: 50 mL of GAAE to 1

litre of drinking water, respectively. Throughout the starter phase, water and feed were provided *ad-libitum*. Heat and ventilation were supplied in compliance with accepted management practices (Akinlade and Okusanya, 2020).

Parameters measured

Water intake: Records of water intake were taken daily by subtracting the volume of leftovers from the volume of water given. A known volume of water was kept separately in the pen to determine evaporative losses in the pen.

Weight gain: The body weight of each replicate was measured at the start of the study and then once a week. The weekly weight increase was calculated by deducting the starting weight from the finished weight.

Feed Conversion ratio: Feed conversion was calculated by dividing the total feed consumed by the total weight gained.

Anti-coccidial evaluation: Faecal samples were collected before the treatments were administered to the birds and subsequently weekly to determine the oocyst count. The oocyst counts were determined according to (El-Banna et al., 2016)

Statistical Analysis

The data were subjected to ANOVA and the Duncan range test at $p < 0.05$ statistical significance.

RESULTS

The effect of the aqueous blend of the experimental diets on the performance characteristics of broiler chicken is shown in Table 1. The aqueous blends significantly ($p<0.05$) influenced the feed intake, water intake, final weight gain, and feed conversion ratio. The group given the aqueous herbal blend had higher values of water intake (SLAE: 5716.25 ml, GIAE: 5679.66 ml and GAA E: 5761.40 ml). Those given GIAE had a higher feed intake value (2757.14 g). The birds given GAAE have a higher final weight (1151.85 g) and the lowest feed conversion ratio (2.31).

Table I: Effect of aqueous blend of the experimental diets on performance characteristics of broiler chicken at the starter phase

Parameters	T1 (Water)	T2	T3	T4	±SEM	p-value
Feed intake (g)	2517.16±2.25 [c]	2686.25±1.00 [b]	2757.14±1.50 [a]	2652.66±1.10 [b]	34.37	0.03
Water intake (mL)	4945.48±2.00[b]	5716.25±1.15[a]	5679.66±2.01[a]	5761.40±1.10[a]	131.92	0.00
Initial weight (g)	206.00±1.01	205.00±1.05	207.00±1.00	206.00±1.10	5.72	2.23
Final Weight (g)	874.07±1.13 [c]	1081.48±2.10[b]	1096.29±1.84[b]	1151.85±0.10[a]	52.17	0.03
FCR	2.87±0.44[a]	2.48±0.62[b]	2.55±0.50[b]	2.31±0.10[c]	0.13	0.04

Means on the same row with the same superscript are not significantly different (P>0.05)

Table II: Mean oocyst per gram of feces in control and groups given aqueous blend of the experimental diets

	Fecal Egg Count/g				
Week	T1	T2	T3	T4	p-values
Initial count (Week 1)	800±80.44[a]	500±115.00[b]	300±108.00[c]	600±100.00[b]	0.03
Week 2	500±110.00[a]	200±72.10[b]	150±93.00[b]	0.00±0.00	0.00
Week 3	3500±144.16[a]	100±88.50[b]	150±87.00[b]	0.00±0.00	0.00
Week 4	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	1.15

Means on the same row with the same superscript are not significantly different (P>0.05)

Microscopic changes were observed in the intestines,, especially in the T1 chickens. There was severe atrophy of villi, necrosis and sloughing of enterocytes in the small intestines. A few intra-lesional coccidial oocysts were observed in the enterocytes. These were, however, absent in the T2-T3 chickens (Plate 1). Gut morphometric changes were also observed to vary in the different treatment groups (Table 2).

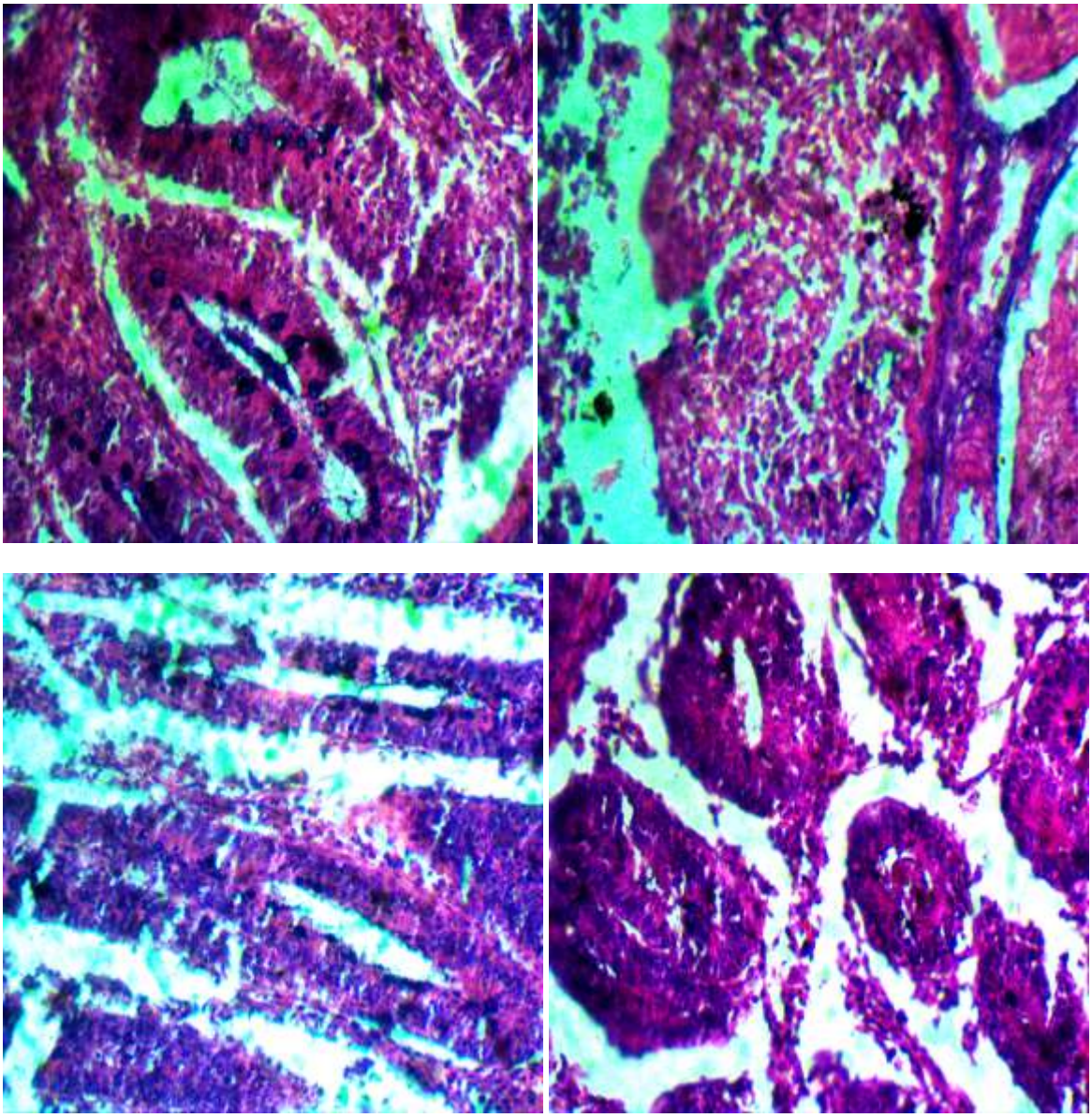

Plate 1- intestines from the chicken showing intra-lesional coccidial oocysts in T1, normal villi in T2, mild atrophy of villi in T3 and T4. HE x400

Table III: Gut morphometric parameters of broiler chicken at the starter phase fed an aqueous blend of the experimental diets

Treatment	Villi height (μm)	Villi width (μm)	Cryptal depth (μm)	Cryptal width (μm)	Muscle thickness (μm)
Control	2716.23±0.50[d]	181.59±1.00[c]	535.76±1.00[d]	188.38±1.05[d]	232.63±1.52[d]
T1	3268.42±1.00[a]	220.93±1.00[d]	750.08±1.00[a]	219.35±1.00[c]	236.33±1.05[c]
T2	3041.89±1.00[b]	214.95±1.00[b]	552.05±0.50[b]	211.69±1.05[b]	281.67±1.00[a]
T3	3232.80±0.50[c]	201.31±0.00[a]	618.10±0.75[c]	201.11±1.00[a]	275.07±00[b]
p-values	0.00	0.00	0.00	0.00	0.00

DISCUSSION

Natural ingredients like garlic (*Allium sativum*), scent leaf (*Ocimum gratissimum*) and ginger (*Zingiber officinale*) have become increasingly popular in animal feed in recent years. Numerous bioactive characteristics, such as antibacterial, immunomodulatory, and antioxidant activities, have been found in these substances. Growth performance is one of the key components in the production of poultry. The effects of scent leaf, ginger, and garlic on broiler chicken development performance have been the subject of numerous studies. Scent leaf, for example, increased feed intake, weight gain, and feed conversion ratio in broiler diets, according to a study by Adewale *et al*. (2022). Likewise, Al-Khalaifah *et al*. (2022) discovered that broiler hens' body weight gain and feed conversion ratio were enhanced by ginger supplementation. These findings are in agreement with the result obtained in this experiment. The final body weight of birds in the experimental diets is higher and significantly different from that of the control, as shown in Table 1.

Additionally, this result is consistent with the research conducted by (Javendel *et al*., 2008; Demir *et al*., 2003), which found that broilers fed herbal plants as growth promoters had different body weights and feed conversion ratio values than broilers that did not receive the treatment (control). The reported difference could be attributed to the bioactive substances in scent leaf, ginger, and garlic which helped to increase the gut's ability to absorb nutrients by stimulating the secretion of digestive enzymes leading to better nutrient utilization from the feed with the resultant effect of better growth performance.

Anti-microbial effects of scent leaf, ginger, and garlic are well established. Bioactive chemicals such as *eugenol* in scent leaf, *allicin* in garlic, and *gingerol* in ginger, have been demonstrated to have inhibitory effects on a range of diseases, including fungi, bacteria, and parasites. These substances can strengthen nutrition consumption, increase growth performance, and improve gut health by lowering the bacteria burden in the gut (Onu and Aja 2011; Pourali *et al*., 2010).

Treatment 4 (50 mL/Lit GAAE) had the highest weight and better utilized the feed. This is consistent with the findings of Adegoke *et al*. (2022), who found that adding ginger to broiler diets increased the height of the villus and the depth of the crypt in the jejunum, indicating improved gut health and nutrient absorption. Another important factor in the production of broilers is the anticoccidial impact. The protozoan parasite *Eimeria* is the source of the common and significant economic disease coccidiosis in chickens. Conventional anticoccidial medications frequently leave residues in poultry products and are linked to drug resistance. Therefore, other approaches, such as the use of natural chemicals, are being investigated to manage coccidiosis. It has been suggested that garlic, ginger, and scent leaves may have anticoccidial properties. These compounds can inhibit the growth and reproduction of *Eimeria* parasites, leading to reduced coccidial infection and improved gut health. According to a study by Ojimelukwe *et al.,* (2018), ginger extract in broiler chicks had anticoccidial effectiveness against *Eimeria spp*. This corroborates the result obtained in this experiment where the oocyst count observed from the treatments varied ($P<0.05$) from the control. The initial oocyst count recorded signifies the presence of the coccidial eggs in the birds across the treatments. After the administration of the herbal diet, the observed values reduced significantly across the groups but remained higher in the control group until the anti-coccidial drug was administered. Treatment 4 (50 mL/Lit GAAE) shows no egg count (NEC) from the second week to the last week. This result agrees with the findings of Dosu *et al*. (2023), who reported that oocyst per gram was significantly ($P <0.05$) low in the control treatment when the anti-coccidial drug was administered as well as those given herbal treatment weekly.

The high antioxidant content of scent leaf, ginger and garlic helps scavenge free radicals in the body. These substances can preserve gut integrity, protect gut tissue, and promote the ideal gut by lowering oxidative stress. Also, the anti-inflammatory properties of these herbs can help in reducing inflammation. By controlling inflammation, these compounds can promote gut healing, improve nutrient absorption, and support gut histology (Mączka, *et al*, 2023, Oppong *et al.*,2021).

CONCLUSION AND RECOMMENDATION

The results of this investigation indicate that there is no discernible adverse effect on the growth of the birds when 50 millilitres each of SLAE, GIAE, and GAAE were added to one litre of drinking water as compared to the control group. The birds' performance was greatly enhanced by the herbal aqueous blend. The aqueous blend of the herbs was also seen to have improved the health status of the birds as none among the treatments came down with coccidiosis .

The addition of any among Scent leaf, Ginger and Garlic at this level, 50 mL of SLAE, 50 mL of GIAE, and 50 mL of GAAE to 1 litre of drinking water can therefore be used as growth promoters and anti-coccidial in broiler chicken production. It should be noted that the effects that are observed may vary depending on the precise dosages and ratios of the herbs given.

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