Evaluation of Guinea Hen Weed (*Petiveria alliacea*) Leaf Extract as Alternative to Antibiotic on Growth Performance and Faecal Bacteria Load in Broiler Chickens

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Abstract

Some plants extract consists of high content of different bioactive compounds and natural components that elicit improved productivity and immunity of broiler chickens, one of such plant is guinea hen weed. However, the use of Petiveria alliacea (PA) against antimicrobial resistance and gut health in livestock production are limited. Therefore, this study aimed to evaluate guinea hen weed (Petiveria alliacea) (PA) leaf extract as alternative to antibiotics on growth performance and faecal bacteria load in broiler chickens. One hundred and ninety-two (192), day-old Cobb500 strain broiler chicks were assigned to four treatments: Control (0.25 mL of 20% Enrofloxacin), 200, 400, and 600 mL of Petiveria alliacea extract per 1000 mL of water in treatments 2, 3, and 4, respectively in a completely randomized design. Each treatment had 48 chicks per group. Data on growth performance, carcass indices, and faecal bacteria load were subjected to one-way ANOVA. Results revealed no significant ($p>0.05$) effect of PA on growth performance indices. However, 600mL concentration of Petiveria alliacea extracts significantly ($p<0.05$) influenced the weight of wings compared to other treatment groups. The oocyst counts decreased, with the most significant reduction recorded in chicks administered 600 mL of the extracts while total bacteria counts was lowest in 600 mL concentration of Petiveria alliacea extracts compared to the 400 mL group and other treatment groups. A significant continuous reduction was observed all through with a 100 percent reduction of Salmonella spp and Pseudomonas spp counts as the administration level increased across the treatment with the highest reduction observed in the 600 mL group. The administration of 600 mL PA extracts resulted in improved growth performance and carcass characteristics, and reduced broiler chickens' oocyst and expulsion of pathogenic bacteria from the gut.

Keywords: *Petiveria alliacea*, Growth performance, Carcass traits and Faecal bacteria load.

Évaluation des extraits de feuilles de l'herbe de pintade (*Petiveria alliacea*) comme alternative aux antibiotiques sur la performance de croissance et la charge bactérienne fécale chez les poulets de chair

Résumé

Certains extraits de plantes contiennent une forte concentration de divers composés bioactifs et composants naturels qui améliorent la productivité et l'immunité des poulets de chair, et l'une de ces plantes est l'herbe de pintade. Cependant, l'utilisation de Petiveria alliacea (PA) contre la résistance antimicrobienne et la santé intestinale dans la production animale est limitée. Par conséquent, cette étude visait à évaluer l'extrait de feuille de Petiveria alliacea (PA) comme alternative aux antibiotiques sur la performance de croissance et la charge bactérienne fécale chez les poulets de chair. Cent quatre-vingt-douze (192) poussins de la souche Cobb500 âgés d'un jour ont été répartis en quatre traitements : Contrôle (0,25 mL de 20 % d'Enrofloxacine), 200, 400 et 600 mL d'extrait de Petiveria alliacea par 1000 mL d'eau pour les traitements 2, 3 et 4, respectivement, dans un plan complètement randomisé. Chaque traitement comptait 48 poussins par groupe. Les données sur la performance de croissance, les indices de carcasse et la charge bactérienne fécale ont été soumises à une analyse de variance à un facteur (ANOVA). Les résultats ont révélé qu'il n'y avait pas d'effet significatif ($p>0,05$) de PA sur les indices de performance de croissance. Cependant, la concentration de 600 mL des extraits de Petiveria alliacea a influencé de manière significative ($p<0,05$) le poids des ailes par rapport aux autres groupes de traitement. Le nombre d'oocystes a diminué, avec la réduction la plus significative enregistrée chez les poussins ayant reçu 600 *mL des extraits, tandis que le nombre total de bactéries était le plus bas dans le groupe à 600 mL des extraits de Petiveria alliacea par rapport au groupe de 400 mL et aux autres groupes de traitement. Une réduction continue significative a été observée tout au long de l'étude, avec une réduction de 100 % des comptes de Salmonella spp et Pseudomonas spp à mesure que le niveau d'administration augmentait dans les traitements, la réduction la plus importante ayant été observée dans le groupe à 600 mL. L'administration de 600 mL d'extraits de PA a entraîné une amélioration de la performance de croissance et des caractéristiques de la carcasse, ainsi qu'une réduction des oocystes et de l'expulsion des bactéries pathogènes du tractus intestinal chez les poulets de chair.*

Mots-clés: *Petiveria alliacea*, Performance de croissance, Caractéristiques de la carcasse, Charge bactérienne fécale.

Introduction

Health challenges in poultry production can devastate a farm leading to serious economic losses, damaging performance, and reduced profitability (Mudzengi *et al.,* 2014). Due to the intensification of broiler production, broiler chickens often are susceptible to diverse health problems such as poor digestion, stress, reaction to mycotoxins in feed, and the presence of pathogenic microbes (McGaw, 2020). According to the report of Food and Agriculture Organization (2018) estimated losses due to disease outbreaks in the livestock sector among smallholder farmers to be 35% in the developing countries. Most of these losses are cause by pathogenic organisms which could be minimized mainly through the use of synthetic antibiotics thereby disrupting the microbial life without compromising the immune system and productivity (Olawuwo *et al.,* 2022). However, the escalating cost of synthetic antibiotic and growth promoters and indiscriminate application of conventional drugs associated with emerging poultry farmers in preventing subclinical infectious for poultry birds, either in feed or orally, is responsible for the scourge of antimicrobial resistance bacteria worldwide and gut health problems (Fouche *et al.,* 2017; McGaw, 2020).

The efficacy and use of sub-therapeutic doses of antibiotics as prophylactic and curative remedies have been successfully effective in improving growth, immune response, and maximization of feed efficiency and in the control of infectious disease (Engberg *et al.,* 2000; Mehdi *et al.,* 2018). Besides the growth-promoting ability and production efficiency observed in broiler production, the combined effect of antibiotics, strict biosecurity measures, and adequate hygiene practices have helped the poultry industry to extremely grow by reducing the incursion of poultry disease (Bermudez, 2003). The resilience of pathogenic microorganisms in poultry farms because of unorthodox administration of synthetic compounds such as penicillins, tetracyclines, streptomycin, and erythromycin and antibiotics growth promoters without following technical directives is identified to be a significant factor contributing to the spread and emergence of antimicrobial resistance genes in perishable products such as meat (Gnanou and Sanders, 2000; Castanon, 2007; Dhama *et al.,* 2015). Despite the negative implications associated with the usage and administration of antibiotics and stringent measures imposed on poultry farmers and veterinary practitioners to limit the use of antibiotic growth promoters in Nigeria and several countries of Africa prove abortive (McGaw, 2020). Therefore, there is a need to consider the use of natural growth promoters that may be incorporated into intensive poultry production to enable emerging farmers to meet the increasing demand for poultry products (McGaw, 2020). In addition, the use of plant metabolites and low-cost plant extracts with potent therapeutic properties could be developed and promoted for use in the treatment and management of poultry diseases replacing the need for synthetic drugs to improve food security and supply (McGaw, 2020; Nwafor and Nwafor, 2022).

The use of ethnomedicinal resources by smallholder farmers heightened the potential of ethno products in the treatment of poultry diseases, which prominently provides growth support features in such practices, further exacerbating the development of valuable organic pharmacological agents (McGaw *et al.,* 2020). In line with this, leaves, bark, and roots of plants are believed to contain broad spectrum metabolites and bio-stimulants, advocated through their growth promotion ability to diminish the innocuous effect and prevalent of pathogenic bacteria via the food chain (Jelveh *et al.,* 2018). Above all, they represent a rich source of bioactive compounds and essential stimulating properties attributed to organic compounds such as polyphenols, amino acids, plant hormones, and vitamins, as well as micro and macronutrients (Godlewska *et al.,* 2021). However, recent developments in the administration of phytobiotics as extract have observed enhanced growth performance, reduced incidence of disease, and improved overall health condition of broiler birds (Rahman *et al.,* 2011; Akosile *et al.,* 2023). Among the medicinal plant extracts is *Petiveria alliacea*, an emerging potential source of new avian ethnomedicine to treat several poultry diseases.

Petiveria alliacea (Guinea hen weed) is an herbaceous species of wild perennial cosmopolitan shrub plant that is prevalent in the tropical areas in South and Central America, the Caribbean, and Africa. The strong garlicky odour that is released following tissue damage is connected to this medicinal plant (Di Stasi *et al.,* 2002). It contains different beneficial effects of bioactive compounds useful for gut microflora that in turn improves enteric health (Rafeeq *et al.,* 2023). The enhancement of digestion and absorption of nutrient and stable intestinal functions may be principles of growth promotion by *Petiveria alliacea* herbal extract (Kikusato, 2021) and biological activities by secondary metabolism such as alkaloids, flavonoids, pinitol, saponins, coumarins, benzaldehyde, benzoic acid, triterpenoids, steroids, polysulfides, essential oil at a varying concentration (William *et al* 2007; Websters *et al.,* 2008; Ekunseitan *et al.,* 2016). *Petiveria alliacea* has been used in traditional medicine with different purposes such as antimicrobial, analgesic, antispasmodic, sedative, diuretic, and stimulant, and anti-inflammatory effects and used for the treatment of hemoptysis and respiratory conditions (Volpato *et al.,* 2009; Vandebroek *et al.,* 2010; Alonso-Castro *et al.,* 2011; Ekunseitan *et al.,* 2016; Mulyani *et al*., 2018).

Recent development in the administration of *Petiveria alliacea* in poultry birds have revealed various growth promoting and antimicrobial potential capable of stimulating growth, expelling pathogenic microbes and health-problem of broiler chickens and their products (Ekunseitan *et al.,* 2016). A previous study reported that broiler chickens of cobb strain fed *Petiveria alliacea* root meal exhibited improved growth performance and carcass traits without a detrimental effect on the health of the birds (Odetola, 2016). Similarly, finishing broiler chickens fed *Petiveria alliacea* root meal as phytobiotic additive exhibited improved carcass characteristics (Sobayo *et al.,* 2018). However, Odetola *et al.* (2019) reported meat-type birds fed graded levels of *Petiveria alliacea* root meal elicited improved growth performance of broiler chickens. Furthermore, administrating growing pullets with aqueous extract of *Petiveria alliacea* root led to an improvement in growth rate while maintaining health status (Oyeleke *et al.,* 2021a). These aqueous extract of *Petiveria alliacea* rich in antimicrobial compounds and bioactive metabolites are reported to lowered the Oocyst and bacteria counts of growing pullets (Oyeleke *et al.,* 2021a) and laying birds (Oyeleke *et al.,* 2021b) respectively.

Despite, the proliferation of studies on the use of *Petiveria alliacea* in literature, there is limited information on the effect of leaves extract of *Petiveria alliacea* in broiler chickens. Therefore, this study was designed to examine the evaluation of *Petiveria alliacea* leaf aqueous extract as alternative to antibiotic on growth performance and faecal bacteria load in broiler chickens.

Materials and Methods

The experiment was conducted at the Poultry Department, Directorate of University Farms, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria.

Harvested *Petiveria alliacea* leaves were separated from the petiole, washed thoroughly with clean water to remove sand and dirt, and then air-dried at constant moisture content. The aqueous extract of *Petiveria alliacea* was obtained by infusing 500 g of the air-dried *Petiveria alliacea* leaves in 5 litres of boiled water and subsequently allowed to cool for 1 h. The extracts were filtered with a sieve while the filtrate was collected and stored in an airtight container for further use

One hundred and ninety-two (192), day-old broiler chicks were assigned to four treatments: Control (0.25 mL of 20% Enrofloxacin), 200, 400, and 600 mL of *Petiveria alliacea* extract per 1000 mL of water in treatments 2, 3, and 4 respectively in a completely randomized design. Each treatment had 48 chicks per group. The prepared aqueous extract of *Petiveria alliacea* was administered to the bird for three consecutive days per week while ordinary water was given on other days of the week throughout the experiment. The birds were fed starter and finisher commercial diet ad libitum.

Table 1: Nutritional Composition of Diet Fed to Broiler Chickens at the Starter and Finisher Phases

Determined Analysis %	Starter diet	Finisher diet
Metabolizable energy (kcal/kg)	3000.00	3100.00
Crude protein (%)	22.00	18.00
Ether extract (%)	6.00	6.00
Crude fibre (%)	5.00	5.00
Calcium (%)	1.00	1.00
Available Phosphorus (%)	0.45	0.40
Lysine (%)	1.00	0.85
Methionine (%)	0.50	0.34
Sodium (%)	0.30	0.30

Data Collection

Determination of Growth Performance: Performance indices such as final weight gain (g), total weight gain (g), feed consumption (g), and mortality were measured every week while the feed conversion ratio was calculated.

Determination of Carcass Quality: On day 42nd of the study, two birds with weights close to the average of each replicates/group were selected for carcass analysis. The birds were starved for 6 hours to empty gastrointestinal content to avoid carcass contamination before severing the neck and then allowed to bleed. The exsanguinated birds were weighed to determine the slaughtered weight after which they were eviscerated following commercial standard procedures (Jensen, 1984). The cut-up parts' weight (head, neck, shank, thigh, drumstick, breast, wing, and back) and organs (liver, heart abdominal fat, gizzard, and lung) were measured as a percentage of the live weight.

Procedure for Faecal (Oocyst, Egg worm, and total bacteria counts)

On day 42nd of the experiment, the faecal collection was carried out from each replicate using trays covered with aluminum foil placed on each rearing unit's floor to prevent contamination with litter materials. Sterile forceps were used to pick the fresh faecal samples into labeled sterile bottles separately to estimate oocyst and egg worm counts as described by the MacMaster method (Maff, 1986). The total number of bacterial colonies was counted using a standard plate count method consisting of diluting a faecal sample with phosphate buffer diluent until the bacteria were dilute enough to count accurately.

Statistical Analysis

Data obtained were subjected to One-way analysis of variance (ANOVA) in a completely randomized design by SPSS (2009). Significant differences among means were separated using the Duncan's multiple range test at 5% level of significance.

Results

The effects of oral administration of aqueous extracts of *Petiveria alliacea* leaves on final weight (g/bird), total weight gain (g/bird), weight gain (g/bird/day), total feed intake (g/bird), and feed conversion ratio of broiler chicken are presented in Table 2. The result obtained showed that the administration of *Petiveria alliacea* extracts had no significant influence (p>0.05) on all growth performance indices assessed in the broiler chickens.

Table 2: Effect of Oral Administration of *Petiveria alliacea* on Performance of Broiler Chickens

	Aqueous extracts of *Petiveria alliacea* (mL) per 1000 mL of water				
Parameters	**0**	**200**	**400**	**600**	**P-Value**
Initial Weight/Birds (g/bird)	38.74 ± 0.10	38.52 ± 1.49	37.70 ± 1.06	38.43 ± 0.96	0.65
Final Weight(g/bird)	1677.27 ± 7.87	1684.85 ± 20.50	1695.94 ± 51.69	1701.52 ± 47.75	0.861
Total Weight Gain(g/Bird)	1638.53±7.77	1646.33 ± 19.17	1656.23 ± 52.71	1663.08 ± 46.93	0.853
Weight Gain (g/Bird /day)	39.01 ± 0.19	39.20 ± 0.46	39.43 ± 1.26	39.01 ± 1.12	0.853
Total Feed intake/g/bird	5859.28 ± 18.16	5923.95 ± 16.33	5965.85 ± 33.99	5912.97 ± 67.73	0.064
Feed conversion ratio	3.57 ± 0.02	3.60 ± 0.05	3.60 ± 0.11	3.56 ± 0.14	0.921

SEM: Standard error of meal

The effects of oral administration to aqueous *Petiveria alliacea* leaf extracts on the carcass quality of broiler chickens is presented in table 3. No significant (P>0.05) effect of *Petiveria alliacea* was observed on the carcass characteristics of the broiler chickens except for wings. The administration of *Petiveria alliacea* extracts significantly (p<0.05) influenced the weight of the wings in broiler chickens with similar higher value was observed in 200 mL and 600 mL concentration of *Petiveria alliacea* but highest in 600 mL concentration of *Petiveria alliacea* extracts

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Table 3: Effect of Oral Administration of *Petiveria alliacea* Leaves on Carcass Traits of Broiler Chickens

Parameters	0	200	400	600	P-Value
Breast pH	6.02 ± 0.29	5.92 ± 0.07	5.97 ± 0.24	5.93 ± 0.10	0.7340
Breast Temp (^{o}C)	34.93 ± 1.91	34.68 ± 1.76	34.53 ± 2.38	34.95 ± 1.76	0.9670
Final body weight (g)	1666.00 ± 117.73	1697.25 ± 175.81	1700.63 ± 147.40	1695.38 ± 148.54	0.9630
Dressing percentage (%)	64.68 ± 1.47	65.02 ± 1.94	64.61 ± 2.20	65.92 ± 1.96	0.5080
Cut up part (%)					
Head	2.08 ± 0.27	2.14 ± 0.21	2.02 ± 0.12	2.03 ± 0.27	0.7080
Neck	4.04 ± 0.45	4.29 ± 0.56	4.29 ± 0.45	3.84 ± 0.31	0.1510
Shank	4.33 ± 0.53	4.37 ± 0.36	4.22 ± 0.32	4.60 ± 0.68	0.4730
Thigh	9.79 ± 0.63	10.00 ± 0.34	10.14 ± 0.79	9.97 ± 0.62	0.7270
Drumstick	10.02 ± 0.44	9.83 ± 0.53	10.15 ± 0.59	10.06 ± 0.39	0.6220
Breast	20.34 ± 1.38	20.60 ± 1.38	20.00 ± 1.13	21.54 ± 2.03	0.2330
Wing	6.05 ± 0.62^{bc}	6.58 ± 0.46^{ab}	6.15 ± 0.43^{b}	6.71 ± 0.42^{a}	0.0290
Back	12.83 ± 1.24	12.83 ± 0.80	12.64 ± 0.69	12.95 ± 0.78	0.9200
Organs (%)					
Liver	1.94 ± 0.28	1.73 ± 0.15	1.64 ± 0.41	1.75 ± 0.33	0.2750
Heart	0.41 ± 0.06	0.38 ± 0.05	0.42 ± 0.09	0.66 ± 0.68	0.3520
Abdominal fat	0.38 ± 0.53	0.30 ± 0.43	0.52 ± 0.59	0.40 ± 0.69	0.8840
Gizzard	2.28 ± 0.26	2.21 ± 0.22	2.18 ± 0.32	2.28 ± 0.23	0.8250
Lung	0.48 ± 0.13	0.43 ± 0.08	0.40 ± 0.12	0.44 ± 0.08	0.5040

The faecal oocyst counts of birds administered aqueous extract of *Petiveira alliacea* (*PA*) were significantly influenced by the administration of *PA* extracts as shown in Figure 1. The oocyst counts decreased, with the most significant reduction recorded in the treatment administered 600 mL of the extracts. The oocyst count (OPG) was significantly lower in the 600ml group (P=0.0471) compared to the control group.

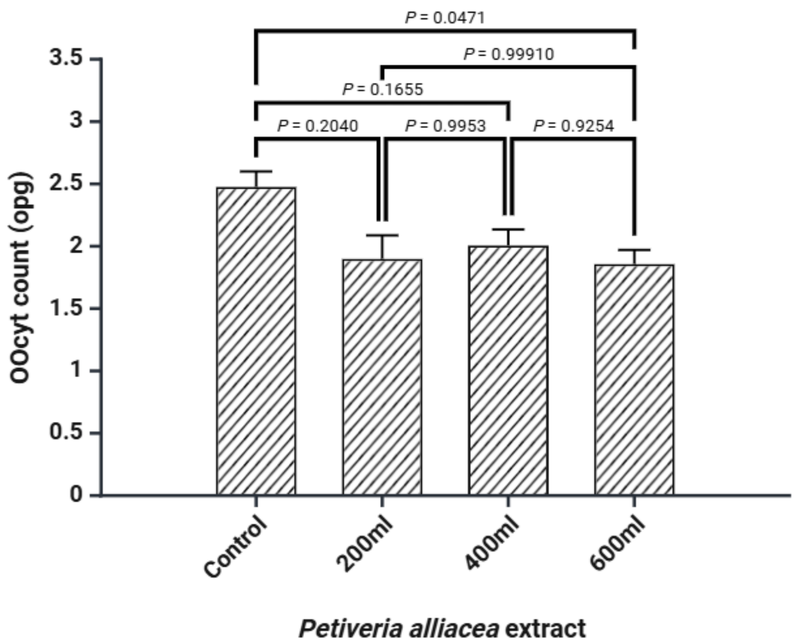

Figure 1: Effect of *Petiveria alliacea* extract on the faecal Oocyst counts of broiler chickens

The oral administration of *Petiveria alliacea* extracts positively affected the total bacteria count of broiler birds presented in Figure 2. The reduction was numerically higher in the concentration of 600 mL *Petiveria alliacea* extract which had the lowest value compared to the 400 mL group.

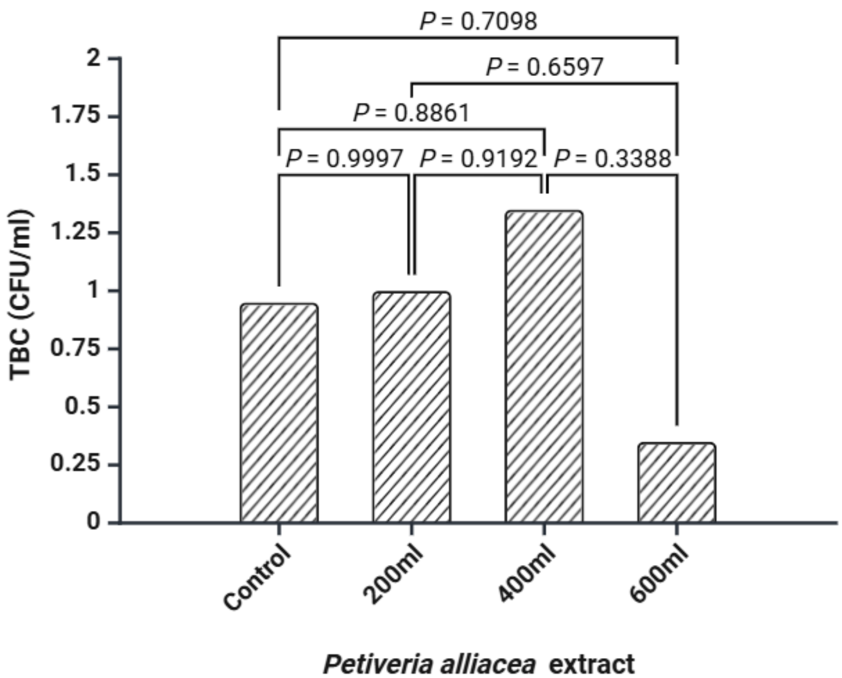

Figure 2: Effect of extract of *Petiveria alliacea* on Total bacteria counts of birds administered *PA* extract

Petiveria alliacea extract positively influenced all bacteria identified as presented in Figure 3. However, significant continuous reduction was observed all through with a 100 percent reduction of *Salmonella spp* and *Pseudomonas spp* counts as the administration level increased across the treatment with the highest reduction observed in the 600 mL group.

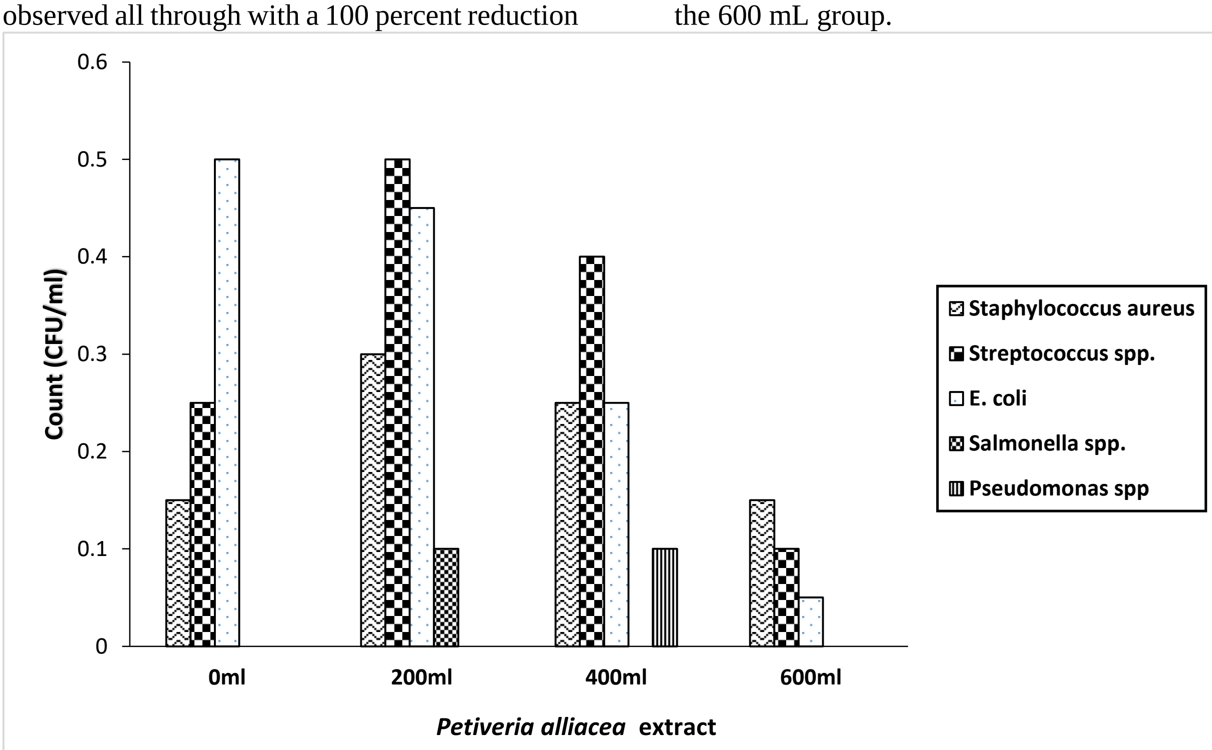

Figure 3: Effect of extract of *Petiveria alliacea* on bacteria counts of birds administered *PA* extract

Discussion

The plant extract and their secondary metabolites have been proposed as an alternative to antibiotics due to their significant and abundant wealth of chemical structures which will continue to be a source of novel antimicrobial, bio-stimulant, and growth promoting effect in poultry birds (Baydar *et al.*, 2004; Sokmen *et al.*, 2004; Ayodele *et al.*, 2017; Ogbole *et al.*, 2018). The similarities observed in the study potentiates that extract of *Petiveria alliacea* from leaves administered to broiler chickens contained important biological active metabolites. These bioactive metabolites are broad spectrum observed to be non-nutritive secondary metabolites found in plant without consequential effect on growth performance of the broiler chickens (Afrin *et al.*, 2020). However, weight gain and feed conversion ratio were numerically better in broiler chickens administered 600 mL *Petiveria alliacea* extract. This effect could be a result of biological compounds present in *Petiveria alliacea* ability of influencing the beneficial microflora within the gut leading to similar growth performance in broiler chickens as observed in the study. This study is consistent with the report of Odetola *et al.* (2019), who observed similar growth performance in broiler chickens, fed a diet supplemented with graded levels of *Petiveria alliacea* root meal of 500, 1000, 1500, and 2000 g/kg feed compared to the control. In addition, Sobayo *et al*. (2018) reported a non-significant effect on the performance of *Petiveria alliacea* parts based on the level of inclusion in broilers. However, Muhammad *et al*. (2019) observed significant growth performance of growing pullets fed a diet containing 100 mg of *Petiveria alliacea* root meal per kg of feed. This improvement in growth performance might be due to the combined nutritive value of the root and leave meal of *Petiveria alliacea* against the aqueous leaves extract used in this study. However, several mechanisms of action of plant metabolites have been postulated such as changes in gut microbial ecology, increasing the secretion of digestive enzymes, and better nutrient absorption (Stevanovic *et al.*, 2018). Sinurat *et al.* (2020) concluded that the administration of low doses of plant bioactive compounds into a diet, improved broiler performance, especially the feed conversion efficiency.

The positive influence on the weight of wings obtained at 600 mL of administered *Petiveria alliacea* extract is directly associated with the live weight obtained. This result might be attributed to the positive response of the bioactive compound which was able to exert a biological effect thereby increasing the amount of muscles in the wing at that level (Zavyalov *et al.*, 2022). Sobayo *et al.* (2018) found significant differences in the carcass variable of finisher broiler chickens administered with *Petiveria alliacea* roots and leaves meal. Odetola, (2016) found no negative effect in primer cuts using *Petiveria alliacea* root meal for 56 days. Pourali *et al.* (2010) reported that the addition of a different mixture of phytobiotics when fed to broiler birds did not induce differences in carcass quality characteristics. The discrepancy between the previously mentioned studies and our results is possible due to differing modes of preparation for the test ingredient and the ability of the *PA* extract preparation to accumulate in the muscle tissues without exerting a significant effect on metabolic processes.

The highest reduction observed in oocyst counts at 600 mL of *PA* extract could suggest that the concentration of biologically active compounds at the level is responsive to the presence of active ingredient contained in the *PA* extract administered to the broiler birds by eradicating the oocyst eggs than other concentration. The anticoccidial effect of root and leaf extract of *Petiveria alliacae* has been reported on growing pullets and laying hens by Oyeleke *et al.* (2021a,b). The anticoccidial activity is attributed to the presence of active phytochemical compounds in drugs used for the control of protozoan disease, particularly *Eimeria spp* (Ekunseitan *et al.*, 2016). Several secondary metabolites such as alkaloids, saponin, phenolic coumarins, flavonoids, tannins, and compounds containing sulfur have been isolated from *Petiveria alliacae* and most of these active ingredients possess powerful antiparasitic effects. The most effective and common sites of action of secondary metabolites are the cytoplasmic membranes, through cell lysis, activating the leakage of cell contents and replication and subsequently cell death (Nunes *et al.*, 2024). The promotion of therapeutic action by the secondary metabolites is also a possible factor due to the interaction with the parasitic genetic material and protein synthesis. The interaction between the bioactive compound and genetic material can alter the genetic architecture of the Eimeria spp resulting in ineffective transcription and disturbance of vital functions for the cell (Hayek, 2013; Gyawali and Ibrahim, 2014). Strong antioxidant compounds such as tannins and flavonoids act on the gut microflora's cell membranes and cell walls to limit lipid oxidation by reducing the activity of protozoa in the gastrointestinal tract (Tian *et al.,* 2009). The result obtained from the study showed the potential and effectiveness of *PA* extract against the pathogens responsible for coccidiosis in broiler birds at 600 mL concentration to reduce faecal oocyst output. This could possibly lower the cost incurred by poultry farmers in developing nations for purchase of synthetic anticoccidial compounds and address the problem of resistance Eimeria spp. The overall impact will be higher productivity and economic return to poultry farmers.

The reduction observed in total bacteria count and bacteria identified in broiler birds administered 600 mL *PA* extract might be suggestive of the organosulfur compound responsible for the activity and interfered with the permeability of the membrane that hindered the growth, preventing changes that are vital for the growth process, inhibiting the enzymes responsible for competing with the receptors for growth factors present in the structure of the bacteria (Silva *et al.,* 2020). Reduced total bacteria counts suggest reduced metabolic activity of the bacteria possibly due to antimicrobial properties of secondary compounds on broiler birds in the gut. The antimicrobial properties of *Petiveria alliacea* extract were found to be due to essential oil, amino acids derivatives, flavonoids, terpenoids, thiosulfate, polysulfides, oxalate, saponins, carotenoids, phenols, and alkaloids (Ekunseitan *et al.,* 2016; Silva *et al.*, 2018). Tannins present in *Petiveria alliacea* extract, altered protein synthesis in the intestinal mucosa forming complexes of tannins. The complexes form a coat over the intestinal mucosa which makes it more resistant to chemical changes and reduces secretion affirming its antimicrobial activity (Pandey *et al.*, 2012). *Petiveria alliacea* extract presents a broad spectrum of antimicrobial activity like benzyl-2-hydroxyethyl trisulfide, thiobenzaldehyde-S-oxide, and S-Benzyl-L-cysteine sulfoxide which are known to have an inhibitory effect and also interfered with the synthesis of the bacterial cell wall (Mulyani *et al.,* 2018, Silva *et al.*, 2018). The observed trend in this study shows the bacterial identified *Staphylococcus aureus,* Streptococcus spp, *Escherichia coli*, Salmonella spp, and Pseudomonas spp while Salmonella spp and Pseudomonas spp were eliminated in the 600 ml *PA* extract. This implies the administration of 600 ml *PA* extract may inhibit the growth of pathogenic bacteria and cross-transmission of infection in poultry farms.

Conclusion

The administration of *Petiveria alliacea* extract at 600 mL/Litre of water improved growth performance and carcass trait, and reduced oocyst and total bacteria counts of broiler chickens and therefore could be recommended as a beneficial health management ethnomedicinal alternative to antibiotics either as a curative or prophylactic remedy for poultry birds.

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