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The Effects of Moringa Leaf Extract on the Growth and Microbial Load of Boiler

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ABSTRACT

The adverse effect of microbes in poultry production, especially broiler chicken remains a major concern for poultry breeders. This study determined the effects of Moringa leaf (*Moringa Oleifera)* extract on the performance and microbial loads of broiler birds. A total of 25 broiler chicks were used and separated into 5 groups in an iron pen with 5 chicks in each group. Group 1 (control, with no treatment), group 2 (received a treatment of 62.5mg/L), group 3 (received a treatment of 125mg/L), group 4 (received a treatment of 250mg/L), group 5 (received a treatment of 500mg/L). After 4 weeks of treatment, the faeces from each group, the control group inclusive were collected for microbial analysis. The result showed that the *Moringa Oleifera* leaf extract at all doses recorded non-significant difference in the parameters analysed among the groups. It was also noticed that the disparities of the results were great. Some as much as 11.5 and 168. 37 standard error of mean. Moreover, Group 3, receiving 125mg/L, exhibited a substantial reduction in E. coli, salmonella, total bacteria count, and pseudomonas activities compared to other groups. Group 3 had the highest water consumption. Amongst the treatment group, group 3 had the highest increase in weight. In conclusion, Moringa leaf extract effectively lowered the microbial load in broiler chicks at the treatment of 125mg/L without any adverse effects.
Keywords: *Moringa Oleifera*, Moringa leaf, microbial load, broiler birds.

INTRODUCTION

Since the 1960s, the global production of poultry meat has been growing faster than that of any other meat in both developed and developing countries. This growth pattern is expected to continue because of the inherent efficiency in feed conversion and the lower production costs associated with intensive poultry production. Such production efficiency is particularly beneficial to developing countries, which tend to have limited agricultural resources but burgeoning, and often poor, populations. Declining poultry prices and increasing incomes have been attributed to increases in per capital poultry consumption, which is sensitive to both price and income changes [1]. The significant growth in poultry (especially broiler) production and consumption in the developing countries has important implications for the global trading of all meat products, as well as feeds and related inputs [2][1]. The United States is one of the world's largest producers and exporters of poultry meat. In 2003, US poultry meat production totalled 17.5 million metric tons (t) (38.5 billion pounds), of which 84% was broiler meat with a farm value of $US15.2 billion (ERS 2004). US broiler production is concentrated in a few states because of agro-climatic conditions that favour broiler production. The top five broiler-producing states are Georgia, Arkansas, Alabama, Mississippi, and North Carolina; together they account for around 60% of total broiler production in the United States. The US broiler industry has, no doubt, been a technological and marketing leader. One of its major contributions is the development of contract farming and vertically integrated production systems that prevail in the world broiler industry today [3]. Contract farming has been the dominant means of coordinating broiler production in the United States since the mid-1950s [4]. Initially, feed companies used contracts with broiler producers to increase and stabilize demand for their products. Later in the 1960s, they also became involved in broiler processing and marketing. In 2004, Brazil took over from the United States as the leading exporter of broiler meat in the world because of the Avian Influenza outbreaks in the United States (specifically Texas, Delaware, Maryland, and Pennsylvania), whose imports to 50 countries, including Japan and China, had been banned. The Brazilian poultry sector has experienced significant growth in the past three decades. Poultry meat production jumped from 217,000 t in 1973 to 7,654,000 t in 2003, while exports

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jumped from 3,700 t in 1975 to 1,922,000 t in 2003. Annual per capita consumption also jumped from 2.3 kg to 33.4 kg during the same period. Brazilian broiler production is expected to continue to grow as a result of strong growth in export markets as well as an increase in domestic demand. According to World Bank, in Nigeria, the growth rate of the livestock sub-sector (12.7%) was higher than that of the agricultural sector (6.8%) in 2017. The higher growth rate in the livestock sub-sector was a result of increase in consumer demand orchestrated by growing populations, a shift toward urban living, and increasing incomes. The socio-economic development and nutritional security of the country hinge on the sub-sector as it provides about 37% of the total protein intake of Nigerians. Protein products such as poultry and fish are increasingly capturing market share from red meat driven by fast food expansion, consumer preferences, competitiveness, and health concerns over the safety of red meat.

Diseases remain one of the major threats to boosting poultry production in Nigeria [5]. The major diseases are the Newcastle disease, Avian influenza, Avian pox, Infectious Bursal disease, Colisepticemia, Coccidiosis and Worm infestation with, Newcastle Disease being the most recognized by poultry farmers [6]. Diseases reduce productivity resulting in less meat, less milk or fewer eggs. It provides less draught power and poorer-quality food and fibre. In economic terms, output declines, costs rise and profits fall [7]. Economic losses experienced by poultry farmers for the years 2009-2011 amounted to over three billion Naira due to Infectious Bursal Disease outbreaks alone [8]. Poultry disease management involves taking steps to ensure good hygiene and increasing the standards of cleanliness as well as containment to reduce the risk of introducing disease into a flock. It involves biosecurity practices, medication and mitigation [9]. Application of standard biosecurity measures is vital in protecting poultry birds from any disease [10]. Biosecurity is security from transmission of infectious diseases, parasites and pests [11]. Biosecurity has focus on maintaining or improving the health status of animal and preventing the introduction of new disease pathogens by assessing all possible risks to animal health [12]. . [13], reported that the implementation of sound biosecurity measures will go a long way in minimizing the problems of disease outbreak and spread in the Nigerian poultry industry and also maintain consumers' confidence in Nigerian poultry products. So many poultry farms have recorded economic losses due to increasing vaccine and treatment expenditure [14]. As birds are infected with diseases such as colibacillosis which is caused by the bacteria Escherichia coli, a major source of concern for poultry breeders since it results in significant financial losses [14]. Antibiotics are often used in chickens to treat illness. As a preventive measure, or as a growth booster. However, it has the potential to increase medication toxicity and exacerbate residual effects. One of the major challenges is antibiotics overuse in the treatment of certain microbiological infections which of course renders many antimicrobe useless in the treatment of such infection [15]. Persistence to antimicrobial agents has become a worldwide problem. However, regardless of the many methods of medication development, plants continue to be the primary source of natural herbal medicines. Scientists have proposed that the global production of poultry meat, especially Broiler chicken has been growing faster than that of any other meat in both the developed and developing countries. However, diseases remain one of the major threats to boosting poultry production as their growth and productivity is influenced by microorganisms. Also, poultry farms have recorded losses due to increasing vaccine and treatment expenditure. This study will be relevant in identifying the microbes in broiler chicks and also determine the microbial load using *Moringa oleifera*. The findings as regards the effects of *Moringa* extract on microbial loads of broilers shall aid the government, non-governmental organisation, private enterprises and individuals in the nation and serve as a data base for the management of chicken or poultry products before making it available for public consumption. The risk of illness arising from the consumption of infected poultry meat may be reduced by the administering of *Moringa* extract. The study is significant in determining the microbial load during the microbial analysis. This study is limited to poultry products, especially broiler chicken. The microbial organism analysis is limited to *staphylococcus aureus*, *E. coli*, *salmonella*, Total Bacteria Count (TBC), *pseudomona* and fungi. And the herbal plants screened is limited to *Moringa oleifera*. *Moringa oleifera* Lam. is the most widely cultivated species of the tropical flowering plant family Moringaceae containing thirteen diverse species [16]. *Moringa oleifera* is indigenous to south Asia, where it grows in the Himalayan foothills from North-Eastern Pakistan to North-Western Bengal, India [17].The species was introduced and became naturalized in other parts of the world including East and West Africa [18]. It has a great potential to serve as a high-value food crop, medicinal products, as well as fodder for animals, particularly in developing countries [19]. The key uses of Moringa include human nutrition (leaves, seeds, flowers), alley cropping (biomass production for biodiesel and fertilizing), animal forage (leaves and treated seedpod-cake), biogas (from leaves), domestic cleaning agent (crushed leaves), blue dye (wood), fencing (living trees), fertilizer (seed-cake), foliar nutrient (juice expressed from the leaves), green manure (from leaves). The species is also mainly used as gum (from tree trunks), honey and sugar cane juice-clarifier (powdered seeds), honey (flower nectar), medicine (all plant parts), ornamental plantings, biopesticide (soil incorporation of leaves to prevent seedling damping off), pulp (wood), rope (bark), tannin for tanning hides (bark and gum), water purification (powdered seeds). *Moringa oleifera* is the cheapest and credible alternative to not only providing good nutrition, but also to cure and prevent a lot of diseases [18]. Actually, the great interest in *M. oleifera* is related to its multipurpose uses and its ability to guarantee a good yield, where other crops cannot, in countries where people are mostly at risk of suffering from nutritional deficiencies. Indeed, its cultivation is localized in developing countries where different parts of the plant are utilized. Moringa oleifera is very useful as a feed

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supplement for animals, as its leaves are highly nutritious. The leaves of M. oleifera are the most nutritious part, being a significant source of vitamin B complex, vitamin C, pro-vitamin A as beta-carotene, vitamin K, manganese, and protein among other essential nutrients [19]. *Moringa oleifera* leaves have antimicrobial roles and are rich with fats, proteins, vitamins, and minerals. The extracts from leaves of Moringa oleifera contain low amounts of polyphenols, which might have effects on blood lipid metabolism. Moringa oleifera can be used as a source of micronutrient and as a dietary supplement in poultry. In addition, Moringa oleifera leaf powder has anti-septic and detergent properties due to presence of different phytochemicals in the leaves.

Materials and Methods

The study was carried out at a farm in Road 5, Rumuekini, Port Harcourt, Rivers State, Nigeria.

A total of twenty-five broiler chicks were used in a completely randomized design (CRD) experiment. The chicks were randomly assigned to five treatment groups. The chicks were given two weeks of brooding period prior to the commencement of/ the experiment. They were housed in an iron pen with adequate ventilation with natural 12-hour light/dark cycle for a duration of 8weeks. All the daily management practices associated with chicken production were carried out. Moringa (*moringa oleifera*) was harvested from Elibrada in Emohua LGA, Rivers State. The harvested moringa was cleaned and dried at room temperature for 7days. Thereafter, the dried leaves were selected from the stock and were blended. 450g of blended moringa leave was weighed and macerated with 5.4litres of aqueous ethanol for 72hrs (3days) with intermittent shaking. The solution was filtered at the end of the day-3. The filtrate was concentrated using rotary evaporator to recover the ethanol. Thereafter, the water solution was dried on a water bath at 50°C. 50g of the dried extract was weighed and diluted with 500ml of water. Treatment T1 was the control with no treatment, T2 was the group 2 with 1/2ml of extract in 1litre of water, treatment 3 was the group 3 with 1ml of extract in 1litre of water, treatment T4 was the group 4 with 2ml of extract in 1litre of water, treatment T5 was the group 5 with 4ml of extract in 1liter of water. Data collected were statistically analysed using ANOVA version 21 of Statistical Package for Social Sciences (SPSS).

RESULTS

The weight of the birds from beginning of the experiment and weekly weight in course of the study were recorded per group at the beginning, group 1 had a mean weight of 480±32.95g while group 2, 3, 4 and 5 had their initial weight to be 414.8± 27.14g, 514.0±17.32g, 472.1.1±47.82g and 420.2±62.24g, respectively at the first week, there was an average increase of weight by 187 ±40.97g, 67g, 56g, 199, 624g. Week two had a remarkable increase in the growth rate of all the groups. They had weekly increase of 408.4g, 439g, 416g, 428.2g, 398g, for group 1,2,3,4 and 5 respectively. Week 3 growth rate was slowed down and the weekly increment was 180g, 180g, 120g, 130g, 160g, respectively for the five growths. While in week 4, they had 290g, 280g, 330g, 230g, 300g, respectively. It was noticed that the disparities of the results were great. Some as much as 11.5 and 168.37 standard error of mean. The result was also observed not be significantly different among the groups results; (Table 1). Mean weight of birds at different weeks. At week one, group 1,2,3,4,5 had an initial weight of 480g, 430g, 500g, 480g, 420g, respectively. At week two, there was an increase in weight across the group with group one having more increase, the weight at group two recorded 600g, 470g, 580g, 470g and 480g for group 1,2,3,4 and 5. At week 3, there was a remarkable increase across the groups with the weight of 1000g, 960g, 980g, 920g and 890g for group 1,2,3,4 and 5. At week four, there was a slight increase of weight which recorded 1180g, 1120g, 1100g, 1040g and 1020g. Finally, at week 5, there was another remarkable increase in weight for group 1, 2, 3, and 5 with the weight of 1480g, 1400g, 1420g, 1300g and 1/340g respectively. From the distribution, it was be observed that the increase in weight was constant throughout the weeks as there was a remarkable increase of 400g, 490g, 400g, 450g and 410g for group 1,2,3,4 and 5 at respectively between week 2 and week 3. It was also be observed that there was decrease in weight at week 5 as the weekly increase in weight recorded 300g, 360g, 320g, 260g, 320g compared to that of week 3. It was noticed that the result showed no significant difference for the mean weight of the birds at different groups result.

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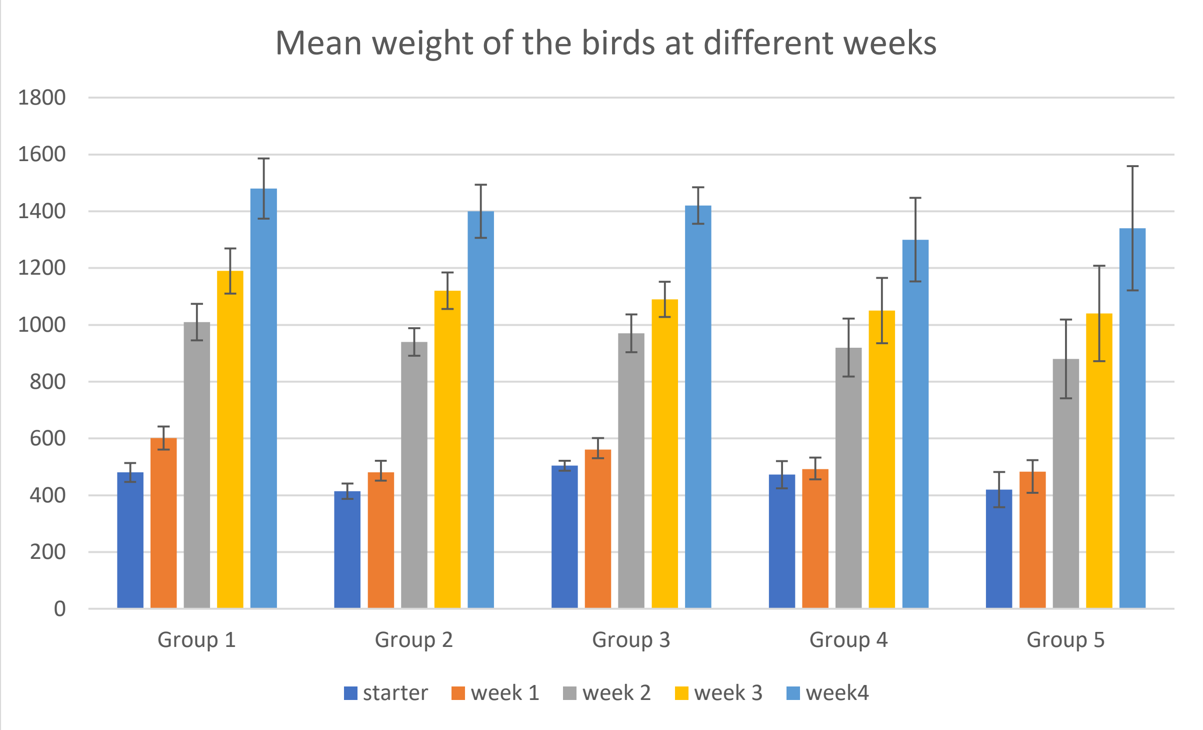

Fig. 1: Mean weight of the birds a different week

The quantity of extract consumed per group was not measured daily due to the drinkers in some groups falling as a result of the activities of the chickens. So, extract consumed was only measured for group 2, 3, 4, and 5 as group 1 was the control group with no extract. Extract was only measured where the drinkers that contained the extract for group 2, 3, 4 and 5 did not overturn for two consecutive days. Hence, the quality extract consumed was only measured weekly. At week 1, group 2, 3, 4 and 5 consumed 54.6 mg, 119mg, 168mg and 431.2mg of the extract respectively. At week 2, group 1, and 2 recorded a slight decrease in extract consumption of 9.1 ml and 7 ml, respectively. During the same period, group 4 had the quantity of 168mg of extract consumed while group 5 recorded a considerable decrease of 89.6 mg of extract consumption. Now, at week 3, the quantity of extract given to groups 2, 3, 4 and 5 was doubled. And each group recorded a more increase in extract consumption with group 5 having the highest quantity of all extract consumed. The increase at week 3 was 52.5mg, 89.6mg, 221.2mg and 375.2mg for group 2, 3, 4 and 5, respectively. At week 4, group 2 had slight reduction in extract consumption of 5.6mg, group 3 recorded a slight increase of extract consumed while group 4 and 5 having significant increase in extract consumption with group 5 having the highest. Group 3, 4 and 5 had an increase of 7.7mg, 86.8mg, and 162.4mg respectively. From the result, it was observed that there was significant increase in quantity of extract consumed which, of course, necessitated the doubling in the quantity of extract administered across the groups from group 2. It was also noticed that the irregularities in the result was much, group 5 having a decrease of 89.6mg at week 2, at week 3, an increment of 375.2mg and at week 4, the increment was 162.4mg. It was also observed that group 5 had the highest quantity of extract consumed among the groups results, (Table 2). Group 1 which was the control group had no extract consumed. Group 1,2,3,4 and 5 had 290.5mg, 641.9mg, 120.2mg, and 2368.8mg, respectively. The result indicates that group 5 had the highest extract consumption of 2368.8mg.

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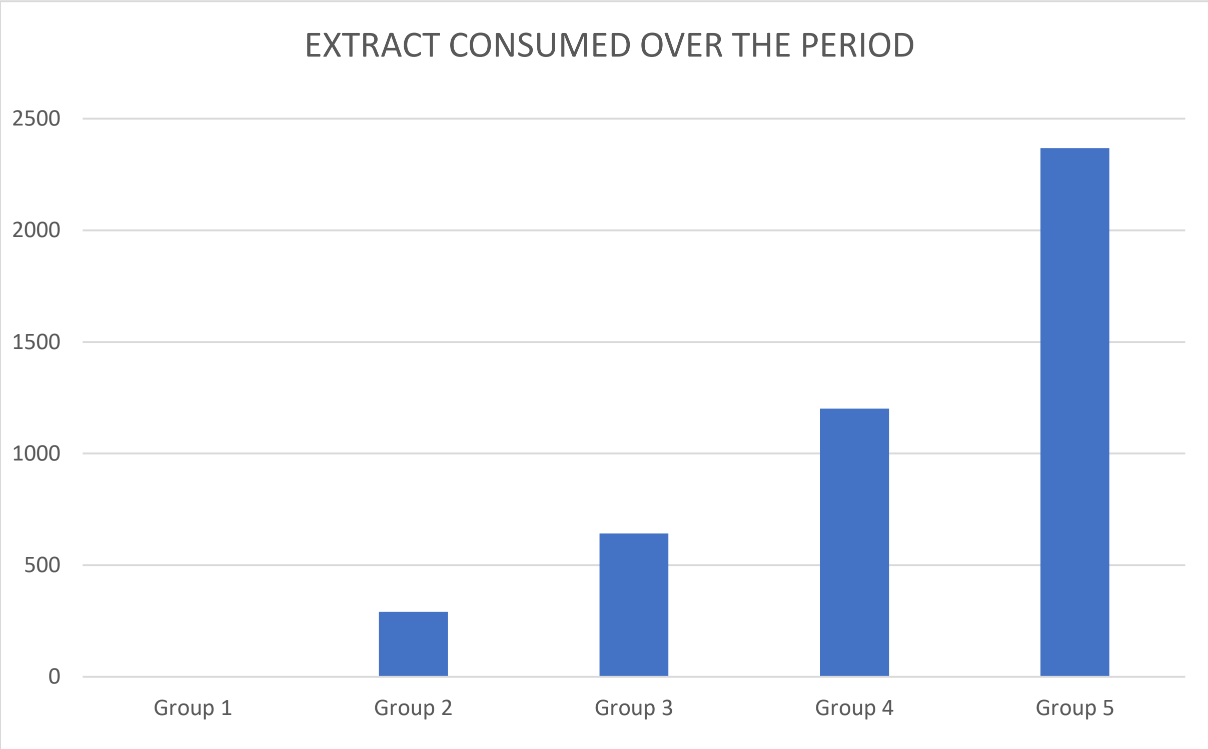

Fig. 2: Extract consumed over the period

At week 1, each group from group 1, 2, 3, 4, 5 were given 1 litre of water each which is equivalent to 1000ml. 800ml, 780ml, 750ml, 600ml, 770ml was total consumed by group 1, 2, 3, 4, 5 respectively. At week 3, there was a remarkable increase in growth across the groups. 730ml, 750ml, 640ml, 790ml, and 670ml for group 1,2,3,4 and 5 respectively. At week 4, the water consumption was greatly decreased for group 1, 3, 4, 5 with weekly increase of 20ml, 55ml, 310ml, 290ml, respectively group 2 had a decrease of 80ml. From the result it was observed that group 3 had the highest water consumption. And also, the weekly increase was not regular as at week 3. There was a remarkable increase in water consumption as much as 730ml, 750ml, 640ml, 790ml, and 670ml for all the group results, Table 3. It was also found that group 1 consumed 4370 litres, group 2 consumed 4150 litres, group 3 consumed 4570 litres, group 4 consumed 4280 litres, group 5 consumed 4220 litres. This result indicates that group 3 had the highest water consumption; (Fig. 3).

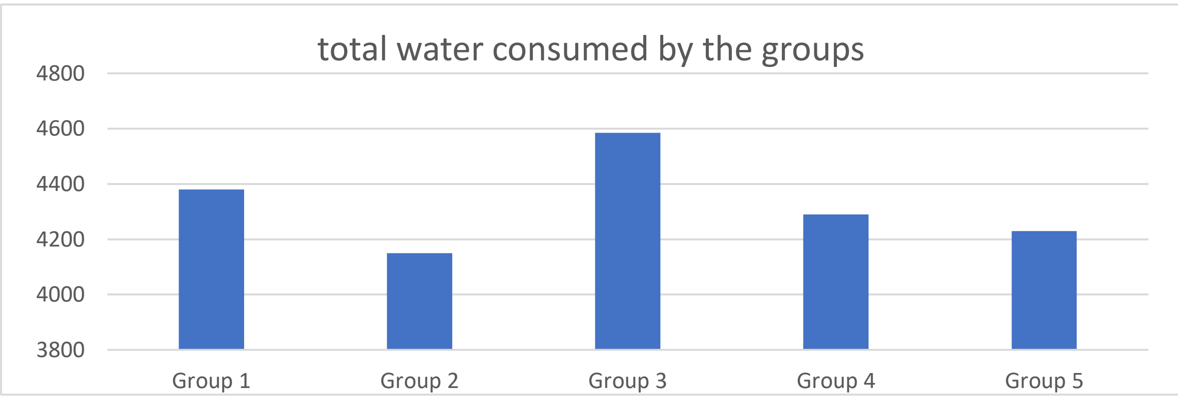

Fig. 3: Total water consumed by the groups

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DISCUSSION

The absence of notable difference among the performance parameters (mean weight of the birds, extract consumed per group over the period, and water consumed over the period) in the current study is consistent with those reported by [18] who reported that the control group had higher feed intake compared to the treatment groups when moringa leaf meal was fed to white laghorn type of chickens, which of course resulted to higher mean weight in the control groups. The decrease in mean weight as a result of low feed intake in birds on the treated groups is also in line with those of [20] who observed that *Moringa oliefera* aqueous leaf extracts in drinking water significantly decreased feed intake of broilers. However, [21] observed improvement in body weight of chicken as a result of available nutrient and some growth stimulating constituents in *Moringa oleifera.*
The significant difference recorded for E. coli, Salmonella, total bacteria count (TBC), and pseudomonas in this present study is in agreement with those other reports. It has been reported that giving *Moringa oleifera* aqueous extract had been shown to have beneficial effect on immune response, thus improving the health status of broiler chickens. Thus, the significant reduction of E.coli, total bacteria count (TBC), Salmonella and Pseudomonas among chickens given the test extract of moringa in treatment 3 may be attributed to the presence of phytochemicals (alkaloids, flavonoids, and saponins) in an aqueous extract of *Moringa oleifera* improved anti-bacterial activity against E.coli [19]. The presence of bioactive substances such as flavonoids, phenolic acid and carotenoids in the Moringa oleifera plant may explain its anti-bacterial efficacy against both micro-organisms.
The absence of mortality or molt wounds across the treated groups with regards to those in the control group may be attributed to the excellent anti-microbial properties of the extract and its effectiveness in controlling virus, bacteria, fungal disease leading to sound health of broiler chickens.

CONCLUSION AND RECOMMENDATION

Moringa oleifera has proven from the current study that it can be exploited as a good alternative to costly antibiotic growth promoters and to enhance immune functions in broiler chickens. Since the mini livestock, macro livestock, and the poultry industry is going through a crucial stage of increasing demand for the products, the sustainable present and future of chicken production necessitates the implementation of herbal remedies like moringa, which could overcome the problem of antibiotic growth promoters.
The results of this study recommends that 125mg/ml of aqueous moringa extract should be adopted since it gave the best result on the parameters analysed. This will certainly help researchers and produces in the mini-livestock industry overcome the challenge of raising healthy chickens without recourse to chemical-base additives.

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