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ADMINISTRATION OF AQUEOUS GINGER EXTRACT AND BACTERIA GROWTH IN THREE BREEDS OF BROILERS CHICKEN

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ABSTRACT

To investigate the effect of administering concentrated ginger extract on bacteria (Salmonella spp and Escherichia coli) growth, 270 day old chicks (Arbor acre Plus, Cobb 500 and Ross 308) were used in a completely randomized design experiment. The birds were fed a single phase diet (23.34% CP; 2948.05 ME kcal/kg). The birds were randomly divided into three groups of 90 birds each, designated as groups T1, T2 and T3. The chicks in each group were further divided into 3 treatments with 3 replicates of 10 chicks. The experiment ran for 8 weeks. The birds were given a levelled table spoonful of Oxytetracycline® in 2 litres of water as recommended by the manufacturer (control), 4% and 6% aqueous ginger extract (treatment 2 and 3) in drinking water, respectively. Samples were collected from the crop of the birds at the end of the experiment and used for bacterial count analysis. Results showed no significant (p>0.05) differences in the growth of Salmonella spp and Esherichia coli in the birds. However, a marked increase in Esherichia coli count was observed in Arbor acre and Ross 308 birds administered the ginger extract. Contrariwise, higher levels of the bacteria were observed in Cobb 500 birds in the control and those on 4% aqueous ginger extract. It was concluded that, the effect of aqueous ginger extract is breed and concentration dependent.

Keywords: Bacteria count, antibiotics, *Salmonella, Escherichia coli,* ginger.

INTRODUCTION

Poultry species including turkey, goose, fowl, guinea fowl and duck are domesticated birds that are raised primarily for the purpose of egg or meat production (Oluyemi and Roberts, 2007). They are very popular and vital sources of animal protein consumed all over the globe without any religious and or cultural barriers. Antibiotics have been the most common feed additives used in time past. However, the use of synthetic antibiotics is being regulated because of the development of resistant microorganisms and their effect on human health (Yahya *et al*., 2014; Joseph *et al*., 2015). In recent times, herbs and spices have gained useful applications in broilers chicken production. This can be attributed to their inherent antimicrobial, growth promoting and fat reducing properties. Ginger is one of the spices recommended as a natural growth enhancer; it contains several compounds such as shogaols, gingerdione, gingerol, phenolic, and gingerdiol (Zhao *et al*., 2011). Some of the essential phytochemicals in ginger are implicated for improved weight gain and impart pharmacological benefits on broiler chickens health (Ali *et al*., 2008).*Escherichia coli* (*E. coli*) is a gram negative, non-spore forming bacillus and it is a common inhabitant of the intestinal tract of poultry. The bacteria survive for long periods outside their host and are present in all bird environments, particularly the litter, and in poultry house dust which may contain up to 10^5 - 10^6 *E. coli*/g. Feed and feed ingredients are often contaminated with pathogenic coliforms and are a common source of introducing new serotypes into a flock (Martins Da Costa *et al.* 2006). In spite of advancement in technology and practices of hygiene at the various stages of broilers chicken production, *Salmonella spp* infections remain a very serious threat to human and animal health. In many parts of the world, high incidence of salmonellosis in human have been attributed to infection from contaminated poultry eggs, meat and meat products. The contaminated products cause disease as a result of inadequate cooking or cross contamination of working surfaces in the kitchen environment (Hafez, 2001; Omwandho and Kubota, 2010). The aim of the study therefore, was to

evaluate the effect of administering concentrated aqueous ginger extract on *E. coli* and *Salmonella spp* count in three breeds of broilers chicken.

MATERIALS AND METHODS

The research was carried out at the Poultry Unit of the Teaching and Research Farm of the Department of Animal Production, Federal University of Technology, Gidan Kwano, Minna, Niger State, Nigeria. Fresh ginger rhizomes were thoroughly washed with water to remove dirt, peeled, and cut into chips. The ginger was then ground with a warring blender (Polyester electric blender, model PV-BL999B) into mash. A concentrated ginger juice was obtained from the mash using an extractor as described by Joseph *et al.,* 2015). The squeezed juice was stored in a bottle and refrigerated at 4°C until the time of usage.

The experimental diet was formulated to provide the chickens with a metabolizable energy of 2948.05 kcal/kg and a protein level of 22.34% as shown in Table 1.

Table 1: Compositions of the experimental diets

Ingredients	**(%)**
Maize	54.90
Groundnut cake	33.00
Fish meal	3.00
Wheat offal	4.00
Limestone powder	1.00
Bone meal	2.00
Palm oil	1.00
Salt	0.25
Lysine	0.25
Methionine	0.25
Toxin binder	0.10
*Premix	0.25
Total weight (kg)	100.00
Calculated analysis	
Crude protein (%)	22.34
Crude fibre (%)	3.70
Ether extract (%)	5.50
Ash (%)	3.04
Ca (%)	1.31
Avail P (%)	1.00
Lysine	0.53
Methionine	0.62
ME (kcal/kg)	2948.05

*0.25kg contain vita. A – 2,500,000iu:, vita. D-500,000iv, vita. E- 5,000iv, vita. k- 562.5mg; thiamine – 42.5mg; 3iboflavin – 1,250mg; Pyridoxine – 687.5mg; Niacin- 6,875mg; vit B12 - 3.75mg; Pantothenic acid – 1,875mg; folic Acid – 1,875mg; Biotin – 12.5mg; manganese – 20g; zine – 12.5g; copper – 1.25g; iodine 0.38g; selenium – 50mg and cobalt – 50mg;

Two hundred and seventy (270) day old commercial broilers chickens breeds (Arbor acre Plus, Cobb 500 and Ross 308) chicks were used for the experiment. Before arrival of the birds, the experimental house was washed and disinfected. The chicks on arrival were weighed and distributed randomly into the experimental groups. They were given anti-stress through drinking water on arrival, and anytime they were stressed. The experimental design used was the completely randomized design. The chicks in each group were divided into 3 replicates of 10 chicks making 30 birds per treatment. The groupings for each breed were designated as treatment 1, 2, and 3 (T1, T2 and T3). Treatment 1 birds were administered a table spoonful of Oxytetracycline® in 2 litres of water and served as the control. Birds in T2 and T3 were given 4% aqueous ginger extract in 192 mL and 6% aqueous ginger

extract in 188 mL of drinking water, respectively. After finishing this, fresh water was provided to the chickens *ad libitum*.

The birds were housed on deep litter for 56 days. They were administered preventive vaccination using attenuated live vaccines of Gumboro and Lasota on days 7, 14, 21, and 28, respectively. At the end of the experiment, three birds were randomly selected from the treatments and slaughtered. The crops of the birds were excised and the contents collected carefully for microbial analysis. The microbes of interest were *E. coli* and *Salmonella spp*. Data collected was subjected to one-way analysis of variance using SPSS software.

RESULTS AND DISCUSSIONS

Table 2 shows the results of bacterial count (*Salmonella spp and E. coli*) of broiler birds administered concentrated aqueous ginger extract. The results showed no significant ($p>0.05$) differences in the values obtained among the birds administered the concentrated ginger extract.

Table 2: Bacterial count of broiler birds administered concentrated aqueous ginger extract

Parameter	*Salmonella spp*			*Escherichia coli*		
	T_1	T_2	T_3	T_1	T_2	T_3
Arbor acre plus	0.00	0.00	0.00	0.00	0.00	1.3×10^6
Ross 308.	0.00	0.00	0.00	0.00	0.00	1.2×10^6
Cobb 500	0.00	0.00	0.00	1.1×10^6	1.0×10^6	0.00

*Statistical analysis showing no significant difference and the absence of value for F could be as a result of lack of data to be analyzed (i.e. zeros).

T1: birds administered Oxytetracycline (Control)

T2: birds administered 4% ginger extract.

T3: birds administered 6% ginger extract.

E. coli count in Arbor acre plus and Ross 308 breeds were observed to be higher in birds administered 6% of the aqueous ginger extract (1.30 and 1.20 x 10^6 cfu/g, respectively) while no growth was observed in birds administered 0 and 4% of the aqueous extract. This could be as a result of breed difference. Values obtained for Cobb 500 revealed decrease in E. coli count with increased level of administration of the aqueous ginger extract up to 4% followed by a drastic decrease at 6%. For *Salmonella spp*, no growth was recorded in all the breeds administered different levels of the aqueous extract of fresh ginger. The report of this study is comparable with those of Pepper and Gerba (2005), Bhargava *et al*. (2012) and Umeh *et al*. (2013) who all reported on the proven success of ginger in reducing growth of pathogenic bacteria especially *Salmonella spp* and *E. coli*.

CONCLUSION

The use of concentrated aqueous ginger extract up to 6% totally prevented the growth of *Salmonella spp* in the crop of the three breeds of broilers chicken studied. However, increasing the dosage rate did not completely stop the growth of *E. coli* in Arbor acre, Ross 308 and Cobb 500 birds.

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