

EFFECTS OF PHYTOGENIC SUPPLEMENTS ON THE INTESTINAL MICROBIOTA OF BROILER CHICKENS

Daramola O.T

Department of Agricultural Technology, Federal Polytechnic, Ado-Ekiti
Corresponding Author : olajumoke.daramola2016@gmail.com 07086656092

Abstract

This study assessed the effects of phytogetic supplements of cinnamon, ginger root and *Moringa* leaf meal on the intestinal microbiota of broiler chickens. A basal diet divided into 4 portions, designated: diet 1 (the control), diets 2, 3 and 4 supplemented with 0.2% cinnamon, 0.2% ginger root and 0.2% *Moringa* leaf meal, respectively. A total number of one hundred and twelve (112) day-old broiler chicks were randomly assigned to the four experimental diets (28birds/diet; 7birds per replicate) using a Completely Randomized Design. At the end of the 56th day, caeca contents of the experimental birds (1bird per replicate) were collected for bacterial analysis for culturing lactic acid producing bacteria, total aerobic bacteria, coliform bacteria and intestinal negative bacteria. The parameters were not significantly ($p>0.05$) affected by phytogetic supplements. It was observed that all bacteria target group had reduced levels in birds administered the phytogetic supplements. It may be concluded that phytogetic supplementation of experimental diet regulated antimicrobial phytoegen adhesion and subsequent modification of gut microbiota which enhances intestinal epithelial integrity.

Keywords: Broilers, Microbiota, PhytoGENICS, Cinnamon, Antibiotics.

INTRODUCTION

The cecal microbiota is an important topic for recent study, not only in humans but also in animals (Placha *et al.*, 2014). Anything that affects the gut microbiome can affect all the system of the animal, thus altering feed uptake and requirements (Choct, 2009). Recently, the use of medicinal plants or phytogetic feed additives in diet of poultry has been put forward as a likely alternative to antibiotic growth promoters. The synthetic antibiotics have been banned by European Union since 2006. (Cherian *et al.*, 2013). There are numerous findings that showed the antibacterial and antioxidant activities of botanicals in vitro. Corresponding in vivo experimental evidence supports that the effects are still rather limited (Khattak *et al.*, 2014). Furthermore, Jamroz *et al.* (2006) described that incorporating mixture of carvacrol, cinnamaldehyde, and capsaicin to food reduced the amount of parasites, *Clostridium perfringens*, and *E. coli* in broiler Caeca fluid. Furthermore, Jang *et al.* (2007) demonstrated that the dietary addition of a commercial blend of basic oils, with thymol as the most active component, reduced the *E. coli* population in broilers' ileo-cecal digesta.

In order to maximize the effectiveness of phytogetic supplements and benefit from their synergistic and additive effects, phytogetic supplements (such as cinnamon powder, moringa leaf meal, and ginger root) and their separated components are novel strategies. Research should therefore concentrate on how phytogetic supplements affect their antibacterial characteristics, according to (Bassole & Juliani, 2012). Therefore, the goal of this study was to determine the intestinal microbiota activities on broiler chicken as affected by phytogetic supplements.

MATERIALS AND METHODS

Location and experimental site

The study was carried out at the Poultry Unit of Teaching and Research farm Department of Agricultural Technology, The Federal Polytechnic Ado Ekiti, Ekiti state, Nigeria. The state is located in South Western part of the country, Ekiti State covers a land area of 6353km square (2453sqm) with a population estimated in 2005 to be 2737,186.

Site preparation

The poultry house was thoroughly washed, fumigated with disinfectant. The poultry house was allowed to stay and dried for two weeks before the arrival of the experimental birds, proper weeding of the surrounding was carried out to prevent predators and pests.

Experimental animals

A total number of one hundred and twelve (112) birds of commercial breed were used in this experiment. There were four treatments and four replicates per treatment. Seven (7) birds were allotted per replicates amounting (28) birds per treatment. Normal medications and vaccinations were given to the experimental birds.

Test ingredients

The test ingredients Cinnamon (*Cinnamomum Zeylanicum*) and Ginger (*Zingiber officinale*) used were gotten from a local market in Ado Ekiti while Moringa leaf meal (*Moringa oleifera*) were harvested within the premises of The Federal Polytechnic Ado Ekiti, Ginger was sliced, air-dried for 10 days, while Moringa was air-dried for a period of 7 days in order to reduce the moisture content. They were milled into fine particles and used to formulate the diets.

Management of experimental birds

A broiler chicken's basal diet each was prepared for the starter phase (0 to 28day) and finisher phase (29-56day) to meet the requirements of the birds (NRC, 1994). At each of the phases the basal diet was divided into four equal portions and designated to Diets 1 to 4. Diet 1 was the control while diets 2, 3 and 4 were supplemented with 0.2% of cinnamon powder, 0.2% ginger root and 0.2% *Moringa oleifera* leafmeal. One hundred and twelve (112) one-day old broiler chicks were randomly assigned to four experimental diets (28 birds per diet; 7 birds per replicate) using a completely randomized design (CRD). The birds were raised on wire mesh.

Table 1 Composition of Experimental Diets (g/100kg) for Broiler Starter

		T1	T2	T3	T4	Ingredients
Maize	53	53	53	53		
Soybean meal (SBM)	22	22	22	22		
Groundnut cake (GNS)	16	16	16	16		
Fish meal	2	2	2	2		
Bone meal	3	3	3	3		
Limestone	2	2	2	2		
Premix	0.25	0.25	0.25	0.25		
Methionine	0.25	0.25	0.25	0.25		
Lysine	0.25	0.25	0.25	0.25		
Salt	0.25	0.25	0.25	0.25		
Oil	1	1	1	1		
Cinnamon	-	0.2	-	-		
Ginger	-	-	0.2	-		
Moringa	-	-	-	0.2		
Total	100	100	100	100		
Calculated composition						
Metabolizable energy	2980	2980	2980	2980		
Crude protein	23.4	23.4	23.4	23.4		
Average calcium		1.99	1.99	1.99		1.99
Average phosphorous	0.69	0.69	0.69	0.69		
Lysine	1.33	1.33	1.33	1.33		
Methionine	0.60	0.60	0.60	0.60		

Table 2 Composition of Experimental Diets (g/100kg) for broiler finisher diets

Ingredients	T1	T2	T3	T4
Maize	58	58	58	58
Soybean meal (SBM)	22	22	22	22
Groundnut Cake (GNC)	11	11	11	11
Fish meal	2	2	2	2
Bone meal	3	3	3	3
Limestone	2	2	2	2
Premix	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Oil	1	1	1	1
Cinnamon	-	0.2	-	-
Ginger	-	-	0.2	-
Moringa	-	-	-	0.2
Total	100	100	100	100
Calculated composition				

Crude protein	19.86	19.86	19.86	19.86
Metabolizable Energy	3019.7	3019.7	3019.7	3019.7
Calcium	1.98	1.98	1.98	1.98
Average phosphorous	0.68	0.68	0.68	0.68
Lysine	1.27	1.27	1.27	1.27
Methionine	0.58	0.58	0.58	0.58

DATA COLLECTION

The contents of the caeca from the experimental birds (1 bird/replicate) were collected for bacterial analysis. A day prior to collection of caeca content, agar plates were prepared using aseptic techniques. The plates were smeared on the experimental site to evaluate the bacteria's growth. The aerobic bacteria were cultured in the nutrient agar, lactic acid-producing bacteria were cultured in Man Rogosa agar while the coliforms and intestinal negative lactose bacteria were cultured in the MacConkey agar (Dibaji *et al.*, 2014; Seldan and Simoes, 2015)

STATISTICAL ANALYSIS

All data collected in this study were subjected to Analysis of Variance using SPSS. Duncan's Multiple Range test of one-way ANOVA was used to analyze the mean differences of the same parameter. Significant differences were considered where necessary at a level of ($P \leq 0.05$).

RESULTS AND DISCUSSION

Lactic acid producing bacteria, total aerobic bacteria, coliforms were not significantly ($p > 0.05$) affected by phytogetic supplements.

Table 3: Effects of phytogetic supplements on the intestinal microbiota of broiler chickens

Parameters	Diets				± SEM	p-value
	1 Control	2 0.2% cinnamon	3 0.2% ginger	4 0.2% Moringa		
LAPB	9.11	9.08	8.94	8.89	0.07	0.71
TAB	10.38	10.19	10.14	10.20	0.05	0.29
Coliforms	8.98	8.63	8.87	8.89	0.07	0.29
INB	9.89	9.80	9.74	9.80	0.07	0.28

Means within a row with different superscripts are significantly different ($P > 0.05$); SEM – Standard Error of Mean; LAPB- Lactic Acid Producing Bacteria; TAB- Total Aerobic Bacteria; INB- Intestinal Negative Bacteria

It was shown that all bacterial target groups had numerically reduced values of birds administered the phytogetic supplement. All bacterial target groups were reduced as a result of adding phytogetic feed additives to the experimental diets which was consistent with Jia-chi *et al.* (2012) report. The phytogetic supplementation of experimental diet regulated antimicrobial phytogets adhesion and subsequent modification of gut microbiota which enhances intestinal epithelial integrity. Although Mountzoris *et al.* (2011) found that lactobacillus spp. had a propensity to proliferate following the addition of phytogetic supplements, this finding does not corroborate the findings of the present investigation. However, comparable findings about a decrease in total bacteria and coliform bacteria were noted.

CONCLUSION AND RECOMMENDATION

It may be concluded that phytogetic supplements of 0.2% cinnamon, 0.2% ginger and 0.2% moringa enhanced their gut functions and improve their growth performance and health status. For further research, the inclusion rate of 0.2% test ingredients (Cinnamon powder, Ginger root and Moringa leaf meal) can be increased to 0.4%.

REFERENCES

- Cherian G, Orr A, Burke IC, Pan W. (2013). Feeding *Artemisia annua* alters digesta pH and muscle lipid oxidation products in broiler chickens. *Poultry Science*. 92:1085–1090.
- Choct, M. (2009). Managing gut health through nutrition. *British Poultry Science*, 50, 9–15.

- Dibaji, S.M., Seidavi, A., Asadpour, L. & Mareira da silva, F. (2014). Effect of symbiotic on the intestinal microflora of chickens. *Journal of Applied Poultry Research*, 23, 1-6.
- Jamroz D, Wiertelcki T, Houszka M, Kamel C. (2006). Influence of diet type on the inclusion of plant origin active substances on morphological and histochemical characteristics of the stomach and jejunum walls in chicken. *Journal of Animal Physiology and Animal Nutrition*. 90:255–268.
- Jang IS, Ko YH, Kang SY, Lee CY. (2007). Effect of a commercial essential oil on growth performance, digestive enzyme activity and intestinal microflora population in broiler chickens. *Animal Feed Science Technology*. 134:304–315.
- Jia-Chi., Steiner Y., Aufy, A., Tu-Fal. (2012). Effects of supplemental essential oil in growth performance, carcass, organic blood characteristics and intestinal microflora of broilers. *Livestock Science*, 137; 219-225.
- Khattak F, Ronchi A, Castelli P, Sparks N. (2014). Effects of natural blend of essential oil on growth performance, blood biochemistry, cecal morphology, and carcass quality of broiler chickens. *Poultry Science* 93:132–137.
- Mountzoris K.C., Paraskevas, Tsirtsuios P., Palamidi, I., Steiner T., Schatzmayr, Fegeris K. (2011). Assessment of a phytogenic feed additive; effect on broiler growth performance nutrient digestibility and cecal microflora composition. *Animal Feed Science and Technology* 168, 3;223-23`.
- NRC (1994). Nutrient Requirement of Poultry (9th revised. edition.). National Academy Press, Washington Dc, USA P.3
- Placha I, Takacova J, Ryzner M, Cobanova K, Laukova A, Strompfova V, Faix S. (2014). Effect of thyme essential oil and selenium on intestine integrity and antioxidant status of broilers. *British Poultry Science*. 55:105–114.