International Journal of Advanced Research in Biological Sciences
ISSN: 2348-8069
www.ijarbs.com
DOI: 10.22192/ijarbs Coden: IJARQG(USA) Volume 6, Issue 8 -2019

Research Article

DOI: http://dx.doi.org/10.22192/ijarbs.2019.06.08.017

Growth performance and haematology of broiler birds fed diets containing Korean ginseng

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Abstract

The study was conducted to determine the effect of dietary Korean ginseng inclusion on growth performance and haematology of broiler birds. A total of One hundred and sixty (160) day old chicks were used for the study. The birds were randomly divided into four treatments and assigned to four treatment diets in a Completely Randomized Design (CRD) as follows T_0, T_1, T_2, and T_3 containing 0g, 2g, 4g and 6g per 5kg feed inclusion in their diet respectively. Routine management practices were carried out as at when due and the experiment lasted for eight weeks. The result showed that there were significant ($P<0.05$) difference in their body weight gain, feed intake, feed conversion ratio and mortality rate of broilers fed 4g and 6g per 5kg feed of Korean ginseng. The haematological indices showed that there were significant ($P<0.05$) difference only in Packed cell volume. From the results, it was concluded that Korean ginseng inclusion at 4g and 6g per 5kg diet enhanced growth performance and reduced mortality of broiler birds.

Keywords: Korean ginseng, broiler birds, growth performance, haematology.

Introduction

Poultry production is one of the fastest means to achieving appreciable improvement in the nutritional standard of the populace because of its short generation interval, quick turnover rate and relatively low capital investment (Ani and Okeke, 2011). As a primary source of animal protein, the poultry sector offers a valuable repository to bridge the gap between demand and the availability of balanced nutrition. During the last few decades, antibiotics have been widely used in the livestock industry for growth promotion and enhanced feed efficiency. However, there is growing concern about the possibility that the use of antibiotics in livestock and poultry feed increases number of antibiotic-resistant pathogens and creates antibiotic residue problems in animal products, especially in meat and eggs (Kelley *et al*., 1998). These residues might pose a potential health hazard to humans (Dipeolu *et al.*, 2005). Therefore, in response to the restriction and drug resistance problem emanating from their use has made nutritionists to look inward for alternatives. Such alternative feed additives are probiotics, yeast, prebiotics, organic acids and feed grade enzymes (Windisch *et al.*, 2007; Ndelekwute *et al*., 2014). The search is continuing and bioactive plant materials otherwise known as phytogenics have been adjudged to be other good alternative (Wei and Shibamoto 2007). Phytogenic compounds such as essential oils and spices have been

reported to exhibit growth promoting properties (Windisch *et al*., 2007). Ginseng (*Panax ginseng Meyer*) is a perennial plant that grows in shaded and humid areas throughout Korea, Japan, and China. It is considered an adaptogenic agent that helps to enhance physical performance, promote vitality and stimulate metabolic function (Yildinm *et al.,* 2013). Several researches have well documented that ginseng contains saponins, antioxidants, peptides, polysaccharides, alkaloids, lignin etc. Among these, saponins (ginsenoside) are considered to be the principal bioactive ingredients (Palazon *et al*., 2003). Saponins are known to possess anti-inflammatory property, hemolytic activity, cholesterol-binding properties, and bitterness. Alkaloids, on the other hand, are known to possess many pharmacological properties including antihypertensive effect, anti-malarial activity, and anti-carcinogenic potentials (Saxena *et al.,* 2013). They are believed to boost the immune system and to provide pharmaceutical and antioxidant benefits to humans and animals (Kim and In, 2010; Yildirim *et al.,* 2013). These positive properties could be explored for better broiler productivity. Therefore, the objective of the experiment was to determine the effect of ginseng on growth performance and haematology of broiler chickens.

Materials and Methods

Ethical Approval

This study was carried out in compliance with the ethical and scientific standards for biomedical research on humans and animal subjects (UNN, Research Policy Document, 2013).

Location of the experiment

The experiment was carried out at the poultry Unit of the Teaching and Research Farm, Department of Animal Science, University of Nigeria, Nsukka in Enugu State, Nigeria.

Experimental diets, animals and management

A total of One hundred and sixty (160) day old broiler chicks were used in a completely randomized design consisting of four dietary treatments and four replicates per treatment. Each treatment had ten birds per replicate, reared on a deep litter system. Routine management practices including vaccination and drug administration where necessary were observed with water and feed provided *ad libitum*. Four treatment diets were formulated which were

T_0 = Birds in this treatment received 0g ginseng per 5kg feed (control).

T_1 = Birds in this treatment received 2g ginseng per 5kg feed inclusion in their diet.

T_2= Birds in this treatment received 4g ginseng per 5kg feed Inclusion in their diet.

T_3= Birds in this treatment received 6g ginseng per 5kg feed inclusion in their diet.

Initial and final weights of birds were taken at the beginning and at the end of the experiment. Daily feed intake and weekly weight gain were measured and recorded per group. Data on feed intake, water intake, body weight gain, feed conversion ratio and mortality were recorded as they occurred. The study lasted for a period of eight weeks.

Blood Haematology

At the end of the finisher phase, blood samples were collected from four birds per treatment from the birds' wing vein using a 5 mL syringe and placed in sterilized bottles containing ethylenediaminetetraacetic acid anticoagulant for determining the hematological indices. The hematological parameters of packed cell volume (PCV), red blood cell count (RBCC) and total white blood cell count (TWBCC) were determined using Mindray Hematology Analyzer (Mindray BC-2300, Guangzhou Shihai Medical Equipment Co., Ltd, China)

Statistical Analysis

Data were subjected to subjected to analysis of variance (ANOVA) using IBM SPSS statistics, version 21 (SPSS, 2013) and significantly different means were separated using Duncan's new multiple range test procedure and accepted at 5% (0.05) probability level.

Table 1. Percentage composition of broiler finisher diets

	Dietary inclusion of Korean ginseng			
Ingredients	**T_1 (0.g)**	**T_2 (2g)**	**T_3 (4g)**	**T_4 (6g)**
Maize	41.50	41.50	41.50	41.50
Wheat Offal	20.00	20.00	20.00	20.00
Palm kernel meal	12.30	12.30	12.30	12.30
Soybean meal	7.00	7.00	7.00	7.00
Groundnut cake	12.20	12.20	12.20	12.20
Fish meal	2.00	2.00	2.00	2.00
Salt	0.25	0.25	0.25	0.25
Bone Meal	4.00	4.00	4.00	4.00
Vit-Min Premix*	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Total	100	100	100	100
Calculated composition:				
Crude protein (%)	19	19	19	19
Energy (Mcal/kgME)	2.90	2.90	2.90	2.90

* Vit A – 10,000.00 iu., D_3-2,000 iu., B_1-0.75g., B_2-5g., Nicotinic acid – 25g., Calcium pantothenate 12.5g., B_12-0.015g., K_3-2.5g., E-25g., Biotin – 0.050g., Folic acid –1g., Manganese 64g., Choline chloride 250g., Cobalt-0.8g., Copper 8g., Manganese 64g., Iron –32G., Zn-40g., Iodine-0.8g., Flavomycin-100g., Spiramycin 5g., Dl-methionie-50g, Selenium 0.6g., Lysine 120g., BAT-5g.

Results and Discussion

Growth performance of broiler birds fed diets containing varying levels of Korean ginseng is presented in Table 2.

Table 2: Growth performance of broiler birds fed diets containing varying levels of Korean ginseng

Parameters	**T_0**	**T_1**	**T_2**	**T_3**	**p**
IBW(g)	353.30±0.35	356.71±0.05	343.33±0.01	353.33±0.09	NS
FBW(g)	2142.00 ± 0.02^{b}	1931.33 ± 0.14^{c}	2218.67 ± 0.19^{b}	2718.33 ± 0.329^{a}	*
BWG(g)	1788.70 ± 0.35^{b}	1574.63 ± 0.16^{b}	1875.34 ± 0.18^{b}	2365.00 ± 0.29^{a}	*
DFI(g)	117.86±0.05	104.36±0.15	103.82±0.25	109.91±0.22	NS
DWG(g)	42.59 ± 0.23^{b}	37.49 ± 0.11^{c}	44.65 ± 0.33^{b}	51.07 ± 0.33^{a}	*
FI(g)	4950.00 ± 0.22^{a}	4383.10 ± 0.11^{b}	4360.80 ± 0.23^{b}	4300.00 ± 0.08^{b}	*
FCR	2.76 ± 0.12^{a}	2.78 ± 0.94^{a}	2.32 ± 0.48^{b}	2.30 ± 0.82^{b}	*
Mortality	4^{a}	1^{b}	0^{c}	0^{c}	*

^{abc}Means on the same row with different superscript are significantly ($p < 0.05$) different.
*=Significant. T1 = 0g of ginseng, T2= 2g of ginseng, T3= 4g of ginseng, T4= 6g of ginseng. IBW= initial body weight, FBW= final body weight, BDW= body weight gain, DFI= daily feed intake, DWG= daily weight gain, FI= feed intake, FCR= feed conversion ratio.

Result shows that there was no significant ($p>0.05$) difference among treatments in daily feed intake (DFI). However supplementing the diets with ginseng significantly influenced ($p<0.05$) final body weight (FBW), body weight gain (BWG), daily weight gain (DWG), feed intake (FI), feed conversion ratio (FCR) and mortality when compared with the control group. L.Yan *et al.* (2011) reported that inclusion of wild-ginseng adventitious root meal (WGM) in broiler diet increased their growth performance.

Ginseng is known to contain Saponins which possess anti-inflammatory property and confer bitterness to feed stuffs. Jenkins and Atwal (1994) reported that dietary saponins (ginsenosides) had adverse effect on feed intake of chicks due to their bitter taste which was similar to the findings of this study. Irrespective of the lowered feed intake observed in the ginseng treated group, feed conversion ratio (FCR) was improved. This improvement is attributed to the mechanism of action of saponins (ginsenosides) based on the alteration of the intestinal microbiota, morpho-histological maintenance of the gastrointestinal tract and increased enzyme secretion (Yildirim *et al.*, 2013). This enhanced feed digestion and utilization thereby improving the growth performance of broilers. However, the finding of this study is not in agreement with the reports of Ao *et al*. (2011) who reported that inclusion of ginseng in diet of broilers had no positive effect on their growth performance. Also from the results of the experimental study it shows that Korean ginseng had positive significant effect on the mortality rate of broiler birds because ginseng is believed to exert immune-stimulatory, anti-fatigue and hepatoprotective physiological effects. Mortality in the present study was significantly reduced in the groups fed ginseng supplement. The lowest mortality was observed in T2 (4g ginseng) and T3 (6g ginseng), followed by T1 (2g ginseng), with the highest mortality observed in the control group. Ginseng inclusion in poultry diets enhances the immune function by increasing lymphocyte levels as previously observed in broilers and laying hens (llsely *et al.*, 2005; Ao *et al.*, 2011). This benefit is primarily due to the specific effects of saponins which is the main bioactive ingredient in ginseng, on immune system. Kim *et al*. (2014) also found that supplementing broiler diets with 3% red ginseng marc markedly decreased mortality.

Table 3: The result of the effect of Korean ginseng inclusion on haematological indices of broiler birds

Parameters	T1	T2	T3	T4	P
HB (%)	9.12±0.65	7.73±0,=.41	7.92±0.60	8.63±0.59	NS
PCV (%)	28.75±0.75^{a}	22.25±0.75^{b}	24.50±2.50^{ab}	24.50±0.50^{ab}	*
RBCC(10^6/µ)	3.44±0.38	3.33±0.37	2.64±0.07	3.75±1.06	NS
TWBCC (10^6/µ)	69.00±1.00	74.00±12.00	60.00±18.00	86.50±39.50	NS

^{abc} Means on the same row with different superscript are significantly ($p < 0.05$) different.
*=Significant. T1 = 0g of ginseng, T2= 2g of ginseng, T3= 4g of ginseng, T4= 6g of ginseng. TWBCC= total white blood cell counts, RBCC= red blood cell counts, HB= haemoglobin, PCV=packed cell volume.

Hematological profile refers to those indices associated with blood and blood-forming organs which serve as tools for the assessment of the health and physiological status of farm animals. They are influenced by nutrition, environment, breed, and the clinical conditions of the animal (Adeyemo, and Sani. 2013). The blood serves as a pathological reflector of the condition of an animal exposed to toxicants and other environmental stressors (Olafedehan *et al.*, 2010). It is a means of assessing clinical and nutritional health of animals in feeding trials (Agbede and Aletor 2003).

The result above shows there was no significant difference ($P>0.05$) between treatments on total white blood cell counts (TWBCC), red blood cell count (RBCC) and haemoglobin (HB) values. However, significant difference ($p<0.05$) was observed among treatments on Packed cell volume of broilers fed Korean ginseng. A decrease in packed cell volume is an indication of liver and kidney diseases (Demoranvilles and Best, 2013). However, the values obtained from this study were within the range (21.25 – 30.45) reported by Aguihe *et al*. (2014). Result shows there was no effect of ginseng on white blood cell counts and red blood cell counts. This is in line with the result of (Tolba, 2015) who reported that inclusion of ginseng in the diet of broilers had no significance effect on red blood cell and white blood cell. The observed non-significant difference in the

measured hematological indices clearly indicates that ginseng was not toxic, and hence had no negative effect on the health and physiological condition of the birds.

However higher RBCC was observed in T4 (6g), indicating that ginseng inclusion may have accelerated red blood cell formation from the bone marrow.

Conclusion

Our findings revealed that inclusion of Korean ginseng improved broiler growth performance. Dietary inclusion of ginseng at 4g and 6g improved feed conversion ratio, increased broiler weight gain, and reduced mortality to 0%.

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Quick Response Code

DOI:10.22192/ijarbs.2019.06.08.017

How to cite this article:

Amaefule, B.C., Uzochukwu, I. E., Ezema, N.C., Egom, M.A., Ezekwe, M., Ndofor-Foleng, H.M, and Machebe, N.S. (2019). Growth performance and haematology of broiler birds fed diets containing Korean ginseng. Int. J. Adv. Res. Biol. Sci. 6(8): 120-125.

DOI: http://dx.doi.org/10.22192/ijarbs.2019.06.08.017