

EFFECT OF GARLIC (*ALLIUM SATIVUM*), GINGER (*ZINGIBER OFFICINALE*), AND THEIR COMBINATION ON THE PERFORMANCE OF BROILER BIRDS

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ABSTRACT

This experiment was carried out to determine the effect of garlic (*Allium sativum*), ginger (*Zingiber officinale*), and their combination as immune booster on performance of broiler chickens. In a completely randomized design a total of one hundred and fifty (150) day old broiler chicks of Marshall Strain were randomly allotted into three replicates of 10 chicks/replicate (n = 30) used for the experiment. Four experimental diets were formulated in such a way that control diet (T1) contained neither ginger nor garlic. Birds in T2 were fed diet containing 2% garlic, while those in T3 were fed 2% ginger. Birds in T4 were fed combination of 1% of garlic and 1% ginger. Birds in T1 were administered vaccines (Lasota and Gumboro), while the rest treatments were not vaccinated. The experiment lasted eight weeks. Results showed that there were no significant differences in all the performance parameters measured except in feed conversion ratio (FCR). Birds fed in T4 had the best (1.82) feed conversion ratio, while the least (2.00) was recorded in birds fed garlic (T2). Birds fed combination of the test ingredients had the best (2003.21g) final body weight, followed by those fed control diet (T1) (1907.83g), while the least (1885.47g) was recorded in those fed garlic (T3). No mortality was recorded in birds fed combination of garlic and ginger while, those fed control diet had the highest. It can be concluded that the test ingredients improved the immune system of the birds.

Key words: Performance, garlic, ginger, immune, broiler

INTRODUCTION

Antibiotic growth promoters (ABGPs) have been intensely used in broilers diets to improve their productivity. However, many countries have currently banned the use of these growth promoters (drugs and antibiotics) due to the side effects on animals and humans (Khachatourian, 1998). Search for alternatives to the growth promoters has arisen in animal production practices, especially in the use of additives of plant origin which are natural and safe to consumers (Soliman, 2003). Garlic and ginger can be used as natural growth promoters for their antimicrobial, antifungal, antibacterial, anti-protozoal, immuno-modulatory, anti-inflammatory, hypoglycemic and cardiovascular protecting effects (Zhang *et al.*, 2009). It was on the above that the study investigated the effect of garlic, ginger and their combination on the performance of broiler chickens.

MATERIALS AND METHODS

Experimental site

The experiment was conducted at the Poultry Unit of the Teaching and Research Farm, Ibrahim Badamasi Babangida University, Lapai Niger State. The area is located in the Guinea Savannah, Middle Belt of Nigeria. It lies on longitude 9.02°N and latitude 6.3°E of the equator with an average temperature range of 21°C – 36.5°C and a rainfall range of 1100-1600mm (Usman, 2013).

Source and processing of test ingredients

Garlic and ginger were purchased at Kure Modern Market in Minna, Niger State. Garlic bulbs were peeled manually and both (ginger and garlic) were cut into smaller pieces after the removal of fibrous material (ginger) and dry scales (garlic). They were crushed using pestle and mortar, and later air dried. After drying, they were ground, passed through 1mm sieve and later mixed with other ingredients.

Experimental diets

Four diets containing approximately 23 and 21% crude protein in starter and finisher diets respectively were formulated for the experiment (Table 1). The Metabolizable energy for both starter and finisher diets was 2877.37 and 2917.04kcal/kg respectively. The diets were formulated in such a way that control diet (T1) contained neither ginger nor garlic. Birds in T2 were fed diet containing 2%

garlic, while those in T3 were fed 2% ginger. Birds in T4 were fed combination of 1% of garlic and 1% ginger.

Table 1: Gross composition of broiler starter and finisher diets

Ingredient (%)	Starter				Finisher			
	Control	Garlic	Ginger	Combination	Control	Garlic	Ginger	Combination
Maize	54.40	52.40	52.40	52.40	56.40	54.40	54.40	54.40
Groundnut cake	31.90	31.90	31.90	31.90	26.40	26.40	26.40	26.40
Wheat offal	5.00	5.00	5.00	5.00	10.50	10.50	10.50	10.50
Fish meal	5.00	5.00	5.00	5.00	3.00	3.00	3.00	3.00
Bone meal	0.50	0.50	0.50	0.50	2.00	2.00	2.00	2.00
Limestone	2.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00
Premix	0.50	0.50	0.50	0.50	0.25	0.25	0.25	0.25
Common salt	0.50	0.50	0.50	0.50	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Garlic	0.00	2.00	0.00	1.00	0.00	2.00	0.00	1.00
Ginger	0.00	0.00	2.00	1.00	0.00	0.00	2.00	1.00
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Calculated:								
Crudeprotein(%)	23.60	23.90	23.90	23.67	20.69	20.93	20.93	20.94
Metabolizable energy (kcal/kg)	2903.06	2893.94	2893.94	2878.07	2869.71	2859.91	2859.93	2860.34

T1 = control diet, T2 = diet + garlic, T3 = diet + ginger, T4 = diet + garlic + ginger

Experimental birds and management

One hundred and twenty day old broiler chicks were used for the study. In a completely randomized design (CRD), the birds were divided into four treatments of 30 birds each and 10 chicks per replicate. Prior to the arrival of the chicks, the pens were washed and disinfected using IZAL[®] solution and the floor of the pen was covered with wood shavings. The experiment lasted eight (8) weeks. On arrival, the chicks were served experimental diets and clean water containing anti-stress (Vitalyte[®]). The chicks were allocated into four treatments (T1, T2, T3 and T4). On the 10th day, chicks fed control (T1) were administered Infectious Bursal Diseases (IBD) (Gumboro) vaccine via drinking water, and on the 21st day, they were administered Newcastle Disease Vaccine (Lasota) via drinking water. On the 35th day, the infectious bursal disease vaccine was repeated. At the fourth week, Coccidiostat (Amprolium[®]) was administered for 3-5 days. The above vaccines were administered only to the chicks in T1.

Data collection

Feed intake was recorded on weekly basis. It was the total amount of feed consumed by the birds within the week minus the left over at the end of the week. The birds were weighed on weekly basis. Initial weight was subtracted from the final weight to get the body weight gain. Feed conversion ratio was calculated at the end of each week as:

$$\text{Feed conversion ratio} = \frac{\text{Feed consumed (g)}}{\text{Body weight gain (g)}}$$

The number of birds that were alive at the expiration of the experiment was recorded and expressed as percentage (%) of the total number of stocked birds.

$$\text{Survival (\%)} = \frac{\text{Number of survived birds}}{\text{Number of stocked birds}} \times 100$$

Statistical analysis

Data collected were subjected to one-way analysis of variance (ANOVA) according to the procedure of Steel and Torrie (1980). The significant means were separated using Duncan's Multiple Range Test (Duncan, 1955) at 5% probability level.

RESULTS AND DISCUSSION

Table 2 showed the results of the performance characteristics of broiler chickens fed garlic, ginger and their combination. Birds in T4 recorded no mortality while the highest mortality was recorded in T1. There were no significant ($p>0.05$) differences among the treatments in all the parameters studied in this trial except the feed conversion ratio (FCR). Birds in T4 had the best (1.82) feed conversion ratio, followed by those in T1 (1.95), T3 (1.96), and lastly by those in T2 (2.00) as far as this study is concerned. Birds in T4 had the highest (2003.21g) final weight gain and mean daily body weight gain of 35.77g, followed by birds in T1 (1907.83g) with mean daily body weight gain of 34.07g. Birds in T3 had the lowest mean final weight of 1885.47g with mean daily body weight gain of 33.82g. Birds in T2 had the highest (3778.91g) feed intake while, those in T4 had the lowest (3653.90g). The mean daily feed intake followed the same pattern as in feed intake.

Table 2: Performance characteristics of broilers fed test ingredients as immune booster

Parameter (g)	Control	Garlic	Ginger	Combination	<i>p</i> value
Initial body weight	37.00	36.00	35.00	34.00	0.69
Final weight	1907.83	1894.06	1885.47	2003.21	0.35
Mean daily body weight gain	34.07	33.82	33.67	35.77	0.44
Mean Feed intake	3721.79	3778.91	3686.56	3653.90	0.77
Mean daily feed intake	66.46	67.48	65.83	63.46	0.55
Feed conversion ratio (FCR)	1.95 ^b	2.00 ^c	1.96 ^b	1.82 ^a	0.04
Survival (%)	86.67	93.33	93.33	100.00	-

^{abc}: Means with different superscripts are significantly ($p<0.05$) different. T1 = control diet, T2 = diet + garlic, T3 = diet + ginger, T4 = diet + garlic + ginger

The supplementation of garlic and ginger diets fed alone in the birds does not exert any significant effect on FCR as compared to control. Results obtained in this study for the final weight showed that combination of garlic and ginger (T4) improved the growth of the birds at the inclusion rate better than treatments where ginger and garlic were used singly. These results contradicted the findings of Aji *et al.*, (2011) who has reported non-significant effect of garlic on FCR. These results did not corroborate with the reports of Ademola *et al.* (2009) and Thayalini *et al.* (2011), who did not observe any significant improvement in the feed conversion ratio of broilers fed on a diet containing ginger powder as compared to the control group. The mean feed intake of the experimental birds showed no significant ($p>0.05$) differences. It showed that there was no effect of smell or taste of garlic and ginger on the palatability of feed in the broiler diets. Total body weight gain (g) of experimental birds fed with combination of garlic and ginger T4 showed higher value as compared to other treatments. Similar and slightly different results were reported by Zhang *et al.* (2009). Improvement in final weight and mean daily body weight gain of broiler chicks fed combination of garlic and ginger might be due to the active components in the test ingredient which stimulate digestive enzymes and improve overall digestion and thus led to increase of both parameters. Survival percent showed that the antimicrobial, antibacterial, antiviral, anti-protozoal and antifungal properties of both ginger and garlic were in action. These agreed with the reports of Rahman (2001) and Ogbuewu *et al.* (2019) that both ingredients lowered mortality and increase livability.

CONCLUSION AND RECOMMENDATION

It was concluded that the use of garlic, ginger and the combination of garlic and ginger can be used to improve growth performance of broiler birds at 20g/kg of feed, and reduced mortality rate. Though there were no statistically significant differences observed among the birds fed the different diets, but T4 (combination of garlic and ginger) recorded no mortality, and higher final weight compared to T1, T2 and T3, it is therefore, recommended that combination of garlic and ginger be used to improve broiler growth. However, further research work is recommended.

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