

EFFECT OF GARLIC (*ALLIUM SATIVUM*) ON GROWTH PERFORMANCE AND haematological INDICES OF BROILER CHICKENS

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ABSTRACT

This study was conducted to evaluate the effect of garlic on growth performance and haematological indices of broiler chickens. A total number of 72-day-old chicks were allotted to four experimental groups in a completely randomized design, and fed graded levels (0g, 2g, 3g, and 5g) of garlic (*Allium sativum*) for eight weeks (56 days). The experimental groups which were designed as treatments T₁, T₂, T₃; and T₄, respectively were further replicated three times with six birds per replicate so that each group had a total of 18 birds. Treatment one which contained 0% garlic served as the control. Growth parameters that were determined were final live weight, feed intake and feed conversion ratio. At the end of the feeding trial, blood samples were collected from the birds of each treatment group to evaluate the blood profile. The results showed that there was a significant ($P < 0.05$) difference in growth performance. There were significant ($P < 0.05$) variations in all the parameters evaluated except packed cell volume and red blood cell. Results on haematological parameters of the broiler chickens showed a general increase in PCV, Hb, WBC, RBC and MCHC of broiler chickens fed garlic diets. Diet T₄ had the best weight gains and feed conversion ratio. The current findings indicated that garlic can help in the development of strategies to mitigate disease outbreak in broiler production without any adverse effects on growth performance.

Keywords: Garlic (*Allium sativum*), Additive, Broiler, Feed Security, Ingredients

INTRODUCTION

Garlic has been used for centuries in various cultures for its believed health benefits, making it a common dietary supplement for humans and potentially for poultry too. Garlic has a long history of use, modern research is just beginning to understand its effects on poultry health, with conflicting findings that need further investigation. Poultry birds; can suffer from diseases like cardiovascular disorders and metabolic syndrome; so, exploring garlic's potential to improve blood and body chemistry could offer new ways to prevent and manage these conditions. Understanding how garlic affects poultry birds' health markers is crucial for informing farmers and veterinarians about its potential benefits and risks, so they can make decisions about using garlic in poultry diets. Incorporating feed resources in livestock feed for sustainable feed security and circular economy in Africa is imperative (Prince, *et al.*, 2023). Garlic has been demonstrated to reduce the expanding range of pathogenic microorganisms in the poultry digestive tract, thereby leading to the birds' rapid growth due to increased feed conversion ratio, good health, and enhanced immunity (Kumar *et al.* 2020). Garlic has positive effects on haematological indices, but its mechanisms behind these effects are yet not known. It contains an active ingredient called Allicin, diallyl disulphide-oxide which is released from garlic (alliin) as a systemic vasodilator (Sang *et al.* 2023). Garlic preparation indicated significant decrease in diastolic blood pressure in severely hypertensive cases (McMahon and Vargas, 2023). Ether extracts of garlic and partially purified distilled extracts of garlic have been reported to inhibit human platelet aggregation in vitro (Apitz-Castro *et al.* 2023). Despite garlic's widespread use, there are concerns about its safety and effectiveness, especially in poultry. Therefore, this study was designed to evaluate low garlic (*Allium sativum*) inclusion as a safe additive for growth promoting agent in broiler chickens.

MATERIALS AND METHODS

Experimental site

The research was conducted at the Teaching and Research farm, Department of Animal Science, Faculty of Agriculture, Alex Ekwueme Federal University Ndufu-Alike, Ebonyi State.

Sources of experimental material

Garlic bulbs were sourced from a local farm, and the bulbs were removed from the plants, sorted, cleaned with water, and sprayed under the sun for 1-2 weeks. The garlic bulbs were grounded using grounding machine. They were dried up to 12-13% moisture content. It was stored for mixing with other ingredients.

Experimental diet

Four diets (T₁, T₂, T₃, and T₄) were formulated; Diet T₁, the basal diet served as control (without garlic powder inclusion). The other three experimental Diets T₂, T₃ and T₄ contained 2g, 3g and 5g garlic powder meal inclusions per 1kg diet, respectively

Ingredients Composition of Experimental Diets for Broiler Chickens

Ingredients	T ₁	T ₂	T ₃	T ₄
Garlic (additive)	0.0g	2.0g	3.0g	5.0g
Maize	50.00	50.00	50.00	50.00
Wheat offal	10.00	10.00	10.00	10.00
Palm Kernel cake	10.00	10.00	10.00	10.00
Soybean meal	23.00	23.00	23.00	23.00
Fish meal	3.00	3.00	3.00	3.00
Bone meal	3.00	3.00	3.00	3.00
Salt	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
Vitamins premix	0.25	0.25	0.25	0.25
Total	100	100	100	100
Cal. Chemical Composition (%)				
Energy (kcal/kg)	2888.33	2887	2886.35	2886
Crude protein (CP)	21.28	21.84	21.90	21.94

Premix content to be used will contain: Folic Acid, Biotin, Choline chloride, Cobalt

Experimental animals and management of the broiler chickens.

Seventy-two days old chicks were used for this experiment. Each bird was weighed before the commencement of the experiment and weekly throughout the experiment period. The birds were randomly allotted to four dietary treatments in a completely randomized design (CRD). The birds were raised in deep litter and other management practices were adopted (Makinde, *et al.*, 2017). The experiment lasted for eight weeks (56 days). Water and feed were provided *ad-libitum*. Diets were formulated to meet nutrient requirements for starter and grower broiler chickens.

Statistical analysis

All data obtained were statistically analysed. The data collected were subjected to analysis of variance (ANOVA) as outlined by (Snedecor and Cochran, (2005). Duncan's New Multiple Range Test as outlined (by Obi, (1990) was used to separate the means.

Collection of blood samples and analysis

Blood (2mLs) was collected from three birds of each replicate via wing vein. Samples collected were put in a sterile bottle tube containing Ethylene Diaminetetra-acetic acid (EDTA) as anticoagulant to prevent blood clotting before the analysis. Packed cell volume (PCV) and haemoglobin count were determined as described (by Mitruka and Rawnsely (1977). Serum albumin and protein were analysed using sigma kits determined spectrophotometrically.

Results and Discussion**Table 1: Proximate Composition of Garlic as Additive in Broiler Diets**

Parameters (%)	Garlic
Dry Matter (DM)	74.03
Crude Protein (CP)	12.63
Crude Fibre (CF)	2.65
Ether Extract (EE)	4.02
Total Ash	4.05

The results show that there were marked ($P < 0.05$) variations in the final body weights of the broilers chickens among the treatment groups. Birds fed garlic diets (T₄) showed significantly ($P < 0.05$) superior final body weights and improved feed conversion ratio than birds fed control diets. The findings are in line with that of Hayat *et al.*

(2022), who found that incorporating garlic powder to the basal diet of broilers improved growth performance. Similar findings were reported by Sheoran *et al.* (2017), who claimed that birds fed a diet supplemented with garlic improved body weights gain of broiler chickens. This is indication that garlic contains active compounds capable of substituting the role of synthetic antibiotics used in poultry production.

Table 2: Performance Characteristics of broiler Chickens fed the Experimental Diets

Parameter (g)	0g (garlic)	2g (garlic)	3g (garlic)	5g (garlic)
Initial Weights (g)	147.92 ^a	143.75 ^a	150.00 ^a	147.92 ^a
Final Weights (g)	2139.58 ^b	2148.75 ^b	2373.75 ^a	2387.34 ^a
Feed Intake (g)	3018.34 ^b	3026.67 ^b	3034.17 ^a	3052.06 ^a
Feed Conversion Ratio	3.07 ^a	3.15 ^a	2.77 ^b	2.65 ^b

a, b, Means with different superscripts along the same row are significantly ($P < 0.05$) different.

Table 3: Haematology of Broiler Chickens fed the Experimental Diets

Parameters	T ₁ (0g)	T ₂ (2g)	T ₃ (3g)	T ₄ (5g)
Haemoglobin Conc. (g/100ml)	8.91 ^b	8.80 ^b	9.00 ^a	9.10 ^a
Packed Cell Volume (%)	28.90 ^a	29.50 ^a	29.10 ^a	29.08 ^a
White Blood Cell (x 10 ⁹ /L)	9.80 ^b	8.50 ^b	10.50 ^a	10.20 ^a
Red Blood Cell (x 10 ¹² /L)	1.90 ^a	1.85 ^a	2.30 ^a	1.90 ^a
M. C.H. Conc. (g/L)	614.00 ^b	619.00 ^b	659.00 ^a	633.00 ^a

a,b, Means with different superscripts along the same row are significantly ($P < 0.05$) different.

There was no significant ($P > 0.05$) variation in PCV and red blood cell (RBC) of birds fed garlic diets T₂, T₃, and T₄, respectively. The white blood cell and mean cell Haemoglobin concentration values of birds fed garlic diets (T₃ and T₄) were significantly ($P < 0.05$) higher than the control (T₁) 0%. The result for the packed cell volume and red blood cells although not significantly different among the treatments showed that as the level of inclusion of test ingredient increased, the value obtained for those parameters increased. This increased packed cell volume which is an indication of the nutrients absorption, transportation of oxygen and has prevented anaemia which resulted in the increase in the white blood cell and mean cell Haemoglobin concentration values of T₃ and T₄ diets. Thus, result indicated that the immune system of the birds was not compromised because the white blood cells function primarily as defence system in the body (Eroschenko, 2000).

CONCLUSION

Based on the current findings, 5g of garlic powder enhanced growth performance and improved health of the birds. It is therefore suggested that, 5g of garlic powder as an additive growth promoter should be included in diets of broiler chickens in commercial production while future research should focus on the best way of processing to avoid losing its efficacy.

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