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THEME
SECURING ANIMAL AGRICULTURE AMIDST GLOBAL CHALLENGES

EFFECT OF GRADED LEVELS OF GARLIC (*Allium sativum L.*) SUPPLEMENTATION ON GROWTH PERFORMANCE AND NUTRIENT DIGESTIBILITY OF BROILER CHICKENS

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Abstract

The effect of graded levels of garlic (*Allium sativum l.*) supplementation on growth performance and nutrient digestibility of broiler chickens was investigated. One hundred and twenty day-old broiler chicks of Arbor acre strain were assigned to four treatment groups each replicated thrice with ten chickens per replicate in a completely randomized design. Chickens in treatment one were fed the control diet while other treatment groups were fed diets containing graded levels of garlic (*Allium sativum l.*) supplementation. Fresh garlic bulbs were processed by removal of the outer coating using a knife, after which they were chopped into small pieces, shade dried and later ground into fine particles. Garlic was supplemented in the diets at graded levels of 0.0, 1.0, 1.5 and 2.0% in treatments T₁, T₂, T₃ and T₄ respectively. Parameters measured were initial weight, final weight, weight gain and feed intake. Feed cost per gain was calculated while mortality was recorded as it occurred. At the end of the finisher phase, apparent digestibility was determined using three chickens selected from each replicate. Results showed that there was a non-significant ($P < 0.05$) increase in weight gain across the treatments. However, it improved by 3.8% at 2.0% level of garlic supplementation. Feed intake increased by 3.24% at 1.5 and 2.0% levels of garlic supplementation. Nutrient digestibility significantly ($P < 0.05$) increased as the levels of garlic supplementation increased in the diets. The study concluded that garlic can be supplemented in broiler diets at 2.0% for its slight improvement in growth performance.

Keywords: garlic, broiler, supplementation, performance, digestibility

Introduction

Antibiotics have been used widely to prevent infections and poultry diseases as well as for improvement of meat and egg production, thus reducing mortality in farm animals. However, the use of antibiotics is restricted due to drug resistance by bacteria in the gut which may cause alteration of natural gut micro flora (Botsoglou *et al.*, 2002). Garlic is a natural growth promoter that is a potential alternative for antibiotics (Demir *et al.*, 2003). Garlic has been used as a spice and a native medicine for many years. It has been indicated to possess antibacterial, antifungal, antiparasitic, antiviral, antioxidant, anti-cholesteremic, anticancerous and vasodilatory properties (Hanieh *et al.*, 2010). This study focused on evaluating the growth performance and apparent nutrient digestibility of broiler chickens fed diets containing graded levels of garlic supplementation.

Materials and Methods

Experimental Site

The experiment was carried out at the Teaching and Research farm, in the poultry unit, of the Department of Animal Technology, Federal College of Forestry, Jos-Plateau state. The farm is located on latitude 9° 56'49.0" N and longitude 8° 53'34.1" E, at an altitude of 1250m above sea level. The temperature of the area ranges between 21-25°C depending on the season (FCF, 2019).

Source of Broiler Chicks

One hundred and twenty (120) day old broiler chicks of Arbor Acre strain were sourced from Agrited hatchery located in Ibadan, Oyo state, Southwestern Nigeria.



Source and Processing of fresh garlic bulbs

Raw Garlic cloves were bought from new market in Jos metropolis, Plateau state. They were processed by removal of the outer coating using a knife, after which they were chopped into small pieces, shade dried and later ground into fine particles.

Experimental Design and Management of Chickens

One hundred and twenty (120) day old broiler chicks of Arbor Acre strain were used for the experiment. The chicks were weighed to obtain their initial weights and randomly allotted to four dietary treatments each replicated thrice with ten (10) chickens per replicate in a completely randomized design (CRD). The treatment group was designed as T₁, T₂, T₃, and T₄. All management practices ideal for broiler chickens were strictly practiced.

Experimental diets

Four iso-caloric and iso-nitrogenous broiler finisher diets having 3000kcal/kg ME and 20% CP were formulated to meet the nutrient requirement of the chickens.

The following ingredients were used for formulation of the diets; maize-62.90kg, GNC-6.00kg, soya cake-24kg, blood meal-0.20kg, bone meal-2.90kg, limestone-1.20kg. garlic-0.0,1.0,1.5 and 2.0 for treatments T₁, T₂, T₃ and T₄ respectively.

Result and Discussion

Performance of Broiler Finisher Chickens Fed Diets Containing Graded Levels of Garlic

Supplementation (6-9weeks)

Performance of broiler finisher chickens fed diets containing graded levels of garlic supplementation is presented in Table 1. Chickens in the control group (0.0%) and those fed 1.5 and 2.0% garlic based diets showed significantly (P<0.05) higher final weight compared to chickens fed diet containing 1.0% level of garlic supplementation. Although final weight was found to increase up to 2.0% level of garlic supplementation, it was similar to the control group. This is indicative that garlic did not show marked effect on productive parameter such as final weight and weight gain. This negates the report of Shi *et al.* (1998) who reported increase in body weight gain in broiler chickens. However, it agrees with the report of Ari *et al.* (2012) who found no effect of garlic supplementation on broiler weight gain.

There was significantly (P<0.05) higher feed intake among chickens fed 1.0 and 2.0% dietary levels of garlic supplementation which was followed by those fed 1.5% garlic based diet. Chickens in the control group (0.0%) showed the least feed intake. The highest percentage mortality was observed among chickens fed diet containing 1.5% garlic supplementation. This was followed by chickens fed 2.0% dietary garlic supplementation while no mortality occurred in the other treatments.

Table 1: Growth Performance of Broiler Finisher Chickens Fed Diets Containing Graded Levels of Garlic Supplementation (6-9 weeks)

Parameters	Levels of Garlic (%)				SEM
	0.0	1.0	1.5	2.0	
Initial weight (g/bird)	1081.88	1111.52	1141.94	1143.33	35.47
Final weight (g/bird)	2334.28 ^a	2070.39 ^b	2150.74 ^a	2483.59 ^a	169.84
Weight gain (g/bird)	1252.50 ^{ab}	957.90 ^b	1008.50 ^b	1338.90 ^a	163.78
Feed intake (g/bird)	3030.00 ^c	3232.00 ^a	3131.00 ^b	3333.00 ^a	71.42
Feed conversion ratio	2.43 ^a	3.58 ^b	3.14 ^a	2.72 ^a	0.36
Feed costs/kg gain (₦/kg)	545.10	795.90	754.60	644.40	83.65
Mortality (%)	0.00	0.00	6.66	3.33	N/A



a, b, c=Means with different superscript on the same row differ significantly (P<0.05), N/A = not analysed, SEM= Standard error of mean, g/bird= gram per bird, %= Percentage, ₦/kg= Naira per kilogram

Nutrient Digestibility of Broiler Chickens fed Diets Containing Graded Levels of Garlic Supplementation

The apparent nutrient digestibility of broiler chickens fed diets containing graded levels of garlic supplementation is presented in Table 2. There were significant (P<0.05) differences in all parameters investigated.

Nutrient digestibility in all parameters were significantly (P<0.05) higher among chickens fed 2.0% garlic based diets followed by those fed diets containing 1.5% garlic supplementation. Nutrient digestibility was poor (P<0.05) in chickens fed 0.0 and 1.0% garlic based diets. Thus, as the levels of garlic supplementation increased there was significant (P<0.05) corresponding increase in apparent nutrient digestibility.

According to Peinado *et al.* (2013), compounds found in garlic increased nutrient digestibility and the activity of intestinal mucosa enzymes, and concluded that they may represent an alternative to antibiotics in broiler nutrition.

Table 2: Nutrient Digestibility of Broiler Chickens fed Diets Containing Graded Levels of Garlic Supplementation

Parameters (%)	Levels of garlic (%)				SEM
	0.0	1.0	1.5	2.0	
Dry matter	69.98 ^c	70.00 ^c	77.00 ^a	75.00 ^b	0.01
Crude protein	71.83 ^c	71.85 ^c	76.26 ^b	77.12 ^a	0.01
Crude fibre	67.37 ^c	67.38 ^c	72.65 ^b	73.71 ^a	0.01
Ether extract	69.86 ^c	69.88 ^c	75.24 ^b	78.26 ^a	0.01
Ash	70.28 ^c	70.29 ^c	76.31 ^b	77.96 ^a	0.01
Nitrogen free extract	66.99 ^c	67.00 ^c	74.00 ^b	75.00 ^a	0.01

a, b, c=Means with different superscript on the same row differ significantly (P<0.05), SEM= Standard error of means, %= percentage

Conclusion

The study observed that garlic supplementation in broiler diets at 0.0, 1.0, 1.5 and 2.0% did not remarkably improve growth performance in broiler chickens but improved nutrient digestibility. It is unclear why the trend observed in apparent nutrient digestibility did not clearly improve growth performance during the feeding trial. The study concluded that garlic can be supplemented in broiler diets at 2.0% for its slight improvement in growth performance. Hence, it's utilization in broiler diets may be for its possible therapeutic benefits as opined by several authors rather than growth performance.



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Recommendations

1. It may be possible that growth performance may increase at higher levels of garlic supplementation beyond 2.0% as weight gain numerically increased up to the highest level of garlic supplementation (2.0%). Hence, it is recommended that higher levels of garlic supplementation above 2.0% should be utilized in broiler diets to determine its effect on growth performance.
2. Other herbs having similar phytochemical constituents as garlic can be utilized in combination with garlic to ascertain their combined nutritive value on performance of broiler chickens.

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