
EFFECT OF DIETARY QUERCETIN ON GROWTH PERFORMANCE OF BROILER CHICKENS

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ABSTRACT

This research work was carried out to ascertain the effects of dietary quercetin on growth performance of broiler birds at different levels of inclusion. A total of 150 14-day old Arbor Acres broiler birds were randomly divided into five treatment groups in a complete randomized designed (CRD) with thirty birds each. Each treatment had three replicates with 10 broiler birds. The treatments include: (T1 = 0.0mL, T2 = 0.1mL, T3 = 0.3mL, T4 = 0.5mL of quercetin/kg diet, and T5 = 1g oxytetracycline) per kg of feed. Parameters measured and determined were growth parameters. Data collected were subjected to statistical analysis of variance (ANOVA) while significant means were separated using Duncan new multiple range test. Birds on treatment 4 fed 0.5mL/kg of feed had the highest value of final body weight (FBW) 3998.00g, total weight gain (TWG) 3583.67g and average daily weight gain (ADWG) 85.33g with improved FCR of 1.68 and least feed cost per kg weight gain of N571.20 than other treated groups. Dietary quercetin supplementation in this experiment has shown to improve growth performance of broilers birds especially at 0.5mL quercetin/kg inclusion level.

Keywords: Dietary, growth, gut, broiler, quercetin,

INTRODUCTION

European Union legislation prohibits the use of certain antibiotics in poultry production due to potential health risks to humans after consumption. Drug residues have been found in animal products as a result of the misuse of antibiotics (Gonzalez *et al.*, 2017). Recent development in poultry production has attracted a lot of researches in poultry industry on the use of alternatives to Antibiotics. The neem plant is a perennial plant in which many researches has been carried out on basically because of its medicinal value such as anti-microbial effect, antifungal effects and anti-bacterial effects (Ezzat *et al*, 2018).The flavonoid quercetin, which belongs to the flavonol class, is present in neem (*Azadirachta indica*) and has been shown to lessen oxidative stress at the cellular level (Arsgar, 2015). This may enhance cellular integrity and genomic stability, as well as enhance immunity and gut health, all of which may lower the risk of infectious diseases and improve animal performance (Arsgar, 2015). It is evident that some of these beneficial phytochemicals in neem may not be properly absorbed when used together because of the masking effect of some anti- nutritive factors. Therefore this study was aimed at finding the effect of using the extracted flavonoid quercetin on broiler bird's production._

MATERIALS AND METHODS

Location of the study and duration:

This study was carried out at the Poultry Unit at Animal Science Farm, Department of Animal Science Teaching and Research Farm, University of Nigeria, Nsukka. Nsukka is position in the latitude 7°24E and longitude 6°25N. The climate of the study area is typically tropical, with relative humidity ranging from 65 to 80% and mean daily temperature of 26.8°C (Okonkwo and Akubuo, 2007).The study lasted for eight (6) weeks.

Extraction method of dietary quercetin from neem leaves

Freshly neem leaves were harvested from neem plants within the University of Nigeria Nsukka and its environs. The compound was extracted from the neem leaves by methods described by Pongtip (2006) . Decoction: Fresh leaves of neem tree were immersed in distilled water and boiled for 6 hours. This was later filtered and the filtrate was evaporated for concentrating the extract. Maceration: Fresh leaves were dried in hot air oven, powdered and mixed with 20%, 50% and 80% ethanol respectively, then keep at Room temperature for 7 days. This was later filtered and evaporated for further concentration. 2kg of the grounded neem leaves were measured and put inside 50Litres of

gallon and soaked with 2Litres of analytical methanol and closed with a tight cover. The soaked grounded neem leaves were left for seventy-eight hours and filtered. The filtrate was collected using a clean dried bottle which was evaporated using rotary evaporator as the volatile methanol escaped into air leaving behind dietary quercetin that was in a jelly form.

Experimental animals and management

A total of 150 14-day-old Arbor acres broiler chicks of both sexes were used for the experiment. The birds were randomly allotted to five treatments, thirty birds per treatment. The animals were further divided into three replicates with 10 birds per replicate in a completely randomized design (CRD). The feeding strategy consisted of starting (0-28 days) and finishing (29-42 days) basal diets (BD). The dietary quercetin was administered to the birds 4 times in a week. The different levels of dietary quercetin used in the various treatments are listed below:

T1 = Control, T2 = 0.1mL of dietary quercetin/Kg of feed, T3 = 0.3mL of dietary quercetin/Kg of feed, T4 = 0.5mL of dietary quercetin/Kg of feed and T5 = 1g of Oxytetracycline/Kg of feed (used as Positive control). Feed and water were supplied *ad libitum* to the birds. Vaccinations and other management practices were strictly followed.

Proximate analysis

The proximate composition of the feed sample was determined according to the Association of Official Analytical Chemists methods (AOAC, 2005)

Parameters measured

The following parameters were measured and determined:

Weekly body weight: the weights of the birds were taken on a weekly basis with the aid of a top weighing balance. **Weight gain:** this was calculated by difference between two consecutive weighing.

Daily feed intake: this was obtained from the difference between the quantity of feed offered and that of the leftover from the previous day divided by the number of birds per treatment. **Feed conversion**

ratio: this was calculated as the ratio of feed intake per bird to that of weight gain per bird

Statistical analyses

Data collected were subjected to analysis of variance (ANOVA) for completely randomized design (CRD) using a statistics package for social sciences (SPSS 2015) model. Significantly different means were separated using Duncan's New Multiple Range Test (SPSS, 2015)

RESULTS AND DISCUSSION

Growth performance of broiler birds fed varying levels of dietary quercetin is shown in table 2.

Result showed that birds on diet in treatment 4 had significantly ($P<0.05$) higher total weight gain (3583.67g) and ADWG (85.33g) than other treatments. Birds on T1 (control) had significantly ($P<0.05$) higher TFI, ADFI, FCR, FC/Kg/gain, and FC (8201.33g, 195.27g, 2.68, 911.20g and ₦2788.45 respectively) than those on quercetin diets and T5. The results of the study showed that birds on quercetin diets had similar ($P>0.05$) TFI, ADFI, FCR, PER, FCKG and FC values with that of birds on positive control diet.

Table 1: The proximate composition of the experimental diets used

Chemical Composition	Starter diets	T2	T3	T4	T5	Finisher diets	T2	T3	T4	T5
	T1					T1				
Moisture	10.00	11.60	9.60	10.20	8.40	8.60	9.60	8.40	8.40	7.20
Crude protein (%)	21.56	22.00	21.96	21.78	21.89	21.15	22.85	21.08	22.00	21.96
Ether extract (%)	3.00	3.00	4.00	3.00	3.00	5.00	1.00	4.00	3.00	5.00
Crude fibre (%)	5.03	5.05	5.00	4.98	5.01	5.05	5.00	5.07	5.03	5.02
Ash (%)	4.00	6.00	7.00	9.00	5.00	6.00	5.00	5.00	8.00	4.00
NFE (%)	51.01	48.35	47.44	41.04	49.7	53.20	49.55	53.45	49.57	51.82
CHO (%)	56.04	53.40	52.44	46.02	54.71	58.25	54.55	58.52	54.60	56.84

NFE= Nitrogen free extract, CHO= Carbohydrate

The significant increase observed on birds on quercetin treatments in FBW, TWG, and ADWG and PER appeared to be dose dependent. That is the parameters increases in value as inclusion of quercetin increases. This agrees with Sohaib *et al.*, (2015) who fed broiler chicks with 0.1, 0.2, or 0.3 g/kg plant derived quercetin containing diet and found an increase of body weight gain (BWG) and a decrease of FCR compared with those fed with the control diet. The enhancement of performance

parameters in our study was ascribed to the metabolic prebiotic effect of quercetin as reported by (Liu *et al.*, 2014). This compound has the capacity to modify the gut microbiota by elevating the quantity of advantageous bacteria, such as Lactobacilli, and lowering the quantity of *C. perfringens* and total coliform counts (a selective action that improves the health and performance of broiler chickens (Prihambodo *et al.* (2021).

Table 2: Growth performance of broilers fed varying levels of dietary quercetin.

Parameters	T1(0.0mL) quercetin	T2(0.1mL) Quercetin	T3(0.3mL) quercetin	T4(0.5mL) Quercetin	T5(1g) oxytetracycline	SEM	P. Value
IBW(g)	412.00	410.33	413.33	414.67	413.67	0.64	0.25
FBW(g)	3470.67 ^c	3689.67 ^b	3807.00 ^b	3998.00 ^a	3698.33 ^b	50.31	0.00
TWG(g)	3058.33 ^c	3279.67 ^b	3393.67 ^b	3583.67 ^a	3285.00 ^b	50.07	0.00
ADWG(g)	72.82 ^c	78.09 ^b	80.80 ^b	85.33 ^a	58.670 ^b	0.89	0.00
TFI(g)	8201.33 ^a	6569.33 ^b	6477.30 ^b	6027.67 ^b	6244.33 ^b	230.03	0.00
ADFI(g)	195.27 ^a	156.41 ^b	154.22 ^b	143.52 ^b	148.67 ^b	4.09	0.00
FCR	2.68 ^a	2.00 ^b	1.91 ^b	1.68 ^b	1.90 ^b	0.09	0.003
PER	3.17 ^b	3.40 ^a	3.51 ^a	3.71 ^a	3.40 ^a	0.09	0.003
FC/KG/GAIN	911.20 ^a	680.00 ^b	649.40 ^b	571.20 ^b	646.00 ^b	78.19	0.00
FC(%)	2788.45 ^a	2233.57 ^b	2202.28 ^b	2049.41 ^b	2123.07 ^b	33.77	0.00

^{abc}Means on the same row with different superscripts (<-0.05) different. SEM = standard error of the mean

CONCLUSION

The result of this research work revealed that the inclusion of dietary quercetin (neem flavonoids) in broiler's diet had beneficial effects on the growth performance of broilers. The study therefore recommends 05mL/kg inclusion of dietary quercetin to enhance broiler production.

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