

GROWTH PERFORMANCE AND ECONOMIC ANALYSIS OF BROILER CHICKENS FED *Ocimum gratissimum* and *Ocimum canum* LEAVES MEALS SUPPLEMENTED DIETS AS PHYTOBIOTICS

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Abstract

The study evaluated the growth performance and economic benefit of broiler chickens fed diets supplemented with *Ocimum gratissimum* and *Ocimum canum* leaves meals using 360 Cobb 500 broilers chicks allotted to six dietary treatment of 0g, 400g and 800g of *O. gratissimum*, 400g and 800g of *O. canum* leaves meals while oxytetracycline (oxytet) as recommended by the manufacturer was used as positive control. Birds were housed in a deep litter pen, feed and water were supplied *ad libitum*. Data were collected on growth parameters economic benefits. All data collected were subjected to analysis of variance and significant differences among treatment means were compared using Tukey procedures. The growth performance result showed high final weight, weight gained, feed intake and feeding efficiency in broiler chickens fed diets supplemented with *O. gratissimum*, *O. canum* and oxytet. Broiler chickens fed diets containing oxytet and *Ocimum canum* at 800 g/100kg diet had better economic returns with higher return per naira invested of 2.07 and 2.08, respectively. Hence, addition of *O. gratissimum* and *O. canum* in broiler chickens diets at 800g/100kg diet significantly improved weight gained and economic return and can be used at 800g/100kg diets as an alternative to synthetic antibiotic growth promoters (AGPs) for improved growth performance and higher economic returns.

Keywords: Antibiotics, Essential Oils, Microorganisms, Phytogetic Feed Additives, Resistance

Introduction

The use of antimicrobial drugs, in both humans and animals, contribute to the development of antimicrobial resistance which have become a threat to public health. Many microorganisms naturally develop resistance to withstand an antibiotic's attack (Lewis, 2016). Though antibiotic resistance is a natural phenomenon, societal factors also contribute to the problem. These factors include increased infection transmission, coupled with inappropriate antibiotic use (Lewis, 2016). Hence, the need for alternatives. Alternatives such as in feed enzymes, organic acids, prebiotics, probiotics, phytochemicals like essential oils are used commercially for growth promotion and occasionally disease prevention. Several types of herbal products and their oil extracts have enhanced broiler chickens performance and resulted in growth-promoting effects due to their antimicrobial properties (Burt, 2004), oxidative-resistant activity, enhancement of the immune system and consequently improvement in poultry performance (Hume, 2011) which in return broadens economic benefit. Scent leaf (*O.*) and curry leaf (*O. canum*) essential oils possess all the attributes of Natural Growth Promoters (NGPs) as alternative to AGPs. This study was therefore undertaken to evaluate *O. gratissimum* and *O. canum* leaves meals as potential sources of natural antibiotic growth promoters in broiler chickens production as replacement for synthetic antibiotic growth promoters and their effect on growth and economic benefit.

MATERIALS AND METHODS

Experimental site

The experiment was conducted at the Poultry Unit of the Department of Animal Science Teaching and Research farm, Ahmadu Bello University, Zaria, Kaduna State, located on longitude 11° 09' 01.78'' N and 7°39'14.79''E 671m above sea level with a mean annual rainfall of 700-1400mm (IARMS, 2019).

Experimental design and management of birds

A total of 360 day-old Cobb 500 broiler chicks were allotted to six dietary treatments with 3 replicates of 22 birds each in a completely randomized design (CRD). The birds were housed in deep litter pens and managed with all necessary routine management practices. Feed and water were provided *ad libitum*.

Experimental diets

Six treatment diets were formulated to meet the requirements of the birds for the starter and finisher phases respectively containing 0g (negative control), 400g and 800g of *O. gratissimum* and 400g and 800g of *O. canum* as additives and oxytetracycline as recommended by manufacturer as positive control.

Growth study

Initial and final weights of birds were taken at the beginning and at the end of both starter and finisher phases. Weight gain and feed intake were measured weekly while feed/gain ratio and cost per Kg gain were computed for both phases. Mortality was recorded as they occur.

Economic analysis

The economic benefit of feeding broiler chickens with the test materials was determined using gross margin analysis.

Statistical analysis

All data obtained were statistically analyzed using the General Linear Model Procedure of Statistical Analysis Systems software package while significant difference between treatments means were separated using Tukey Procedure (SAS, 2002).

RESULTS AND DISCUSSION

Growth performance of broiler chickens fed diets supplemented with *O. gratissimum* and *O. canum*

The growth performance of broiler chickens fed diets supplemented with *O. gratissimum* and *O. canum* is presented in Table 1. The result showed that there were significant ($p < 0.05$) differences final weight, weight gained, feed intake, feed conversion ratio (FCR) and feed cost per kg gain. Final weight, weight gain and feed intake were significantly ($p < 0.05$) higher in birds fed diets supplemented with oxytetracycline, *O. gratissimum* and *O. canum* at 800 g/100kg diets respectively. Feed intake was higher in birds fed diets containing 800g of *O. gratissimum* and lower in other treatment groups. FCR was better in broiler chickens fed diets containing *O. canum* at 800 g per 100kg diet (1.65) and oxytetracycline (1.67), followed by birds fed diets containing 400g of *O. canum* (1.72), 400g and 800g of *O. gratissimum* with values of 1.72 and 1.73 respectively while the negative control group had worst (1.83). Feed cost per kg gain was significantly ($p < 0.05$) better in birds fed diets containing oxytetracycline and the experimental materials and least in the control group and those fed 800g of *O. gratissimum*. The higher final weight and total weight gain observed for broiler chickens fed diets containing the experimental material and oxytetracycline could be as a result of exclusive elimination of harmful bacterial load in the gut of the birds leading to higher concentration of beneficial bacterial that helped in effective feed digestion and nutrient utilization.

Table 1: Growth performance of broiler chickens fed diets supplemented with *Ocimum gratissimum* and *Ocimum canum* (0-7weeks)

	Inclusion levels of experimental materials (g/100kg diet)						
		<i>O. gratissimum</i>		<i>O. canum</i>			
Parameters	0	400	800	400	800	Oxytet	SEM
Initial weight (g/b)	46.46	46.46	46.46	46.47	46.42	46.53	0.34
Final weight (g/b)	2426.72 ^b	2478.03 ^b	2650.74 ^a	2513.88 ^b	2689.36 ^a	2645.54 ^a	65.68
Weight gain (g/b)	2380.26 ^c	2431.57 ^{bc}	2604.28 ^a	2467.41 ^b	2642.94 ^a	2599.01 ^a	43.21
Feed intake (g/b)	4350.83 ^b	4193.35 ^c	4513.11 ^a	4247.32 ^{bc}	4357.53 ^b	4340.24 ^b	56.64
Feed conversion ratio	1.83 ^c	1.72 ^b	1.73 ^b	1.72 ^b	1.65 ^a	1.67 ^a	0.03
Feed cost (₦/kg)	111.60	114.60	117.60	114.80	117.80	115.35	NA
FC/kg gain (₦/kg)	203.99 ^b	197.63 ^{ab}	203.80 ^b	197.61 ^{ab}	194.22 ^a	192.63 ^a	4.11
Mortality (%)	2.98	2.98	2.98	1.49	0.00	1.49	1.66

^{abc}Means with the same superscripts along the rows are not significantly different ($p > 0.05$), SEM: standard error of means, NA: not analyzed.

The higher final weight and total weight gain observed for broiler chickens fed diets containing the experimental material and oxytetracycline could be as a result of exclusive elimination of harmful bacterial load in the gut of the birds leading to higher concentration of beneficial bacterial that helped in effective feed digestion and nutrient utilization. Feed intake was highest ($p < 0.05$) for birds fed diet containing 800 g of *Ocimum gratissimum* (3011.70g/bird). Better FCR and feed cost per kg gain observed in broiler chickens fed diets containing 800 g of *Ocimum canum* and oxytetracycline and other levels of *Ocimum gratissimum* and *Ocimum canum* compared to the control groups may indicates increased proliferation of absorptive surfaces leading to higher feed utilization. The higher feed intake by birds on higher levels of *Ocimum gratissimum* could be as a result of the appetite

stimulating effect of the essential oil of the materials. The result of this study agrees with the finding of Grashorn (2010) who stated that phytogetic feed additives stimulates higher feed intake in livestock, improve growth rate and efficiency of feed utilization (Weerasingha and Atapattu, 2013). Inclusion of *Ocimum gratissimum* and *Ocimum canum* in the diets of broiler chickens may stimulate early gut development and improve overall efficiency of the chicken gastro intestinal tract and thereby improving the overall performance and economic efficiency of the enterprise (Apajalahti *et al.*, 2004).

Economic analysis of broiler chickens fed diets containing *Ocimum gratissimum* and *Ocimum canum*

The economic benefit analysis of dietary inclusion of *O. gratissimum* and *O. canum* in the diet of broiler chickens is presented in Table 2.

Table 2: Economic analysis of production of broiler chickens fed diets supplemented with *Ocimum gratissimum* and *Ocimum canum* (0-7weeks)

Parameters	Inclusion of Experimental Materials (g/100kg Diet)					Oxytet
	0	O. gratissimum		O. canum		
		400	800	400	800	
Variable costs						
Day-old chicks	220.00	220.00	220.00	220.00	220.00	220.00
Starter feed cost/kg (₦/kg)	118.10	121.10	124.10	121.10	124.10	121.60
Starter feed intake (kg)	1.49	1.42	1.50	1.47	1.49	1.46
Feeding cost starter (₦)	176.91	172.20	186.27	178.50	185.16	177.90
Finisher feed cost/kg (₦/kg)	105.10	108.10	111.10	108.30	111.30	109.10
Feed intake (kg/b)	2.85	2.77	3.01	2.77	2.87	2.88
Finisher feeding cost (₦)	299.85	299.65	334.63	300.32	318.87	313.99
Total feeding cost (₦/kg)	476.76	471.86	520.91	478.82	504.03	491.89
Water (₦)	12.37	12.37	12.37	12.37	12.37	12.37
Wood shaving (₦)	5.68	5.68	5.68	5.68	5.68	5.68
Labour (₦)	60.60	60.60	60.60	60.60	60.60	60.60
Brooding (₦)	50.51	50.51	50.51	50.51	50.51	50.51
Vaccination (₦)	9.59	9.59	9.59	9.59	9.59	9.59
Repair (₦)	25.25	25.25	25.25	25.25	25.25	25.25
Transportation (₦)	20.19	20.19	20.19	20.19	20.19	20.19
TVC (₦)	880.96	876.05	925.10	883.01	908.22	896.08
Revenue (R)						
Average weight (kg/b)	2.43	2.48	2.65	2.51	2.69	2.65
Cost of live chicken (₦/kg)	700.00	700.00	700.00	700.00	700.00	700.00
Revenue per chicken (₦)	1701.00	1736.00	1855.00	1757.00	1883.00	1855.00
Gross margin (R-TVC)	820.04	859.95	929.90	873.99	974.78	958.92
Return/naira invested	1.93	1.98	2.01	1.99	2.08	2.07

Oxytet; oxytetracycline, kg; kilogram, kg/b: kilogram/ bird, TVC: total variable cost, Gross margin: Revenue-TVC, Return/naira invested: Revenue/TVC.

The results showed that broiler chickens fed the control diet had the least economic gain with a gross margin of ₦820.04 while birds fed diet containing *Ocimum canum* at 800 g/100kg diet had the best economic gain with a gross margin of ₦974.78 which is ₦154.74 above what was obtained for the control. The result also showed that broiler chickens fed diets containing oxytetracycline and *Ocimum canum* at 800 g/100kg diet had better economic returns with higher return per naira invested of 2.07 and 2.08, respectively meaning that for every ₦1 invested in broiler chickens production with the inclusion of these feed additives, there was a corresponding return of ₦2.07 and ₦2.08 with a gain of ₦1.07 and ₦1.08 respectively while those fed diets containing *Ocimum gratissimum* at 800 g/100kg diets was 2.01 implying an additional gain of ₦1.01 for every ₦1 invested. This corresponds to the report of Akbarian *et al.* (2012) who stated that the use of feed additives accounted for higher economic gain in addition to other numerous purposes in poultry production. In another study on the

economic benefit of broiler chickens fed diets containing PFA, higher economic gain was reported (Maidala *et al.*, 2017).

Conclusion

Addition of *Ocimum gratissimum* and *Ocimum canum* in broiler chickens diets at 800g/100kg diet significantly improved weight gained and economic return.

Recommendations

Ocimum gratissimum and *Ocimum canum* can be used at 800g/100kg diets as an alternative to synthetic antibiotic growth promoters for improved growth performance and higher economic returns.

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