EFFECTS OF TURMERIC (*CURCUMA LONGA)* AND QUANTUM BLUE® AS PHYTOGENIC AND EXOGENOUS ENZYME SUPPLEMENTS ON THE PERFORMANCE OF BROILER CHICKENS

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ABSTRACT
The effects of Turmeric (Curcuma longa) and Quantum Blue® as phytogenic and exogenous enzyme supplements on the performance parameters of broiler chickens were studied using one hundred and eighty (n= 180) day old chicks in a 2 x 2 factorial arrangement at both the starter and finisher levels as thus; T1 (0g Turmeric; 0ppm Enzyme), T2 (5g Turmeric; 0ppm Enzyme), T3 (0g Turmeric; 0.05ppm Enzyme) and T4 (5g Turmeric, 0.05ppm Enzyme). Feed and water were provided ad libitum during the 7 weeks period. Parameters measured were final weight, weight gain, feed intake, feed conversion ratio, performance index, protein intake, protein efficiency ratio, survival percentage. In the finisher phase, all parameters showed no significant (P>0.05) difference except protein intake (values and units of the PI) and protein efficiency ratio (values and units of the PER).For the enzyme all parameters showed no significant (P>0.05) difference except survival percentage (values and units of the SP) and protein efficiency ratio (values and units of thePER). Enzyme addition decreased feed conversion ratio. It is therefore concluded that T4 presented better performance and therefore 5g Turmeric and 0.05ppm Enzyme is recommended for broiler feeding.
Key words : Turmeric, Phytogenic, Exogenous enzyme, performance, broilers.

INTRODUCTION

Protein insufficiency in the meals of most Africans and Nigerians in particular is acute in supply, resulting from many factors which include high cost in production of animal protein and also the recent persistent clashes between herders and farmers in most parts of Nigeria. In order to enhance poultry production the problems of poultry feed supply and safety must be addressed as feeds constitute over 70% of production cost (Ogbe *et al.*, 2013). Use of antibiotics has been phased via the European Union (2006). Phytogenic sources such as turmeric (*Curcuma longa*) was reported to have enhanced performance in monogastrics (Al-sultan., 2003;Durrani *et al.,* 2006). Feed breakdown especially of fibrous feed materials into easily digestible nutrients by exogenous enzyme supplementation in monogastric feeds has been reported (Ogbe *et al.*, 2013). The objective of this research is therefore to evaluate the effects of Turmeric and Quantum Blue® enzyme as phytogenic and exogenous enzymes on the performance of broilers

MATERIALS AND METHODS

Experimental Site and sources of feed ingredients

These experiments were conducted at the Teaching and Research Farm Animal Science Department of the Faculty of Agriculture, Nasarawa State University, Keffi, Shabu-Lafia campus. Turmeric rhizome was purchased from a local farmer in Kubacha, Kagarko Local Government Area of Kaduna State while other ingredients such as maize, guinea corn, groundnut cake, fish meal and Quantum Blue® were purchased from a market dealer in Lafia and Karu, Nasarawa State. Turmeric was washed with clean water; cooked at 100^0C for 45 minutes and oven dried for 24 hours. It was grounded into powdered form and preserved in air tight container to prevent growth of mold

Experimental Diet Formulation and preparation

This experiment was designed as a single diet for all the experimental birds formulated to provide 3002.13kcal of metabolisable energy and 22.06% crude protein for the starter diet while 3102.80Kcal of metabolisable energy and 18.22% crude protein for the finisher diets. The test ingredients; turmeric (*Curcuma longa*) and commercial enzyme (Quantum Blue®) were supplemented in different proportions thereby forming the treatment groups' diets. The single formulated diets at starter and finisher phases were prepared by grinding of the following ingredients (maize, sorghum, groundnut

cake prior to mixing with other feed ingredients) as prescribed in the feed table presented in Tables 1.The experimental design is a 2x2 factorial arrangement fitted into a completely randomized design. Each of the experimental treatment was replicated three times with each cage having 15 birds.

Table 1: Composition of Experimental Diets kg/100kg

Ingredients	**T1**	**T2**	**T3**	**T4**
Basal diet				
Maize	42.75	42.75	42.75	42.75
Sorghum	10.00	10.00	10.00	10.00
Rice bran	4.75	4.75	4.75	4.75
Maize bran	4.75	4.75	4.74	4.75
Groundnut cake meal	30.0	30.0	30.0	30.0
Soya oil	3.50	3.50	3.50	3.50
Fish meal	1.30	1.30	1.30	1.30
Limestone	0.75	0.75	0.75	0.75
Bone meal	1.50	1.50	1.50	1.50
Premix	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10
Table salt	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**
Calculated values				
CP%	18.85	18.85	18.85	18.85
ME/Kcal/Kg	3102.80	3102.80	3102.82	3102.82
Dry matter %	88.77	88.77	88.77	88.77
Crude fiber%	5.50	5.50	5.50	5.50
Ether extract %	8.43	8.43	8.43	8.43
Lysine	0.71	0.71	0.71	0.71
Methionine	0.37	0.37	0.37	0.37
M+C	0.64	0.64	0.64	0.64
Calcium	0.75	0.75	0.75	0.75
Phosphorus	0.57	0.57	0.57	0.57
Price ₦/Kg feed	250	250	250	250
Supplementation				
Turmeric(g)	0.00	5.00	0.00	5.00
Enzyme(ppm)	0.00	0.00	0.05	0.05

Experimental Birds , Management and data collection

A total of 180 day old broilers were purchased from a commercial hatchery to be used for the research. Prior to the arrival of the birds, the cages were washed with strong disinfectant to destroy micro- organisms that could pre dispose the birds to disease infection. The feeders and drinkers were thoroughly cleaned with disinfectant. Light bulbs were used as heat source. Birds were administered anti-stress, weighed and assigned to treatments. They were offered the same quantity of feed measured in grams; water was given *ad – libitum*. Records of feed consumption, weight gain, feed intake and fecal samples were taken. The starter diets were fed for 4 weeks, while the finisher diet were fed for 3 weeks. The data collected were: weight gain, feed conversion ratio, energy efficiency ratio).

Statistical Analysis

All data obtained were analysed using general linear model (SPSS version 20). Duncan Multiple Range Test (Duncan, 1955) was used to separate means where significant difference exist.

Results

The result for the performance parameters are shown in table 2 Effects of Turmeric (5g) show values for final weight, weight gain, feed intake, feed conversion ratio, survival percentage and protein

intake as 551.50(g), 18.24(g), 23.22g, 1.29, 97.92% and 4.477 respectively. The values for protein intake for both Turmeric (0g, 5g) showed significant (P< 0.05) differences while all the other factors showed no significant (P> 0.05) difference.

The interactive effects of Turmeric and Enzymes showed significant (P< 0.05) difference for final weight, weight gain, feed conversion ratio, and survival percentage.

TABLE 2: Effects of Turmeric (*Curcuma longa*) and Quantum Blue® as Phytogenic and Exogenous Enzyme Supplement on the Performance Parameters of Broiler Chickens

Starter phase			IW (g)	FW (g)	WG/ Day	FI/day	FCR	Sur%	PI	PER	EI	EER	Pi
	Turmeric	0g	40.89	598.33	19.91	24.29	1.23	95.58	5.160^{a}	3.85	74.90	26.57	1573.42
		5g	40.89	551.50	18.24	23.22	1.29	97.92	4.477^{b}	4.12	74.41	24.55	1432.71
		SEM	0.16	17.99	0.64	0.34	0.05	1.17	0.07	0.16	1.05	0.94	108.27
	Enzymes	0ppm	40.89	588.33	19.55	24.28	1.26	96.95	5.087^{a}	3.836	75.022	26.078	1544.95
		0.05ppm	40.89	561.50	18.59	23.23	1.26	96.54	4.550^{b}	4.136	74.291	25.047	1461.18
		SEM	0.16	17.99	0.64	0.34	0.05	1.17	0.07	0.163	1.048	0.939	108.269
Turmeric*Enzymes		T1	40.89	527.00^{b}	17.36	24.04	1.385^{a}	97.03	4.831	3.599^{b}	74.774	23.255^{b}	1222.199^{b}
		T2	40.89	547.00^{b}	18.08	24.05	1.331^{ab}	94.28	4.978	3.630^{b}	74.535	24.243^{b}	1279.141^{b}
		T3	40.89	576.00^{ab}	19.11	22.41	1.191^{ab}	98.81	4.123	4.643^{ab}	74.046	25.851^{ab}	1643.220^{ab}
		T4	40.89	649.67^{a}	21.74	24.53	1.128^{b}	96.87	5.342	4.072^{a}	75.27	28.902^{a}	1867.700^{a}
SoV		Turmeric	Ns	ns	ns	ns	ns	ns	*	Ns	ns	Ns	ns
		Enzymes	Ns	ns	ns	ns	ns	ns	*	Ns	ns	Ns	ns
		Tur*enzy	Ns	*	*	ns	*	ns	ns	*	ns	*	*
Finisher	Turmeric	0g	598.33	1109.83	24.36	53.29	2.19	84.92	11.32^{a}	2.15^{b}	170.97	14.25	950.03
		5g	551.50	1111.83	26.68	52.2	1.96	89.8	10.06^{b}	2.66^{a}	170.74	15.63	1236.7
		SEM	17.99	12.21	1.18	0.35	0.29	1.56	0.07	0.12	1.12	0.71	108.54
	Enzymes	0ppm	588.33	1126.5	25.63	53.2	2.07	84.67	11.14	2.31^{b}	172.17	14.89	1048.17
		0.05ppm	561.50	1095.17	25.41	52.28	2.06	90.05	10.23	2.51^{a}	169.54	15	1138.55
		SEM	17.99	12.21	1.18	0.35	0.09	1.56	0.07	0.12	1.12	0.71	108.54
Tum*Enzy		T1	527.0^{b}	1090	26.81	53.03	1.98	81.98^{b}	10.66^{c}	2.52	173.05	15.5	1112.68
		T2	547.0^{b}	1056.67	24.27	53.19	2.2	82.48^{b}	11.01^{b}	2.2	170.66	14.22	916.4
		T3	576.0^{ab}	1133.67	26.56	51.37	1.93	97.62^{a}	9.45^{d}	2.81	168.42	15.77	1360.71
		T4	649.67^{a}	1163	24.44	53.38	2.9	87.37^{b}	11.63^{a}	2.1	171.28	14.28	983.66
		SEM	25.44	17.27	1.66	0.49	0.13	2.21	0.1	0.17	1.59	1	153.5
SoV		Turmeric	Ns	ns	ns	ns	ns	ns	*	*	ns	Ns	ns
		Enzymes	Ns	ns	ns	ns	ns	*	ns	*	ns	Ns	ns
		Turmeric*enzyme	*	*	ns	ns	ns	*	*	Ns	ns	Ns	ns

Significant difference (p>0.05), SoV- Source of variation

a b- means on the same row having different superscript are significantly different (p<0.05)

IW-Initial weight, FW-Final weight, WG-Weight gain, FCR-Feed Conversion Ratio, ns-Not Significant, Pi-Performance Index,

EER-Energy Efficiency Ratio, PER-Protein Efficiency Ratio, FI-Feed intake, FCR-Feed Conversion Ratio, Sur-Survival percentage, SEM-Standard Error of Mean, g-grams, ppm- part per million

Discussion and RECOMMENDATION

The performance of birds as indicated by weight gain did not differ with the inclusion of turmeric, quantum blue enzymes and their interaction, as well as the control diets. Birds fed 5g Turmeric (T2) at the finisher phase showed lower weight gain as compared to the other treatment groups, this finding is similar to that of Emadi *et al*. (2006) and Namagirilakshmi. (2010) who found that broiler chickens fed turmeric at 2.5, 5.0, 7.5 and 10% did not significantly gain weight compared to the control. Protein intake values were higher for the control group as compared to Turmeric supplemented diets probably due to the presence of anti-nutritional factors like flavonoids, alkanoids, tannin, phytate and Saponin that are associated with nutrient impairment in broilers (Ari *et al.*, 2012).

CONCLUSION

Studies have been conducted to understand the effects of phytogenic feed additives and exogenous enzymes on the performance of broilers due to their economic and social benefits in general as providers of safe alternative to the use of antibiotics in animal feeding.

It suffice therein to state that from the result of feed composition of the diets with Turmeric powder and Quantum Blue® enzyme supplementation in broiler diet that there is synergy with weight gain, feed intake, feed conversion ratio, survival percentage. The combination of Turmeric and exogenous Enzymes (Quantum Blue®) at (5g and 0.05ppm) respectively is recommended in view of its overall performance.

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