EFFECTS OF PHYTASE AND PROBIOTICS ON ECONOMICS OF PRODUCTION FOR BROILER FINISHER CHICKENS

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ABSTRACT
This study evaluated the effects of commercial exogenous probiotics (flavagen) and phytase (megazyme) on the economics of production for broiler finisher chicken. The feeding trials of broiler finisher chicken was supplemented with phytase and probiotics. Two hundred and forty (240) day old Arbor Acres broiler finisher chickens were allotted at random to 6 dietary treatments, each with four (4) replicate pens of 40 birds laid in a Completely Randomized Design in a factorial arrangement. Treatment 1 (T1) (control) had 0.00% phytase/probiotics, T2 had 0.03% probiotics, T3 had 0.05% probiotics, T4 had 0.05% phytase, T5 had 0.03% probiotics/0.05% phytase and T6 had 0.05% probiotics/phytase respectively. The economics of production indicated non-significant variation on the main of phytase and probiotics but their interaction showed reduction in the cost of feed, there were corresponding increase in cost saved, net income, net income ratio and return in naira invested for finisher chicken.
Keywords: Phytase, Probiotics, Broiler chicken, Production, Economics

INTRODUCTION

The authorities of several regions of the world are restricting the use of antibiotics in livestock because of its detrimental effects on both the animals and the populace that consume meat (WHO, 2000). Approximately 61–70% phosphorus found in poultry diet ingredients is in the form of phytate phosphorus but the monogastric animals like poultry birds are unable to utilize this source of phosphorus due to lack of endogenous phytase enzyme (Shahzad *et al*., 2013). Probiotics are referred to as a single or a mixture of live microorganisms which when fed to animals, have beneficial effects by enhancing the properties of internal microflora of the Gastro-intestinal Tract (GIT) (Hong *et al*., 2005).

It was because of residual effect and the inability of chickens to digest phytate nutrients for absorption that the need arose to search for alternative measures. Among these alternatives, the use of phytase and probiotics in animal feeds is gaining prominence. Therefore, the major objective of this study is to evaluate the effects of phytase and probiotics on economics of production for broiler finisher chickens.

MATERIALS AND METHODS

Location of the study

The experiment was carried out at the Teaching and Research Farm of the Faculty of Agriculture, Nasarawa State University, Keffi, Shabu – Lafia Campus. Lafia is located on latitude 08^0 35″ and longitude 08^0 33″. It is geographically located in Guinea Savanna Zone of North Central Nigeria. It has the mean maximum monthly temperature of 35.06^0 C and mean minimum monthly temperature of 20.16^0 C with a mean monthly relative humidity of 74%. The annual rainfall is about 168.90 mm (NIMET, 2008).

Experimental birds and Design

A 2 x 3 factorial experiment comprising 2 levels of commercial exogenous phytase (CePhytase) as factor A and 3 levels of exogenous probiotics (CePro) as factor B, was laid in a Completely Randomized Design (CRD). The study was replicated four times with ten (10) birds per replicate. A total of 240 Arbor Acre broiler finisher chickems were weighed and allotted at random to 6 dietary treatments, each with 4 replicate pens such that 10 birds were assigned to each replicate and a total of 40 birds made up a treatment. The finisher phase considered economic of production which lasted 4 weeks (28-56 days). The birds were fed broiler finisher diets containing about 20% CP and 3000 Kcal/Kg metabolizable energy. The birds were housed in a deep litter with partitions using wire mesh. Least cost feed formulation software feed win was used to formulate the experimental diets. Diets were formulated to be essentially isocaloric and isonitrogenous at each phase of the study. All birds received both feed and water *ad libitum*. Feed eaten and leftover records were maintained throughout the period of the

experiment. Other routine management practices like waterer and feeder placement, litter management were adopted as outlined (Yakubu *et al*., 2010)

Economics of Production

The cost of every operation was recorded accordingly. The composition of feed ingredients presented in Table 1 was used to compute the cost of feed ingredients per kilogram(kg)of diet by multiplying the cost (naira/₦) of each ingredient by its fraction per unit of the diet to determine its cost contribution to the diet. Market cost of ingredients at the time of the study was used to calculate the cost of feed in naira per kilogram (₦/kg). The cost of feed consumed was determined by calculating feed consumed per bird in Kg and multiplied by unit cost of feed in naira (₦). Cost of feed per kg/weight gain per bird was determined by multiplying the feed conversion ratio as fed-basis by cost per kg of diet. Variable cost included cost of vaccine, vitalyte, drugs, day old chicks, brooms, buckets and kerosene and polythene bags incurred during the study. While fixed cost is referred to as variable that remained constant during the course of production.Cost of housing as a fixed cost was calculated as cost of rentage of the pen. Total cost of production was the sum of the total variable and fixed costs. The prevailing market prices of the chicken were fixed as the cost (₦/kg) of birds sold in the market at the time of the study. Cost saved was calculated as the total cost of production of birds fed the control diet minus cost of production of birds fed the test diets. Net income ratio has been calculated as the total cost of production divided by the net income / bird. Total revenue was established as the total sales of bird value in ₦/bird. Net income served as the difference between revenue and cost of production. Return to naira invested on capital was calculated as the ratio of net income divided by total cost of production or total expenditure incurred as established by (Ogundipe and Sanni, (2002).

Statistical Analysis

Data collected were subjected to analysis of variance (ANOVA) to test the fixed effects of phytase and probiotics as well as their interaction on production performance and cost of production. Significant differences between treatment means were separated using the Duncan's Multiple Range Test option of the IBM SPSS (2017) and Tukey's HSD test of R software (Nanda, *et al*.,2021).

RESULTS AND DISCUSSION

Effect of phytase on economics of production of broiler finisher

The main effect of phytase in Table 1 did not significantly (P>0.05) vary on economic of production for all parameters studied except for cost saved in broiler finisher. The significant improvement observed on cost saved at 0.05% phytase inclusion may have suggested the catalytic ability of the enzymes to hydrolyze phytate when diet was fed consequently, improving digestibility and nutrient utilization. This result is similar to Sousa *et al*. (2015) who reported that, phytase increase nutrient and energy bio-availability for broilers.

Table 1: Effect of phytase on economics of production of broiler finisher

Parameter	Phytase (%)		P-value
	0.00	0.05	
Final Live Weight (kg/bird)	2.73±0.09	2.63±0.09	0.47^{NS}
Cost of feed Consumed (₦/kg)	175.57±8.77	180..73±8.77	0.68^{NS}
Energy Consumed (₦/bird)	10.56±0.54	11.07±0.54	0.51^{NS}
Protein Consumed (₦/bird)	7.04±0.36	7.38±0.36	0.51^{NS}
Cost of Feed Consumed (₦/kg WG)	450.83±25.53	468.71±25.53	0.63^{NS}
Variable Cost (₦/bird)	130.07±5.65	134.91±5.65	0.55^{NS}
Fixed Cost (₦/bird)	77.00	77.00	-
Total Cost of Production (₦/bird)	207.07±5.65	211.91±5.65	0.55^{NS}
Cost Saved (₦/bird)	$0.02±9.59^{b}$	$0.08±9.59^{a}$	0.001^{*}
Prevailing Market Price (₦/bird)	1250.00	1250.00	-
Total Revenue (₦/bird)	3408.33±111.28	3291.67±111.28	0.47^{NS}
Net Income (₦/bird)	3201.26±110.70	3079.76±110.70	0.45^{NS}
Net Income Ratio	1.07±0.003	1.07±0.003	0.45^{NS}
Returned in Naira Invested on Capital	15.55±0.62	14.65±0.62	0.32^{NS}

$^{*a, b}$ = Means on the same row with different superscripts are significantly different (P< 0.05) * = significant difference (P<0.05), NS = Not significant

Result of the effect of probiotics on economics of broiler finisher is presented in Table 2. The effect on economic of production for broiler finisher had no significant influence for all parameters except for cost saved. This mean that inclusion of probiotics at the highest level of 0.05% in diet reduced cost of production of broiler finisher. This

result was similar to El-Faham *et al*. (2018) report on significant effect on feed restriction with supplementation of probiotic with enzymes preparation on economic traits of broiler chickens during finisher period.

Table 2: Effect of probiotics on Cost of production of broiler finisher

Parameter	Probiotics (%)			P-value
	0.00	0.03	0.05	
Final Live Weight (kg/bird)	2.57±0.11	2.80±0.11	2.67±0.11	0.34^{NS}
Cost of feed Consumed (₦/kg)	183.52±10.75	178.52±10.75	172.42±10.75	0.77^{NS}
Energy Consumed (₦/bird)	11.25±0.66	10.94±0.66	10.27±0.66	0.57^{NS}
Protein Consumed (₦/bird)	7.49±0.44	7.29±0.44	6.85±0.44	0.58^{NS}
Cost of Feed Consumed (₦/kg WG)	467.79±31.27	455.22±31.27	456.30±31.27	0.95^{NS}
Variable Cost (₦/bird)	142.25±6.92	125.55±6.92	129.68±6.92	0.23^{NS}
Fixed Cost (₦/bird)	77.00	77.00	77.00	-
Total Cost of Production (₦/bird)	219.25±6.92	202.55±6.92	206.68±6.92	0.23^{NS}
Cost Saved (₦/bird)	0.39 ± 11.75^{c}	9.44 ± 11.75^{a}	5.31 ± 11.75^{b}	0.001^{*}
Prevailing Market Price (₦/bird)	1250.00	1250.00	1250.00	-
Total Revenue (₦/bird)	3210.94±136.29	3503.13±136.29	3335.94±136.29	0.34^{NS}
Net Income (₦/bird)	2991.69±135.57	3300.58±135.57	3129.26±135.57	0.30^{NS}
Net Income Ratio	1.08±0.004	1.06±0.004	1.07±0.004	0.11^{NS}
Returned in Naira Invested	13.79±0.76	16.32±0.76	15.19±0.76	0.09^{NS}

$^{*a, b,}$ = Means on the same row with different superscripts are significantly different (P< 0.05), * = significant difference (P<0.05), NS = Not significant

Table 3: Effect of interaction between phytase and probiotics on economic of production in broiler finisher

Parameters	Phytase (0.00%)			Phytase (0.05%)			P-value
	Prob 0.00%	Prob 0.03%	Prob 0.05%	Prob 0.00%	Prob 0.03%	Prob 0.05%	
FLW (Kg/b)	2.51±0.15	3.02±0.15	2.65±0.15	2.63±0.15	2.59±0.15	2.69±0.15	0.19^{NS}
S/FC (₦/kg)	180.08±15.20	173.48±15.20	173.16±15.20	186.95±15.20	183.56±15.20	171.67±15.20	0.93^{NS}
EC (₦/b)	11.04	10.62±0.93	10.03±0.93	11.45±0.93	11.25±0.93	10.50±0.93	0.99^{NS}
PC (₦/b)	7.36±0.62	7.08±0.62	6.69±0.62	7.63±0.62	7.50±0.62	7.01±0.62	0.99^{NS}
CF (₦/kg WG	460.62±44.22	427.67±44.22	464.22±44.22	474.97±44.22	482.78±44.22	448.38±44.22	0.93^{NS}
VC (₦/b)	134.99±9.79	125.55±9.79	129.68±9.79	149,51±9.79	125.55±9.79	129.68±9.79	0.70^{NS}
FC (₦/b)	77.00	77.00	77.00	77.7	77.00	77.00	-
TCP (₦/b)	211.99±9.79	202.55±9.79	206.68±9.79	226.51±9.79	202.55±9.79	206.68±9.79	0.70^{NS}
CS (₦/b)	0 ± 16.6^{b}	9.44a	5.31 ± 16.61^{b}	-14.52 ± 16.61^{b}	9.44 ± 16.61^{a}	5.31 ± 16.61^{b}	0.001^{*}
PMP (₦/kg)	1250	1250	1250	1250	1250	1250	-
TR (₦/b)	3140.6	3771.9±192.74	3312.5±192.74	3281.3±192.74	3234.4±192.74	3359.4±192.74	0.19^{NS}
NI (₦/b)	2829±19.73	3569±19.73	3105±19.73	3055±19.73	3032±19.73	3153±19.73	0.20^{NS}
NIR	0.07±0.01	0.06±0.01	0.07±0.01	0.08±0.01	0.07±0.01	1.07±0.01	0.34^{NS}
RNI	13.96±0.07	17.62±0.07	15.08±0.07	13.63±0.07	15.02±0.07	15.30±0.07	0.40^{NS}

$^{*a, b,}$= Means on the same row with different superscripts are significantly different (P< 0.05), NS = Not significant (P> 0.05), SEM = Standard error of mean, T = treatment, T1 = Control, T2 = (0 % ePhytase/0.03 % ePro), T3 = (0 % ePhytase/0.05 % ePro), T4 = (0.05 % ePhytase), T5 = (0.05 % ePhytase/0.03 % ePro) and T6 = (0.05 % ePhytase/ePro), FLW = final live weight, S/FFC = starter/finisher feed cost, EC = energy cost, PC = protein cost, VC = variable cost, FC =fixed cost, TCP = total cost of production, CS = Cost save, PMP = prevailing market price, TR = total revenue, NI = net income, NIR = net income ratio, RNI = return on naira invested, Kg/b = Kilogram per bird, ₦/b = naira per bird, ₦/kg = naira per kilogram, WG = Weight gain.

The result of phytase and probiotics interaction on economic of production for broiler finisher is presented in Table 3. The broiler finisher fed combination of phytase and probiotics had no significant variations except on cost saved. This may be translated that the inclusion of phytase and probiotics in the diet, increased cost saved (profit maximization) at the end of broiler finisher production period.

CONCLUSION

Phytase and probiotics supplementation greatly improved the economics of production of broiler finisher. This was seen through increased of cost saved for broiler finisher at 0.05% phytase/probiotics/100 kg inclusion.

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