

## EFFECTS OF PHYTASE AND PROBIOTICS ON HAEMATOLOGY AND SEROLOGY OF BROILER FINISHER CHICKENS

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### Abstract

*This study evaluated the effects of commercial exogenous probiotics (flavagen) and phytase (megazyme) on haematology and serology of broiler finisher chickens. The feeding trial 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 haematological indices had non-statistical deviation on the main effect of phytase and the combined effect of phytase and probiotics while main effect of probiotics varied on hemoglobin. Serological indices had significant variation for the main effect of phytase while main effect of probiotics and their combination did not vary.*

**Keywords:** Phytase, Probiotics, Broiler chicken, Haematology, Carcass

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### 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 hematology and serology of broiler finisher chickens.

### MATERIALS AND METHODS

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° 35' and longitude 08° 33'. It is geographically located in Guinea Savanna Zone of North Central Nigeria. It has the mean maximum monthly temperature of 35.06° C and mean minimum monthly temperature of 20.16° C with a mean monthly relative humidity of 74%. The annual rainfall is about 168.90 mm. (NIMET, Faculty of Agriculture, Lafia, 2008).

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). A total of 240 Arbor Acres broiler finisher' chickens were weighed and allotted at random to 6 dietary treatments, each with 4 replicate pens such that 10 birds were assigned to each replicate of 40 birds made up a treatment. 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. 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).

### Effect of phytase on haematological indices of broiler finisher

Table 1 is the main effect of phytase inclusion which had no significant influence on all haematological indices. This study is similar to the report of Obajuluwa *et al.* (2020) for haematological indices of broiler finisher.

**Table 1: Effect of phytase on hematological indices of broiler finisher**

Parameter	Phytase (%)		P-value
	0.00	0.05	
Hemoglobin (g/dl)	9.49±0.22	9.42±0.22	0.81 <sup>NS</sup>
Red Blood Cell (10 <sup>12/L</sup> )	3.05±0.06	2.97±0.06	0.35 <sup>NS</sup>
White Blood Cell (10 <sup>9/L</sup> )	104.58±7.94	116.92±7.94	0.29 <sup>NS</sup>
Packed Cell Volume (%)	28.83±0.64	28.08±0.64	0.42 <sup>NS</sup>
Mean Corpuscular Volume (fL)	93.64±0.32	94.25±0.32	0.20 <sup>NS</sup>
Mean Corpuscular Hemoglobin (pg)	31.52±0.25	31.79±0.25	0.44 <sup>NS</sup>
MCHC (g/dL)	33.65±0.22	33.67±0.22	0.96 <sup>NS</sup>

% = percentage, g/dl = gram per deciliter, fL = femtoliter, pg = pictogram, NS = Not significant, MCHC = mean corpuscular hemoglobin concentration.

#### Effect of probiotics on hematological indices of broiler finisher

With respect to the main effect of probiotics inclusion in Table 2, non-statistical effect was noted for hematological indices of broiler finisher. However, a significant improvement was seen on hemoglobin. This may infer that inclusion of probiotics increases the production of blood hemoglobin which was responsible for carriage of oxygen to all parts of the body and removal of carbon dioxide from the body as a sign of good health status that manifested in low percent mortality in broiler finisher of this study. Contrariwise, Obajuluwa *et al.* (2020) reported non-significant ( $P>0.05$ ) variation of hematological indices of broiler finisher.

**Table 2: Effect of probiotics on hematological indices of broiler finisher**

Parameter	Probiotics (%)			P-value
	0.00	0.03	0.05	
Hemoglobin (g/dl)	10.03±0.26 <sup>b</sup>	11.20±0.26 <sup>a</sup>	11.14±0.26 <sup>a</sup>	0.05 <sup>*</sup>
Red Blood Cell (10 <sup>12/L</sup> )	3.15±0.07	2.94±0.07	2.94±0.07	0.10 <sup>NS</sup>
White Blood Cell (10 <sup>9/L</sup> )	119±9.73	114.25±9.73	98.88±9.73	0.33 <sup>NS</sup>
Packed Cell Volume (%)	29.75±0.78	27.63±0.78	28.00±0.78	0.15 <sup>NS</sup>
Mean Corpuscular Volume (fL)	93.89±0.40	94.13±0.40	93.83±0.40	0.86 <sup>NS</sup>
Mean Corpuscular Hemoglobin (pg)	31.90±0.30	31.38±0.30	31.69±0.30	0.48 <sup>NS</sup>
MCHC (g/dL)	33.88±0.27	33.45±0.27	33.65±0.27	0.54 <sup>NS</sup>

% = percentage, g/dl = gram per deciliter, fL = femtoliter, pg = pictogram, \* = significant difference ( $P<0.05$ ), NS = Not significant

**Table 3: Interaction effect of phytase and probiotics for hematological indices of 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%	
Hb (g/dl)	9.93±0.72	9.60±0.72	8.95±0.72	10.13±0.72	8.80±0.72	9.33±0.72	0.26 <sup>NS</sup>
RBC (10 <sup>12/L</sup> )	3.12±0.10	3.08±0.10	2.94±0.10	3.42±0.10	2.80±0.10	2.94±0.10	0.25 <sup>NS</sup>
WBC (10 <sup>9/L</sup> )	117.75±13.76	97.00±13.76	99.00±13.76	120.50±13.76	131.50±13.76	98.75±13.76	0.40 <sup>NS</sup>
PCV (%)	29.25±1.10	29.00±1.10	28.25±1.10	32.75±1.10	26.25±1.10	27.75±1.10	0.26 <sup>NS</sup>
MCV (fl)	93.68±0.56	94.15±0.56	93.10±0.56	94.11±0.56	94.10±0.56	94.55±0.56	0.41 <sup>NS</sup>
MCH (Pg)	31.78±0.43	31.30±0.43	31.48±0.43	32.03±0.43	31.45±0.43	31.90±0.43	0.95 <sup>NS</sup>
MCHC(g/dl)	34.10±0.38	33.25±0.38	33.60±0.38	33.65±0.38	33.65±0.38	33.70±0.38	0.54 <sup>NS</sup>

<sup>a, b, c</sup> = 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, % = percentage, Trt = treatment, Trt 1 = Control, Trt 2 = (0 % ePhytase/0.03 % ePro), Trt 3 = (0 % ePhytase/0.05 % ePro), Trt 4 = (0.05 % ePhytase), Trt 5 = (0.05 % ePhytase/0.03 % ePro) and Trt 6 = (0.05 % ePhytase/ePro), Hb = hemoglobin concentration, RBC = red blood cell, WBC = white blood cell, PCV = packed cell volume, MCV = mean corpuscular volume, MCH = mean corpuscular hemoglobin, MCHC = mean corpuscular hemoglobin concentration, g/dl = gram per deciliter, L = Liter, % = percentage, fl = femtolitre, pg = pictogram, g/dL = .gram per deciliter.

#### Effect of phytase, probiotics and their combination on hematological indices of broiler finisher

The results presented in Table 3 were broiler finisher's hematological indices fed diet containing phytase and probiotics. Results indicated non-significant ( $P>0.05$ ) effects among experimental treatments. This implies that supplementing diet with phytase and probiotics at 0.05% level of inclusion had no detrimental effects on broiler

finisher. This study is similar to the report of Obajuluwa *et al.* (2020) for hematological indices of broiler finisher at 56 days of age.

#### Effect of phytase on serological indices of broiler finisher

The main effect of phytase on serological indices of broiler finisher as presented in Table 4 did not vary significantly for all parameters. However, significant increase was recorded on glucose when probiotics was included at level of 0.05%. This may be said that the inclusion of phytase has improved supply of energy for metabolic processes that has showed in the final body weight of broiler finisher. This result supported Chauhan *et al.* (2020) report on significant ( $P<0.05$ ) influence on the effect of feed supplements on serum mineral profile of broiler chicken.

**Table 4: Effect of phytase on serological indices of broiler finisher**

Parameter	Phytase (%)		P-value
	0.00	0.05	
<b>Blood Protein (g/l):</b>			
Total Protein	48.42±1.82	50.00±1.82	0.55 <sup>NS</sup>
Glutinin	3.87±0.29	3.42±0.29	0.28 <sup>NS</sup>
Albumin	26.25±1.35	29.42±1.35	0.11 <sup>NS</sup>
Globulin	25.08±1.20	22.83±1.20	0.20 <sup>NS</sup>
<b>Blood Enzymes (u/l):</b>			
AST	92.25±6.59	93.75±6.59	0.87 <sup>NS</sup>
ALT	88.00±4.27	96±4.27	0.20 <sup>NS</sup>
<b>Blood Metabolites (mmol/l):</b>			
T-Chol	3.73±0.38	4.35±3.38	0.26 <sup>NS</sup>
Urea	3.17±0.13	3.31±0.13	0.45 <sup>NS</sup>
Creatine	41.67±1.41	39.00±1.41	0.20 <sup>NS</sup>
Glucose	4.28±0.37 <sup>b</sup>	5.43±0.37 <sup>a</sup>	0.04 <sup>*</sup>

% = percentage, g/L = gram per, AST = Aspartate aminotransferase, ALT = Alanine aminotransferase, T-Chol = Total cholesterol, g/l = gram per liter, u/L = Unit per liter, mmol/l = Millimole per liter, \* = significant difference ( $P<0.05$ ), NS = Not significant

#### Effect of probiotics on serological indices of broiler finisher

With regard to main effect, probiotics inclusion in Table 5, all serological indices of broiler finisher had no significant deviation. This is in line with the finding of Obajuluwa *et al.* (2020) who reported non-significant ( $P>0.05$ ) variation of hematological indices of broiler finisher.

**Table 5: Effect of probiotics on serological indices of broiler finisher**

Parameter	Probiotics (%)			P-value
	0.00	0.03	0.05	
<b>Blood Protein (g/l):</b>				
Total Protein	45.50±2.23	50.25±2.23	51.88±2.23	0.14 <sup>NS</sup>
Glutinin	3.90±0.35	3.30±3.30	3.73±3.30	0.47 <sup>NS</sup>
Albumin	26.00±1.65	27.75±1.65	29.75±1.65	0.30 <sup>NS</sup>
Globulin	21.63±1.46	25.50±1.46	24±1.46	0.17 <sup>NS</sup>
<b>Blood Enzymes (u/l):</b>				
AST	108.38±8.07	84.25±8.07	86.38±8.07	0.90 <sup>NS</sup>
ALT	90.50±5.23	89.63±5.23	96.00±5.23	0.65 <sup>NS</sup>
<b>Blood Metabolites (mmol/l):</b>				
T-Chol	3.69±0.46	4.01±0.46	4.43±0.46	0.53 <sup>NS</sup>
Urea	3.36±0.16	3.09±0.16	3.26±0.16	0.48 <sup>NS</sup>
Creatine	42.13±1.72	38.88±1.72	40.00±1.72	0.42 <sup>NS</sup>
Glucose	5.19±0.45	4.91±0.45	4.45±0.45	0.52 <sup>NS</sup>

% = percentage, g/L = gram per, AST = Aspartate aminotransferase, ALT = Alanine aminotransferase, T-Chol = Total cholesterol, g/l = gram per liter, u/L = Unit per liter, mmol/l = Millimole per liter, \* = significant difference ( $P<0.05$ ), NS = Not significant

**Interaction effect of phytase and probiotics on serological indices of broiler finisher**

Presented in Table 6 were the results of the chemical analysis of broiler finisher' blood serum fed diet containing phytase and probiotics. The result did not significantly ( $P>0.05$ ) differ in all the parameters studied. This result agreed with the report of Owosibo *et al.* (2013) and Obajuluwa *et al.* (2020) who reported non-significant differences for serum biochemical indices of broilers finisher fed probiotic-based diets for total protein, albumin and globulin.

**Table 6: Interaction effect of phytase and probiotics on serological indices of 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%	
<b>Blood protein (g/l):</b>							
Total Protein	46.50±3.16	48.50±3.16	50.25±3.16	44.50±3.16	52.00±3.16	53.50±3.16	0.63 <sup>NS</sup>
Glutinin	3.85±0.49	3.40±0.49	4.35±0.49	3.95±0.49	3.20±0.49	3.10±0.49	0.38 <sup>NS</sup>
Albumin	24.00±2.33	25.00±2.33	26.75±2.33	25.00±2.33	28.50±2.33	29.75±2.33	0.49 <sup>NS</sup>
Globulin	22.75±2.07	24.00±2.07	23.50±2.07	19.50±2.07	24.00±2.07	23.00±2.07	0.41 <sup>NS</sup>
<b>Blood Enzymes (u/l):</b>							
AST	97.75±11.41	95.75±11.41	83.25±11.41	119.00±11.41	72.75±11.41	89.50±11.41	0.17 <sup>NS</sup>
ALT	84.50±7.40	89.75±7.40	89.75±7.40	96.50±7.40	89.50±7.40	102.25±7.40	0.63 <sup>NS</sup>
<b>Blood Metabolites (mmol/l):</b>							
T-Chol	3.78±0.65	3.85±0.65	3.58±0.65	3.60±0.65	4.18±0.65	5.28±0.65	0.35 <sup>NS</sup>
Urea	3.08±0.22	3.13±0.22	3.30±0.22	3.65 ±0.22	3.05±0.22	3.23 ±0.22	0.27 <sup>NS</sup>
Creatine	45.75±2.44	38.25±2.44	41.00±2.44	38.50±2.44	39.50±2.44	39.00±2.44	0.24 <sup>NS</sup>
Glucose	4.28±0.64	4.65±0.64	3.90±0.64	6.10±0.64	5.18±0.64	5.00±0.64	0.60 <sup>NS</sup>

\*a, b, c, = 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, Trt = treatment, Trt 1 = Control, Trt 2 = (0 % ePhytase/0.03 % ePro), Trt 3 = (0 % ePhytase/0.05 % ePro), Trt 4 = (0.05 % ePhytase), Trt 5 = (0.05 % ePhytase/0.03 % ePro) and Trt 6 = (0.05 % ePhytase/ePro), AST = Aspartate aminotransferase, ALT = Alanine aminotransferase, T-Chol = Total cholesterol, g/l = gram per liter, u/l = Unit per liter, mmol/l = Millimole per liter.

**CONCLUSION**

The inclusion of commercial exogenous phytase (megazyme) and probiotics (flavagen) at 0.05% in broiler's feeds, phytase main effect improved glucose synthesis and probiotics increased hemoglobin proliferation while their combination indicated non-detrimental influence on blood indices for broiler finisher chickens.

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