EFFECTS OF DIETS CONTAINING DEFATTED SESAME MEAL WITH PHYTASE ENZYME SUPPLEMENTATION ON HAEMATOLOGICAL INDICES AND SERUM METABOLITES OF BROILER CHICKENS.

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Abstract

Adequacy of diets in livestock production reflects in the blood parameters. Serum and haematological parameters are used to evaluate nutrient composition of diet and health status of animal in which the diet is being tested. One hundred and eighty broiler chicks of Marshall Strain were used to evaluate the effects of phytase enzyme supplementation on the utilization of diet containing defatted sesame meal (DSM) by broiler chickens. Six dietary treatments in a 2×3 factorial experimental arrangement of 0.25g/100kg phytase supplementation at 3 level of DSM inclusion (0, 50 and 100 %). Each treatment had 30 birds subdivided into three replicates of 10 birds each. The result obtained indicated White blood cells, creatine and Uric acid were significantly ($P<0.05$) affected by sesame inclusion and enzyme supplementation interaction. Birds fed enzyme supplemented diets containing 50% sesame meal recorded the highest ($P < 0.05$) WBC value 35.02 x 10^{12}/l. Birds fed 100% sesame meal (T6) showed least ($P < 0.05$) value 0.80 g/dl for creatinine. PCV, HB, RBC, total protein and albumin were not significantly influence by sesame inclusion and enzyme supplementation interaction. Defatted sesame meal with Phytase enzyme supplementation could replace soybean up to 100% in broiler chickens diets without hazard effect on the health status.

Key words: Phytase; enzyme; sesame; broiler chickens.

Introduction

The prevailing high cost of soybean necessitated the use of cheap locally available and nutritionally comparable alternatives which could be found in defatted sesame meal (DSM). Since DSM meal (47.1%CP) has protein composition similar to that of soybean meal (47.7%CP) (Mamputu, 1995), then DSM could replace SBM in the diet of broiler.

Mamputu (1995) reported that the performance of broiler chicken feed with the diet containing DSM at 15% of dietary CP was not different from that of the control chicken feed the SBM diet and since sesame seed contains phytic acid which does not allow efficient utilization of the product, supplementing this feedstuff with phytase enzyme can be of help in removing the deleterious effects of phytic acid content and increasing availability of dietary phytate phosphorus in the diet (Schafer *et al.,* 1995). This study therefore seeks to investigate the effect of enzyme supplementation on diets containing different levels of deffated sesame meal on performance and nutritional utilization of broiler chicken.

Materials and methods

Location of study

The experiment was carried out at the Livestock Teaching and Research Farms. University of Agriculture, Alabata, Abeokuta. Alabata ($7^{0}10^{1}$N and $3^{0}2^{1}$E) is in Odeda Local Government Area of Ogun-State. This area lies in the tropical climate with an average rainfall of 1100mm, a mean ambient temperature of about 34ºC and yearly average relative humidity of 82%.

Experimental Animals

A total of one hundred and eighty day old broiler chicks of Marshall Strain were purchased from Obasanjo Farms Nigeria Limited, Ota. The house and the equipment were thoroughly washed and disinfected before the arrival of the chicks. The birds were raised on deep litter system for 56days; they were raised in two phases: starter phase and finisher phase. Routine management and medication (drug and vaccines) program were observed. Feed and water were supplied to the birds *ad libitum.*

Experimental diets

Six experimental diets were formulated such that defatted sesame meal seed replaced soybean meal at 0%, 50% and 100% inclusion level of soybean meal in the diet. The first three diets were without phytase enzyme, while the other three diets were supplemented with phytase enzyme as presented in Table1.

Table 1: Percentage composition of experimental diets (4-8weeks)

Enzyme	**Without enzyme (0g/kg)**			**With enzyme(0.25g/kg)**		
Sesame levels (%)	**0 T1**	**50 T2**	**100 T3**	**0 T4**	**50 T5**	**100 T6**
Ingredients:						
Maize	54.00	54.00	54.00	54.00	54.00	54.00
Soybean	30	15	-	30	15	-
Sesame meal	-	15	30	-	15	30
Fish meal	1.0	1.0	1.0	1.0	1.0	1.0
Wheat offal	9	9	9	9	9	9
Bone meal	2.0	2.0	2.0	2.0	2.0	2.0
Limestone	3.0	3.0	3.0	3.0	3.0	3.0
Lysine	0.2	0.2	0.2	0.2	0.2	0.2
Methionine	0.25	0.25	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25	0.25
Enzyme	-	-	-	+	+	+
Total	100.00	100.00	100.00	100.00	100.00	100.00
Determined analysis:						
Crude protein %	22.04	21.77	20.67	21.66	20.97	21.46
Fat %	4.37	4.46	3.87	3.54	3.65	3.76
Ash %	12.37	12.25	11.87	12.64	12.07	12.17
Crude fibre %	14.37	14.35	14.16	13.97	14.23	14.35
NFE %	36.50	37.10	39.21	37.83	38.74	38.00
DM %	89.63	89.87	89.87	89.53	89.64	89.73

Premix composition per 2.5kg feed the following; Vitamin A (I.U.) 12,000,000, Vit. D_3 (I.U.) 2,500,000, Vit. E(mg) 40,000, Vit. K (mg) 2,000, Vit. B_1(mg) 3,000, Vit. B_2(mg)4,000, Biotin (mg) 75, Folic Acid (mg) 1,000, Niacin (mg) 50,000, D Caal. Pn (mp) 11,000, Co.(mg) 300, Cu(mg) 8,000, I (mg) 1,500 Se (mg) 120, Zn (mg) 60,000, Fe (mg) 40, 000, Mn (mg) 100,000, Cl (mg) 300,000.

Experimental Design

180 day old broiler chicks were randomly allotted to the dietary treatments. There were two levels of enzyme supplementation (+phytase enzyme, -phytase enzyme) and three replacement levels of SBM by DSM (0%, 50%, and 100%). The design was a 2x3 factorial arrangement in a randomized complete design.

Haematological and Serum Parameters

At the end of 8th week of the study, 2.5ml of blood was collected from a bird per replicate through a neck slitting into the bottles containing ethylene diamine tetraacetate (EDTA) for haematological parameters , (packed cell volume, haemoglobin concentrate ,white blood cell, red blood cell, count). Another 2.5mls was collected in hypodermic syringe for the biochemical analysis of serum: total protein, creatinine, globulin, albumin, and uric acid

Statistical Analysis

The experimental layout was a 2 x3 factorial arrangement in a completely randomized design. Data obtained were subjected to analysis of variance using SAS, statistical package, SAS (1999). Significant means were separated using Duncan' Multiple Range Test, Duncan (1955).

RESULTS AND DISCUSSION

Haematology and serum metabolite of broiler chickens

The interactive effect of sesame inclusion and enzyme supplementation on heamatology and serum metabolite is shown in Table 2. White blood cells, creatine and Uric acid were significantly ($P<0.05$)

affected by sesame inclusion and enzyme supplementation interaction. Birds fed diet containing 50% sesame inclusion with 0.25 k/kg enzyme supplementation (T5) showed higher ($p<0.05$) of 35.02×10^9/L. Birds fed diet containing 50% sesame inclusion with 0 k/kg enzyme supplementation (T2) and 100% sesame with 0g/kg (T3) revealed least ($p<0.05$) value of 28.15×10^9/L and 27.46×10^9/L respectively. Ranged value 27.46×10^9/L – 35.02×10^9/L obtained in this study were within the normal range 20.90 – 37.40×10^9/L reported in literature (Tirmidhi *et al*., 2022). The values obtained for white blood cells in this study showed adequacy of the diets for broiler chickens. Elevated white blood cell indicates that birds are reacting to one or more factors in the feed (Oduguwa, 2006). White blood cells play prominent role in disease resistance especially with respect to the generation of antibodies and the process of phygocytes (Wintrobe, 1983).

Ranged values 0.8g/l – 1.10 g/l recorded for creatinine in this study were close to values 1.0 g/l – 3.0 g/l reported in literature (Meluzzi *et al*., 1992). The results for creatinine did not follow any specific pattern. Least ($p<0.05$) value of 0.80 g/l was recorded for birds fed 100% sesame inclusion with 0.25 g/kg enzyme supplementation. Birds fed diet containing 50% sesame inclusion with 0 g/kg enzyme supplementation (T2) recorded highest ($p<0.05$) value of 1.10 g/l. The lower the value of creatinine for a particular test feed stuffs, the better the protein quality (Ologbobo *et al.,* 2007, Akinmutimi and Abasiekong, 2002). Creatinine has also been found to have a linear relationship between protein in the diet and total serum protein as it has been used as standard to measure protein quality of diets (Eggum, 1997). Ranged values 8.70 -13.60 mg/dl obtained for uric acid in this study were close to range values 2 – 10 mg/dl reported in literature (Meluzzi *et al*., 1992). Birds fed diet containing 50% sesame inclusion with 0 g/kg enzyme supplementation (T2) recorded highest ($p<0.05$) value of 13.60 mg/dl for uric acid. Least numerical value 8.70 mg/dl was recorded for birds fed 0% sesame inclusion with 0 g/kg enzyme supplementation.

The PCV, HB, RBC, total protein and albumin were not significantly influence by sesame inclusion and enzyme supplementation interaction. Values obtained for total protein and albumin shown adequacy of the diet.

The main effect of sesame inclusion and enzyme supplementation is shown in Table 3. The main effect of sesame and enzyme supplementation had no significant ($p>0.05$) effect on parameters determined. Though not significantly influenced, the values were at close range to reference values in the literature.

Table 2: Interactive effect of sesame inclusion and enzyme supplementation on haematology and serum metabolites of broiler chicken (0-8 weeks)

Enzyme	**0g/kg**			**0.25g/kg**				
Sesame levels (%)	**0**	**50**	**100**	**0**	**50**	**100**		
	T1	**T2**	**T3**	**T4**	**T5**	**T6**	**SEM**	**R-Value**
PCV (%)	31.0	29.70	30.6	27.70	27.00	26.00	1.22	22.00-35.00
Hb (g/dl)	10.60	10.10	10.50	9.60	9.20	8.90	0.43	7.00-13.00
WBC (x 10^{12}/l)	33.05^{b}	28.15^{d}	27.46^{d}	33.12^{b}	35.02^{a}	30.80^{c}	1.10	20.90-37.40
RBC (x 10^{12}/l)	2.70	2.60	2.70	2.50	2.30	2.10	0.17	2.77-3.88
Total Protein (g/l)	56.50	49.70	53.20	50.80	48.90	49.70	2.95	30.00-35.00
Albumin (g/l)	37.20	32.50	35.10	31.50	28.30	33.30	1.74	32.80-34.80
Creatinine (g/l)	0.90^{c}	1.10^{a}	0.90^{c}	1.00^{b}	1.00^{b}	0.80^{d}	0.04	1.00-3.00
Uric acid (mg/dl)	8.70^{c}	13.60^{a}	11.10^{b}	11.80^{b}	11.10^{b}	9.70^{c}	0.80	2.00-10.00

[ab] Means on the same row having different superscript are significantly different ($P<0.05$).
Reference values: (Meluzzi *et al*., 1992; Tirmidhi *et al*., 2022)

Table 3: Main effect of sesame inclusion and enzyme supplementation on haematology and serum metabolites of broiler chicken (0-8 weeks)

	Sesame				**Enzyme**			
Parameter	**0%**	**50%**	**100%**	**SEM**	**0g/kg**	**0.25g/kg**	**SEM**	**R-Value**
PCV (%)	29.35	28.35	28.3	0.87	30.43	26.9	0.71	22.00-35.00
Hb (g/dl)	10.1	9.65	9.7	0.36	10.4	9.23	0.25	7.00-13.00
WBC (x10^9/l)	33.085	31.585	29.13	782,77	29.55	32.98	639.94	20.90-37.40

RBC (x 10^{12}/l)	2.6	2.45	2.4	0.12	2.66	2.3	0.10	2.77-3.88
Total Protein (g/l)	53.65	49.3	51.45	2.09	53.13	49.8	1.70	30.00-35.00
Albumin (g/l)	34.35	30.4	34.2	1.23	34.93	31.03	1.01	32.80-34.80
Creatine (g/l)	0.95	1.05	0.85	0.03	0.96	0.93	0.02	1.00-3.00
Uric acid (mg/dl)	10.25	12.35	10.4	0.57	11.13	10.86	0.46	2.00-10.00

Reference values: (Meluzzi *et al*., 1992; Tirmidhi *et al*., 2022)

Recommendation

Defatted sesame meal with Phytase enzyme supplementation could replace soybean up to 100% in broiler chickens diets without hazard effect on the health status.

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