

Effect of Soya Bean Residue Supplemented with Kingzyme on Haematology and Serum Biochemistry of Broiler Finisher Chickens Diets.

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Abstract

This study was carried out to investigate the potentials of soya bean residue (SBR) supplemented with Kingzyme® at finisher phase (4th – 8th weeks). A total of three hundred and sixty (360) day old Cobb 500 broiler chickens were randomly allocated to four (4) dietary treatments containing soya bean residue meal supplemented with Kingzyme® with different levels of supplementation designated as 0, 25, 30 and 35g. Each treatment was replicated thrice with thirty (30) birds per replica in completely randomize design (CRD). There were no significant ($P>0.05$) differences among treatment groups for all the haematological parameters except packed cell volume (PCV), haemoglobin (Hb), mean corpuscular volume (MCV) and mean corpuscular haemoglobin (MCH) which showed significant ($P<0.05$) differences but no definite trend in terms of Kingzyme® supplementation. However, in serum biochemical indices, there is no significant ($P>0.05$) differences among all the treatments group, total protein, albumin, globulin, urea, creatine, sodium (Na), potassium (K), aspartate aminotransferase (ASAT) and alanine aminotransferase (ALAT) while glucose, cholesterol, chloride, direct bilirubin, and conjugate bilirubin showed significant ($P<0.05$) differences among the treatment groups. Therefore, in conclusion, broiler chicken diets containing 18% soya bean residue supplemented with Kingzyme® can be used as protein source based on haemato-serum biochemical profile.

Keywords: Soya Bean Residue, Kingzyme®, Haematology, Serum Biochemistry, Broiler Chickens

1. Description of problem

Poultry meats provide high quality animal protein containing sufficient amounts and proper ratios of amino acids for human consumption and, therefore, play an important role in the growth, development, and health of all individuals (1). Because there are growing concerns about the suboptimal efficiencies of poultry production and its impact on environmental

sustainability, much attention has been paid to the formulation of low-protein diets and precision nutrition through the addition of low-cost or alternative sources of protein feedstuffs (2) However, successful production of these birds requires adequate feeding which is estimated to stand at about 60 -80% of the total cost of production (3, 4). Diets are formulated to provide specific levels of nutrients that are needed for

optimum performance. In general, blood analysis has been suggested as a readily available and fast means of assessing nutritional status of animals on feeding trials, because ingestion of dietary components has measurable effects on blood composition (5). However, in general, blood examination is performed for several reasons as a screening procedure to assess general health (6). Glucose, cholesterol, calcium, total protein, alkaline phosphates, uric acid, sodium, potassium, chloride levels are diagnostic values for diabetes, liver disease, hypoparathyroidism, chronic hepatopathy and gout, kidney disease, chronic diarrhea and dehydration as reported by (7). However, haematological values are important to clinicopathological diagnosis such as traumatic injury, parasitism, organic disease, bacterial septicemia and nutritional deficiencies (7, 8). (9) reported that, malnutrition, especially inadequate protein and energy intake lowers the pack cell volume (PCV) and haemoglobin concentration (Hb) of poultry chickens. These are microscopic status of the red blood cell and are indicators of anemia (10). (11) reported that, low blood glucose is an indication of inadequate energy intake while low blood albumin indicates low protein intake. It has been observed that fast growing animals especially broiler chickens have high serum albumin, haemoglobin concentration, glucose and low concentration of potassium. Enzymes have been approved for use in poultry feed because they are natural products and pose no threat to the animal or consumer (12, 4). Soya bean residue is a protein source available locally, with crude protein content of around 27% and energy close to 2800kcal (5). Therefore, the objective of this study was to

access the effects of diets containing soya bean residue supplemented with or without *Kingzyme*® (enzyme) on the haematological and serum biochemical indices of broiler finisher chickens.

Materials and Methods

The study was conducted at the University of Maiduguri Teaching and Research Farm Maiduguri. Maiduguri is located between latitude 11° 5' and 12° North and longitude 13°05 and 14° East at an altitude of 353 m above sea level (13), the Borno state is located on latitude 11°51 N", longitude 13° 09 E" and at altitude of 354m above sea level with mean relative humidity ranges from 30% to 45% (12).

Experimental Diets and Management

A total of three hundred and sixty (360) *Cobb 500* broiler chickens were allocated to four (4) dietary treatments with different levels of *Kingzyme*® supplementation designated as 0, 25, 30 and 35g as presented in Table 1. The study lasted for 28 days at the finishing phase. Feed and water were supplies *ad-libitum*. Each treatment is replicated thrice containing 30 chickens per replicate; in completely randomize design (CRD).

Blood collection and Response Criteria:

At the end of the feeding trial, six birds were randomly selected from each replicate. The ventral part of the left wing was carefully defeathered to locate the veins. About (5 ml) of blood was collected via the left wing vein of each of the representative birds using a 10ml gauge syringe and scalp vein needle. About 3ml of the blood was fed in to a sterile bottle containing Ethylene Diethyl Tetra Acetic acid (EDTA), as anticoagulant for haematology assay. It was placed in an ice-

Table 1: Ingredient Composition of the Experimental Broiler Finisher Diets Containing SBR with Different Levels of Kingzyme® Supplementation (4 – 8 weeks)

Ingredients (%)	Level of Kingzyme® supplementation/100kg			
	0	25	30	35
Maize	54.00	42.00	42.00	42.00
Soya bean meal	24.00	16.00	16.00	16.00
Soya bean residue	0.00	18.00	18.00	18.00
Groundnut cake	13.50	10.00	10.00	10.00
Wheat offal	2.00	5.50	5.50	5.50
Palm oil	2.00	4.00	4.00	4.00
Bone meal	2.50	2.50	2.50	2.50
Limestone	1.00	1.00	1.00	1.00
Min-Vit Premix*	0.30	0.30	0.30	0.30
Methionine	0.20	0.20	0.20	0.20
Lysine	0.20	0.20	0.20	0.20
NaCl	0.30	0.30	0.30	0.30
TOTAL	100.00	100.00	100.00	100.00
Calculated Analysis				
ME (Kcal/kg)	3204.00	3203.00	3203.00	3203.00
Crude protein (%)	20.13	20.14	20.14	20.14
Ener. protein ratio	158.41	157.22	157.22	157.22
Ether extract (%)	9.02	9.77	9.77	9.77
Crude fibre (%)	3.37	6.11	6.11	6.11
Calcium (%)	1.10	1.11	1.11	1.11
Avai. Phos. (%)	0.45	0.44	0.44	0.44
Ca.: P. Ratio (%)	2.50	2.25	2.25	2.25
Lysine (%)	1.11	1.09	1.09	1.09
Meth + cys. (%)	0.79	0.71	0.71	0.71

ME= Metabolizable energy, Ca=Calcium, P/Phos=Phosphorus, Meth=Methionine, Cys=Cysteine

* = Bio Mix Broiler Finisher Premix supplying the following per Kg of feed: Vitamin A=3,400,000IU, Vitamin D₃= 600,000IU, Vitamin E=4,000mg, Vitamin K₃ = 600mg, Vitamin B₁ = 640mg, Vitamin B₂ = 1600mg, Niacin = 8,000mg, Pantothenic=2000mg, Vitamin B₆ = 600mg, Vitamin B₁₂ = 4mg, Folic acid =200mg, BiotinH₂ = 300mg, Choline Chloride = 70,000mg, Cobalt = 80mg, Copper = 1200mg, Iodine = 400mg, Iron = 8,000mg, Manganese =16,000mg, selenium=80mg, Zinc=12,000mg and Antioxidant=500mg.

moist jute material to avoid Haemolysis. The remaining 2ml was fed in to yet another sterile but plain bottle. This was later spinned in a haematocrit centrifuge for about 6 minutes at 200 rpm to separate serum from the plasma. It was then allowed to stand for 2hrs at room temperature. Sample of the blood with EDTA was drowned in a heprinised capillary tube and PCV was

determined by microhaematocrit method. Determination of RBC and WBC (along with differential leucocytes count) were carried out according to (14) while MCV, MCH and MCHC were calculated as follows:
 $MCV (fl) = PCV \times 10 / RBC \times 10$; $MCH (pg) = Hb \times 10 / RBC (%)$; $MCHC (%) = Hb \times 100 / PCV$.

From the centrifuged blood sample in plain

bottles, serum was collected for biochemical assay. Blood glucose was determined using *Hexokinase method*. Total protein and albumin were determined by *Biuret method* and *Bromocresol Green method* respectively. Blood Urea Nitrogen (BUN), Creatinin as well as activities of the liver enzymes (ASAT and ALAT) were determined by Standard Enzymatic method. Serum Cholesterol was determined by *Burchad reaction*.

Statistical Analysis: Data collected were subjected to analysis of variance (ANOVA) in completely randomize design (CRD). Significant differences among treatment means were compared using Duncan's Multiple Range Test (15). SPSS version 9.0 was used for the computer analysis of the data.

Results and Discussion

The haematological parameters of broiler chickens fed diets containing SBR supplemented with or without enzyme are presented in Table 2. The results for all parameters of haematological indices revealed non-significant ($P > 0.05$) differences among all the dietary enzyme supplemented groups for Packed Cell Volume (PCV), Haemoglobin (Hb) concentration, Red Blood Cells (RBC) count, and White Blood Cells (WBC) count, respectively. RBC counts recorded in this study are 3.33, 3.66, 4.00 and 3.80 $\times 10^6/\text{mm}^3$ for supplementation levels 0, 25, 30 and 35g respectively were within the normal range ($2-4 \times 10^6/\text{mm}^3$) for broiler chickens reported by (16). However, the mean RBC value at 30g level of supplementation is slightly higher

Table 2: Hematological parameters of broiler chickens fed diets containing soya bean residue (SBR) supplemented with enzyme (*Kingzyme*®)

Parameters	Level of <i>Kingzyme</i> ® supplementation (g/100kg)					Ref. Value *
	0	25	30	35	SEM	
PCV (%)	23.0	23.0	23.0	25.0	0.01 ^{NS}	24.00-44.00*
Hb (g/dl)	7.83	7.76	7.73	8.30	0.40 ^{NS}	9.10-13.90*
RBC ($\times 10^6/\text{mm}^3$)	3.33	3.66	4.00	3.80	0.29 ^{NS}	1.58-4.10*
WBC ($\times 10^3/\text{mm}^3$)	12.16	12.40	12.46	12.40	0.62 ^{NS}	9-13*
MCV (fl)	81.70	83.27	88.07	77.80	0.08 ^{NS}	90-140**
MCH (pg)	25.80	27.47	27.00	28.53	0.33 ^{NS}	33-47**
MCHC (%)	33.10	33.28	33.13	33.20	0.85 ^{NS}	26-35**
Differential Leucocytes counts (%)						
Neutrophils	20.33	29.00	28.00	24.00	5.12 ^{NS}	50-70*
Monocytes	0	0	0	0	0 ^{NS}	0-7*
Eosinophil	1.33	2.66	0.66	1.66	1.17 ^{NS}	0-5*
Basophils	0	0	0	0	0 ^{NS}	0-1*
Lymphocyte	78.33	68.33	71.33	74.33	5.16 ^{NS}	40-100**

*a, b, = means within the same row bearing different superscripts differ significantly ($P < 0.05$), SEM = Standard Error of Mean s, PCV = Packed cell volume, WBC = White blood cells counts, Hb = Haemoglobin concentration, RBC = Red blood cell counts, MCV = Mean corpuscular volume, MCHC = Mean corpuscular haemoglobin concentration, MCH = Mean corpuscular haemoglobin, Ref. Value = * 17, **18.*

(4.00 X10⁶/mm³) than the reported value (3.57 X10⁶/mm³) by (19) and also lower compared with the range (5.86-7.33 X10⁶/mm³) values reported by (20). The results obtained for WBC in this study were 12.16, 12.40, 12.46 and 12.40 X10³mm³ for treatments 1, 2, 3 and 4 respectively, and were all within the normal range for broiler chickens (90-13 X10³mm³) reported by Anon (16). This suggests normal production of defensive mechanism to combat infection. MCH, MCV and MCHC showed no significant (P>0.05) effect across the treatments. MCH, MCV and MCHC values with the exception of MCH falls within the normal physiological limit, while MCH recorded lower (5.48-6.04 pg) range value and wide range gap compared with reference value reported by (16). (14) observed that, MCH, MCV and MCHC values lower than

the range of values postulated, manifested as anaemic condition and might result from less efficient feed-utilization. Despite the fact that, no significant (P>0.05) differences were observed, this does not indicate ill-health or disease in the birds during the study period and agrees with the report of (19).

The results of serum biochemical indices of broiler chickens fed diets containing SBR with or without enzyme supplementation are presented in Table 3. The following biochemical parameters evaluated showed no significant (P>0.05) differences among all treatments with respect to total protein, globulin, urea, creatinine, cholesterol, chloride, direct bilirubin, and conjugated bilirubin and alanine aminotransferase (ALAT) while albumin, glucose, sodium (Na), potassium (K) and aspartate aminotransferase (ASAT) showed significant (P<0.05) differences among all the treatment groups.

Table 3. Serum biochemical indices of broiler chickens fed diets containing soya bean residue (SBR) supplemented with or Without enzyme (Kingzyme®)

Parameters	Level of Kingzyme® supplementation (g/100kg)				SEM	Ref. value*
	0	20	25	30		
Total protein (g/dl)	49.00	45.00	48.00	52.00	2.14 ^{NS}	30.00 – 49.00
Albumin (g/dl)	31.66 ^{ab}	27.66 ^b	30.00 ^b	37.33 ^a	1.85*	10.00 – 16.00
Globulin (g/dl)	17.33	17.33	18.00	18.00	1.31 ^{NS}	19.00 -29.00
Blood urea (g/dl)	5.60	5.58	6.20	5.86	0.92 ^{NS}	1.9 – 12.5
Glucose (iu/l)	7.50 ^a	5.30 ^b	6.36 ^{ab}	6.00 ^{ab}	0.55*	5 – 12
Creatinine (mg/dl)	4.33	4.00	4.00	6.33	0.46 ^{NS}	5.00 -7.00
Cholesterol (mmol/l)	5.60	4.30	4.23	5.30	0.64 ^{NS}	52 – 148
Sodium (mmol/l)	145.33 ^a	140.33 ^{ab}	137.33 ^b	137.33 ^b	1.98*	139 – 155
Potassium (mmol/l)	4.76 ^b	5.73 ^a	5.26 ^{ab}	4.96 ^b	0.25*	1.7 - 4.2
Chloride (mmol/l)	92.00	96.33	99.00	96.66	2.57 ^{NS}	108 – 124
Direct Bilirubin (mmol/l)	1.53	1.80	1.80	1.60	0.31 ^{NS}	5 – 8
Conjugate Bilirubin. (mmol/l)	2.56	3.26	2.63	2.80	0.41	5 – 8
ASAT (iu/l)	50.00 ^a	20.67 ^b	33.33 ^{ab}	21.00 ^b	3.36*	6 - 21
ALAT (iu/l)	15.00	17.00	18.33	10.00	2.82 ^{NS}	7 – 21

ASAT = Aspartate aminotransferase, ALAT = Alanine aminotransferase, Ref. value = Reference value, (21), SEM=Standard error mean, NTS = Not tested statistically, NS = Not Significant (P>0.05) * = Significant (P<0.05) a, b, = means within the same row bearing different superscripts differ significantly (P<0.05)

Albumin values recorded varied significantly ($P < 0.05$) across the enzyme supplementation group with 37.33 g/dl being the highest at 35g level of enzyme supplementation and the lowest 27.66 g/dl recorded at 25g level of enzyme supplementation. The range observed in this study was higher than the value reported by (22) and similar to values reported by (23) while glucose values recorded were within the range (5-12 g/dl) postulated by (21) with significantly ($P < 0.05$) higher value (7.50 g/dl) recorded in the control (0g) group and lowest in birds on diets with 25 g/100kg enzyme supplementation. Higher blood albumin value recorded above normal range and glucose value recorded, falling within suggested range indicates that normal protein metabolism occurred in the experimental animals (8), since normal protein synthesis is related to the amount of protein available in the diet (6). Therefore, this might have been influenced by energy protein ratio and effects of exogenous enzyme supplementation in the diets. Among the serum electrolytes determined (sodium, potassium and chloride), significant ($P < 0.05$) differences was observed in sodium (N^+) and potassium (K^+). A significantly ($P < 0.05$) higher value (145.33 mmol/l) of sodium was recorded at 0g (control) supplemented group, followed by 140.33, 137.33 and 137.33 (mmol/l) for 25, 30 and 35g respectively for *Kingzyme*® supplementation, which shows a definite trend of decreased in value as supplementation level increased. Values recorded were within the range reported by (23). Potassium also followed same pattern as sodium but with lower value (4.76 mmol/l) recorded for birds at the control group. Aspartate amino transaminase (ASAT) showed significant ($P < 0.05$) differences among all supplemented groups, broiler chickens at 0 g *Kingzyme*® supplementation

(control) expresses higher ($P < 0.05$) significant values (50.00 iu/l) for ASAT while the lowest value (20.67 iu/l) was observed at 25 g *Kingzyme*® supplementation. Values recorded for ASAT and ALAT followed no particular trend and this disagree with the report of (24). However, the values recorded were within the values reported by (25) and (26). Higher levels of ALAT and ASAT recorded might be an indication of tissue damage. The liver is rich in some enzymes such as ALAT and ASAT, however, the release of these enzymes into the blood is an indication of possible damage to organ and tissues particularly liver.

Conclusion

Therefore, since no sign of ill health was observed during the study, it may be concluded that, the chickens were on adequate nutritional plane and affirm the significant effect of soya bean residue supplemented with enzyme (*Kingzyme*) in the diets of broiler chickens.

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Palm oil Sludge as Energy Substitute in Finisher Broiler Diets: A Pathway Out of the Current Feed Energy Crisis?

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Target audience: Poultry farmers, Feed millers, Livestock extension agents

Abstract

The high cost of energy feed ingredients has pushed feed prices to astronomical levels thereby making cost of mature broiler chickens out of reach of the average consumer. In a bid to keep poultry producers in business the search for cheaper alternative feed ingredients would continue to ensure that consumers have access to live chickens at affordable costs. This experiment investigated the effect of different levels of inclusion of enzyme supplemented Palm Oil Sludge (POS) in the diet of finisher broiler birds. One hundred and twenty 4 week-old birds of the Ross 308 strain were randomly allotted to four treatment diets in a completely randomized design with three replications. Each treatment group contained 30 birds with 10 birds per replicate. Four diets were formulated such that palm oil sludge (POS) replaced maize at 5, 10 and 15% respectively, designated as T₂, T₃ and T₄. The control treatment T₁ contained no palm oil sludge. The experiment lasted for 28 days. The results showed that the birds on T₄ recorded significantly higher weight gains, better feed conversion ratio, reduced feed intake and lower feed costs when compared to the other treatments. Birds on 15% inclusion level recorded final body weight of 2.42kg compared to 2.25kg for the control treatment. It can be concluded that inclusion of enzyme supplemented Palm oil sludge at 15% in finisher broiler diet resulted in increased weight gains and cheaper feed cost which is therefore recommended for adoption by farmers and feed millers in this era of exorbitant cost of feed and mature broiler birds.

Keywords: Broiler birds, cost efficiency, energy, south eastern Nigeria, palm oil industry

Description of problem

The quest for food security for the teeming world population has been a top priority of governments around the world. (1) notes that the world is moving backwards in its efforts to end hunger, food insecurity and malnutrition in all its forms due to conflict, climate extremes, economic shocks combined with high cost of nutritious food. It

is estimated that the number of malnourished people of the world grew by 150 million people between 2019 and 2022, after a decade of steady decline. Animal protein in the form of meat, milk and eggs remain a very vital part of the food security equation especially in sub-Saharan Africa hence its potential to improve access to good nutrition for adults and children under 5 years cannot