



The Effect of Enzymes Supplementation and grain source on Biochemical Profile of Some Blood Constitutes of Broiler Chicks

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Abstract

The effect of enzymes supplementation of maize-based and sorghum based broiler diets on blood constitutes was investigated. A total of 400 one day old broiler chicks (Hubbard) were randomly distributed into 4 dietary treatments (maize based diet with enzymes, maize based diet without enzymes, sorghum based diet with enzyme and sorghum based diet without enzymes) in a 2x2 factorial arrangement complete randomized design experiment (100 birds/treatment). An enzyme mixture (Optimize for sorghum based diet or Optizyme for maize based diet) which consisted of phytase and non-starch polysaccharides (NSP) enzymes (xylanase and β -Glucanase) used in the broiler diet supplementation with inclusion rate of 1g/kg feed. Blood glucose, protein, phosphorus, calcium, glutamate oxaloacetate transaminase (GOT) and glutamate pyruvate transaminase (GPT) levels were significantly ($P<0.05$) affected by the dietary treatments. All these blood constituents except blood calcium were significantly ($P<0.05$) affected by enzymes supplementation, while blood calcium was affected by both factors.

Keywords: Enzyme supplementation, Grain source, biochemical profile, Optimize, Optizyme.

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Introduction:

Despite the well demonstrated beneficial effects of In-Feed-Antibiotics (IFA) in improving the growth rate, reducing the mortality, and increasing resistance to disease challenges. Concerns exist that the use of IFA leads to development of antimicrobial resistance, posing a potential threat to human health (WHO, 2012). However, there might be a link between the practice of using sub-therapeutic

antibiotics and the development of antimicrobial resistance among the microflora. (Cosby, et al, 2015). Gadde, et al, (2017) study the use of many antibiotics alternatives for maximizing growth performance and feed efficiency in poultry. Similar results reported by Abdel-Latif, et al, (2017) who found that the exogenous dietary lysozyme improves the growth performance and gut microbiota in broiler chicken which positively improve the

biochemical profile of blood constituents. The mode of action of NSP enzymes and phytase was found to be highly effective and extremely specific catalysts and they play important roles in catalysis. There is a potential improving in the utilization of protein ingredients, such as soy bean meal, although again this may essentially revolve around improved utilization of carbohydrates that are normally undigested by the bird. (Lesson and summer, 2001 and Lin, 2014). Future research may also confirm that phytase enzyme increase the availability of nutrients other than phosphorous and calcium, because positively charged molecules such as lysine can complex with the negatively charged phytase molecule. Studies of (Lin, 2014) showed that the bioavailability of energy significantly improved when phytase was added to broiler diets. The effects of microbial and / or endogenous phytase of wheat based diets on broiler performance and mineral excretion were investigated, the results showed that phytase addition to high phytate broiler diet resulted in a significant improvement of Phosphorus and Calcium bioavailability and significant increase of total protein, glucose, GPT and GOT. (Lin et al. 2014). Effect of supplementation with enzyme cocktail (NSP enzyme +Phytase) was resulted in significant increase in serum total protein and glucose while insignificant increased in GPT and

GOT (Attia. et al, 2014). Similar results were reported by Gidado, et al, (2020). Varying inclusion levels of sorghum were significantly influence on serum total protein g/dl, serum albumin g/dl, and serum globulin g/dl. The finding showed that the complete replacement of maize by sorghum supplemented broiler diets resulted in significant increase of serum total protein g/dl, serum albumin g/dl and serum globulin g/dl while no significant differences in serum glucose mg/dl. (Gidado, et al, 2020). The present study was conducted to investigate the effect of supplementation of sorghum and maize based broiler diets with a mixture of enzymes consist of phytase, xylanase and beta glucanase on the biochemical profile of some blood constituents of the experimental birds.

Materials and Methods:

Four experimental diets were formulated to meet the broiler requirements as outlined by NCR (1994). The experimental diets were maize base diet without enzymes sorghum base diet without enzyme, maize base diet with enzymes (Optizyme) and sorghum base diet with enzymes (Optimize) with inclusion rate (1g/Kg). The experimental diets were offered to the experimental birds in both production periods (starting and finishing), (Table 1) and (Table 2) showed the composition, calculated analysis and determined analysis respectively.

Table (1): Composition and calculated analysis of experimental diets (%):

(A) Composition

Diet Ingredient	Starter diets		Finisher diets	
	Sorghum	Maize	Sorghum	Maize
Grains	60.8	57.8	60.80	60.90
Groundnut cake 47%	25.0	25.0	24.0	16.0
Sesame cake	7.50	10.0	8.77	13.0
Vegetable oil	0.40	1.00	-	2.0
Wheat Bran	-	-	-	1.81
Di calcium phosphate 18%	0.10	0.10	0.5	0.1
Limestone flour	0.80	0.73	0.5	0.82
Salt	0.25	0.25	0.25	0.25
Lysine HCL	0.09	0.07	0.08	0.07
DI. Methionine	0.09	0.05	0.10	0.05
Super- concentrate (provimi)	5.0	5.0	5.0	5.0
Total	100%	100%	100%	100%

(B) Calculated analysis (as fed)

Diet Component	NRC (1994)		Starter diets		Finisher diets	
	Starter	Finisher	Sorghum base diets	Maize base diets	Sorghum base diets	Maize base diets
Metabolism energy (MJ/kg)	12.97	13.39	12.98	12.84	13.03	13.23
Crude protein (%)	23.00	20.00	23.08	23.04	20.20	20.60
L-lysine (%)	1.10	1.00	1.24	1.25	1.15	1.16
DI-methionine (%)	0.50	0.38	0.50	0.49	0.44	0.45
DI- methionine + Cystine (%)	0.90	0.72	0.87	0.82	0.80	0.75
Crude fiber (%)	0.50	0.50	4.05	4.06	0.84	3.68
Calcium (%)	1.00	0.90	0.92	0.88	0.89	0.88
Av- phosphorus (%)	0.45	0.40	0.45	0.45	0.49	0.44

Super concentrate (Provimi B. V.) Netherlands proximate analysis Crude protein 38.0%, crude fiber 2.5%, calcium 6.52%, phosphorus 4.80%, L. lysine 10%, DI methionine 3.70%, DI- methionine + Cystine 4.05%, metabolizable energy 2010 (Kcal./Kg)

Table (2): Determined proximate analysis of the experimental starter and finisher diets (percent as fed)

Diet Component	Starter diets		Finisher diets	
	Sorghum base diets	Maize base diets	Sorghum base diets	Maize base diets
Dry matter (%)	93.8	95.02	95.03	95.12
Crude protein (N% ×6.25)	24.62	23.52	20.6	21.1
Crude fiber (%)	3.7	5.29	3.42	5.44
Ether extract (%)	9.69	7.88	7.91	8.61
Ash (%)	4.77	7.77	5.05	5.78
NFE* (%)	51.03	50.56	52.45	57.08
ME (MJ/kg) **	12.30	12.16	12.66	13.09

Analysed values are means of duplicated samples.

* NFE = nitrogen free extract value was calculated by difference

** ME = metabolizable energy value was calculated according to the equation of Lodhi *et al.* (1976).

A total of 400 one day old broiler chicks (Hubbard) were allocated to the four dietary treatments (100birds/treatment) and each treatment consist of five replicates (20 birds / replicate) in a factorial arrangement 2X2 complete randomize experiment .Water and feed were provided ad libitum .lighting was provided 24 hours per day . Experimental birds were vaccinated against Newcastle, IB and Gumboro diseases Before slaughtering birds were fasted for 6 hours only from feed. Two birds were randomly selected from each replicate (10 birds / treatment) for blood sampling. Blood samples were collected from the Jugular vein and received in labeled test tubes, which were placed horizontally on racks at room temperature. Blood serum was separated by centrifugation. Blood samples were used directly to determine glucose and protein, and then stored in a deep freezer at -20°C to determined calcium, phosphorous, (GOT) and (GPT) Serum glucose was determined using Colorimetric. G O D-PAP Methods and enzymatic coloro – metric kits were supplied by plasmatic laboratory products (Crescent Diagnostics) according to the method described by Trinder (1969) Serum protein and serum phosphorous were determined using Buriet Colorimetric method –according to the method described by Burtis *and Tietz*, (1999).Calcium was determined according to the method described by Gindler and King (1972).The serum GPT and GOT was determined according to the method described by Saleh et al, (2014).The determined analyses were made according to the methods of A.O.A.C. (1990). Metabolizable energy values were estimated according to the equation of Lodhi *et al.* (1976).A factorial arrangement 2X2 was used in a complete randomized design experiment. Collected data were subjected to two way analysis of variance. Least significant difference {LSD} test was used to assess the significance among dietary treatments means according to Steel, et al, (1996).

Results and discussion

The results of the biochemical profile of blood constituents of the broiler chicks are presented in table (3) the results showed that blood glucose, protein, phosphorus and calcium concentration due to grain source ($P<0.05$),while (GOT), (GPT) and calcium levels were significantly ($P<0.01$) affected by the dietary treatments. Blood glucose, protein and phosphorus were significantly ($P<0.05$) increased for birds fed on enzymes supplemented diets of both grains compared to unsupplemented ones. Birds fed on supplemented based maize-diet had a significantly ($P<0.05$) higher blood calcium level compared to those birds fed on unsupplemented maize based diet. On the other hand, a significant ($P<0.01$) lower (GOT) and (GPT) was observed for birds fed unsupplemented diets for both grains compared to supplemented ones, while no significant differences due to the grain source factor. The statistical analysis of the main effects showed that the significant differences for all parameters except blood calcium level were due to enzymes supplementation rather than grain source. Also it can be seen that the significant difference in blood calcium is due to the grain source and enzymes supplementation. Sorghum-based diets showed a significant ($P<0.01$) increased in blood calcium level compared to maize-based diets, while enzymes supplemented diet caused a significant ($P<0.01$) increase in blood calcium compared to supplemented ones.

Table (3) Effect of enzymes supplementation and grain source on the biochemical profile of the blood constituents of broiler chicks.

Parameter Treatment		Glucose (mg/dl)		Protein (mg/dl)		Phosphorous (mg/dl)		Calcium (mg/dl)		(GOT) (IU/l)		(GPT) (IU/l)	
Grain	Enzymes												
Maize	With	370.9±43.17 ^a		3.66±1.17 ^a		3.62±1.18 ^a		11.68±7.27 ^a		16.17±5.6 ^{ab}		8.4±3.74 ^d	
	Without	343.02±49.98 ^b		1.63±0.66 ^b		3.12±1.25 ^b		4.17±3.06 ^b		28.86±18.91 ^a		38.7±5.35 ^a	
Sorghum	With	395.4±18.12 ^a		2.06±1.60 ^a		3.46±1.02 ^a		15.17±5.90 ^a		10±3.67 ^b		13.1±4.97 ^c	
	Without	362.6±23.63 ^b		1.85±0.69 ^b		3.18±1.76 ^b		10.71±5.52 ^a		26±15.99 ^a		32±5.45 ^b	
Main effects													
		Mean	LS	Mean	LS	Mean	LS	Mean	LS	Mean	LS	Mean	LS
Grains	Maize	356.98		2.65		3.37		7.93		22.51		23.6	
	Sorghum	379.04		1.96		3.32		12.94		18.00		22.6	
Enzymes	With	383.19		2.86		3.54		13.43		27.43		10.4	
	Without	352.83		1.75		3.15		7.44		13.08		35.4	
Grain × Enzymes		NS		NS		NS		NS		NS		**	

LS: Level of significances; NS=Not significant, *=significant at (P<0.05), **=significant at (P<0.01).
a-b Values with in column with different superscripts are significantly different.

The biochemical profile of blood constituents Glucose (mg/dl), protein (mg/dl), phosphorous (mg/dl) and calcium (mg/dl) was found to increased significantly (P<0.05) by enzyme supplementation rather than grain source except calcium concentration which found to be affected by both factors grain (Sorghum or Maize) and enzyme supplementation (with or without) The increase in blood constituents might be due to the fact that supplementation broiler diets resulted in a significant improvement in phosphorous bioavailability by catalyzes the hydrolytic phosphorous which can be absorbed . Other minerals and amino acids that are bound may also be available for absorption (Attia, et al, 2021, Saleh, et al, 2019 Ahmed, et al 2013 and Leeson and Summer, 2001). Also the findings of the present study are in agreement of that reported by Munir and Maqsood (2013), Attia et al. (2021) and Gidado. et al, (2020) who found that phytase supplementation of broiler diets resulted in improved phosphorous and calcium

bioavailability .However, the enzyme supplementation was found to improve true metabolizable energy of broiler diets (Gidado, et al 2020) this result might explained the significant increase in blood glucose of birds fed enzyme supplemented diets in the present study. (GOT) and (GPT) were significantly (P<0.05) increased by enzyme supplementation, while no significant differences due to grain source. This result might be due to the significant improvement in absorption and utilization of blood protein and blood glucose so the higher secretion of these constituents (GOT and GPT) occurred in birds fed supplemented diets of both grains. These results are in agreement with those results reported by Chandel, et al (2022), Attia, et al, (2021), Gidado, et al (2020) and Lei, et al, (2017 in the results of serum total protein, glucose and Calcium concentration .The significant increase in blood P and Ca for birds fed on supplemented broiler diets with a combination of enzyme might be due the enhance nutrient utilization based on the

concept that xylanase releasing the encapsulated nutrients and reduction of digesta viscosity may facilitate the action of phytase on phytic acid complexes and absorption of liberated nutrients. On the other hand, Munir and Maqsood (2013) suggested that the improvement of the efficiency of energy utilization was better in broiler diets supplemented with enzymes. Similar results were reported by Attia, et al, (2014). Who reported that the microbial and / or endogenous phytase of wheat based diets resulted in statistically higher apparent retention of phosphorous and calcium and increase their bioavailability compared to those birds fed on the control diets

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تأثير مكملات الإنزيمات ومصدر الحبوب على الخصائص البيوكيميائية لبعض مكونات الدم في كتاكيت اللحم

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المستخلص

تم دراسة تأثير إضافة الإنزيمات الي أعلاف الدجاج اللحم علي اساس حبوب الذرة الشامية أو حبوب الذرة الرفيعة كمصدر طاقة للعلف علي مكونات الدم الكيموحيوية .تم إستخدام عدد 400 كتكوت لاحم عمر يوم (هبرد) حيث تم توزيعها عشوائيا علي 4 معاملات علفية (حبوب الذرة الشامية +الانزيمات وحبوب الذرة الشامية بدون إضافة الانزيمات : حبوب الذرة الرفيعة +الانزيمات وحبوب الذرة الرفيعة بدون إضافة الانزيمات) وذلك بإستخدام التصميم العشوائي الكامل وفقاً لتنظيم التجارب العلمية (1002) X2 طائر/ معاملة علفية) وكل معاملة تم تقسيمها الي 5 مكررات (20 طائر/ مكرر). تمت إضافة مخلوط إنزيمي (اوبتمايز) للذرة الرفيعة والمخلوط الانزيمي (ابترايم) للذرة الشامية (إنزيمات سكريات عديدة غير نشوية) كلا الانزيمين يتكونان من البيتا جلوكانيز ، زابيلينزو الفايتيزوتمت الاضافة بمعدل 1 جرام/كجم علف. اوضحت النتائج ان معدل الجلوكوز ، البروتين ، الفسفور وانزيمات الكبد (GOT) و(GPT) قد تأثرت معنوياً بإضافة المخلوط الانزيمي ولم تتأثر بنوع الحبوب في حين ان مستوى الكالسيوم في الدم قد تأثر معنوياً بكلا العاملين.