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The Effect of Dietary Microbial Phytase Enzyme supplementation on the performance of broiler chicks

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ABSTRACT: This experiment was conducted to evaluate the ability of supplemental microbial phytase enzyme (500FTU) to improve the utilization of essential amino acids mainly (lysine and methionine) that could be bounded to phytate in plant based diet for broilers ..A total of 150 -7th days old unsexed commercial broiler chicks(Ross-308)were weighed and allotted randomly to 3 treatment groups (50 birds for each treatment)each one divided into 5 replicates with 10 chicks per each .All chicks were experimentally fed for 6 weeks on ground brooding rearing system . Three experimental diets were formulated :A) a positive control diet (PC)which was contained imported super –concentrate to suffice the essential amino acids: B) as a negative control diet (NC)based on only plant protein which was marginally deficient in lysine and methionine, and (C) NC diet supplemented with microbial phytase . All diets were formulated to be iso- nitrogenous (23CP) and iso -caloric (3100kcal/kg). The results indicated that addition of microbial phytase enzyme to NC diet caused a significant ($p<0.05$) improvement in body weight gain , feed intake , feed conversion ratio , protein efficiency ratio dressing percentage and net profit of the broiler chicks , but this values are still significantly lower than that achieved by positive control (PC).

***Keywords*:** phytase , Broiler , growth performance carcass dressing percentage.

INTRODUCTION

In the Sudan poultry feed costs about 65-70 % of the total variable cost in poultry industry and protein costs involve about 45% of the total feed cost (Bin Baraik, 2010; Mukhtar ., 2007). The proper ration should provide all requirement nutrients by the broiler chicks. Most of the main feed ingredients used in broiler diets such as cereal grain and oil seed cakes are deficient in essential amino acids quantity and quality wise. The imported supper-concentrate was provided to suffice for essential amino acids and other micro- nutrients which consequently increase the total cost of poultry feed.

Researcher now seeking to find means to improve the utilization of the essential amino acids and other nutrients of the plant based diet in order to achieve high production with least cost to maintain and sustain production (Mukhtar . 2010a and 2010b).

In this view the addition of microbial phytase to the broiler diets led to hydrolysis of phytate which bind phosphorous, protein , amino acid, and starch ,in plant based diet thereby, increases the availability of these nutrients for broilers chicks(Onyango ,2005 Olukosi ,2007,Peter etal,2009, Cowieson ,2011). Mukhtar .,(2013) studied the effect of dietary microbial phytase (Nutrias P) enzyme (1000, 1500) on performance and carcass characteristics of broiler chicks fed on diets containing 15% Prosopis pods (mesquite). The results showed that addition of microbial phytase enzyme, to diet containing Prosopis pods improved significantly ($P\leq0.05$) the body weight gain, feed intake and feed conversion ratio values of broiler chicks throughout the experimental period (5 weeks), no significant

differences among all treatment groups in percentages of carcass dressing percentage also the mortality rate was not significantly influenced by the dietary treatments.

Mariam ., (2013) reported improved significantly (P≤0.05) the body weight gain, feed intake and feed conversion ratio values of broiler chicks fed diets containing Prosopis pods supplemented with combinations of microbial xylam and phytase enzymes. Also the results showed that the microbial enzymes supplementation did influence significantly the mortality rate, percentages of carcass dressing , Giblets (liver, heart and gizzard) and commercial cuts (thigh, drumstick and breast).

Also addition of microbial phytase in low protein diet have been reported to improve growth performance of broiler (Lan , 2002, Elsaeed, 2013) and improve phosphorous digestibility for certain plant based feedstuffs and over all utilization of broiler diets (Ghasemi , 2006, Bin Baraik, 2010).Therefore, the objective of this study is to evaluate the effects of dietary microbial phytase on performance of broilers chicks fed only plant based diet.

MATERIALS AND METHODS

A total of 150day-old-commerial –unsexed broiler chicks of Ross 308 strain were purchased from the Coral Company-Khartoum, and transported to the student poultry premises College of Agricultural Studies, Sudan University of Science and Technology. Chicks were adopted to the premises and fed over 7 days before started of the experiment .At the end of adaptation period, all chicks were weighted with an average weight (75 g) , then assigned randomly into 3 dietary treatment groups A ,B ,and C in a completely randomized design(CRD), each group was divided into five replicates with 10 chicks per each. .Each pen was equipped with one feeder and drinker to allowed optimum consumption of feed and water .The house was cleaned and disinfect before the commencement of the experiment. Chicks were bought vaccinated against Newcastle disease at 22 days of age using Lasota strain and Gambaro disease at 11 days of age through drinking water, soluble multi-Vitamin compounds (pantominovit pantex Holland B .V 5525 ZG Duizel Holland), and antibiotics (Neomycin, Avico, Jordan) were given during the first 3 days of age and 4 days before and after vaccination to guard against stress. Light was provided 24 hours in a form of natural light during the day and artificial light during night.

Three experimental diets (A, b and C) based on cereal grains (sorghum) were formulated to be similar in metabolizable energy (3100k cal /kg) and crude protein (23%). Diet (A) as positive control which contained super concentrate , diet (B) negative control (NC) based on only plant protein source (groundnut cake) which was deficient in lysine (44%) and methionine (55%) from that recommended by NRC, (1994), but supplemented by vitamins and minerals.

Diet (B) similar to diet (C) but supplemented with microbial phytase enzyme (BASF), added to provide 500 phytase units (FTU)/Kg feed. The ingredients percent composition, calculated (according to Ellis, 1981) and determinate analysis (according to AOAC, 1988) shown in table (1). The live body weight and feed intake of chicks were recorded weekly throughout the experimental period, while feed conversion ratio (feed intake (g)/weight gain (g)) and weight gains were calculated at the end of the experiment. The data obtained (feed intake, body weight gain, feed conversion ratio, protein efficiency ratio , hot and cold dressing) were tabulated and subjected to analysis of variance (one way ANOVA) using the SAS computer program (SAS 1994) .The least Significant Differences (LSD) was used for treatment means separation as outline by Steel and Torrie (1960) .

Table 1. The Ingredient Composition of Experimental Diets

Ingredient	Treatment		
	A	B	C
Sorghum	64.0	64.0	64.0
Methionine	0.14	-	-
Groundnut Cake	28.61	33.0	33.0
Wheat Bran	1.0	-	-
Oster Shell	0.5	1.5	1.5
Salt	0.25	0.25	0.25
Dical Phosphate	0.5	1.0	1.0
Conc	5.0	-	-
Vit .And Mineral	-	0.25	0.25
500 FTU/K	-		500.0

Calculation Chemical Analysis of experimental diets			
Dry matter	89.20	87.57	87.57
Crude Protein	23.10	22.98	22.98
Crude Fiber	4.44	4.60	4.60
Ether Extract	3.90	4.90	4.90
Ash	4.60	4.10	4.10
Nitrogen Free Extract	63.90	63.20	63.20
Calcium	0.91	0.92	0.92
Phosphorus	0.68	0.70	0.70
Available Phosphorus	0.45	0.45	0.45
Metabolizable Energy (Mcal/kg)	3102.84	3132.57	3132.57

Determined Chemical Analysis of Experimental Diets			
Crude Protein	23.09	23.07	23.07
Ether Extract	3.96	3.92	3.92
Ash	4.45	4.47	4.47
Crude Fiber	4.33	4.32	4.32

Metabolizable Energy: calculated according to (Ellis, 1981,Kuku Bulletin)

Table 2. The effect of supplementary microbial phytase on the performance of broiler chick fed plant –based diet deficient in lysine and methionine

Item	+	Mean± Stander deviation		
	F Value	A	B	C
Initial weight (g/bird)	-	75	75	75
Final weight (g/bird)	-	2180	914	1133
Weight gain (g/bird)	*361.195	2105^{a}±51.3	839^{b} ±106,.4	1058^{c}±35.2
Feed intake/g (g/bird)	*400.47S	4315.0^{a}±1278	2028^{b}±161.0	2376.0^{c}±56.5
FCR(gfeed/g gain)	13.08NS	2.050^{a}±9.456	2.14^{a} ±1394	2.22^{a}±o.355
Protein efficiency ratio g/gain /g protein intake		2.12±	0.99±	1.66±
Survivability %	NS	100	100	100
Hot carcass	32.21S	72.26^{a} ±1.302	67.93^{b} ±0.2160	70.93^{c}±9.430
Cold carcass	31.53S	71.66^{a} ±9031	67.26^{b} ±9428	69.26^{c}±0.377
Total returns /bird	-	1.458	0.683	0.978
Net profit /bird	-	6.64	1.090	3.900

*T: with (2-9) degree of freedom S:siginicant (p<0.05)

* NS No significant different (p>0.05) *: Denote F value significiant

Means in arrow followed by the same letter don't different significant (p>0.05)

*Total cost calculation according toOctober 2012. *Price Kilograms of bird calculation a cording to December 2012

RESULTS AND DISCUSSION

The results of performances of broilers fed different dietary treatments were given in table (2)., it revealed that addition of microbial phytase to broiler diet containing only plant protein , marginally deficient in lysine and methionine caused significant (P<0.05) improvement of body weight gain accompanied by increasing in feed intake compared with un-supplemented diet (NC). Similar results have been reported by Olukosi , (2007) who found that the addition of microbial phytase to nutritionally marginal corn-soybean meal improved body weight gain and feed intake of broiler chicks.

Also (Saleh ., 2005) found that addition of microbial phytase to broiler diets containing only plant protein, nutritionally deficient in lysine and methionine caused significant (P<0.05) improvement in body weight gain and feed intake of the broiler. This improvement in body weight gain due to dietary microbial phytase could be explained by the improvement in phytin phosphorus utilization in the chicks intestine, and hydrolysis of phytin improves the overall nutritive value of the diet through better utilization of protein , essential amino acids, trace elements, energy and carbohydrates for bird growth (Kies ., 2001, Onyango , 2005, Bingol et a.,l 2009 and Bin –Baraik, 2010) .Also, the increases in feed intake with microbial phytase supplementation might be resulted from increases in digestibility nutrients and partial cell wall degradation (Naher 2002; Ahmed , 2004 and Bingol ., 2009). On the other hand, this results contradicts with the findings of Wilson, (1999) who found that the feed intake was decreased due to addition of enzymes since birds feed fulfill their nutrients requirements by taking less amount of feed . Although the addition of microbial phytase to the (NC) diet increased body weight gain and feed intake in current study, but still these values were less than those achieved by chicks received normal broiler diets (PC). This may be due to the concentration of the microbial phytase used in this study is not quite enough to liberate all amounts of nutrients which

bounded by phytic acid in plant based diets. (Morz, 2002) reported that the degree of the improvement in digestibility/ utilization of dietary protein and energy may be dependent on the sources and level of dietary phytate , protein , energy and stability of phytate complex.

The feed conversion ratio (FCR) was not affected significantly by addition of microbial phytase. However, the chicks fed (PC) diet had the best FCR,while slightly improvement was observed on those fed (NC)diet supplemented with phytase .Similar results, observed by many researchers(Brenes ., 2003; Atif ,2006; Boskurt ., 2006, Olukosi , 2007 and Bingol ., 2009) .In contrast, many reasearchers (Onyango ., 2004; Ghasemi ., 2006 and Bin- Baraik, 2010).

The results of the protein efficiency ratio (PER) reported here showed that phytase supplementation to the (NC) diet which low in lysine and methionine significantly ($P<0.05$) improved PER of the broiler diets ,but the value still less than those fed normal diets (PC). These results were in line with those obtained by El-Madani ., (2002) who found that addition of microbial phytase significantly improved PER of broiler fed low protein. These results support the idea that phytase improved the utilization of protein and amino acids that could be bounded to phytate (Kies, 2001; Pourreza and Classen,2001; Onyango ., 2005 and Olukosi, 2007).

The microbial phytase enzyme supplementation to broiler diets had no effect on broiler chicks health. This result coincides with the finding of (Alam , 2003, Arabi, 2006 and Atif, 2006 Mariam .,2013; Mukhtar .,2013).

The results showed that, hot and cold carcass dressing percentages of broiler chicks fed different dietary treatments were improved significantly ($P<0.05$) by addition of microbial phytase to the (NC)diet, however these values were still significantly ($P<0.05$) lower than those obtained by (PC)diet group .Ahmed ., 2004 and Bingol .,2009) reported coincided results with the addition of microbial phytase to broiler diets.

The economical evaluation of the experimental diets indicated that the addition of microbial phytase to plant base diets which deficient in Lysine and methionine (NC) increased the net profit from 1.040 to 3.400 Sudanese pound /bird, but this values were still lower than that gained by broiler fed normal diet (PC) (6.646 SP/bird) . This may be due to the highest returns in weight gain recorded by the (PC) groups.

Considering to the above findings it may be concluded that addition of microbial phytase enzyme to the plant based diet, which low in methionine and lysine improved significantly, the values of live body weight gain, feed intake, protein efficiency ratio, dressing percentage and net profit of broiler chicks, but these values were still less than that achieved with normal broiler diets (PC) which completed in lysine and methionine.

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