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ORIGINAL ARTICLE

FEEDING BROILER CHICKS ON DIETS CONTAINING 15% PROSOPIS PODS FLOUR SUPPLEMENTED WITH MICROBIAL PHYTASE ENZYME ON THE PERFORMANCE AND CARCASS CHARACTERISTICS

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ABSTRACT: This experiment was run to study 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). Four diets were formulated, (A) control diet (without Prosopis pods or enzymes) and B (control diet with 15% Prosopis pods), two levels of microbial phytase , 1000 and 1500 g/ton were added to diet B to formulate diets C and D *respectively* using 112 chicks, four replicates , each of 7 chicks in a complete randomized design (CRD).All diets were formulated to be iso-caloric (3100 K cal/Kg) and iso-nitrogenous crude protein (22.8%) to meet the nutrient requirements for broiler. Experimental parameters covered performance, carcass characteristics and economic appraised. The results showed that addition of microbial phytase enzyme, to diet containing Prosopis pods improved significantly ($p \leq 0.05$) the body weight gain, feed intake and feed conversion ratio values of broiler chicks throughout the experimental period (5 weeks). No significant differences were observed between Prosopis pods diets supplemented with the enzyme, in body weight gain, feed intake and feed conversion ratio values of broiler chicks. The mortality rate was not significantly influenced by the dietary treatments. The results indicated that there were no significant differences among all treatment groups in percentages of carcass dressing, Giblets (liver, heart and gizzard), commercial cuts (thigh, drumstick and breast) and their percent of meat, meat chemical composition (moisture, protein, fat and ash) and subjective meat quality parameters (tenderness, juiciness, flavor and color) of broiler chicks. Economically appraised values were Profitability ratio (1.68) of group C (1000 gm / ton phytase) was the highest of the test groups.

KEYWORDS: Microbial Phytase Enzyme, Prosopis Pods, Economical Appraised.

INTRODUCTION

Prosopis spp. Which is known locally as mesquite, is an extremely hardly, drought-tolerant plant. The potential uses of Prosopis as food, feed, fuel and building materials have been reviewed by Felker and Badurski (1979); Ausol (2011) and Munassur (2011). The indehiscent pods are palatable to man and animals Prosopis now occupies many hectares and distributed widely, several efforts were made to control it but with little success (Eltyeb *et al.,* 2001). Now the Prosopis is considered one of the most important species for forestation and consequently as a solution for some problems like fodder, shortage, in addition to its protective value against wind (Fagg and Stewart, 1994).

Whole pods of Prosopis juliflora were found to provide 7% digestible crude protein and 75% total digestible nutrients on dry matter basis. Dietary fiber represents 30% of the pulp and is largely insoluble (Mohammed, 2001). More than half of the fiber fraction consists of neutral poly-saccharine. The high level of phytic acid which acts as anti-nutritional factor can reduce the availability of minerals in plant products (Reddy *et al.,* 1982). Poultry have no endogenous Phytase activity and so there is little digestion of Phytase phosphorus. Many researchers Tested the effect of microbial Phytase on the growth performance and nutrient utilization of broiler chickens (Arabi, 2006; Munassur 2010; Oslukosi *et al.,* 2007; Bin Baraik, 2010 and *Bahadoran et al.,* 2011).

This study was conducted to evaluate the effect of commercial dietary phytase enzyme on performance, carcass characteristics meat yield and quality and economical evaluation of broiler chicks fed on 15% Prosopis juliflora pods based diet.

MATERIAS AND METHODS

The experiment testing different levels of commercial phytase enzyme on the performance and carcass characteristics of broiler chicks fed diets containing Prosopis pods was carried out. The experiment conducted during the period

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from 19th December 2010 to 23rd January 2011. The average weekly temperature ranged between 16.9 C° and 31.8 C°, respectively. A total of 112 one day old (Ross 308) commercial-unsexed broiler chicks were obtained, transported, housed with facilities, adopted to premises and feed over 7 days before the start of the experimental period, weighted and experimentally allocated randomly to 4 groups and replicated with 7 chicks arrangement. Sixteen pens, 1 m each, inside the house were prepared using wire mesh partitioning. Each pen was equipped with one feeder and drinker to allow ad libitum consumption of food and water. Light was provided 24 hours, in the form of natural light during the day and artificial light during night. The house was cleaned and disinfected before the commencement of the experiment.

Prosopis pods were harvested from Khartoum North. Stretched in a well-ventilated opened building for two days till they were dried. Pods were cleaned, and milled in an electric mill to pass through a forty mesh sieve. Milled pods then subjected to a process of drying for overnight, after that sealed in plastic bags to avoid insect infestation, and stored for chemical analysis.

Microbial phytase (Nutrase P) was used in this experiment. It is an enzyme preparing made from bacteria E coli which produced by Nutrex Company for feed enzyme production, Achtersten 5, 2275 Lille Belgium, contained 500 U phytase/g. Four experimental diets A,B,C and D based on cereal grains were formulated to be iso-caloric (3100 Kcal/Kg) and iso-nitrogenous (22.8%) crude protein to meet the nutrient requirements of broiler chicks according to NRC (1994).

(A) Diet standard control (without Prosopis pods and phytase enzyme).

(B) Diet (contained 15 % Prosopis pods without enzyme).

(C) Diet (diet B supplemented with 1000 g. phytase / ton.

(D) Diet (diet B supplemented with 1500 g. phytase / ton.

The percent composition and the calculated experimental diet were presented in tables (1 and 2)

Table 1: Composition of the experiment diets

Ingredients %	Diets			
	A	B	D	C
Sorghum (feterita)	65.75	49.11	49.11	49.11
Prosopis pods	-	15	15	15
Ground nut cake	13	21.86	21.86	21.86
Sesame cake	15	5.1	5.1	5.1
Concentrate *	5	5	5	5
Oyster shell	1	0.7	0.7	0.7
Oil	-	2.68	2.68	2.68
Vit. And Min. **	-	0.2	0.2	0.2
Salt	0.25	0.25	0.25	0.25
Methionine	-	0.1	0.1	0.1
Phytase	-	-	0.1	015
Total	100	100	100	100

*Broiler concentrate: crude protein 40%, crude fiber 1.5%, lysine 13.5%, methionine 5.9%, meth+cystine 60.25%, calcium 6.8%, phosphorous 7%, sodium 1.5%, Me2.122Kcal/ Kg. added vitamins and minerals per Kg: V.A250,000IU, V.D3 60.000IU, V.E 800ppm, V.K3 60ppm, V.B12 40ppm, B2 100ppm, pantothenic acid 200ppm, niacin 800ppm,V,B6 50 ppm, V.B12 300 ppm, V.C 4.000ppm, Biotin 2000 ppm, Folic acid 30 ppm, choline chloride 10,000 ppm, iron(Fe) 1.000ppm, copper (Cu) 300 ppm, zinc (Zn) 1.000 ppm, Manganese (mn) 1.600 ppm, iodine 20 ppm, cobalt 12 ppm , Antioxidant added . **Vitamins and minerals supplement per Kg product: V.A 300,000 IU, V.D3 100,000 IU, V.E 4.00ppm, V.K 98 ppm, V.B2 1.320 ppm, V.B12 4.00ppm, pantothenate 2.0 ppm, Niacin 20.0 ppm, Folic acid 100 ppm, coline 50.0 ppm, copper 15.0 ppm, iodine 250 ppm.

Table 2: Calculated analysis of experimental diets used

Ingredients %	Treatments			
	A	B	C	D
Dry matter	94.85	95.49	95.49	95.49
Crude protein	22.7	22.8	22.8	22.8
Crude fiber	7.35	8.05	8.05	8.05
Ether extract	3.35	3.54	3.54	3.54
Ash	4.65	4.77	4.77	4.77
N F E	59.8	56.33	56.33	56.33
Calcium	1.06	1.07	1.07	1.07
Total phosphorous	0.79	0.82	0.82	0.82
Available phosphorous	0.5	0.4	0.4	0.4
M E K cal /Kg. *	3097	3079	3079	3079

*Calculated according to (Ellis, 1981: Kuku Bulletin).

Average body weight, weight gain and feed consumption (g) for each group were determined weekly throughout the experimental period. Heath of the experimental stock and mortality data were closely observed and recorded daily.

At the end of the experiment birds were fasted over night with only water allowed, weighted individually before slaughtered. After bleeding they were scaled in hot water, hand plucked and washed. Evisceration was accomplished by a posterior vertical cut to remove the visceral organs. Hot carcass, liver, heart and gizzard were separately weighted.

The carcass was then divided in to right and left sides by mid sawing along the vertebral column and each side was weighted. The left side was divided into three commercial cuts; breast, drumstick and thigh. Each cut was weighted separately (Mohammed, 1998). The meat was frozen and stored for chemical analysis and panel tests.

Triplicate samples were analyzed at Food Research Centre Laboratories-Shambat, for chemical analyzed of protein, moisture, fat and ash contents according to the AOAC (1988).

Triplicate meat samples were slightly seasoned wrapped individually in aluminum foil and roasted at 190°c for 70 minutes. The cooked meat was allowed to cool to room temperature in about 10 minutes. Taste panel group of ten well trained people were used to give score for, color, flavor, tenderness and juiciness of meat (Cross et al., 1978). The scale of the taste panel was from 1-8 degrees. The samples were served randomly to each judge; water was available for use between samples.

RESULTS

The data concerning the performance of broiler chicks fed on Prosopis pods flour based diet supplemented with phytase enzyme were found in Table (3).

Results revealed that treatment groups A, C and D had positive significant (P<0.05) higher body weight gain compared to chicks fed on (B). The same trend was recorded for feed conversion ratio , however groups A,C and D treatment recorded significantly (P<0.05) the best values compared to chicks in group B. Data recorded for feed consumption and mortality rate of experimental chicks showed no significant (P>0.05) differences althrough the experimental period .

Table 3: Effect of different levels of phytase enzyme on performance of broiler fed diets contained Prosopis pods for 5 weeks

Items	Treatment groups				
	A	B	C	D	SE
Initial body (g)/bird	198	200	189	197	
Final body weight (g)/ bird	2037	1908	1876	2084	
Body weight gain (g)/bird	1840[a]	1708[b]	2974[a]	1850[a]	0.02
Feed intake (g)/bird	3950[a]	4000[a]	3970[a]	3985[a]	98.04
Feed conversion ratio	2.14[a]	2.34b	2.16[a]	2.15[a]	0.04
Mortality%	0.00[a]	0.25[a]	0.00[a]	0.00[a]	0.12

Means on the same raw having different superscript letters are significantly different (p<0.05). (A)= Standard control (without Prosopis pods and enzyme). (B)= Positive control (contained Prosopis pods without enzyme). (C)= B + 1000g.phytase /ton. (D)= B+ 1500g phytase /ton.

Hot dressing percentage expressed as a percentage of final body weight and non carcass components expressed as hot dressing percentage found in Table (4). Results showed no significant (P>0.05) difference between tested groups. Percentage of commercial cuts and the values of meat expressed as percentage from the total weight of the commercial cuts. There was no significant (P >0.05) treatment effect in drumstick, breast, and thigh values and all treatment (mean values were similar). No significant (P>0.05) effect was observed between the treatment groups in meat percentages of breast, thigh and drumstick cuts

Meat chemical composition aspects (moisture, crude protein, ash and ether extract) were shown in table (5). Result obtained showed no significant (P>0.05) difference between treatment groups.

Average subjective meat values (color, tenderness, flavor and juiciness) of chicks showed were not significantly (P>0.05) differ among all the measurement groups. The score groups given for all attributes are above moderate acceptability.

Profitability ratio/Kg meat of the group D (1500 phytase) and A (standard control) were the highest of the tested groups.

Table 4: Effect of different levels of phytase enzyme on dressing percentage, body components and Commercial cuts expressed as percentage

Items	Treatment groups				
	A	B	C	D	SE
Dressing %	70.15[a]	70.00[a]	70.15[a]	70.20[a]	0.8775
Heart %	0.89[a]	0.85[a]	0.89[a]	0.86[a]	0.09487
Liver %	2.31[a]	2.29[a]	2.31[a]	2.32[a]	0.307
Gizzard%	2.32[a]	2.31[a]	2.32[a]	2.33[a]	0.2574
Drumstick %	16.21[a]	16.27[a]	16.21[a]	16.27[a]	0.1278
Breast %	23.40[a]	23.39[a]	23.40[a]	23.39[a]	2.077
Thigh %	19.31[a]	19.33[a]	19.31[a]	19.33[a]	0.6643

Means on the same raw with the superscript are not significant (p>0.05). (A)= Standard control. (B)= Contained 15% Prosopis pods without enzyme. (C)=B+1000 g phytase/ton (D)= B + 1500 g phytase/ton.

Table 5: Effect of different levels of phytase enzyme on meat chemical composition and subjective meat attributes of experimental chicks

Items	Treatment groups				
	A	B	C	D	SE
Moisture %	70.90[a]	70.74[a]	70.91[a]	70.89[a]	0.2875
Protein %	19.30[a]	19.29[a]	19.32[a]	19.30[a]	0.0948
Ether extract %	8.80[a]	8.78[a]	8.81[a]	8.79[a]	0.1366
Ash %	0.79[a]	0.77[a]	0.81[a]	0.79[a]	0.0182
Color	6.20[a]	6.18[b]	6.21[a]	6.19[a]	0.0026
Tenderness	6.33[a]	6.31[b]	6.34[a]	6.35[a]	0.005
Flavor	6.12[a]	6.15[b]	6.14[a]	6.13[a]	0.0018
uiciness	5.93[a]	5.90[b]	5.93[a]	5.92[a]	0.0023

Means on the same raw with the superscript are not significant (p>0.05). (A)= Standard control. (B)= Contained 15% Prosopis pods without enzyme. (C)=B+1000 g phytase/ton (D)= B + 1500 g phytase /ton.

DISCUSSION

Results showed significant reduction (P>0.05) in weight gain and feed conversion ratio of chicks fed on diet B compared to control group. In this experiment the body weight gain of chicks fed on diets supplemented with phytase (750, 1000) improved significantly (P<0.05) compared to group B. This improvement in body weight gain

might be due to that the supplementation of phytase enzyme increases the phytin phosphorus utilization in the chicks intestine, also hydrolysis of phytin which improved the overall nutritive value of Prosopis pods diets through better utilization of essential trace minerals, protein, amino acids, energy and carbohydrates for birds growth (Ravindran *et al.*, 2000; Kies *et al.*, 2001). Similar results were obtained by Woyengo *et al.*, 2010 and Sabha, 2008 who found that the addition of phytase to wheat–base diets improved the weight gain of broiler by 17.5%. Also the results were in line with that of Bin Baraik, (2010) who reported an improvement in body weight gain due to supplementation of phytase enzyme to broiler diets contained wheat bran. In contrary, Wu *et al.*, (2004) reported that the supplementation of phytase enzyme to corn-soya bean diets did not recorded any significant effects on body weight gain of broilers.

Feed intake of chicks in this experiment showed no significant (P>0.05) differences, might be due to low level of phytase in the Prosopis pods. This results in agreement with the report of Bin Baraik, (2010).

The feed conversion ratio improved significantly by the addition of phytase enzyme to diets contained 15% Prosopis pods flour for the two levels (1000, 1500 g/ton) however chicks fed on diet B recorded poor feed conversion ratio compared to other tested groups. These results were in line with the finding of Bin Baraik, (2010) and with the report of Kies *et al.*, (2001) but the results were disagree with the researchers. These records may be related to the efficiency of phytase enzyme which dependent on several factors like microbial source, form of enzyme, temperature and diet mineral concentration (Ca, Fe, Mg, Cu, and Zn) (Ravindran, 1995). Also these results disagreed with Oslukosi *et al.*, (2007) who, reported that the addition of combination of phytase and cocktail of xylanase and protease (XAP) to corn–soy bean based diet improved the performance of broiler chicks, but the improvement is more likely from phytase, because phytase alone was able to improve daily weight gain. The results showed no significant differences in commercial cuts (thigh, breast and drumstick) percentages. These results agreed with the results of Bin Baraik, (2010); Arabi, (2006); Makkawi, (2009) and Bharathidhasan *et al.*, (2009).

Results also revealed that feeding test enzyme had no significant effect on broiler meat chemical composition (moisture, ether extract, crude protein and ash) values. These results were confirmed by the subjective quality values in broilers meat (tenderness, color, juiciness and flavor) they all being at moderate values. These results were agreed with Arabi, (2006) who found that phytase addition had no significant affect on either subjective or objective meat quality attributes. While, Makkawi, (2009) found that the quality parameters were not affected by inclusion of xylam enzyme to broiler diets. Also these findings were in agree with the results of Bin Baraik, (2010) who found no significant affect on the subjective and objective quality values due to use of xylanase and phytase enzymes individually or in combinations. The health of the experimental chicks was good and the mortality rate was in normal range. This might be to good management. The results were in agreement with that of Bin Baraik (2010); Munassur, (2011) and Makkawi, (2009).

The results of economical evaluation of the experimental diets showed that supplementation of microbial enzyme to diets contained 15% Prosopis pods improved the performance of broiler chicks and resulted economically benefits.

Based on the results obtained it can be concluded that Supplementation of microbial phytase enzyme to diet containing 15% Prosopis pods improved the performance of broiler chicks, with no significant effect on carcass characteristics and internal organs of broiler chicks and economic benefits. Prosopis pods flour inclusion in broiler diets can be a good mechanical method of control and management strategies.

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