Effect of Feed Supplemented with Different levels of Xylam Enzyme on Performance, Carcass Characteristics and Meat Quality of Broiler Chicks

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Abstract

This experiment was carried out to identify the impact of inclusion different levels of commercial xylam enzyme (zero, 0.5kg, 0.75kg, and 1 kg) in the feed on performance, carcass characteristics and meat quality of broiler chicks.300 unsexed one- day old (Ross 308) broiler chicks were used in the experiment. The chicks were randomly distributed to four dietary treatments and with each carrying 75 experimental birds. The treatments were subdivided into three replicates; each was given 25 experimental birds. All chicks were fed experimental diets to for five weeks which formulated according to (NRC) to meet the nutrient requirements. The results indicated that addition of xylam enzyme to diet improved significantly (p<0.05) the feed intake, body weight gain and feed conversion ratio values of broiler chicks throughout the experimental period. The results indicated that there were no significant differences between all treatment groups in percentages of commercial carcass cuts (breast, drumstick ,thigh and wing) and chemical composition of breast meat (moisture, fat, and ash), results also showed that no significant differences observed between all treatment groups in some physical properties of broiler breast meat (PH and WHC). It is concluded that adding (1 kg) of commercial xylam enzyme in broiler chicks diets resulted in economic benefits.

Keywords: *Broiler chicks, Xylam enzyme, Performance*

Introduction:

The provision of good protein in shortest period of time in form of meat and eggs is the major contributing role of poultry in human nutrition (Daffa alla *el at*., 2015). In poultry management, nutrition is considered as a master prerequisite for a successful production. Approximately 70% of the total cost of broiler feed is required to meet energy needs (Abdelgadir, 2009).

Poultry diet generally consists of cereal grains as plant energy sources, most commonly corn, but also sorghum, wheat, and barley, plant protein sources are soya bean, sunflower, groundnut, and cottonseed cake .The major broiler feed content determinants are energy and protein feed supply. A broiler diet of a high energy and protein content promotes fast growth of broiler chicks. Therefore, the broiler metablizable energy (ME) content should not be less than 12.2MJ/kg (whitehead, 2002).

Unfortunately, the rapid growth of the human population has intensified the competition between human and poultry for sorghum grain resulting to the high cost of feed and consequently high prices of poultry products in Sudan (Ahmed, 2013). The most costly components in the poultry feed diet are especially the plant proteins (Khan *el at*., 2006).Enzymes decrease the viscosity of gut contents, resulting in improvements in nutrient digestibility and performance when added to poultry diets (Marquardt *et al*., 1994).

Enzyme supplementation in poultry Diet:

The supplementation of poultry feed with exogenous enzymes can improve the nutritional value of feed in the digestive system of poultry. Since the mid-1980s, feed enzymes have dramatically improved the profitability of commercial poultry production. The current feed enzymes market is worth an estimated $ 700-800 million USD (Bao, *et al*., 2013).

The availability of nutrients in feedstuffs is often limited by the presence of anti-nutritional factors. Six anti-nutritional factors have been identified in plant protein such as soybean (Huisman and Tolman, 1992).Moreover; there are many other important demands for using the exogenous enzymes (Johnson *et al*., 1993).

First, there is an increasing shift in the use of alternative feedstuffs in formulating diets. Second, the use of enzymes has been known to be effective against particular dietary components. Third, novel by-products such as wheat bran and linseed meal have a depressing

effect on growth. Fourth, there is an introduction of excreta pollution control by governments, examples which include phytase and protease reducing excretion of P and N (Francesch *et al*., 2005).

Fifth, there are indirect physiological actions on problems on problems of commercial importance.

Commercial enzyme xylam is assumed to degrade the high fiber content of non- starch polysaccharide (NSP) resulting in increased nutrient availability to broiler chicks (Khan *et al*., 2006; BinBarik, 2010, Munasser 2011 and Mariam, 2013).

Description: Xylam is an exogenous enzyme prepared from microbial Bacillus stabiles and Bacillus amyloliquefaciens (Santos Jr *et al*., 2004).

Therefore, the objective of this study was conducted to examine the effect of different levels of xylam enzyme in broiler diets on its performance, dressing percentage, commercial carcass cuts and meat quality.

Materials and Methods:

The study was conducted at the poultry production farm unit, College of Animal production, University of Bahri during the period from 11 th November 2015 to 15th December 2015 in standard managemental conditions (close system) in which temperature provided weekly were 28c^{o} and 34 c^{o} minimum and maximum respectively. The duration of the experiment was five weeks.

Experimental Birds:

Three hundred unsexed one- day old Ross 308 broiler chicks were purchased from a commercial company (Inmaa for poultry production company, Omdurman –Sudan).The chicks were weighted with an average of initial weight 41 gm. Then used after a week of adaptation period. During the first three days, the chicks were administered to multi-vitamins AD3E+coliston 0.2ml/1L in the drinking water, the chicks were fed on pre-starter (pellets) at the rate of 100gm.per chick in the first week (Table 1),then starter feed mash at the rate of 1.25kg. Per chick and finisher feed mash for the rest period. Water and the feed were freely provided.

Chicks were vaccinated against Newcastle disease at one- day old (spraying) and 21days of age (in drinking water), and against Gambaro disease by using (Hipra Gambaro) at 12 days of age and repeated at 19days old. Soluble multi-vitamins were given to the chicks before and after

three days of the vaccination to guard against stress. The chicks were randomly assigned to four dietary treatments and with each carrying 75 experimental birds T1, T2, T3 and T4 respectively. The treatments were subdivided into three replicates; each was given 25 experimental birds.

Housing:

The experimental chicks were kept in an open experimental wire mesh pen which was constructed on the concrete floor (1.5m2) inside the poultry house. Partitioning of the pens was done by using the wire mesh. Each pen was supplied with nipples line of drinking water and 2feeder (5Kg) which were cleaned and disinfected before feeding started. The feeders and water lines heights were adjusted, according to the progressive growth of the chicks.

Data Collection:

I. Performance Data:

Average body weight, weight gain and feed consumption for all groups were determined and recorded weekly throughout the experimental period. Health of the experimental stock and mortality data were directly observed and recorded daily.

II. Slaughter Procedures:

At the end of a 5th week, the experimental birds have fasted overnight with only water allowed. Birds were weighted individually before slaughter by severing the right and left carotid and jugular vessels, trachea and the esophagus. After bleeding they were scalded in hot mixed with salt water, hand-plucked and washed. The head was removed close to skull and feet and shanks. Evisceration was accomplished by a posterior ventral cut to completely remove the visceral organs.

At the end of slaughter finishing, 5 birds from each dietary treatment were randomly taken to determine the **following:**

1- Dressing %(dressed carcass was weighed and the dressing percentage was obtained by expressing the dressed carcass weight as a percentage of live body weighed).

2- Commercial carcass cuts% (prepared from the hot carcass by dividing the carcass into right and left sides by mid sawing along the vertebral column ,then the left side was divided into commercial cuts; breast, drumstick ,thigh and wing. Each cut was weighted separately and deboned).

3- Chemical and physical analysis (the produced meat was frozen and stored for some chemical and physical analysis. Then 5 samples were stored for 24 hours in a blast freezer and analyzed at

Food Research Centre Laboratories-Shambat, Sudan for chemical analyzed (moisture, fat and ash contents according to the AOAC, 1988),and physical analysis{WHC% and PH}).

Statistical Analysis:

Data were analyzed by one way analysis of variance (ANOVA), by using the PROC MIXED of SAS (SAS, 2003).

Experimental Broiler Diet:

The diet was formulated in a required manner to meet the dietary needs of the experimental birds as recommended by (NRC, 1994). The commercial microbial xylam 500 (composed of α - amylase 8000 U/gm., and 1- 4 β xylanase 1260 U/gm. and the experimental diet was as **follows:** T1, T2, T3 and T4 contained (zero [control], 0.5kg, 0.75kg, and 1kg) of commercial xylam respectively per 1000 kg of feed. The percent composition of the starter and finisher feed mash of the experimental diets were presented in (Table 2 and 3).

Table (1). The ingredients composition of the pre-starter feed (pellets)

Ingredients	**Percentage (%)**
Crude Protein	22.00
Crude Fat	7.00
Crude Fiber	3.00
Sodium	0.19
Lysin	1.30
Methionine	0.55
Meth. +Cyst.	0.95
Calcium	0.95
Total Phosphorus	0.65

***** *ME (Kcal/KG) = 3200*

Table (2) .The ingredients composition starter feed (mash)

Ingredients (%)	**Treatments**			
	1 (control)	**2 (0.5kg)**	**3 (0.75kg)**	**4 (1kg)**
Dura(feterita)	70	65.5	65.5	65.5
Groundnut	21.5	12	11	13
Concentrates	5.00	5.00	5.00	5.00
Wheat bran	2	10	9.0	8.0
Lime stone	1			
Salt	0.2	0.25	0.25	0.25
Lysine	0.2	0.1	0.1	0.1
Methionine	0.1	0.1	0.1	0.1
Xylam(kg)	0 (Control)	0.05	0.75	1.0

***** *ME (Kcal/KG) = 3110*

Table (3) .The ingredients composition finisher feed (mash)

Ingredients (%)	Treatments			
	1 (control)	**2 (0.5kg)**	**3 (0.75kg)**	**4 (1kg)**
Dura(feterita)	75	75	75	75
Groundnut	16	16	16	16
Concentrates	5	5	5	5
Wheat bran	2	2	2	2
DCP.	0.2	0.2	0.2	0.2
Lime stone	1	1	1	1
Salt	0.3	0.3	0.3	0.3
Lysine	0.2	0.2	0.2	0.2
Methionine	0.1	0.1	0.1	0.1
Xylam(kg)	0 (Control)	0.05	0.75	1.0

***** *ME (Kcal/KG) = 3148*

Results:

The results of data obtained for the performance of broiler chicks fed on diets supplemented with (zero [control], 0.5kg, 0.75kg, and 1kg) of commercial xylam respectively per 1000kg of feed were shown in Table 4. The broiler chicks recorded high significant (P<0.01) difference between positive and negative control in all parameters of performance (feed intake, feed conversion ratio and body weight gain). Chicks fed on diet supplemented with 0.5kg of xylam recorded high significant increased (P<0.01) in feed intake, while the chicks fed on diet supplemented with 0.75kg of xylam recorded high significant less (P<0.01) in feed intake compared to all experiment chicks groups. Chicks fed on a diet supplemented with 0.5kg of xylam recorded high significant (P<0.01) higher weights in body weight gain.

Table (4). Effect of Feed Supplemented with Different levels of Xylam Enzyme on Performance of broiler chicks

Parameter	Treatment				SE±	L.S
	1 (control)	2 (0.5kg)	3 (0.75kg)	4 (1kg)		
Feed intake	631.933	671.866	623.179	648.125	31.985511	**
Body weight gain	277.240	309.190	273.667	281.895	35.994812	**
Feed conversion ratio	1.34646	1.40807	1.33286	1.31186	0.04153910	**

In this table and in subsequent tables:
L.S = Level of Significance.
(SE±)= Standard error.
N.S = No significance (p>0.05).
* = Significance (p< 0.05).
** = High significance (p<0.01).

Result also explained that chicks fed on diet supplemented with (1) kg of xylam recorded high significant (P<0.01) the best feed conversion ratio (FCR) while chicks fed on diets supplemented with 0.75 kg of xylam and without recorded similar value of (FCR) although

chicks fed on diet supplemented with0.5kg of xylam recorded high significant (P<0.01) high weights in body weight gain.

Data of dressing percentage and commercial cuts were shown in Table 4. Carcass dressing was expressed as a percent of final body weight, while body components were expressed as a percentage of hot carcass weight. Results showed that there was no significant (P>0.05) difference between treatment groups, all treatment groups' values were similar. Chicks fed on a diet supplemented with (1) kg of xylam recorded significantly (p < 0.05) high percentage in Carcass dressing.

Table (5). Breast, drumstick, thigh, and wing

Parameter	**Treatment**				**SE±**	**L.S**
(%)	**1 (control)**	**2 (0.5kg)**	**3 (0.75kg)**	**4 (1kg)**		
Dressing	63.5524	61.9326	61.9111	65.6506	0.96587	*
Breast	33.1660	33.7101	33.1759	34.5851	0.79845	N.S
Drumstick	7.73530	7.80853	6.98421	7.08635	0.24693	N.S
Thigh	8.67345	8.23606	8.82245	8.36564	0.27531	N.S
Wing	6.23320	6.33610	6.57441	6.00252	0.27139	N.S

Table (6). Effect of Feed Supplemented with Different levels of Xylam Enzyme on Some Chemical Composition of Broiler Breast Meat

Parameter	**Treatment**				**SE±**	**L.S**
(%)	**1 (control)**	**2 (0.5kg)**	**3 (0.75kg)**	**4 (1kg)**		
Moisture	69.5800	69.5747	69.5660	69.5533	0.08756	N.S
Fat	5.65867	5.66067	5.64267	5.58467	0.06205	N.S
Ash	1.50267	1.50933	1.47067	1.44867	0.04643	N.S

Some chemical composition of broiler breast meat (moisture, fat, and ash) was shown in table 6. The results indicated that there was no significant (P >0.05) effect among all treatment groups. On the other hand, the results of some physical properties of broiler breast meat (PH and WHC) which were shown in table 7, also revealed that there was no significant (P >0.05) effect among all treatment groups.

Table (7). Effect of Feed Supplemented with Different levels of Xylam Enzyme on Some physical properties of Broiler Breast Meat

Parameter	Treatment				SE±	L.S
(%)	1 (control)	2 (0.5kg)	3 (0.75kg)	4 (1kg)		
PH	5.34333	5.34667	5.349333	5.37267	0.0251	N.S
WHC	1.61933	1.59733	1.58667	1.56200	0.01493	N.S

Discussion:

In this study, results showed that chicks fed on diet supplemented with (0.75kg) of xylam showed high significantly ($P<0.01$) low values in body weight gain, feed conversion ratio and feed intake compared to those fed on control diet, also results showed that addition of different levels of xylam enzyme to diet significantly improved the body weight gain, feed intake and feed conversion ratio throughout the experimental period. These results agreed with those of (Amoni *et al*.2011Selle *et al*.2010 and Wyatt *et al* 1997) who found that incorporation of enzymatic complex (xylanase, amylase and protease) or only xylanasis activity increased significantly the feed intake of broiler chicks received either sorghum or maize diets. These results close to that reported by Amal *et al.* 2015 who found that the chicks received diets supplemental with enzymes tended to consume more feed than control.

The results revealed that addition of xylam enzyme to diet significantly effect on the body weight gain. These results are inconsistent with that reported by (Amoni *et al*.2011, Cowieson *et al*.2006, Wyatt *et al* 1997 and Selle *et al* 2010) who stated that addition of the microbial xylanase individually or in combination with amylase and protease to the sorghum or maize based diet had a significant effect on the body weight gain of broiler chicks. These results contradict with the reports of Amal *et al.* 2015 who found that addition of enzymes to the diet had no significant effect on the body weight gain, even though the diet supplemental with enzyme improved the body weight gain of broiler chicks in their study.

The results showed that feed conversion ratio (FCR) in this study was high significantly affected in broiler fed on diets supplemented with xylam. These results are in line with the findings of Zenella *et al.*1999 Park *et al.*1997 Hajati *et al*.2009 and Lee *et al* .2010 who reported that the (FCR) was improved significantly with the addition of the microbial enzymes to broiler diets containing either sorghum or maize.

The results showed that the addition of xylanase enzyme effect on dressing percentages of carcass yield. These results agreed with those observed by Mariam *et al*.2013who mentioned that the addition of xylanase and phytase enzymes combinations at all levels to diets contained 15% Prosopis pods effect on dressing percentages, carcass yield and internal organs (liver, heart and gizzard) percentages of the experimental chicks. On the contrary, Bin Baraik, (2010) found no effect of xylanase and phytase enzymes individually or in combinations on dressing percentage, carcass yield and internal organs of broiler chicks. The results of this experiment revealed no significant differences in commercial cuts (breast, drumstick, thigh and wing) percentage. These results agreed with the results of Mariam et al.2013.

The results of this experiment also indicated that diets supplemented with xylam had no significant effect on chemical composition (moisture, fat, and ash) values and some physical properties of broiler breast meat samples (PH and WHC). These findings were in agreeing with the results of Bin Baraik, (2010) who found no significant effect in chemical composition on the subjective and objective quality values due to the use of xylanase and phytase enzymes individually or in combinations.

Conclusion:

Commercial enzyme xylam added to diet improved the performance of broiler chicks comparing to that obtained by the control group. The addition of xylam enzyme had no significant effect on chemical and physical analysis carcass and characteristics of broiler chicks. Utilization of diet containing (1) kg of xylam resulted in economic benefits.

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