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Evaluation of Some Commercial Growth Promoters on the Performance and Carcass Quality of Broiler Chickens

Ibrahim Ismail Hamid[*1] and Osama Elsheikh Yassin[2]

[1] Animal Production Research Center, P.O. Box 1355, Khartoum North
[2]Sudan University of Science and Technology, Kuku, Khartoum North
[*]Corresponding author: Email:hamidnaile@hotmail.com
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Abstract

This research was conducted to compare between growth promoters Zigbir (commercial herbal product), Biogine (Probiotic) and X Mos (Yeast) on the growth performance and carcass quality of broiler chicken. One hundred twenty eight one week-old unsexed broiler chicks of Arbor Acres hybrid were randomly allotted to four experimental diets: 1- control (basal diet), 2- basal diet plus Zigbir, basal diet plus Biogine and basal diet plus X Mos Yeast, in a complete randomized design. Each treatment contained 32 chicks (8 birds/ replicate). Feed intake, Body weight gain and feed conversion ratio were recorded weekly. On the 35th day 4 birds per treatment were slaughtered and the weights of carcass, carcass cuts and edible organs of individual birds were measured. Results of this study revealed no significant ($P > 0.05$) improvement of performance, carcass yield, carcass cuts and edible organs of broiler chicken by the dietary supplements compared to the control.

Keywords: Broiler chicken, carcass, growth, zigbir, biogene, Yeast.

Introduction

Lorençon *et al*. (2007) stated that, growth promoters are the main additives used in the poultry feed; they are responsible for improvement in productivity, especially in the early stages of rearing. The majority are antibacterial products used in sub-therapeutic doses for almost the whole life of birds, respecting only the withdrawal period before slaughter. With increasing public concerns about bacterial resistance to antibiotics, the use of antibiotics in therapeutic or sub-therapeutic doses in poultry feed has been severely limited or eliminated in many countries. European Union has preventively banned the use of antibiotics as growth promoters since 2006, therefore, alternatives to growth promoter need to be proposed to livestock producers in order to maintain bird health, productivity and carcass quality.

There has long been interest in finding alternatives to antibiotics for poultry production. Probiotics have been defined as a live microbial feed supplement which beneficially affects the host animal by improving its intestinal balance' (Fuller, 1989). The probiotic mode of action is by 'competitive exclusion', meaning there is competition for attachment sites in the gastrointestinal tract.

There is a tendency to increase the use of probiotics in diets for animals, which is a more reasonable option, since they do not leave residues in the environment or in the

animal body and do not cause cross-resistance in men compared with antibiotics (Nepomuceno and Andreatti, 2000). Afshin *et al* (2013) Compared the effect of growth promoters (prebiotic, probiotic, symbiotic and acidifier) on growth and intestinal morphology of broiler chickens were 1- Control (basal diet), 2- basal diet plus prebiotic (1kg of ActiveMOS/ton) 3-basal diet plus probiotic (150,100,50gr of Protexin/ton of the starter, grower and final diets respectively) 4- basal diet plus synbiotic (1kg of Amax4x/ton) 5- basal diet plus acidifier (2 liter of Globacid/ton). They found performance of broilers improved in experimental groups compared with control group at the end of the experiment, the groups supplemented with prebiotic, synbiotic and acidifier had a significant ($P<0.05$) effect on broiler performance; Whereas, probiotic group had no significant ($P>0.05$) effect on broiler performance.

Lutful Kabir (2009) noted that the mode of action of dry yeast in poultry included (i) maintaining normal intestinal microflora by competitive exclusion and antagonism: (ii) altering metabolism by increasing digestive enzyme activity and decreasing bacterial enzyme activity and ammonia production: (iii) improving digestion and (iv) stimulating the immune system. Gao *et al* (2008) evaluated the effect of supplemental yeast culture (Diamond V XP Yeast Culture) in broiler diets on performance, digestibility, mucosal development and immunomodulatory functions. Diets contained 0, 2.5, 5.0, and 7.5 g/kg of yeast culture for 42 days. They found that, dietary supplemented yeast culture at 2.5 g/kg improved average daily gain and feed conversion during grower and overall periods ($P \leq 0.05$), but did not affect protein retention and energy digestibility. Manal (2012) supplemented three levels of Dry Yeast (DY) 0.3, 0.5 and 0.7% in broiler diet and found that chicks fed 0.5% DY gave higher body weight gain and performance index, lower feed intake, better feed coversion and improved all parameters of carcass characteristics compared to the control. Hassanein (2011) studied the effects of stocking densities and feed additive on broiler performance carcass traits. three stocking densities (sd) with 7, 8 and 9 birds in a cage of 97x50x45 cm, feeding on diet with or without enzymatic growth promoters, they found that, low densities of birds fed on diet supplemented with enzymes showed the highest ($p<0.05$) body weight and body weight gain, improved feed intake (fi) and feed conversion ratio and increased relatively carcass yields compared to other treatments.

Herbs or products including plant extracts, essential oils or the main components of the essential oil are among the alternative growth promoters that are already being used in practice (Ocak *et al*., 2008). Harifi *et al*. (2013) supplemented with 5, 3 and 2 g/kg of dried cumin, peppermint, yarrow or poley herbs in broiler diet. They found that, peppermint and cumin supplementation to the diet increased the body weight gain of the broiler chickens, whereas dietary poley and yarrow significantly reduced the body weight gain and increased feed conversion ratio they concluded that, under the conditions of this study, peppermint improved growth performance and adding it to the diet could be an alternative to the use of antibiotics as growth promoters. They also stated that, there is evidence suggesting that herbs, spices, and various plant extracts have appetizing, digestion-stimulating and antimicrobial properties but there is only limited evidence about whether their inclusion as a solid material would have growth promoting effects in live birds.

Zigbir is a commercially available feed additive which is a synergistic blend of phytochemical actives with performance enhancing characteristics. It has been shown that Zigbir has beneficial effect on liver health

and productivity of animals (Kapil *et al*., 1993). David *et al* (2012) Studied the effects of herbal dietary supplements control, 0.0125% flavomycin (positive control), 0.1% Moringa leaf powder (MLP), 0.05% Moringa leaf powder 0.035% Zigbir (commercial herbal product), 0.1% Moringa fruit powder (MFP) and 0.05% Moringa fruit powder on the growth performance and carcass quality of broiler chickens. They found that all selected herbal dietary supplements significantly ($P<0.05$) improved the growth performance and carcass yield of broiler chickens compared to the negative control. Among the herbal feed additives, the commercial herbal product Zigbir was the most effective in improving the growth performance of broiler chickens. Hamid, (2014) fed broiler chicks basal diet supplemented with 0, 50, 75 and 100% herbal methionine as replacer of synthetic methionine in broiler diet and found no significant difference among the dietary treatments in terms of performance indices, feed intake, body weight gain and feed conversion ratio and found also no significant differences on carcass characteristics represented by the carcass cuts; breast, thigh, drumsticks or wings. In the same way the giblets; liver, heart, gizzard were also statistically not affected.

The objective of this study was to evaluate the beneficial effects of Zigbir compared to Biogine (Probiotic) and X Mos (Yeast) on the performance and carcass quality of broiler chickens.

Materials and methods

Site and duration of the study*:* This study was carried out in an open sided poultry house equipped with cages (1X1 m) at the Animal Production Research Centre (APRC) at Kuku, Khartoum North, Sudan. The experiment lasted for 5 weeks during March and April 2015 The maximum temperatures outside the poultry unit during this period ranged between ˚30 C and 40˚C.

Experimental birds*:* A total of 128 one day old unsexed broiler chicks of Arbor Acres strain were randomly selected from a stock of 500 chicks after adaptation in the brooder. Birds were subdivided in a completely randomized design (CRD) into four treatment groups. Each group was subdivided into 4 replicates each with 8 birds. Birds were individually weighed at the beginning of the experiment, maintaining that initial weights of the groups were similar.

Experimental diets*:* Four diets were formulated; diet 1 as a basal diet (control) and this basal diet was supplemented with either Zigbir, Biogine (Probiotic) or X Mos (Yeast) as growth promoters to give diet 2, 3 and 4 respectively. Zigbir is a combination of herbal plants *Andrographis paniculata, Solanum nigrum, Phylanthus niruni* and *Boerhavia diffusa*, that have same mechanism of action in the body produced by an Indian company (Natural Remidies). All diets were formulated to meet the nutrients requirement of broilers in the starter and finisher period as recommended by the National Research Council (NRC, 1994)**.** The studied growth promoters are available in the Sudanese market. The supplemented doses of these promoters were according to manufacturer's recommendations. Compositions and chemical analysis of the experimental diets of the starter and finisher periods are presented in table 1 and 2 respectively. All birds were fed a commercial prestarter ration during the adaptation period. Feed and water were offered *ad libitum* throughout the experiment.

Table 1: Composition and chemical analysis of the experimental diets in the starter period

Diet Ingredient	1 (Control) %	2 (zigbir) %	3 (Biogene) %	4 (X Mos Yeast)%
Sorghum	69	69	69	69
Groundnut cake	24	24	24	24
Concentrate*	2.5	2.5	2.5	2.5
Poultry offal meal	2.5	2.5	2.5	2.5
Lime stone	0.8	0.8	0.8	0.8
Salt	0.2	0.2	0.2	0.2
Methionine	0.5	0.5	0.5	0.5
Lysine	0.3	0.3	0.3	0.3
Broiler premix	0.1	0.1	0.1	0.1
Antimycotoxine	0.2	0.2	0.2	0.2
Zigbir	0	0.04	0	0
Biogene	0	0	0.1	0
X Mos Yeast	0	0.	0	0.1
Total	100.10	100.14	100.20	100.20
Chemical analysis (calculated)				
ME, Kcal/Kg	3100	3100	3100	3100
Crude protein %	22.9	22.9	22.9	22.9
Ether extract %	3.7	3.7	3.7	3.7
Crude fiber %	4.2	4.2	4.2	4.2
Calcium %	1.14	1.14	1.14	1.14
Available phosphor %	0.68	0.68	0.68	0.68
L. Lysine %	1.17	1.17	1.17	1.17
DL. Methionine %	0.77	0.77	0.77	0.77

Broiler concentrate* (Intraco) contains 2300 Kcal/kg, 4% EE, 7% CF, 6% Ca, 4% Ph, 11% Lys and 3% Met.

Management: The house was cleaned, washed and disinfected then bedded with wood shavings before the arrival of the birds. The house equipments were thoroughly washed and disinfected. The passage between the cages rows was sprayed with water in periods of high temperature. Drinkers were daily cleaned and filled with fresh water. Vaccination program was implemented according to that followed in the poultry farm at the Animal Production Research Centre. Birds were vaccinated against Newcastle, Infectious Bronchitis and Gumboro. The studied production performance parameters: feed intake (FI), body weight gain (BWG) and feed conversion ratio (FCR) were recorded weekly for each replicate. A digital sensitive balance was used for weighing of birds or feed and mortality was monitored daily and recorded whenever occurred.

Carcass characteristics assessment: For the determination of carcass characteristics birds were slaughtered at 42 day of age. A number of 4 birds from each treatment, of about average body weight, were slaughtered, scalded, and feathers, head, shanks and internal viscera were manually removed. The abdominal fat as well as edible organs (giblets) liver, gizzard and heart were separately weighed. The eviscerated carcasses were weighed to determine the dressing%. (Carcass weight/ live body weight x 100), chilled in iced and salted water, and kept in deep freezer under -18 C°. The dissection was carried out for the cold carcass, whereby breast, thigh,

drumstick and wings were carefully cut and weighed in a sensitive balance. Their proportions to live body weight were recorded.

Data statistical analysis: StatSoft, Inc. (2001). STATISTICA (data analysis software system), version 6 was used. Data obtained were subjected to one way analysis of variance (ANOVA) to detect significant treatment differences. The means were separated using the Duncan`s New Multiple Range Test (DNMRT) (Steel and Torrie, 1980).

Table 2: Composition and chemical analysis of the experimental diets in the finisher period

Diet Ingredient	1 (Control) %	2 (zigbir) %	3 (Biogene) %	4 (XMos Yeast)%
Sorghum	69	69	69	69
Groundnut cake	20	20	20	20
Wheat bran	1.7	1.7	1.7	1.7
Concentrate*	2.5	2.5	2.5	2.5
Poultry offal meal	2.5	2.5	2.5	2.5
Lime stone	1	1	1	1
Salt	0.2	0.2	0.2	0.2
Methionine	0.2	0.2	0.2	0.2
Lysine	0.1	0.1	0.1	0.1
Broiler premix	0.1	0.1	0.1	0.1
Antimycotoxine	0.1	0.1	0.1	0.1
Tallow	2.6	2.6	2.6	2.6
Zigbir	0	0.04	0	0
Biogene	0	0	0.1	0
X Mos Yeast	0	0.	0	0.1
Total	100.00	100.04	100.10	100.10
Chemical Composition (calculated)				
ME, Kcal/Kg	3151	3151	3151	3151
Crude protein %	21.21	21.21	21.21	21.21
Ether extract %	4.14	4.14	4.14	4.14
Crude fiber %	3.89	3.89	3.89	3.89
Calcium %	1.02	1.02	1.02	1.02
Available phosphor %	0.54	0.54	0.54	0.54
L. Lysine %	0.91	0.91	0.91	0.91

Broiler concentrate* (Intraco) contains 2300 Kcal/kg, 4% EE, 7% CF, 6% Ca, 4% Ph, 11% Lys and 3% Met.

Results

Data collected was tabulated, statistically analyzed. The effect of the growth promoters on the studied broilers performance parameters, feed intake, body weight gain and feed conversion are presented in Tables 3,4 and 5. The results obtained for the whole period 2-5 weeks are summarized in Table 6.

Table (3) shows result of the effect of the growth promoters on the weekly feed intake. It showed no significant difference ($p > 0.05$) in feed intake between Zigbir and control groups through the experimental weeks, however, groups fed on X Mos Yeast displayed the highest feed intake (655.85 g/bird) in the 4th week of age compared to other groups.

The weekly live body weight gain result was presented in Table (4). It showed no statistical difference ($p > 0.05$) between the treatments. In exception to the results of weight gain in the 3rd week weight gain was significantly lower by the control group compared to the growth promoters groups. Feed conversion ratio (FCR) was significantly similar ($p \leq$

0.05) among the tested groups throughout the Results of the effect of growth promoters on the broilers performance parameters during the whole period (2- 5 weeks of age) was summarized in table (6). Results showed no significant difference ($p > 0.05$) among the dietary treatments in terms of feed intake, body weight gain and FCR. There was improvement in body weight gain by supplementation of growth promoters in broiler diet and the Yeast gave the highest gain, however this improvement was not statistically significant.

different experimental weeks (Table 5).

Table 3: Effect of the growth promoters on feed intake g/bird/week, n=32

Treatment/week	2	3	4	5	Total
1 (control)	252.50±4.1	399.06±34.9	574.81 ^{b} ±51.7	536.56±51.0	1762.94±138.7
2 (Zigbir)	254.98±29.6	407.19 ±20.5	574.60 ^{b} ±30.5	516.01±51.5	1752.78±77.0
3 (Biogene)	250.00±33.3	424.84±23.8	609.06 ^{ab} ±46.7	532.12±48.9	1816.03±147.9
4 (X Mos Yeast)	243.91±25.2	441.70±42.7	655.85 ^{a} ±56.5	569.11±47.7	1910.56±146.8
LS	NS	NS	*	NS	NS

NS =Not Significant: LS = Level of Significance: * =Significant ($p \leq 0.05$)

Table 4: Effect of the growth promoters on live body weight gain g/bird/week. n=32

Treatment/weeks	2	3	4	5	Total
1 (control)	132.22±25.2	209.22^{b}±33.4	301.72±54.1	279.38±22.8	922.50±128.7
2 (Zigbir)	142.32±9.2	221.16^{ab}±18	321.79±39.0	253.52±35.0	938.72±34.3
3 (Biogene)	135.47±9.1	218.75^{ab}±17.9	346.41±25.6	282.68±51.0	983.30±76.8
4 (X Mos Yeast)	159.38±17.3	252.17^{a}±28.6	338.10±50.1	302.43±90.9	1052.01±98.7
LS	NS	*	NS	NS	NS

NS =Not Significant: LS = Level of Significance: * =Significant ($p \leq 0.05$)

Table 5: Effect of the growth promoters on feed conversion ratio (g feed/g gain), n=32

Treatment/weeks	2	3	4	5	Total
1 (control)	1.97±0.4	1.93±0.2	1.93±0.2	1.93±0.2	1.94±0.2
2 (+ Zigbir)	1.79±0.2	1.85±0.2	1.80±0.2	2.07±0.4	1.88±0.1
3 (Biogene)	1.86±0.4	1.95±0.2	1.76±0.2	1.92±0.3	1.87±0.2
4 (X Mos Yeast)	1.53±0.1	1.76±0.1	1.98±0.4	1.98±0.4	1.81±0.1
LS	NS	NS	NS	NS	NS

NS = Not Significant ($p > 0.05$): LS = Level of Significance

Table 6: Effect of the growth promoters on performance for the whole period (2–5 Wks) n= 32

Treatments Parameters	1 (control)	2 (Zigbir)	3 (Biogene)	4 (XMos Yeast)	LS
Initial weight*	166.56.±5.7	164.06±3.1	167.19±6.0	164.06±3.1	NS
Final body weight*	1089.05±130.4	1102.78±34.7	1150.49±75.5	1216.07±96.0	NS
Body weight gain**	921.50±128.7	938.72±34.3	983.30±76.8	1052.01±98.7	NS
Feed intake**	1762.94±138.7	1752.78±77.0	1816.3±147.9	1910.57±146.8	NS
Feed conversion ratio	1.93±0.2	1.87±0.1	1.85±0.2	1.82±0.1	NS

*= g/bird **= g/bird/ week NS = Not Significant ($p > 0.05$): LS = Level of Significance: n= number of birds/treatment

***Effect of the growth promoters on carcass characteristics*:** Table (7) and Table (8) show the effect of Zigbir and the other growth promoters on the carcass characteristics.

The results in table (7) showed no significant differences ($p > 0.05$) in dressing percentage and in the measured carcass cuts relative to live body weight; breast, thigh, drumsticks, wings or necks % of the corresponding live body weight between the different treatments. Table (8) revealed no significant differences ($p > 0.05$) between the giblet weights; liver, heart, gizzard and the weights abdominal fat of the different groups.

Table 7: Effect of growth promoters on dressing% and carcass cuts relative to live body weight

Treatment/ Cut part	1 (control)	2 (+ Zigbir)	3 (Biogene)	4 (Mos Yeast)	LS
Dressing out%	68.51±1.7	69.19±1.3	69.44±2.4	69.85±0.1	NS
Breast, %	27.74±1.8	28.45±1.3	27.61±3.7	31.06±0.6	NS
Thigh, %	18.84±1.5	19.88±1.8	19.91±2.3	20.27±2.8	NS
Drumstick, %	15.25±0.5	14.57+1.0	14.41±1.3	14.75±1.1	NS
Wings, %	11.30±0.5	11.48±0.5	10.87±0.7	12.23±2.4	NS
Neck, %	7.44±0.7	6.89±0.6	7.59±0.9	7.20±2.1	NS

LS= significance level: NS = not significant. Number of birds= 4 birds/ treatment.

Table 8: Effect of growth promoters on weights of edible organs (giblets) and abdominal fat (g)

Treatment/ Organ	1(control)	2 (Zigbir)	3 (Biogene)	4 (Mos Yeast)	LS
Liver	33.75±10.3	31.25±8.5	35.00.±0.0	36.00±7.5	NS
Gizzard	43.75±8.5	37.50±2.9	33.75±4.2	35.00±7.1	NS
Heart	10.00±0.0	7.50±2.9	8.75±2.5	6.25±256	NS
Abdominal fat	31.25±11.1	28.75±7.5	27.50±9.6	31.25±7.5	NS

LS= significance level: NS = not significant. Number of birds = 4 birds/ treatment.

Discussion

The obtained results showed no significant differences for the effect of the studied growth promoters on `FCR, this agreed with findings of Silva *et al*. (2011) who found no effect of some growth promoters on the final weight, weight gain, feed intake and feed conversion of broilers in the period of 1-42 days of age. Similar results were observed by Rocha *et al*. (2010), who evaluated the use of different growth promoters in feed for broiler chickens from 22 to 43 days of age and found no effect on the final weight, weight gain and feed intake. Similar results were obtained by Faria *et al*. (2009), Lorençon *et al*. (2007) and Pelicano et al. (2004), who stated that, the use of different growth promoter additives did not influence the results of broiler performance on the same line Lee *et al.*, (2010): Amerah *et al*. (2013) and Nikpiran *et al*. (2013) found no effect of broibiotic on weight gain. On the other hand., other researcher, (Maiorka *et al*. 2001, Capcarova, 2010, Hijova *et al*. 2012: Nikpiran *et al*. (2013) Hrncar *et al*. 2014 Zhang *et al*. (2014) and Musaad *et al*. (2017). reported, that, dietary supplementation of probiotic and/or prebiotic or their combination significantly increased body weight gain, better feed conversion.

Results of this study indicated that, the supplementation of herbal product as Zigbir had no effect on broiler performance. In contrast David *et al* (2012) found that supplementation of Moringa leaf or fruit powder, or Zigbir significantly ($P<0.05$) improved the growth performance of broiler chicken compared to the negative control. Among the herbal feed additives, the commercial herbal product Zigbir was the

most effective in improving the growth performance of broiler chicken.

Yeast supplementation also showed no significant improvement in the broiler performance. This result disagrees with Gao *et al* (2008) who found that, dietary supplemental Yeast Culture at 2.5 g/kg improved average daily gain and feed conversion, and disagrees with Manal (2012) and Hassanein (2011) who found that, supplementation off Dry Yeast in broiler diet gave higher body weight gain and performance index, lower feed intake, better feed conversion and improved all parameters of carcass characteristics compared to the control.

From the obtained results it can be concluded that neither the carcass yield and carcass cuts nor the edible organ weights were affected by the supplementation of the studied growth promoters in broiler diet, however, David *et al* (2012) found that supplementation of Moringa leaf or fruit powder, or Zigbir significantly ($P<0.05$) improved carcass quality .similarly Karaoğlu *et al* (2014) showed that, the use of probiotic in broiler diets had significant effect on whole breast ($p<0.05$), but, thigh, drum sticks, wings and neck weights were not affected.

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تقييم بعض محفزات النمو التجارية بالنسبة الأداء الانتاجي وجودة الذبيحة للدجاج اللاحم

إبراهيم إسماعيل حامد * [1] وأسامة الشيخ يس [2]

[1] مركز بحوث الانتاج حيوانى ، ص.ب 1355 ، الخرطوم بحري

[2] جامعة السودان للعلوم والتكنولوجيا ، كوكو ، الخرطوم شمال

البريد الالكتروني hamidnaile@hotmail.com

هاتف. رقم 924260241 0122572705

المستخلص

أجريت هذه الدراسة للمقارنة بين محفزات النمو الزقبر (منتج عشبي تجاري) والبيوجين (البروبيوتك) والاكس موس (خمائر) علي أداء النمو و جودة الذبيح لكتاكيت اللاحم. تم توزيع عدد 120 كتكوت لاحم عمر يوم من سلالة (الأربر اكرز) عشوائيا حسب برنامج التوزيع العشوائي الكامل علي علائق التجربة الاربعة وهي 1 عليقة مقارنة (العليقة اساسية) ، 2 العليقة الاساسية مضاف اليها الزقبر و – العليقة الاساسية مضاف لها البيوجين و – العليقة الاساسية مضاف لها خمائر الاكس موس. احتوت كل معاملة علي 32 كتكوت (8 كتاكيت/ مكرر). تم تسجيل كل من ، تهلاك العلف و الزيادة في لوزن ومعدل التحويل الغذائي اسبوعيا. وفي اليوم الخامس والثلاثين ، تم ذبح 4 طيور من كل معاملة وتم قياس أوزان الذبيحة قطع الذبيحة والأعضاء الصالحة للأكل لكل طائر علي حده. أظهرت نتائج هذه الدراسة عن عدم تحسن معنوي ($P > 0.05$) في الأداء ، و انتاج الذبيحة ، و قطع الذبيحة والأعضاء الصالحة للأكل للدجاج اللاحم بعد الإضافات العلفية مقارنة بالعليقة الضابطة.