

Response of Broiler Chicks to Different Dietary Levels of Black Cumin Oil as a Natural Growth Promoter

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Abstract:

A total of 140, five days-old, unsexes (Ross 308) broiler chicks were used. Chicks were randomly divided into five groups of 28 chicks per each, with four replicates for each group. Five experimental diets were formulated (A,B,C,D and E). diets A as negative control (NC), diet B control diet supplemented with antibiotic (Neomycin 16 mg/Kg) as positive control (PC), diets C,D and E were NC supplemented with Black Cumin oil (BCO) at 50,100 and 150 mg/Kg respectively. Result obtained showed that addition of BCO improved significantly ($P \leq 0.05$) the performance (BWG,FI and FCR) of broiler chicks compared to group fed on NC while no significant($P \leq 0.05$) differences between chicks fed on diets supplemented with BCO and PC group. The mortality rate did not influenced by the dietary treatments. Result revealed no significant differences ($P \leq 0.05$) among all treatment groups in the percentage of carcass dressing, giblet, commercial cuts and their percentage of their separable tissue, meat chemical composition and subjective meat quality parameters. Supplementation of BCO in the broiler diets at various levels resulted in significant ($p > 0.05$) reduced of serum cholesterol, urea and ALP enzyme activity compared to both NC and PC groups while the level of total protein, calcium ,phosphorus and AST remained unchanged. Economically the addition of BCO improved the performance of broiler chicks and resulted in economical benefits, This study showed that BCO when added as growth promoter in broiler diets have a similar effect as that with antibiotic without any adverse effects.

Keywords: *Black cumin, carcass dressing, cholesterol, performance.*

المستخلص

استخدمت مجموعه 140 كتكوت لاجم عمر خمسة أيام غير مجنسه (روس 308). تم تقسيم الكتاكيت عشوائيا إلى خمس مجموعات من 28 كتاكيت لكل، مع أربعة مكررات لكل مجموعة. وضعت خمسة علائق (A، B، C، D و E). A عبارة عن العليقه القياسيه (NC)، العليقه B عبارة عن العليقه القياسيه تستكمل بالمضاد الحيوى (16 ملغ نيومايسين / كغ) وتعتبر العليقه الإيجابية (PC)، واما المجموعات C، D و E عبارة عن العليقه القياسيه NC تستكمل بزيت الكمون الأسود (BCO) بالنسب 50، 100 و 150 ملغم / كغم على التوالي. وأظهرت النتيجة أن إضافة BCO أدى إلى تحسن كبير ($P \geq 0.05$) في الأداء (الوزن المكتسب، العليقه المستهلكه

ونسبة التحويل الغذائي) من الدجاج اللحم مقارنة بالمجموعة القياسية السالبة مجموعة NC بينما لم تظهر اى فروق بين الدجاج المغذى على الوجبات الغذائية المستهلكه BCO و PC المجموعة. لم يتأثر معدل النفوق بالمعاملات. اظهرت النتيجة عدم وجود فروق معنوية ($0.05 \geq P$) بين جميع المجموعات في النسب المئوية للذبيحة، الأحشاء، والاجزاء التجارية ونسبتهم من فصل الأنسجة، التركيب الكيميائي للحوم. أدى اضافة BCO في العلف على مختلف المستويات تاثير معنوي ($p < 0.05$) خفضت نسبة اليوريا في الدم والكولسترول ونشاط انزيم ALP مقارنة كلا NC والمجموعات PC في حين أن مستوى البروتين الكلي والفوسفور والكالسيوم وAST لم يتغير. إضافة BCO حسنت اقتصاديا أداء الدجاج اللحم وأسفرت عن فوائد اقتصادية.

كلمات مفتاحية: الكمون الأسود، الكولسترول، الذبيحة، أداء

Introduction:

In Sudan feed is the major problem facing poultry production, the producer expend about 85% of the total cost of production on feed purchase (Mukhtar,2007).However, to minimize the cost of feed many research strategies have been practical such as introducing feed supplements and feed additives. Antibiotic feed additives have long been used as growth promoters in poultry nutrition ,but it has been prohibited since 2006 in the European Union (Buchanan et al.,2008)due to cross resistance against pathogens and residues in tissues. Therefore, scientists searched for alternatives. As a result herbs and various plant extracts such like essential oils became interesting due to their antimicrobial (Guler,etal.,2007) antioxidant effects and their stimulating effects on animal performance and digestive enzymes (Lee et al.,2003).

The black cumin (Nigella sativa),belong to the family Rununculacea , carries various names, Habat Albaraka, Alhabat Alsawda,Alkamoun Alaswad and Kalongi (Eltahir,2006) has high nutritional potential. The major component of black cumin essential oil was the fixed oil which consist of linoleic acid ,oleic acid and palmitic acid (Zoui et al.,2002)where as the volatile oil ranged from0.4-0.7 %of the seeds weight, which contain various pharmacologically active constituents included thymoquinone (Bruits and Burcar,2000), carvacral, phenol(Aboutabl,1986).Also BC seeds oil contain the alkaloid nigellimine which seems to be the active ingredient and sterols such as steryl gluosides.

Black cumin oil has been shown to have antibacterial antioxidant (Sahin, et al.,2003) immune potentiating (Swamy and Tan,2000) and hepatoprotective (Daba and Abdel-Rahman (1995).

The present study was conducted to evaluate the effect of various levels of BCO as a natural growth promoter on the performance , carcass characteristics, blood and serum metabolite and enzyme activities of broiler chicks. The oil decreased blood presser and increase respiration (Ali and Blunden,2003).

Materials and Methods:

The experiment was conducted during winter season (1th Feb-14th March 2009) the ambient temperature ranged between 20-45c. A total 140 one-day old, unsexed(Ross 308)



were transported to Poultry Farm, College of Agriculture Studies ,Sudan University of Science and Technology . Chicks were weighed and randomly assigned to five groups in a completely randomized design. Each treatment was further subdivided into four replicates of seven chicks per each and kept in an opened house. Feed and water were provided adlibitum. Light was provided 24 hours in a form of natural during day and artificial light during the night. BCO was extracted from black cumin seeds, five experimental diets were formulated (A,B,C,D and E) as, group A fed on control diet used and as a negative control (NC),group B fed on NC supplemented with antibiotic (Neomycin 16 mg/kg, and used as positive control (PC),groups C,D and E chicks fed on NC supplemented with BCO at levels of 50, 100 and 150mg /kg respectively. The control diet to meet the requirements of broiler chicks according to NRC (1994).

Chicks were weighed weekly and feed consumption was determined at the time of weighing ,body weight gain and feed conversion ratio (FCR) were calculated, Serum prepared from the blood of chicks analyzed for concentrations of metabolites, total protein, cholesterol, urea, enzyme activities ,ALP ,AST and minerals.

At the end of the experiment chicks were fasted overnight except from water, weighed individually .slaughtered, scaled after bleeding. Hand plucked , washed and eviscerated, Hot carcasses ,liver, gizzard and heart were weighed separately .the carcass was divided into two halves, the left side was divided into commercial cuts (breast, thigh, drumstick), then each cut was weighed and deboned, the meat of cuts frozen and stored for panel test and chemical analysis.

Data collected subjected to analysis of variance, means were further subjected to Duncan's multiple range tests(Duncan,1955).

Results:

The results in (Table,1)showed that chicks of groups B,C,D and E obtained significantly ($P<0.05$) higher body weight gain(BWG) ,feed intake(FI) and FCR compared to of NC while there was no significant ($P>0.05$) difference between groups B,C,D and E during the experimental period .The treatment had no significant ($p>0.05$) effect on mortality rate.

Commercial cuts showed no significant ($p>0.05$) differences (Table,2)between treatments groups in weight of cuts, meat values .Serum metabolite mean values of urea and cholesterol results indicated highly significant ($P<0.05$) differences in groups A and B compared to other tested groups. The treatment effect on serum electrolytes and enzyme activities was not significant ($P>0.05$)in calcium, phosphorus and AST, where it recorded significantly ($P<0.05$) high in ALP in groups A and B compared to other treatment groups. Calculations showed that groups D and E recorded the highest profitability ratio.

Discussion:

Chicks fed on diets supplemented with BCO consumed significantly more amount of feed compared to NC, this might be due to that essential oil (EO) improved diet palatability , enhancing et al appetite of chicks and/or quicker digestion and passage of nutrients through the digestive effects of EO, these results were in agree with the results of Hernandez., (2004);Gilani et al.,(2004) Alclcek et al., (2004) Erener et al.,(2010)Teklei et al.,2011 and Ismail,2011. These results were contradictory with the finding of Albaza et al.,(2008)who found that the addition of BCO in the diet reduced significantly feed consumption of broiler chicks.



Improvement in body weight gain of chicks fed on diets supplemented with BCO may attributed to increase of total feed intake or might related to oil content active compounds such as thymoquinone , antimicrobial, antioxidant activities, stimulate the digestive enzymes in the intestinal mucosa and pancreas that improve digestion of dietary nutrients and feed efficiency subsequently increasing growth rate. These results were in line with those of Albaza et al.,(2008); Arslan et al.,(2005).

Results showed that dietary essential BCO at various inclusion levels performed similar to antibiotic growth promoter group in body weight gain ,feed intake and feed conversion of broiler chicks. This might be attributed to the decreased number of pathogenic bacteria, the formation of amore stable intestinal flora and better digestion. Results were in agree with that reported by Mohan, 2004; Abaza,2008 and Tekeli et al.,2010.

Addition of BCO to diets had no significant effect on mortality rate, result was agree with the finding of Guler et al.,(2007)

Results showed no significant differences in dressing giblet percentages. they were in agreement with that reported by Abaza, 2008; Erener et al. , 2010 and Ismail,2011. Also there was no significant differences in commercial cuts percentages, their separable tissues, the result agreed with the findings of Osman and Muna (2002). Chemical composition of meat was not affected significantly by dietary BCO ,this result was confirmed by the subjective meat quality values and was inline with the finding of Albaza(2008).

Data showed that serum cholesterol and urea values were significantly lowered for groups fed on diets containing BCO compared to NC and PC groups. The decrease of cholesterol might be to the oil active ingredients which inhibit hepatic 3-fenchyl-3-methyl glutary co-enzyme A(HMG-CO A reductase activity which is a key regulatory enzyme in cholesterol synthesis. The result was in line to the finding of Tamely et al., 2011; Rahimi et al.,2011, but the reduction of urea level might be due to the active compounds such as thymoquinone which could have stimulated the excretion of uric in urine. The result was in agreed with El-tahir report. There was a significant reduction in the activity in the alkaline phosphate) ALP _enzyme of the serum of chicks fed on BCO, where as the treatment effect was not significant on aspartate amino transfers (AST) enzyme. The reduction of ALP to the dietary black cumin essential oil and/or to the protective action on the liver, while the result on AST enzyme activity could be supported by the findings of Dieumou (2009).

Based on the results of the study it can be concluded that various levels of BCO supplemented in broiler diets as a natural growth promoter improved the performance of chicks and recorded similar results that obtained by antibiotic growth promoter without any adverse effect.

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- Table (1): The effect of different dietary black cumin oil (BCO) and Antibiotic on the performance of broiler chicks



Items	A	B	C	D	E	SE
Initial weight g/b	71	71	71	71	71	-
Final weight g/b	1511 ^b	1604 ^b	1601 ^a	1606 ^a	1612 ^a	-
Weight gain g/b	1440 ^b	1533 ^a	1530 ^a	1535 ^a	1541 ^a	5.357
Feed intake g/b	1604 ^b	3289 ^a	3270 ^a	3278 ^a	3286 ^a	3.082
FCR	2.26 ^b	2.15 ^a	2.14 ^a	2.15 ^a	2.13 ^a	0.0002
Mortality	0.5	0.25	0.25	0.25	0.25	0.025

SE=standard error

Means in a row bearing the same letter or no letter superscripts do not differ significant ($p>0,05$).

Table (2): The effect different dietary black cumin oil (BCO) and antibiotic on the carcass, giblets and commercial cuts of the experimental chicks

Items	A	B	C	D	E	SE
Dressing%	70	70.01	70.19	70.2	70.21	0.1463
Gizzard%	2.72	2.73	2.73	2.75	2.79	0.0258
Heart%	0.81	0.83	0.84	0.86	0.89	0.0258
Liver%	2.47	2.51	2.5	2.53	2.55	0.1366
Breast%	24.41	24.46	24.43	24.31	24.44	0.1722
Thigh%	19.31	19.33	19.3	19.35	19.55	0.1633
Drumstick%	19.11	19.11	19.12	19.15	19.16	0.0183

SE=standard error

Means in a row bearing the same letter or no letter superscripts do not differ significant ($p>0,05$).

Table(3):The effect different dietary black cumin oil (BCO) and antibiotic on the meat objective and subjective values of the experimental chicks

Items	A	B	C	D	E	SE
Moisture%	70.75	70.55	70.56	70.59	70.55	0.167
Crude protein%	17.47	17.49	17.49	17.45	17.44	0.0683
Ash%	1.34	1.3	1.33	1.32	1.3	0.0316
Ether Extract%	4.56	4.55	4.6	4.54	4.55	0.0817
Juiciness	5.97	6.23	6.27	6.33	6.00	0.1581
Tenderness	6.67	6.63	6.5	6.33	6.60	0.2671
Color	6.1	6.00	6.40	5.97	6.30	0.2751
Flavor	6.30	6.40	6.17	6.03	6.20	0.2041

SE=standard error

Means in a row bearing the same letter or no letter superscripts do not differ significant ($p>0,05$).



Table(4):The effect different dietary black cumin oil (BCO) and antibiotic on the serum metabolite and serum electrolyte and enzyme activities of the experimental chicks

Items	A	B	C	D	E	SE
Cholesterol mg/dl	140 ^a	140 ^a	102 ^b	104 ^b	103 ^b	1.549
Total protein g/dl	3.2	3.15	3.18	2.9	2.97	0.1807
Urea mg/dl	12.9 ^a	12.95 ^a	10.53 ^b	10.7 ^b	10.3 ^b	2.214
Calcium mg/dl	7.9	8.8	7.7	7.7	8.3	0.2295
Phosphorus mg/dl	11.38	11.2	11.11	11.2	11.3	0.1817
AST(iu/l)	24.4	24.2	24.4	24.34	23.63	0.1924
ALP (iu/l)	232 ^b	200 ^b	175 ^a	169 ^a	160 ^a	0.643

SE=standard error

Means in a row bearing the same letter or no letter superscripts do not differ significant ($p>0,05$).