EFFECT OF DIFFERENT LEVELS OF LEMON GRASS OIL (LGO) AS ANATURAL GROWTH PROMOTER ON THE PERFORMANCE, CARCASS YIELDS AND SERUM CHEMISTRY OF BROILER CHICKS

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BSTRACT: *This experiment was conducted to evaluate the response of feeding broiler chicks diets containing gradual levels of essential oil extracted from lemon grass(LGO).A total of 200, five days-old, unsexes (Ross 308) broiler chicks were subjected to a 42 day experimental period. Chicks were randomly divided into five groups of 40 chick's ,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),while diets C,D and E served as NC supplemented with (LGO) at 50,100 and 150 mg/Kg respectively.*

Result obtained showed that addition of LGO significantly improved (P≤0.05) performance (body weight gain, feed intake and feed conversion ratio) of broiler chicks as compared to the group NC while no significant(P≤0.05) differences were noted among broilers fed on diets supplemented with LGO and PC groups respectively. The mortality rate was not influenced by anyof the dietary treatments. Results revealed no significant differences (P≤0.05) among all treatment groups regarding carcass dressing percentages giblet, commercial cuts(breast, drumstick and thigh) and percentage of their separable tissue, meat chemical composition and subjective meat quality parameters. Supplementation of LGO in the broiler diets at various levels resulted in significant (p>0.05) reduction of serum cholesterol, urea and alkaline phosphate (ALP) enzyme activity as compared to both NC and PC groups while total protein, calcium ,phosphorus and AST remained unchanged. Economically the addition of LGO improved the performance of broiler chicks and resulted in economical benefits,

This study showed that LGO when added as growth promoter in broiler diets had a similar effect as that with antibiotic without any adverse effects.

INTRODOCTION

The poultry production has increased recently due to the increase in population, incomes and standard of living, therefore, the poultry industry is under increasing pressure to produce high quality products for the consumers. Poultry feed costs resemble about 70% of the total variable costs of poultry production (Mukhtar, 2007). Feed additives are assuming apposition of prime importance

in poultry nutrition for promoting growth and production, amongst enzymes, amino acids, pigments, minerals, vitamins and antibiotics. Antibiotics have been used as feed additives for decades, but their use has been banned due to their residues in animal products (Buchanan et al.,2008), which encouraged scientists to search for other natural alternatives that can be used for maintaining health and improving performance of poultry.

Lemon grass (LG) of the family Poaceae, is a tall aromatic coarse grass,(Burkill,1996). Lemon grass contains 5.76% moisture, 4.56% crude protein, 2.7% ash, 9.78% crude fat and 55%carbohydrate,. Has also contains steroids, alkaloids, phenols, saponine tannins, anthraquinines and flavonides. The LG essential oil has three main components, mircene, geranial and neral. The (LGO) is used for curing intestinal worms, anemia and manufacture of pesticides, perfumes and cosmetics (Haj Ali, 1995). Many biological active substances have been isolated; citral is the most important, muscle cramps, rheumatism and headache (Russo, 1992).

This study was carried out to evaluate the effect of addition of various levels of LGO as a natural growth promoter on the performance, carcass yields, serum metabolites, serum electrolytes and enzyme activities and economical appraise of broilers .

MATERIALS AND METHODS

The experiment was conducted during winter season (1st of Feb to 14th of March 2009) with the ambient temperature ranged between 20-45 C. A total 200 one-day old, unsexed (Ross 308) were transported to the Poultry Farm, College of Agricultural Studies, Sudan University of Science and Technology. Chicks were weighed and randomly assigned to five groups in a completely randomized design (CRD). Each treatment was further subdivided into four replicates of ten chicks per group and kept in an opened house. Feed and water were provided *ad libitum*. Light was provided for 24 hours in a form of natural during day and artificial light during the night although out the entire experiment.

Lemon grass oil used in this experiment was purchased from an industrial research and consulting centre, Khartoum State. Five experimental diets were formulated (A, B, C, D and E) as follow, group A was fed on control diet used and as a negative control (NC, without antibiotic and LGO), group B was fed on control diet supplemented with antibiotic (Neomycin 16 mg/kg, and used as positive control (PC), groups C ,D and E chicks fed on control diet supplemented with LGO at levels of 50, 100 and 150mg /kg respectively. The control diet to meet the requirements of broiler chicks according to NRC (1994). Broilers were weighed weekly and feed consumption was recorded at the time of weighing ,body weight gain and feed conversion ratio (FCR) were calculated .Birds blood samples obtained from chicks at the end of the experiment were centrifuged at 3000r,p,m, for 5 minutes and sera were stored at -20C until analyzed for concentrations of metabolites, total protein, cholesterol, urea, enzyme activities ,ALP ,AST and minerals (duplicate samples .were measured by an enzymatic colorimetric method using a kit,DIALAB Laboraories Ltd,Austria).

At the end of the experiment chicks were fasted overnight, weighed individually .slaughtered, scaled after bleeding, feather hand plucked, and eviscerated,

Hot carcasses ,liver, gizzard and heart were weighed separately .Then carcasses were divided into two halves, with the left side divided into commercial cuts (breast, thigh, drumstick), then each cut was weighed and deboned, the meat of cuts was frozen and stored for further tests of panel test and chemical analysis.

Data collected were subjected to analysis using one-way analysis of variance (ANOVA) .Frequency distributions were set and treatment means were compared for significance using the statistical test at the 5% level of probability (Obi, 1990).

RESULTS

The effect of feeding different levels of dietary LGO on the performance of broiler chicks was shown in Table (1). The results showed that broilers fed diets supplemented with various levels of LGO consumed significantly more amount of feed compared to the broilers fed control NC diet, where was no significant difference if compared with antibiotic group. The results show significant improve in body weight gain of broiler fed diets supplemented with LGO compared with control group, and with no significant with antibiotic group.

The results revealed significant improve in feed conversion ratio for broilers fed diets supplemented with various levels of LGO compared with control group, while there was no significant for broilers on antibiotic group.

The treatment had no significant ($p>0.05$) effect on mortality rate, all throughout the experiment period, the mortality rate was negligible with no differences among all treatment groups.

Results showed no significant ($p>0.05$) differences (Table,2)between all treatments groups in weight of carcass cuts ,dressing percentage, non carcass components meat chemical composition and subjective meat values(Table 3).

Serum metabolite mean values of urea and cholesterol results were lower significant for groups fed on LGO compared to control and antibiotic groups, where was no significant difference observed between groups fed on diets with LGO. The treatment effect on phosphorus, calcium and AST showed no significant ($p>0.05$), whereas mean values of ALP in groups A and B were higher significant ($p<0.05$) compared to other tested groups (Table 4).

Economically LGO can be used as natural growth promoter instead of antibiotic growth promoter without any adverse affects .Profitability ratio (1.13) of test group E was the higher of the test groups.

DISCUSSION

The results showed that broilers fed diets supplemented with various levels of LGO consumed significantly more amount of feed compared to the broilers fed control NC diet, where was no significant difference if compared with antibiotic group. This positive effects of essential oil on feed consumption can be evaluated on the basis of different perspectives, firstly, the appropriateness of the extract levels for broilers and associated improvement in the feed taste, due to the essential oil as natural feed improving diet palatability, enhancing appetite of poultry, secondly the quicker passage and digestion of nutrients through the digestive effects of these natural products. These findings were in agreed with those of (Alcicek, *et al*., 2004). These results contradictory with finding of Abaza *et al*., 2008 who found that addition of black cumin essential oil in the diet reduced significantly feed consumption of broilers.

Results revealed that chicks fed on diet with antibiotic and those supplemented with LGO recorded significantly heavy weight gain, This improve may be attributed to the increase in total feed consumption, the active compounds, antimicrobial and antioxidant activities of the LGO. These results are in agree with findings of (Hernandez, *et al*., 2004 and Tekeli, 2011) .

The results revealed significant improve in feed conversion ratio for broilers fed diets supplemented with various levels of LGO compared with control group, while there was with no significant broilers on antibiotic group.

This result is agreed with the findings of (Tekeli, 2011 and Mukhtar, 2011).

Results showed no significant differences in dressing giblet percentages, non carcass components, which agreed with that reported by Abaza *et al*., 2008, but not agreed with the report of Alcicek *etal*. 2004 who observed improvement in dressing percent by the dietary essential oil. Also there was no significant differences in commercial cuts percentages, their separable tissues and meat subjective and objective values, the result agreed with the findings of Abaza *et al*., (2008)

The results of serum metabolite showed that cholesterol and urea values were significantly lower for groups fed on LGO compared to control antibiotic groups .The *hypocholesterolemic* effect of oil might be due to its active ingredients that inhibit hepatic 3-hydroxyl-3-methylglutary co-enzyme A (HMG-COA). Results were in line with Fuliang et al., 2005; Elbagir et al., 2006,who found that plant extract lead to a decrease in the level of cholesterol concentration In contrast Tekeli (,2011) found no effect on serum cholesterol level. The reduction in urea level might be due to the LGO active compounds which stimulate the excretion of uric acid in urine .This result could be supported by the findings of (El-tahir, 2006).

Results showed a significant reduction in the activity of alkaline phosphate (ALP) enzyme for chicks on diets supplemented with LGO compared to PC and NC groups. This might be due to LGO protective action on the liver. Treatment effect on AST enzyme was not significant; this could be supported by the report of Dieumou, et al.,(2009).

Result of economical evaluation showed that the addition of dietary LGO improved the performance of broiler chicks and resulted in economical benefits compared to control and antibiotic groups.

As the above results it can concluded that all levels of LGO added to broiler diets improved the growth performance and similar to that obtained by antibiotic growth promoter ,and without any effects on carcass yield, and meat quality and reduced levels of serum cholesterol, urea and ALP enzyme activity and without any effect on the total protein ,calcium ,phosphorus. And AST enzyme activity and that the addition of LGO to broiler diet economically feasible.

Table (1): The effect of different dietary amounts of LGO and antibiotic on the performance of broiler chicks fed (6) weeks.

Items	A	B	C	D	E	SE
Initial weight g/b	71.O	71.0	71.0	71.0	71.0	
Final weight g/b	1511.0 [b]	1604.0 [a]	1601.0 [a]	1606.0 [a]	1616.0	
Weight gain g/b	1440.0 [b]	1533.0 [a]	1530.0 [a]	1535.0 [a]	1545.0 [a]	6.452
Feed intake g/b	3260.0 [b]	3289.0 [a]	3288.0 [a]	3294.0 [a]	3300.0 [a]	4.414
FCR	2.26 [a]	2.15 [a]	2.15 [a]	2.14 [a]	2.13 [a]	0.00016
Mortality %	0.5	0.25	0.3	0.25	0.4	0.025

SE=Standard error A=control B=antibiotic C,D and E supplemented with LGO at 50,100 150 mg/kg

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

Table(2): The effect of feeding broiler chicks on diets containing antibiotic and different levels of LGO on percent of carcass, giblets and commercial cuts of broiler chicks.

Items	A	B	C	D	E	SE
Dressing %	70.0	70.1	70.0	70.17	70.13	0.143
Gizzard%	2.72	2.73	2.74	2.76	2.79	0.0258
Heart%	0.81	0.83	0.82	0.85	0.88	0.0316
Liver%	2.42	2.51	2.49	2.51	2.52	0.158
Breast%	24.41	24.46	24.44	24.46	24.48	0.1517
Drumstick%	19.1	19.11	19.15	19.17	19.17	0.0182
Thigh%	19.31	19.33	19.35	19.34	19.39	0.176
Breast meat%	80.79	81.81	81.83	81.85	81.88	0.2983

SE=Standard error A=control B=antibiotic C,D and E supplemented with LGO at 50,100 150 mg/kg

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

Table (3): The effect of feeding broiler chicks on diets containing antibiotic and different levels of LGO on meat chemical and subjective values of broiler chicks

Items	A	B	C	D	E	SE
Crude protein%	17.47	17.49	17.41	17.46	17.45	0.0136
Ash%	1.34	1.30	1.35	1.33	1.32	0.0135
Moisture%	74.08	70.55	70.55	70.56	70.55	7.497
Ether extract%	4.56	4.55	4.57	4.58	4.55	0.1125
Juiciness	6.40	6.17	6.40	6.53	6.30	0.1278
Tenderness	6.43	6.20	6.53	6.43	6.37	0.2222
Color	6.63	6.63	6.40	6.47	6.30	0.2817
Flavor	6.40	6.83	6.43	6.27	6,23	0.2113

SE=Standard error A=control B=antibiotic C,D and E supplemented with LGO at 50,100 150 mg/kg

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

Table(4): The effect of feeding broiler chicks on diets containing antibiotic and different levels of LGO on serum metabolite value and serum electrolyte and enzyme activities of broiler chicks

Items	A	B	C	D	E	SE
Cholesterol mg/dl	140.0 [a]	140.0 [a]	110.0 [b]	109.0 [b]	104.0 [b]	1.337
Total protein g/dl	3.20	3.15	2.60	2.60	2.90	0.237
Urea mg/dl	12.9 [b]	12.95 [b]	10.77 [a]	10.70 [a]	10.30 [a]	0.191
Calcium mg/dl	8.70	8.80	8.30	8.40	8.25	0.2058
Phosphorus mg/dl	11.38	11.20	11.10	11.10	11.12	0.1581
AST(iu/L)	24.5	24.2	24.25	24.28	24.49	0.2017
ALP(iu/L)	232.0 [a]	200.0 [a]	160.0 [b]	155.0 [b]	150.0 [b]	4.928

SE=Standard error A=control B=antibiotic C, D and E supplemented with LGO at 50,100 150 mg/kg

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

REFERENCES

Abaza, I.M.; M.A.Shehata; M.S.Shoieb and I.I.Hassan (2008). *Evaluation of some natural feed additive in growing chick's diets. International Journal of Poultry Science 7(9):872-879.*

Alcicek, A. Bozkurt, M. and Cabuk, M. (2004). *The effect of a mixture of herbal essential oils on organic acid or a probiotic on broiler performance. South African Society for Animal Science, 34(4):217-222.*

Buchana, N.P.; Hott, J.M.; Cutlip, S.E.'Rock, A.l.; Asamer, A. and MortizJ, S, (2008*). The effect of a natural antibiotic alternative and anatural growth promoter feed additive on broiler performance and carcassquality.J.Appl.Poult.Res.202 -210.*

Burkill, I.H. (1996). *The useful plants of West .Royal Botanic Garden Ken2:29-30*

Dieumou, F.E., Dieumou, A.Teguia-Kuiate, J.R.,Tamokou,J,D. Fonge, N.B. and Dongmo,M.C.(2009)*. Effect of ginger (Zingiber officinale) and garlic (Allium sativa), essential oils on growth performance and gut microbial population of broiler chickens. Livestock Research for Rural Development, 21:25-34.*

El-tahir, K.E.H. (2006). *The black seed Nigella sativa Linnaeus –A, mine for multi cures: Aplea for urgent clinical evaluation of its volatile oil. JTU.Mrd.Sc. 1(1):1-19.*

El bagir, N.M., Hama,A.V., Hamed, R.M., Abd-El-Rahim, A.G.and en,A.C.(2006). *Lipid composition of egg yolk and serum in laying hens fed diet containing black cumin (N.sativa).J.Poult, Sci.5:574-578.*

Fuliang, H.U.; Hepburn, H.R.Kuan, H.; Chen, M.; Daya, S.,Radioff, S.E.(2005). *Effect of propolis and blood glucose, blood lipid and free radicals in rats with diabetes mellitus.Pharmacol, Res.51:147 - 152.*

Haj Ali, D.M. (1995). *A comparative phytochemecal study on menthe species grown in Sudan's University of Khartoum.*

Ismail, Z.S.H. (2011). *Effects of dietary black cumin growth seeds (Nigella sativa L.)Or its extract on performance and total coliorm bacteria count on broiler chicks. Research Arti.*

Obi, I.O. (1990). *Statistical methods of detecting differemces between treatment means.2nd Edn-Snaap Press.Enugu, Nigeria, pp:25-85.*

Mukhtar, A. M., (2007). *The effect of feeding Rosella (Hibiscus sabdarifta) seed on broiler chicks performance. Research Journal of Animal and Veterinary Sciences 2: 21-23.*

Mukhtar, A.M. (2011). *The effect of feeding clove oil on broiler performance. Australian Journal of Basic Sciences. 5(7):49-51.*

NRC (1994) *Nutrient requirements of poultry .9th Rev.Ed. National Academy press, Washington, DC, USA.*

Tekeli, A.,Kutla,H.R. and Colic,L.(2011). *Effect of Z.officinal and propalis extracts on the performance of broiler chicks. Current Research in poultry science .7:441-451.*

Russo, E.B. (1992.Headache Treatments by Native People of the Ecuadorian Amazon: Apreliminary Cross – Disciplinary ssessment).*J.Ethinopharmacol.36:1 93-203.*

الملخص العربي

إستخدام زيت حشيشة الليمون كمحفز للنمو فى تغذية الدجاج اللاحم

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تم اجراء هذة التجربة لتقييم مدى استجابة الدجاج اللاحم للعلائق المحتوية على مستويات مختلفه من مستخلص عشب حشيشة الليمون. شملت قياساًت التجربة الاداء الانتاجى, مواصفات الدبيحة, بعض مقاييس الدم، النشاط الآنزيمى والمعادن والتقييم الآقتصادى. صمت التجربة باستخدام النظام العشوائى الكامل. تم توزيع عدد 160 كتكوت غير مجنس عمر اسبوع من سلالة الرومى (308) عشوائيا فى 5 معاملات تجريبية بكل معامله ثلاث مكررات متساوية .تم تكوين خمسه غلائق وتم تقسيم الكتاكيت عليها. المجموعة الاولى تم تغذيتها على العليقة القياسيه (السالبة) الخاليه من المضاد الحيوى والمستخلص (الزيت الطيار)، المجموعه الثانية تغذت على العليقة القياسية مع اضافة المضاد الجيوى (النيومايسين 16 ملجم/كجم) كعليقة قياسية موجبة اما المجموعات الآخرى الثالثة، الرابعه والخامسة فقد تمت تغذيتها على العليقة القياسية مع اضافة مستويات مختلفة من زيت حشيشة الليمون (50, 100 و150 ملجم/كجم) على التوالي. اوضحت النتائج بأن اضافة مستويات مختلفة من الزيت ادت الى زياده معنوية قيم وزن الجسم المكتسب، العليقة المستهلكة ومعدل التحويل الغذائى مقارنة بالعليقة القياسيه السالبه بينما لم تلاحظ اى فروقات معنويه بين العلائق المحتوية على الزيت والعليقة القياسية الموجبة .لم يتأثر معدل النفوق معنويا بالمعاملات الغذائية المختلفة.

دلت النتائج على انه لا توجد اى فروقات معنوية بين مجموعات المعاملات المختلفة على نسب التصاقى, الاعضاء الداخلية, القطع التجارية ونسب اللحم بكل منها والتركيب الكيميائي وقياسات اللحم الانطباعيه للدجاج اللاحم.كما اظهرت النتايج الخاصه بقياسات الدم بان اضافة زيت جشيشة الليمون بالمستويات المختلفه قد ادت الى خفض مستوى الكلسترول واليوريا معنويا بينما لم يؤثر على البروتين الكلي.لم تظهر المغاملات المختلفه اي تاثير معنوى على النشاط الانزيمي وقيم الكالسيوم والفسفوروAST بينما اثرت معنويا على قيم ALT حيث سجلت المجموعات المغداة على المستويات المختلفه للمستخلص مقارنة مع الكتاكيت المعداة على العليقه القياسيع الموجبه والسالبه.

اظهرت الدراسة الاقتصاديه اعلى ربحية نسبيه (1.13) لمجموعة الاختبارالمغداة على(150 ملجم/كجم) لمستخلص حشيشة الليمون .وقد حلصت الدراسة بانه يمكن اضافة المستخلص لعلايق الدجاج اللاحم كمحفز طبيعى للنمو دون اي تاثيرات سالبة.