Response of Broiler Chicks to different Dietary Levels of Spearmint Oil (SPO) as a Natural Groth Promoter

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المستخلص

الكتاكيت عشوائيا إلى خمس مجموعات من 28 كتاكيت لكل، مع أربعة مكررات لكل مجموعة. تم تركيب خمسة علائق (A، B، C، D و E). A العليقه القياسيه السالبه (NC)، B العليقه القياسيه السالبه تستكمل بالمضادات الحيوية (16 ملغ نيومايسين / كغ) وتعتبر العليقه القياسيه الإيجابية (PC)، والمجموعات C، D و E تعتبر العليقه القياسيه السالبه مع اضافة زيت النعناع (SPO) في50، 100 و150 ملغ / كجم على التوالي. وأظهرت النتيجة المتحصل عليها أن إضافة SPO ادت زياده معنوبه ($P \geq 0.05$) في الأداء النتاجى (وزن الجسم، استهلاك العلف ونسبة التحويل الغذائي) اللدجاج اللاحم مقارنة بالمجموعة القياسيه السلبه بينما لم تظهر اى فروق معنويه بين مجموعات الدجاج المغذى على الوجبات الغذائية المضاف لها SPO ومجموعة PC. لم يتأثر معدل النفوق بالمعاملات المختلفه. كشفت نتيجة عدم وجود فروق معنوية ($P \geq 0.05$) بين جميع ا لمجموعات في النسب المئوية للذبيحة، الأحشاء، والاجزاء التجارية ونسبة اللحم من الأنسجة، والتركيب الكيميائي للحم . أدى اضافة SPO في العلف على مختلف المستويات تاثير معنوي ($p< 0.05$) حيث ادى لخفض مصل اليوريا، والكولسترول ونشاط انزيم ALP مقارنة كلا من المجموعتين NC وPC في حين أن مستوى البروتين الكلي والفوسفور والكالسيوم وAST لم يتغير. تحسنت اقتصاديا إضافة SPO أداء الدجاج اللاحم وأسفرت عن فوائد اقتصادية، وأظهرت هذه الدراسة أن SPO عند إضافتها في علائق الدجاج اللاحم يكون لها تأثير مماثل لمضاد حيوي دون أن مع أي آثار ضارة.

الكلمات المفتاحية: زيت النعناع، الكلسترول، الفوائد الاقتصادية، الآثارالضارة

Abstract:
A total of 140, day-old, unsex (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 Spearmint oil (SPO) at 50,100 and 150 mg/Kg respectively.

Result obtained showed that addition of SPO improved significantly (P≤0.05) the performance (body weight gain, feed intake and feed conversion ratio) of broiler chicks compared to group fed on NC while no significant(P≤0.05) differences between chicks fed on diets supplemented with SPO and PC group. The mortality rate did not influenced by the dietary treatments. Result revealed no significant differences (P≤0.05) among all treatment groups in the percentages of carcass dressing, giblet, commercial cuts and their percentage of their separable tissue, meat chemical composition and subjective meat quality parameters. Supplementation of SPO 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 SPO improved the performance of broiler chicks and resulted in economical benefits, This study showed that SPO when added as growth promoter in broiler diets have a similar effect as that with antibiotic without any adverse effects.

Keywords: Spearmint oil, cholesterol, economic benefits, adverse effects

Introduction:

Spearmint oil (Mentha spicata) is applied to several species and varieties of genus menthe such as Menthe spiacta L., Menthe vividis and Menthe gentiles processing a distinct odor due to high carvone content (Guenther, 1994). In Sudan spearmint known by the name Elnana Albaladi, it is grown in different areas in Sudan (Bashir, 2000).It is harvested continuously for 5-6 years during the flowering stage, when it contains the maximum amount of oil.

The chief constituents of spearmint oil is carvone,it contains phellandrine ,limonine ,and dihydrocarvest actetate,germacrene,pipertenones oxide a-caryophyllene(Nori-Shargh etal.,2002 and Rassoli and Rezaei 2002), esters of acetic, butyric and caprioc or caprylic acids(Guenther,1994).It is reported that it contain vitamins such as vitamin A, riboflavin and vitamin C, spearmint is also rich in minerals.

Menthe essential oil (MEO) stimulates secretion of hormones, discharge of enzymes, gastric juices and bile and stimulates nerves, brain and blood circulation .This keeps the metabolism activated and functioning property and also boosts immune system. Furthermore, it is very useful to deal with digestive problems including flatulence, constipation, diarrhea and nausea, as it relaxes the stomach muscles (Spirling and Daniels, 2001).Recently the oil was utilized in India for improving water quality by removing the toxic metals such as chromium and cadmium.

Al-Ankari *etal*.,(2004) used Habek mint to investigate the effect of its incorporating in basal diet of broilers on overall performance and immunity of the birds. The results showed that including 150g habek/kg broiler diet make a significant improvement in the body weight, daily average gain, feed intake and feed conversion. Galib(2010),studied the performance of broilers fed diets supplemented with dry pepper mint (Menthe piperita L.) .The results appeard improvement in performance traits for all treated groups compared with the control group.It was expected that supplementing the dietary herbs (Bampidis etal.,2005) would stimulate the growth performance of broilers.

The objective of this study was to evaluate the effect of addition of various levels of SPO as a natural growth promoter on the growth performance, carcass parameters, total plasma cholesterol, serum metabolites, serum electrolytes and enzyme activities and economical appraise of broiler chicks.

Materials and Methods:

The experiment was conducted during winter season (6th Feb-20th March 2010) the ambient temperature ranged between 25-45c. A total of 140 day-old, unsexed(Ross 308) ,purchased from a local commercial hatchery, 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.

Spearmint oil (SPO) was extracted by water steam distillation method. Fatty acid composition of the oil was determined by gas liquid Chromatography, free fatty acids determined according to AOAC (1988).

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 SPO at levels of 50, 100 and 150mg /kg respectively. The diet has been controlled 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, . Blood samples obtained from chicks were centrifuged at 3000r.p.m. for 5 minutes and sera was analyzed to determine the concentrations of cholesterol, urea, total protein, AST, ALP activities and minerals..Cholesterol concentration was measured by an enzymatic colorimetric method using akit (DIALAB Laboratories, Ltd, Austria).Serum urea concentration was estimated by an enzymatic calorimetric method using akit (Crescent Diagnostics,MUSLCO sj, Saudi Arabia).Serum calcium and phosphorus concentration were determined by acolometric method using a commercial kit (Spinreact,S.A.U. Spain).

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 carcasses were divided into two halves, the left side was divided into commercial cuts (breast, thigh, drumstick), then each cut was weighed and deboned, Duplicate samples of stored meat were analyzed to determine (moisture, protein, fat and ash content) according to AOAC (1988).The subjective meat attributes was done following (Hawrysh etal., 1980).

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

Results

The effects of the supplementation of various levels of an essential oil and antibiotic on the feed intake ,weight gain and feed conversion ratio were presented in Table(1).Results showed that chicks fed on various level of essential oil and antibiotic (B,C,D and E) obtained significantly ($P<0.05$)higher body weight gain(BWG) ,feed intake(FI) and FCR compared to chicks fed on 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. Economical calculations showed that groups D (1.12) and E(1.14) recorded the highest profitability ratio.

Discussion

The experimental chick's health was good although out the experimental period, the mortality rate was negligible with no differences among all treatment groups. Dietary SPO had no significant effect on mortality rate and this was agreed with the reports of (Ismail, 2011).

Results showed that chicks fed on diets supplemented with SPO consumed significantly more feed compared to control group, where as no significant differences were observed when compared with antibiotic group. This might be due to improvement in the feed taste, diet palatability which enhance chicks appetite, or due to quicker digestion and passage of nutrients through the digestive tract. These findings were similar to that of (Ismail 2011 and Tekeli *etal*., 2011).

Concerning body weight gain, results showed the same trend to that obtained for feed consumption. The improvement may attributed to increase of total feed intake /or relate to content of active compounds of SPO such as piperitin and limonene, posses antimicrobial and antioxidant activities , also as stimulant of digestive enzymes in the intestinal mucosa and pancreas that improve digestion of dietary nutrients and feed efficiency subsequently increasing growth rate. The improvement in body weight gain in this experiment agreed with results reported by(Botsoglou etal.,2004; Mukhtar,2011and Ismail,2011),found that the addition of an essential oil to broiler diet had no beneficial effect on performance.However,contrary to these,Botsoglou *etal*.,(2004) and Lee *etal*.,(2003a) who found that the addition of essential oil isolated from oregano to broiler diet had no beneficial effect on performance.

The same results were recorded for FCR. The improvement of FCR resulted from
the increase in appetite due to the stimulating of salivary and gastric glands by SPO, the decrease in pathogenic bacteria and better digestibility. The findings were inline with those of (Tekeli ,2011).Although the results were disagreed with the findings of Ismail,2011,who found no significant effects on FCR of broilers chicks when fed on ration supplemented with black cumin oil.

Results showed that dietary SPO at various inclusion levels performed similar to antibiotic growth promoter group on body weight gain ,feed intake and feed conversion ratio for broiler chicks, this might be attributed to the decrease number of pathogenic bacteria and/ the formation of a more stable intestinal flora and better digestion. These results agreed with the report of (Ismail, 2011 and Tekeli etal. 2011).

Results showed no significant ($p>0.05$) differences between all treatments groups in weight of carcass cuts, dressing percentage, non carcass components meat chemical composition and subjective meat values. The findings are on contrary to results recorded by Jamroz and Kamal (2002) that carcass yield was not affected by the dietary essential oil treatments.

The results obtained from this study revealed that all levels of SPO added to broiler diets significantly improved the growth performance of broiler chicks 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 SPO to broiler diet economically feasible. So SPO may be considered as a growth promoter similar to organic acids.

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

Items	Control	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]	1598.0 [a]	1604.0 [a]	1611.0	-
Weight gain g/b	1440.0 [b]	1533.0 [a]	1527.0 [a]	1533.0 [a]	1540.0 [a]	4.284
Feed intake g/b	3260.0 [b]	3289.0 [a]	3274.0 [a]	3277.0 [a]	3283.0 [a]	3.735
FCR	2.26 [a]	2.15 [a]	2.14 [a]	2.13 [a]	2.13 [a]	0.00015
Mortality %	0.5	0.25	0.6	0.25	0.3	0.025

SE=Standard error A=control B=antibiotic C,D and E supplemented with SPO at 50,100 150 mg/kg respectively
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 SPO on percent of carcass, giblets and commercial cuts of broiler chicks

Items	A	B	C	D	E	SE
Dressing %	70.0	70.01	70.12	70.16	70.15	0.132
Gizzard %	2.72	2.73	2.72	2.75	2.77	0.01826
Heart%	0.81	0.83	0.8	0.83	0.87	0.0316
Liver%	2.42	2.51	2.51	2.55	2.52	0.1602
Breast %	24.41	24.26	24.25	24.47	24.57	0.217
Drumstick%	19.11	19.13	19.14	19.15	19.15	0.0188
Thigh%	19.31	19.29	19.3	19.30	19.38	0.176
Breast meat%	80.79	80.79	80.81	80.84	80.87	0.2

SE=Standard error A=control B=antibiotic C,D and E supplemented with SPO at 50,100 150 mg/kg respectively.
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 SPO on meat chemical and subjective values of broiler chicks

Items	A	B	C	D	E	SE
Crude protein %	17.47	17.47	17.46	17.50	17.42	0.1835
Ash%	1.34	1.30	1.30	1.29	1.31	0.0605
Moisture%	70.57	70.55	70.50	70.57	70.54	0.220
Ether extract %	4.56	4.55	4.70	4.88	4.55	0.1317
Juiciness	6.10	6.10	6.00	6.07	6.20	0.0875
Tenderness	6.80	6.70	6.80	6.60	6.70	0.103
Color	6.60	6.70	6.70	6.60	6.50	0.193
Flavor	6.50	6.60	6.60	6.50	6,50	0.1095

SE=Standard error A=control B=antibiotic C,D and E supplemented with SPO at 50,100 150 mg/kg respectively.
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 SPO 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]	111.0[b]	116.3[b]	110.0[b]	1.513
Total protein g/dl	3.22	3.15	2.90	2.79	2.74	0.0966
Urea mg/dl	12.91[b]	12.95[b]	10.75[a]	10.90[a]	10.60[a]	0.1958
Calcium mg/dl	7.90	8.81	8.50	8.60	8.00	0.238
Phosphorus mg/dl	11.39	11.22	11.80	11.54	11.60	0.240
AST(iu/L)	24.6	24.21	24.30	24.25	24.20	0.161
ALP(iu/L)	232.0[a]	200.0[a]	184.0[b]	186.7[b]	179.4[b]	4.928

SE=Standard error A=control B=antibiotic C,D and E supplemented with SPO at 50,100 150 mg/kg respectively .
Means in a row bearing the same letter or no letter superscripts do not differ significant(p>0,05).