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Effect of Dietary Coriander (*Coriandrum Sativum*) Seeds Powder on Growth Performance, Carcass Characteristics and Blood Biochemical Parameters of Broiler Chicks

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Abstract

Phytogenic feed additives such as herbs and spices can be used as feed additives and viable alternatives to antibiotics in chicken production. The objective of the present study was to evaluate the effect of dietary supplementation of coriander (*Coriandrum sativum*) seeds powder on growth performance, carcass Characteristics and blood biochemical parameters of broiler chicks. A total of 108-day-old unsexed broiler chicks (Arbor Acres) were randomly divided into four (27 birds per treatment). Each treatment was randomly divided into three replicates (9 chicks each). The treatments were randomly allocated to one of the four experimental dietary treatments being, basal diet (controll, A), basal diet with antibiotic in drinking water (Oxytetracycline HCL 200mg, 1g/2L, B), basal diet supplemented with 0.5% of grounded *C. sativum* seed C) or basal diet supplemented with 1% of *C. sativum* D). The results showed that the average body weight gain (g/bird) was significantly (P<0.05) higher for the treatment received 1% *C. sativum* compared to the re treatment received antibiotics during the finishing and entire experimental period but not during the starter period. Feed intake (g/bird) was significantly (P<0.05) higher for the treatment received the control diet and the that fed 1% *C. sativum* compared to other. Feed conversion ratio (g feed/g gain), carcass traits and internal organ of broilers were not affected by dietary treatment. Serum albumin concentration was significantly higher (P<0.05) for the group fed 1% *C. sativum* seed powder compare to those fed control diet. However, serum cholesterol, triglycerides, and total protein concentrations were not affected by dietary treatments. It was concluded that using coriander seeds powder in broiler diets as alternative to antibiotics resulted in better body weight gain without any adverse effect.

Keywords: Coriander Seeds, Antibiotics, Carcass Characteristic, Broiler chickens

Introduction

Using dietary antibiotic as growth promoters in animal and poultry nutrition was a common practice for decades. However, most of these antibiotics have been banned in many countries, particularly the European Union, because of public health concerns regarding their residues in animal products and the development of antibiotic resistance in bacteria (Dibner and Richards, 2005; Lee *et al.*, 2004).

Presently, Consumers are increasingly interested in poultry products that do not contain antibiotic residues (Huyghebaert *et al.*, 2011). As a result, scientists are interested to discover suitable alternatives to antimicrobial compounds. Among the feed additives, more attention has been paid to probiotics, prebiotics, organic acids, enzymes and medicinal plants mainly due to their prophylactic and growth promoting effects. Thus, the use of probiotics, medicinal plants, herbs and spices in poultry diets has become more popular worldwide as an alternative to antibiotics to minimize the disease incidence and achieving better performance in chicken (Huyghebaert *et al.*, 2011).

Phytogenic feed additives such as herbs and spices are commonly incorporated into the diets of agricultural livestock, particularly swine and poultry (Gazwi *et al.*, 2022), to improve flavor and palatability and thus to enhance productive performance (Windisch *et al.*, 2008).

Coriander (*Coriandrum sativum*) is viewed as both herb and spice, and has been used in.

Human medicine for thousands of years. Coriander seed powder contains 0.5–1.0% essential oil (carvone, geraniol, limonene, borneol, camphor, elemol and linalool) having antimicrobial properties against food borne pathogen such as *Salmonella* species (Silva *et al.*, 2011). Coriander seeds possess antioxidant (El-Hack *et al.*, 2019), diuretic, antidiabetic (Eidi *et al.*, 2009), anti-inflammatory (Lee *et al.*, 2017), antibacterial (Ghazanfari *et al.*, 2015), anthelmintic and anti-mutagenic (Cortés-Eslava *et al.*, 2004) qualities. In addition, it has appetizing and stimulatory effects in the digestion process by increasing production of digestive enzymes and juices, which stimulates digestion and peristaltic motion, thus improves feed efficiency (Nadeem *et al.*, 2013; Rajeshwari and Andallu, 2011). Coriander seed powder as an alternative to antibiotic growth promoter has been recommended for feeding in broilers by several authors (Barad *et al.*, 2017; Naeemasa *et al.*, 2015; Taha *et al.*, 2019). Therefore, the objective of the present experiment was to evaluate the effect of dietary coriander seeds on growth performance and carcass characteristics of broiler chickens.

Materials and Methods

Study area, bird housing and management

The study was carried out at Extension and Rural Development Centre (E.R.D.C.), Faculty of Animal Production, University of Gezira, Elmanagil, Gezira state, Sudan from April to May, 2018. During the period of the experiment, the ambient temperature ranged from 28ºC- 47ºC, whereas the relative humidity ranged from 45% - 80%. A total of 108-day-old unsexed broiler chicks (arbor acres) were randomly divided into four treatments 27 birds per each. Each treatment was randomly allocated into three replicates (9 chicks each), kept in a wire cage (100 × 100× 90 cm), and provided with a feeder and drinker. The brooding temperature was set at 34 °C for the first 3 days, and then decreased gradually to 24 °C at the end of the experimental period. The chicks were reared under a continuous program with 24 h of light during the 1st week and 23 h of light and 1 h of darkness for the remaining experimental period. experimental groups were allocated randomly to one of dietary treatments being, basal diet (control, A), basal diet with antibiotic in drinking water (Oxytetracycline HCL 200mg, 1g/2L, B), basal diet supplemented with 0.5% of

grounded *C. sativum* seed B) or basal diet supplemented with 1% of *C. sativum* C). All broiler chicks were received starter (0–3 weeks) and finisher (4–7 weeks) diets formulated according to the National Research Council (NRC, 1994). Feed proximate analysis was conducted using the procedure described by (AOAC, 2004). The ingredients and chemical composition of starter and finisher diets are presented Table 1. Coriander seeds were purchased from the local market, oven dried, milled into powder and stored in an air tight polyethylene bags until use.Feed and water were supplied *ad libitum* during the entire experimental period. The birds were vaccinated against Newcastle disease at 1 and 18 days of age and Gumboro disease at 14 and 24 days of age. Body weight gain feed consumption and feed conversion ratio were measured during starter (0–3 weeks), finisher (4–7 weeks), and entire experimental periods (0–7 weeks).

Table (1) Ingredients and chemical composition of starter diets of broiler chicks

Ingredients %	Starter	Finisher
Sorghum	62.20	62.20
Ground nut cake	28	22
Wheat bran	0.28	6.28
Super concentrates	5	5
Di calcium phosphate	1.02	1.02
Sodium chloride	0.30	0.30
Lysine	0.50	0.50
Vegetable oil	2.40	2.40
Premix*	0.30	0.30
Total	100	100
Calculated chemical composition		
Crude Protein (%)	21.97	20.39
ME (kcal/kg)	3206.69	3220.66
Lysine (%)	1.10	1.05
Methionine (%)	0.50	0.38

A, basal diet; B, basal diet and antibiotic in drinking water; C, basal diet plus 0.5% of *C. sativum* D, basal diet plus 1% of *C. sativum.*

Carcass traits and blood sampling

At the end of feeding trial,3 birds were selected from each experimental unit and hand slaughtered. Carcass and internal organs were removed and individually weighed. Blood was collected at slaughter time in heparinized tubes to determine the following biochemical parameters: cholesterol, tri-glyceride, total protein, albumin, glucose and globulin using commercial colorimetric kits.

Statistical Analysis

Data were subjected to one way analysis of variance by SAS. The differences between means at $P<0.05$ were compared using Duncan multiple range test.

Results and Discussion

Growth performance

Table 2. shows the average body weight gain, feed consumption, feed conversion ratio of broiler chicks fed diets supplemented with 0.0%,0.5%, 1% *C. sativum* seed or antibiotic in drinking water during starter, finisher, and entire experimental periods. The results revealed that inclusion of *1% C sativum* seeds in the diets significantly ($P<0.05$) improved the average body weight gain during the finisher and entire experimental period but not during the starter period. This finding could be mainly due to the presence of antioxidants and phenolic substances in *C. sativum* seeds that stimulate the growth

performance (Gazwi *et al.*, 2022). Earlier report showed that adding *C. sativum* oil to the broiler diet significantly increased body weight (Jang, 2011). However, comparable findings were revealed by (Khubeiz and Shirif, 2020) who added up to 3.5% of *C. sativum* seed powder in the broiler diets.

Feed intake during the finisher period was significantly higher (P<0.05) for the group of broiler chicks received control diet and those fed 1% *C. sativum* seeds. The positive results in weight gain and feed intake for the group fed 1% C. *sativum* in the finishing period 4-7 weeks might be due to the accumulated positive effect of the essential oils in C. *sativum* seeds (linalool and alpha- terpineol and others oils which known that its positively stimulate the digestive process ,beside it have strong antibacterial effect (Lee *et al.*, (2017), Husseinzadeh, *et al.*, (2015) and Farag (2013)). Similarly, Hady, *et al.*, (2015) reported that these essential oils have broad spectrum antimicrobial activity due to the improvement gut healthiness. On the other hand, Chandel, *et* al., (2021), Freires, *et al.*, (2014) and Farag (2013) reported that the essential oils of C. sativum seed played a vital role as an antioxidant, anti-inflammatory and antibiotic alternative which was positively affect broiler health and performance.

Alghough the feed conversion ratio was not significantly affected by dietary treatments during the entire experimental period, it was intended to be numerically lower in the group received 1% *C. sativum* seed powder. Similar results were reported by (Khubeiz and Shirif, 2020; Naeemasa *et al.*, 2015). Contrary, (Gazwi *et al.*, 2022) reported that feed conversion ratio was improved when broiler checks fed diet containing *C. sativum* and *Cichorium intybus*. The inconsistency of the data could be attributed to different environmental condition, composition of basal diet and the level of inclusion of *C. sativum* in the basal diet.

Table (2) Effect of the dietary addition of *C. sativum* seeds on the growth performance of broiler chicks

	Treatments					
Items	**A**	**B**	**C**	**D**	**SEM**	**Level of significance**
Body weight gain (g)						
0-3 weeks	848.00	831.30	847.30	865.30	12.87	NS
4-7 weeks	1069.30^{ab}	1018.70^{b}	1082.70^{ab}	1218.30^{a}	46.372	*
0-7 weeks	1917.30^{ab}	1850.00^{b}	1930.00^{ab}	2083.70^{a}	52.53	*
						Feed intake (g)
0-3 week	1059.30	1121.30	1184.3	1105.70	39.68	NS
4-7 weeks	1685.30^{a}	1516.30^{b}	1536.30^{b}	1721.30^{a}	34.575	*
0-7 weeks	2744.70	2637.70	2720.70	2827.70	66.91	NS
						Feed conversion ratio
0-3 weeks	1.25	1.35	1.40	1.27	0.05	NS
4-7 weeks	1.58	1.50	1.42	1.41	0.057	NS
0-7 weeks	1.43	1.43	1.41	1.35	0.04	NS

A, basal diet; B, basal diet and antibiotic in drinking water; C, basal diet plus 0.5% of *C. sativum* D, basal diet plus 1% of *C. sativum.*

a,b Within the same rows, means have similar letter (s) are not significant different at ≤ 0.05.

SEM standard error of the mean.

NS not significant.

Carcass traits

Table 3. Shows the carcass characteristics of broiler chicks fed diets supplemented with 0.0%,0.5%, 1%*C. sativum* seed or antibiotic in drinking water during. The results indicated that supplementation of *C.*

sativum seeds has no effect of any of the carcass traits. This finding is not in line with the report published recently by Gazwi *et al.*, (2022) who revealed that dietary supplementation with *C. sativum* and *Cichorium intybus* increased liver and carcass weight and decreased abdominal fat percentage. However, dressing percentage was not affected when broiler chicks fed different levels of *C. sativum* seeds (Khubeiz and Shirif, 2020; Naeemasa *et al.*, 2015). These findings are similar to those obtained by Silva *et al.*, (2020) who reported that the coriander seeds in broiler diets improve carcass yield. The contradictory findings between the experiments might be attributed to the different forms and levels of coriander seed applied to the broilers.

Table: (3) Effect of supplementation of Coriander seed powder and anti-biotic on carcass Characteristics of broiler chicks

	Treatment					
Items (g)	**A**	**B**	**C**	**D**	**SEM**	**Level of significance**
Carcass	1212.00	1272.70	1264.70	1343.30	46.76	NS
Heart	0.46	0.54	0.53	0.60	0.05	NS
Liver	2.05	2.33	2.27	2.13	0.21	NS
Pancreas	0.24	0.26	0.22	0.21	0.03	NS
Proventriculus	0.70	0.57	0.54	0.64	0.07	NS
Gizzard	2.94	3.55	3.07	3.33	0.45	NS
Abdominal	1.47	1.49	1.15	1.51	0.14	NS
Spleen	0.17	0.11	0.08	0.06	0.82	NS
Drumstick	8.78	9.96	8.45	9.71	0.79	NS
Breast	17.37	15.46	15.16	16.13	0.74	NS

A, basal diet; B, basal diet and antibiotic in drinking water; C, basal diet plus 0.5% of *C. sativum* D, basal diet plus 1% of *C. sativum.*
SEM standard error of the mean.
NS not significant.

Broilers blood component

Table 4. shows the blood biochemical parameters of broiler chicks fed diets supplemented with 0.0%,0.5%, 1%*C. sativum* seed or antibiotic in drinking water during. The dietary treatments had no effect on blood cholesterol, triglycerides and total protein. However, blood albumin was significantly higher ($P<0.05$) for the group received diet supplemented with 0.5% *C. sativum* compared to those received control diet. Similar results were reported recently by (Gazwi *et al.*, 2022) who indicated that supplementation of broilers diet with *C. sativum* and *Cichoriumintybus* did not significantly affect plasma total protein, albumin, globulin and A/G ratio. Previously, (Al-Jaff, 2011) reported that supplementation broiler diets with coriander seeds at a level of 1% numerically increased serum albumin concentration by about 3.15%.

Table (4) The Effect of supplementation of Coriander seed powder and anti-biotic supplementation on broilers blood components

	Treatments					
Contents	A	B	C	D	SEM	Level of significance
Cholesterol mg/dl	200.33	176.67	213.67	195.67	18.87	NS
Triglycerides mg/dl	55.67	52.67	65.33	64.33	17.93	NS
Total protein mg/dl	3.76	3.79	3.99	3.85	0.08	NS
Albumin mg/dl	1.21^{b}	1.40^{ab}	1.64^{a}	1.41^{ab}	0.11	*

A, basal diet; B, basal diet and antibiotic in drinking water; C, basal diet plus 0.5% of *C. sativum* D, basal diet plus 1% of *C. sativu*
SEM standard error of the mean
NS not significant.

Conclusion

Results of this study indicated that feeding broiler chickens on diets containing coriander seeds as natural feed additives can replace the antibiotics in broiler diets and (1%) inclusion was the best percentage of coriander seeds in the whole experimental periods to increase feed consumption and weight gain and increase final carcass weight.

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مسحوق بذور الكسبرة علي الاداء الانتاجي. صفات الذبيحة وصفات الدم البيوكيميائية في الدجاج اللاحم

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المستخلص

يمكن إستخدام المضافات النباتية مثل الأعشاب والتوابل كإضافات علفية حيوية بدلاً عن المضادات الحيوية في إنتاج الدجاج اللاحم. أجريت هذه الدراسة بغرض تقييم أثر إضافة مسحوق بذور الكسبرة (*Coriandrum sativum*) علي الأداء الإنتاجي، صفات الذبيحة وقياسات الدم الكيموحيوية في الدجاج اللاحم. تم تقسيم عدد 108 من كتاكيت الدجاج اللاحم غير المجنسة عمر يوم واحد (Arbor Acres)عشوائياً لعدد اربعة معاملات (27 كتكوت لكل معاملة و تحتوى كل معاملة عدد ثلاث مكررات (9 كتاكيت في كل) .لاحقاً تم تقسيم هذه المجموعات للتغذية على إحدي المعاملات الغذائية التالية: العليقة الأساسية (مجموعة التحكم A)، العليقة الأساسية مع مضاد حيوي في مياه الشرب (Oxytetracycline HCL 200 mg, 1g/2L, B)، العليقة الأساسية مضافاً اليها 0.5% من مسحوق بذور الكسبرة (C، العليقة الأساسية مضافاً اليها 1% من مسحوق بذور الكسبرة (D. أظهرت النتائج أن متوسط الوزن المكتسب (جرام لكل طائر) كان أعلى معنويا (lP <0.05) المعاملة التى تغذت على العليقة المضاف اليها 1% من مسحوق بذور الكسبرة مقارنة مع تلك المجموعة المغذاة على عليقة الأساس بجانب المضادات الحيوية فى مياه الشرب . متوسط إستهلاك العلف (جرام/طائر) كان أعلي معنوبا (P<0.05)فى محموعة التحكم و تلك المجموعة التي تغذت علي العليقة المضاف اليها 1% من مسحوق بذور الكسبرة مقارنة بالمجموعات الأخري. معدل التحويل الغذائي (جرام علف/جرام وزن مكتسب)، صفات الذبيحة و الاحشاء الداخلية للدجاج اللاحم لم تتأثر بالمعاملات الغذائية. تركيز الألبيومين أظهر معدلات أعلي في المجموعة التي تغذت علي عليقة ال 1% مسحوق بذور الكسبرة مقارنةً بمجموعة التحكم. ولكن، تركيز الكوليسترول، الأحماض الدهنية الثلاثية والبروتين الكلي لم تتأثر بالمعاملات الغذائية. إستخدام مسحوق بذور الكسبرة في علائق الدجاج اللاحم كبديل للمضادات الحيوية اظهر تحسناً في مستوي النمو مع عدم وجود اي تأثير سلبي.