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Effects On Production Performance and Ileal Microflora of Broiler Chicks by Adding Various Levels of Coriander Seed (Coriandrum Sativum L.) Powder to Ration

ABSTRACT

The aim of the current study was to assess the impacts of adding various levels of coriander (Coriandrum Sativum L.) on broiler production efficiency and ileal microflora. Five treatments, consisting of 90 ROSS (308) broiler chicks each, were created from a total of 450 broiler chicks that were one day old. Each therapy was applied three times (30 chicks per replicate).The experiment included five treatments: a control diet without coriander, a control diet supplemented with four levels of coriander powder (0.2%, 0.4%, 0.6%, and 0.8%). After 21 days, the value of final weight, weight gain, feed intake, and feed conversion ratio were increased significantly in the birds received diet that contained coriander compared with control. However, this trend was not significant in the day 35 and day 42 of experiment. These findings suggested that synthetic antibiotics might be replaced in poultry diets by natural feed additives and growth enhancers like coriander powder.

INTRODUCTION

In 2020, the value of broiler, egg, turkey, and chicken production as a whole was $35.5 billion, an 11% decrease from $40.0 billion in 2019. Less than 1% of the total was produced by chickens, 25% by eggs, 15% by turkeys, and 61% by broilers. Broilers were produced for $21.7 billion in 2020, a 23% decrease from 2019. In 2020, there were 9.22 billion broilers produced worldwide, a little increase over 2019. In 2020, 59.4 billion pounds worth of live weight broilers were produced, and increase of 2% over the previous year (USDA, 2021). Production levels, exports, and imports of chicken meat are all rising along with consumer demand (Biesek *et al*., 2020).

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One of the key factors affecting the production, quality, and commercial feasibility of chicken meat is diet. The amount and kind of food given to birds has an impact on their growth rate, feed intake, and feed conversion ratio per kilogram of body weight gain, litter quality, water intake, and excreta hydration. The management method, genotype, sex, and age of the birds affect the carcass and meat quality (Swiatkiewicz *et al*., 2017).

Even though they have not been proven to be essential components, herbal plants and their essential oils, also known as phytobiotics, phytogenics, phytochemicals, spices, or botanicals, include a range of physiologically active compounds that may have a positive influence on animal growth and health (Christaki *et al*., 2020). Their low abundance, which varies from 1% to 5% of dry weight, usually serves to distinguish them (Hashemi and Davoodi, 2011). A possible method of providing supplements with biologically active composites is by using aromatic plants and their derivatives in animal feed. Their antibacterial, antiviral, antifungal, antioxidant, anti-inflammatory, and immune-stimulating properties stand out among them (Diaz-Sanchez *et al*., 2015; Adaszynska-Skwirzynska and Szczerbinska, 2017; Ribeiro-Santos *et al*., 2018).

The herb and spice coriander (*Coriandrum sativum L*.) is considered to provide health benefits. It has been used in medicine for a very long time (Nadeem *et al*., 2013). These plants' leaves, flowers, seeds, and fruit include, among other things, antioxidant, diuretic, anti-diabetic, sedative, antibacterial, anthelmintic, anti-mutagenic, and sedative properties (Pathak *et al*., 2011; Rajeshwari & Andallu, 2011).

The present study was aimed to determine the effects of various coriander (Coriandrum sativum L.) meal supplementation levels on the growth performance and intestinal flora of Ross (308) broiler chickens.

MATERIALS AND METHODS

Chicken management and feeding

A feeding experiment was conducted at Grdarasha Station, Department of Animal Resources Station, College of Agricultural Engineering Sciences, Salahaddin University-Kurdistan, Iraq. Two stages were used to implement the current study program. At the Department of Animal Resources Station's poultry facility, the field experiment for the first stage was conducted for 42 days. The second stage was completed in a laboratory. The microbiological testing was carried out in the laboratories of the General Authority for Agricultural Research (blood parameters).

A total of 450 Ross (308) broilers were divided into five assemblies at random, each consisting of three replicates and 30 chicks each. The following groups were assigned:

T1: Baseline diet plus 0% (dried coriander seeds powder)
T2: Dietary base plus 0.2% (dried coriander seeds powder)
T3: Dietary base plus 0.4% (dried coriander seeds powder)
T4: Dietary base plus 0.6% (dried coriander seeds powder)
T5: Basic nutrition + 0.8% (dried coriander seeds powder)

To meet their dietary needs, the meals for the chicks were formulated. Each 1.5 m^2 wire floor pen holds 30 broilers that are raised in rolls of paper. Throughout the study, the chicks received food and water as needed. Experimental animals were inoculated against the Newcastle and Gumboro diseases based on their age. The chicks were exposed to 23 hours of light and 1 hour of darkness while the lighting and temperatures were kept under control throughout the experiment. Temperatures started out at 33°C and dropped 3°C throughout the course of the second and third weeks before stabilizing at 23°C for the duration of the trial.

Microflora Study

At the end of the feeding experiment, each killed bird was rapidly dissected, and the digesta contents of the intestinal segment (1g) were gathered and homogenized with 10 mL phosphate buffer solution. Rapid dissection of the ileum from the Meckel's diverticulum to 4 cm above the ileo-caecal junction was performed (PBS, pH 7). The ileal digesta samples were delivered to the lab in ice packs (Reda *et al*., 2020).

Table (1): Formulation and proximate analysis of the experimental diets (dry weight)

Ingredients %	Commercial		
	Starter(0–21 days)	grower (22–35 days)	finisher (36–42 days)
Corn	57.00	64.00	64.00
Soybean meal%48	39.50	33.00	32.25
Oil	1.53	1.50	1.60
Limestone	1.31	1.35	1.34
Salt	0.05	0.05	0.05
Vitamins-minerals	0.025	0.025	0.025
Dicalicium phosphate	0.50	0.50	0.50
Lysine%	0.05	0.05	0.05
Methionine	0.04	0.04	0.04
Calculated nutrient content			
Crud protein	23.0	21.0	19.0
Metabolizable energy (kcal/kg feed)	2950	3050	3100

According to N.R.C. (1994).

Statistical analysis

One-way ANOVA was used to evaluate the data, and Duncan's Multiple Range Test was used to determine whether treatment variances were significant ($P<0.05$). Standard error (SE) and mean values are used to express all results. SPSS statistics version 26 for Windows was used to conduct the statistical analysis (SPSS Inc., an IBM company, copyright 1989-2019).

RESULTS AND DISCUSSION

Production traits

Mortality

The impacts of addition of different levels of coriander (0%, 0.2%, 0.4, 0.6 and 0.8%) on mortality level were presented in figure (1). The level of mortality was 5.5 % for T1 and 1.1% for T3 and T4 whereas the mortality was zero for T2 and T5. This is revealed that dietary supplementation of coriander significantly enhanced chicken health and reduced the mortality rate.

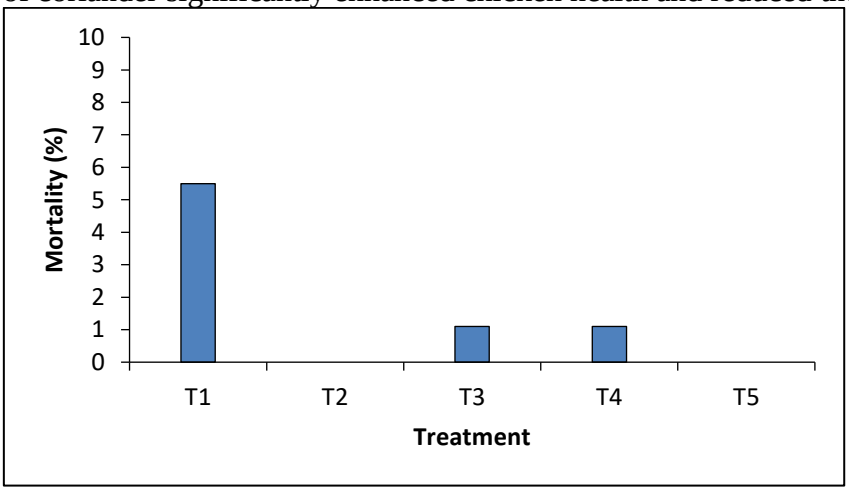

Fig. (1): Average mortality during experiment period

T1: Basal diet + 0% (dried coriander seeds powder), T2: Basal diet + 0.2% (dried coriander seeds powder), T3: Basal diet + 0.4% (dried coriander seeds powder), T4: Basal diet + 0.6% (dried coriander seeds powder) and T5: Basal diet + 0.8% (dried coriander seeds powder).

Body weight

The effects of coriander addition on live body weight at various concentrations (0, 0.2, 0.4, 0.6, and 0.8%) were demonstrated in table (2). In day 21 live body weight was significantly higher in T4 in comparison with control, while this trend was not significant ($P > 0.05$) in other three groups. No significant ($P > 0.05$) difference was found among treatments body weight at day 35 and 42.

The findings of the present work are in line with (Naeemasa *et al*., 2015) finding, which discovered that coriander supplementation improved broiler chicken production performance at a level of 1.2% coriander powder supplementation. However, the results of this study disagree with those of previous studies (Ahmad *et al*., 2016; Barad *et al*., 2016; Zuhairi *et al*., 2018; Hamodi *et al.*, 2010). The results of the present investigation, however, disagreed with those of (Kirubakaran *et al.*, 2016; Elradi *et al.*, 2018; Samira and Messai, 2022; Samani *et al*., 2020; Khubeiz *et al*., 2020).

Table (2): Effects of different levels of coriander seeds (C*oriandrum Sativum L.*) powder, live body weight during feeding program (starter, grower, finisher) broiler chickens

Age(days)	Live body weight(gm)				
	TI	T2	T3	T4	T5
P1(starter) (21)days	674.11± 7.05^{b}	713.33± 17.06^{ab}	724.33± 17.78^{ab}	739.77± 23.85^{a}	709.00± 13.67^{ab}
P2; Grower (35)days	2034.30± 74.72^{a}	2056.11± 45.66^{a}	2158.26± 54.61^{a}	2072.66± 57.17^{a}	2079.22± 29.82^{a}
P3; Finisher (42)days	2453.97± 51.71^{a}	2530.77± 43.95^{a}	2523.11± 73.30^{a}	2460.00± 20.21^{a}	2546.33± 29.37^{a}

T1: Basal diet + 0% (dried coriander seeds powder), T2: Basal diet + 0.2% (dried coriander seeds powder), T3: Basal diet + 0.4% (dried coriander seeds powder), T4: Basal diet + 0.6% (dried coriander seeds powder) and T5: Basal diet + 0.8% (dried coriander seeds powder).

Body Weight gain (BWG):

Table 1 illustrates how different coriander supplementation amounts (0%, 0.2%, 0.4, 0.6, and 0.8%) affected live body weight gain in the 21st, 35th, and 42nd days. The body weight gain in the T3 and T4 treatment groups (603.22, 620.44 g/bird) was significantly higher ($P <0.05$) in comparison with control groups for the period from (1-21) days of age when compared to the control group (548.22 g/bird) during the commencing phase. On day 21, the body weight growth in T3 and T4 (603.22, 620.44 g/bird) was significantly higher ($P <0.05$) than the control (548.22 g/bird). However, there was no discernible variance in weight gain between the treatments at the grower and finisher stages (35–42 days) ($P>0.05$). Enhanced digestion, higher nutrient absorption, and antimicrobial action are further potential contributors that could all promote the bird's immunity and, as a result, increase growth performance (Hamodi *et al*., 2010).

The findings of the current investigation are supported by (Barad *et a*l., 2016; Sayed and Ahmed, 2017; AL-Zuhairi *et al*., 2018). However, our findings don't agree with those of (Abadi and Andi, 2014; Kumari et al., 2014; Osman, 2017; Khubeiz *et al*., 2020).

Table (3): Effects of different levels of coriander seeds *(Coriandrum Sativum L.)*, weight gain during feeding program (starter, grower, and finisher) broiler chickens

Age(days)	Weight gain (g)				
	T1	T2	T3	T4	T5
P1(starter) 21d	548.22± 4.43^{b}	594.44± 15.24^{ab}	603.22± 16.20^{a}	620.44± 24.08^{a}	589.77± 12.14^{ab}
P2; Grower 35d	1360.19± 81.68^{a}	1342.77± 57.64^{a}	1433.93± 57.97^{a}	1332.88± 77.21^{a}	1370.22± 35.99^{a}
P3; Finisher42d	487.42± 56.50^{a}	454.40± 26.77^{ab}	504.11± 43.86 ^{a}	441.77± 13.91^{ab}	466.55± 0.55^{ab}

T1: Basal diet + 0% (dried coriander seeds powder), T2: Basal diet + 0.2% (dried coriander seeds powder), T3: Basal diet + 0.4% (dried coriander seeds powder), T4: Basal diet + 0.6% (dried coriander seeds powder) and T5: Basal diet + 0.8% (dried coriander seeds powder).

Feed intake (FI):

Table (4) demonstrates the impact of coriander on the quantity of feed ingested. The results demonstrated that adding coriander to the diet in various levels (0.2%, 0.4, 0.6, and 0.8%) considerably increased feed consumption in the early stage compared to the control. This impact may be due to an increase in digestive enzymes, which is connected to an increase in feed consumption, because of the presence of linalool and enhanced food palatability (Applegate *et al*., 2010). However, there was no obvious distinction between the treatments at ages 35 and 42.

Our outcomes concurred with those of (Naeemasa *et al*., 2015; Hady *et al.,* 2016; AL-Zuhairi *et al*., 2018; Chandel *et al*., 2021). However, the results of this inquiry conflicted with those of (Elradi et al., 2018; Samira and Messa, 2022; Samani *et al*., 2020; Khubeiz *et al*., 2020). Osman (2017) found that despite group C (0.5%) having the highest feed intake values, there were no appreciable changes (*P>0.05*) in the experimental groups' feed intake reactions to the addition of coriander at the various doses of 0%, 0.1%, and 0.5%.

Table (4): Effects of different levels of coriander seeds (*Coriandrum Sativum L.*), feed intake during feeding program (starter, grower, and finisher) broiler chickens

Age(days)	Feed intake (gm)				
	T1	T2	T3	T4	T5
P1(starter) (21)days	1162.32± 5.73^{a}	1148.64± 2.03^{b}	1148.29± 4.64^{b}	1155.30± 2.41^{ab}	1148.51± 1.74^{b}
P2; Grower (35)days	1924.60± 49.37^{ab}	1889.64± 10.89^{b}	2036.23± 48.61^{ab}	2177.33± 31.73^{a}	2095.62± 26.31^{a}
P3; Finisher (42)days	1124.00± 30.34^{a}	1077.69± 16.95^{a}	1073.88± 9.27 ^{a}	1071.58± 20.21^{a}	1088.39± 14.65^{a}

T1: Basal diet + 0% (dried coriander seeds powder), T2: Basal diet + 0.2% (dried coriander seeds powder), T3: Basal diet + 0.4% (dried coriander seeds powder), T4: Basal diet + 0.6% (dried coriander seeds powder) and T5: Basal diet + 0.8% (dried coriander seeds powder).

Feed conversion ratio (FCR):

The effect of varying coriander additions on FCR was demonstrated in (table 5). Adding various quantities of coriander were significantly reduced the level of FCR in the starter phase (1.93, 1.90, 1.86, and 1.94) in comparison with control phase (2.12); however, in the grower phase, the dietary supplement coriander had no appreciable impact on FCR. The FCR score in T2 during the growth phase was 1.40 at its lowest. But when compared to controls, pigeons fed meals supplemented with coriander throughout the finisher phase showed a considerable rise in FCR value T3 (2.16). (2.35). However, the FCR values at time points T1, T2, T4, and T5 were identical. The altered feed consumption and maybe improved feed digestibility were the causes of the

improvement in FCR. The study's findings that adding coriander seed powder to chicken diets enhanced the FCR are supported by the current findings (Hamodi et al., 2010; Al- Jaff, 2011; Farag, 2013). The fact that broilers fed various combinations of commercial essential oils showed a considerable rise in pancreatic amylase, trypsin, and maltase activity may help to explain this (Brenes and Roura, 2010).

The findings of present work agreed with those of (Abadi and Andi 2014; Habiyah *et al*., 2016; Elradi *et al*., 2018; AL-Zuhairi *et al*., 2018). In broiler diets, adding 2% coriander seed boosts average live weight, weight gain, feed intake, and feed conversion, according to research by Hamodi et al. (2010). Although, the most recent findings was differed from those (Osman, 2017; Samani et al., 2020; Khubeiz et al., 2020; Samira and Messai, 2022).

Table (5): Effects of different levels of coriander seeds (*Coriandrum Sativum L.*), feed conversion ratio during feeding program (starter, grower, and finisher) broiler chickens

Age(days)	Feed conversion ratio (gm)				
	T1	T2	T3	T4	T5
P1(starter) (21)days	2.12±0.02^{a}	1.93±0.04^{b}	1.90±0.04^{b}	1.86±0.07^{b}	1.94±0.03^{b}
P2 (Grower) (35)days	1.42±0.09^{a}	1.40±0.02^{a}	1.42±0.08^{a}	1.60±0.11^{a}	1.53±0.02^{a}
P3; Finisher (42)days	2.35±0.23^{ab}	2.38±0.10^{ab}	2.16±0.19^{a}	2.42±0.03^{ab}	2.33±0.03^{b}

T1: Basal diet + 0% (dried coriander seeds powder), T2: Basal diet + 0.2% (dried coriander seeds powder), T3: Basal diet + 0.4% (dried coriander seeds powder), T4: Basal diet + 0.6% (dried coriander seeds powder) and T5: Basal diet + 0.8% (dried coriander seeds powder).

Bacteriology:

The findings of a microbiological analysis of the cecal contents of broiler chicken (308) fed on varied quantities of coriander powder supplementation for six weeks were published in (figure 2). The amount of lactic acid bacteria increased significantly ($P<0.05$) in T3 after the addition of coriander powder but not in T2, T4, or T5. Coriander powder supplementation considerably decreased the level of E. coli in T3, T4, and T5 despite the fact that this trend was not significant in T2.

The outcomes of the current work were in agreement with those of (Rahimi *et al*., 2011; Rajeshwari, and Andallu, 2011; Ghazanfari *et al*., 2014). Additionally, according to Guo *et al*. (2004), plant extracts increased the number of beneficial bacteria while concurrently reducing the amount of dangerous bacteria (E. coli) (Lactobacilli and Bifidobacteria). But the results of this investigation did not match those of the studies by (CAbuk *et al*., 2003; Vidanarachchi *et al*., 2006; Ouwehand *et al*., 2010; Akbarian *et al*., 2013). Skyrme (1997) found that the E. coli level for the same garlic was more than ten times higher than the Lactobacillus casei count. According to research by Ghazanfari *et al*. (2015), adding coriander essential oil had no discernible effect on the prevalence of Lactobacillus spp. Birds given antibiotics and coriander essential oil at mounts of 200 and 300 mg/kg showed decreased counts of Escherichia coli in their ceca when compared to the control treatment ($P< 0.05$). The effects of different dietary quantities of coriander seed powder or extract on the ileum microbiota parameters of Ross 308 broilers at the 21st and 42nd day of age were not significantly different ($P > 0.05$), according to Hosseinzadeh *et al*., (2014). However, chickens received control diet at 21 and 42 days of age showed a higher concentration of Escherichia coli (E. coli) than the other groups, with the exception of T6 ($P< 0.05$).

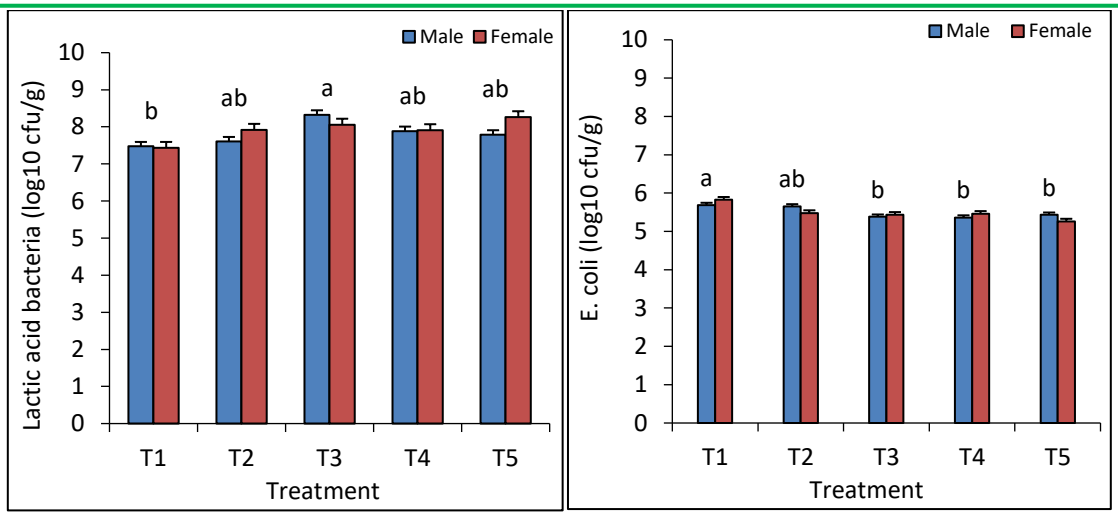

Figure (2): Effect of dietary supplements on bacteriology at 6th week in broilers.

CONCLUSION

In conclusion, adding coriander seed powder to the meal improved the growing performance of broiler chickens, as well as the ability of the nutrients to be digested. This shows that *Coriandrum sativum* may be able to substitute antibiotic growth supporters in broilers and that adding it to a broiler's diet can aid to improve performance. Additionally, broilers fed diets containing coriander seed experienced an increase in lactic acid bacteria. More research needs to be conducted to utilize different broiler species at different stages.

Disclosure statement

The writers state that they have no conflicts of interest.

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تأثير اضافة مستويات مختلفة من مسحوق بذور الكزبرة (Coriandrum sativum L.) الى العليقة في الاداء الانتاجي و ميكروبيولوجيا الأمعاء لدجاج التسمين

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الكلمات المفتاحية:
روز 308 ، بذور الكزبرة ، أداء النمو ، ميكروبيولوجيا الأمعاء

الخلاصة

كان الهدف من الدراسة الحالية هو معرفة تأثير الاضافات الغذائية بمستويات المختلفة من مسحوق بذور الكزبرة في اداء الانتاجي و ميكروبيولوجيا الأمعاء لفروج اللحم. تم تقسيم 450 دجاجة من نوع ROSS بعمر يوم واحد بشكل عشوائي إلى خمس معاملات من تسعون طائرًا لكل معاملة. كل معاملة تحتوي على ثلاث مكررات وفي كل مكرر 30 طائرا. المجموعة الأولى عليقة قياسية بدون مسحوق بذور الكزبرة ، وأربع معاملات والتي تضمنت عليقة قياسية بمستويات مختلفة من مسحوق بذور الكزبرة بنسبة (0.2٪ ، 0.4٪ ، 0.6٪ ، 0.8٪), تم اخذ القياسات طوال مدة التجربة. تم تحسين معدلات تحويل العلف بشكل عام من خلال اضافة مسحوق بذور الكزبرة في العلائق طوال مدة التجربة. تشير هذه النتائج إلى أن مسحوق بذور الكزبرة في العلف يمكن أن يحل محل المضادات الحيوية الاصطناعية ويمكن اعتباره مضافًا طبيعيًا للأعلاف ومحفزًا للنمو في أعلاف الدواجن.