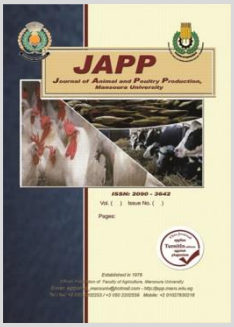
Journal of Animal and Poultry Production

Journal homepage & Available online at: www.jappmu.journals.ekb.eg

Effect of Dietary Supplementation of Coriander Seed Powder on Growth Performance, Carcass Characteristics, Blood Parameters, Microbiological Traits and Physiological Status of Broiler Chicks

El-Gogary, M. R.*; Tork M. Dorra and H. R. Khalil

Department of Poultry Production, Faculty of Agriculture, Mansoura University, 35516, Egypt



ABSTRACT

The purpose of the investigation was to determine how adding coriander seed powder affected the broiler chicks' physiological status, blood parameters, microbiological properties, and growth performance as well as carcass characteristics of broiler chickens. A total of 120 One-day-old Avian 48 broiler chickens were divided into four treatment groups, each of which included three replicates. The diet are treatments contained four levels of coriander seed powder (0.0, 3.0, 5.0 and 7.0 %) and lasted for 42 days. The dietary supplementation of coriander seed powder (CSP)did not significantly affect ($p > 0.05$) growth performance and carcass characteristics of chicks during the whole experiment period compared to control group. However, feeding diets with different levels of CSP had no significant effect on blood serum levels of glucose, total protein, albumin, Uric acid, AST, cholesterol, triglycerides, LDL, HDL, TAC, MDA, immunoglobin G and hematological parameters of broiler chicks. However significantly lower serum levels of ALT were recorded for broilers supplemented with CSP at level 70g/kg compared with other groups. On the other hand, the addition of CSP excreted a notable reduction in the number of coliform bacteria compared to the control group. However, the dietary added CSP led to an increase in the total count compared with the control chicks. The gut morphology characteristics of broiler chicken fed different supplementation levels of CSP are improved compared to the control group. Accordingly, it is concluded that dietary supplementation is beneficial for the productive performance and hematological parameters of broilers.

Keywords: coriander, broiler chicken, carcass characteristics, blood parameters, performance.

INTRODUCTION

Coriander, scientifically known as *Coriandrum sativum*, belongs to the Apiaceae Umbeliferae family and is an herbal plant. The seeds of coriander contain essential oil (0.5% to 1.0%), which is rich in beneficial phytonutrients such as carvone, limonene, camphor, geraniol, elemol, borneol and linalool. Additionally, coriander also contains flavonoid compounds, including phenolic acid. Research has shown that coriander has potential antibacterial properties (Brut, 2004), acts as an antioxidant (Wangensteen *et al.*, 2004), and has a stimulatory effect on the gastrointestinal tract (Saeid and Al-Nasry, 2010).

Coriander, is recognized as a versatile herb and spice that is believed to offer various health benefits. Its medicinal use dates back thousands of years (Nadeem *et al*., 2013). Different components of this plant, including the leaves, flowers, seeds, and fruit possess a range of beneficial properties such as antioxidants, diuretics, antidiabetics, sedatives, antimicrobials, anthelmintics, and anti-mutagenics (Pathak *et al.*, 2011). The presence of phytochemicals in diets modifies and stabilizes the intestinal microbial population, leading to a decrease in harmful microbial byproducts in the gut. This is due to the direct antimicrobial effects of phytochemicals on different pathogenic bacteria (Kim *et al.*, 2015). Conversely, the use of antibiotics has negative effects on the health and productivity of animals, the inclusion of residues in tissues, prolonged withdrawal periods, the emergence of resistance in microorganisms, allergic reactions, and genotoxicity are all factors that need to be taken into consideration. (Markovicv, 2005).

The broiler chicks' body weight increased significantly in the starter, finisher, and overall phases when extracts of C. Sativum and C. Intybus were added to their diets. The enhanced growth performance of the broilers can be credited to the existence of antioxidants and phenolic substances discovered in them, leading to this favorable result. In research conducted by Jang (2011) the inclusion of coriander oil in broiler diets also showed a significant contribution to increasing live body weight. Similar results were published by Faramarzzadeh *et al.* (2017). Serhat and Muzaffer, 2016 and Ghazanfari *et al*. (2015) reported that the increase in body weight observed when incorporating coriander essential oils into broiler diets could potentially be attributed to the existence of linalool. Linalool possesses promising therapeutic advantages that contribute to better overall health and support intestinal mucosa parameters. These include villus height, crypt depth, and decreases in goblet cell numbers and epithelial thickness, all of which contribute to improved nutrient absorption. Saeid and Al-Nasry (2010) discovered that the addition of *Coriandrum Sativum* to the diet resulted in an elevation of serum total protein levels and a reduction in serum total triglycerides and cholesterol levels when compared to the control group. Furthermore, linalool in coriander has been shown to hurt intestinal populations of *Salmonella Typhimurium*,

* **Corresponding author.**
E-mail address: melgogary@mans.edu.eg
DOI: 10.21608/jappmu.2024.261694.1105

Escherichia Coli, Staphylococcus Aureus, Pseudomonas Aeruginosa, Clostridium Botulinum, and Clostridium Perfringens, as reported by çabuk *et al.* (2003).

The present investigation aimed to evaluate the influence of coriander on growth performance, carcass yield, blood metabolites, immunity, microbiological characteristics, and histological observations of the duodenum in the gut of broiler chickens.

MATERIALS AND METHODS

This study was carried out at the Poultry Production Farm at the Centre of Agricultural Research and Experiments, Faculty of Agriculture, Mansoura University, Egypt, from September to October 2022. The study's main goal was to assess how can coriander seed powder affected the growth and health of broiler chickens in various contexts.

The design and administration of the experiment:

A total of 120 one-day-old Avain 48 broiler chickens were allocated into four treatment groups, each comprising three replicates (pens). The diet treatments included a control group (0.0%), as well as groups with coriander seed powder at concentrations of 3.0%, 5.0%, and 7.0%. Each treatment group had 30 birds and the experiment lasted for 42 days. The broilers were accommodated in battery cages with dimensions of 0.168 m^3 (70 cm in length, 60 cm in width, and 40 cm in height). They were provided with their designated experimental diets based on a nutritional regimen until they attained 42 days of age.

The chickens were initially fed a starter diet from day 1 to day 21 (3050 kcal of ME/kg of diet, 22.9% CP), followed by a grower diet from day 21 to day 42 (3050 kcal of ME/kg of diet, 21% CP). The experimental diets were formulated to meet the recommended nutritional requirements for broiler chickens as per the NRC (1994) guidelines. The chickens had free access to feed (in mash form) and fresh water. Table 1 provides the composition and chemical analysis of the coriander seed powder used in the study, while Table 2 presents the details of the experimental diets.

Table 1. The determined nutrient composition of coriander seeds powder used in this study.

Chemical Component	Dry matter	Crude protein	Ash	Ether extract	Crude fiber	N-Free Extract
Amount (% dry matter basis)	93.4	12.4	7	14.7	21.6	54.9

Table 2. ingredient composition and calculated analysis of the experimental diets fed to broiler chickens from one to 42 days of age.

Ingredients (%)	CSP*							
	Starter				Grower			
	0.0	3.0%	5.0%	7.0%	0.0	3.0%	5.0%	7.0%
Yellow corn	60	59.44	59.25	59	65.2	64.63	64.4	64.3
Soybean meal 44%	23	16	11.4	6.52	21.3	14.7	9.86	4.7
Corn gluten 60%	11.85	16.25	18.9	21.9	9.5	13.5	16.4	19.5
Dicalcium phosphate	1.78	1.8	1.85	1.9	1.25	1.29	1.34	1.39
Limestone	1.43	1.5	1.49	1.49	1.45	1.48	1.5	1.5
DL-Methionine	0.09	0.06	0.06	0.04	0	0	0	0
L-Lysine	0.25	0.35	0.45	0.55	0.2	0.3	0.4	0.51
Salt	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Premix**	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Soybean oil	1	1	1	1	0.5	0.5	0.5	0.5
Calculated Analysis (As fed basis: NRC, 1994)								
ME, kcal/Kg	3051	3050	3045	3045	3056	3048	3046	3049
CP,%	22.9	22.9	22.9	22.9	21	21	21	21
Calcium %	1	1.02	1.01	1.01	0.9	0.9	0.9	0.9
Av-Phosphorus%	0.45	0.45	0.45	0.45	0.35	0.35	0.35	0.35
Methionine %	0.51	0.5	0.52	0.51	0.39	0.4	0.42	0.43
Meth.+Cys.	0.9	0.9	0.9	0.9	0.75	0.77	0.78	0.79
Lysine,%	1.10	1.10	1.10	1.10	1.04	1.0	1.0	1.0

****Premix provided the following per kilogram of diet: VA (retinyl acetate), 2654 µg; VD3 (cholecalciferol), 125 µg; VE (dl-α-tocopheryl acetate), 9.9 mg; VK3 (menadionedimethylpyrimidinol), 1.7 mg; VB1 (thiamin mononitrate), 1.6 mg; VB12 (cyanocobalamin), 16.7 µg; riboflavin, 5.3 mg; niacin (niacinamide), 36 mg; calcium pantothenate, 13 mg; folic acid, 0.8 mg; d-biotin, 0.1 mg; choline chloride, 270; BHT, 5.8; Fe (iron sulphate monohydrate), 50 mg; Cu (copper sulphatepentahydrate), 12 mg; I (calcium iodate), 0.9 mg; Zn (zinc oxide), 50 mg; Mn (manganous oxide), 60 mg; Se (sodium selenite), 0.2 mg; Co (cobalt sulphate), 0.2 mg.*coriander seed powder was included in these starter and grower diets at the expense of the total diet.**

Performance of Broiler chickens:

During the whole period of the study, the weekly measurements of Live body weight (LBW), feed intake (FI), and body weight gain (BWG) were documented for the broiler chickens. Then, the feed conversion ratio (FCR) was calculated as the proportion of feed to gain in grams. Birds in each replication were weighed in the early morning before getting any food or water at the start of the trial (day-old), and then at weekly intervals. During the study, deaths and medical conditions were visually observed and recorded daily.

Carcass traits:

Upon completion of the study at 42 days of age, three birds from each treatment group were selected at random for slaughter. Subsequently, the carcass, liver, gizzard, heart, and lymphoid organs (spleen and bursa of Fabricius) were gathered and individually weighed. The ratio of the weight of these organs to the live body weight was then calculated.

Blood Sampling and Blood Biochemical Parameters:

Blood samples were collected in non-heparinized test tubes after the slaughter of three chickens from each treatment. The sera from the blood samples were obtained by centrifuging at 4000 rpm for 15 minutes, and it was then stored at -20°C for analysis. According to the instructions provided by the manufacturers, commercial kits were used to analyze serum contents of blood biochemical parameters calorimetrically. Albumin (Alb), total protein (TP), glucose,

alanine amino transferase (ALT), aspartate amino transferase (AST), uric acid (UA), cholesterol, high-density lipoprotein (HDL-cholesterol), Triglyceride, total antioxidant capacity (TAC), immunoglobulins (IgG, IgA and IgM), malondialdehyde (MDA). Another group of blood samples collected in heparinized test tubes were also determined hemoglobin (HB), red blood cells (RBCS), packed cell value (PCV), mean corpuscular value (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), Platelet, Heterophil, Lymphocyte, WBCS, Monocyte and Eosinophil.

Intestinal morphometric measurement

The duodenum was assessed for morphometric variables such as villus height, villus width, and crypt width (Langhout *et al.*, 1999). On day 42, three birds from each treatment group were sacrificed by decapitation. Subsequently, 3 cm segments of the duodenum, specifically at the midpoint of the pancreatic loop, were collected for morphological measurements of the gut. The intestinal samples obtained from each section were immediately preserved in formaldehyde and subsequently immersed in Bouin's solution and paraffin for embedding purposes. Subsequently, histological analyses were performed utilizing the procedures outlined by Iji *et al.* (2001). Paraffin sections, with a thickness of 6 µm, were meticulously prepared from every sample and subsequently stained using hematoxylin and eosin. The villus height, villus width, and crypt width were estimated by examining these sections under light microscope. A linear scaled graticule was utilized to measure the intestinal crypt's depth and the intestinal villi's length.

Measurement of cecal microflora concentration:

Each pen's composite cecal sample, weighing one gram, was diluted with 9 ml of a 0.9% saline solution and thoroughly mixed using a vortex. To determine the viable bacterial counts in the cecal samples, serial 10-fold dilutions (in 1% peptone solution) were plated onto three different types of agar plates. These included Plate count agar (PCA) Aryal and Sagar (2021), Macconkey agar plates Anderson and Cindy (2013), and Salmonella shigella (S.S) agar plates Atlas and Snyder (2006) The aforementioned text source is Difco Laboratories, Becton, Dickinson and Company, located in Sparks, MD. The objective of utilizing these plates was to separate Lactobacillus, Escherichia coli, and Salmonella. Subsequently, the Lactobacilli MRS agar plates were placed in anaerobic conditions and incubated at 37°C for a duration of 48 hours. Conversely, the Macconkey agar plates and Salmonella Shigella agar plates were incubated in aerobic conditions at the same temperature for a period of 24 hours. After the incubation period, the Lactobacillus, E. Coli, and Salmonella colonies were promptly counted upon removal from the Twin Room Incubator (DS-12B, Dasol Scientific Co. Ltd., Hwaseoung, South Korea). The identification of bacterial colonies was determined by their respective color appearances, with Lactobacillus colonies exhibiting a yellowish hue, E. Coli colonies displaying a red/pink color, and Salmonella Shigella colonies appearing colorless.

Statistical analysis:

The data obtained underwent statistical analysis through the application of one-way analysis of variance (SAS, 2006). To identify significant differences between means, the Tukey multiple range test was utilized (Tukey, 1977).

RESULTS AND DISCUSSION

Growth performance of broiler chicks:

Live body weight:

Table 3 presents the impact of incorporating coriander seed powder(CSP) into the diet on the live body weight of broiler chickens between one and 42 days of age. In the present study, supplementation of different levels of coriander seed powder (0.0, 3.0, 5.0 and 7.0%) in the diet influenced the LBW of broiler chicks at 7, 14, 21, 28, 35 or 42 days of age.

There were no significant differences ($p > 0.05$) between the levels of (3.0 or 5.0) CSP on the LBW throughout the entire duration of the experiment, in contrast to the control group (0.0). However, adding a high level of CSP (7.0%) led to a significant decrease($P \leq 0.05$) in LBW of broiler chicks at 7, 14, 21, 28 and 35 days of age compared to control group. The data obtained in the present study are in agreement with the findings of Sunbul *et al.* (2010) that feeding 2% coriander seed in broiler diets improved the means of live body weight. Furthermore, a study conducted by Taha *et al.* (2019) demonstrated that birds exhibited enhanced performance and increased body weight when provided with CSP at a concentration of 0.4%. Similarly, Gazwi *et al.* (2022) discovered that incorporating 1000 mg of *C. sativum* 500 mg of *C. intybus*, or a combination of 500 mg of *C. sativum* and 250mg of C. intybus extracts per kilogram of diet significantly improved the body weight of broiler chickens. The extracts of *C. sativum* and C. *intybus* include phenolic compounds and antioxidants that significantly improved the growth performance. The beneficial effects of feeding CSP on broiler chickens' performance were also observed by several investigators Al-Jaff (2011), Jafar (2011), Ansari *et al.* (2006), and Al-Mashhadani *et al.* (2011). The control group was compared to broilers that were fed on coriander at a concentration ranging from 1.5% to 2.0%, and it was observed that the latter exhibited a higher live body weight. Moreover, Al-Jaff (2011), Saeid and AL-Nasry (2010), and Naeemasa *et al.* (2015) have reported that the addition of 0.2% and 0.3% coriander seed, as well as 952 mg/kg of coriander extract, to broiler diets, led to enhanced growth performance.

Table 3. The influence of dietary supplementation of coriander seed powder (CSP)on live body weight (LBW; g) of broiler chicks from 1-42 days of age.

Treatments	LBW Day 1	LBW Day 7	LBW Day 14	LBW Day 21	LBW Day 28	LBW Day 35	LBW Day 42
0.0% CSP	45.83	151.1 ^{a}	423.1 ^{a}	811.6 ^{a}	1390 ^{a}	1963 ^{a}	2615
3.0 % CSP	46.33	155.1 ^{a}	418.1 ^{a}	790.3 ^{a}	1335 ^{ab}	1942 ^{ab}	2588
5 .0% CSP	45.16	153.5 ^{a}	393.6 ^{a}	773.3 ^{a}	1321 ^{ab}	1925 ^{ab}	2535
7 .0% CSP	45.66	128.0^{b}	318.8 ^{b}	646.6 ^{b}	1193 ^{b}	1815 ^{b}	2424
Pooled SEM	0.263	4.489	12.792	24.09	35.194	31.76	42.43
p-value	0.0770	0.0084	0.0014	0.0052	0.0229	0.0427	0.0530

a-b means in the same column bearing different superscripts differ significantly ($p \leq 0.05$). LBW= Live body weight, SEM= Standard error of the means.

Body weight gain:

Table 4 presents the impact of incorporating various amounts of coriander seed powder (CSP) into the diet on the weight gain of broiler chickens. It was observed that dietary supplementation of CSP at a level of 7.0 % led to a significant reduction ($p \leq 0.01$) in BWG of broiler chicks during the first two weeks of life compared to other groups. On the other hand, adding different levels of CSP (0.0, 3.0, 5.0 and 7.0 %) had no effect (P>0.05) on the BWG of chicks during the periods of 14-21, 21-28, 28-35, 35-42, or 1-42 days of age. The findings of the present study harmonize with those of Khubeiz and Shirif (2020), who discovered that the supplementation of coriander at various levels (0.0%, 1.5%, 2.5%, and 3.5%) had no significant impact on BWG of broiler chickens. This could be attributed to the previous conclusion made by Deans and Waterman (2011) that the inclusion of coriander in poultry diets has the potential to improve growth performance through the stimulation of endogenous enzymes and the regulation of intestinal microflora balance. These results may be attributed to the presence of anti-nutritional factors in the basal diets, such as lignin, trypsin inhibitor, alkaloids, oxalates, phenolic compounds, and phytates, this may lessen digestibility and impede the absorption of additional vital nutrients that support an increase in body weight, according to Abadi and Andi (2014). Moreover, Hamodi *et al.* (2010), Sunbul *et al.* (2010), and Al-Mashhadani *et al.* (2011) observed a significant improvement in body weight gain when coriander seed powder was supplemented at 2% in broiler diets compared to control groups. Additionally, Rashid *et al.* (2014) found that coriander seed meal in broiler diets exhibited antioxidant properties, potentially acting as organic growth enhancers and leading to enhancements in broiler weight gain. Furthermore, Guler *et al.* (2005) reported that broilers supplemented with 3.0% or 4.0% coriander seed meal displayed higher body weight gain. Lastly, Gazwi *et al.* (2022) discovered that feeding broiler chickens with 1000mg of *C. sativum*, 500mg of *C. intybus*, or a combination of 500 mg of *C. sativum* and 250 mg of *C. intybus* extracts per kilogram of diet significantly improved body weight gain.

Table 4. Effect of dietary supplementation of coriander seed powder(CSP) on body weight gain (BWG; g) of broiler chicks from 1-42 days of age.

Treatments	BWG 0-7day	BWG 7-14 day	BWG 14-21 day	BWG 21-28 day	BWG 28-35 day	BWG 35-42 day	TBWG 0- 42 day
0.0% CSP	105.33[a]	272.00[a]	388.50	578.33	573.33	651.66	2569.16
3.0 % CSP	108.83[a]	263.00[a]	372.20	545.00	607.60	645.16	2541.80
5 .0% CSP	108.33[a]	240.16[a]	379.66	548.33	603.33	610.00	2489.83
7 .0% CSP	82.33[b]	190.86[b]	327.80	546.46	621.86	609.06	2378.40
Pooled SEM	4.576	10.443	15.498	12.325	12.360	21.023	42.346
p-value	0.0097	0.0024	0.0930	0.2498	0.1143	0.3843	0.0530

a-b means in the same column bearing different superscripts differ significantly ($p \leq 0.05$). BWG= Body weight gain, TBWG = Total body weight gain SEM= Standard error of the means.

Feed intake:

The impact of levels of CSP supplementation on the feed intake of broiler chicks during the whole experimental period is displayed in Table 5. The effect of supplementation of different levels of CSP had a significant effect (P≤0.05) on the FI of chicks during the periods of 7-14, 35-42 or 1-42 days of age, the group fed high level of CSP (7.0 %) exhibited a significant reduction in the FI of chicks compared to other groups. On the other hand, the supplementation of different levels of CSP up to 5% was ineffective (P>0.05) on the FI of chicks throughout the course of this study. The findings of the present study concur with those of Khubeiz and Shirif (2020), who discovered that the inclusion of CSP at levels of 0%, 1.5%, 2.5%, and 3.5% in the diets of chicks did not have an impact on feed intake (FI). In disagreement with the present results, Gazwi *et al.* (2022), Rahimi *et al.* (2011), and Sunbul *et al.* (2010) noticed notable increases in the broiler chickens' feed intake when coriander seed powder was added to their diet at 42 days of age. Furthermore, Adaszyńska and Szczerbińska (2017) stated that photogenic bioactive compounds, such as those found in coriander seed, possess various properties that enhance performance parameters, including rapid growth with reduced feed consumption, as well as promoting optimal health in poultry. Furthermore, Jang (2011) and Al-Mashhadani *et al.* (2011) found that adding coriander oil in broiler diets resulted in a notable enhancement in feed intake. Lastly, it is important to highlight that the feed intake was unaffected by feed diets containing 2.0 % coriander seeds (Abou-Elkhair *et al.*, 2014), harmonizing with the findings of this study.

Table 5. Effect of dietary supplementation of coriander seed powder (CSP) on Feed intake (FI; kg)of broiler chicks from 1-42 days of age.

Treatments	FI 0-7day	FI 7-14day	FI 14-21day	FI 21-28day	FI 28-35day	FI 35-42day	TFI 1-42day
0.0% CSP	156.5	422.1[a]	636.0	907.0	1102	1322[ab]	4546[ab]
3.0 % CSP	167.5	421.7[a]	649.3	933.2	1080	1267[b]	4520[ab]
5 .0% CSP	158.6	416.8[ab]	644.8	981.0	1168	1425[a]	4795[a]
7 .0% CSP	144.3	363.8[b]	583.8	876.8	1132	1300[b]	4401[b]
Pooled SEM	5.980	12.01	43.67	27.31	19.12	23.12	66.65
p-value	0.1290	0.0234	0.7046	0.1234	0.0514	0.0069	0.0178

a-b means in the same column bearing different superscripts differ significantly ($p \leq 0.05$). FI= feed intake, TFI = Total feed intake, SEM= Standard error of the means.

Feed conversion ratio:

Table 6 illustrates the results of adding various amounts of dietary CSP on the feed conversion ratio (FCR) of broiler chicks aged 1 to 42 days. The effect of different levels of CSP had a significant effect (P≤0.05) on the FCR of chicks during the periods of 1-7, 7-14, 28-35, 35-42 or 1-

42 days of age between all groups. while the supplementation of CSP levels had no effect (P>0.05) on the FCR of chicks during the periods of 14-21, 21-28 or 28-35 days of age between all groups. On the other hand, the groups fed 0.0 or 3.0 % CSP had the best FCR compared to the other groups during the whole experimental period. This may be explained by the fact that coriander acts as an effective stimulant that aids in the production of enzymes and digestive juice in the gastrointestinal tract. This, in turn, stimulates the movement of the intestines and enhances digestion, ultimately leading to an improved feed conversion ratio (FCR) as stated by Rajeshwari and Andallu (2011). Various reports support these findings. For instance, it has been observed that supplementing Japanese quail feed with 200g of coriander seeds per 100 kg of feed resulted in enhanced body weight and feed conversion efficiency. Furthermore, Sunbul *et al.* (2010) discovered that including 2% coriander seeds in broiler diets improved feed conversion compared to other treatments. Moreover, studies conducted by Hamodi *et al.* (2010), Aljaff (2011), and Farag (2013) demonstrated that the FCR was enhanced when CSP was added to chicken diets. The observed enhancement can be attributed to the notable rise in pancreatic amylase, trypsin, and maltase activities in broilers that were provided with diets incorporating varying amounts of CSP (Brenes and Roura, 2010).

Table 6. Effect of dietary supplementation of coriander seed powder (CSP) on feed conversion ratio (FCR; kg feed: kg gain) of broiler chicks from 0-42 days of age.

Treatments	FCR 1-7days	FCR 7-14 days	FCR 14-21days	FCR 21-28days	FCR 28-35 days	FCR 35-42days	T FCR 1-42 days
0.0% CSP	1.497 ^{ab}	1.55 ^{b}	1.63	1.56	1.92	2.03 ^{b}	1.77 ^{b}
3.0 % CSP	1.538 ^{ab}	1.60 ^{b}	1.75	1.71	1.77	1.96 ^{b}	1.77 ^{b}
5 .0% CSP	1.463 ^{b}	1.74 ^{ab}	1.69	1.79	1.94	2.33 ^{a}	1.92 ^{a}
7 .0% CSP	1.758 ^{a}	1.90 ^{a}	1.78	1.60	1.82	2.13 ^{ab}	1.85 ^{ab}
Pooled SEM	0.064	0.054	0.116	0.064	0.036	0.048	0.029
p-value	0.0460	0.0067	0.8113	0.1253	0.0389	0.0034	0.0195

a-b means in the same column bearing different superscripts differ significantly ($p \leq 0.05$). FCR= feed conversion ratio, TFCR = Total feed conversion ratio, SEM= Standard error of the means.

Broiler chicken lymphoid organs and carcass characteristics:

Table 7 demonstrates the results of adding various amounts of CSP to the diet on the carcass characteristics and percentage of lymphoid organs in broiler chicks (42 days old). It revealed no significant difference at the levels of carcass %, heart %, spleen %, and bursa of Fabricius% in all experimental treatments. The increased dressing percentage observed in this study may be attributed to the stimulatory effects of coriander on pancreatic secretions. These secretions, in turn, enhance the secretion of digestive enzymes and promote the production of additional nutrients, such as amino acids, which are then digested and absorbed by the digestive system (Rahimi *et al.*, 2011). In contrast to the present results Farag (2013) observed a significant increase in the relative weights of carcass and relative organ weights of broiler chicks with coriander seed supplementation. Abo Omar *et al.* (2016) also discovered that the presence of antioxidants and phenolic substances in coriander extract improved the carcass breast of broiler chickens. Furthermore, Kavita *et al.* (2023) found that feeding broilers on a diet enriched with 1% CSP along with a basal diet significantly increased gizzard weight. Lastly, Rahul *et al.* (2021) found that incorporating 1.5% coriander seed powder in broiler diets improved various carcass traits and the composition of meat muscle. In harmony with our results, Rahimi *et al.* (2011) reported no significant difference in the weight of organs in broiler chickens.

Table 7. Effect of dietary supplementation of coriander seed powder (CSP) on carcass yield, edible organs and lymphoid organs weights of 42-day-old broiler chicks.

Treatments	LBW kg	Carcas(%)	Heart (%)	Liver (%)	Gizzard(%)	Spleen (%)	Bursa (%)
0.0% CSP	2848	73.06	0.006	2.23	1.43	0.11	0.17
3.0 % CSP	2886	73.19	0.005	2.12	1.31	0.10	0.15
5 .0% CSP	2865	73.67	0.005	2.16	1.33	0.11	0.15
7 .0% CSP	2830	72.94	0.005	2.63	1.24	0.09	0.16
Pooled SEM	134.401	1.220	0.075	0.209	0.127	0.016	0.024
p-value	0.2451	0.3198	0.4371	0.3491	0.2145	0.8255	0.8922

LBW= live body weight, SEM= Standard error of the means.

Blood serum parameters:

Results of serum parameters (total protein, albumin, glucose, uric acid, ALT, AST, cholesterol, triglycerides, HDL-C, antioxidant status, and immunoglobin G) for the different experimental groups of broiler chickens fed diets supplemented with different levels of CSP are illustrated in Table 8 and 9. Feeding diets with different levels of CSP had no significant effect on total protein, albumin, glucose, Uric acid, AST, cholesterol, triglycerides, HDL, TAC, MDA and immunoglobin G among all groups. However, significantly lower serum levels of ALT were recorded for broilers supplemented with CSP at a level of 70 g/kg compared with other groups. The findings of the present study concur with those of Khubeiz and Shirif (2020), who discovered that the average levels of serum glucose remained unchanged when coriander was supplemented at various concentrations (0.0%, 1.5%, 2.5%, and 3.5%) compared to the control group. The decrease in serum ALT and AST concentrations may serve as evidence for the hepatoprotective effect of coriander seed and its essential oil (Al-Jaff, 2011). Hong *et al.* (2012) showed that the response of blood lipoproteins to essential oil treatments lacked any observable patterns. Coriander has been shown to increase the excretion of natural sterols and bile acids in feces, which lowers blood cholesterol levels. Apart from the studies conducted by Khubeiz and Shirif (2020) and Abadi and Andi (2014), the higher concentration of essential oil in the 3.5% coriander seed powder group may account for the poorer performance and adverse effects on blood parameters compared to the 1.5% coriander seed powder group.

Table 8. Effect of dietary supplementation of coriander seed powder (CSP) on serum parameters total protein, albumin, Glucose, UA, ALT and AST of 42-day-old broiler chicks.

Treatments	T. Protein (g/dl)	Albumin (g/dl)	Glucose (g/dl)	UA (mg/dl)	ALT (U/L)	AST (U/L)
0.0% CSP	3.06	1.73	167.00	7.30	17.00^{a}	178.33
3.0 % CSP	2.56	1.40	182.66	5.03	12.66^{ab}	235.66
5 .0% CSP	2.50	1.43	192.33	6.10	10.33^{bc}	238.66
7 .0% CSP	2.93	1.56	169.00	5.86	7.33^{c}	252.33
Pooled SEM	0.261	0.108	13.246	0.871	1.118	22.110
p-value	0.3980	0.1974	0.5208	0.3848	0.0018	0.1664

a-c means in the same column bearing different superscripts differ significantly ($p \leq 0.05$), total protein (TP), alanine amino transferase (ALT), aspartate amino transferase (AST), uric acid (UA), SEM= Standard error of the means.

Furthermore, a study conducted by Dhanapakiam *et al.,* 2007 showed that consuming CSP raised average serum LDL and HDL values by 1.5% and 3.5%, respectively. Coriander oil was found to have interfered with the synthesis of mevalonate by functioning as a reversible competitive inhibitor of the HMG-CoA reductase enzyme, which was the cause of the concentration increase. As a result, hypocholesterolemia was observed. However, Al-Jaff , 2011 found that chicks fed 2% coriander seed had significantly lower serum cholesterol levels (LDL), however, birds fed 2% and 3% coriander seed had significantly higher HDL values. Additionally, studies conducted by Warshafsky *et al.,* 1993 and Kleijnen *et al.,* 1989 discovered that while HDL-cholesterol levels are unaffected, herbs can successfully lower LDL and triacylglycerol concentrations, hence reducing the risk of heart attack and stroke. Moreover, Barad *et al.,* 2016 concluded that there were no negative impacts on blood biochemical indicators when 2% coriander seed was added to the diets of Cobb-400 broilers.

Table 9. Effect of dietary supplementation of coriander seed powder (CSP) on serum lipid profile antioxidant status and immunoglobulins of 6-week-old broiler chicks.

Treatments	Cholesterol (mg/dl)	TG (mg/dl)	HDL-c (mg/dl)	TAC (mM/l)	MDA (U/ml)	IgA (mg/dl)	IgM (mg/dl)	IgG (mg/dl)
0.0% CSP	124.00	89.66	62.33	0.60	40.00	22.00	55.00	400.00
3.0 % CSP	121.66	58.66	66.33	0.70	35.00	18.00	62.00	512.00
5 .0% CSP	144.66	59.00	49.66	0.50	42.00	24.00	51.00	352.00
7 .0% CSP	156.33	109.66	46.33	0.60	40.00	23.00	53.00	401.00
Pooled SEM	10.743	15.782	5.027	0.086	5.492	2.345	3.427	49.968
p-value	0.1418	0.1336	0.0618	0.4872	0.8277	0.3521	0.2001	0.2178

high-density lipoprotein (HDL-c), Triglyceride (TG), total antioxidant capacity (TAC), malondialdehyde (MDA), immunoglobulins (IgG, IgA and IgM), malondialdehyde (MDA) , SEM= Standard error of the means.

complete blood picture.

Tables 10 and 11 show the effects of dietary supplementation of different levels of CSP on a complete blood picture that has been investigated. Feeding diets with different levels of CSP had no significant effect on parameters of hemoglobin (HB), red blood cells (RBCS), packed cell value (PCV), mean corpuscular value (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC) among all groups. Saeid and AL-Nasry (2010) conducted a study that revealed a significant increase in PCV%, RBCs count and Hb concentration in chicks that were fed diets containing 0.3% coriander seed. This was in comparison to chicks-fed diets with lower concentrations of coriander seed (0.2% and 0.1%), as well as those fed control diets. Similarly, Farag (2013) observed that the addition of 0.4% coriander seed to broiler diets resulted in a significant increase in RBC concentration, Hb concentration, and PCV% when compared to the control group. Hasen (2016) further emphasized that the increase in blood levels of Hb, PCV, and RBCs counts in birds fed on coriander is indicative of a higher oxygen-carrying capacity of the cells, leading to improved nutrient availability and overall well-being. Khubeiz and Shirif (2020) also found that feeding chickens with different levels of coriander powder had a significant impact on the differentiation of white blood cells (WBC), while monocyte cells remained unaffected. Additionally, Abadi and Andi (2014) and Chandrakar (2011) found that the number of monocyte cells in chickens fed a meal supplemented with 15 g/kg of coriander was considerably higher. Finally, Rahul *et al.* (2021) reported that the inclusion of 1.5% CSP in broiler diets improved hematological parameters.

Table 10. Effect of dietary supplementation of coriander seed powder (CSP) on blood parameters of 42-day-old broiler chicks.

Treatments	Hb (g/dl)	RBCs ($\times 10^6$/µL)	PCV (%)	MCV (fl)	MCH (pg)	MCHC (%)
0.0% CSP	17.00	5.60	50.66	90.50	30.36	33.56
3.0 % CSP	13.43	4.73	40.63	85.96	28.30	32.90
5 .0% CSP	12.96	4.36	39.90	91.30	29.63	32.46
7 .0% CSP	13.70	4.76	41.10	86.90	28.83	33.23
Pooled SEM	1.012	0.387	2.785	2.328	0.555	0.527
p-value	0.0781	0.2229	0.0770	0.3475	0.1190	0.5307

hemoglobin (HB), red blood cells (RBCS), packed cell value (PCV), mean corpuscular value (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), SEM= Standard error of the means.

Table 11. Effect of dietary supplementation of coriander seed powder on blood parameters of 42-day-old broiler chicks.

Treatments	Platelet ($\times 10^3$/µL)	WBCs ($\times 10^3$/µL)	Heterophil ($\times 10^3$/µL)	Lymphocyte ($\times 10^3$/µL)	Eosinophil ($\times 10^3$/µL)	Monocyte ($\times 10^3$/µL)
0.0% CSP	358.00	14.30	19.90	69.53	1.33	9.23
3.0 % CSP	385.66	14.66	22.46	68.86	0.80	7.86
5 .0% CSP	396.00	16.00	20.80	71.63	0.83	6.73
7 .0% CSP	451.00	16.30	22.50	70.36	0.50	6.63
Pooled SEM	25.464	0.919	1.845	3.013	0.618	1.736
p-value	0.1489	0.3900	0.7019	0.9226	0.8169	0.6997

WBC , white blood cells, SEM= Standard error of the means.

Microbiological Traits:

The cecal contents of chickens were enhanced due to feeding the diets containing, specifically affecting the populations of total bacterial count, Mackoncy, and S.S. (*Salmonella typhimurium, Staphylococcus aureus*) (Table 12). these findings indicated that the inclusion of CSP led to a significant decrease in the count of coliform bacteria (Mackoncy and S.S.) compared to the control treatment.

However, feeding the CSP-Containing diets resulted in a significant increase in the total viable bacterial count. The group that was given CSP-diet 7.0% recorded the lowest coliform bacteria counts compared to the other groups. The results of this study agree with those of Taha *et al.* (2019), who found that broilers supplemented with different concentrations of CSP (0.1%, 0.2%, and 0.4%) exhibited significantly lower counts of E. *coli* and C. *perfringens* compared to the control group. This antimicrobial effect may be attributed to the essential oil content of coriander, as demonstrated by Burt (2004) in his research on plants producing essential oils with antimicrobial properties.

Table 12. Effect of dietary supplementation of coriander seed powder (CSP) on microbial characteristics of broiler chickens at 42days of age

Treatments	Total bacteria count	Mackoncy	S.S
0.0% CSP	7.47^{c}	5.98^{a}	3.87^{a}
3.0 % CSP	7.35^{c}	5.42^{ab}	3.08^{b}
5 .0% CSP	7.85^{b}	5.41^{ab}	4.00^{a}
7 .0% CSP	8.33^{a}	2.76^{b}	2.39^{c}
Pooled SEM	0.0496	0.694	0.0484
p-value	0.0001	0.0431	0.0001

a-c means in the same column bearing different superscripts differ significantly (p ≤ 0.05), SEM= Standard error of the means.

Furthermore, a study conducted by Sabahat and Perween (2007) discovered that the coriander seed essential oil had antibacterial activity against both Gram-positive bacteria (*Staphylococcus aureus* , *Bacillus spp.*) and Gram-negative bacteria (*Escherichia coli, Salomonella typhi ,Klebsiella pneumonia, Proteus mirabilis, Pseudomonas aeruginosae*), as well as a pathogenic fungus called Candida albicans. In a similar contest, Si *et al.* (2006) discovered that plant bioactive compounds can be carefully chosen to effectively combat gut pathogens without damaging the beneficial bacteria such as Lactobacillus and Bifidobacteria. Furthermore, Guo *et al.* (2004) reported that plant extracts can decrease the presence of harmful bacteria (E. coli) while simultaneously increasing the population of beneficial bacteria (Lactobacilli and Bifidobacteria). However, Lee *et al.* (2004) made a noteworthy finding that E. coli counts were significantly reduced in birds that were fed diets containing coriander essential oil and antibiotics compared to those on the control diet. This improvement is likely attributed to the decrease in *Escherichia coli* in the gut. Additionally, Çabuk *et al.* (2003) documented that linalool had detrimental effects on intestinal populations of *E. coli ,Pseudomonas aeruginosa ,Salmonella typhimurium ,Staphylococcus aureus, Clostridium botulinum, and Clostridium perfringens*. Moreover, Delaquis *et al.* (2002) revealed that gram-negative bacteria were negatively impacted by essential oils extracted from coriander seeds. Moreover, the application of phytogenic feed additives to suppress pathogens and lower the total number of bacteria in the digestive tract can ultimately improve the body's ability to absorb nutrients and energy (Yang *et al.*, 2015).

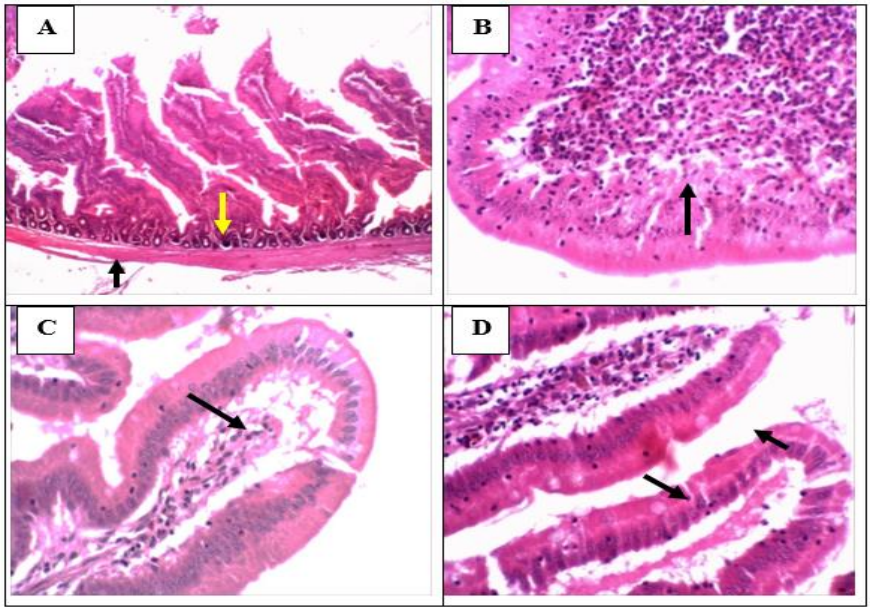
Histological observations of duodenum:

The gut morphology characteristics of broiler chicken fed different levels of CSP supplementation are shown in Table 13 and Fig.1.

Table 13. Effect of dietary supplementation of coriander seed powder (CSP) on villus height, villus width and crypt width in the duodenum of broiler chickens at 42 days age.

Treatments	villus height µm	villus width µm	crypt width µm
0.0% CSP	439.71	276.77^{a}	48.12^{b}
3.0 % CSP	469.94	236.25^{a}	50.78^{ab}
5 .0% CSP	697.34	105.41^{b}	72.84^{a}
7 .0% CSP	680.21	114.01^{b}	69.44^{ab}
Pooled SEM	72.349	24.968	5.504
p-value	0.0393	0.0002	0.0101

a-b means in the same column bearing different superscripts differ significantly (p ≤ 0.05), SEM= Standard error of the means



Representative photomicrograph of intestine from different treatment groups.

Fig 1. The sections of the small intestines (duodenum) showing villus height (red arrow), villus width, crypt depth and muscular is thickness (yellow arrow) in all group. Hematoxylin and eosin staining. Scale bars represent 200 µm. A:- T. S. of duodenum from control group, B:- T. S. of duodenum from group given 3.0% coriander seed powder, C:-T. S. of the duodenum from group given 5.0% coriander seed powder , D:- T. S. of duodenum from group given 7.0 % coriander seed powder.

The duodenum of birds fed CSP-enriched diets showed increased numerical villus height compared with the control group in finisher phases. However, the duodenal villus width was significantly greater in birds fed the control diet or the diet containing 3.0 % CSP than in other treated groups (5.0 and 7.0%) in the finisher phases. On the other hand, the crypt width in the duodenum of broiler chickens fed the diet having 5.0% CSP was greater than other treatments in phase finisher. The study conducted by the study conducted by Çabuk *et al. (*2003) revealed that linalool, the main constituent of coriander oil, has the potential to enhance the height of broiler villi. This increase in villi height is believed to enhance the activity of digestive enzymes, leading to improved nutrient digestion and absorption enhanced feed conversion ratio, and accelerated growth rate. Conversely, Pluske *et al.* (1996) suggest that the intestine's better absorption and digestion processes are probably going to occur alongside the villus height increase. This is explained by the higher expression of nutrient transport systems and brush boundary enzymes, as well as the greater surface area available for absorption. Furthermore, Serhat and Muzaffer (2016) and Ghazanfari *et al.* (2015) have also mentioned that adding linalool-containing coriander essential oils to the chicken diet may cause the birds' body weight to rise. This is thought to be because of the therapeutic advantages of linalool, which have a favorable effect on a number of intestinal mucosal parameters, including goblet cell counts, villus height, crypt depth, and epithelial thickness, as well as general health. In the end, these upgrades promote the absorption of nutrients.

CONCLUSION

The results of this study show that the inclusion of coriander seed powder at a 3% concentration in broiler diets led to improved growth performance and enhanced carcass characteristics. Importantly, this inclusion did not have any negative impact on hematological parameters. Furthermore, the most favorable microbiological traits were observed when the coriander seed powder was used at a ratio of 7%, as it effectively reduced the population of harmful ileum bacteria.

REFERENCES

Abadi, K.M.A. and M.A. Andi, 2014. Effects of using coriander (*Coriandrum sativum L.*), savory (*Satureja hortensis L.*) and dill (*Anethum graveolens L.*) herb powder in diet on performance and some blood parameters of broilers. Int. J. Biosci. 5, 95–103.

Abo Omar, J., A. Hejazi and R. Badran, 2016. Performance of broilers supplemented with natural herb extract. Open J. Anim. Sci. 6, 68–74.

Abou-Elkhair, R., H.A. Ahmed and S. Selim, 2014. Effects of black pepper (Piper nigrum), turmeric powder (Curcuma longa) and coriander seeds (Coriandrum sativum) and their combinations as feed additives on growth performance, carcass traits, some blood parameters and humoral immune response of broiler chickens. Asian-Australas J. Anim. Sci. 27, 847–854.

Adaszyńska-Skwirzyńska, M., and D. Szczerbińska ,2017. Use of essential oils in broiler chicken production – a review. *Annals of Animal Science, 17*, 317 - 335.

Al-Jaff, F.K., 2011. "Effect of coriander seeds as diet ingredient on blood parameters of broiler chicks raised under high ambient temperature," International Journal of Poultry Science,vol.10, no. 2, pp. 82–86.

AL-Jaff, F.K., 2011. Effect of Coriander Seeds as Diet Ingredient on Broiler Chicks Raised under High Ambient Temperature. International Journal of Poultry Science, 10: 82-86.

Al-Mashhadani, E.H., F.K. Al-Jaff, S.J. Hamodi and H.E. Al-Mashhadani, 2011. "Effect of different levels of coriander oil on broiler performance and some physiological traits under summer condition,"Pakistan Journal of Nutrition,vol.10,no.1, pp. 10–14.

Al-Mashhadani, H.E., F.K. Al-Jaff, S.J. Hamodi and H.E. Al-Mashhadani, 2011. Effect of Different Levels of Coriander Oil on Broiler Performance and Some Physiological Traits under Summer Condition, Pakistan Journal of Nutrition 10 (1): 10-14.

Anderson and Cindy, 2013. Great Adventures in the Microbiology Laboratory (7th ed.). Pearson. pp. 175–176. ISBN 978-1-269-39068-2.

Ansari M.A., S. Ahmed and N.I. Haider, 2006. *Coriandrum sativum* A non conversional herbal option for the management of seasonal allergic rhinitis. Pakistan Journal of Pharmacology, 23: 31-35.

Aryal and Sagar, 2021. "Streak Plate Method- Principle, Methods, Significance, Limi tations". Microbe Notes. Retrieved 12-10.

Atlas, R.M. and J.W. Snyder, 2006. Handbook of Media for Clinical Microbiology (2ed.).T aylor and Francis Group. p. 173.ISBN 9780849337956.

Barad, N. A., H. H. Savsaniz, S. S. Patil, D. D. Garg, O. Das and V. Singh, 2016. Effect of feeding coriander seeds, black pepper and turmeric powder as feed additives on hemato- biochemical profile and performance of broiler chickens. International Journal of Science and Environmental Technology, 5, 3976–3982.

Brenes, A. and E. Roura, 2010. Essential oils in poultry nutrition: main effects and modes of action. Anim.Feed Sci. Technol. 158, 1–14.

Burt, S., 2004. Essential oils: Their antibacterial properties and potential applications in foods: A review. Int. J. Food Microbiology. 94: 223-253.

Çabuk, M.C., A. Alçiçek, M. Bozkurt and N. Imre, 2003. Antimicrobial properties of the essential oils isolated from aromatic plants and using possibility as alternative feed additives. In Proceedings of the 11th National Animal Nutrition Congress (p. 184-187), Konya, Turkey.

Chandrakar, K., 2011. Evaluation of *coriaderum sativum* as an alternative to antibiotic growth promoter in broiler birds, Raipur, India: Chhattisgarh Kamdhenu Vishwavidyalaya, Thesis, pp: 37–57.

Delaquis, P.J., K. Stanich, B. Girard and G. Mazza, 2002. Antimicrobial activity of individual and mixed fractions of dill, cilantro, coriander and eucalyptus essential oils. International Journal of Food and Microbiology;74:101-109.

Dhanapakiam, P., J.M. Joseph, V.K. Ramaswamy, M. Moorthi and A.S. Kumar, 2007. The cholesterol lowering property of coriander seeds (*Coriandrum sativum*): mechanism of action. J. Environ. Biol. 29, 53–56.

Farag, S.A., 2013. The efficiency of coriander seeds as dietary additives in broiler Chicken's diets. Egypt. J. Nutr. Feed 16, 491–501.

Gazwi, H.S.S., M.E. Mahmoud and M.A. Toson, 2022. Analysis of the phytochemicals of Coriandrum sativum and Cichorium intybus aqueous extracts and their biological effects on broiler chickens, Scientifc Reports:12:6399.

Ghazanfari, S., Z. Mohammadi and M. Adib Moradi, 2015. Effects of coriander essential oil on the performance, blood characteristics, intestinal microbiota and histological of broilers. Brazilian Journal of Poultry Science, 17, 419–426.

Guler, T., O.N. Ertas, M. Ciftci, and B. Dalkilic, 2005. The effect of coriander seed (*Coriandrum sativum L.*) as diet ingredient on the performance of Japanese quail. S. Afr. J. Anim. Sci. 35: 261-267.

Guo, F.C., B.A. Williams and R.P. Kwakkel etal, 2004. "Effects of mushroom and herb polysaccharides, as alternatives for an antibiotic, on the cecal microbial ecosystem in broiler chickens," Poultry Science, vol. 83, no. 2, pp. 175–182.

Hamodi, S.J., E.H. Al-Mashhadani, F.K. Al-Jaff and H.E. Al-Mashhadani, 2010. Effect of coriander seed (*Coriandrum sativum L.*) as diet ingredient on broilers performance under high ambient temperature. Int. J. Poult. Sci. 9, 968–971.

Hong, J.C., T. Steine, A. Aufy and T. F. Lien ,2012. Effects of supplemental essential oil on growth performance, lipid metabolites and immunity, intestinal characteristics, microbiota and carcass traits in broilers. Livestock Science 144:253-262.

Iji, P.A., A.A. Saki and D.R. Tivey, 2001. Intestinal development and body growth of broiler chicks on diets supplemented with non-starch polysaccharides. Animal Feed Science and Technology; 89:175-188.

Jafar, P.J., 2011. Effect of different levels of coriander seed on performance of broiler Chickens, Annals of Biological Research 2: 578-583.

Jang, J.P., 2011. Effect of different levels of coriander oil on performance and blood parameters of broiler chickens. Ann. Biol. Res. 2, 578–583.

Kavita Meena, Manju, Sheela Choudhary, Monika Karnani, Vijay Prakash Saini and Dharmendra Chharang, 2023. Effect of ajwain, coriander, cumin and fennel seeds powder on carcass characteristics of broiler chickens, The Pharma Innovation Journal; SP-12(7): 2132-2135.

Khubeiz, M. M. and A. M. Shirif , 2020. Effect of coriander (*Coriandrum sativum L.*) seed powder as feed additives on performance and some blood parameters of broiler chickens. Open Veterinary Journal, Vol. 10(2): 198–205.

Kim, J.E., H.S. Lillehoj, Y.H. Hong, G.B. Kim, S.H. Lee and E.P. Lillehoj, 2015. Dietary Capsicum and Curcuma longa oleoresins increase intestinal micro biome and necrotic enteritis in three commercial broiler breeds. Res J Vet Sci; 102:150-158.

Kleijnen, J., P. Knipschild and G. Ter Riet, 1989. "Garlic, onions and cardiovascular risk factors. A review of the evidence from human experiments with emphasis on commercially available preparations," British Journal of Clinical Pharmacology, vol. 28, no.5, pp.535–544.

Langhout, D.J., J.B. Schutte, L.P. Van, J. Wiebenga and S. Tam-Minga, 1999. Effect of dietary high and low methylated citruspectin on the activity of the ileal micro flora and morphology of the small intestinal wall of broiler chickens. British Poultry Science; 40:340-347.

Lee, K.W., H. Everts and A.C. Beynen, 2004. Essential oils in broiler nutrition. International Journal of Poultry Science;3:738-752.

Markovicv, R., 2005. The effect of different growth promoters in broiler nutrition on performance and health status. PhD Thesis, Faculty of Veterinary Medicine.

Nadeem, M., F. Muhammad Anjum, M. Issa Khan, S. Tehseen, A. El-Ghorab and J. Iqbal Sultan, 2013. Nutritional and medicinal aspects of coriander (*Coriandrum sativum L.*) A review. Br. Food J. 115, 743–755.

Naeemasa, M., A.A. Alaw Qotbi, A. Seidavi, D. Norris, D. Brown and M. Ginindza, 2015. Effects of coriander (*Coriandrum sativum L.*) seed powder and extract on performance of broiler chickens. South Africa J Anim Sci45 (4): http:// dx.doi.org/10.4314/SAJAS.V45I4.3.

NRC, 1994. Nutrient Requirements of Poultry, 9th rev. ed. (Washington, DC, Natl. Acad. Press)

Pathak, N.L., S.B. Kasture, N.M. Bhatt and J.D. Rathod, 2011. Phyto pharmacological properties of (*Coriander sativum*)as a potential medicinal tree: an overview. J. Appl. Pharm. Sci. 1, 20–25.

Pluske, J.R., M.J. Tompson, C.S. Atwood, P.H. Bird, I.H. Williams and P.E. Hartmann, 1996. Maintenance of villus height and crypt depth and enhancement of disaccharide digestion and monosaccharide absorption, in piglets fed on cows' whole milk after weaning. British Journal Nutrition;76:409-422.

Rahimi, S., Z.T. Zadeh, M.A.K. Torshizi, R. Omidbaigi and H. Rokni, 2011. Effect of the three herbal extracts on growth performance, immune system, blood factors and intestinal selected bacterial population in broiler chickens. J. Agric. Sci. Technol. 13, 527-539.

Rahul Singh Chandel, Zile Singh Sihag, Anuj Singh, Ramsawroop, Sandeep Kumar and Jyotsana, 2021. Effect of dietary supplementation of coriander seed powder on carcass traits, carcass composition and blood haematology of broiler chicks, The Pharma Innovation Journal; SP-10(11): 557-562.

Rajeshwari, m.U. and B. Andallu, 2011. Medicinal benefits of coriander (*Coriandrum sativum L*). Spatula DD-Peer Reviewed Journal on Complementary Medicine and Drug Discovery,1,51–58.

Rashid, M.M., M.U. Ahammad, M.S. Ali, M.S. Rana, M.Y. Ali and N. Sakib, 2014. Effect of different levels of Dhania seed (*Coriandrum sativum*) on the performance of broiler. Bangladesh J. Anim. Sci. 43, 38–44.

Sabahat, S. and T. Perween ,2007. Antimicrobial activities of *emblica officinalis* and Coriandrum sativum against gram positive bacteria and candida albicans. Pak. J. Bot. 39(3): 913-917.

Saeid, J. M. and A.S. AL-Nasry, 2010. Effect of dietary coriander seeds supplementation on growth performance, carcass traits and some blood parameters of broiler chickens. International Journal of Poultry Science, 9: 867-870.

Serhat, A. and D. Muzaffer, 2016. Application of plant extracts as feed additives in poultry nutrition. Scientific papers series D. Animal science, 59, ISSN 2285-5750.

Si, W., J. Gong and R. Tsao, 2006. "Antimicrobial activity of essential oils and structurally related synthetic food additives towards selected pathogenic and beneficial gut bacteria," Journal of Applied Microbiology,vol.100,no.2,pp.296–305.

Sunbul, J., Hamodi, E.H. Al-Mashhadani, F.K. Al-Jaff and E.A. Hanan, 2010. Effect of Coriander Seed (*Coriandrum sativum L.*) as Diet Ingredient on Broilers Performance under High Ambient Temperature, International Journal of Poultry Science 9 (10): 968-971.

Taha, A.E., S.S. Hassan, R.S. Shewita, A.A. El-Seidy, M.E. Abd El-Hack, E.O.S. Hussein, I.M. Saadeldin, A.A Swelum and M.A. El-Edel, 2019. Effects of supplementing broiler diets with coriander seed powder on growth performance, blood haematology, ileum microflora and economic efficiency. Journal of Animal Physiology Animal Nutrition, 103, 1474–1483.

Tukey, J.W., 1977 Exploratory data analysis. Addison-Wesley, Reading

Wangensteen, H., A.B. Samuelsen and K.E. Malterud, 2004. Antioxidant activity in extracts from coriander. Food Chemistry. 88: 293-297.

Warshafsky, S., R.S. Kamer and S.L. Sivak, 1993. "Effect of garlic on total serumcholesterol: ameta-analysis, "Annals of Internal Medicine,vol.119,no.7,pp.599–605,1993.

Yang, C., M. A Kabir Chowdhurry, Y. Hou and J. Gong ,2015. Phytogenic compounds as alternatives to in-feed antibiotics: potentials and challenges in application. Pathogen. 4: 37 56.

تأثير المكملات الغذائية لمسحوق بذور الكزبرة على الأداء الإنتاجى وخصائص الذبيحة وقياسات الدم والصفات الميكروبيولوجية والحالة الفسيولوجية لبداري التسمين

محمد رأفت الجوجرى ، ترك محمد درة و حسام رضا محرم على خليل

قسم إنتاج الدواجن، كلية الزراعة، جامعة المنصورة، ٣٥٥١٦، مصر

الملخص

هدفت هذه الدراسة إلى معرفة تأثير إضافة مسحوق بذور الكزبرة لدجاج التسمين على الأداء الإنتاجى، خصائص الذبيحة، قياسات الدم، الصفات الميكروبيولوجية والحالة الفسيولوجية للطيور تم تقسيم ١٢٠ كتكوت بعمر يوم واحد من سلالة إيفيان ٤٨ إلى أربع مجموعات تجريبية، تحتوى كل واحدة منها على ثلاث مكررات وكانت المعاملات الغذائية (٠، ٣، ٥ ، ٧٪) من مسحوق بذور الكزبرة لمدة ٤٢ يوم. أظهرت النتائج: أنه لم تكن هناك فروق معنوية بين المستويات المختلفة لمسحوق بذور الكزبرة فى الأداء الإنتاجى وخصائص الذبيحة للكتاكيت خلال فترة التجربة بأكملها مقارنة بمجموعة الكنترول . ومع ذلك لم يكن هناك تأثير معنوى للتغذية علي العلائق التى تحتوى على مستويات مختلفة من مسحوق بذور الكزبرة على البروتين الكلى – الألبيومين – الجلوكوز – حمض اليوريك – الكوليسترول – الدهون الثلاثية – الهيموجلوبيولين المناعى. ومع ذلك انخفضت مستوياتALT عند المعاملة بمستوى ٧٠ جرام / كجم من مسحوق بذور الكزبرة مقارنة بالمعاملات الأخرى. ومن ناحية أخرى ، أدى إضافة مسحوق بذور الكزبرة إلى إنخفاض أعداد بكتريا القولون الضارة مقارنة بالكنترول. ومع ذلك ،أدت المعاملة بمسحوق بذور الكزبرة إلى زيادة كبيرة فى العدد الكلى للبكتريا. وقد تحسنت الخصائص المورفولوجية لأمعاء بداري التسمين الذى تم تغذيته بمستويات مختلفة من مسحوق بذور الكزبرة مقارنة بالكنترول. وبناء على ذلك، نستنتج من الدراسة أن تدعيم الغذاء بمسحوق الكزبرة لها تأثير إيجابى على الأداء الإنتاجى وقياسات الدم .