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THE EFFECT OF CORIANDER OIL IN DRINKING WATER OF BROILER CHICKENS IN GROWTH PERFORMANCE AND IMMUNE RESPONSE

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Abstract

This study aimed to investigate the effects of added coriander oil in drinking water of broiler chickens on growth performance and immune response. A total of 200 day-old broiler chicks (Ross 308) have been brought to carry out this experiment, on day one, 20 chicks randomly selected then sacrificed for blood collected to assayed maternal antibody titer (MAT) against Infectious bursal disease (IBD) by enzyme-linked immunosorbent assay (ELISA). rest 180 chicks were randomly distributed into two equal groups with three replicates. The chicks in group A supplemented with tap water considered as a control group while chicks in group B supplemented with 0.3ml/liter Coriander (*Coriander sativum*) oil in drinking water from day one till the end of experiment (day 35). All birds were fed on the same ration also, all birds vaccinated against IBD at 17 days of age. The body weight, weight gain, food intake, and feed conversion ratio were calculated weekly. On day 35, the ELISA antibody titer was calculated also, the relative weight of immune organs were calculated. The chickens were supplemented with coriander oil significantly increase mean body weight and weight gain and decrease food intake and feed conversion ratio, registered higher antibody titer against IBD compared with the control group.

Key words : Coriander oil, broiler chickens, growth performance, immune response.

Introduction

Poultry industries in Iraq exposed for many stressors like different pathogen agents and other environmental factors which causes huge economic losses (Almremdhy, 2014; Kshash and Oda, 2019). These stressors increased the concentration of reactive oxygen species (ROS), causing lipid peroxidation, severe oxidative damage to cellular membranes, trigger inflammation because the lack of sufficient antimicrobials and antioxidants lead to impair growth performance and immune response (Cuzzocrea *et al*., 2001; Yunus *et al*., 2011; Lee *et al.*, 2017). So that, various feed additives, like antibiotics, probiotics, prebiotics and herbal plants, have been added to animal diets to stimulate the immune responses to eliminate the negative influence of environmental stressors and improve growth performance (Lin *et al*., 2015; Lai *et al*., 2015; Lin *et al*., 2016; Teng *et al*., 2017; Lin *et al*., 2017; Lin *et al*., 2018). A relatively new type of feed additives used in poultry industry are herbal plants their essential oils because it have appetite stimulating properties, anti-bacterial effects, and antioxidant functions (Mountzouris *et al.,* 2007) lead to improve growth performance and health condition because of their ability to increase dietary digestibility, to balance the gut microbial ecosystem, improving gut health, and to stimulate the secretion of endogenous digestive enzymes (Jamroz *et al.,* 2005; Cross *et al.,* 2007; Hong *et al.,* 2012).

One of important herbal plant used as feed additive in poultry industry is Coriander (*Coriander sativum*). Coriander has multiple a medical uses an antimicrobial,, antioxidant, hypolipidemic, hypocholesterolemic and anticonvulsant compound (Delaquis *et al.,* 2002). In addition, it stimulates appetite and digestion (Cabuk *et al.,* 2003). Therefore, this study aimed to investigate the effect of coriander oil on growth performance and immune response of broiler chickens against IBD.

Materials and Methods

This experiment conducted in the Department of Pathology and Poultry diseases in the College of Veterinary medicine of Al-qasim green university. Two hundred, day-old broiler chicks Ross 308 breed were

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obtained from a local hatchery to carry out this experiment. The chicks were reared in separated pens after supplemented with all equipments of broiler rearing for 35 days under good hygienic conditions. The birds were fed standard chick feed *ad-libitum* and provided clean drinking water throughout the experiment. The birds were offered a starter diet from 1 to 20 days and finisher diet from day 21 to day 35. All chicks were vaccinated against IBD virus (Live attenuated IBD virus, which contains the D78 strain, Intervet – Holland) by intra-crop rout at 17 days of age.

At one day of age, twenty chicks were chosen randomly to be sacrificed to collect blood samples for estimation of maternally antibody titer (MAT) against Infectious bursal disease (IBD) by using enzyme-linked immunosorbent assay (ELISA) ProFLOK® IBD ELISA Kit (Synbiotics–USA). The rest one hundred and eighty chicks were randomly divided into two groups 90 chicks in each group (group A and B) with three replicates (n = 30) each. The chicks in group A were supplemented with tap water as control group while as the chicks in group B were added Coriander oil 0.3ml/L of drinking water from first day of experiment until the end day of experiment at day 35 of chickens age which consider as treatment group.

Bodyweight, body weight gain, feed intake and feed conversion ratio were assessed weekly.

Blood samples were collected twice, the first, at 14 day of age (2 ml) from wing vein, for assess of maternal immunity against IBD by ELISA test for determine the optimal age for vaccination, while the second, at day 35 of chickens age, (2 ml) from each chicken were aspirated from jugular vein to determine humoral immune response (18 days postvaccination) against IBD by indirect ELISA. At the same time, five chickens from each replicate were randomly selected, individually weighed and killed then thymus, spleen, and bursa of Fabricius were collected, dry and individually weighed (g) for each individual and the ratio of thymus, bursa, spleen weight: body weight (%) was calculated and their relative weights were calculated according to (Heckert *et al.,* 2002).

The independent T-test was used for statistical comparison of means between groups.

Results

The results appeared there are significant increase ($P<0.05$) in weekly average body weight and weight gain, while as there were significantly ($P<0.05$) decrease in average feed intake and feed conversion ratio (FCR) of broiler chickens between coriander supplemented group (group B) and control (group A) a long experimental period as shown in Table I.

Table 1: Weekly growth performance parameters of broiler.

Age	Parameters	Treatment	
		Control group(A)	coriander group(B)
1st week	Avg. bodyweight (g)	171.1± 3.10^{B}	173.1±2.68^{A}
	Avg. weight gain (g)	114.1±3.10^{B}	117.1± 2.68^{A}
	Avg. feed intake (g)	140.1±2.64^{A}	135±4.13^{B}
	Avg.FCR	1.22±0.052^{A}	1.15±0.045^{B}
2nd week	Avg. bodyweight (g)	399.9±7.51^{B}	413.3±7.19^{A}
	Avg. weight gain (g)	229.9±9.35^{B}	240.1±6.74^{A}
	Avg. feed intake (g)	317.5±3.74^{A}	315±4.78^{B}
	Avg.FCR	1.38±0.046^{A}	1.32±0.064^{B}
3rd week	Avg. bodyweight (g)	816.1±8.93^{B}	849.6±12.52^{A}
	Avg. weight gain (g)	416.1±12.67^{B}	436.3±14.76^{A}
	Avg. feed intake (g)	669±8.43^{A}	666±10.82^{B}
	Avg.FCR	1.6±0.045^{A}	1.52±0.066^{B}
4th week	Avg. bodyweight (g)	1359.6±12.75^{B}	1394.3± 8.65^{A}
	Avg. weight gain (g)	543.5±15.03^{B}	545±18.56^{A}
	Avg. feed intake (g)	999.5± 43.74^{A}	959±13.49^{B}
	Avg.FCR	1.84±0.10^{A}	1.76±0.053^{B}
5th week	Avg. bodyweight (g)	1970±13.54^{B}	2011.5±12.20^{A}
	Avg. weight gain (g)	613.7±22.43^{B}	620.5±15.42^{A}
	Avg. feed intake (g)	1176±22.21^{A}	1130±9.44^{B}
	Avg.FCR	1.91±0.087^{A}	1.83±0.044^{B}

Means within a row marked with different letters were significantly different ($P<0.05$).

The results of immune response appeared higher ($P<0.05$) serum ELISA antibody titers against infectious bursal disease (IBD) in day 35 of age, in the coriander supplemented group (group B) compared with control (group A) as listed in Table II. At the same time, immune organs (bursa of Fabricius, thymus, and spleen) weighed more ($P<0.05$) in the supplemented group compared with control as listed in Table III.

Discussion

There are significant increase ($P<0.05$) in weekly average body weight and weight gain, while as there were significantly ($P<0.05$) decrease in average feed intake and feed conversion ratio (FCR) of broiler chickens between coriander supplemented group (group B) and control (group A) a long experimental period as shown in Table I.

These results may be attributed to effect of main component, linalool (60-70%) in coriander (Nadeem *et al.,* 2013),

Table 2: ELASA antibody titer against IBD in broiler on various days.

Treatment	ELISA Antibody titer on various days		
	Day 1	Day 14	Day 35
Control group(A)	7362^{A}	1020^{A}	4760±396.4^{A}
Coriander group(B)	7362^{A}	1026^{A}	5913.5±296.2^{B}

Means within a column marked with different superscripts were significantly different (P <0.05).

Table 3: Relative weight of immune organs in broilers.

Treatment	Relative organs weight[1] at day-35		
	Bursa of fabricius	Spleen	Thymus
Control group(A)	0.101±0.006^{B}	0.108±0.021^{B}	0.246±0.022^{B}
Coriander group(B)	0.152±0.006	0.145±0.010	0.326±0.026

Means within a column marked with different superscripts were significantly different (P<0.05)

1Relative organs weight = organ weight/bodyweight × 100

which lead to increase in the utilization of feed and enhancement of digestive functions, improve the function of liver and increase the pancreatic digestive enzymes thus encouraged the metabolism of carbohydrates and proteins finally resulting in enhanced growth performance this interpreted agreement with Cabuk *et al*., (2003) who attributed improvement in feed conversion ratio, and greater growth rate in chickens which fed on ration supplemented with coriander due to that the main component of coriander oil, linalool, promoted increase in broiler villi height, and therefore, may enhance the activity of digestive enzymes, resulting in higher nutrient absorption. The results of this study corresponded with Essa *et al.,* (2010) who found beneficial effect to coriander seed in improving live body weight, feed conversion, weight gain and feed intake of the broilers. Or may be attributed the improvement in growth performance parameters in supplemented group (group B) compared with control group (group A) due to antioxidant and antimicrobial properties of essential oil of coriander that lead to inhibit harmful bacterial populations in the gastrointestinal tract may cause breakdown of amino acids and thereby reduce their metabolism that lead to intestinal health improvement associated with improvements in broiler growth performance. this interpreted agreement with Ghazanfari *et al*., (2015) who observed the intestinal health improvement obtained with coriander oil was associated with improvements in broiler growth performance.

The significant improvement in ELISA antibodies titers against IBD in supplemented group (group B) compared with control might be attributed to the activity of coriander essential oil through increased the stimulation of nonspecific immune system specially the peripheral blood mononuclear cells (PBMCs) which are critical component in the immune system to fight infection. This interpretation is consistent with Cherng *et al.,* (2007) observed that the aqueous crude extract in coriander has been shown to stimulate the peripheral blood mononuclear cells (PBMCs) and increase INF-λ secretion. Or might be attributed to the ability of coriander oil to induce production of vitamin C which play importance role in stimulation immune response this interpretation is agreement with Cook and Samman (1996) who noted that herbal extracts stimulate immune response by increasing vitamin C activity. The improvement in immune response might be attributed to antimicrobial activity and antioxidant of essential oil of coriander. The results of immune response in this study agreement with Hesam *et al.,* (2014) also with Abou-Elkhair *et al.,* (2014) who stated the ability of coriander oil to stimulate the immune response in broiler chickens against different pathogens. This study conclude that essential oil of coriander has positive effect in improvement growth performance and immunity in broiler chickens.

References

Abou-Elkhair, R., H. 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. *Asian-Australas J. Anim. Sci.*, **27(6):** 847-854.

Almremdhy, HA. (2014). Retrospective study of causes of respiratory infections in broiler chickens which presented to Babylon veterinary hospital during 2012. *Veterinary Medical Sciences*, **5(1):** 41-49.

Cabuk, M., A. Alcicek, M. Bozkurt and N. Ýmre (2003). Antimicrobial properties of the essential oils isolated from aromatic plants and using possibility as alternative feed additives. Proceedings of the 2nd National Animal Nutrition Congress; Sep 8-20; Konya. Turquia,184-187.

Cherng, J.M., W. Chiang and L.C. Chiang (2008). Immunomodulatory activities of common vegetables and spices of Umbelliferae and its related coumarins and flavonoids. *Food Chemistry*, **106 (3):** 944–950.

Cook, N.C. and S. Samman (1996). Flavonoids—chemistry, metabolism, cardioprotective effects, and dietary sources. *Journal of Nutritional Biochemistry*,**7(2):**66–76.

Cross, D.E., R.M. Mcdevith, K. Hillman and T. Acamovic (2007). The effect of herbs and their associated essential oils on performance, digestibilities and gut microflora in chickens 7 to 28 d of age. *British Poultry Science*, **4:** 496-506.

Cuzzocrea, S., D.P. Riley, A.P. Caputi and D. Salvemini (2001). Antioxidant therapy: a new pharmacological approach in shock, inflammation, and ischemia/reperfusion

injury. *Pharmacol Rev*., **53:** 135-59. [PubMed] [Google Scholar]

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.

Essa, H., S. Hamodi, Al-jaff F and H.S. 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(10):** 968-971.

Ghazanfari, S., Z. Mohammadi and M.A. Moradi (2015). Effects of Coriander Essential Oil on the Performance, Blood Characteristics, Intestinal Microbiota and Histological of Broilers. *Rev. Bras. Cienc. Avic*., **17(4):** Campinas Oct./ Dec. 2015.

Heckert, R.A., I. Estevez, E. Russek-Cohen, R. Pettit- Moraes, Salle and A. C T P Padilha.

Hesam, H., Ali Ahmad Alaw Qotbi, Alireza Seidavi, David Norris, and David Brown (2014). "Effects of Different Levels of Coriander (*Coriandrum sativum*) Seed Powder and Extract on Serum Biochemical Parameters, Microbiota, and Immunity in Broiler Chicks". *The Scientific World Journal*, vol. 2014, Article ID 628979, 11 pages, 2014.

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.

Jamroz, D., A. Wiliczkiewicz, T. Wertelecki, J. Orda and J. Scorupinska (2005). Use of active substances of plant origin in chicken diets based on maize and domestic grains. *British Poultry Science*, **46:** 485-493.

Kshash, B. and H. Oda (2019). Constraints Facing Poultry Producers in Iraq. *Journal of Agricultural Extension*, **23 (2):** 90-100.

Lee, M.T., W.C. Lin, B. Yu and T.T. Lee (2017). Antioxidant capacity of phytochemicals and their potential effects on oxidative status in animals-A review. *Asian-Australas J. Anim. Sci*., **30:** 299–308. [PMC free article] [PubMed] [Google Scholar]

Lin, W..C, M.T. Lee, C.T. Lo, S.C. Chang and T.T. Lee (2018). Effects of dietary supplementation of *Trichoderma pseudokoningii* fermented enzyme powder on growth performance, intestinal morphology, microflora and serum antioxidantive status in broiler chickens. *Ital. J. Anim. Sci*., **17:**153–64. [Google Scholar]

Lin, W.C., M.T. Lee, Y.L. Chang and *et al*. (2017). Effects of mulberry leaves on production performance and the potential modulation of antioxidative status in laying hens. *Poult. Sci.*, **96:** 1191–203. [PubMed] [Google Scholar]

Lin, M.J., S.C. Chang and Y.S. Jea, *et al*. (2016). *In vitro* antioxidant capability and performance assessment of White Roman goose supplemented with dried *Toona Sinensis*. *J. Appl. Anim. Res.*, **44:** 359–402. [Google Scholar]

Lai, L.P., M.T. Lee, J. Chen, B. Yu and T.T. Lee (2015). Effects of co-fermented *Pleurotus eryngii* stalk residues and soybean hulls by *Aureobasidium pullulans* on performance and intestinal morphology in broiler chickens. *Poult. Sci*., **94:** 2959–69. [PubMed] [Google Scholar]

Lin, M.J., S.C. Chang, Y.S. Jea, W.S. Chen and T.T. Lee (2015). Effects of dietary garlic scape meal on the growth and meat characteristics of geese. *Br. Poult. Sci*., **56:** 716–22. [PubMed] [Google Scholar]

Mountzouris, K.C., P. Tsistsikos, E. Kalamara, S. Nitsh, G. Schatz-Mayr and K. Fegeros (2007). Evaluation of the efficacy of a probiotic containing *Lactobacillus, Bifidobacterium, Enterococcus and Pediococcus* strains in promoting broiler performance andmodualting cecal microflora composition and metabolic activities. *Poultry Science*, **86:** 309-317.

Nadeem, M., F.M. Anjum, M.I. Khan, S. Tehseen, A. El-Ghorab and J.I. Sultan (2013). Nutritional and medicinal aspects of coriander (*Coriandrum sativum* L.): a review. *British Food Journal*, **115(5):** 743–755.

P and Riley, V P. (2002). Effects of density and perch availability on the immune status of broilers. *Poult. Sci*., **81:** 451-457.

Teng, P.Y., C.H. Chung and Y.P. Chao *et al*. (2017). Effects of *Bacillus amyloliquefaciens* and *Saccharomyces Cerevisiae* as directed-fed microbials on performance, intestinal microflora, and intestinal morphology in broiler chickens. *J. Poult. Sci*., **54:** 134–41. [Google Scholar]

Yunus, A.W., E. Razzazi-Fazeli and J. Bohm (2011). Aflatoxin B1 in Affecting broiler's performance, immunity, and gastrointestinal tract: a review of history and contemporary issues. Toxins. 3:566–90. [PMC free article] [PubMed] [Google Scholar]