

## Effect of incorporation of coriander seed meal at varying levels on serum biochemical profile in Japanese quail diets

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### Abstract

#### Keywords:

Bio- Chemical Profile; Cholesterol;  
Coriander Seed Meal;  
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An experiment was conducted to study the effect of coriander seed meal (CSM) at varying levels in the diet of quails on serum biochemical profile. One hundred and fifty day old quail chicks were randomly allotted into 5 experiment groups each with 3 replicates of 10 chicks. CSM was incorporated at 0, 0.5, 1.0, 1.5 and 2.0% levels. All the diets formulated were iso-caloric and iso-nitrogenous. At the end of the experiment, blood was collected from 2 birds/ replicate, thus a total of 30 birds and serum was separated. Results revealed that the total protein, globulin, albumin, calcium and phosphorous contents were increased, ( $p < 0.01$ ) whereas serum glucose ( $p < 0.05$ ), triglycerides, total cholesterol and creatinine ( $P < 0.01$ ) levels were decreased with increase in the level of inclusion of CSM from 0 to 2.0% in the diet. Further, in this study increase ( $P < 0.01$ ) in the HDL Cholesterol level and decrease ( $p < 0.01$ ) in LDL and VLDL Cholesterol levels were recorded in serum with increased level of inclusion of CSM from 0 to 2.0% in the diet. The present study indicated that coriander seed meal can be incorporated up to 2.0% level as a natural feed additive in the diet of quails for production of low cholesterol meat without any adverse effect on production performance.

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### Introduction

Quail farming is cropping up as a new venture of diversification of poultry farming due to diverse choices of taste and to strengthen the meat production unit for fulfilling the shortage of animal protein demand. Quail farming is economically viable and technically feasible because quails are quite resistant to various diseases, early sexual maturity (6 weeks of age) and easily adapt to various rearing conditions [1].

In addition, quail meat is a rich source of micronutrients and a wide range of vitamins including the B complex, folate, vitamin E and K. Physical condition and health status of quails can be assessed basing on evaluation of the hematological and serum biochemical profile making them useful tools in differentiating apparently healthy birds from abnormal or diseased ones.

The use of antibiotics as growth promoters has been banned in many countries, due to public concern about their residues in animal products which forced the nutritionist to search for an alternative to antibiotics. Herbs and spices are the most important part of human diet. In addition to boosting flavor, herbs and spices are also known for their potential antimicrobial and stimulating effects on the digestive system. Coriander (*Coriandrum sativum L.*), a well-known aromatic medicinal plant grows in nature and is cultivated in India. Coriander seed has got health supporting reputation. It has anti-diabetic, anti-inflammatory, anti-fungal, anti-parasitic, anti-helminthic, anti-septic, analgesic, sedative and antioxidant properties [2]. Studies conducted earlier indicated that inclusion of coriander seed at 2% level in the broiler diet resulted in decreased glucose, total and LDL cholesterol levels and increased serum total protein, albumin, triglycerides and HDL cholesterol levels [3].

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Keeping in view of demand from the consumer for lean meat and available literature is scanty on hypo-cholesterolemic effect [4] of coriander seeds, the present investigation was conducted to study the effect of incorporation of coriander seed meal at varying levels in diet on serum biochemical profile in Japanese quails.

**Materials and Methods**

One hundred and fifty day old quail chicks were procured and randomly allotted into 5 groups each with 3 replicates of 10 chicks. Chicks were wing banded and weight of the chick was recorded. The experiment was carried out for 5 weeks in a completely randomized design (CRD). During the experiment, coriander seed was ground and was included at 0% (Control, T<sub>1</sub>), 0.5% (T<sub>2</sub>), 1.0% (T<sub>3</sub>), 1.5% (T<sub>4</sub>) and 2.0% (T<sub>5</sub>) levels in diets. All the diets were iso-caloric and iso-nitrogenous. The quail diets were formulated as [5] specified. All the chicks were housed in battery brooders under uniform management conditions. Feed and water were provided *ad libitum*.

At the end of the trial (5<sup>th</sup> week), two birds per replicate and thus a total 6 birds per treatment were randomly selected, weighed and slaughtered. Blood

was collected from each bird (total of 30 birds) and serum was separated. Serum biochemical parameters like total protein, albumin, globulin, glucose, triglycerides and total cholesterol, various other forms of cholesterol, creatinine, calcium and phosphorus were estimated by using diagnostic kits (M/s. Span Diagnostics Private Limited). All the feed samples were analyzed for proximate principles [6].

*Statistical Analysis*

Statistical analysis of the data was carried out according to the procedures suggested [7].

**Results and Discussion**

The ingredient and chemical composition of diets formulated by incorporating coriander seed meal at varying levels and fed to Japanese quails in the present study was shown in Table 1. The diets were iso-nitrogenous and iso-caloric with a protein energy ratio of 1:121, by using ingredients like maize, DORB, soybean meal, fish meal and coriander seed meal as per [5] specifications. The effect of inclusion of coriander seed at varying levels in the diet on serum biochemical profile of quails was shown in Table 2 & 3.

**Table 1:** Ingredient (%) and Chemical composition (% DM basis) of quail diets

Constituent/ Diet	T <sub>1</sub> Control	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>
Maize	49.80	49.5	49.40	49.20	49.00
De oiled rice bran	8.30	8.10	7.70	7.40	7.10
Soybean meal	34.50	34.50	34.50	34.50	34.50
Fish meal	5.00	5.00	5.00	5.00	5.00
Coriander seed	0.00	0.50	1.00	1.50	2.00
Di calcium phosphate	0.30	0.30	0.30	0.30	0.30
Shell grit	1.20	1.20	1.20	1.20	1.20
Salt	0.25	0.25	0.25	0.25	0.25
Trace min mix	0.15	0.15	0.15	0.15	0.15
Feed additives	0.50	0.50	0.50	0.50	0.50
Total	100	100	100	100	100
ME* (kcal/kg)	2900.33	2900.58	2903.13	2904.53	2905.93
Crude protein# (%)	24.03	24.05	24.04	24.04	24.05

\*Calculated value # analyzed value

**Table 2:** Effect of dietary incorporation of CSM at varying levels on total serum protein, albumin and globulins (g/dl)

Treatment	Total protein	Albumin	Globulin
T <sub>1</sub>	3.80 <sup>a</sup> ± 0.01	2.36 <sup>a</sup> ± 0.01	1.44 <sup>a</sup> ± 0.01
T <sub>2</sub>	3.86 <sup>b</sup> ± 0.01	2.40 <sup>a</sup> ± 0.02	1.46 <sup>a</sup> ± 0.02
T <sub>3</sub>	3.93 <sup>c</sup> ± 0.16	2.45 <sup>b</sup> ± 0.01	1.48 <sup>a</sup> ± 0.01
T <sub>4</sub>	4.05 <sup>d</sup> ± 0.01	2.51 <sup>c</sup> ± 0.01	1.54 <sup>b</sup> ± 0.01
T <sub>5</sub>	4.10 <sup>e</sup> ± 0.01	2.54 <sup>c</sup> ± 0.13	1.56 <sup>b</sup> ± 0.01
SEM	0.02	0.01	0.01
SS	**	**	**

Values in column bearing different super scripts differ significantly \*\* (p<0.01).

Table 3: Effect of dietary incorporation of CSM on serum biochemical profile (mg/dl)

Treatment	Glucose	Triglycerides	Total cholesterol	HDL-C	LDL-C	VLDL-C	Creatinine	Calcium	Phosphorous
T <sub>1</sub>	235.56 <sup>b</sup> ± 0.22	143.35 <sup>c</sup> ± 0.01	210.61 <sup>d</sup> ± 0.01	131.62 <sup>a</sup> ± 0.01	50.32 <sup>c</sup> ± 0.01	28.69 <sup>a</sup> ± 0.01	1.30 <sup>c</sup> ± 0.01	18.44 <sup>a</sup> ± 0.01	8.36 <sup>a</sup> ± 0.01
T <sub>2</sub>	233.07 <sup>b</sup> ± 2.22	138.04 <sup>b</sup> ± 0.01	208.54 <sup>c</sup> ± 1.00	133.21 <sup>a</sup> ± 0.92	47.72 <sup>c</sup> ± 1.90	27.60 <sup>b</sup> ± 0.01	1.27 <sup>bc</sup> ± 0.01	18.71 <sup>b</sup> ± 0.01	8.48 <sup>a</sup> ± 0.01
T <sub>3</sub>	225.66 <sup>ab</sup> ± 7.41	136.34 <sup>b</sup> ± 1.27	204.69 <sup>b</sup> ± 0.94	135.16 <sup>b</sup> ± 1.04	42.26 <sup>b</sup> ± 1.66	27.27 <sup>b</sup> ± 0.25	1.26 <sup>b</sup> ± 0.01	19.35 <sup>c</sup> ± 0.01	8.51 <sup>a</sup> ± 0.01
T <sub>4</sub>	221.51 <sup>a</sup> ± 0.12	133.01 <sup>a</sup> ± 1.44	202.17 <sup>a</sup> ± 0.01	137.26 <sup>c</sup> ± 0.01	38.30 <sup>b</sup> ± 0.29	26.60 <sup>b</sup> ± 0.29	1.24 <sup>ab</sup> ± 0.01	19.93 <sup>d</sup> ± 0.01	8.75 <sup>b</sup> ± 0.10 <sup>b</sup>
T <sub>5</sub>	219.80 <sup>a</sup> ± 0.09	131.16 <sup>a</sup> ± 0.01	201.97 <sup>a</sup> ± 0.01	138.25 <sup>c</sup> ± 0.01	37.48 <sup>a</sup> ± 0.01	26.23 <sup>a</sup> ± 0.01	1.22 <sup>a</sup> ± 0.01	20.09 <sup>e</sup> ± 0.05	8.76 <sup>b</sup> ± 0.08
SEM	1.84	0.86	0.69	0.52	1.05	0.17	0.01	0.12	0.04
SS	*	**	**	**	**	**	**	**	**

Values in column bearing different super scripts differ significantly \*\* (p<0.01), \*(p<0.05).

### Serum Total Protein

The serum total protein content (g/dl) increased significantly (p<0.01) with increased level of coriander seed meal in the diet of quails (Table 2). These results corroborated with the findings [3], who reported significantly (p<0.05) higher total serum protein values upon feeding 2.0% coriander seed meal in broiler diet under high ambient temperatures. Similarly, increased total serum protein concentration upon feeding diets containing coriander seed in broiler chickens were also reported earlier [8,9,10].

### Serum Albumin

A significant increase (p<0.01) in serum albumin content (g/dl) was observed with increased level of incorporation of coriander seed meal from 0 to 2.0% in the diet of quails (Table 2). Corroborating the results of the present study, [3] reported significantly (p<0.05) higher serum albumin content in broilers fed coriander seed at 2.0% level in the diet under high ambient temperatures. Similarly, [11] reported increased plasma albumin levels in broiler chicken upon feeding basal diet with 0.1 and 0.2% levels of summer shield supplementation, which contained 10% coriander extract along with other herbs. On other hand, [9] reported that feeding diets containing different levels of coriander seeds (0.2, 0.4 and 0.6% levels) had no effect (p>0.05) on serum albumin content in broiler chicken as compared to the control.

### Serum Globulin

The serum globulin content (g/dl) increased significantly (p<0.01) with increased level of incorporation of coriander seed meal in the diet of quails (Table 2). This might be attributed to the improved immune system. The results of the present study are in agreement with those of [11] who reported increased plasma globulin levels in broiler chicken upon feeding basal diet with 0.1 and 0.2% levels of summer shield supplementation, which contained 10.0% coriander extract along with other herbs. On other hand, [9] observed feeding coriander seed had no effect (p>0.05) on serum globulin content in broiler chicken. In contradiction, [3] reported lower (p<0.05) serum globulin levels in broiler chicken when fed 2.0% coriander seed in the diet as compared to the control.

It is reported that coriander has anti-microbial effects [12], anti-fungal effects [13] and contain anti-oxidants that decrease lipid oxidation [14] which might have enhanced the immune system resulting in increased concentration of serum parameters related to immunity viz. total protein, albumin and globulin levels.

### Serum Glucose

The serum glucose content (mg/dl) decreased significantly (p<0.05) with increased level of coriander seed from 0 to 2.0% in the diet of quails (Table 3). These results are in agreement with the findings of [3] in broiler chicks under high ambient temperatures, by incorporation of CSM upto 2%. The reduction

in serum glucose content observed upon coriander seed inclusion in the diet may be attributed to the insulin releasing and insulin like activity of coriander seed [15].

In line with the findings of present study [8,16,10,11] reported decreased serum glucose content in broiler chickens, in contrast to this [17] reported, incorporation of coriander seed in broiler diets had no effect ( $p>0.05$ ) on serum glucose concentration.

#### *Serum Triglycerides*

The serum triglyceride content (mg/dl) decreased significantly ( $P<0.01$ ) with increased level of coriander seed from 0 to 2.0% in the diet of quails (Table 3). [18] reported that supplementation of coriander oil at 2.0 % in the diet had resulted in significant decrease ( $p<0.05$ ) in serum triglyceride content of broilers. Similarly, decreased serum triglyceride content in broiler chicken upon feeding coriander seed in the diet was reported earlier [8,9,10,11,19]. The decreased serum triglyceride content observed in quails upon feeding coriander seed in the diet might be attributed to its hypo-lipidaemic effect [4].

In contradiction to this results, [3] reported higher ( $p<0.05$ ) serum triglyceride content in broilers fed coriander seed at 2.0 and 3.0% in the diet under high ambient temperature compared to control and 1.0% groups. However, [17] reported that feeding coriander seed in the diet had no effect ( $p>0.05$ ) on serum triglyceride content in broiler chicken.

#### *Serum Total Cholesterol*

The serum total cholesterol content (mg/dl) decreased significantly ( $p<0.01$ ) with increased level of incorporation of coriander seed from 0 to 2.0% in the diet of quails (Table 3). Whereas, [3] Reported lower ( $p<0.05$ ) serum cholesterol in broilers fed coriander seed at 2.0 and 3.0% level under high ambient temperature. The decrease in the serum cholesterol levels observed in the present study could be attributed to the incorporation of coriander seed in the diet might reduced the activity of 3- enzyme-3-methylglutaryl CoA (HMG-CoA) in the liver which is the key regulatory enzyme in cholesterol synthesis [20]. Whereas, observed 2% lowering of serum cholesterol in poultry by inhibiting 5% of HMG-CoA reductase. Further, coriander seeds increases the concentration of hepatic and fecal bile acids and neutral sterols which resulted in increasing hepatic degradation of cholesterol [20].

Corroborating the results of the present study, several researchers reported that inclusion of

coriander seed resulted in decreased serum total cholesterol content [9,11,17] in broiler chicken.

#### *Serum HDL Cholesterol*

The serum HDL cholesterol content (mg/dl) increased significantly ( $p<0.01$ ) with increased level of coriander seed from 0 to 2.0% in the diet of quails (Table 3). Whereas, [3] also reported that feeding coriander seed in the diet resulted in increased ( $p<0.05$ ) serum HDL cholesterol concentration in broiler chicks reared under high ambient temperature. The increased serum HDL content observed in quails upon feeding coriander seed in the diet might be due to the significant hypo-lipidaemic effect resulting in lowering the total cholesterol levels and triglycerides and thus increasing the levels of high density lipoprotein [4].

Similarly, [11] observed increased serum HDL cholesterol levels in broiler fed diets supplemented with summer shield at 0.1 and 0.2% level which contained 10% coriander extract along with other herbs. However, [17,18] reported that feeding of coriander seed in the diet had no effect ( $p>0.05$ ) on serum HDL cholesterol content in broiler chicken.

#### *Serum LDL Cholesterol*

The serum LDL cholesterol content (mg/dl) decreased significantly ( $p<0.01$ ) with increased level of coriander seed from 0 to 2.0% in the diet of quails (Table 3). However, [3] reported significantly ( $p<0.05$ ) lower serum LDL cholesterol in broiler chicken fed coriander seed at 2.0% level in the diet under high ambient temperature. The decreased serum LDL content observed in quails upon feeding coriander seed in the diet might be attributed to enhanced hepatic bile acid synthesis and to increased degradation of cholesterol to fecal bile acids and neutral sterols [20]. Similarly, [11,18] reported significantly ( $p<0.05$ ) reduced serum LDL cholesterol while [17] reported no effect ( $p>0.05$ ) on serum LDL cholesterol content in broiler chicken upon feeding coriander in the diet.

#### *Serum VLDL Cholesterol*

The serum VLDL cholesterol content (mg/dl) decreased significantly ( $p<0.01$ ) with increased level of coriander seed from 0 to 2.0% in the diet of quails (Table 3). This might be attributed to the hypo-lipidaemic effects of coriander seeds that enhanced hepatic bile acid synthesis and increased the degradation of cholesterol to faecal bile acids and neutral sterols [20].

### Serum Creatinine

The serum creatinine content decreased significantly ( $p < 0.01$ ) with increased level of coriander seed from 0 to 2.0% in the diet of quails (Table 3). Whereas [9] reported that creatinine levels showed a significant ( $p < 0.01$ ) decrease in broilers receiving 0.2, 0.4 and 0.6% coriander seed in the diet as compared to the control. Significant increase in serum uric acid and creatinine levels are indicative of nephrotoxicity in broiler chickens [21]. Thus, the decreased ( $p < 0.01$ ) serum creatinine content observed in the present study indicate the improved kidney health in terms of filtration rate which may be attributed to the incorporation of coriander seed in the diet.

### Serum Calcium and Phosphorous

The serum calcium and phosphorous contents increased significantly ( $p < 0.01$ ) with increased level of coriander seed from 0 to 2.0% in the diet of quails (Table 3). The increased serum calcium and phosphorous level observed in the present study may be attributed to the higher levels of calcium and phosphorus present in coriander seed meal. Similarly, several authors reported that feeding herbs and spices *viz.* fenugreek [22], cinnamon [23], and black pepper [24] in the diets resulted in increased serum calcium and phosphorous content in quails.

### Conclusion

The present study indicated that incorporation of coriander seed meal up to 2.0% level in the diet had improved the good cholesterol content (HDL-C) and reduced the total, LDL and VLDL cholesterol and triglyceride content in quails. Thus, it is concluded that coriander seed can be incorporated up to 2.0% level in the diet of quails without any adverse effect.

### References

1. Randall M, Bolla G. Raising Japanese quail. 2<sup>nd</sup> Edition 2008. p.1-5.
2. Lee KW, Everts H, Beynen A C. Essential oils in broiler nutrition. International Journal of Poultry Science 2004;3:738-52.
3. Al-Jaff, F.K. Effect of coriander seeds as diet ingredient on blood parameters of broiler chicks raised under high ambient temperature, International Journal of Poultry Science, 2011;10 (2):82-86.
4. Chithra V, Leelamma S. Hypolipidemic effect of coriander seeds (*Coriandrum sativum*). Antioxidant

enzyme in experimental animals. Ind J Biochem Biophys 1997;36:59-61.

5. NRC. National Research Council. Nutrient requirements of Poultry. 9<sup>th</sup> Edition. National Academy Press, Washington, DC., U.S.A. 1994.
6. AOAC. Association of Official Analytical Chemists, Official methods of Analysis 2007 (18<sup>th</sup> Ed). Washington DC. 2007.
7. Snedecor, G.W. and Cochran, W.G. Statistical methods. 9<sup>th</sup>ed. IOWA, USA: Iowa state university press. 1993.
8. Saeid, J.M. and Al-Nasry, A.S. Effect of dietary coriander seeds supplementation on growth performance carcass traits and some blood parameters of broiler chickens. Int.J.Poult.Sci. 2010;9(9):867-870.
9. Farag SA. The Efficiency of coriander seeds as dietary additives in broiler chicken's diets. Egyptian j nutrition and feeds 2013;16(3):491-501.
10. Abou-Elkhair, R., Ahmed, H.A. and Selim, S. 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. 2014;27(6):847-54.
11. Saleh, A.A., Ijiri, D. and Ohtsuka, A. Effects of summer shield supplementation on growth performance, nutrient utilization, and plasma lipid profiles in broiler chickens. Veterinarian Medicine. 2014;59(11):536-542.
12. Cabuk M, Alcicek A, Bozkurt M and Imre N. Antimicrobial properties of the essential oils isolated from aromatic plants and using possibility as alternative feed additives" in proceedings of the 11<sup>th</sup> national animal nutrition congress, Sep 2003. pp.184-187, Konya, Turkey.
13. Soliman KM, Badea RI. Effect of oil extracted from some medical plants on different mycotoxigenic fungi. Food and Chemical Toxicology 2002;40:1669-1675.
14. Al-Mamary MA. Antioxidant activity of com-monly consumed vegetables in Yemen. Malaysian Journal of Nutrition 2002;2:179-89.
15. Deepa B, Anuradha CV. Antioxidant potential of *Coriander sativum* L. Indian J Exp Biol 2011;49:30-38.
16. Al-Mashhadani, Al-JaFF FK, Hamodi SJ and Al Mashhadani HE. Effect of different levels of coriander oil on broiler performance and some physiological traits under summer condition. Pakistan journal of Nutrition, 2011;10(1):10-14.
17. Hosseinzadeh, H., Qotbi, A.A.A., Seidavi, A., Norris, D. and Brown, D. Effects of Different Levels of Coriander (*Coriandrum sativum*) Seed Powder and Extract on Serum Biochemical Parameters, Microbiota, and Immunity in Broiler Chicks. *Scientific*

- 14 Balachenna Reddy N., Srinivas Kumar D., Raja Kishore K. et. al. / Journal of Animal Feed Science and Technology 6 (2018) 09-14  
*World Journal*. Article ID 628979, 2014.p.11 pages.
18. Jang JP. Effect of different levels of coriander seed on performance of broiler chickens. *Annals of Biological Research* 2011;2:578-83.
19. Abadi KMA, Andi MA. Effect 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. *International Journal of Biosciences* 2014;5(6):95-103.
20. Dhanapakiam, P., Joseph, J.M., Ramaswamy, V.K., Moorthi, M. and Kumar, A.S. The cholesterol lowering property of Coriander seeds (*Coriandrum sativum*): Mechanism of Action. *Egyptian Poultry Science Journal*. 2008;12:36-39.
21. Huff WE, Kubena LF, Harvey RB. Progression of ochratoxicosis in broiler chickens. *Poult Sci* 1988;67:1139-1146.
22. Vamsidhar B. Effect of inclusion of fenugreek seed (*Trigonella foenum graecum*) as dietary ingredient on the performance of Japanese quail. M.V.Sc thesis submitted to Sri Venkateswara Veterinary University, Tirupati. 2015.
23. Priyanka MV. Effect of cinnamon (*Cinnamomum cassia*) powder as phytobiotic growth promoter on the performance of Japanese quail. M.V.Sc thesis submitted to Sri Venkateswara Veterinary University, Tirupati. 2017.
24. Sri Divya V. Effect of black pepper (*Piper nigrum*) as natural feed additive on the performance of Japanese quail. M.V.Sc thesis submitted to Sri Venkateswara Veterinary University, Tirupati. 2017.
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