

## **The effects of *Cinnamomum zeylanicum* Blume and *Thymus vulgaris* in blood serum and egg yolk of Japanese quail (*Coturnix japonica*)**

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### **Abstract**

This study was conducted to determine the effects of dietary inclusion of *Cinnamomum zeylanicum* Blume and *Thymus vulgaris* powder on some production traits and serum and egg yolk lipid profile in Japanese quails (*Coturnix Japonica*). The experimental treatments were divided as control (no supplementation) and four groups (supplemented with 1.0, 2.0% of thymus powder and 1.0, 2.0% of cinnamon powder). The experiment used 100 quails (42–105 days of age) with five treatments. Each treatment was further divided into five replicates, each having four birds (1 male and 3 female bird). In this trial, cholesterol and triglyceride concentration in serum and egg yolk were determined. The results indicated that thymus powder to the diet significantly reduced ( $P<0.05$ ) the concentration of egg yolk cholesterol and triglycerides. Dietary thymus and cinnamon powder decreased ( $P<0.05$ ) serum total cholesterol. Serum triglycerides content was not influenced by treatments. It was concluded that 1 or 2% thymus had a positive effect on the production performance and cholesterol profile of the Japanese quail.

**Keywords:** Thymus; cinnamon, egg yolk cholesterol, Japanese quail, *Coturnix japonica*.

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### **Introduction**

Aromatic plants, plant extracts and species can be important alternatives for the health and nutrition of the poultry. They have a wide range of activities such as stimulation of feed intake and endogenous secretions or have antimicrobial, cocciostatic or anathematic activity. In addition, these plants can also have positive effects on blood metabolites. Plants have evolved a wide range of secondary metabolites. Most of these active secondary plant metabolites belong to classes of isoprene derivatives, flavonoides and a large number of these compounds have suggested functions as antibiotics or as antioxidants in vivo as well as in food (Shin et al., 1995). Fat and cholesterol reduction of processed egg yolk has been a primary concern of the egg industry. Consumers continue to emphasize low cholesterol and low lipid food products (Froning et al., 1998). Cholesterol content in the eggs is influenced by genetic factors, diet composition, lay intensity, layer

age and medical treatment (Qureshi et al., 2011). Yang et al. (2003) reported that cholesterol as well as fatty acids levels of plasma decreased when animals were fed different levels of medicinal plant by-products such as green tea. Similarly, garlic paste in the diets of laying hens reduced serum and yolk cholesterol concentrations (Chowdhury et al., 2002). There are many records available of previous work on inclusion of herbal plant powders or essential oils extracted from medicinal plants in animal diets (Bolukbasi and Erhan, 2007; Al-Kassie, 2009; Liu et al., 2010).

*T. vulgaris* is a medicinal herb in the *Lamiaceae* family, cultivated worldwide for culinary, cosmetic perennial and medical purposes. This species has special functions such as antispasmodic, expectorant, antiseptic, antimicrobial and antioxidant (Hertrampf, 2001; Abu-Darwish et al., 2009). Thymol (5-methyl-1-2-isopropyl phenol) and carvacrol (5-isopropyl-2-methyl phenol) are the main phenolic components in *T. vulgaris* (Masada, 1976). A number of studies have

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documented the antilipidimic and hypocholesterolaemic effect of thymus in poultry (Ali et al., 2007; Al-kassie, 2009). Also *C. zylenticum* is commonly used in the food industry because of its special aroma. Additionally, it has strong antibacterial properties, anticandidial, antiulcer, analgesic, antioxidant and hypocholesterolaemic activities (Suhr and Nielsen, 2003). Cinnamaldehyde is the predominant compound of cinnamon, and presents antimicrobial and antioxidant activity (Lee et al., 2003; Faix et al., 2009). The objective of this research was to determine the effects of supplemented thymus and cinnamon powder on yolk and serum lipid profile in Japanese quails.

## Materials and Methods

A total of 100 Japanese quails (*C. japonica*) 42 – 105 days of age were used as in one-tier cage (60×50×40cm) in an environmentally controlled room with 16-h constant overhead lighting. The experiment used a completely randomized design (CRD) with five treatments (five replicates). Each replicate contained four birds (1 male and 3 female bird). The five dietary treatments used in this study were as follows: 1) basal diet (control), 2) basal diet + 1.0% of thymus powder 3) basal diet + 2.0% of thymus powder 4) basal diet + 1.0% of cinnamon powder and 5) basal diet + 2.0% of cinnamon powder. The composition and nutrients content of the basal diets is shown in Table 1. Sample of 10 eggs was randomly collected from each cage at each for egg yolk cholesterol and triglyceride analysis at the end of the trial. The yolk cholesterol and triglyceride values obtained by the enzyme method solubilized samples (Pasin et al., 1998). Blood samples from the brachial vein of 2 quails in each pen were collected, the blood samples were collected in test tubes with an anticoagulant (Sodium Etyhlene Ditetra amino) and plasma were obtained by centrifugation of blood at 3500 r.p.m. for 15 min. and kept at – 18° C until analyzing. Data were analyzed based using SAS software (version 9.1).

## Results and Discussion

The results related to the effects of the dietary addition of thymus and cinnamon powder on cholesterol and triglyceride concentration in egg and serum are presented in Table 3. Minimum values of yolk cholesterol and triglyceride were found at group of 1.0% thymus powder and 2.0% thymus powder respectively ( $P<0.05$ ). There were no significant differences among treatments in serum triglyceride ( $P>0.05$ ). The minimum concentration of serum cholesterol observed at group 2.0% cinnamon ( $P<0.05$ ). A similar observation was reported by Bölükbaş et al. (2008). Bölükbaş et al. (2007) showed that adding essential oils

**Table 1: The ingredients and composition of basal diet**

Ingredients	%
Corn	43.1
Soybean meal	38.9
Oyster shell	8.38
Dical. Phos.	2.28
Fatty acid	6.0
Common salt	0.047
CaCO <sub>3</sub>	0.44
Vitamin-Mineral premix <sup>A</sup>	0.6
Vitamin E	0.3
<i>Calculated values</i>	
ME. Kcal/Kg	2900
Cp. %	20.0
Calcium. %	1.0
Available phosphorus. %	0.5
Lysin. %	1.0

<sup>A</sup>Provided per kilogram of diet: retinol (vitamin A), 7700 IU; cholecalciferol (vitamin D<sub>3</sub>), 3300 IU; DL-alpha-tocopherol acetate (vitamin E), 6.6 IU; menadione (vitamin K<sub>3</sub>), 0.55 mg; thiamine, 1.5 mg; riboflavin, 4.4 mg; pantothenic acid, 22 mg; niacin, 5.5 mg; pyridoxine, 3 mg; choline chloride, 275 mg; folic acid 1.1 mg ; biotin 0.055 mg; vitamin B<sub>12</sub> (cyanocobalamin), 0.088 mg; antioxidant, 1 mg; Manganese, 66 mg; zinc, 66 mg; iron, 33 mg; copper, 8.8 mg; iodine, 0.9 mg; selenium, 0.3 mg.

**Table 2: Effect of treatments on cholesterol and triglyceride of serum and yolk egg**

Treatments	Yolk cholesterol (mg/dl)	Yolk triglycerides (mg/dl)	Serum cholesterol (mg/dl)	Serum triglyceride (mg/dl)
control	306.55 <sup>c</sup>	217.00 <sup>a</sup>	172.70 <sup>a</sup>	167.20
1.0% thymus powder	247.10 <sup>d</sup>	215.00 <sup>a</sup>	159.30 <sup>b</sup>	171.57
2.0% thymus powder	311.80 <sup>c</sup>	181.90 <sup>b</sup>	145.50 <sup>c</sup>	158.57
1.0% cinnamon powder	339.60 <sup>b</sup>	217.50 <sup>a</sup>	143.30 <sup>c</sup>	129.22
2.0% cinnamon powder	379.35 <sup>a</sup>	205.50 <sup>a</sup>	132.20 <sup>d</sup>	113.20
SEM	4.71	3.62	2.91	22.88

<sup>abc</sup>Means in a column with different superscripts differ significantly ( $P<0.05$ ).

of thymus (200 mg/kg) into layer diet of hen decreased triglyceride ratios of yolk but not affected cholesterol ratios of yolk. This may be due to the possible mechanism of hypocholesterolaemic and hypolipidemic action of medicinal plant products which depresses the hepatic activities of lipogenic and cholesterologenic enzymes such as malic enzyme, fatty acid synthase, glucose-6-phosphatase dehydrogenase (Qureshi et al., 1983a) and 3-hydroxyl-3-methyl-glutaryl- CoA (HMG-CoA) reductase (Qureshi et al., 1983b). El-Ghosein and El-Beitawi (2009) and Abdulkarimi et al. (2011) postulated that hypocholesterolemic and antilipidimic effects of thymus powder may be due to the action of thymol and carvacrol on HMG-CoA reductase, the rate limiting enzyme of cholesterol, which reduced fat

absorption from the gut or the lipid catabolism for gluconeogenesis.

The low level of blood biochemical parameters can be due to substances like carvacrol and thymol in herbal plants which have reducing effects on cholesterol, LDL and triglyceride of blood (Jafari et al., 2011).

It was concluded that thymus and cinnamon powder supplementation did not negatively affects Japanese quail's performance and their egg quality. It was also concluded that the addition of 1% of thymus powder significantly improved Japanese quail's performance and reduced the yolk cholesterol and triglycerides concentration.

## References

- Abdulkarimi, R., Daneshyar, M. and Aghazadeh, A. M. 2011. Thymus (*Thymus vulgaris*) extract consumption darkens liver, lowers blood cholesterol, proportional liver and abdominal fat weights in broiler chickens. *Italian Journal of Animal Science*, 10: e20.
- Abu-Darwish, M.S., Abu-Dieyeh, Z.H., Batarseh, M., Al-Tawaha, A.R.M. and Al-Dalian, S.Y.A. 2009. Trace element contents and essential oil yields from wild thymus plant (*Thymus serpyllum*, L.) growth at different natural variable environments. *Jordan Journal of Food and Agriculture Environment*, 7: 920-924.
- Ali, M.N., Hassan, M. S. and Abd El-Ghany, F. A. 2007. Effect of strain, type of natural antioxidant and sulphate ion on productive, physiological and hatching performance of native laying hens. *International Journal of Poultry Science*, 6: 539-554.
- Al-Kassie, G.A.M. 2009. Influence of two plant extracts derived from thymus and cinnamon on broiler performance. *Pakistan Veterinary Journal*, 29: 169-173.
- Bolukbasi, S. and Erhan, M. 2007. Effect of dietary Thymus (*Thymus vulgaris*) on laying hens performance and *Escherichia coli* (E. coli) concentration in feces. *International journal of natural and engineering science*, 1: 55-58.
- Bölükbaş, Ş.C., Erhan, M.K. and Kaynar, Ö. 2008. The effect of feeding thymus, sage and rosemary on laying hen performance, cholesterol and some proteins ratio of egg yolk and *Escherichia coli* count in feces. *Archive Geflügelkunde*, 72: 231-237.
- Bölükbaş, Ş.C., Erhan, M.K. and Kaynar, Ö. 2007. Effect of dietary thymus oil on laying hens' performance, cholesterol ratio of egg yolk and *Escherichia coli* concentration in feces. *3rd Joint Meeting of the Network of Universities and Research Institutions of Animal Science of the South Eastern European Countries, Thessaloniki 10-12 February, 2007*.
- Chowdhury, S.R., Chowdhury, S.D. and Smith, T.K. 2002. Effects of dietary garlic on cholesterol metabolism in laying hens. *Poultry Science*, 81:1856-1862.
- El-Ghousein, S. S. and Al-Beitawi, N. A. 2009. The effect of feeding of crushed Thymus (*Thymus vulgaris*) on growth, blood constituents, gastrointestinal tract and carcass characteristics of broiler chickens. *Journal of Poultry Science*, 46: 100-104.
- Faix, Š, Faixová, Z. Plachá, I. and Koppel J. 2009. Effect of *Cinnamomum zeylanicum* essential oil on antioxidative status in broiler chickens. *Acta Veterinaria Brno*, 78: 411-417.
- Froning, G.W., Wehling, R.L., Cuppett, S. and Niemann, L.1998. Moisture content and particle size of dehydrated egg yolk affect lipid and cholesterol extraction using supercritical Carbon Dioxide. *Poultry Science*, 77: 1718-1722.
- Hertrampf, J.W. 2001. Alternative antibacterial, performance promoters. *Poultry International*, 40: 50-52.
- Jafari, B., Kamerani, M. and Rezazadehreyhani, Z. 2011. Influence of different level of Spearmint (*Mentha spicata*) extracts on different parameters of Laying Hens. *Annals of Biological Research*, 2: 517-521.
- Lee, K.W., Everts, H., Kappert, H.J., Frehner, M., Losa, R. and Beynen, A.C. 2003. Effects of dietary essential oil components on growth performance, digestive enzymes and lipid metabolism in female broiler chickens. *British Poultry Science*, 44: 450-457.
- Liu, X., Zhao, H.L., Thiessen, S., House, J.D. and Jones, P.J.H. 2010. Effect of plant sterol-enriched diets on plasma and egg yolk cholesterol concentrations and cholesterol metabolism in laying hens. *Poultry Science*, 89: 270-275.
- Masada, Y. 1976. Analysis of essential oils by gas chromatography and mass spectrometry. *John Wiley and Sons Inc., New York NY*, pp: 334.
- Qureshi, A.A., Abuirmeileh, N. Din, Z.Z., Elson, C.E. and Burger, W.C. 1983a. Inhibition of cholesterol and fatty acid biosynthesis in liver enzymes and chicken hepatocytes by polar fractions of garlic Lipids. *Journal Nutrition*, 18: 343- 348.
- Qureshi, A.A., Abuirmeileh, N, Din, Z.Z., Elson, C.E. and Burger, W.C. 1983b. Suppression of avian hepatic lipid metabolism by solvent extracts of garlic: Impact on serum lipids. *Journal Nutrition*, 113: 1746- 1755.
- Qureshi, S. R., Sahni, Y. P. and Singh, S. K. 2011. *Withania somnifera* reduces egg yolk total lipids,

- cholesterol and triglycerides in birds. *Research Journal of Pharmaceutical, Biological and Chemical Sciences*, 2(2): 730-739.
- Shin, L., Pelley, R.P. and Kripke, M.L. 1995. Use of *Aloe vera* yoghurt for acid production, viscosity, sensory properties and quality retention. *Journal of Investigative Dermatology*, 102: 197-204.
- Suhr, K.I., and Nielsen, P.V. 2003. Antifungal activity of essential oils evaluated by two different application techniques against rye bread spoilage fungi. *Journal Applied Microbiology*, 94: 665-674.
- Yang C.J., Yang, I. Y., Oh, D. H., Bae, I. H., Cho, S. G., Kong, I.G., Uuganbayar, D., Nou, I.S. and Choi, K. S. 2003. Effect of green tea by-product on performance and body composition in broiler, chicks. *Asian-Australian Journal of Animal Science*, 16: 867-872.