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Effect of dietary supplementation of peppermint and eucalyptus essential oils on serum biochemical parameters of Japanese quails

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Abstract
This experiment was carried out to study the effect of dietary supplementation of peppermint and eucalyptus essential oils on the serum biochemical parameters of Japanese quails. A total of 180 Japanese quail chicks were divided into 5 groups with 3 replicates containing 12 birds each. The treatments were as follows: T_0 (basal diet), T_1 (basal diet + 0.2% peppermint essential oil), T_2 (basal diet + 0.2% eucalyptus essential oil), T_3 (basal diet + 0.1% each of peppermint and eucalyptus) and T_4 (basal diet + 0.05% each of peppermint and eucalyptus). After 35th day of rearing, blood samples were collected from 2 birds of each replicate. It was analysed and the serum biochemical parameters were determined. The results revealed that serum glucose, serum total cholesterol, serum triglycerides, serum LDL cholesterol, serum uric acid, serum creatinine, serum bilirubin concentration, SGPT and SGOT activity was reduced significantly (p<0.05) in the groups supplemented with peppermint and eucalyptus essential oils. Total serum protein, serum albumin, A/G ratio, serum HDL cholesterol were significantly (p<0.05) increased with the supplementation of peppermint and eucalyptus essential oils. Globulin however remained unaffected. Thus, it is found that group T_1 (0.2% peppermint essential oil), T_2 (0.2% eucalyptus essential oil) and T_3 (0.1% of peppermint and eucalyptus in combination) improved the serum biochemical parameters of Japanese quails.

Keywords: Japanese quails, serum biochemical parameters peppermint and eucalyptus essential oils

1. Introduction
Poultry sector in India has made a tremendous growth since past few decades providing eggs and meat to the consumers. Poultry production was first started as an extensive backyard farming in rural India which has now transformed into a large-scale industry. Although India stands 5th in total Poultry production and is 2nd largest egg producer and 5th largest meat producer, a breach in demand, production and supply is seen. Although, ICMR recommends consumption of 180 eggs and 11 kg meat per year per person, the per capita availability of eggs is 103 and meat is 7.39 kg per year which is less than the recommended level (BAHS, 2024). For the constantly growing population and increasing need for animal protein sources, more reliable and sustainable farming options with smaller investments are needed which can meet growing demand for poultry meat products. Considering all these, various poultry species have been reared and studied out of which quail has proven to be one of the species of poultry whose production require less resource, space, and investment. It also has other advantageous traits like rapid growth, early sexual maturity, high egg production and short generation interval showing a quick response to selection. Various delicacy like tandoori and pickles can also be prepared with the quail's eggs and meat (Mishra and Shukla, 2014) [15].
The use of antibiotics in livestock farming has led to antimicrobial resistance (AMR) not only in farm animals but also in humans who consume livestock products because of which many antibiotics fail to work against various diseases. This concern has led to vast outrage among the consumers. Many national and international organisations like National network of veterinary laboratories for Antimicrobial Resistance (AMR) and WHO has stressed on the concept of "One Health" parallelly banning the abuse of antibiotics in livestock sector. The potent antibiotic replacements with similar antimicrobial and growth promotion properties can work wonders to help reducing antibiotic level in farm animal ration or provide antibiotic

free products to consumers. Essential oils can serve the purpose as it has been used as a medicine since decades due to its antimicrobial, antioxidant, and anti-inflammatory properties (Bento *et al.*, 2013) [6]. In this experiment peppermint and eucalyptus essential oils have been supplemented in the diet of Japanese quails to determine its effect on the serum biochemical parameters.

2. Materials and Methods

The experiment was conducted at Instructional Poultry Farm (I.P.F), Govind Ballabh Pant University of Agriculture and Technology, Pantnagar (U.S. Nagar), Uttarakhand for 5 weeks with CRD (Completely Randomized Design). For this study, 180, six-day old, Japanese quail chicks were divided randomly into five treatment groups each consisting of 36 birds. This treatment groups were further allocated into three replicates each having 12 quail chicks. These birds were reared in battery cages with 24 hrs. light supply and were given ad libitum access to water. Feeding was done according to different phases: Starter diet (I-II week) and Finisher diet (III-V week) which were composed according to the specifications of ICAR (2013) [10]. The peppermint and eucalyptus essential oils were provided through feed. The treatments groups were T_0 (control) fed with basal diet without essential oils, T_1 fed with basal diet containing 0.2% peppermint essential oil, T_2 fed with basal diet containing 0.2% eucalyptus essential oil, T_3 fed with basal diet containing combination of 0.1% peppermint essential oil and 0.1% eucalyptus essential oil and T_4 fed with basal diet containing combination of 0.05% peppermint essential oil and 0.05% eucalyptus essential oil. As essential oils are potent, they were incorporated into feed after mixing it with food grade coconut oil which acted as a carrier.

The birds were reared for 5 weeks and after which 2 birds from each replicate were bled by puncturing the jugular vein. The collected blood was stored in serum vial and was later used for analyzing the serum biochemical parameters of Japanese quails using Auto span Diagnostics kit. The results were recorded, analyzed, and assessed according to Snedecor and Cochran (1994) [17].

3. Results and Discussions

The outcome of this experiment is presented in the Table 1, 2 & 3.

The serum glucose was significantly (p<0.05) reduced in all the essential oil supplemented group except for T_4. The group T_1 supplemented with 0.2% peppermint essential oil had the lowest serum glucose level. Hasan and Sadeq (2020) also found a significant decrease in the serum glucose in the broilers supplemented with peppermint. However, Abdel-Waretha and Lokhare (2020) [1] found no significant difference in serum glucose concentration.

The effect of peppermint and eucalyptus essential oil supplementation on lipid profile showed that serum total cholesterol and serum triglycerides were significantly (p<0.05) reduced in T_1, T_2 and T_3 with the lowest value in T_2. Similarly, Hussein (2021) [9] found a significant difference in the serum total cholesterol concentration due to peppermint (*Mentha piperita*) powder. It is contradicted by Mohebodini *et al.* (2021) [16] who noted no significant difference in the serum total cholesterol concentration when supplemented with eucalyptus essential oil.

In this experiment while the serum HDL cholesterol was significantly (p<0.05) increased, serum LDL cholesterol was significantly (p<0.05) reduced by dietary supplementation of peppermint and eucalyptus essential oil in the Japanese quails. However, this findings are in contrast with the results founded by Mehri *et al.* (2015) [14] who showed that the supplementation of dried peppermint in Japanese quails resulted in the non-significant variation in the serum HDL concentration and serum LDL cholesterol concentration. Mashayekhi *et al.* (2018) [13] also found no significant variation in serum HDL concentration and serum LDL cholesterol concentration with the supplementation of eucalyptus powder in the broiler diet in a increasing level.

The data of health-related parameters of birds are denoted in the Table 2 which shows that total serum protein, albumin, A/G ratio, serum uric acid, serum creatinine and serum bilirubin were also significantly (p<0.05) affected by the essential oil supplementation. Serum total protein was significantly (p<0.05) high in T_1, T_2 and T_3. All the essential oil supplemented group had significantly (p<0.05) high serum albumin. The results are in accordance with Ameri *et al.* (2016) [5] who found a significant variation in the total serum protein and serum albumin concentration with the supplementation of peppermint powder in broilers. In contrast, Kaur *et al.* (2022) [11] showed that supplementing eucalyptus powder to the layers resulted in no significant variation in the serum total protein and albumin concentration.

Globulin remained unaffected by the supplementation of essential oils. Al-Kassie (2010) [4] also recorded that no significant difference in serum globulin concentration in broilers was seen when supplemented with dried peppermint. However, it is contradicted by Kaur *et al.* (2022) [11] who showed that supplementing eucalyptus powder to the layers resulted in significant difference in the serum globulin concentration.

All the essential oil supplemented groups had significantly (p<0.05) lower serum uric acid, serum creatinine and serum bilirubin when compared to T_0. This results are in contrast with Ahmed *et al.* (2016) [2] who noted that the peppermint oil supplemented @ 125 mg/kg in the broiler diet did not result in significant variation in serum creatinine concentration when compared to control. Similar results was showed by Akbari and Torki (2013) [3] who noted that the supplementation of peppermint essential oil to the broiler chickens did not result in the significant variations in the serum uric acid concentrations.

The serum enzymatic profile recorded in Table 3 indicating the status of liver health of birds was also significantly affected by the peppermint and eucalyptus essential oil supplementation. All essential oil supplemented group showed significantly (p<0.05) reduced SGPT and SGOT especially in the group T_3. The results are in accordance with Khodadust *et al.* (2015) who recorded a significant reduction in SGPT and SGOT in broiler chicken with CCL_4 induced hepatotoxicity receiving the supplementation of alcoholic extract of peppermint. However, Hussein (2021) [9] showed that SGPT and SGOT was not significantly affected in coccidiosis infected broilers supplemented with peppermint powder. Kaur *et al.* (2022) [11] also showed that supplementing eucalyptus powder to the layers resulted in no significant difference in the SGOT concentration.

Table 1: Effect of peppermint and eucalyptus essential oils supplementation on serum glucose and lipid profile of Japanese quails (Mean ± S.E.)

Treatment	Serum glucose* (mg/dl)	Serum total cholesterol* (mg/dl)	Serum triglycerides* (mg/dl)	Serum HDL cholesterol* (mg/dl)	Serum LDL cholesterol* (mg/dl)
T_0	125.95^{a}±1.26	189.88^{a}±1.52	120.53^{a}±0.44	39.72^{c}±0.58	150.16^{a}±2.08
T_1	120.44^{b}±0.65	183.59^{b}±2.12	110.86^{b}±1.20	42.82^{ab}±0.34	140.77^{b}±2.32
T_2	120.80^{b}±0.73	180.85^{b}±2.90	109.23^{b}±2.35	41.53^{b}±0.48	139.32^{b}±3.33
T_3	121.23^{b}±0.50	182.55^{b}±0.92	111.49^{b}±0.65	42.27^{ab}±0.48	140.28^{b}±0.62
T_4	123.96^{a}±0.57	184.43^{ab}±0.60	117.74^{a}±0.49	43.55^{a}±0.67	140.89^{b}±0.18

Within the identical column, values with distinct superscripts differ significantly (*p<0.05)

Table 2: Effect of peppermint and eucalyptus essential oils supplementation on serum protein profile and health status related parameters of Japanese quails (Mean ± S.E.)

Treatment	Total serum protein* (g/dl)	Albumin* (g/dl)	Globulin (g/dl)	A/G Ratio*	Serum uric acid* (mg/dl)	Serum creatinine* (mg/dl)	Total bilirubin* (mg/dl)
T_0	4.09^{b}±0.01	1.14^{b}±0.02	2.95 ±0.02	0.38^{b}±0.01	1.60^{a}±0.02	0.65^{a}±0.01	2.42^{a}±0.015
T_1	4.40^{a}±0.12	1.25^{a}±0.02	3.15 ±0.13	0.40^{ab} ±0.02	1.37^{b}±0.04	0.55^{b}±0.01	2.34^{b}±0.012
T_2	4.36^{a}±0.07	1.26^{a}±0.02	3.10 ±0.09	0.42^{ab}±0.02	1.43^{b}±0.01	0.56^{b}±0.01	2.35^{b}±0.012
T_3	4.39^{a}±0.05	1.24^{a}±0.03	3.15±0.04	0.43^{ab}±0.01	1.40^{b}±0.04	0.54^{b}±0.02	2.33^{b}±0.02
T_4	4.19^{ab}±0.02	1.26^{a}±0.02	2.94 ±0.01	0.45^{a}±0.02	1.37^{b}±0.02	0.53^{b}±0.00	2.31^{b}±0.01

Within the identical column, values with distinct superscripts differ significantly (*p<0.05)

Table 3: Effect of peppermint and eucalyptus essential oils supplementation on enzymatic profile of (IU/L) Japanese quails (Mean ± S.E.)

Treatment	SGPT*	SGOT*
T_0	16.69^{a}±0.05	159.52^{a}±0.75
T_1	13.49^{c}±0.11	142.63^{bc}±1.98
T_2	13.83^{c}±0.13	139.40^{c}±1.29
T_3	12.56^{d}±0.23	131.47^{d}±0.85
T_4	14.37^{b}±0.12	144.97^{b}±1.17

Within the identical column, values with distinct superscripts differ significantly (*p<0.05)

4. Conclusion

It can be concluded that the groups supplemented with peppermint and eucalyptus essential oil had significantly (p<0.05) improved serum biochemical parameters in birds favouring the health of the birds especially in the group T_1 (0.2% peppermint essential oil), T_2 (0.2% eucalyptus essential oil) and T_3 (0.1% of peppermint and eucalyptus in combination).

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6. Conflict of Interest

There is no conflict regarding this research.

References

1. Abdel-Waretha AAA, Lohakare, JD. Productive performance, egg quality, nutrients digestibility, and physiological response of bovans brown hens fed various dietary inclusion levels of peppermint oil. Animal Feed Science and Technology. 2020;267(1):114554.
2. Ahmed AMH, El-Sanhoury MHS, Mostafa MME. Effect of peppermint extracts inclusion in broiler chick diet on chick performance, plasma constituents, carcass traits and some microbial populations, enzymatic activity, and histological aspects of small intestine. Asian Journal of Animal and Veterinary Advances. 2016;11:441-45.
3. Akbari M, Torki M. Effects of dietary chromium picolinate and peppermint essential oil on growth performance and blood biochemical parameters of broiler chicks reared under heat stress conditions. International Journal of Biometeorology. 2013;58(6):1383-1391.
4. Al-Kassie GAM. The role of peppermint (*Mentha piperita*) on performance in broiler diets. Agriculture and Biology Journal of North America. 2010;1(5):1009-1013.
5. Ameri SA, Samadi F, Dastar B, Zerehdaran S. Effect of Peppermint (*Mentha piperita*) Powder on Immune Response of Broiler Chickens in Heat Stress. Iran Journal of Applied Animal Science. 2016;6(2):435-445.
6. Bento MHL, Ouwehand AC, Tiihonen K, Lahtinen S, Nurminen P, Saarinen MT, *et al*. Essential oils and their use in animal feeds for monogastric animals-Effects on feed quality, gut microbiota, growth performance and food safety: A Review. Veterinary Medicine. 2013;58(9):449-458.
7. Hasan HI, M'Sadeq SA. Effect of peppermint supplementation as powder or extract on broiler performance, serum biochemical content and gut health under *E coli* challenge. Iraqian Journal of Agricultural. Science. 2020;51(1):299-310.
8. http://dahd.nic.in Basic Animal Husbandry Statistics (BAHS) Department of Animal Husbandry and Dairying, 26/11/2024.
9. Hussein SM. Effect of Peppermint (*Mentha piperita*) Powder on Performance, Gut Morphology, and Immune Organs Response of Coccidiosis Infected Broilers. Iraqian Journal of Agricultural Science. 2021;52(2):276-290.
10. ICAR. Nutrient Requirements of Poultry, Indian Council of Agricultural Research, New Delhi. 2013.
11. Kaur M, Kumar R, Mondal BC, Siddiqui R, Kumar A, Palod J, *et al*. Effect of Supplementation of Eucalyptus (*Eucalyptus globulus*) Leaf Powder in Diet Containing Phytase Enzyme on Performance of Commercial Laying Hens. Indian Journal of Veterinary Science and Biotechnology. 2022;18(1):28-33.

12. Khodadust MR, Samadi F, Ganji F, Jafari Ahangari Y, Asadi GH. Effects of peppermint (*Mentha piperita* L.) alcoholic extract on carbon tetrachloride-induced hepatotoxicity in broiler chickens under heat stress condition. Poultry Science Journal. 2015;3(1):1-16.
13. Mashayekhi H, Mazhari H, Esmaeilipour O. Eucalyptus leaves powder, antibiotic and probiotic addition to broiler diets: effect on growth performance, immune response, blood components and carcass traits. Animals. 2018;12(10):2049-2055.
14. Mehri M, Sabaghi V, Bagherzadeh-Kasmani F. *Mentha piperita* (peppermint) in growing Japanese quail's diet: Performance, carcass attributes, morphology, and microbial populations of intestine. Animal Feed Science and Technology. 2015;207: 104-111.
15. Mishra P, Shukla S. Quail Farming: An Introduction. International Journal of Life Sciences. 2014;2(2):190-193.
16. Mohebodini H, Jazi V, Ashayerizadeh A, Toghyani M, Tellez-Isaias G. Productive parameters, caecal microflora, nutrient digestibility, antioxidant status, and thigh muscle fatty acid profile in broiler chickens fed with *Eucalyptus globulus* essential oil. Poultry Science. 2021;100(3):100922-100932.
17. Snedecor GW, Cochran WB. Statistical Methods. 8th Edn. The Iowa State University Press, Ames, IOWA, USA; 1994.