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# Effects of different herbs and herbal mixture combinations on biochemical profile of Japanese quails

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**Abstract**
The aim of the study was to evaluate the effect of different herbs as non nutrient feed additives on biochemical parameters of Japanese quail (*Coturnix coturnix japonica*). A total four hundred and eighty day-old straight run Japanese quail chicks were randomly allotted into eight different treatment groups with three replicates 20 birds each. The experimental diets were control (T1), Ginger rhizome powder @1% (T2), 1% Turmeric rhizome powder @1% (T3), Tulsi leaf powder @1% (T4), Coriander seed powder @1% (T5) and herbal mixture combinations *viz*., Turmeric rhizome powder @ 0.25% + Tulsi leaf powder @ 0.25% + Ginger rhizome powder @ 0.25% + Fenugreek seed powder @ 0.25% (T6), Turmeric rhizome powder @ 0.25% + Ginger rhizome powder@ 0.25% + Fenugreek seeds powder@ 0.25% + Coriander seeds powder @ 0.25% (T7) and Turmeric rhizome powder@ 0.25% + Curry leaf powder@ 0.25% + Ginger rhizome powder@ 0.25% + Fenugreek seed powder @ 0.25% (T8). At the end of 42 days experiment period, the birds were slaughtered and blood samples were collected for determination of serum biochemical parameters *viz*., total protein, albumin, cholesterol triglycerides and glucose. The serum total protein content is significantly ($P< 0.05$) higher in T3 and T4 groups compared to control and other treatment groups. Significantly ($P< 0.05$) lower serum cholesterol (21.97 mg/dl) in T4 group supplemented with Tulsi leaf powder at 1.00 per cent level compared to control group. The results showed that serum triglycerides level among all treatment groups were significantly lower ($P< 0.05$) compared to control. It was concluded that supplementation of different herbs as non nutrient feed additives improved biochemical profiles of Japanese quails.

**Keywords:** Herbs, biochemical profile, cholesterol, Japanese quails

## 1. Introduction
Antibiotic growth promoters (AGP) have been widely utilised as non-nutrient feed additives in livestock and poultry feed for many years to boost growth and productivity, and this practice has resulted in significant improvements in livestock and poultry growth and productivity. However, the use of AGP in livestock and poultry increased production costs and also resulted in residues in meat and eggs due to the development of antibiotic-resistant bacteria in the gut microflora of livestock and poultry (Yang *et al*., 2009; Sojoudi *et al*., 2012) [14, 12]. Antibiotic residues in meat and eggs and their negative impact on the development of antibiotic resistance in consumers. Because of the presence of antibiotic residues in meat and eggs, as well as their negative impact on the development of antibiotic resistance in consumers, many nations have outlawed the use of antibiotic growth promoters in livestock and poultry. Many natural alternatives, such as probiotics, prebiotics, plant extracts, and essential oils, are currently gaining popularity as a replacement to AGP for feeding poultry and animals because of their ease of availability, favorable influence on bird productivity, and lack of residual effects (Tipu *et al*., 2006) [13]. Presence of secondary plant metabolites as bioactive compounds in herbs enhance the metabolic process and health status of livestock and poultry. The serum biochemical profiles used as indices for assessing the health status of the birds and very few studies have been conducted with supplementation of herbs and herbal mixture combinations and its impact on biochemical parameters of Japanese quails.
Keeping in view of the above the current study was designed and conducted to assess health benefits of the effect of different herbs and herbal mixture combinations on serum biochemical profile of Japanese quail (*Coturnix coturnix japonica*).

## 2. Materials and Methods
The growth study was conducted for a period of six weeks at College of Poultry production and Management, Hosur. A total of four hundred and eighty day-old straight run Japanese quail chicks were individually weighed to 0.1 g accuracy and the mean chick weight was

calculated and randomly allotted into eight different treatments. Sixty birds were allotted to each treatment and each treatment had three replicates of 20 birds each. The experimental diets were control (T1), Ginger rhizome powder @1% (T2), 1% Turmeric rhizome powder @1% (T3), Tulsi leaf powder @1% (T4), Coriander seed powder @1% (T5) and herbal mixture combinations *viz*., Turmeric rhizome powder @ 0.25% + Tulsi leaf powder @ 0.25% + Ginger rhizome powder @ 0.25% + Fenugreek seed powder @ 0.25% (T6), Turmeric rhizome powder @ 0.25% + Ginger rhizome powder@ 0.25% + Fenugreek seeds powder@ 0.25% + Coriander seeds powder @ 0.25% (T7) and Turmeric rhizome powder@ 0.25% + Curry leaf powder@ 0.25% + Ginger rhizome powder@ 0.25% + Fenugreek seed powder @ 0.25% (T8). The herbs used in this study were procured locally and incorporated at 1.0 per cent level in experimental diet of each treatment group. The experimental diets were formulated as per ICAR (2013) specifications for Japanese quails. During the experiment, birds were fed standard quail brooder and grower cum finisher diets containing 2900 and 2950 Kcal/kg ME and of 25.00 and 21.50% crude protein respectively.

For the first two weeks, the birds in all treatment groups were reared under deep litter system and from third week and up to six weeks, the birds in all treatment groups were reared in grower cages. Electrical brooding was practiced up to two weeks. Adequate care was taken to provide optimum and uniform management to all the treatments groups. Sufficient feeders and waterers were kept inside the premises to provide adequate feed and water for the birds.

At the end of 42 days of experimental period, six birds in each treatment (three males and three females) randomly selected and samples of blood were collected in serum collection vacutainer tubes. Blood samples were allowed to clot and centrifuged at 2500 rpm for 5 minutes to separate the serum and stored in -20 $^{0}$C and the serum samples were used for determination of biochemical parameters *viz*., total protein, albumin, cholesterol triglycerides and glucose. The assay was carried out according to the manufacturer's protocols (M/s. Span Diagnostics Private Limited). The data were collected and analyzed statistically as per Snedecor and Cochran (1993) [11].

## 3. Results and Discussion

The results on the effect of supplementation of Japanese quails with various herbs and herbal mixture combinations on serum biochemical profiles *viz*., total protein (g/dl), albumin g/dl), globulins (g/dl), cholesterol (mg/dl), triglycerides (mg/dl) and glucose (mg/dl) were presented in Table 1.

The data on present study revealed that the average serum total proteins ranged from 3.57 in T1 to 9.97 g/dl in T3, serum cholesterol levels ranged from 21.97 in T4 group to 39.90 mg/dl in T5 group, serum triglycerides ranged from 27.13 in T7 group to159.99 mg/dl in control group and serum glucose ranged from 82.62 in control group to 178.84 mg/dl in T3 group. The serum albumin and globulin values ranged from 1.38to 2.05 g/dl and 1.49to 8.60 g/dl, respectively among treatment groups.

The serum total protein content is significantly ($P$<0.05) higher in T3 and T4 groups compared to control and other treatment groups. The higher serum total protein content of 5.46 in T2 group supplemented with Ginger rhizome powder in Japanese quails compared to control group is comparable with the findings of Oleforuh-Okoleh *et al.*,(2015) [7] who reported higher serum total protein levels when supplemented with different levels of ginger extract has significantly increased the total protein content. They attributed the higher protein levels may be due to presence of an enzyme, zingibain a protein digesting enzyme which increased the assimilation of protein in broilers. In contrast to the findings of the present study, Al-Homidan (2005) [2] observed reduction in serum total protein content in broilers supplemented with ginger extract which might be due to high dose of ginger supplementation.

The findings in the present study also revealed significantly ($P$< 0.05) lower serum albumin content in control and T4 group compared to other treatment groups. In contrast to the findings of the present study Raju *et al.,* (2019) [9] reported that no significance in serum albumin content of Japanese quails supplemented with different herbal immunomodulators in water.

The results of the study showed that there was a significant ($P$< 0.05) reduction in serum cholesterol (21.97 mg/dl) content in T4 group supplemented with Tulsi leaf powder at 1.00 per cent level compared to control group. Serum cholesterol content of 25.47, 23.20 and 21.97 mg/dl in T2, T3 and T4 groups supplemented with Ginger rhizome powder, Turmeric rhizome powder, and Tulsi leaf powder respectively is significantly lower ($P$< 0.05) compared to control group (30.90 mg/dl). The results are also comparable with the findings of Arslan *et al*., (2017); Abdel-Kader *et al*., (2018) and Oleforuh-Okoleh *et al.,* (2015) who reported reduction in serum cholesterol level in broilers supplemented with various herbs [3, 1, 7].

However, significantly ($P$< 0.05) higher cholesterol levels were reported in T5 group supplemented with Coriander seed powder at 1.00 per cent level compared to control group and the results of this study contradicts with the findings of Chenna Reddy, (2017) [4] observed that increased level of incorporation of coriander seed from 0 to 2.0 per cent in the basal diet of Japanese quails diet significantly ($P$< 0.01) reduced both triglycerides and cholesterol content.

The data on the present study indicated that serum triglycerides level among all treatment groups were significantly lower ($P$< 0.05) compared to control. Among the individual herbal treatment groups, the group supplemented with Tulsi leaf powder (T4) had significantly ($P$< 0.05) lowest serum triglycerides level than other herbal groups. Among the herbal mixture combinations, treatment groups T6, T7 and T8 showed significantly ($P$<0.05) lowest serum triglycerides content compared to treatment groups supplemented with herbs and control. The triglycerides content of 65.99, 60.83 and 63.76 (mg/dl) respectively in herbs in T3, T4 and T5 groups are nearly 2.5 times lesser when compared to the control group. Similar findings in triglycerides were reported by Abdel-Kader *et al*., (2018) [1], who reported reduced levels of serum triglycerides and cholesterol content when supplemented with 3.0 per cent turmeric powder in basal diet of Japanese quails This might be due to presence of bioactive component curcumin in turmeric rhizome powder which reduces plasma LDL and VLDL significantly and liver cholesterol content as reported by Kamal-Eldin *et al*., (2000) [6] along with an increase alpha tocopherol level in rat, suggesting *in vivo* interaction between curcumin and alpha tocopherol that may decrease cholesterol levels.

Sambiah and Srinivasan (1991) [10] indicated that presence of minimum curcumin level, a bioactive compound of turmeric

has its stimulative effect on enzyme hepatic cholesterol -7-hydroxylase and lowers the cholesterol level by stimulating the conversion of cholesterol to bile acids consequently excreting cholesterol from the body without affecting the digestibility of triglycerides in rats

There is a significant increase in serum glucose level in all the treatment groups supplemented with herbs and herbal mixture compared to control group. The serum glucose level in T3 group is significantly higher ($P< 0.05$) compared to control group. The glucose level in T3 group (178.84 mg/dl) is almost twice the level in control group (82.62 mg/dl). These findings are in contrast to the findings of Rehman *et al*., (2011) [8] who reported a significant decrease in serum glucose concentration in mice supplemented with a methanol extract of a *Delonix regia* leaf.

**Table 1:** Biochemical parameters in Japanese quails (Mean ± SE) supplemented with control and experimental diets up to six weeks of age each value is a mean of six observations

| Parameters | T1 | T2 | T3 | T4 | T5 | T6 | T7 | T8 |
|---|---|---|---|---|---|---|---|---|
| Total Protein (g/dl)* | 3.57± 0.57$^{ef}$ | 5.46± 0.37$^{cd}$ | 9.97±0.56$^{a}$ | 9.82±0.56$^{a}$ | 3.82± 0.27$^{ef}$ | 7.94± 0.51$^{b}$ | 4.71±0.43$^{de}$ | 6.56± 0.88$^{bc}$ |
| Albumin (g/dl)* | 1.38± 0.10$^{cd}$ | 1.71± 0.09$^{b}$ | 2.05± 0.88$^{a}$ | 1.22± 0.03$^{d}$ | 1.85± 0.06$^{ab}$ | 1.44± 0.07$^{c}$ | 1.75± 0.07$^{b}$ | 2.04± 0.03$^{a}$ |
| Cholesterol (mg/dl)* | 30.90±3.12$^{bc}$ | 25.47±1.16$^{cd}$ | 23.20±2.04$^{d}$ | 21.97±1.27$^{d}$ | 39.90±3.13$^{a}$ | 36.07±2.04$^{ab}$ | 28.17±1.56$^{cd}$ | 28.80±2.43$^{cd}$ |
| Triglycerides (mg/dl)* | 159.99±5.04$^{a}$ | 94.29±3.81$^{b}$ | 65.99±1.17$^{c}$ | 60.83±3.31$^{c}$ | 63.76±2.57$^{c}$ | 44.59±1.35$^{d}$ | 27.13±2.28$^{e}$ | 27.17±1.51$^{e}$ |
| Glucose (mg/dl)* | 82.62±5.89$^{d}$ | 107.50±8.83$^{cd}$ | 178.84±25.86$^{a}$ | 106.40±6.61$^{cd}$ | 158.17±15.39$^{ab}$ | 133.23±10.94$^{bc}$ | 147.57±6.26$^{ab}$ | 147.57±6.26$^{ab}$ |

*Mean values bearing different superscripts in a row differ significantly ($P< 0.05$)

| | | | | |
|---|---|---|---|---|
| T1 | - | Control (Basal diet alone) | - | - |
| T2 | - | Ginger rhizome powder | @ | 1.00% |
| T3 | - | Turmeric rhizome powder | @ | 1.00% |
| T4 | - | Tulsi leaf powder | @ | 1.00% |
| T5 | - | Coriander seed powder | @ | 1.00% |
| T6 | - | Turmeric rhizome powder @ 0.25% + Tulsi leaf powder @ 0.25% + Ginger rhizome powder @ 0.25% + Fenugreek seed powder @ 0.25% | @ | 1.00% |
| T7 | - | Turmeric rhizome powder @ 0.25% + Ginger rhizome powder @ 0.25% + Fenugreek seed powder @ 0.25% + Coriander seed powder @ 0.25% | @ | 1.00% |
| T8 | - | Turmeric rhizome powder @ 0.25% + Curry leaf powder @ 0.25% + Ginger rhizome powder @ 0.25% + Fenugreek seed powder @ 0.25% | @ | 1.00% |

## 4. Conclusion

The study indicated that supplementation of different herbs and herbal mixture combinations at 1.0 per cent level in basal diet of Japanese quails elicited the beneficial effects on serum biochemical profiles by reducing cholesterol and triglycerides level. It was concluded that supplementation of different herbs and herbal mixture combinations as non-nutrient feed additives in basal diets improved the biochemical profiles of Japanese quails compared to control group.

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