Effect of Supplementing laying Japanese quail (*Coturnix coturnix japonica*) diets with Amla and Green Tea Extracts on the Product Performance and Biochemical Parameters

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Abstract. This study was conducted in the Poultry farm technical-Agriculture research center in Salah Aldeen  to investigate amla and green tea extract effect to product performance and some blood parameters on Japanese quail. In total, 300 17 weeks old quail birds were used in this study and were randomly distributed into four treatments (three replicate each treatment (n=25). The treatment groups were control (basal diet) without supplement, 1% green tea extract (GT 1%), 1% amla (AM 1%) and 1% mixed (GT+AM 1%) respectively. The results show that amla extract improved egg production significantly (P≤0.05) compared to control. The egg weight and egg mass were not significant (P<0.05) between each group. Amla aqueous extract (1%) shows a significant difference in feed intake as compared to the control. Hematology traits revealed a significant increase in Red Blood Cell (RBC) and hemoglobin (Hb) in green tea and amla extracts compared with control and a significant difference was observed between the aqueous extract groups and control in PCV % value. The results showed that there are no significant differences between treatments in each of Total Protein, Albumin and Globulin, but the results indicated a significant decrease (P<0.05) of Triglyceride, Cholesterol and Glucose, in the treatments of amla and green tea aqueous extract compare the control treatment.

1. Introduction

Plant extract is one of the phytogenic and herbal products have received increased attention many years ago as a natural additive they [1]. They have high acceptability amongst consumers and growth promoters, flavour agents and antioxidants to improve the live performance of animals, such as essential oils extracted from thyme, oregano, pepper, and rosemary [2]. This class of feed additives has recently enjoyed increasing interest, especially for use in animal farms and improve the product, as can be seen from a significant increase in the number of scientific publications from 2000 onwards. Several authors have indicated that the use of medicinal plants containing compounds and essential oils (e.g., thyme, turmeric, fennugreek, ginger, green tea, amla and cinnamon) would stimulate the digestive enzymes production and activity; and induce a higher secretion of bile acids [3,4 and 5]. Green tea and amla is one of these medicinal plants that have been used as feed additives or plant extracts, green tea (*Camellia sinensis*) is also included in the list of phytogenic substances and widely used beverage, the prominent flavonoid in green tea is the flavon, catechin, epicatechin,
epicatechin gallate and epigallocatechin gallate. Amla (Emblica officinalis) plant is one of the highly wealthiest sources of ascorbic acid, minerals, tannins, amino acids and phenolic compounds contains linolenic acid (8.8%), linoleic acid (44.0%), oleic acid (28.4%), stearic acid (2.1%), palmitic acid (3.0%) and myristic acid (1.0%) [6, 7, and 8], and it is good sources for alkaloids and phenols. Amla is highly nutritious and it is one of the richest sources of vitamin-C, amino acids, minerals and contains several chemical constituents like tannins, alkaloids and gallic acid are reported to possess biological activity as a stimulate the digestive enzymes production and antioxidants [9]. Amla having phytoestrogens that help to balance sexual hormones levels in animals [10]. This research was carried out with the aim of investigating the effect of amla and green tea extract as a natural or phytobiotic additives in the drinking water of laying Japanese quail.

2. Materials and Methods
This experiment was conducted in the Quail farm at Tikrit Research Part-Office (RRO), Tikrit, Iraq between December 2019 and November 2019. A total of 300 unsexed quail birds (all age 17 weeks) randomly divided into three groups distributed to four treatments (each replicates 25 birds), the birds treated with aqueous extract of Amla and green tea with drinking water as follows:

Control: Basal diet.
GT: Basal diet supplemented with aqueous extract 1% green tea in drinking water.
AM: Basal diet supplemented with aqueous extract of 1% Amla in drinking water.
GT+AM: Basal diet supplemented with Mix aqueous extract (1% green tea + 1% Amla) in drinking water.

The treatments diets were based on corn and soybean meal and formulated according to the requirements for laying Japanese quail (20.84% crude protein, 2825.05 kcal/kg metabolizable energy, 2.5% Ca, 0.60% available P, 0.95% digestible methionine + cysteine, 1.10% digestible lysine, and 1.50% digestible methionine).

The aqueous extract of the amla fruit and green tea were prepared by grinding the dried fruits and adding 50 g of them each 1 litre of water for 24 hours before using. Then filtered by eight layers of clean dry gauze and then the filtrate was heated at 40-50 °C. For 10 minutes, left set until got cool down and then completed the volume with distilled water to 1000 ml. The required concentrations were calculated as mentioned in the method of [11]. The birds were housed on in floor pens with sawdust (50-70 cm) for four weeks, eggs were collected regularly one a day (n=25 per group) and evaluated after collection (HD (%), egg weight (g), egg mass and FCR (g/g)). The samples of blood were collected after at end of the experiment (28 days) by tow type of tubes, one of them contains anticoagulation to estimation the blood hematology procedure (RBC, PCV and Hb) and the other tubes without anticoagulation centrifuged at 3000 rpm for 20 minutes used for obtaining Serum to determine biochemical Parameters of blood which evaluation as [12].

The data in the present study were subjected to statistical analysis using one-way (ANOVA) of STATA in a randomized complete block design and all data were reported as mean ± SEM, when significant differences were identified between treatments, Duncan’s test was used for multiple comparisons [13].

3. Result and Discussion
The results showed in Figure (1) effect of addition aqueous extracts of amla and green tea in egg production, average egg weight, egg mass and feed conversion of laying Japanese quail. The static analyses of data revealed amla aqueous extract (1%) and green tea aqueous extract (1%) treatments have an improved significantly in egg production as compared to the control (Figure1 a). There were no significant differences in average egg weight and egg mass between the aqueous extract treatments and control (Figure1 b and c). Amla aqueous extract
(1%) show a significant difference in average feed intake as compared to the groups (Figure1 d). The higher egg production of amla and green tea aqueous extracts group in the present study could probably be due to rich this aqueous extract from the minerals and contains several chemical constituents like tannins, alkaloids and gallic acid are reported to possess biological activity [9]. [14] show the medical plants have different roles to encourage digestive system in poultry through improve mechanical function of the digestive enzymes as well as liver efficacy and increase the pancreatic. [15,16]. [17] and [18] reported that laying hens add green tea powder to diet showed a significantly increased egg production and egg mass than the control. The significantly increased results obtained in the treatment of adding medicinal plants to the diets of broiler breeder compared to the control relationship free of addition in productive traits in terms of a significant increase in egg production (% (HD), egg weight (g), egg mass (g / day) and decrease. The significance of the percentage of eggs not suitable for hatching (%), maybe due to the provision of the body with nutrients and compounds with beneficial nutritional and health effects, as many sources and studies indicated that these plants contain many components and general nutrients with synergistic effects as they have good proportions of protein, which helps provide a variety of amino acids, especially the essential ones that work to meet the needs of the body [19].

Figure 1. a,b,c and d: Effect of addition aqueous extract of Amla and Green tea on Production of laying Japanese quail

Values that have different letters vertically indicate a significant difference at (p≤0.05).
Control: Basal diet; GT 1%: aqueous extract 1% green tea in drinking water; AM 1%: aqueous extract of 1% Amla in drinking water and GT+AM: aqueous extract mixture (1% green tea + 1% Amla) in drinking water.

The Hematology Traits (Figure 2) revealed a significant increase in Red Blood Cells (RBC) and Hemoglobin (Hb) in amla aqueous extract (1%) and aqueous extract mixture treatments compared with control a group. A significant difference was observed between the aqueous extract groups and control in PCV % value, that reveal the clear positive effect of Amla and green tea extract to the RBC generation and the active ingredients in amla extract have a stimulating effect to increase the formation of red blood cells and increase the concentration of hemoglobin. [20] have shown that the reason for increasing red blood cell numbers when treated with amla may be due to its active components such as vitamin C and tannins (emblicanin A and B) that work to protect the cell, in addition to, amla helps to absorb Iron from the gut as well as its good content of that element all these boosts the manufacture of red blood cells and thus increases their numbers [21].

Values that have different letters vertically indicate a significant difference at (p≤0.05).

Figure 2. Effect of addition aqueous extract of Amla and Green tea on hematology parameters of laying Japanese quail
Table (1) showed a significant decrease of Triglyceride, Cholesterol and Glucose in the treatments of amla and green tea aqueous extract, at tested levels, but there were no significant differences between treatments in each of Protein, Albumin and Globulin. Green tea containing high catechin may have an inhibitory effect on intestinal absorption of lipid and the lowering serum cholesterol may also lead by the suppressing the posttranscriptional action of 3-hydroxy-3-methylglutaryl coenzyme A (HMG-CoA) reductase, the ratelimiting enzyme in the mevalonate pathway of endogenous cholesterol synthesis by the liver [15,22]. [23] reported that the phenolic compounds such as tannin and flavonoids present in amla extract have a high efficacy in reducing glucose and lipid levels. In a previous study of [24], the results showed that the addition of green tea powder to quail diet did have a significant effect on decreasing the blood serum cholesterol concentrations. Amla has a lowering effect on cholesterol levels too [25]. In the study of [26] significantly lowest serum cholesterol when supplemented amla fruit powder broiler chicken. It has been observed that the amla fruit have a positive effect to reduce triglycerides and cholesterol levels, and these results confirm with observed of [27]. In addition to the aforementioned, the lowering effect of cholesterol exhibited by amla treatments may be due to the high content of polyphenol phenolic compounds [28]. previous studies of [29].

Table1. Effect of addition aqueous extract of Amla and green tea on biochemical parameters of laying Japanese quail

| Treatment  | Triglyceride (mg/dl) | Cholesterol (mg/dl) | Glucose (mg/dl) | Total Protein (g/dl) | Albumin (g/dl) | Globulin (g/dl) |
|------------|----------------------|---------------------|-----------------|----------------------|----------------|-----------------|
| Control    | 225.15±7.25          | 187.00±7.88         | 289.00±6.88     | ±0.25 4.85           | 2.7±0.10       | 2.15±0.3        |
| GT 1%      | 195.00±9.52          | 169.12±6.18         | ±6.90           | ±0.36 5.25           | 3.12±0.2       | 2.13±0.2        |
| AM1%       | 201.05±7.88          | 172.21±6.33         | 276.25±7.06     | ±0.19 4.71           | 2.95±0.1       | 1.76±0.1        |
| GT+AM      | bca±8.21             | 161.02±5.25         | 280.00±7.21     | ±0.41 5.00           | 3.05±0.2       | 1.95±0.2        |

Values that have different letters vertically indicate a significant difference at (p≤0.05). Control: Basal diet; GT 1% : aqueous extract 1% green tea in drinking water; AM 1% : aqueous extract of 1% Amla in drinking water and GT+AM : aqueous extract mixture (1% green tea + 1% Amla) in drinking water.

Conclusion
The results of this study, the aqueous extracts of Amla and green tea added to the drinking water of layers can improve the productive performance, biochemistry and reduce the cholesterol content in the serum. Adding Amla and green tea as aqueous extracts, do not have side effects on the health of the birds. As for that, using each one of the aqueous extracts or both together prove that their growth promoter and performance of poultry by improving digestion, metabolism and absorption of certain nutrients which ultimately improve body health increases.
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