Effect of Adding Different Levels of Pomegranate Peel Powder to Feed on Some Biochemical Blood Traits of Laying Hens

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Abstract

The study was conducted to determine the effect of adding pomegranate peel powder to feed on some blood traits of laying hens was studied. The experiment treatment were as 0, 2, 4 and 6 g pomegranate peel powder / 1 kg diet for treatments (T1, T2, T3 and T4). The study traits were the concentration of cholesterol, LDL, HDL, triglycerides, glucose, total protein, albumin, and globulin. Results show that the concentration of cholesterol, LDL, HDL, triglycerides, glucose, total protein, albumin, and globulin concentration that there were no significant differences in these traits at the beginning of the experiment (at the age of 60 weeks), while increased significantly at the age of 72 weeks compare with the control.

Keywords: Pomegranate peel powder, Biochemical blood traits, Laying hens.

1. Introduction

Recent studies have shown the importance of using herbs and plants, whether through direct use or by extracting these herbs, to ensure their effectiveness on the one hand, and few negative effects as well as economic on the other hand [1]. One of these plants is the pomegranate, as it was found that traditional Chinese medicine uses preparations from the pomegranate fruit, represented in its roots, tree bark and fruit juice, especially the dry peel of the fruit, to treat many diseases, including alkaline blood, hemorrhoids, diarrhea, infections and microbes [2]. The pomegranate has been widely and widely used in folk medicine since several cultures and decades ago. There are some properties and qualities that have recently emerged, such as antioxidants and protective effects against atherosclerosis and others [3].

The active compounds in pomegranate peels delay the oxidation of Low Density Lipoprotein (LDL), which has a negative effect on the organism’s body, as an increase of more than 200 mg / dL causes it to be deposited in the walls of blood vessels, causing severe damage to the work of the heart, leading to the occurrence of thrombosis [4]. The phenolic compounds present in the pomegranate peel act as antioxidants that are able to prevent the oxidation of molecules in vivo. It converts electrons from a specific substance into an oxidizing agent, which damages cells. Antioxidants terminate this chain of reaction by removing the primary mediator completely. It prevents other oxidation reactions from oxidizing themselves and thus maintains the vitality of a living cell [5].

The tannins in pomegranate peels treat problems, that affects the digestive system, the most important of which is stomach acidity, one of the main causes of which is an increase in the secretion of hydrochloric acid from the stomach, or due to a disruption of the acid neutralization process inside the stomach due to a lack of some enzymes. Tannins reduce the effect of hydrochloric acid secreted from the stomach, and stimulating some secreted enzymes to facilitate digestion [6]. Studies have proven that tannic acid extracted from pomegranate peels is effective against the herpes simplex virus. As tannic acid prevents the replication of this virus inside the cell, it is also effective against the common cold virus if it prevents the virus from multiplying inside the living cell [7], [8], showed that the extract of pomegranate peels is not different from the efficacy of Tinidazol in getting rid of Eimeriatenella parasite, which infects domestic chickens due to the presence of both tannins and phenolic compounds that have the ability to precipitate proteins in the cell membrane, reduces the possibility of the parasite’s action, while the drug Tinidazol works on the rapid penetration of the living cell, which inhibits the action of the enzyme ferredoxinoxidoreductase, which is necessary for the reproduction of the parasite.

Pomegranate peels give a non-oxidizing anti-bacterial, as it works by inhibiting the Tyrosinase enzyme. It prevents pathogenic bacteria from benefiting from the action of this enzyme. Pomegranate peels are effective for fighting cancerous tumors of the human breast as well as treating external fungal infections [9].
indicated that pomegranate peel extract contains 14.7% tannins and 2.6% saponins. It had a significant effect in inhibiting the action of pathogenic bacteria isolated from humans. The most important of which are salmonella and Escherichia coli compared to the use of some antibiotics, including ampicillin and chloramphenicol. The pomegranate peels contain Pelletierine, one of the substances that eliminate tapeworms [11]. The pomegranate peels gave a significant decrease in the average egg production, the pomegranate peel did not have a significant effect on feed consumption and feed conversion ratio, no significant effect was recorded on the yolk index, the whiteness index, or the eggshell index, a significant decrease in total cholesterol and LDL, as for Abbas et al. 2017 (85) in an experiment on Japanese quail by partially replacing yellow corn with pomegranate peel powder at levels of (2.5, 5.0, 7.5%). The replacement treatments gave an improvement in the feed conversion ratio, egg production, number of eggs, egg weight and egg mass. The third treatment gave (5.0)% a decrease in the level of cholesterol in the blood, triglycerides and glucose concentration [12].

This study aims to demonstrate the effect of adding different levels of pomegranate peel powder to feed on some blood traits of laying hens (ISA Brown).

2. Materials and Methods

2.1 Experiment site

The field work of this study was conducted in the poultry field of the Department of Animal Production, College of Agriculture, Al-Muthanna University, from 1/7/2020 to 22/9/2020.

2.2 Experiment design and chick management

A total of 84 layer hens (ISA brown) were used, prepared from the poultry field located in the Agricultural Research and Experiments Station belonging to the College of Agriculture, Al-Muthanna University, 60 weeks age. Put at one of the ground rearing halls located in the poultry field of the Animal Production Department, it was distributed over four treatments distributed over four places (3x3 m), each was divided into three equal sections, each section containing 7 laying hens (21 laying hens / treatment). The effect of adding pomegranate peel powder to feed on some blood traits laying hens was studied. The experiment parameters were as follows:

T1: (control treatment) free of pomegranate peel powder.
T2: adding pomegranate peel powder at a diet of 2 g/ kg of feed.
T3: adding pomegranate peel powder at a diet of 4 g /kg of feed.
T4: adding pomegranate peel powder at a diet of 6 g / kg of feed.

2.3 Pomegranate peel powder

Prepare pomegranate peels from local markets in Al-Muthanna Governorate, after confirming that the pomegranate peels are clean and free of impurities, foreign substances and dust, wash them with water and leave them to dry, the pomegranate peels with a size of (1) mm were ground using a special mill in the Poultry Laboratory, Faculty of Agriculture, after the milling process was completed, it was transferred to the field to complete the diet processing process.

2.4 Studied traits

2.4.1 Biochemical traits of blood

All analyzes of the biochemical characteristics of the blood were carried out in the laboratory of Bashaaer Al Harthiya for pathological analyzes (a private laboratory). Blood samples were collected twice, the first at the beginning of the experiment (at 62 weeks of age), and the second at the end of the experiment (at 72 weeks of age), by taking blood samples from the brachial vein from 6 birds for each treatment. The blood was collected in 10ml glass tubes that did not contain anticoagulant, placed horizontally to get rid of the clot (fibrinogen proteins), put the blood into the centrifuge at 3000 rpm for 15 minutes. The serum was stored in other sterile tubes at a temperature of -18°C, for the purpose of conducting laboratory analyzes and according to the instructions attached with the ready-made kits for the purpose of estimating the concentration of cholesterol, LDL, HDL, triglycerides, glucose, total protein, albumin, and globulin.
2.5 Statistical analysis

Complete Random Design (CRD) was used to study the effect of different sources of imported premixes in laying hens’ diets on the studied traits, and significant differences between means were compared with Duncan [13] multiple range test under the 0.05 level of significance. The program SPSS [14] was used in the statistical analysis.

3. Results

Table (1) shows the effect of adding different levels of pomegranate peel powder on the concentration of cholesterol, LDL and HDL in the plasma of laying hens. It was noted that there were no significant differences in these traits at the beginning of the experiment (at the age of 60 weeks), as well as that the cholesterol concentration was not significantly affected at the age of 72 weeks (end of the experiment). The LDL concentration increased significantly at the age of 72 weeks in the control and T2 treatment compared to the T3 treatment, and no significant differences were observed between T1, T2 and T4 on the one hand and between the treatments T2, T3 and T4 on the other hand.

Table (2) shows the effect of different levels of pomegranate peel powder for fodder on triglycerides and glucose, no significant differences between all treatments at the age of 60 weeks, and that the moral effect was found at the age of 72 weeks. Triglyceride levels increased in T4 compared to the T3 treatment, which was significantly superior compared to the T2 treatment. No significant differences were observed between treatments T1 and T2 and treatments T1 and T3. The level of glucose was significantly increased in the treatment T4 compared to T2 and T3, which was significantly superior compared to the control treatment. T2 and T3 coefficients did not differ significantly.

Table (3) shows the effect of adding different levels of pomegranate peel powder to feed on total protein, albumin and globulin in laying blood plasma. It was noticed that there were no significant differences between all the experimental treatments and the traits of total protein, albumin and globulin at the age of 60 weeks, and that T4 was significantly superior to T1, T2 and T3 in both total protein, albumin and globulin at 72 weeks of age, and treatments T1, T2 and T3 did not differ significantly.

Table 1. Effect of adding different levels of pomegranate peel powder on the concentration of cholesterol, LDL and HDL in the plasma of laying hens (mean ± standard error).

| Treatments | Cholesterol (mg/100 ml) | LDL (mg/100 ml) | HDL (mg/100 ml) |
|------------|------------------------|----------------|-----------------|
|            | 60 week                | 72 week        | 60 week         | 72 week         | 60 week         | 72 week         |
| T1         | 4.29±0.295.25          | 0.33±282.53    | 1.36±221.44     | 0.19±219.91     | 0.55±36.05      | 0.12±35.71      |
| T2         | 0.50±300.32            | 0.02±282.75    | 0.33±220.57     | b0.04±219.53    | 0.29±36.03      | b0.04±36.03     |
| T3         | 0.64±300.02            | 0.06±282.77    | 0.20±220.71     | b0.03±219.45    | 0.09±35.91      | b0.04±36.10     |
| T4         | 0.17±300.93            | 0.08±283.12    | 0.38±220.48     | a0.09±219.81    | 0.26±35.70      | a0.03±36.29     |
| Sig.       | N.S                    | N.S            | N.S             | *               | N.S             | *               |

Table 2. Effect of adding different levels of pomegranate peel powder on the concentration of triglycerides and glucose in the plasma of laying hens (mean ± standard error).

| Treatments | Triglycerides (mg/100 ml) | Glucose (mg/100 ml) |
|------------|---------------------------|---------------------|
|            | 60 week                   | 72 week             | 60 week         | 72 week         |
| T1         | 1.07±143.71               | b0.06±144.00        | 3.70±205.93     | a0.19±206.32    |
| T2         | 0.05±144.12               | b0.03±143.97        | 0.59±209.44     | b0.02±206.76    |
| T3         | 0.23±143.90               | b0.03±144.16        | 0.36±209.38     | b0.07±206.81    |
| T4         | 0.42±143.92               | a0.06±144.42        | 0.82±209.01     | a0.07±207.34    |
| Sig.       | N.S                       | *                   | N.S             | *               |
Table 3. Effect of adding different levels of pomegranate peel powder on the concentration of total protein, albumin and globulin in the plasma of laying hens (mean ± standard error).

| Treatments | Total protein (mg/100 ml) | Albumin (mg/100 ml) | Globulin (mg/100 ml) |
|------------|--------------------------|---------------------|----------------------|
|            | 60 week                  | 72 week             | 60 week              | 72 week              | 60 week         | 72 week              |
| T1         | 0.04±4.70                | 0.04±4.65           | 0.01±2.30            | 0.017±2.283          | 0.02±4.400      | 0.03±2.366           |
| T2         | 0.03±4.72                | 0.01±4.70           | 0.01±2.30            | 0.005±2.310          | 0.02±4.16       | 0.008±2.393          |
| T3         | 0.02±4.72                | 0.01±4.70           | 0.01±2.31            | 0.011±2.320          | 0.017±4.16      | 0.014±2.393          |
| T4         | 0.04±4.71                | 0.02±4.85           | 0.01±2.30            | 0.012±2.376          | 0.025±4.10      | 0.017±2.476          |
| Sig.       | N.S                      | *                   | N.S                  | *                    | N.S             | *                    |

4. Discussion

It is noted that the addition of pomegranate peel powder led to an increase in the level of glucose, cholesterol and triglycerides in the blood plasma of birds at the expense of the control treatment. It may be due to stimulating digestion and opening the appetite, which leads to an increase in the delivery of nutrients through the blood, which increases their level in the blood plasma [15], and the increase in the levels of glucose, cholesterol and triglycerides as a result of the effectiveness of enzymes in the digestive tract, especially the enzymes responsible for digesting carbohydrates and fats, which raises their levels in the blood. The cause of the high level of cholesterol may be due to the rapid absorption of added fats by the intestines and thus raises the level of fatty acids of the type HDL (high density proteins), which carries cholesterol from the walls of blood vessels and returns it to the bloodstream, to be used in the manufacture of steroid hormones, including estrogen, progesterone and testosterone, as it provides cholesterol, sterol precursor, which is the basis for the manufacture of steroid hormones [16].

The levels of albumin, globulin and total protein were significantly increased in the treatment of adding pomegranate peel powder compared to the control treatment. It may be due to the presence of the active compounds, which are all flavonoids, phenols, triterpenes and triterpenes [17], which were considered as antioxidants, which have a role in stimulating the process of synthesis of proteins in their various locations in the body, reduces lipid peroxide and increases catalase, which prevents the formation of free radicals in the body. The significant increase in blood proteins is a result of the role of antioxidants in reducing oxidative stress, reflected in the inhibition of cortisone secretion from the adrenal cortex, which maintains or raises the level of proteins in the plasma [18].

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