Effect of Chia Seeds Water Extract on Some Physiological Traits of Broiler

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Abstract

This experiment was conducted at Poultry field, Agricultural Research and Experiment Station, College of Agriculture, Al-Muthanna University from 12/2/2020 to 6/1/2020. A total of 240 one-day-old, 40 g, Ross 308 broiler chicks, were used. The chicks were reared in four-storey batteries. Each floor contains a cage of dimensions 1.5 x 1 m. The chicks were randomly distributed to four experimental treatments of 60 chicks. For each treatment, three replicates of the treatment (20 chicks/duplicate). The treatments were as T1, T2, T3 and T4 were add water extract of chia seeds to drinking water by 0, 2, 4 and 6 ml / liter of drinking water respectively.

Keywords: Chia seeds, Water extract, Physiological traits, Broiler.

1. Introduction

Chia plant (Salvia hispanica L) of the family Lamiaceae, grown for its seeds and oil, native to central and southern Mexico and Guatemala. Economic historians have pointed out that it was no less important than corn as a food crop. Seeds were sometimes ground up, while the whole seeds are used for nutritious drinks and as a food source. Chia is a herbaceous annual that grows to 1 m tall, with opposite leaves 4–8 cm long and 3–5 cm wide. Purple and white flowers are arranged in panicles at the tip of each stem, the seeds were oval in shape and about 1 mm in diameter. As for their color, they are brown, grey, black, and white spotted [1]. Known as a superfood, chia contains high levels of essential fatty acids, fiber, vitamins and antioxidants. 100 g of chia seeds contain 60-62 g of linolenic acid, 19-20 grams of linoleic acid, 7-8 g of palmitic acid, 7-7.5 g of oleic acid, and 3-4 g of stearic acid [2]. Chia seed oil is 11.12% saturated fatty acid (SFA), 7.29% monounsaturated fatty acid (MUFA), and 81.59% polyunsaturated fatty acid. Approximately 90% of chia seed oil is made up of PUFA, 55-64% of it is omega-3 and 18-20% is omega-6 fatty acid [3].

The fact that eggs contain significant levels of fat and cholesterol causes a decrease in the consumption of eggs. For this reason, many studies have been done to change the fat and cholesterol content in egg yolks with modification of diets, but the desired results in terms of cholesterol levels cannot be obtained. Studies on modifying the fatty acid composition of egg yolks have been more successful. Successful results have been achieved in increasing the level of omega-3 from eggs, a food that can be considered poor in terms of omega-3 content. Compared to other vegetable oils such as corn oil (76.5), canola oil (2.2), soybean oil (6.7) and olive oil (17.8). The n-6/n-3 ratio of shea oil is relatively low. The lower n-6/n-3 ratio of Chia oil can be expected to contribute to the increased n-3/n-6 yolk ratio and thus functional egg production[4,5].

In the poultry industry, efforts continue to increase the value of egg feed. This is because foods rich in omega-3s have higher economic returns. Today, the effects of chia seed oil, which has a rich omega-3 content, on the performance properties and egg quality of poultry has become a subject of curiosity [6]. In a study comparing the effects of dietary supplementation of laying hens with chia seed oil, flaxseed oil, and fish oil, it was reported that the amount of n-3 fatty acids in chicken eggs consuming chia seed oil was increased by 100-120% compared to chicken eggs consuming other fats, one study reported that for chickens, supplementing sources of fatty acids in omega-3 content, such as chia oil, to the diet had positive effects on egg production, egg weight, feeding efficiency and some parameters of egg quality [7].

It was found that chia seeds supplemented with quail laying diets increased egg yolk PUFA levels by 2.96% and decreased n-6/n-3 ratios. Fat and palmitic acid in dark meats increased the level of alpha-linolenic acid significantly [8]. Diet containing 2.5% chia oil supplied to broilers during the period from 29 to 42 days of age improves the feed conversion ratio, thereby resulting in meat with higher nutritional quality [4]. The current study aims to demonstrate the effect of water extract of chia seeds on some physiological traits of broiler.
2. Materials and Methods

2.1 Research design

This experiment was carried out in the poultry field, Agricultural Research and Experiment Station, College of Agriculture, Al-Muthanna University from 12/2/2020 to 6/1/2020. A total of 240 oneday, 40 g, Ross 308 broiler chicks, were used. The chicks were reared in four-storey batteries. Each floor contains a cage of dimensions 1.5 x 1 m. The chicks were randomly distributed to four experimental treatments of 60 chicks. For each treatment, three replicates of the treatment (20 chicks/duplicate). The transactions were as follows:

T1: (the control without any treatments).

T2: add water extract of chia seeds to drinking water by 2 ml / liter of drinking water.

T3: add water extract of chia seeds to drinking water by 4 ml /liter of drinking water.

T4: add water extract of chia seeds to drinking water by 6 ml / liter of drinking water.

Chia seeds were brought from the local markets in Al-Muthanna Governorate. The leaves were ground by an electric grinder and kept in plastic bags until use. The water extract was prepared according to the method of Hernandes et al. [9] by placing 1 kg of seed powder in 10 liters of distilled water and boiled over low heat 60 °C for 60 minutes, and left for 24 hours at room temperature, then filtered so that the concentrated liquid was ready. The concentrated extract was used in three different concentrations distributed by three treatments, were 2, 4 and 6 ml (water extract) / liter (drinking water). The chicks were reared in four-storey batteries, each floor contains 20 broiler chicks. The temperature was regulated by thermometer from one day to marketing (35 days) and by using gas incubators and air vans, while providing all the special conditions for raising broilers. Offer feed and water freely (ad libitum). The continuous lighting system was used 23 hours a day during the first three days of the chicks' life, with one hour of darkness given for the purpose of accustoming the chicks and preventing their disturbance and accumulation, and the number of lighting hours was gradually reduced. Plastic feed trays with a diameter of 38 cm were used in the first week, with one dish for each floor. Clean water (added to the water extract of chia seeds in different concentrations) was prepared and served in inverted plastic with a capacity of 5 liters during the first two weeks of life. The birds were fed three types of diets, the starter diet from the age of 1-14 days, the growth diet from the age of 15-21 days, and the final diet from the age of 22 days until the end of the experiment at the age of 35 days.

2.2 Study traits

2.2.1 Physiological traits

Blood samples were collected at the end of the fifth week by taking blood samples from the pterygoid vein 6 birds from each treatment, the birds were slaughtered and blood was collected in 10 ml glass tubes that do not contain anticoagulant and were placed horizontally to get rid of the clot (fibrinogen proteins) to study the following physiological traits:

2.2.1.1 Glucose (mg. 100ml serum)

Followed the method of Barham and Trinder [10] based on the enzymatic hydrolysis of glucose, and followed the steps supplied with the ready-made measuring kit from Linear Chemicals, S.L. Spanish for the estimation of glucose in the blood of birds.

2.2.1.2 Total cholesterol (mg. 100ml serum)

The method of enzymatic degradation of cholesterol in the serum of birds was followed according to the method of Richmond [11] using ready-made kits from the Stain bio laboratory (American).

2.2.1.3 Triglycerides (mg. 100ml serum)

The concentration of triglycerides in the serum of birds was determined by enzymatic hydrolysis of serum according to the method of Fossati and Prencipe [12].
2.2.1.4 Total protein (g. 100ml serum)

The method of [13], was used after the reagent solution was mixed with the zeroing and standard solution and the sample sequentially. The solutions were left for half an hour at a temperature of 25°C, zeroing the spectrophotometer with the zeroing solution. Read the absorption coefficient of the standard solution and the sample solution at a wavelength of 570 nm.

2.2.1.5 Total albumin (g. 100ml serum)

The method referred to by [14], was adopted after mixing the contents of the tubes (the zeroing solution, the standard solution and the sample) with the reagent solution well and left for 5 minutes at 25°C, then zeroing the spectrophotometer with the zeroing solution, and the absorbance of the standard solution and the sample solution was measured along 570 nm wavelength.

2.2.1.6 Total globulin (g. 100ml serum)

The concentration of globulin was calculated from the difference between the concentration of total protein and albumin, as reported by [15], and globulin was measured in (g / 100 ml of serum).

2.3 Statistical Analysis

Complete Randomized Design (CRD) was used to study the effect of different treatments on the studied traits and the significant differences between means were compared with [16], multiple range test under the significance level of 0.05 and 0.01. The program SPSS [17] was used in the statistical analysis.

3. Results and Discussions

Table 1. shows the effect of using the water extract of chia seeds on the blood characteristics of broilers, where all treatments of water extract of chia seeds show a (P≤ . 5) compared to the other treatments, and there was no significant difference between all treatments of water extract of chia seeds.

| Treatments | Glucose (mg/100ml serum) | Total cholesterol (mg/100ml serum) | Triglycerides (mg/100ml serum) |
|------------|--------------------------|-----------------------------------|------------------------------|
| T1         | 0.22±182.44              | 0.11±144.32                       | 0.17±143.66                  |
| T2         | 0.14±174.57              | b                                  | b                            |
| T3         | 0.23±173.71              | b                                  | b                            |
| T4         | 0.26±172.14              | b                                  | b                            |
| Sig.       | 0.05                     | 0.05                               | 0.05                         |

Improvement of blood characteristics when using water extract of chia seeds, as the decrease in the concentration of glucose, cholesterol and triglycerides may be due to the increase in the number of red blood cells, which increased due to the special effect of chia seeds, which contains omega, which is an antioxidant that protects cells from oxidative stress, which It protects the membranes of red blood cells from the effect of free radicals, as well as the fact that omega is an effective hypoglycemic and anti-diabetic agent, possibly due to increased glucose uptake and metabolism in the liver, along with adipose tissue and inhibition of gluconeogenesis in the liver [18,19]. The table 2. indicates the effect of different levels of chia seed water extract on albumin, globulin and total protein in broiler blood plasma. The results did not show non-significant differences between all treatments of water extract of chia seeds in the same characteristics.
increase catalase, which prevents the formation of free radicals in the body.

Chia seeds stimulate humoral immunity, meaning an increase in the number of type B lymphocytes, which in turn leads to an increase in immunoglobulins, which increases the level of blood proteins. A significant increase in blood proteins is a result of the role of antioxidants in reducing oxidative stress, which is reflected in the inhibition of cortisone secretion from the adrenal cortex, which maintains or raises the level of proteins in the plasma. Chia seeds stimulate humoral immunity, meaning an increase in the number of type B lymphocytes, which in turn leads to an increase in immunoglobulins, which increases the level of globulin in the blood plasma of birds [20, 21].

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