Effect of Adding Different Levels of Turmeric Root Powder and Carnation Flowers to The Diet on Some Blood and Microorganisms Traits of Broilers Under Heat Stress Condition

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Abstract

The current study was carried out on a poultry farm which belongs to the Animal production department - College of Agriculture - University of Kufa, for a period of 35 days starting from October 10 to November 13, 2020 for 5 weeks to find out the effect of adding different levels of turmeric root powder and carnation flowers to the diet on some productive traits of broilers. in the experiment, 360 broiler chicks were used, one-day-old Ross-308 hybrid, The chicks were divided randomly into 6 treatments (60 chicks/treatment) by 3 replicates per treatment, with 20 chicks for each with an average initial weight of 40gm and the treatments were as follows: 0, 3, and 5 gm/kg diet of turmeric root powder for treatments T0, T1, T2, as well as 3 and 5 gm/kg diet fodder of carnation flower powder for treatments T3 and T4, respectively.

Keywords: Stress, Heat, Broilers, Root.

1. Introduction

The poultry industry faced some difficulties, such as rising in environmental temperatures in the world and Iraq in particular, where this rises poultry to heat stress, which leads to physiological and immune imbalances and deterioration in the health status of poultry [1,2]. Therefore, nutritional methods used to treat heat stress can be beneficial and economical, such as using vitamins (A, E, C) and betaine or salicylic acid with the diet or drinking water, and they are important antioxidants to raise the immunity of the bird and thus increase its resistance to heat stress [3,4]. Medicinal plants and herbs were also used, as turmeric roots and carnation flowers were used because of their active substances. Turmeric contains volatile oils in addition to important metabolites such as alkaloids, flavonoids, phenols, tannins. As for cloves, it was found through studies that it is the main source of phenolic acids such as hydroxybenzoic acid, gallic acid, and flavonoids such as hydroxyphenyl propane, hydroxycinnamic acids, and eugenol, which is the main biologically active part [5,6]. It's important to lower the bird's body temperature and the negative effects of heat stress and improvement of the physiological and immune characteristics of domestic birds [7,8].

2. Materials and Methods

This study was carried out in a poultry farm which belongs to the Animal production department College of Agriculture University of Kufa, for a period of 35 days starting from October 10 to November 13, 2020 for 5 weeks to find out the effect of adding different levels of turmeric root powder and carnation flowers to the diet on some productive traits of broilers. in the experiment, 360 broiler chicks were used, a one-day-old Ross-308 hybrid, The chicks were divided randomly into 6 treatments (60 chicks/treatment) by 3 replicates for each treatment, as each replicate included 20 chicks with an average initial weight of 40gm and the treatments were as follows: 0, 3, and 5 gm/kg diet of turmeric root powder for treatments T0, T1, T2, as well as 3 and 5 gm/kg diet fodder of carnation flower powder for treatments T3 and T4, respectively, and treatment T5 contained 4 gm/kg diet fodder mix of Both turmeric root powder and carnation flowers, The chicks were fed with a starter diet with a protein content of 23.04% and representative energy of 2991 Kg/Kcal for three weeks (1-21) days, as well as a final diet containing a protein percentage of 20.08% and representative energy of 3199 Kg/Kcal for two weeks of (22-35) days.
2.1 Laboratory tests related to blood

Blood samples were collected from 2 male birds from each replicate at the end of the fifth week after the end of the experiment period. The samples were collected through the brachial vein by a medical syringe and placed in tubes containing an anticoagulant, the blood was used directly to estimate the total and differential blood cell counts for white blood cells. Heterophil cells (H) and lymphocytes (L) were counted by taking blood smears on glass slides and stained with Wright-Giemsa dye according to the method of [9]. Then it was examined under a microscope as reported in [10] and the L/H ratio was extracted by dividing the total heterophil cells by the total lymphocytes. Anticoagulant-free tubes and blood serum was separated by centrifugation for the purpose of biochemical tests, estimated glucose concentration, total protein concentration, albumin, and globulin by means of ready-made solutions (Kit) produced by the French company (Biolabo).

2.2 Calculating the number of microorganisms

The number of microorganisms in the small intestine was calculated and the analysis was conducted directly, whereby an amount of 1 g of samples (feces) was taken by a sterile pipette and added to the decimal dilution of MicroPeptone water, which had sterilized by autoclave to estimating the number microorganisms in a Pour-Platmethod method which are reported by [11].

3. Results and Discussion

It was clear from Table 1 that there were no significance differences between all treatments in the number of white blood cells, significance increase (P<0.01) in lymphocyte observed in the blood of T1, T2, T3, T4, and T5 Compared with control treatment. As for heterophilic blood cells the ratio of heterophilic cells to lymphocytes (H/L) the significance increase (P<0.01) was observe. In the number of heterophilic blood cells and the ratio (H/L) in the control compared to other treatments T1, T2, T3, T4, and T5. The significance (P<0.01) increase in the number of lymphocytes indicates a decrease in the effect of heat stress on treatment birds, T1, T2, T3, T4, and T5 compared with control. This may be attributed to the role of the active substances of both turmeric and cloves in reducing heat stress on birds Thus, reducing the ratio of heterophilic to lymphocytes in the blood [12,13]. Cloves reduce body temperature by inhibiting the formation of prostaglandins that raise body temperature [14], thus maintaining the number of lymphocytes that are affected by high body heat and turmeric affects the formation of corticosterone, which reduces has crashed of Lymphocytes [15] and consequently the synergistic effect of turmeric and cloves to obtain the best ratio, as in the treatment T5 of cell lymphocytes and cell heterophilic, and the ratio of heterophilic to lymphocytes [16].

Table (2) shows a significance increase (P<0.01) in the concentrations of glucose and uric acid and significance (P<0.01) decrease in the concentration of total protein and globulin for the control birds in general compared to the rest of the experimental treatments. The significance and arithmetic rise in the glucose concentration of control birds compared with the other treatments is due to the high temperatures in the breeding hall and the birds’ exposure to heat stress. This result agrees with what was found by [17]. Which confirmed the high concentration of glucose in the blood of birds when exposed to high temperatures, and this rise may be due to the increase in the rate of secretion of the hormone corticosterone, which is mainly responsible for the production of sugar from non-carbohydrate sources by the process of gluconeogenesis, as this hormone is released in response to maintaining a high level of glucose in the blood Which is the main source of energy for the brain and nervous system [18,19], and this can be inferred from the increase in the H/L ratio of the control birds compared to the other treatments. The high ratio of H/L is an evidence of the occurrence of stress in the control treatment Table 1. The significance (P<0.01) decrease in the values of total protein and globulin and the increase in uric acid values of the control treatment birds compared with the other treatments, It is clear evidence of exposure of control treatment birds heat stress, which leads to an increase in the level of glucose in the blood, and the source of this new glucose is the increase in protein catabolism by the process of gluconeogenesis, which leads to a decrease in the proportion of protein in the blood of control-treated birds and an increase in the level of uric acid as a result of protein catabolism [23,24]. The significance (P<0.01) improvement that occurred in the above characteristics of the birds all treatments compared to the birds of the control may be due to the active substances present in turmeric and cloves, or the synergistic effect of both substances, as they work to reduce the heat stress to which the birds of these treatments are exposed. This can be inferred from Through the moral improvement that occurred in the ratio of H/L for treated birds (Table 1), where [22] mentioned that broilers fed on turmeric or cloves or their mixture lead to an increase in the concentration of total protein and globulin and a decrease in the concentration of glucose and uric acid.

Table (3) shows an increase in the number of harmful E.coli bacteria in the intestines of the control birds T0 under the probability level of (P<0.01) compared with the birds of the treatments T1, T2, T3, T4, and T5. As for the harmful Salmonellla bacteria, the number of bacteria in the intestines of control treatment birds T0 increased under the probability level of (P<0.05) compared to T5 birds. As for the beneficial lactobacilli bacteria, a significance (P<0.05) superiority was
observed in the intestines of T5 birds under the probability level of (P<0.01) compared to the birds of the T0, T1, T3, and T4, and the significance (P<0.01) superiority of the treatments T1, T3 and T4 compared to the control. That improvement in decreased the number of harmful bacteria *E.coli*, *Salmonella* and increased the number of beneficial bacteria *Lactobacillus* for all treatments compared to the control. This may be attributed to the active substance of turmeric and cloves. Turmeric has a high ability to prevent the formation of bacteria colonies in the intestines and the presence of curcumin, the active substance of turmeric, in addition to flavonoids and terpenoids [8,23], and Turmeric improves the microbial environment in the intestines by reducing the number of harmful bacteria and increasing the number of beneficial bacteria in poultry [1]. While the effect of cloves was shown, as eugenol affects both positive and negative bacteria for gram stain where it inhibits the growth process of *E.coli* and *Salmonella* bacteria [12], Eugenol improves the environment and the number of beneficial microorganisms [15]. And the synergistic effect of Cloves and turmeric in T5 treatment reduced the number of harmful bacteria and increased the number of beneficial bacteria.

### Table 1. Total and differential white blood cell count for broilers.

| Treatments | WBC | Heterophils% | Lymphocytes% | H/L |
|------------|-----|--------------|--------------|-----|
| T0         | 28.33 ± 3.84 | a26.80 ± 0.23 | b64.57 ± 2.91 | a0.42 ± 0.02 |
| T1         | 33.75 ± 0.30 | b22.60 ± 0.17 | a73.20 ± 0.40 | b0.31 ± 0.005 |
| T2         | 33.12 ± 1.00 | c19.40 ± 0.52 | a72.50 ± 0.66 | c0.27 ± 0.006 |
| T3         | 33.21 ± 0.50 | b22.68 ± 0.56 | a71.86 ± 1.77 | b0.32 ± 0.008 |
| T4         | 33.28 ± 0.48 | b21.38 ± 0.61 | a72.53 ± 1.57 | b0.29 ± 0.003 |
| T5         | 33.82 ± 0.31 | c18.29 ± 0.62 | a71.66 ± 1.29 | c0.26 ± 0.006 |

**Significant level**

** The vertically different letters indicate the presence of significant differences between the averages under the probability level p < 0.01, N.S indicates no significant differences within the same column.

WBC: white blood cells.

H/L: The ratio of heterophile to lymphocytes.

### Table 2. The biochemical characteristics of broilers.

| Treatments | Glucose (mg/100ml) | Total protein (gm/100ml) | Albums (gm/100ml) | Globulin (gm/100ml) | Uric acid (mg/100ml) |
|------------|--------------------|--------------------------|-------------------|---------------------|---------------------|
| T0         | 313.64 ± 4.97      | b2.80 ± 0.05             | 1.00 ± 0.01       | 2.21 ± 0.12         | 313.64 ± 4.97       |
| T1         | 282.33 ± 7.88      | a3.13 ± 0.14             | 1.10 ± 0.05       | b2.07 ± 0.12        | 313.64 ± 4.97       |
| T2         | 267.66 ± 14.49     | ab3.13 ± 0.20            | 1.06 ± 0.08       | b3.31 ± 0.68        | 267.66 ± 14.49      |
| T3         | 298.65 ± 4.48      | ab3.20 ± 0.05            | 0.90 ± 0.01       | b4.53 ± 0.80        | 298.65 ± 4.48       |
| T4         | 297.00 ± 4.04      | a3.40 ± 0.11             | 0.96 ± 0.08       | b3.76 ± 0.29        | 297.00 ± 4.04       |
| T5         | 228.62 ± 8.98      | a3.36 ± 0.13             | 0.93 ± 0.14       | b4.32 ± 0.21        | 228.62 ± 8.98       |

**Significant level**

** The vertically different letters indicate the presence of significant differences between the means under the level of probability P < 0.05 and P < 0.01, respectively. N.S indicates the absence of significant differences within the same column.

### Table 3. The logarithmic numbers of *Lactobacillus*, *Salmonella*, and *E.coli* bacteria for broilers.

| Treatments | *E.coli* | *Salmonella* | Lactobacillus |
|------------|----------|--------------|---------------|
| T0         | 125 ± 4.04 | 100 ± 4.61    | 140 ± 3.46    |
| T1         | 97 ± 6.35  | 91 ± 2.31     | 177 ± 4.61    |
| T2         | 90 ± 5.03  | 96 ± 4.04     | 187 ± 4.61    |
| T3         | 93 ± 4.61  | 95 ± 6.92     | 176 ± 4.62    |
| T4         | 88 ± 3.46  | 87 ± 1.73     | 185 ± 4.04    |
| T5         | 85 ± 4.04  | 86 ± 2.30     | 199 ± 0.57    |

**Significant level**

** The vertically different letters indicate the presence of significant differences between the means under the level of probability P < 0.05 and P < 0.01, respectively.
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