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

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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, start 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 this experiment, 360 broiler chicks were used, a one-day-old Ross-308 hybrid. Chicks were divided randomly into 6 treatments (60 chick/treatment). Each treatment had 3 replicates with 20 chicks each. These replicate included 20 chicks with an initial average weight of 40gm and the treatments were as follows: 0, 3, and 5 gm/kg diet of turmeric root powder for T0, T1, T2, as well as 3 and 5 gm/kg diet of carnation flower powder for T3 and T4, respectively, and T5 contained 4 gm/kg diet fodder mix of both turmeric root powder and carnation flowers. Chicks were exposed to Cyclical day temperature. Results showed a significant increase (P<0.01) in the total body weight average in T2 and T5 Compared with T0, T1, and T3. Total weight gain increased significantly in T5 (P<0.01) compared to T0, T1, T2, T3, and T4. Also, results showed a significant increase (P<0.01) in the total feed consumption ratio in T1, T2, T4, and T5 compared to T0 and T3. In addition, the total conversion coefficient for the birds showed a significant increase (P<0.01) in T4 and T5 by showing the lowest value 1.58 for both treatments compared to T1 and T3 (1.64 and 1.62), respectively.

Keywords: Broilers, Powder, Stress, Turmeric.

1. Introduction

Despite the development in the poultry industry, it faced several difficulties such as rising in the environmental temperatures in the world and Iraq in particular, whereas this rise led to exposing poultry to heat stress, and that leads to a deterioration in the performance and productivity of birds and economic loss [1]. Therefore, a lot of research and studies have been carried out to reduce the negative effects of heat stress, nutritional methods used to treat heat stress, and it can be useful and economical such as using vitamins (A, E, C), Betaine or salicylic acid with the diet or drinking water. Due to their important antioxidants property which raises the bird's immunity and thus increases its resistance to heat stress [3-8]. Using turmeric root powder and carnation flowers to poultry adding to the diets affect positively growth performance, feed conversion efficiency, and the amount of feed consumed [9,10]. This study aims to use the powder of both turmeric roots and carnation flowers in a broiler diet at different levels to improve production, performance, and reduce heat stress.

2. Materials and Methods

This study was carried out in 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 study 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. Chicks were divided randomly into 6 treatments (60 chick/treatment). Each treatment had 3 replicates with 20 chicks. The average initial weight for each treatment was 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 mix 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. As shown in the table (1), the characteristics were studied productivity (live body weight rate, live weight gain rate, the rate of feed consumption, and the feed conversion factor). Use the program (The Statistical Analysis System) to statistically analyze the studied traits [11], and determine the effect of different treatments for the studied traits using (Complete Randomized Design) and use Duncan's Multilevel Test [12].

Table 1. Shows the components of the starter and Finisher diet used in the experiment.

| Feed material     | starter diet % | Finisher diet % |
|-------------------|----------------|-----------------|
| Corn              | 54             | 58.5            |
| Wheat             | 5              | 5               |
| Soybean meal*     | 36             | 29              |
| Premixes**        | 2.5            | 2.5             |
| Limestone         | 1.1            | 1.1             |
| Dicalcium phosphate*** | 0.1           | 0.1             |
| Salt              | 0.3            | 0.3             |
| Oil               | 1              | 3.5             |
| The total         | 100            | 100             |

| chemical composition | starter diet | Finisher diet |
|----------------------|--------------|---------------|
| Crude Protein %       | 23.04        | 20.08         |
| ME (Kg/Kcal)          | 2991         | 3199.5        |
| Calcium               | 1.101        | 1.085         |
| Phosphorous           | 0.75         | 0.72          |
| Methionine            | 0.49         | 0.46          |
| Cysteine              | 0.35         | 0.31          |
| Calorie/Protein ration| 129.8       | 159.33        |

*Soybean meal Argentinian, 48% crude protein.
**Premixes (Dutch, Maxicare), contain per Kg: V.A 400.000 IU; V.D3 100.000 IU; V.E 1.600 IU; V.K 80mg; V.B1 80mg; V.B2 240mg; Calcium Pantothenate 5.200mg; Niacine 1.400mg; Biotin 2mg; Follice Acide 40mg; V.B12 0.4mg; Dicalcium Phosphate 120.000mg; Phytase 4.000mg; oil 20.000mg; CaCO3 122.000mg; Choline 20.000mg; Protein 20%; ME 3000Kcal/kg; Dig.Lysine 5.71%; Dig.
***Dicalcium phosphate (Turkish) Contain: 22% Inorganic Calcium, 18% Inorganic Phosphorus.

3. Results and Discussion

3.1. live body weight and weight gain

It is clear from tables 2 and 3 the effect of different treatments on live body weight and weight gain for weeks 1, 2, 3, 4, and 5 of age. Table (2) showed, in the 5th week, superior (P<0.01) total weight in T2 and T5 compared to T0, T1, and T3. Total weight gain, table (3), showed a superiority significant increase (P<0.01) in T5 compared to T0, T1, T2, T3, and T4. In addition, table (3) showed a superiority total weight gain (P<0.01) in T2 and T4 compared to T0, T1, and T3. Total body weight and total weight gain showed a significant increase (P<0.01) in T2, T4, and T5 compared to the control group (T0). This increment in total weight gain and live body weight may be due to the active substances of curcumin and eugenol in both turmeric root powder and carnation flowers, respectively. In addition to that, these plants contain alkaline substances (e.g., phenols, tannins, and glycosides) which are considered as antioxidants material that reduces the effect of heat stress[13,14]. The turmeric powder and carnation flowers are important for increasing the palatability and appetite of birds [15,16], which increases feed intake, body weight, and total weight gain as shown in T2 and T4. The essential oils of eugenol and eugenol acetate of cloves increase the secretion of endogenous digestive enzymes which leads to improving the growth performance of domestic birds[17,18]. These results agreed with what was found by [19].
improves the environment of the intestine and its morphological shape, the height of the intestinal villi, the depth of the crypt, and in addition to reducing heat stress. T4 and T5 contained 4 gm/kg diet fodder mix of Both turmeric root powder and carnation flowers, respectively, and T5 contained 4 gm/kg diet fodder mix of Both turmeric root powder and carnation flowers.

The second reason is due to increased feed consumption by the treatments compared to the control group (T0). These results maybe due to one of the following reasons. The first reason is may due to the improvement in the palatability of the bird’s diets that contain curcumin or cloves eugenol, these plants contain flavonoids and pigmented substances which increased the process of feed consumption by the treatments compared to the control group [20,21]. The second reason for increasing feed consumption is reducing heat stress. Turmeric and cloves may have an effective role in relieving heat stress on birds, as these two substances contain effective substances that have a clear role in reducing heat stress [12]. As a result, increased feed consumption since high environmental temperature reduces feed consumption.

### 3.2 Feed Consumption Rate

It can be seen from table (4) that all of the treatments showed a superior increase in the total feed consumption for T1, T2, T3, T4, and T5 compared to the control group (T0). These results maybe due to one of the following reasons. The first reason is may due to the improvement in the palatability of the bird’s diets that contain curcumin or cloves eugenol, these plants contain flavonoids and pigmented substances which increased the process of feed consumption by the treatments compared to the control group [20,21].

### 3.3 Feed Conversion Coefficient

In the current study, table (5), the conversion coefficient showed a significant improvement (P<0.01) regarding the cumulative feed factor. The conversion coefficient shows a significant improvement for T4 and T5 by reaching the low value of 1.58 for both treatments compared to T0, T1, and T3. These results may be attributed to the additives for turmeric root powder which improves the environment of the intestine and its morphological shape, the height of the intestinal villi, the depth of the crypt, and reducing heat stress. T4 and T5 contained 4 gm/kg diet fodder mix of Both turmeric root powder and carnation flowers.

#### Table 2. live body weight rate of broilers (gm).

| Treatments(1) | 1     | 2     | 3     | 4     | 5     |
|---------------|-------|-------|-------|-------|-------|
|               | 158.65 ± 14.32 | 416.05 ± 5.84 | 805.85 ± 0.71 | 1267.33 ± 2.68 | 1890.28 ± 14.37 |
| T1            | 162.60 ± 1.70  | 437.40 ± 8.64  | 837.75 ± 15.66 | 1347.27 ± 7.40 | 1963.00 ± 1.74  |
| T2            | 163.68 ± 2.04  | 442.18 ± 15.52 | 866.03 ± 2.59  | 1382.02 ± 6.09 | 2014.00 ± 3.56  |
| T3            | 159.33 ± 0.22  | 435.75 ± 2.89  | 820.50 ± 2.13  | 1322.20 ± 0.10 | 1909.00 ± 32.02 |
| T4            | 160.08 ± 1.99  | 448.75 ± 7.43  | 886.75 ± 14.29 | 1394.55 ± 28.26 | 1998.40 ± 0.72  |
| T5            | 166.50 ± 1.95  | 448.50 ± 10.28 | 889.00 ± 19.52 | 1409.20 ± 12.34 | 2040.00 ± 7.51  |

Significant level: * N.S ** *** ****

* 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. live weight gain rate of broilers (gm/week).

| Treatments(1) | 1     | 2     | 3     | 4     | 5     | Total weight gain |
|---------------|-------|-------|-------|-------|-------|------------------|
|               | 118.63 ± 0.94 | 257.40 ± 3.21 | 389.80 ± 5.31 | 461.48 ± 3.39 | 622.95 ± 1.70 | 1850.26 ± 10.21 |
| T1            | 122.51 ± 2.12 | 274.80 ± 5.41 | 400.35 ± 0.20 | 509.52 ± 7.93 | 615.73 ± 7.73 | 1922.91 ± 14.56 |
| T2            | 123.61 ± 2.65 | 278.50 ± 15.80 | 423.85 ± 13.07 | 515.99 ± 4.70 | 631.98 ± 6.77 | 1973.93 ± 4.23  |
| T3            | 119.27 ± 0.22 | 276.42 ± 2.85 | 384.75 ± 4.96 | 501.70 ± 2.03 | 586.80 ± 6.23 | 1868.94 ± 6.20  |
| T4            | 119.99 ± 2.01 | 288.67 ± 6.03 | 438.00 ± 1.15 | 507.80 ± 1.03 | 603.85 ± 2.22 | 1958.31 ± 10.44 |
| T5            | 126.34 ± 1.90 | 282.00 ± 11.87 | 440.50 ± 3.17 | 520.20 ± 4.50 | 630.80 ± 3.24 | 1999.84 ± 13.26 |

Significant level: * N.S ** *** ****

* 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.

(1) 0, 3, and 5 gm/kg diet of turmeric root powder for T0, T1, T2, as well as 3 and 5 gm/kg diet of carnation flower powder for T3 and T4, respectively, and T5 contained 4 gm/kg diet fodder mix of Both turmeric root powder and carnation flowers.
the area of absorption of the villi in the small intestine[16]. In addition to that, carnation flowers have a positive effect on the epithelial layer lining the intestine and increasing the number of beneficial lactobacilli bacteria in broiler chickens [1]. The researcher showed adding either turmeric or cloves or both improve the feed conversion factor for broilers[1,11].

| Treatments | 1   | 2   | 3   | 4   | 5   | Total feed consumption |
|------------|-----|-----|-----|-----|-----|------------------------|
| T0         | b141.50 ± 1.45 | c335.00 ± 2.88 | c566.70 ± 1.73 | b766.00 ± 0.76 | b1151.40 ± 14.48 | c2960.60 ± 9.93 |
| T1         | ab147.66 ± 0.88 | a362.67 ± 3.38 | c580.66 ± 4.33 | a842.33 ± 1.20 | a1216.67 ± 3.33 | a3150.00 ± 8.08 |
| T2         | ab146.67 ± 2.66 | b352.00 ± 0.57 | b612.33 ± 0.88 | a858.33 ± 33.66 | b1170.67 ± 0.33 | a3140.00 ± 12.50 |
| T3         | ab147.33 ± 3.17 | a370.17 ± 1.82 | c571.15 ± 12.09 | a840.20 ± 2.02 | c1108.15 ± 15.17 | b3037.00 ± 23.88 |
| T4         | ab145.00 ± 1.15 | a367.33 ± 1.67 | ab636.67 ± 3.17 | a829.00 ± 15.94 | c1121.00 ± 2.90 | a3099.00 ± 46.10 |
| T5         | ab150.33 ± 2.96 | a353.00 ± 4.93 | ab620.33 ± 2.33 | ab849.67 ± 4.33 | ab1176.67 ± 2.90 | a3150.00 ± 4.61 |

Significant level: *<0.05, **<0.01, N.S indicates the absence of significant differences within the same column.

Table 4. The rate of feed consumption for broilers(gm/week).

| Treatments | 1   | 2   | 3   | 4   | 5   | Feed conversion factor |
|------------|-----|-----|-----|-----|-----|------------------------|
| T0         | 1.19 ± 0.01 | ab1.30 ± 0.01 | b1.45 ± 0.01 | 1.66 ± 0.01 | b1.8 ± 50.04 | b1.60 ± 0.005 |
| T1         | 1.21 ± 0.04 | ab1.32 ± 0.03 | b1.45 ± 0.01 | 1.65 ± 0.01 | a1.98 ± 0.01 | a1.64 ± 0.005 |
| T2         | 1.19 ± 0.01 | bc1.26 ± 0.01 | b1.44 ± 0.01 | 1.66 ± 0.05 | b1.85 ± 0.02 | bc1.59 ± 0.004 |
| T3         | 1.24 ± 0.03 | ab1.34 ± 0.01 | a1.48 ± 0.02 | 1.67 ± 0.01 | b1.89 ± 0.03 | b1.62 ± 0.003 |
| T4         | 1.21 ± 0.02 | bc1.27 ± 0.01 | b1.45 ± 0.01 | 1.63 ± 0.03 | b1.86 ± 0.01 | b1.58 ± 0.008 |
| T5         | 1.19 ± 0.03 | bc1.25 ± 0.02 | a1.41 ± 0.01 | 1.63 ± 0.01 | b1.87 ± 0.01 | b1.58 ± 0.002 |

Table 5. The feed conversion factor of broilers(gm feed/gm weight gain).

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