Effect of Supplementing Two Levels of Resveratrol and Oleuropein to Diet in The Productive Traits of Broilers Chickens Reared Under Natural Conditions

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Abstract

The experiment was conducted in the poultry field of the Animal Production Department belonging to the college of Agriculture, Al-Qasim Green University for the period from 2/3/2020 to 3/16/2020. The 225 broiler chickens of Ross-308 were used in the experiment, aged one day, and provided with free feed and water, \textit{ad libitum}, and the chicks were distributed into 5 groups and the groups were as follows, T1, without adding (control treatment), T2,T3 addition Resveratrol at a concentration of (250, 500 mg/kg feed) respectively. T4,T5 addition Oleuropein at a concentration of (250, 500 mg/kg feed) respectively. The results, Resveratrol and Oleuropein addition treatments were significantly excelled to the T1 control treatment in average final body weight and weight gain, and adding Resveratrol was better than Oleuropein, and the total gain, and the improvement of the feed conversion ratio for the addition treatments compared with the control treatment T1.

Keywords: Resveratrol, Oleuropein, Oxidative Stress, Broiler chickens.

1.Introduction

Oxidative stress, which is characterized by the formation of free radicals, including reactive oxygen species (ROS) and reactive nitrogen species (RNS). It affect the body cells and cause damage to all biological molecules such as DNA, proteins and fats, which leads to cell damage and the occurrence of pathological complications [1]. Therefore, the researchers resorted to using many methods and food additives to reduce the effects of oxidative stress, including green tea extract [2] and dried dill powder [3] Other antioxidants including resveratrol were also used, which is a polyphenol antioxidant compound that works to eliminate Free radicals thus protect DNA from oxidative damage and preserve the cell [4]. Another antioxidant substance, Oleuropein, aids growth, reduces oxidative stress by eliminating free radicals, and increases the efficiency of enzymatic antioxidants to eliminate free radicals [5,6]. Therefore, this study aims to know the effect of these additives on the bird's diet on resisting oxidative stress under natural conditions.

2.Materials and Methods

The experiment was conducted in the poultry field of the Animal Production Department belonging to the college of Agriculture, Al-Qasim Green University for the period from 2/3/2020 to 3/16/2020. The 225 broiler chickens of Ross-308 unsexed were used in the experiment, aged one day, and the average weight was 42 g. The chicks were raised on a bed of sawdust, and feed and water were provided to them in a free form, \textit{ad libitum}. The temperature inside the room ranged from 18-24\textdegree C and the humidity ranged 50-60\%. The chicks were distributed randomly into 5 treatments at an average of 3 replicates per treatment and for each replicate 15 birds. The feed was mixed weekly in the family feed factory. Trans-Resveratrol prepared from the American company aSquared nutrition with a purity of 100\% and Oleuropein material from the Chinese company CHANGSHA VIGORUS – TECHCO COLTD with 98\% purity, were added to the feeds in the field weekly to maintain their availability. Chicks were fed on three experimental diets as shown in Table (1) Chicks were fed on three experimental diets, which are the starter diet for a period of 1-10 days, the growth diet for a period of 11-22 days, and the final diet for a period of 23-42 days, and the treatments were as follows,

T1, Chicks were fed on a standard diet without adding any substance (control treatment).

T2, Chicks were fed on a standard diet added to it a Resveratrol at a concentration of 250 mg/kg feed.

T3, Chicks were fed on a standard diet added to it Resveratrol at a concentration of 500 mg/kg feed.
T4. Chicks were fed on a standard diet added to it Oleuropein at a concentration of 250 mg / kg feed.

T5. Chicks were fed on a standard diet added to it Oleuropein at a concentration of 500 mg / kg feed.

The productive traits were measured (average body weight, weight gain, feed intake and feed conversion ratio for weeks (1-6)) a week according to the equations referred to by [7].

2.1. Statistical Analysis

Statistical Analysis System –[8] was used in data analysis to study the effect of different treatments on studied traits according to a Completely randomized design (CRD). The significant differences between the averages were compared with the [9] polynomial test.

Table 1. The percentages of the components of the diets used in the study and their calculated chemical composition

| Components%                  | Starter1-10 day | Growth 11-22 day | Finisher 23-42 day |
|-----------------------------|-----------------|------------------|--------------------|
| yellow corn                 | 47.7            | 51.5             | 40                 |
| Wheat                       | 10              | 10               | 23.7               |
| Soybean meal (1)            | 33              | 29.2             | 24.8               |
| Animal Protein Concentrate (2) | 5               | 5                | 5                  |
| oil                         | 2               | 2.8              | 4.6                |
| Limestone                   | 1.1             | 1                | 1                  |
| Table salt                  | 0.3             | 0.2              | 0.2                |
| A mixture of vitamins and minerals | 0.2            | 0.2              | 0.2                |
| Dicalcium phosphate DCP     | 0.7             | 0.5              | 0.5                |

Calculated chemical composition

| Metabolizable Energy (kcal / kg feed) | Metabolizable Energy (kcal / kg feed) |
|--------------------------------------|---------------------------------------|
| 3000.5                               | 3093                                  |
| 3203                                 |                                        |

(1) The soybean meal used from an Argentinian source contains 48% crude protein and 2230 kilocalories / kg as representative energy. (2) The protein concentrate used is animal (Al Wafi), Dutch origin imported from Al Muwafak company that contains 40% crude protein 5% Raw fat, 2% crude fiber, 6.5% calcium, 4% available phosphorus, 3.85% lysine, 3.70% methionine, 4% methionine + cysteine, 2.3% sodium, 2100 kcal / kg Metabolizable energy and contains a mixture of vitamins and trace minerals to secure the needs of the bird. Phytebase 15,000 enzyme units / kg concentrate, 5,000 mg / kg choline chloride concentrate. (3) Chemical composition calculated according to [10].

3. Results and Discussion

The above productive traits were measured for weeks 1, 2, 3, 4, 5 and 6 of the bird’s age. Table (2) shows the effect of Resveratrol and Oleuropein on average body weight. Since it is noticed that there are no significant differences between the treatment of Resveratrol (T2 and T3) and the addition of Oleuropein (T4, T5) with the control treatment T1 in the first week of age. It is noticed in the second and fourth week that a significantly excelled occurred (P <0.05) in favor of the two treatments T2 and T3 on the control treatment T1 and there were no significant differences between the treatments T2, T3, T4 and T5 as well as between the treatments T1, T4 and T5. In the third week, treatment T2 excelled on treatment T1, and there were no significant differences between treatments T2, T3, T4 and T5, as well as between treatments T1, T3, T4 and T5. While, in the fifth week, a significantly excelled (P <0.05) of the addition treatments on the control treatment T1 and the control treatment T5 and there were no significant differences between the treatments T2, T3 and T4 as well as between the treatments T1, T3, T4 and T5. Where, in the sixth week, we notice a significantly excelled (P <0.05) of the two treatments T2 and T3 on treatment T1 and there were no significant differences between the treatments T1, T4 and T5 as well as between the treatments T2, T3, T4 and T5. While in the fourth week, it is noticed that there is a significantly excelled of the two treatments T2 and T3 on the treatments T1, T4 and T5, and there are no significant differences between the transactions T1, T4 and T5 as well as between the two treatments T4 and T5 as well as between the two treatments T2 and T3. in the fifth...
week, a significantly excelled of the treatment T2 on the two treatments T1 and T5 was observed, and there were no significant differences between the treatments T1, T3, T4 and T5, as well as between the treatments T2, T3 and T4. Where in the sixth week, we notice a significantly excelled (p<0.05) of the addition treatments on the control treatment, and there were no significant differences between the addition treatments. With regard to the total weight gain, it is noted that the addition treatments on the control treatment T1 and the two treatments T2 and T3 on the two treatments T4 and T5, and there are no significant differences between T2 and T3, as well as between T4 and T5. In the fifth week, a significantly excelled of the treatment T2 on the two treatments T1 and T5 was observed, and there were no significant differences between the treatments T1, T3, T4 and T5, as well as between the treatments T2, T3 and T4. Where in the sixth week, we notice a significantly excelled (p <0.05) of the addition treatments on the control treatment, and there were no significant differences between the addition treatments. With regard to the total weight gain, it is noted that the addition treatments on the control treatment T1 and the two treatments T2 and T3 on the two treatments T4 and T5, and there are no significant differences between T2 and T3, as well as between T4 and T5.

As for the weekly and total feed consumption, where it can be seen from Table (4) that there are no significant differences in the amount of feed intake between the treatments and for weeks 1, 2, 3, 4, 5, 6, as well as there were no significant differences in total feed intake. With regard to the weekly and cumulative feed conversion ratio, it is clear from Table (5) that there were no significant differences in the feed conversion ratio for the first, second and third weeks. In the fourth week, there was a significant improvement (P <0.05) in the food conversion ratio for the treatment T2 compared with the treatment T1 and there were no significant differences between T1, T3, T4 and T5 as well as between the treatments T2, T3, T4 and T5. In the fifth week, there is a significant improvement in the two treatments T2 and T4 compared to the control treatment T1 and a significant improvement for the T2 treatment compared with the T3, T4 and T5 treatments, and there were no significant differences between T1, T3 and T5 as well as between T3, T4 and T5. In the sixth week, a significant improvement (P <0.05) was observed for the addition treatments compared with the control treatment T1, and a significant improvement for the treatment T3 compared with the treatments T2, T4 and T5, and there were no significant differences between the treatments T2, T4 and T5. Where, a significant improvement in the cumulative feed conversion ratio (P<0.01) was noted in favor of the addition treatments compared to the control treatment, as well as a significant improvement in the treatment T2 compared with T4 and T5, and there were no significant differences between T2 and T3 as well as between T3, T4 and T5. The reason for the improvement of most of the productive traits of Resveratrol T2 and T3 treatments on the T1 control treatment may be due to the fact that Resveratrol works to eliminate free radicals ROS due to its possession of a phenyl group capable of giving an electron to free radicals ROS and thus reducing oxidative stress [11]. Resveratrol increases citrulline formation from dimethylarginine asymmetric (ADMA) by the enzyme dimethyl arginine dimethylamino hydrolase (DDAH).

As ROS stops the action of this enzyme and thus does not form citrulline, and that citrulline has functions, including stimulating secretion and growth hormone, which increases protein formation in the body and thus increases the growth and development of the body [12]. It helps blood flow, improves metabolism and regulates metabolic processes [13,14]. Resveratrol also produces nitric oxide NO, which increases blood vessel expansion and thus increases blood flow to cells and tissues, especially the digestive system, in order for nutrients to be digested and absorbed. With high efficacy, increasing ROS stops nitric oxide production [15,16]. The excelled of Oleuropein T4 and T5 treatments on the control T1 treatment in most of the productive traits may be due to its possession of a phenyl group capable of giving an electron to free radicals, including the HOCl root that works on oxidation of protein compounds. Therefore, when eliminating it, it works to protect protein compounds from oxidation, which leads to an increase in the average body weight [17]. Oleuropein also stimulates the increase in the secretion of the enzyme pepsin, which is important in the digestion of protein substances [18] and Oleuropein works to eliminate the root Peroxyl is thus protecting erythrocytes from degeneration. As this root attacks the proteins and fats in the membrane of those cells, leading to their degradation, and thus a deficiency in the preparation of O2 into cells and tissues, which negatively affects the metabolic processes, so when eliminating this root, red blood cells are preserved and thus the amount of O2 prepared for cells and tissues It has an important role in metabolic processes [19]. Oleuropein also stimulates the production of nitric oxide by increasing the production of the enzyme NOS, and that nitric oxide works to increase the expansion of blood vessels and thus increase the supply of blood to cells and tissues, including muscles, and supply them with food components [20].

Oleuropein also stimulates the activity of the pancreas, digestive enzymes, and digestive juices, thus digesting materials and nutrients and utilizing them well in order to meet the necessary requirements for the building and growth of the body. Oleuropein also encourages the growth of beneficial bacteria and the elimination of harmful bacteria [21]. It is evident from what was mentioned above that the reason for the deterioration of the T1 control treatment in some productive traits may have been exposed to oxidative stress, i.e. an increase in the formation of free radicals, which have many negative effects that affect the growth of the body and thus a decrease in the efficiency of absorption and utilization of nutrients and this is negatively reflected on the average weight Living body.
### Table 2. The effect of adding two levels of Resveratrol and Oleuropein to the diet in the average body weight (g) of broiler chickens for the 1-6 weeks of age.

| Treat. | 1 week   | 2 weeks   | 3 weeks   | 4 weeks   | 5 weeks   | 6 weeks   | Total weight gain |
|--------|----------|-----------|-----------|-----------|-----------|-----------|------------------|
| T1     | 143.11±2.18 | 337.99±5.16 b | 760.33±18.65 b | 1323.66±33.57 b | 2033.44±35.39 c | 2664.11±27.40 c | 8092.45±50.79 c  |
| T2     | 149.77±3.22 | 365.55±4.55 a | 811.77±4.62 a | 1421.21±7.73 a | 2198.11±8.99 a | 2963.55±29.34 a | 8592.05±51.24 a |
| T3     | 144.88±1.55 | 363.11±2.56 a | 804.55±4.62 a | 1365.66±21.60 ab | 2108.88±40.28 abc | 2838.33±20.34 b | 8706.55±50.79 a |
| T4     | 149.44±1.77 | 354.55±6.73 ab | 795.11±8.55 ab | 1365.66±21.60 ab | 2108.88±40.28 abc | 2838.33±20.34 b | 8706.55±50.79 a |
| T5     | 147.08±3.22 | 351.44±11.17 ab | 800.44±20.47 ab | 1377.33±25.38 ab | 2108.88±40.28 abc | 2803.99±70.59 b | 8412.55±50.79 a |

The averages carrying different letters within the same column differ significantly between them. * (P <0.05), N.S, not significant.

T1, control treatment (without addition), T2,T3 addition of Resveratrol at a concentration of 250 ,500 mg / kg of diet, T4,T5 addition of Oleuropein at a concentration of 250 , 500 mg / kg of diet.

### Table 3. The effect of adding two levels of Resveratrol and Oleuropein to the diet in the average weight gain (g) of broiler chickens for the 1-6 weeks of age.

| Treat. | 1 week   | 2 week   | 3 weeks   | 4 weeks   | 5 week   | 6 weeks   | Total weight gain |
|--------|----------|----------|-----------|-----------|----------|-----------|------------------|
| T1     | 100.89 ±2.32 | 194.88 ±3.96 b | 422.34 ±13.56 | 563.33 ±15.69 c | 709.78 ±10.53 b | 630.67 ±11.54 b | 2621.89 ±27.56 c  |
| T2     | 107.58 ±3.2  | 215.78 ±3.73 a | 446.22 ±6.78  | 609.44 ±3.96 a | 776.90 ±13.16 a | 765.44 ±38.32 a | 2921.36 ±29.60 a  |
| T3     | 102.75 ±1.84 | 218.23 ±3.89 a | 441.44 ±0.86  | 596.11 ±13.67 a | 734.40 ±10.24 ab | 784.93 ±11.02 a | 2761.62 ±29.29 b  |
| T4     | 107.47 ±1.90 | 205.11 ±4.96 ab | 440.56 ±6.14  | 570.55 ±13.96 bc | 743.22 ±21.55 ab | 729.45 ±10.94 a | 2704.36 ±29.29 b  |
| T5     | 104.71 ±3.72 | 204.36 ±7.98 ab | 449.00 ±10.16 | 576.89 ±16.29 bc | 709.67 ±7.72 b   | 716.99 ±47.24 a | 2761.62 ±29.29 b  |

The averages carrying different letters within the same column differ significantly between them. * (P <0.05), N.S, not significant.

T1, control treatment (without addition), T2,T3 addition of Resveratrol at a concentration of 250 ,500 mg / kg of diet, T4,T5 addition of Oleuropein at a concentration of 250 , 500 mg / kg of diet.

### Table 4. The effect of adding two levels of Resveratrol and Oleuropein to the diet in the amount of feed intake (g / bird) for broiler chickens for weeks 1-6 of age.

| Treat. | 1 week   | 2 week   | 3 weeks | 4 weeks | 5 week   | 6 weeks | Total feed intake |
|--------|----------|----------|---------|---------|----------|---------|------------------|
| T1     | 120.55 ±4.51 | 246.33 ±6.65 | 548.44 ±5.33 | 870.44 ±11.56 | 1117.89 ±13.08 | 1238.88 ±28.56 | 4142.53 |
| T2     | 119.55 ±4.15 | 262.55 ±5.73 | 553.99 ±6.35 | 869.77 ±8.85 | 1103.11 ±3.94 | 1243.88 ±15.64 | 4152.85 ±8.76 |
| T3     | 115.00 ±4.00 | 255.33 ±9.97 | 548.11 ±14.25 | 876.88 ±16.79 | 1119.77 ±1.56 | 1236.10 ±6.47 | 4151.19 ±47.46 |
| T4     | 120.99 ±1.85 | 257.33 ±7.37 | 554.66 ±3.09 | 844.44 ±23.28 | 1089.77 ±24.95 | 1228.78 ±30.51 | 4095.97 ±70.63 |
| T5     | 119.44 ±3.31 | 255.44 ±5.67 | 560.44 ±8.81 | 845.77 ±35.05 | 1083.77 ±4.22 | 1253.44 ±48.87 | 4118.30 ±89.93 |

NS, Not significant.

T1, control treatment (without addition), T2,T3 addition of Resveratrol at a concentration of 250 ,500 mg / kg of diet, T4,T5 addition of Oleuropein at a concentration of 250 , 500 mg / kg of diet.
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We conclude from the above study that Resveratrol and Oleuropein improved most of the production traits due to their role in reducing oxidative stress, and the average body weight and total weight gain in the Resveratrol addition treatments were better than the Oleuropein addition treatments. This indicates that the role of Resveratrol was better than Oleuropein in fighting oxidative stress.

Conclusions

We conclude from the above study that Resveratrol and Oleuropein improved most of the production traits due to their role in reducing oxidative stress, and the average body weight and total weight gain in the Resveratrol addition treatments were better than the Oleuropein addition treatments. This indicates that the role of Resveratrol was better than Oleuropein in fighting oxidative stress.

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Table 5. The effect of adding two levels of Resveratrol and Oleuropein to the diet in the feed conversion ratio (g feed / g gain weight) of broilers for weeks 1-6 of age.

| Treat. | 1 week | 2 weeks | 3 weeks | 4 weeks | 5 weeks | 6 weeks | Total |
|-------|--------|---------|---------|---------|---------|---------|-------|
| T1    | 1.194 ±0.02 | 1.264 ±0.03 | 1.298 ±0.04 | 1.545 ±0.03 a | 1.574 ±0.02 a | 1.964 ±0.08 a | 1.579 |
| T2    | 1.111 ±0.02 | 1.216 ±0.02 | 1.241 ±0.02 | 1.427 ±0.01 b | 1.419 ±0.02 c | 1.625 ±0.08 b | 1.421 |
| T3    | 1.119 ±0.03 | 1.170 ±0.06 | 1.241 ±0.03 | 1.471 ±0.01 ab | 1.524 ±0.03 ab | 1.574 ±0.03 c | 1.442 |
| T4    | 1.125 ±0.02 | 1.254 ±0.01 | 1.258 ±0.01 | 1.480 ±0.02 ab | 1.466 ±0.03 b | 1.684 ±0.06 b | 1.464 |
| T5    | 1.140 ±0.07 | 1.250 ±0.02 | 1.248 ±0.01 | 1.466 ±0.05 ab | 1.527 ±0.01 ab | 1.748 ±0.05 b | 1.491 |

* (P <0.05), **(p <0.01), N.S. Not significant.

T1, control treatment (without addition), T2, T3 addition of Resveratrol at a concentration of 250 mg/kg of diet.

T4, T5 addition of Oleuropein at a concentration of 250 mg/kg of diet.
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