Effect of adding nettle plant on some physiological and biochemical parameters of broiler chickens

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Abstract

The objective of this study is to find out the impact of the nettle plant (Urtica dioica L.) on broiler, because of its wide spread in our regions, and insufficient information about its effects on the broiler, as most of the current researches refers its uses in folk medicine. So, this research had been conducted to evaluate the effects of adding 0.25 and 0.5% crushed nettle/kg diet on the blood picture and some biochemical indices of broiler. 180 broiler chicks (Ross 308), one-day-old were randomly distributed into 3 groups (60 birds/group) with 3 replicates/group (20 birds/replicate), and treated until 42 days age as follows: 1st group (Control): standard diets without additives, 2nd group: 0.25% nettle/kg diet, 3rd group: 0.50% nettle/kg diet. Results showed that crushed nettle plant led to an increase in the values of packed cell volume, hemoglobin, mean corpuscular hemoglobin concentration, and it's shortened clotting time, as well as a significant increase (P≤0.05) in the number of basophils compared to the control group. In regard to the biochemical profile in the blood serum of broiler, most of biochemical indices values became better and significant when adding nettle (high-density lipoproteins, low-density lipoproteins, risk index, total protein, globulin, aspartate aminotransferase and alanine aminotransferase). In conclusion, nettle can be given to broiler in these proportions to improve the hematological and biochemical indices due to its properties and contents.

Introduction

Recently, medicinal and aromatic herbal plants and their extracts have received great attention for their health benefits and for their use as growth promoters (1,2). One of these plants which belongs to the Urticaceae family is Nettle (Stinging nettle) (Urtica dioica L.), which is widely cultivated in the world, and it is noted as a herbal plant with medicinal properties (3). Many species of nettle can be found in Iraq, including Urtica dioica and Urtica urens, which are used to improve human and animals’ health, because they contain more than 50 different chemical compounds, especially their active and effective antioxidant compounds (4). Studies have indicated the importance of using nettle, especially the vegetative part (leaves), as it was used as a nutritional supplement in poultry feed (5) to enhance the physiological and productive performance of hens (6). Nettle plant has a variety nutrients, including: antioxidants, vitamins (vitamin B complex, A, C, E, and K) (7,8), which are necessary for the bird’s resistance against diseases and stress, hemoglobin formation, and tissue growth (9), as well as being a good source of amino acids which is important in the bird’s body growth such as lysine and glutamine and methionine (8).

Also it contains several mineral salts such as calcium, iron, magnesium, cobalt, manganese, phosphorus, potassium and sodium (7). Also, it contains histamine, acetylcholine, serotonin, anticoagulants, formic acid, salicylic acid, thymol and carvacrol (8,10).
Physiological changes were observed by Hashemi et al. (11) in the values of RBCs and platelets of broiler reared on a ration containing different levels of dried nettles.

Materials and methods

A total of one hundred eighty broiler chicks (Ross 308), one-day-old were randomly distributed into 3 groups (60 birds/group), with 3 replicates/group (20 birds/replicate), which were reared on ground pens with dimensions 2.5 x 2.5 x 3.0 m for width, length and height respectively, and the requirements of temperature, humidity, ventilation and lighting were taken into consideration according to the bird's age. Dried nettle leaves (Urtica dioica L.) have been bought from the local markets, then it was crushed and mixed with the standard diets. Diet was formed according to the poultry nutrition requirement (12). The diets included: a starter ration till 21 days aged (21.6% crude protein and 2960 kcal/kg), then a grower ration till 42 days aged (19.3% crude protein and 3060 kcal/kg). The diets and water were offered ad libitum to all birds till 42 days age, and the groups were as follows: 1st group (Control): birds were reared on a standard diet without additives. 2nd group: birds were reared on a standard diet supplemented by 0.25% nettle/kg diet. 3rd group: birds were reared on a standard diet supplemented by 0.50% nettle/kg diet.

At 42 days age, six birds from each group were slaughtered, and the blood specimens were collected directly at the slaughtering in two types of tubes: tubes containing the EDTA anticoagulant and plain tubes (contains gel and a clot activator). The isolated serum was taken into consideration according to the methods described in Campbell (13). The hemoglobin (Hb) concentration was determined according to Steel and Torrie (19). The AST values 222.23, 223.96 U/L in T1, 222.23, 223.96 U/L in T2 and 222.23, 223.96 U/L in T3 were estimated using kits (Biosystems, Spain).

Table 1: Effect of crushed nettle on blood picture and clotting time of broiler at 42 days age (Means ±SE)

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Hb (g/dl)</th>
<th>PCV (%)</th>
<th>MCHC (g/dl)</th>
<th>Clotting time (second)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>10.5±0.33 b</td>
<td>29.67±0.42 b</td>
<td>35.39±0.94 b</td>
<td>41.62±2.50 a</td>
</tr>
<tr>
<td>0.25% Nettle/kg diet</td>
<td>11.95±0.25 a</td>
<td>31.17±0.60 a</td>
<td>38.38±0.83 a</td>
<td>34.58±2.54 ab</td>
</tr>
<tr>
<td>0.50% Nettle/kg diet</td>
<td>12.52±0.10 a</td>
<td>31.50±0.43 a</td>
<td>39.76±0.47 a</td>
<td>27.22±2.65 b</td>
</tr>
</tbody>
</table>

Different letters in the same column mean a statistical difference at P≤0.05.

Statistical analysis

The analysis of data was performed by using Statistical Analysis Statics program (18), according to the one-way analysis of variance in the Complete Randomized Design (C.R.D.). The differences between means were determined by Duncan’s multiple range test at the probability level (P≤0.05) according to Steel and Torrie (19).

Results

As shown in Table 1 there are significant increases (P≤0.05) in the values of PCV, Hb and MCHC in T2 and T3 compared with the control group. While the clotting time has decreased significantly (P≤0.05) in T3 compared with a control group.

Table 2 shows a non-significant difference in differential blood leukocyte count and stress index between the study groups, except for the basophiles which is increased significantly (P≤0.05) in T2 and T3 4.00 and 4.67% respectively compared with a control group 2.67%.

Table 3 showed that nettle treatment improves significantly the lipid profile as represented by the significant increase in the HDL in T1 56.37 mg/dl significant decrease in LDL in T2 and T3 44.72, 46.32 mg/dl and risk ratio (LDL/HDL) 0.86, 0.82 respectively as compared with control group 49.56, 50.41 mg/dl and 1.02 for HDL, LDL and risk ratio respectively at (P≤0.05).

Table 4, revealed that the addition of nettle significantly increased (P≤0.05) the value of total protein, globulin and globulin/albumin in T3 compared to the control group (P≤0.05), while the blood glucose and albumin levels were not affected.

On the other hand, nettle treatments reduce significantly the AST values 222.23, 223.96 U/L in T2 and T3 respectively as compared with control group 268.18 U/L, and ALT 29.40 U/L in T3 as compared with control and T2 groups 37.24, 36.45 U/L respectively (Table 5).

Table 2: Effect of crushed nettle on lipid profile and stress index of broiler at 42 days age (Means ±SE)

<table>
<thead>
<tr>
<th>Treatments</th>
<th>HDL (mg/dl)</th>
<th>LDL (mg/dl)</th>
<th>Risk ratio (LDL/HDL)</th>
<th>Stress index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>49.56 ± 0.43</td>
<td>50.41 ± 0.82</td>
<td>1.02</td>
<td>1.02 ± 0.01</td>
</tr>
<tr>
<td>0.25% Nettle/kg diet</td>
<td>56.37 ± 0.94</td>
<td>44.72 ± 0.38</td>
<td>0.86</td>
<td>1.02 ± 0.01</td>
</tr>
<tr>
<td>0.50% Nettle/kg diet</td>
<td>56.37 ± 0.94</td>
<td>46.32 ± 0.74</td>
<td>0.82</td>
<td>1.02 ± 0.01</td>
</tr>
</tbody>
</table>

Different letters in the same column mean a statistical difference at P≤0.05.
These findings agree with the findings of Mansoub (21) who said that nettle is rich in vitamin K (4), which acts as hemostatic (Antihemorrhagic) (22).

The increase in basophils % due to nettle treatments, may sustain the previous studies that nettle may have allergic effect due to its histamine content (23).

Nettle treatment with dose used in the current study (0.25 and 0.5% /kg diet) for 42 days did not subject any allergic effect due to its histamine content (23).

The addition of nettle improved the blood picture, as it significantly increased the values of PCV, Hb and MCHC compared to the control group. These findings agree with the Al-Salihi et al. (5) and Hashemi et al. (11) who said that nettle plant contains several vitamins, minerals (vitamin C, A, E, B complex, iron, copper) (7,8), antioxidants (4) and formic acid, salicylic acid, thymol and carvacrol (8,10), which increases the absorption and metabolism of iron from the gastrointestinal tract, and activates the secretion of the erythropoietin from the kidney, which in turn stimulates the bone marrow to produce red blood cells and then increase the PCV and Hb (20).

We also observe from Table 1 that the nettle plant led to a reduction in the blood clotting time in the T3 (decrease duration of bleeding) compared to the control group, Nasiri et al. (10) and Mansoub (21) stated that nettle is rich in vitamin K (4), which acts as hemostatic (Antihemorrhagic) (22).

The increase in basophils % due to nettle treatments, may sustain the previous studies that nettle may have allergic effect due to its histamine content (23).

Nettle treatment with dose used in the current study (0.25 and 0.5% /kg diet) for 42 days did not subject any stressful effects on the broiler birds as it was clear by the significant reduction in AST and ALT values (Table 5) and the normal stress index values (Table 2).

The improvement in lipid profile of broiler which represented in the significant increase of HDL and the significant reduction of LDL and risk index was in agreement with Hashemi et al. (11) and Keshavarz et al. (24) who suggested that nettle might improve lipoprotein synthesis and metabolism which is reflected in the enhancement of HDL and reduction of LDL and risk index, Righi et al. (25) suggested that the nettle effect on lipid profile maybe related to its high content of antioxidants as polyphenols and vitamins. On the other, the results of the current study on lipid profile not agree with the results of Mansoub (21) and Safamehr et al. (26) in broiler.

The results of nettle treatments on serum glucose were agree with the finding of Safamehr et al. (26), and the

**Table 2: Effect of crushed nettle on differential blood leukocyte count and stress index of broiler at 42 days age (Means ±SE)**

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Heterophils %</th>
<th>Eosinophils %</th>
<th>Basophils %</th>
<th>Lymphocytes %</th>
<th>Monocytes %</th>
<th>Stress index (H/L Ratio)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>30.00±0.52</td>
<td>2.00±0.37</td>
<td>2.67±0.33</td>
<td>62.50±0.56</td>
<td>2.83±0.17</td>
<td>0.48±0.01</td>
</tr>
<tr>
<td>0.25% Nettle/kg diet</td>
<td>29.67±0.71</td>
<td>2.67±0.49</td>
<td>4.00±0.37</td>
<td>61.17±1.14</td>
<td>2.50±0.22</td>
<td>0.49±0.02</td>
</tr>
<tr>
<td>0.50% Nettle/kg diet</td>
<td>29.83±0.83</td>
<td>1.83±0.31</td>
<td>4.67±0.33</td>
<td>60.67±0.56</td>
<td>3.00±0.37</td>
<td>0.49±0.02</td>
</tr>
</tbody>
</table>

Different letters in the same column mean a statistical difference at P≤0.05.

**Table 3: Effect of crushed nettle on total lipid profile and risk index of broiler at 42 days age (Means ±SE)**

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Cholesterol (mg/dl)</th>
<th>Triglycerides (mg/dl)</th>
<th>HDL (mg/dl)</th>
<th>LDL (mg/dl)</th>
<th>VLDL (mg/dl)</th>
<th>Risk Index (LDL/HDL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>110.37±2.70</td>
<td>51.59±2.52</td>
<td>49.56±1.91</td>
<td>50.41±0.85</td>
<td>10.40±0.50</td>
<td>1.02±0.03</td>
</tr>
<tr>
<td>0.25% Nettle/kg diet</td>
<td>106.71±2.82</td>
<td>49.75±1.01</td>
<td>52.03±1.61</td>
<td>44.72±1.36</td>
<td>9.95±0.20</td>
<td>0.86±0.02</td>
</tr>
<tr>
<td>0.50% Nettle/kg diet</td>
<td>113.59±2.23</td>
<td>54.52±2.07</td>
<td>56.37±1.48</td>
<td>46.32±0.85</td>
<td>10.90±0.42</td>
<td>0.82±0.01</td>
</tr>
</tbody>
</table>

Different letters in the same column mean a statistical difference at P≤0.05.

**Table 4: Effect of crushed nettle on blood glucose, total protein, albumin, globulin, and globulin/albumin of broiler at 42 days age (Means ±SE)**

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Glucose (mg/dl)</th>
<th>Total protein (g/dl)</th>
<th>Albumin (g/dl)</th>
<th>Globulin (g/dl)</th>
<th>Globulin / Albumin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>220.41±5.34</td>
<td>3.36±0.08</td>
<td>1.42±0.06</td>
<td>1.94±0.09</td>
<td>1.38±0.11</td>
</tr>
<tr>
<td>0.25% Nettle/kg diet</td>
<td>215.54±2.34</td>
<td>3.39±0.13</td>
<td>1.20±0.09</td>
<td>2.19±0.15</td>
<td>1.88±0.23</td>
</tr>
<tr>
<td>0.50% Nettle/kg diet</td>
<td>224.26±3.44</td>
<td>3.74±0.07</td>
<td>1.25±0.08</td>
<td>2.49±0.14</td>
<td>2.06±0.25</td>
</tr>
</tbody>
</table>

Different letters in the same column mean a statistical difference at P≤0.05.

**Table 5: Effect of crushed nettle on blood AST and ALT of broiler at 42 days age (Means ±SE)**

<table>
<thead>
<tr>
<th>Treatments</th>
<th>AST (U/L)</th>
<th>ALT (U/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>268.18±4.09</td>
<td>37.24±0.38</td>
</tr>
<tr>
<td>0.25% Nettle/kg diet</td>
<td>222.23±2.28</td>
<td>36.45±0.33</td>
</tr>
<tr>
<td>0.50% Nettle/kg diet</td>
<td>223.96±1.77</td>
<td>29.40±0.22</td>
</tr>
</tbody>
</table>

Different letters in the same column mean a statistical difference at P≤0.05.
albumin levels agreed with the finding of Mansoub (21), and Keshavarz et al. (24), and disagreed with finding of Al-Salih et al. (5) who reported that the addition of nettle watery extract to the drinking water of broiler significantly increase albumin level.

Regarding the effects of nettle on total protein, globulin and globulin/albumin, it was agreed with Sharma et al. (27) in its effect on globulin, but did not agree with it in its effect on total protein and globulin / albumin. Dalla and Sheboun (9) reported that nettle was rich in lysine, glutamine and methionine as well as vitamins and many minerals, which may enhance the serum protein levels.

For the impact of nettle treatments on AST and ALT activities, Ozem and Korkmaz (28) reported that this effect may be related to the activation of some antioxidant enzymes as catalase and glutathione transferase, also EL-Ashmawy et al. (29), Loetscher et al. (30) and Kukric (31) refers that nettle has a high content of vitamin, minerals, isoflavones, and polyphenols which enhance the antioxidant status and reduce the impact of stress on cells.

Conclusions

We can conclude that nettle did not induce negative impacts when added by 0.25 and 0.5% on hematological traits, and improved the physiological performance of broiler. However, it needs more studies to validate the effect of nettle, because there are few studies on the effects of this plant on broiler.

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Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this manuscript.

References


118


