



## 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: 1<sup>st</sup> group (Control): standard diets without additives, 2<sup>nd</sup> group: 0.25% nettle/kg diet, 3<sup>rd</sup> 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 ( $P \leq 0.05$ ) 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.

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### 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 a 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 21days 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: 1<sup>st</sup> group (Control): birds were reared on a standard diet without additives. 2<sup>nd</sup> group: birds were reared on a standard diet supplemented by 0.25% nettle/kg diet. 3<sup>rd</sup> 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 preserved at -20° C until the hematological tests will be done. Packed cell volume (PCV) were performed according to the technique described in Campbell (13), and blood hemoglobin (Hb) concentration was determined according to the Drabkin's method (14) utilizing Kit (Biosystems, Spain) as mentioned in Abdul-Majeed *et al.* (15), then the mean corpuscular hemoglobin concentration (MCHC) was calculated as described by Abdul-Majeed and Abdul-Rahman (16), and as stated in Campbell (13), and the blood clotting time was determined using capillary tube method as described by Pal and Pal (17). Giemsa-stained blood smears for differential leukocyte count (DLC) has been done as stated in Campbell (13).

Also, blood glucose, lipid profiles [total cholesterol, triglyceride, high-density lipoprotein (HDL), low-density

lipoproteins (LDL), and very low-density lipoproteins (VLDL)], total protein, albumin, globulin, aspartate aminotransferase (AST) and alanine aminotransferase (ALT) activities were estimated by utilizing kits (Biosystems, Spain).

## 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 ( $P \leq 0.05$ ) according to Steel and Torrie (19).

## Results

As shown in Table 1 there are significant increases ( $P \leq 0.05$ ) in the values of PCV, Hb and MCHC in T<sub>2</sub> and T<sub>3</sub> compared with the control group. While the clotting time has decreased significantly ( $P \leq 0.05$ ) in T<sub>3</sub> 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 ( $P \leq 0.05$ ) in T<sub>2</sub> and T<sub>3</sub> 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 T<sub>3</sub> 56.37 mg/dl significant decrease in LDL in T<sub>2</sub> and T<sub>3</sub> 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 ( $P \leq 0.05$ ).

Table 4, revealed that the addition of nettle significantly increased ( $P \leq 0.05$ ) the value of total protein, globulin and globulin/albumin in T<sub>3</sub> compared to the control group ( $P \leq 0.05$ ), 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 T<sub>2</sub> and T<sub>3</sub> respectively as compared with control group 268.18 U/L, and ALT 29.40 U/L in T<sub>3</sub> as compared with control and T<sub>2</sub> groups 37.24, 36.45 U/L respectively (Table 5).

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

Treatments	Hb (g/dl)	PCV (%)	MCHC (g/dl)	Clotting time (second)
Control	10.50 $\pm$ 0.33 <sup>b</sup>	29.67 $\pm$ 0.42 <sup>b</sup>	35.39 $\pm$ 0.94 <sup>b</sup>	41.62 $\pm$ 2.50 <sup>a</sup>
0.25% Nettle/kg diet	11.95 $\pm$ 0.25 <sup>a</sup>	31.17 $\pm$ 0.60 <sup>a</sup>	38.38 $\pm$ 0.83 <sup>a</sup>	34.58 $\pm$ 2.54 <sup>ab</sup>
0.50% Nettle/kg diet	12.52 $\pm$ 0.10 <sup>a</sup>	31.50 $\pm$ 0.43 <sup>a</sup>	39.76 $\pm$ 0.47 <sup>a</sup>	27.22 $\pm$ 2.65 <sup>b</sup>

Different letters in the same column mean a statistical difference at  $P \leq 0.05$ .

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

Treatments	Heterophils %	Eosinophils %	Basophils %	Lymphocytes %	Monocytes %	Stress index (H/L Ratio)
Control	30.00 $\pm$ 0.52 <sup>a</sup>	2.00 $\pm$ 0.37 <sup>a</sup>	2.67 $\pm$ 0.33 <sup>b</sup>	62.50 $\pm$ 0.56 <sup>a</sup>	2.83 $\pm$ 0.17 <sup>a</sup>	0.48 $\pm$ 0.01 <sup>a</sup>
0.25% Nettle/k diet	29.67 $\pm$ 0.71 <sup>a</sup>	2.67 $\pm$ 0.49 <sup>a</sup>	4.00 $\pm$ 0.37 <sup>a</sup>	61.17 $\pm$ 1.14 <sup>a</sup>	2.50 $\pm$ 0.22 <sup>a</sup>	0.49 $\pm$ 0.02 <sup>a</sup>
0.50% Nettle/k diet	29.83 $\pm$ 0.83 <sup>a</sup>	1.83 $\pm$ 0.31 <sup>a</sup>	4.67 $\pm$ 0.33 <sup>a</sup>	60.67 $\pm$ 0.56 <sup>a</sup>	3.00 $\pm$ 0.37 <sup>a</sup>	0.49 $\pm$ 0.02 <sup>a</sup>

Different letters in the same column mean a statistical difference at  $P \leq 0.05$ .

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

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

Different letters in the same column mean a statistical difference at  $P \leq 0.05$ .

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

Treatments	Glucose (mg/dl)	Total protein (g/dl)	Albumin (g/dl)	Globulin (g/dl)	Globulin / Albumin
Control	220.41 $\pm$ 5.34 <sup>a</sup>	3.36 $\pm$ 0.08 <sup>b</sup>	1.42 $\pm$ 0.06 <sup>a</sup>	1.94 $\pm$ 0.09 <sup>b</sup>	1.38 $\pm$ 0.11 <sup>b</sup>
0.25% Nettle/kg diet	215.54 $\pm$ 2.34 <sup>a</sup>	3.39 $\pm$ 0.13 <sup>b</sup>	1.20 $\pm$ 0.09 <sup>a</sup>	2.19 $\pm$ 0.15 <sup>ab</sup>	1.88 $\pm$ 0.23 <sup>ab</sup>
0.50% Nettle/kg diet	224.26 $\pm$ 3.44 <sup>a</sup>	3.74 $\pm$ 0.07 <sup>a</sup>	1.25 $\pm$ 0.08 <sup>a</sup>	2.49 $\pm$ 0.14 <sup>a</sup>	2.06 $\pm$ 0.25 <sup>a</sup>

Different letters in the same column mean a statistical difference at  $P \leq 0.05$ .

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

Treatments	AST (U/L)	ALT (U/L)
Control	268.18 $\pm$ 4.09 <sup>a</sup>	37.24 $\pm$ 0.38 <sup>a</sup>
0.25% Nettle/kg diet	222.23 $\pm$ 2.28 <sup>b</sup>	36.45 $\pm$ 0.33 <sup>a</sup>
0.50% Nettle/kg diet	223.96 $\pm$ 1.77 <sup>b</sup>	29.40 $\pm$ 0.22 <sup>b</sup>

Different letters in the same column mean a statistical difference at  $P \leq 0.05$ .

## Discussion

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 T<sub>3</sub> (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

albumin levels agreed with the finding of Mansoub (21), and Keshavarz *et al.* (24), and disagreed with finding of Al-Salihi *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, Ozen 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.

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## تأثير إضافة نبات القريص في بعض المعايير الفسلجية والكيموحيوية لمصل دم فروج اللحم

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البحث والتطوير، محافظة نينوى، العراق

### الخلاصة

الهدف من هذه الدراسة هو معرفة تأثير نبات القريص في فروج اللحم، وذلك لانتشاره الواسع في مناطقنا، ولعدم كفاية المعلومات حول آثاره في الفروج، إذ تشير معظم الأبحاث الحالية إلى استخداماته في الطب الشعبي. لذا فقد اجري هذا البحث لتقييم آثار إضافة ٠,٢٥ و ٠,٥٪ مسحوق نبات القريص/ كغم علف في صورة الدم وبعض المؤشرات الكيموحيوية لفروج اللحم. إذ وزع عشوائياً ١٨٠ فرخاً (روز ٣٠٨) بعمر يوم واحد في ٣ مجموعات (٦٠ طائراً/ مجموعة) وبواقع ثلاثة مكررات/مجموعة (٢٠ طائراً/مكرر)، وربييت الطيور إلى عمر ٤٢ يوماً على النحو الآتي: المجموعة الأولى (مجموعة سيطرة): أعطيت طيورها عليفة قياسية بدون إضافات، المجموعة الثانية: أعطيت طيورها ٠,٢٥٪ نبات القريص/ كغم علف، المجموعة الثالثة: أعطيت طيورها ٠,٥٠٪ نبات القريص/ كغم علف. تبين من النتائج أن مسحوق نبات القريص أدى إلى زيادة في قيم حجم خلايا الدم المرصوفة وخضاب الدم ومتوسط تركيز خضاب الكرية وقلل من زمن تخثر الدم، وأدى إلى زيادة معنوية ( $\geq 0.05$ ) في عدد الخلايا القعدة مقارنة مع مجموعة السيطرة. وفيما يتعلق بالمؤشرات الكيموحيوية في مصل دم فروج اللحم، فقد أصبحت معظم قيم المؤشرات الكيموحيوية أفضل وذو معنوية عند إعطاء نبات القريص (البروتينات الدهنية عالية الكثافة والبروتينات الدهنية واطئة الكثافة ومؤشر الخطورة والبروتين الكلي والكلوبيولين والإنزيمات الناقلة لمجموعة الأمين الاسبارتيت والألنن). نستنتج من ذلك أنه يمكن إعطاء نبات القريص لفروج اللحم بهذه النسب لتحسين المؤشرات الدموية والكيموحيوية وذلك لخصائصه ومحتوياته.