

Effect of nettle (*Urtica dioica*) medicinal plant on growth performance, immune responses, and serum biochemical parameters of broiler chickens

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ABSTRACT: This study was conducted to evaluate the effects of dietary nettle (*Urtica dioica*) medicinal plant supplementation on growth performance, carcass traits, and blood biochemical and immunity parameters in female broiler chicks. A total of 300 (Ross-308) broilers were randomly allocated into one of the following dietary treatments: 1) control, basal diet; 2) basal diet with 0.5% nettle; 3) basal diet with 1 % nettle; 4) basal diet with 1.5 % nettle; 5) basal diet with 2% nettle. There were 4 replications per treatment with 15 chicks per pen. Body weight and feed consumption of broilers were measured weekly until 42 d of age, and feed conversion was calculated, accordingly. At day 42, two birds per replicate were slaughtered for determination of carcass and organ weights and blood samples were collected for biochemical and immune evaluation. The dietary supplementation of the nettle did not influence ($P>0.05$) feed intake. Supplementing 1% nettle increased body weight of broilers at 42 days of age ($P<0.05$). Also, there was no difference among 1 and 2% nettle. Feed conversion ratio of chicks fed diets containing 1% of nettle significantly improved in comparison to the control group at 0-21 and 0-42 days of age ($P<0.05$). In addition, different levels of nettle had no significant difference on FCR. However, serum triglyceride and cholesterol concentrations were significantly decreased in broilers fed 1% nettle diet ($P<0.05$) compared with those fed diets without nettle herb. Furthermore, feeding diets containing different levels of nettle did not significantly affect on carcass yield in comparison to control ($P>0.05$). None of the immune related parameters was statistically different among the treatments. These findings indicate that nettle supplementation at 1-2% can be used as growth promoters in broiler diets, and research to elucidate the mechanism for potentially enhanced growth in broilers is required.

Keywords: Serum biochemistry, Carcass traits, Nettle, Performance, Broiler

Introduction

Recently antibiotics or growth promoters (AGP) have been banned to prevent the development of antibiotic-resistance to human pathogenic bacteria and to remove antibiotic residues from poultry products. On the other hand, there is increasing public and government pressure in several countries of the EU and some non-EU nations to search for natural alternatives to antibiotics (Williams & Losa, 2001; McCartney, 2002). This reality has led to a new urgency in the search for AGP replacements.

Plants have been used for medical treatment since prehistoric time (Dragland *et al.*, 2003). There are some important bioactive components such as alkaloids, bitters, flavonoids, bioflavonoids, glycosides, mucilage, saponins, tannins (Vandergrift, 1998) phenols, phenolic acids, quinones, coumarins, terpenoids, essential oils, lectins and polypeptides (Cowan, 1999) in the structures of nearly all the plants. The use of various plant materials as dietary supplements may positively affect poultry health and productivity. The large number of active compounds in these supplements may therefore present a more acceptable defense against bacterial attack than synthetic antimicrobials. There is evidence to suggest that herbs, spices and various plant extracts have appetizing and digestion-stimulating properties and antimicrobial effects (Gill 1999., Langhout 2000., Madrid *et al.* 2003., Alçiçek *et al.* 2004., Zhang *et al.*, 2005), which stimulate the growth of beneficial bacteria and minimize pathogenic bacterial activity in the gastrointestinal tract of

poultry (Wenk, 2000). On the other hand, supplementing the diet with plant material that is rich in active substances with beneficial effects for the immune system can be used as an alternative to antibiotic growth promoters. Nettle (*Urtica dioica* L.) belongs to the family of *Urticaceae*, which is a perennial plant which grows in temperate and tropical wasteland areas around the world. From the roots of *U. dioica*, steroids (Chaurasia and Wichtl, 1987b), terpenoids (Ganser and Spiteller, 1995), phenylpropanoids, coumarins (Chaurasia and Wichtl, 1987a), polysaccharides (Wagner *et al.*, 1989) and lectins (Galelli and Truffa-Bachi, 1993), and from the flowers of this plant, seven flavonol glycosides (kaempferol-3-O-glucoside, and -3-O-rutinoside; quercetin-3-O-glucoside, and -3-O-rutinoside, isorhamnetin-3-O-glucoside, -3-O-rutinoside and -3-O-neohesperidoside) (Chaurasia and Wichtl, 1987b) have been isolated. The isolated major flavonoid glycosides have been determined to have immune stimulatory, anti carcinogenic, anti inflammatory, antioxidant and antiallergenic activities (Glusker and Rossi, 1986; Akbay *et al.*, 2003).

In folk medicine, nettle plants have been used as diuretic, anti-asthmatic, anti-arthritic, antidandruff, galactagogue, haemostatic, hypoglycemic, and tonic (Rechinger, 1963). Nettle, which is a medical plant (Viegi *et al.*, 2003) was used for its anti-oxidative (Toldy *et al.*, 2005) and growth-stimulating (Krusiński, 2004) properties. Nettles are a very nutritious food that is easily digested and is high in minerals (especially iron), vitamin C and pro-vitamin A (Allardice, 1993). It is hypothesized that it may also affect protein and lipid metabolism and improve their performance. The nettle plant supplement is a common dietary additive for humans, and was chosen for its non-toxic chemical composition, relatively low cost and easy availability in northwest Iran. Because of its high content of nutritive substances such as amino acids, minerals and vitamins and active compounds such as tannins, formic acid, salicylic acid, *carvacrol* and *thymol*, nettles could be used in folk veterinary medicine (Viegi *et al.* 2003; Gulcin *et al.* 2004). However, little information has been published on the effects of dried nettle herb as feed additive in poultry diets. The aim of this study was to evaluate the effects of using different levels of dried nettle (*urtica dioica*) medicinal plant on the performance, carcass traits and some blood biochemical and immunity parameters of broilers.

Material and Methods

2.1. Animals and experimental diets

Three hundred female 1-d-old chicks (Ross 308) were obtained from a local hatchery and were weighed and divided into five groups (pen) of 15 birds each. From days 1 to 21, the birds were fed a starter diet and from days 22 to 42, a grower diet in mash form. The experimental diets were as follows: 1: basal diet, no additives (control), 2, 3, 4 and 5 basal diet containing 0.5, 1, 1.5 and 2 percentage of nettle (*Urtica dioica* L.), respectively. During mixing, plant herb was incorporated directly into the dry mix of the diet. Only edible parts were used. Nettle was collected in May, in Sahand area in Maragheh, Iran. Then, nettle was left on a bench to dry in room temperature. The dried sample was chopped into small parts with a blender. Compositions of nettle were determined according to AOAC (1994). The dried nettle ground contained crude proteins 167 g/kg, crude fiber 225 g/kg, calcium 19 g/kg, phosphorus 1.6 g/kg, and ether extract 85.9 g/kg. The ingredient and chemical composition of the diets are presented in Table 1. The diets were isoenergetic and isonitrogenous. All the experimental diets were formulated to meet the minimum nutrient requirements of broilers (NRC, 1994). The experimental diets and drinking water were provided *ad libitum*. The experiment was conducted in an environmentally controlled floor pen house of commercial design. The birds were kept in 20 pens (1.2 × 1.2 m) on wood shavings as litter material. Each pen was equipped with one hanging feeder and one drinker. The lighting cycle was maintained at 23 h/d. The ambient temperature in the experimental house was maintained at 32 °C during the first week and gradually decreased by 3 °C in the second and third weeks, and was fixed at 22 °C thereafter. All mortalities were recorded and necropsied by a veterinary pathologist.

2.2. Performance and carcass components

During the 42 d experimental period, the growth and feed intake of broilers was evaluated weekly. Feed conversion ratio (FCR) was determined at the end of the 21 and 42 days of experimental periods.

At the end of the experiment (at d 42), 2 birds whose body weights were close to the group average were selected from each of the replicate groups of each treatment. These birds were slaughtered by severing the bronchial vein to determine some measurements of carcass yield, selected internal organs, and abdominal fat. The weights of selected internal organs (liver, and small intestines), and abdominal fat, and small intestinal length were measured individually. The weights of these internal organs were expressed as percentages of live body weight.

2.3. Serum biochemistry and immunity parameters

After 12 h of fasting, blood samples were collected from 8 birds in non-heparinised tubes at day 42 of age in each treatment by puncturing the brachial vein. The blood was centrifuged at 2000×g for 15 min to obtain serum (SIGMA 4-15 Lab Centrifuge, Germany). Individual serum samples were analyzed for glucose, total protein, cholesterol, triglyceride, using the kit package (Pars Azmoon Co; Tehran, Iran). Samples of blood (2 for each bird) were collected from the same 8 birds in each treatment into vials containing EDTA. Immediately, these blood samples (0.3 ml) were assessed for heterophil (H) and lymphocyte (L) counts. Blood smears were prepared using May–Grünwald–Giemsa stain; H and L were counted to a total of 60 cells (Gross, W.B. and Siegel, H.S., 1983).

2.4. Statistical analysis

Collected data were recorded on a weekly basis and statistically subjected to ANOVA using a statistical package program (Version 9.2, SAS Institute, Inc., Cary, NC). When significant differences ($P < 0.05$) were detected, the least significant difference (Duncan's multiple range) test was used to separate the mean values (Steel and Torrie, 1980).

Results

3.1. Performance and carcass characteristics

The results for BW, FI and FCR are presented in Table 2. These results suggest that the supplementation of starter and grower diets with nettle had no significant effect on FI. Additionally, BW were similar ($P > 0.05$) among all treatments between 0-21 and 21-42 d of age, and for the overall experimental period (0-42 d of age), with 1% nettle significantly increasing the BW. However, other levels of nettle supplementation had no significant effect on BW, but there were numerical increases when nettle was added to diets, compared to the control group ($P < 0.05$). Feed conversion ratio was lower for birds fed the nettle diets than for birds fed the control diets for starter, grower, and for the entire period. However, none of the treatments caused significant effects, except for the containing 1% nettle in the grower and overall period ($P < 0.05$). Mortality was not affected ($P > 0.05$) by the treatments (2.23, 0, 0, 2.45, 2.25%, in groups 1-5, respectively) (Table 2). No significant differences, pathological lesion and damages were noticed for heart, gizzard, liver, pancreas, caecum and small intestine.

The results for the carcass characteristics and organ weights of female broilers are given in Table 3. Breast, thigh, abdominal fat, and relative weight of gizzard as well as small intestinal length were not significantly ($P > 0.05$) affected by supplementation of the diet with nettle. In contrast, the carcass yield increased with incorporation of 1% nettle.

Additionally, relative weights of heart, and small intestine decreased with the incorporation of nettle at a level of 1%, but among other treatments was similar ($P > 0.05$). The relative weight of liver was not affected by the level of nettle levels.

3.2. Serum biochemistry and immunity

Table 4 summarizes the impact of nettle levels on serum constituents and immune related parameters at 42 d of age. Broilers receiving different levels of nettle had a similar concentration of glucose, and total protein, as well as heterophil (H), lymphocyte (L), and heterophil to lymphocyte ratio. Feeding different levels of nettle (1-2%) resulted in a marked reduction in the concentration of the cholesterol and triglyceride ($p < 0.05$).

Discussion

The optimal supplementation concentration of nettle for enhanced BW gain and improvement of FCR during the period of 1 to 42 d of age was 1% in the present broiler trial. Although it was expected that supplementing the dietary herbs (Cross *et al.*, 2007; Bampidis *et al.*, 2005) would stimulate the growth performance of broilers, research on herb plant extracts yielded contradictory outcomes (Alcicek *et al.*, 2004; Acamovic and Broker, 2005; Bampidis *et al.*, 2005; Griggs and Jacob, 2005). However, the results of the present study are in agreement with the observations made by Ocak *et al.*, 2008, Cross *et al.*, 2007, Demir *et al.*, 2003, Botsoglou *et al.*, 2004, Hernandez *et al.*, 2004, and Bampidis *et al.*, 2005. Similarly, Jamroz and Kamel (2002) indicated that diet supplementation with a plant extract containing capsaicin, cinnamaldehyde, and carvacrol at 300 ppm improved 8.1% in daily gain and 7.7% in feed conversion ratio in 17-d-old poults. Herbs and phytogetic products could control and limit the growth and

colonization of numerous pathogenic and nonpathogenic species of bacteria in chicks' guts. This may lead to a greater efficiency in the utilization of food, resulting in enhanced growth and improved feed efficiency (Bedford, 2000). The phenolic compounds of nettle like carvacrol and thymol exhibit considerable antimicrobial and antifungicidal activity (Gulcin *et al.*, 2004). There is evidence to suggest that herbs, spices and various plant extracts have appetite- and digestion-stimulating properties and antimicrobial effects (Jain *et al.*, 2008). Also, herbs can stimulate the production of endogenous secretions in the small intestinal mucosa, pancreas and liver, and thus help digestion.

Table 1. Ingredients and chemical composition of the experimental diets (as fed)

Ingredients	Treatment									
	1 -21 days					22 - 42 days				
	Diet 1	Diet 2	Diet 3	Diet 4	Diet 5	Diet 1	Diet 2	Diet 3	Diet 4	Diet 5
Corn	58.51	58.81	57.12	56.43	55.74	67.91	67.20	66.48	65.77	65.05
Soybean meal (43% CP)	32.72	32.74	32.77	32.79	32.82	26.06	26.08	26.11	26.14	26.17
Fish meal	3	3	3	3	3	2	2	2	2	2
Vegetable oil	2.53	2.71	2.89	3.06	3.24	1.01	1.2	1.38	1.57	1.76
Nettle	0	0.5	1	1.5	2	0	0.5	1	1.5	2
Oyster shell	1.3	1.29	1.27	1.26	1.24	1.20	1.20	1.20	1.20	1.20
DCP	1.06	1.07	1.07	1.07	1.07	1.03	1.03	1.03	1.03	1.03
Salt	0.23	0.23	0.23	0.23	0.23	0.25	0.25	0.25	0.25	0.25
Vitamin premix*	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Mineral premix**	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
DL-methionine	0.15	0.15	0.15	0.16	0.16	0.04	0.04	0.04	0.04	0.04
Composition										
ME (KJ/kg)	12.56	12.56	12.56	12.56	12.56	12.56	12.56	12.56	12.56	12.56
Crud protein	21.56	21.56	21.56	21.56	21.56	18.75	18.75	18.75	18.75	18.75
Calcium	0.94	0.94	0.94	0.94	0.94	0.84	0.84	0.84	0.84	0.84
Available phosphorus	0.42	0.42	0.42	0.42	0.42	0.38	0.38	0.38	0.38	0.38
Sodium	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Linoleic acid	1.42	1.42	1.40	1.39	1.38	1.64	1.63	1.62	1.61	1.60
Crude fiber	3.71	3.79	3.88	3.97	4.05	3.20	3.33	3.47	3.62	3.75
Lysine	1.25	1.25	1.25	1.25	1.25	1.02	1.02	1.02	1.02	1.02
Met	0.54	0.54	0.54	0.54	0.54	0.47	0.47	0.47	0.47	0.47
Met + Cys	0.87	0.87	0.87	0.87	0.87	0.68	0.68	0.68	0.68	0.68
Determined Analysis ***										
Crude protein (N×6.25) (%)	19.86	19.97	19.8	19.93	19.7	17.36	17.5	17.38	17.2	17.52
Crude fiber (%)	3.65	3.74	3.85	3.95	4.13	3.36	3.41	3.64	3.78	3.89
Calcium (%)	0.86	0.87	0.84	0.85	0.84	0.78	0.75	0.78	0.8	0.81
Total phosphorus (%)	0.51	0.52	0.48	0.46	0.49	0.51	0.52	0.49	0.5	0.47

*Vitamin premix (/kg diet): Vitamin A: 12000 IU; vitamin D₃:1500 IU; vitamin E: 30 mg; vitamin K₃: 5 mg; vitamin B₁: 3 mg; vitamin B₂: 6 mg; vitamin B₆:5 mg; vitamin B₁₂:0.03 mg; nicotine amid: 40 mg; calcium-D-pantothenate: 10 mg; folic acid : 0.75 mg; biotin : 0.075 mg; choline chloride: 375 mg; antioxidant: 10 mg

**Mineral premix (mg/kg diet): Mn: 80; Fe: 80; Zn - 60; Cu: 8; I: 0.5; Co: 0.2; Se: 0.15.

*** n=2

Table 2: Effects of different levels of nettle on performance of broilers

Treatments	Age(day)	Control	0.5% Nettle	1% Nettle	1.5% Nettle	2% Nettle	SEM
weight gain (g)	0-21	26.56	27.93	30.04	28.37	27.92	1.05
	21-42	68.06	69.41	74.77	70.24	71.47	1.87
	0-42	47.79 ^b	48.75 ^b	51.94 ^a	49.21 ^b	49.75 ^{ab}	0.78
Feed intake (g)	0-21	46.12	46.32	48.67	45.57	48.84	1.44
	21-42	156.21	151.15	155.38	150.91	155.43	3.05
	0-42	100.03	98.54	103.33	98.46	100.94	1.83
Feed conversion ratio	0-21	1.75 ^a	1.66 ^{ab}	1.62 ^{ab}	1.61 ^b	1.68 ^{ab}	0.04
	21-42	2.30 ^a	2.19 ^{ab}	2.08 ^b	2.15 ^b	2.18 ^{ab}	0.04
	0-42	2.09 ^a	2.02 ^{ab}	1.99 ^b	2 ^{ab}	2.03 ^{ab}	0.03
Mortality	0-42	2.23	0	0	2.45	2.25	1.23

Values in the same row not sharing a common superscript differ significantly (P<0.05).

Table 3. Effect of different levels of nettle on carcass traits, and organ weights in broiler chickens

Carcass Traits	Treatments*					SEM
	1	2	3	4	5	
Carcass (%)	71.40 ^{ab}	71.39 ^{ab}	73.46 ^a	70.62 ^b	70.35 ^b	0.68
Breast (%)	31.39	33.43	33.37	32.55	31.68	1
Thigh (%)	26.91	26.05	26.35	26.95	24.49	0.74
Abdominal fat (%)	4.03	4.43	4.45	4.49	3.75	0.25
Liver wt.	3.37	3.34	3.15	3.20	3.54	0.19
Gizzard wt.	2.51	2.84	2.72	2.82	2.61	0.11
Heart wt.	0.91 ^a	0.78 ^{ab}	0.70 ^b	0.77 ^{ab}	0.82 ^{ab}	0.05
Small intestinal wt.	4.88 ^a	4.36 ^{ab}	4.08 ^b	4.57 ^{ab}	4.24 ^b	0.17
Small intestinal length	201	198.67	197.17	201	202.67	7.27

* 1= control, 2, 3, 4, 5 describe diets containing 0.5, 1, 1.5, and 2% nettle, respectively.

Values in the same row not sharing a common superscript differ significantly (P<0.05).

Table 4. Effects of different levels of nettle on the blood biochemical and immunity of parameters

Treat ment*	biochemical parameters**				Immunity (%)		
	Glucose	Protein	Cholesterol	Triglyceride	Heterophil	lymphocyte	H/L
1	184.7	3.35	157.6 ^a	52.9 ^a	6.67	90.84	0.096
2	184.93	3.4	131.47 ^{ab}	34.62 ^{ab}	9.5	88.34	0.108
3	197.62	3.43	98.8 ^c	30.2 ^b	7.34	89.67	0.082
4	186.80	3.52	112.97 ^{bc}	39.23 ^a	10.67	88.5	0.127
5	197.52	3.47	106.55 ^{bc}	36.82 ^{ab}	11	86.64	0.13
SEM	13.64	0.09	11.61	7.06	2.44	2.29	0.032

* 1= control, 2, 3, 4, 5 describe diets containing 0.5, 1, 1.5, and 2% nettle, respectively.

Values in the same column not sharing a common superscript differ significantly (P<0.05).

** (mg/100 mL).

Most studies about medicinal herbs have been carried out their essential oils. However, the vast majority of studies on dietary essential oil supplementation did not find any stimulating or depressive effect of oils on voluntary feed intake of broiler chickens. It is noteworthy that variations related to the source and active components of essential oils, breed and age of the birds, management conditions, and ingredient composition of the experimental diets did not affect the feed intake of birds in any of the studies (Hernandez *et al.*, 2004; Basmacioğlu *et al.*, 2004; Botsoglou *et al.*, 2004; Zhang *et al.*, 2005). The observed trend of herbal feed additives on feed consumption of broilers in our study agrees with those earlier reports. Contrary to the results of these studies, a stimulating effect on cumulative feed intake of an essential oil combination with significant performance improvements was reported by Alçiçek *et al.* (2004). According to the data presented in Table 2, mortality values of all treatments used in this experiment are same, which may be explained by clean, hygienic and unstressed housing conditions. Throughout this trial there was a mortality rate of 2.55% overall among the birds. All mortalities were necropsied by a veterinary pathologist. There were no indications that the dietary nettle treatments had an effect on bird mortality.

The experimental results showed that dietary nettle had no effects on percent of breast, thigh, and abdominal fat. However, the birds fed with 1% nettle had the highest carcass yield (73.46) (P<0.05). In contrast to our results, Alçiçek *et al.* (2003) observed an improvement on carcass yield of broilers when supplemented with an essential oil combination in a broiler diet. A possible explanation for increase of carcass yield corresponds with indices of more intensive protein anabolism (Szewczyk *et al.* 2006). In agreement with the results of our study, Basmacioğlu *et al.* (2004) and Sarica *et al.* (2005) found no beneficial effect of dietary supplementation of oregano essential oil and thyme powder, respectively, on the carcass yield of broiler chickens. Relative weights of most organs were not affected by addition of nettle to the diet in this experiment, which is in agreement with findings by Nobakht (2011). It has been suggested that the presence of antioxidant activity in nettle may induce a decrease in relative weight of liver (Toldy *et al.*, 2005). The bioactive components in natural medicines are quite complex and their mode of action is unclear, though they may serve to provide animals with nutrients and bioactive components such as anti-microbial activity, immune enhancement and stress reduction (Wang *et al.*, 1998). Decrease in the relative weight of heart is due to vasodilation properties (Testai *et al.*, 2002). A

thinning effect on the intestinal wall of birds was induced by the antimicrobial activity of antibiotics (Henry *et al.*, 1986), an experimental blend of mannan oligosaccharides and organic acids (Bozkurt *et al.*, 2005b) and essential oils (Alçiçek *et al.*, 2004; Jamroz *et al.*, 2005). However, this was not measured in the present study. A similar observation was reported by Debersac *et al.* (2001) who indicated that a plant extract from rosemary enhanced hepatic metabolism and hence, increased relative liver weights in rats. The effective components from the nettle were not identified and the mechanisms for decreased liver weight are not well understood. Further studies are needed to investigate the bioactive components of nettle and their modes of action in performance and other traits in broiler chickens

The glucose, total protein, heterophil, lymphocyte and H: L of birds were not influenced by different levels of nettle, whereas concentrations of cholesterol and triglycerides in the blood were affected significantly ($p < 0.05$) by nettle. The difference in cholesterol of serum blood is because of the existence of plant sterols such as stigmasterol and campesterol. They lead to a decrease of cholesterol concentration in the micelles (Avci *et al.*, 2006, Mavi *et al.*, 2004). Moreover, Fremont *et al.* (2000), Visioli *et al.* (2000) reported that the cholesterol levels in blood serum and meat were probably lowered by phenolic compounds. Our results agree with those obtained by other studies such as Lee *et al.* (2003), who found that dietary carvacrol, but not thymol, reduces plasma triglycerides and phospholipids and suggested that carvacrol may have more impact on lipogenesis than on cholesterol biosynthesis. Also, Case *et al.* (1995) reported that dietary carvacrol and thymol at 150 mg/kg of diet significantly decreased serum cholesterol concentrations in cockerels. This result was supported by Elson (1995), who found that these isoprenoids suppress cholesterol synthesis by inhibiting the production of 3-hydroxy-3-methylglutaryl coenzyme A (HMG-CoA) reductase, the rate controlling enzyme of the cholesterol synthetic pathway. Bolokbashi *et al.* (2006) reported that dietary thyme oil increases plasma levels of triglycerides, LDL-cholesterol and HDL-cholesterol in broilers. In contrast to our results, Khosravi *et al.* (2008) reported that the addition of nettle extract to a broiler diet had no significant positive effect on total cholesterol. It is possible that the oil extraction from nettle has changed some bioactive materials. Thus, further study is needed to clarify the mechanism of hypolipidemic actions of nettle or other herbs. The results in Heterophil, lymphocyte and H: L may be attributed to the use of exceptionally clean housing conditions. Although many studies have been conducted with essential oils in broiler diets, the results obtained from these studies are not consistent. It has been noted that well-nourished healthy chicks may not positively respond to growth promoting supplements when they are housed under clean conditions and at a moderate stocking density (Botsoglou *et al.*, 2004). No information has been found in the literature comparing the effects on these traits in the nettle plant.

Conclusion

This study proved that a level of 1-2% nettle supplementation has positive effects on performance, carcass traits and blood biochemical parameters of broilers. The nettle supplementation did not induce any adverse effects on chicks' blood profiles. While nettle exhibited hypo-cholesterolemic properties, further studies in different situations should be conducted to achieve more results related to modes of action and comparison to its essential oil with other medicinal plants.

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