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The Effects of Different Levels of Nettle *Urtica dioica* L. (Urticaceae) Medicinal Plant in Starter and Grower Feeds on Performance, Carcass Traits, Blood Biochemical and Immunity Parameters of Broilers

Research Article

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ABSTRACT

This experiment was conducted to evaluate the effects of different levels of nettle (*Urtica dioica*) a medicinal plant in starter and grower feeds on performance, carcass traits, blood biochemical and immunity parameters of broilers. A completely randomized design was used with 324 broilers (Ross-308) divided in nine treatments and three replicates (with 12 birds in each replicate) 1 to 42 days. The treatment groups consisted of: (1) control group with no nettle supplementation, in other treatments the level of nettle in starter and grower feeds were, (2) 0.75% in both starter and grower, (3) 0 in starter and 0.75% in grower, (4) 0.75% in starter and 0 in grower, (5) 1.5% in starter and 0.75% in grower, (6) 0.75% in starter and 1.5% in grower, (7) 0 in starter and 1.5% in grower, (8) 1.5% in starter and 0 in grower, and (9) 1.5% in both starter and grower. The results showed that the use of different levels of nettle in starter and grower feeds had significant effects on carcass traits of broilers ($P<0.05$). The highest percent of breast and thigh (35.04), (26.29) were observed in groups 9 and 3, the highest percent of gizzard (3.76) was observed in group 6 and finally the highest percentage of liver (3.63) was observed in group 7. The overall results showed that the use of 1.5% of nettle medicinal plant in starter and grower feeds without having any significant effects on performance and blood biochemical and immunity parameters, showed positive effects on carcass traits of broilers.

KEY WORDS blood metabolites, breeding periods, growth promoters, medicinal herbs.

INTRODUCTION

It is conceivable that herbal agents could serve as safe alternatives to antibiotic growth promoters due to their suitability and preference of the broiler meet consumers, reduced risks and minimal health hazards. Plants (especially medicinal herbs) have been used as food with medicinal purposes for centuries, and some of them have played a significant role in maintaining human health and improving the quality of human life for thousands of years (Osman *et al*. 2005). The World Health Organization, in 1985, estimated that 80% of the earth's inhabitants rely on traditional medicine for their primary health care needs and most of these therapies involve the use of plants extracts or their active components (Farnsworth and Soejarto, 1985). These extracts are specifically known for their antiseptic properties and beneficial effects on digestion (Foster and Duke, 1999). Therefore, it is not surprising that several herbal agents have been empirically used in poultry birds and other animals. Many herbs have a long history of use even prehistoric use, in preventing or treating human and animal diseases. Aromatic plants have been used traditionally in therapy of some diseases world-wide for a long time. Research on the use of herbal mixtures in broiler diets has produced inconsistent results (Fritz *et al*. 1993). Some authors state significant positive effects on broiler performance (Ertas *et al*. 2005;

Cross *et al*. 2007; Perić *et al*. 2008a), whereas, another group of authors established no influence on gain, feed intake or feed conversion (Cross *et al*. 2007; Ocak *et al*. 2008).

The Nettle *Urtica dioica* L. (Urticaceae) is widely grown in different parts of the world and has been used to improve human health. Numerous analyses of nettle have revealed the presence of more than fifty different chemical constituents. It has been extensively studied and found to contain starch, gum, albumen, sugar, and two resins. Histamine, acetylcholine, choline, and serotonin are also present. In a study an anti-coagulant was isolated from nettle leaves. Terpene diols, terpene diol glucosides, and alpha-tocopherol were also detected. Five new monoterpenoid components were found, as well as 18 phenolic compounds and eight lignans, some of which were previously unknown. An acetylcholine synthesizing enzyme, choline acetyl-transferase, was found, and it appears that nettle is the only plant to have this enzyme. The phenolic compounds of nettle like carvacrol and thymol exhibit considerable antimicrobial and antifungicidal activity (Gülçin *et al*. 2004). In an experiment the addition of 2% nettle to broiler diet led to increase their body weight (Kwiecien and Mieczan, 2009). Recent studies in broilers showed that using nettle in blend with other medicinal plants had positive effects on performance, carcass traits, and blood biochemical and immunity parameters. Using 1.5% of different mixtures of nettle *Menta pulagum* and Zizaphora medicinal plants in broiler diets improved their performance and carcass quality (Modiry *et al*. 2010). An application of 0.75% of mixtures of nettle, *Menta pulagum* and Zizaphora in the grower period had positive effects on the performance and carcass traits of broilers (Nobakht *et al*. 2010). In pigs the use of nettle extract had positive effects on meat quality, improving oxidative stability and the polyunsaturated/saturated fatty acid ratio (Hanczakowska *et al*. 2007). In broilers the use of nettle extract as growth promoter cannot be as an alternative for antibiotics (Khosravi *et al*. 2008). In laying hens the use of nettle extract via lymphocyte proliferation can stimulate the innatecell mediated immune response (Sandru *et al*. 2007). Addition of 2% nettle to broilers diets had positive effects on their body weight gain (Kwiecien and Mieczan, 2009).

The present experiment was conducted to evaluate the effects of using different levels of nettle inclusion in starter and grower feeds on performance, carcass traits, blood biochemical and immunity parameters of broilers.

MATERIALS AND METHODS

This experiment was conducted in a completely randomized design with 324 day-old broilers (Ross-308) in 9 treatments and 3 replicates (with 12 birds in each pen) from 1 to 42 days and included: (1) control group with no nettle supplement, in other treatments groups the level of nettle in starter and grower feeds were (2) 0.75% in both starter and grower, (3) 0 in starter and 0.75% in grower, (4) 0.75% in starter and 0 in grower, (5) 1.5% in starter and 0.75% in grower, (6) 0.75% in starter and 1.5% in grower, (7) 0 in starter and 1.5% in grower, (8) 1.5% in starter and 0 in grower, (9) 1.5% in both starter and grower. There was similar partition for male and female birds into treatment groups. The rations were similarly formulated in all treatment groups based on the NRC, 1994 Nutrients Recommendations (Table 1).

Dried nettle was supplied from local market and after fine milling, mixed with other ingredients. The diets and water was provided *ad libitum*. The lighting program during the experiment period consisted of a period of 23 hours light and 1 hour of darkness. Environmental temperature was gradually decreased from 33ºC to 25ºC on day 21 and was then kept constant. Body weight, feed intake and feed conversion for different experiment periods were determined weekly on bird bases and mortality was recorded. On day, two birds from each replicate (male and female) were randomly selected for blood collection and approximately 5cc blood samples were collected from the brachial vein. One cc of collected blood was transferred to tubes with EDTA for determination of the white blood cells counts. One hundred leukocytes per sample were counted by heterophil to lymphocyte separation under an optical microscope the heterophil to lymphocyte ratio was calculated and recorded (Gross and Siegel, 1983). The remaining 4 cc blood was centrifuged to obtain serum for determination of the blood biochemical parameters including: glucose, cholesterol and triglyceride. Kit package (Pars Azmoon Company; Tehran, Iran) were used for determination of the blood biochemical parameters using Anision-300 auto-analyzer system.

On day 42 two birds per replicate were randomly selected, slaughtered and carcass percent to liver weight and percent of carcass parts to carcass weight were calculated.

The data were subjected to analysis of variance procedures appropriate for a completely randomized design using the General Linear Model procedures of SAS Institute (2005). Outcome parameters tested for normality by Shapiro Wilks normality test method. Means were compared using the Duncan multiple range test. Statements of statistical significance are based on $P<0.05$.

RESULTS AND DISCUSSION

The effects of different levels of nettle in starter and grower feeds on performance of broilers are summarized in Table 2. Using different levels of nettle in starter and growing feeds did not have any significant effects on feed intake,

Table 1 The ingredients and nutrients composition of starter and grower diets of broilers

Ingredients (%)	Starter (0-21 days)			Grower (22-42 days)		
	Contol Group	0.75% of Nettle	1.5% of Nettle	Contol Group	0.75% of Nettle	1.5% of Nettle
Yellow Corn	58.51	57.7	56.43	67.91	66.27	65.05
Soybean Meal	32.72	32.71	32.79	26.06	26.31	26.17
Fish Meal	3	3	3	2	2	2
Nettle	0	0.75	1.5	0	0.75	1.5
Vegetable Oil	2.53	2.67	3.06	3.06	1.65	1.76
Dicalcium Phosphate	1.06	1.07	1.07	1.07	1.03	1.03
Oyster Shell	1.6	1.29	1.26	1.26	1.2	1.2
Salt	0.23	0.23	0.23	0.23	0.25	0.25
Mineral Premix	0.25	0.25	0.25	0.25	0.25	0.25
Vitamin Premix	0.25	0.25	0.25	0.25	0.25	0.25
DL- Methionine	0.15	0.15	0.16	0.04	0.04	0.04
Nutrients Composition						
Metabolizable Energy (Kcal/kg)	3000	3000	3000	3000	3000	3000
Crude Protein (%)	21.56	21.56	21.56	18.75	18.75	18.75
Calcium (%)	0.94	0.94	0.94	0.84	0.84	0.84
Avail Phosphate (%)	0.42	0.42	0.42	0.38	0.38	0.38
Sodium (%)	0.14	0.14	0.14	0.14	0.14	0.14
Linoleic Acid (%)	1.43	1.36	1.36	1.64	1.61	1.60
Crude Fiber (%)	3.71	4.17	4.17	3.20	3.62	3.75
Lysine (%)	1.25	1.25	1.25	1.02	1.02	1.02
Methionine+Cysteine (%)	0.87	0.87	0.87	0.68	0.68	0.68
Treonine (%)	0.9	0.9	0.9	0.79	0.79	0.79
Tryptophan (%)	0.28	0.29	0.29	0.24	0.24	0.24

[1] Vitamin premix per kg of diet: vitamin A (retinol), 2.7 mg; vitamin D3 (Cholecalciferol), 0.05 mg; vitamin E (tocopheryl acetate), 18 mg; vitamin k3, 2 mg; thiamine 1.8 mg; riboflavin, 6.6 mg; panthothenic acid, 10 mg; pyridoxine, 3 mg; cyanocobalamin, 0.015 mg; niacin, 30 mg; biotin, 0.1 mg; folic acid, 1 mg; choline chloride, 250 mg; Antioxidant 100 mg.

[2] Mineral premix per kg of diet: Fe (FeSO4.7H2O, 20.09% Fe), 50 mg; Mn (MnSO4.H2O, 32.49% Mn), 100 mg; Zn (ZnO, 80.35% Zn), 100 mg; Cu (CuSO4.5H2O), 10 mg; I (KI, 58% I), 1mg; Se (NaSeO3, 45.56% Se), 0.2 mg.

Table 2 The effect of different levels of nettle in starter and grower feeds on performance of broilers

Treatments→ Performance↓	Control Group	0.75% in starter and grower	0.75% in grower	1.5% in starter and 0.75% in grower	0.75% in starter and 1.5% in grower	0.75% in starter and 1.5% in grower	0 in starter and 1.5% in grower	1.5% in starter and 0 in grower	1.5% in starter and grower.	SEM	P-Value
Feed Intake (g/day)	79.46	76.79	82.74	75.29	79.33	82.57	80.86	80.24	80.15	3.24	0.88
Weight Gain (g/day)	38.20	37.73	38.99	36.61	36.52	40.44	39.16	37.48	39.23	1.99	0.79
Feed Conversion	2.08	2.04	2.13	2.06	2.18	2.04	2.1	2.16	2.05	0.09	0.68

Table 3 The effect of different levels of nettle in starter and grower feeds on carcass traits of broilers

Treatments→ Carcass Traits↓ (%)	Control Group	0.75% in starter and grower	0.75% in grower	1.5% in starter and 0.75% in grower	0.75% in starter and 1.5% in grower	0.75% in starter and 1.5% in grower	0 in starter and 1.5% in grower	1.5% in starter and 0 in grower	1.5% in starter and grower.	SEM	P-Value
carcass	71.07	73.11	71.21	72.48	72.27	71.74	71.97	71.32	71.52	0.91	0.63
Abdominal Fat	3.82	2.94	3.39	3.99	3.71	3.48	3.49	3.72	2.71	0.35	0.46
Gizzard	3.29^{ab}	2.89^{b}	3.1^{ab}	3.25^{ab}	3.29^{ab}	3.76^{a}	3.07^{ab}	3.14^{ab}	3.08^{ab}	0.24	0.04
Breast	32.08^{b}	34.93^{ab}	33.67^{ab}	34.32^{ab}	34.43^{ab}	33.25^{a}	34.89^{a}	33.26^{ab}	35.04^{a}	0.76	0.07
Thigh	26^{ab}	24.13^{b}	28.20^{a}	24.49^{ab}	24.92^{ab}	25.33^{ab}	24.46^{b}	25.39^{ab}	26.29^{ab}	0.6	0.048
Liver	3.07^{ab}	3.07^{ab}	3.1^{ab}	2.93^{b}	3.04^{ab}	3.1^{ab}	3.12^{ab}	3.63^{a}	3.13^{ab}	0.19	0.04

*The means in each row that have at least one common letter, do not have significant difference (P>0.05).

Table 4 The effect of different levels of nettle in starter and grower feeds on blood biochemical and immunity parameters of broilers

Treatments→ Blood Parameters↓	Control Group	0.75% in starter and grower	0.75% in grower	1.5% in starter and 0.75% in grower	0.75% in starter and 1.5% in grower	0.75% in starter and 1.5% in grower	0 in starter and 1.5% in grower	1.5% in starter and 0 in grower	1.5% in starter and grower.	SEM	P-Value
Glucose (mg/dL)	171.53	171.95	191.82	188.13	180.95	187.58	173.12	174.92	183.13	17.09	0.99
Cholesterol (mg/dL)	136.48	120.07	174.80	170.17	158.08	156.60	178.67	151.18	212.40	32.97	0.73
Triglyceride (mg/dL)	36.92	49.72	30.26	50.75	39.08	35.30	49.75	39.39	38.23	11.26	0.89
Heterophil (%)	16.34	11.50	14.34	18	19.5	15.34	12.84	15.17	14.17	2.94	0.68
Lymphocyte (%)	84.84	88	83.50	81.84	79.34	82.50	85.34	84.84	84.84	2.93	0.68
Heterophil/Lymphocyte	0.19	0.14	0.17	0.23	0.25	0.19	0.15	0.19	0.17	0.04	0.7

weight gain and feed conversion of broilers (P>0.05). These results are not consistent with the work of Kwiecien and Mieczan, 2009. It was shown that the addition of 2% nettle to broilers' diets had positive effects on their body weight gain. This difference between the results of present experiment and reported above can be the results of different causes such as the nettle variety or the chickens used, farm management and operations used in the rearing of broiler chickens.

The effects of different levels of nettle in starter and grower feeds on carcass traits of broilers are summarized in Table 3. Application of different levels of nettle in starter and grower feeds significantly affected the carcass traits (P<0.05).

The highest percent of breast (35.04) was observed in group 9. The present of antioxidants and phenolic substance in nettle may be the main cause of improvement in breast percent of broilers carcass. The presence of harmful bacterial populations in the gastrointestinal tract may cause breakdown of amino acids and thereby reduce their absorption as antimicrobial substances present in nettle can reduce the harmful bacterial populations in the gastrointestinal tract and improve the levels of absorbed amino acids (Lee *et al*. 2003; Gülçin *et al*. 2004). The carvacrol in nettle has stimulatory effects on pancreatic secretions (Lee *et al*. 2003) by increasing the secretions of digestive enzymes, more amounts of nutrients like amino acids can be digested and absorbed from the digestive tract and thereby improving carcass traits. Else increasing the percent's of gizzard and liver by the use of nettle can have positive effects via physically grinding and increasing bile secretion on nutrient digestion. With increased amounts of absorbed amino acids, organs like breast and thigh draw more growth. The lowest amounts of carcass and breast percent's were recorded in control group (P>0.05). The control group's breast was lower compared with group 6, 7 and 9. Our findings on carcass traits in this experiment are in agreement with the study of Modiry *et al*. (2010) and Nobakht *et al*. (2010) who reported that the presence of nettle in blend with another medicinal herb, significantly affected the carcass traits of broilers.

The effects of different levels of nettle in starter and grower feeds on blood biochemical and immunity parameters of broilers are summarized in Table 4.

The use of different levels of nettle in starter and grower feeds did not have any significant effects on blood biochemical and immunity parameters of broilers. Whereas the lymphocyte proliferation stimulating the innate-cell mediated immune response by use of nettle has been reported (Sandru *et al*. 2007).

CONCLUSION

It can be concluded that the use of 1.5% of nettle medicinal plant in starter and grower broiler diets cannot improve the amounts of feed intake, weight gain and feed conversion, but has positive effects on carcass traits.

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