

Performance of Broilers Supplemented With Peppermint (*Mentha piperita* L.) Powder

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Abstract

This study was conducted to determine the effects of dietary supplementation of peppermint (*Mentha piperita* L.) on the performance of broiler chicks. 500 Ross broiler chicks were divided into 5 treatment groups of 4 replications in a completely randomized design format. The diets were ISO-caloric and ISO-nitrogenous ones and contained 1.5, 3, 4.5, and 6 g/kg of peppermint powder. At start, growing, and end periods, the effects of peppermint powder on average daily weight gain, feed conversion ratio, and mortality rate were studied. The results of the present study showed that over a production period of 42 days peppermint had a significant effect on average daily weight gain and feed conversion ratio when compared with the control group ($P < .05$). The level of 4.5 g/kg had the highest average daily weight gain (52.78 g), and control treatment with 46.98 g had the least average daily weight gain among different levels of peppermint. The level of 4.5 g/kg and 6 g/kg of peppermint had the least mortality compared to control treatment during training period ($P < .05$). From this experiment, we can conclude that treatment with 4.5 g/kg peppermint powder has better performance and carcass characteristics in broilers.

Keywords

medicinal plants, *Mentha piperita* L., performance of broilers

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The use of medicinal plants in the poultry industry has become popular and requires selecting the most suitable plant. Different studies have proved the antimicrobial properties of some medicinal plants in human laboratory.¹⁻³ Nowadays the use of medicinal supplements as antibiotic growth promoters has developed in broiler farms. On the other hand, some studies have shown some adverse effects that resulted from the use of some antibiotic growth promoters.⁴ The extensive use of these antibiotics in broiler farms has some problems such as rising production costs and compromising the health of the society because of consuming the products with pharmaceutical residues. Studies show that using medicinal plants can play an effective role in producing healthy products (organic) besides improving production.⁵ Peppermint is a member of the Labiate family and one of the world's oldest medicinal herbs.⁶ The Labiate family, rich in essential oil, has commercial and medicinal values. These herbs are widespread throughout the world and are widely used in food, flavor, cosmetic, and pharmaceutical industries.^{7,8} The chemical components of peppermint are menthol, menthone, 1,8-cineole, methylacetate, methofuran,

isomenthone, limonene, b-pinene, a-pinene, germacrene-d, trans-sabinene hydrate, and pulegone. Menthol is the main phenolic component in oil of peppermint, which has antibacterial activities.⁹ Studies have shown that this plant has antiseptic, spasmolytic, and disinfectants properties.¹⁰ Therefore, it

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Table 1. Composition (g/kg) and Calculated Analysis of Experimental Diets^a.

Feed Ingredient (g/kg)	Starter (0-14 Days)	Grower (15-28 Days)	Finisher (29-42 Days)
Corn3	577	662	702
Soybean oil	15	23	25
Soybean meal	365	280	240
Di calcium phosphate	19	12	12.4
Salt (NaCl)	3	3	3
Limestone	15.3	13.8	11.6
DL-methionine	1.5	1.2	1
L-lysine	1	—	—
Vitamin premixed	2.5	2.5	2.5
Mineral premixed	2.5	2.5	2.5
Calculated analysis			
AMEn (kcal/kg)	3004	3100	3150
Crude protein (%)	21.92	19.39	17.72
Ca (%)	0.95	0.87	0.79
Available P (%)	0.43	0.35	0.37

^aME_N, nitrogen-corrected apparent metabolism able energy. A mineral mixture supplied (mg per kg diet): Mn, 64.5; Zn, 33.8; Fe, 100; Cu, 8; I, 640; Co, 190; Se, 8, as support. The vitamin mixture supplied the following vitamins (per kg diet): vitamin A 4 400 000 IU; vitamin D 72 000 IU; vitamin E 14 400 IU; vitamin K 2000 IU; cobalamin 640 mg; thiamine 612 mg; riboflavin 3000 IU; calcium pantothenate 4896 mg; niacin 12 160; pyridoxine 612 mg; folic acid 1.5 mg; choline chloride 260 g.

improves carcass traits in broiler production.¹¹ This study aimed to assess the effect of different levels of peppermint powder on the production of broilers and some blood biochemical parameters at different periods of training in broilers.

Materials and Methods

A total of 500 day-old Ross broiler chicks were distributed randomly in 20 separated experimental cages (120 × 120 × 80) in 5 treatments, and each treatment had 4 replications (25 chicks per cage). Each cage contained an equal number of male and female birds. Chicks were raised under environmentally controlled conditions, following a standard temperature regimen that gradually decreased from 32°C to 24°C by 0.5°C daily, and a 23L:1D lighting program. Artificial lighting was provided throughout the experiment. The temperature of the house, humidity, and vaccination program applied was based on broiler raisers' recommendations. The ingredients and composition of the basal diet were ISO-caloric and ISO-nitrogenous and formulated to meet or exceed the nutritional recommendations by the National Research Council.¹² The birds were fed a starter diet from 0 to 14 followed by grower and finisher diets from 15 to 28 days and 29 to 42 days of age, respectively (Table 1).

Peppermint powder was added in the following 5 levels to the basal diet in every period. The treatments were as follows:

- Treatment 1: Control (basal diet without the additive)
- Treatment 2: Basal diet containing 1.5 g/kg peppermint powder
- Treatment 3: Basal diet containing 3 g/kg peppermint powder
- Treatment 4: Basal diet containing 4.5 g/kg peppermint powder
- Treatment 5: Basal diet containing 6 g/kg peppermint powder

Feed and water were providing ad libitum throughout the 6 weeks. The average live body weights, body weight gains,

Table 2. Effects of Experimental Diets on DWG (g), DFI (g), and FCR of Broiler Chicks.

Period	Traits	Treatments					SEM
		Control	1/5 g/kg	3 g/kg	4/5 g/kg	6 g/kg	
Starter	DFI	36.64	36.12	34.65	34.11	36.26	0.220
	DWG	25.27	26.56	26.45	26.24	26.47	0.305
	FCR	1.45	1.36	1.31	1.3	1.37	0.220
Grower	DFI	86.05	92.20	90.35	90.70	89.54	0.829
	DWG	50.62	52.99	55.09	53.67	51.46	0.922
	FCR	1.7	1.74	1.64	1.69	1.74	0.324
Finisher	DFI	164.60	167.60	160.14	160.62	164.45	1.472
	DWG	70.34	72.87	80.88	80.31	76.49	0.809
	FCR	2.34	2.3	1.98	2	2.15	0.523
Total	DFI	86.43	91.70	93.29	91.84	90.02	1.028
	DWG	46.22	51.26	49.3	52.78	49.19	0.626
	FCR	2.17	2.16	2.12	2.04	2.13	0.303

Abbreviations: DFI, daily feed intake (g per bird per day); DWG, daily weight gain (g per bird per day); FCR, feed conversion ratio (g/g); SEM, standard error of the mean.

feed intake, and feed conversion ratio were measure on a weekly basis. In addition, mortality for each treatment was recorded. At the end of the experimental period, 2 birds per treatment cage (n = 10 birds/treatment) were randomly selected, individually weighed, and slaughtered. Carcass yield was calculated by dividing eviscerated weight by live weight. Abdominal fat, gizzard, and liver were collected, weighed, and calculated as a percentage of live body weight.

Statistical Analysis

Data obtained were subjected to ANOVA using the General Linear Models Procedure in SPSS software.¹³ Treatment means were tested using Duncan's multiple-range test, and statistical differences declared at $P < .05$.

Results

As shown in Table 2, feed intake, daily weight gain, and feed conversion ratio were significantly different in broilers fed various levels of peppermint.

Daily Weight Gain

During the starter period, no significant differences were observing between the daily weight gain of birds receiving peppermint and the control diet, although control treatment had the least average daily weight gain among other treatments. In the grower period, a significant growth promoting effect was observed from 4.5 g/kg peppermint powder than the control group ($P < .05$). Significant differences were seen among 3 g/kg, 4.5 g/kg, and 6 g/kg peppermint powders when compared with the control treatment in the finisher period. During

Table 3. Effect of Peppermint on Carcass Yield and Internal Relative Organ Weight of Broiler Chicks*.

Treatments	Carcass Yield (%)	Abdominal Fat (%)	Liver (%)	Gizzard (%)	Heart (%)
Control	71.04 ^b	1.42 ^a	3.1 ± 1.11 ^a	2.7 ± 0.06 ^a	0.63 ± 0.05 ^a
1.5g/kg	72.06 ^{ab}	1.38 ^a	2.9 ± 0.09 ^b	2.8 ± 0.06 ^a	0.58 ± 0.04 ^a
3 g/kg	72.98 ^{ab}	1.40 ^a	2.8 ± 0.09 ^b	2.7 ± 0.07 ^a	0.62 ± 0.03 ^a
4 g/kg	73.58 ^a	1.40 ^a	2.7 ± 0.08 ^b	2.8 ± 0.05 ^a	0.66 ± 0.04 ^a
6 g/kg	73.04 ^a	1.46 ^a	2.8 ± 0.07 ^b	2.7 ± 0.05 ^a	0.67 ± 0.05 ^a
SEM	0.31	0.21	0.16	0.18	0.07

Abbreviation: SEM, standard error of the mean.

*Means in each column with different superscripts are significantly different ($P < .05$).

the overall rearing period birds fed 4.5 g/kg peppermint powder basal diet had significantly ($P < .05$) better daily weight gain compared to the control group.

Feed Conversation Ratio

The results of the present study showed a significant ($P < .05$) improvement in feed conversion ratio of birds kept on a diet containing 4.5 g/kg peppermint powder.

Mortality

Birds fed 4.5 g/kg and 6 g/kg peppermint powder in diet had significantly ($P < .05$) lower mortality compared to the control group.

Carcass Yield and Internal Viscera Organ

The results showed that peppermint powder had an effect on the weight of heart, liver, gizzard, and abdominal fat in broilers. Data showed that there was significant difference ($P < .05$) on liver weight between birds fed 3 g/kg, 4.5g/kg, and 6 g/kg peppermint powder compared to the control group (Table 3).

Discussion

The plants of the Labiate family are widely used in food, flavor, cosmetic, and pharmaceutical industries.⁷ Different studies on the effect of peppermint in humans showed that the plant has antiseptic, spasmolytic, and disinfectants properties.¹⁴ The results of this study indicated that feeding broilers with peppermint led to significant improvements in daily weight gain in the grower and finisher periods. This result was in accord with the results of Ocak et al¹⁵ It seems that the positive effect of different levels of peppermint on increasing average daily weight gain was due to its decreasing effects on gastrointestinal disorders, thus strengthening the digestive system and improving feed efficiency.¹⁶ Moreover, the antiseptic property of peppermint prevents harmful bacterial growth in the digestive system that led to better digestion and absorption. The antiseptic property of peppermint results from the presence of menthol.¹⁷ Sefidcon et al proved that peppermint strengthened the stomach and intestinal slow motion because of alpha humulone.¹⁸ Another study showed that peppermint extract causes neutralization of the ileum spasms in Indian pigs.¹⁹ It seems

that the presence of active compounds such as essential oil in the plant stimulate appetite and improve the digestion and mineral absorption and increase feed efficiency in broilers. Peppermint has also been shown to cure indigestion and gastro-paresis and indigestion in humans.¹⁵ Our results showed that enjoying peppermint especially at the starting period could decrease broiler mortality. It seems that the antiseptic properties of the plant prevented harmful bacterial growth in the intestinal tract and finally decreased broiler mortality. In addition, it has been shown that the improvement in the mortality might be due to the role of peppermint as an immune stimulating factor. Studies have shown that peppermint extract prevented bacterial growth of organisms such as *Shigella dysenteries*, *Bacillus cereus*, and *Salmonella typhi*.²⁰ Sefidcon et al showed that existing limonen in peppermint removed the germs producing pneumococ in 1 to 3 hours, *Staphylococcus* in 20 minutes, and *Streptococcus* in 12 hours.¹⁸ Our results also showed that peppermint had a suitable role in decreasing mortality deriving from heart attack in male chicks at the end of the growth period. It seems the essential oil of the peppermint is effective to set the heart's activity and preventing cardiac complications. In this regard, using the oil of peppermint has been report in heart pharmaceutical formulations such as valocordin and zelenin drops.²¹ It should be noted that peppermint has antioxidant activity and is able to counteract free radicals and oxidative stress.^{22,23} Antioxidants have been shown to combat a wide variety of diseases.²⁴⁻²⁶ Therefore, peppermint, which possess antioxidant activity, might also have protective effects on chicks and also enhance their quality.

Authors' Note

This study has been registered with Code Number 74-0210324-01 with the Vice Chancellor for Research in Education and Promotion, Iran's Ministry of Agriculture.

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Author Contributions

All the authors contribute equally toward writing the first draft of the manuscript. MRK revised and edited the final version.

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Ethical Approval

Ethical issues have been completely observed by the authors.

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