Effect of Thymolina on the Performance and Carcass Characteristics in Ross 308 Broiler Chickens

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Abstract

In the present experiment, 320 one day old Ross 308 broiler chickens were used based on a completely randomized design with 4 treatments, 4 replicates, and each replicate is a pan containing 20 broiler chickens. Experimental treatments include control, 0.5, 1, and 2 percent in chickens' diet. Thymolina is an anti-bacterial powder drug which is made by composing 4 medicinal plants. During the experiment period, chickens had free access to water and food and the livestock raising management was conducted in terms of lighting, humidity, ventilation, and vaccination in accordance with the guide requirements of Ross 308 broider chickens. Weighing was conducted weekly and at the end of feed intake, weight gain and feed conversion ratio of chickens were measured. At the age 42 days old, from each replicate, 2 chickens with the lowest mean difference in weight were selected in order to be used for factors of carcass weight, the amount of fat as well as pectoral muscle and small intestine to obtain histological Morphology. The amount of consumed feed weight gain, body weight, feed consumption, feed conversion ratio was significantly affected and there is significant differences among different treatments ($P<0.05$), but feed conversion ratio (finisher and total) was not affected and there was no significant difference among different treatments ($P>0.05$). The amount of carcass fat in treatments containing Thymolina was decreased and was not affected and there was no significant difference among different treatments ($P>0.05$). In general, results indicated that using Thymolina in the diet of broiler chickens causes improvements in performance characteristics. Therefore, it can be used for the improvement in performance and creation of the favorable broiler chickens.

Keywords: Thymolina; Ross 308; Broiler; Performance; carcass characteristics.

Introduction

Large-scale and compact industrial poultry breeding has increased the possibility of the occurrences of diseases and for reducing the rate of the occurrences of different diseases and also contributing to the development and improvement of production traits, different chemicals including antibiotics are used at large scale in broiler chickens breeding units (Lee *et al.*, 2003). Antibiotics are growth stimulants and are expansively employed in poultry industry and cause the improvement in stimulating growth (Greathead, 2003) and feed efficiency and intestinal microflora stability as well as the prevention of the development of a number of pathogens. In addition, they cause the improvement in performance and increase in production efficiency (Dieumou *et al.*, 2011). But recently, numbers of worries have appeared about the antibiotics residues in poultry meat and its effects on human health and scholars have concluded that these residues can be transmitted to humans through the consumption of poultry products and make humans resistant to consuming antibiotics (Schulte *et al.*, 1967). Regarding the increase in poultry diseases and to achieve better growth and improvement in feed efficiency, nowadays, using medicinal plants is highly recommended (Tipu *et al.*, 2006). Medicinal plants are considerably healthy and do not engender environmental problems. Furthermore, mostly they do not produce side effects for consumers (Botsoglou & Fletouris, 2001; Lee *et al.*, 2003; Ocak *et al.*, 2008).

Results of studies indicate that medicinal plants result in improving growth and weight gain (Jamroz *et al.*, 2003; Cross *et al.*, 2007 and Hernández, 2004), improving feed conversion ratio (Ciftci *et al.*, 2009), reducing Escherichia coli bacteria and population growth of lactobacillus (Jamroz *et al.*, 2005), preventing fat oxidative corruption (Stoni *et al.*, 2006).

Materials and Methods

Animals, Experimental Design and Procedure

In the present experiment, 320 one day old Ross 308 broiler chickens were used based on a completely randomized design with 4 treatments, 4 replicates, and each replicate is a pan containing 20 broiler chickens. Experimental treatments include basal diet containing no supplemented Thymolina (control), basal diet supplemented with 0.5% Thymolina, basal diet supplemented with 1% Thymolina and basal diet supplemented with 2% Thymolina in chickens' diet. Thymolina is an anti-bacterial powder drug which is made by composing 4 medicinal plants (*Salvia officinalis, Matricaria chamomilla, Teucrium polium* and *Origanum majorana*) (Table 1).

Table 1. The chemical composition of Thymolina

Thymolina Ingredient	Important constituents %
Salvia officinalis	camphor (37.17), 1,8 cineole (31.1), α -Thujone (20.34), β-thujene (3.37), borneol (2.02)
Matricaria chamomilla	(*E*)- β -farnesene (24.19), guaiazulene (10.57), α -bisabolol oxide A (10.21), α -farnesene (8.7) and α -bisabolol (7.27)
Teucrium polium	β –caryophyllene (29.5), farnesene-cis-b (11.2), β -pinene (5.2), carvacrol (8.3), bicyclogermacrene (6.4), β-pinene (5.2)
Origanum majorana	Trans-Caryophillene (19.08), Gamma-Cadinene (10.91), Trans-Beta-Farnesene (8.65), Gamma-Terpinene (6.29), Apiol (5.62)

In the present experimental study, the corn- soya based diet was used and to determine chickens' nutritional needs in different breeding periods (Starter (0-15 d), Grower (16-28 d), Finisher (29-42 d)), experimental diets were prepared and regulated based on the UFFDA, and diets were formulized based on food needs catalogue of the diet of Ross 308 and then were balanced in terms of foodstuffs (Table 2).

Performance factors were measured at the age of 15, 28 and 42 days of old. In addition, to measure carcasses traits, the amount of abdominal fat and pectoral muscle, at the age 42 days old, from each replicate, 2 chickens with the lowest mean difference in weight were selected, and then using the cervical vertebrae and dry feather picking methods, they were slaughtered. Factors of carcasses weight, the amount of fact, and pectoral muscle were measured.

Statistical analysis

The experimental data were analyzed using MSTAT-C Statistical Software in a completely randomized design ($Yij = \mu + Ti + eij$) and means were compared using Duncan's multiple range test at the significance level 5%.

Table 2. Ingredient composition of basal diet

Ingredient (g/Kg unless noted)	Starter (0-15 d)	Grower (16-28 d)	Finisher (29-42 d)
Yellow Corn	430.25	430.22	382.23
Wheat	100.00	200.00	300.00
Soybean Meal	380.98	283.92	232.77
Tallow/animal fat	22.96	23.86	25.23
L-Lysine Hcl	3.21	2.47	2.05
DL-Methionine	2.90	1.95	2.09
DCP	20.19	17.54	15.83
CaCo3	11.28	11.95	11.81
NaCl	2.73	2.59	2.49
Minerals premix*	2.50	2.50	2.50
Vitamin premix**	2.50	2.50	2.50
l-Threonine	2.80	2.80	2.80
Salt	2.00	2.00	2.00
Limestone	11.30	11.30	11.30
Sodium bicarbonate	4.40	4.40	4.40
Total	1000	1000	1000
Analyzed composition			
ME, kcal/kg	3025	3150	3200
Crude protein,%	22	21	19
Calcium,%	1.05	0.9	0.85
P available,%	0.5	0.45	0.42
Methionine,%	0.51	0.45	0.41
Lysine,%	1.43	1.24	1.09
Methionine + Cystine,%	1.07	0.95	0.86
Threonine	0.94	0.83	0.74

*Mineral premix provided per kilogram of diet, manganese, 55 mg;zinc, 50 mg; iron, 80 mg; copper, 5 mg; selenium, 0.1 mg; iodine, 0.36mg; sodium, 1.6 g.

**Vitamin premix provided per kilogram of diet, retinylacetate, 8,250 IU; cholecalcipherol 1,000 IU; dl-α-tocopherol, 11 IU; cyanocobalamin,0.012 mg; phylloquinone, 1.1 mg; niacin, 53 mg; choline,1,020 mg; folacin, 0.75 mg; biotin, 0.25 mg; riboflavin, 5.5 mg.

Results and Discussion

The results related to adding different levels of Thymolina on the performance of broiler chickens is indicated in table 3 and 4.

Table 3. Effect of Thymolina on performance

parameter	period	Treatment			
		T1 (0)	T2 (0.5%)	T3 (1%)	T4 (2%)
Weight Gain (g)	Starter	395 ^{d}	495.25 ^{c}	557 ^{b}	592.8 ^{a}
	Grower	568 ^{a}	562.75 ^{a}	527.75 ^{b}	482 ^{c}
	Finisher	1332 ^{a}	737.75 ^{b}	762.75 ^{b}	745 ^{b}
	Total	2295 ^{a}	1795.75 ^{b}	1847.25 ^{b}	1819.8 ^{b}
Body Weight (g)	Starter	440^{d}	540^{c}	600^{b}	640^{a}
	Grower	1008^{b}	1102.75^{a}	1127.75^{a}	1122^{a}
	Finisher	2340^{a}	1840^{b}	1890^{b}	1867^{b}
Feed Consumption (g)	Starter	584 ^{c}	664 ^{b}	706 ^{ab}	742 ^{a}
	Grower	1207 ^{b}	1322 ^{a}	1373 ^{a}	1396 ^{a}
	Finisher	2197	2082	2112	2101
	Total	3988	4068	4191	4239
Feed Conversion Ratio	Starter	1.48 ^{a}	1.34 ^{b}	1.27 ^{c}	1.25^{d}
	grower	2.125 ^{d}	2.35 ^{c}	2.6 ^{b}	2.89 ^{a}
	finisher	1.65 ^{c}	2.84 ^{a}	2.77 ^{b}	2.82 ^{a}
	total	1.74 ^{c}	2.27 ^{b}	2.27 ^{b}	2.35 ^{a}

^{a,b,c,d}Means values within a row with different superscripts different significantly ($P < 0.05$).

Weight gain

Weight-gain of chickens in initial periods was significantly affected. More improvement in weight-gain than in the control group can be the result of the increase in the digestibility and absorption of nutrients in food, reducing the effects of anti-bacterial and anti-fungal available in thymol including carvacrol, thymol, beta-Bisabolene, caryophyllene, and linalool in experiment groups. By stimulating beneficial microflora and reducing the harmful microbial population of the gastrointestinal tract, in addition to contributing to enhancement of health and immune system of chickens cause the improvement in their performances. Findings obtained from this experiment in relation with the relative weight-gain are consistent with reports of Garcia *et al.*, 2006; Brenes and Roura, 2010 and Mosaddegh *et al.*, 2013.

Chickens' weight-gain in final and growth periods as well as the whole period was not affected. Immune stimulation may have opposite effects on growth because more nutrients are consumed and disturbed in the antibody synthesis and growth of immune organs. Therefore, nutrients accessible for growth reduce. Findings obtained from this experiment in relation with the relative weight-gain are consistent with reports Jang *et al.*, 2007; Karimi *et al.*, 2010 and Cabuk *et al.*, 2006.

Studies indicate that the effect of herbal products on the improvement in growth and performance characteristics of broiler chickens depends on the stimulating effect of these products on the digestive system and digestion process, stimulation and intensification of the digestive enzymes secretion, increase in the efficiency of nutrient use, increase in the efficiency of liver function, improve the flavor of foods and the method and duration of the use and concentration of materials (Grashorn, 2010).

Consumed Feed

Consumed feed in initial and growth periods were significantly affected and significant difference was observed among treatments ($P<0.05$). The highest amount of feed consumed in initial and growth periods was related to the 2% Thymolina treatment and the lowest one was related to the control treatment. The increase in the amount of feed consumed in experiment groups containing Thymolina compared to the control group can be due to a range of reasons among which one can refer to factors such as increases in the amount of crude fibers of diets and hence the increase in speed of the intestinal contents passing through the digestive tract, palatability of diets, antimicrobial properties of medicinal plants, and the improvement in the general health and gastrointestinal tract of chickens, the increase in the pancreatic enzymes secretion and therefore increase in appetite to consume more food. Regarding the fact that crude fibers in monogastrics' digestive system are digested to a lesser extent, and are effective on the speed of the passage of food through the digestive tract as well as the reduction of the shelf-life, they can cause the increase in the amount of feed consumed for supplying energy and nutrients needed by the body.

In relation with effective materials available in medicinal plants, actions such as the increase in digestion, stimulation of the digestive enzymes secretion and materials, as well as antioxidant and antimicrobial effects regarding the mechanism of medicinal plants are effective on the performance of broiler chickens. Compounds such as carvacrol and thymol found in medicinal plants have properties of stimulation on excretory organs of the digestive system, especially pancreas and by increasing the amount of digestive juices and also internal enzymes, provide grounds for the maximum digestion and absorption of nutrients. This increase in the digestion and absorption of nutrients can be effective on the amount of consumed feed (Cross *et al.*, 2007).

Using medicinal plants numerically caused improving weight-gain in experiment groups as compared to the control group in initial, development periods as well as in the whole period. This issue can be due to the anti-bacterial and anti-fungal compounds found in plants for the experiment groups which by the reduction in the harmful microbial population of the gastrointestinal tract, in addition to contributing to enhancing health and immune of chickens, caused improving their performances. Findings obtained from this experiment in relation with the increase in consumed feed are consistent with reports of Hernández *et al.*, 2004 and Garcia *et al.*, 2006. In the final and total periods, the highest amount of consumed feed was related to the control treatment and the lowest one was related to the 0.5% Thymolina treatment. Findings obtained from this experiment in relation with the lack of increase in the amount of consumed feed are consistent with those of Deschepper *et al.*, 2003; Cross *et al.*, 2007 and Amooz Mehr & Dastar, 2009.

Feed Conversion Ratio

Experiment groups indicated significant difference in relation with conversion ratio in different periods and therefore, they were significantly affected and there was significant difference among treatments ($P<0.05$). Relative improvement of feed conversion ratio can be related to the antimicrobial effects of medicinal plants because according to Lee *et al.*, (2003), among the deficits of the existence of harmful bacteria in digestive systems, the increase in the breakdown of protein and amino acids by the deamination activity of digestive microbes on consumed proteins and amino acids as well as the increase in their breakdown due to the secretion of substances such as urease enzymes by microbes can be referred to. Regarding the fact that the application of medicinal plants results in reducing the population of microbes in the digestive tract; therefore, the speed of the breakdown of proteins and amino acids in digestive juices reduces and more amounts of them are absorbed and consequently it causes the improvement in feed conversion ratio (Lee *et al.*, 2003).

The results indicated that chickens which had received diets containing Thymolina had higher feed conversion ratio than those which had received the control diet. Thymolina causes the stimulation of the secretion of digestive enzymes such as amylase, protease, and lipase and thereby increasing the digestibility of nutrients; as a result, birds consume their feed with higher appetite; accordingly, the increase in consumed feed compared to weight-gain in related treatments results in the increase in the feed conversion ratio. Furthermore, it seems that with the increase in consumed feed and inaccessibility to nutrients, reduction of digestion, and absorption of nutrients of birds, the conversion ratio was influenced and increased. Findings of the experiment regarding the improvement in conversion ratio are consistent with the results of Marcincak *et al.*, (2008) and Mohebbifar & Torki, (2010).

Table 4. Effect of Thymolina on carcass characteristics

Parameter	treatment			
	T1 (0)	T2 (0.5%)	T3 (1%)	T4 (2%)
Carcass (g)	1641.8 [a]	1181.8 [b]	1246.8 [b]	1335 [ab]
Abdominal fat (g)	33.3	38.3	38.3	38.3
Breast (g)	620 [a]	375 [b]	410 [b]	355 [b]

[a,b,c]Means values within a row with different superscripts different significantly ($P < 0.05$).

Carcass Characteristics

The carcass and pectoral muscle were significantly affected. Experiment groups receiving medicinal plant of Thymolina enjoy numerically higher of carcass and pectoral muscle and less abdominal fat than the control group. The relative increase in the percentage of carcass can be related to the antibacterial effects of the medicinal plant because according to Lee *et al.*, (2003), among the deficits of the existence of harmful bacteria in digestive systems, the increase in the breakdown of protein and amino acids by the deamination activity of digestive microbes on consumed proteins and amino acids as well as the increase in their breakdown due to the secretion of substances such as urease enzymes by microbes can be referred to. Therefore, regarding the fact that the use of medicinal plants reduce the intestinal microbial population; therefore, the speed of the breakdown of protein and amino acids in digestive juices reduces and more amount of them are absorbed and stored in the body; as a result, by improving the percentage of organs of carcasses, it causes the reduction in the conversion of protein to fat and lower amounts of fat can be accumulated in the body.

According to different researchers, the efficiency of the weight of pectoral muscle and carcass in treatments which used Thymolina reduced. The reason can be due to the composition of the basic diet (diets with low digestibility), the feed consumption ratio as well as hygiene and environmental standards. In addition, the use of medicinal plants mainly due to antibacterial effects and effective materials available in them cause the improvement in digestion and absorption efficiency of different nutritional materials such as amino acids and consequently, they causes the improvement in carcass characteristics of broiler chickens. The results obtained from this experiment is consistent with the results of Alcicek *et al.*, 2003 and Bassett, 2000; but inconsistent with those of Sarica *et al.*, 2005. The difference available between the results can be due to the difference in the ratio of using medicinal plants, the type of medicinal plants, the studied chickens, and management conditions.

Conclusion

Results indicated that using Thymolina in the diet of broiler chickens causes improvements in performance characteristics. Therefore, it can be effective on the immune responses of broiler chickens and cause the improvement in performance. In general, the results of experiments of the present study indicated the use of Thymolina as herbal additives which can be replaced by the growth promoting antibiotics without side effects.

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References

1) Alcicek, A., Bozkurt, M., Cabuk, M. 2003. The effect of an essential oil combination derived from selected herbs growing wild in Turkey on broiler performance. South African Journal Animal Science, 33, 89-94.
2) Amooz Mehr, A., Dastar, B. 2009. Effects of alcoholic extract of two herbs garlic and thymus on the performance and blood lipids of broiler chickens, Journal of Agricultural Sciences and Natural Resource, 161, 8p.
3) Bassett, R. 2000. Oregano's positive impact on poultry production. World Poulty, 16,31-34.
4) Botsoglou, N.A., Fletouris, D.J. 2001. Drug Residues in Foods. Pharmacology, Food Safety and Analysis. New York, Marcel Dekker, Inc. pp. 541-548.
5) Brenes A., Roura, E. 2010. Essential oils in poultry nutrition, main effects and modes of action. Animal Feed Science Technology, 158, 1–1410.1016/j.anifeedsci.2010.03.007
6) Cabuk, M., Bozkurt, M., Alcicek, A., Catlı, A.U., Baser, K.H.C. 2006. Effect of a dietary essential oil mixture on performance of laying hens in the summer season. South African Journal Animal Science, 36, 215-221
7) Ciftci, M., Guler, T., Gulcihani Simsek, U., Nihat Ertas, O., Dalkilic, B., Bicer, Z. 2009. The effect of thymus vulgaris l. oil as growth promoter in broilers. Indian Veterinary Journal, 869, 930-932.
8) Cross, D.E., McDevitt, R.M., Hillman, K., & Acamovic, T. 2007. The effect of herbs and their associated essential oils on performance, dietary digestibility and gut microflora in chickens from 7 to 28 days of age, British Poultry Science, 48(4), 496-506.
9) Deschepper, K., Lippens, M., Huyghebaert, G., Molly, K. 2003. The effect of aromabiotic and GALI D, OR on technical performances and intestinal morhology of broilers. In, Proc. 14th European Symp. On Poultry Nutrition, August, Lillehammer, Norway, pp. 189.
10) Dieumou, F. E., Teguia, A., Kuiate, J. R., Tamokou, J. D., Doma, U. D., Abdullahi, U. S., Chiroma, A. E. 2011. Effect of supplemented diets with garlic organic extract and streptomycin sulphate on intestinal microflora and nutrents digestibility broilers. Online Journal of Animal and Feed Research, 3, 107-113.
11) Garcia, A. C. L., Rohde, C., Audino, G. F., Valente, V. L. S., Valiati, V. H. 2006. Identification of the sibling species of the Drosophila willistoni subgroup through the electrophoretical mobility of acid phosphatase-1. Journal of Zoological Systematics and Evolutionary Research, 443, 212-216.
12) Grashorn, M.A. 2010. Use of phytobiotics in broiler nutrition-an alternative to in feed production. Journal of Applied Poultry Research, 17: 750-756.
13) Greathead, H. 2003. Plants and plant extracts for improving animal productivity, Proceedings of the nutrition Society, 62, 279-290
14) Hernández, F., Madrid, J., García, V., Orengo, J. Megías, M.D. 2004. Influence of two plant extracts on broilers performance, digestibility, and digestive organ size. Poultry Science, 83, 169–174.
15) Jamroz, D., Kamel, C., Wiliczkiewicz, A., Wertelecki, T., Orda, J., Skorupinsk, J. 2005. Use of active substances of plant origin in chicken diets based on maize and locally grown cereals. British Poultry Science, 46, 485–493.
16) Jamroz, D., Orda, I., Kamel, C., Wiliczkiewicz, A., Wertelecki, T., Skorupinska, I. 2003. The influence of phytogenic extracts on performance, nutrient digestibility, carcass characteristics, and gut microbial status in broiler chickens. Journal of Animal Feed Science, 12, 583–596
17) Jang, I., Ko, Y., Kang, S., Lee, C. 2007. Effect of a commercial essential oil on growth performance, digestive enzyme activity and intestinal microflora population in broiler chickens. Animal Feed Science Technology, 134, 304-315.
18) Karimi, F., Yan, C., Coto, J. H., Park, Y., Min, C., Lu, J. A., Gidden, J. O., Lay, Jr., Waldroup, P. W. 2010. Effects of level and source of oregano leaf in starter diets for broiler chicks. Journal of Applied Poultry Research. 19 2, 137-145 doi,10.3382/japr.2009-00088.
19) Lee, K.W., Everts, H., Beyen, A.C. 2003. Dietary carvacrol lowers body gain but improves feed conversion in female broiler chickens. *Journal of Applied Poultry Research*, 12:394-399.
20) Marcincak, S., Cabadaj, R., Popelka, P., Soltysova, L. 2008. Antioxidative effect of oregano supplemented to broilers on oxidative stability of poultry meat. Slovenian Veterinary Research, 45,61–66.
21) Mohebbifar, A, Torki ,M .2010 Effects of adding mixed powder of garlic and thyme to diets included graded levels of rice bran on productive performance of laying hens and egg quality characteristics. Advances in Environmental Biology, 43 469-476.
22) Mosaddegh, R., Salari, S., Sari, M., Mohammadabadi, T., Taghizadeh, M. 2013. Comparison between Effects of Addition of Salvia mirzayanii Essence with Virginiamycin on Performance, Carcass Characteristics, Blood Factors and some Immune Parameters of Broiler Chickens. Journal of Studies of Animal Sciences Iran, 51, 20-28.
23) Ocak, N., Erenter, G., Burak, A.K.F., Sungue, M., Altop, A., Ozmen, A. 2008. Performance of broilers fed diets supplemented with dry peppermint Mentha piperita L. or thyme Thymus vulgaris L. leaves as growth promoter source. Czech Journal of Animal Science. 53, 169-175.

24) Sarica, S., Corduk, M., Kilinc, K. 2005. The effect of dietary L-carnitine supplementation on growth performance, carcass traits and composition of edible meat in Japanese quail Coturnix coturnix japonica. Journal of Applied Poultry Research, 14,709–715.
25) Schulte, K. E., Rucker, G., Perlick, J. 1967. The presence of polyacetylene compounds in Echinacea purpurea and Echinacea angustifolia DC. Arzneimittelforschung. 17, 825-829.
26) Stoni, A., Zitterl-Egelseer, K., Kroismayr, A., Wetscherek, W., Windisch, W. 2006. Tissue recovery of essential oils used as feed additive in piglet feeding and impact on nutrient digestibility. Proceedings of the Society of Nutrition Physiology, 15, 60.
27) Tipu, M.A., Akhtar, M.S., Anjumi, M.I., Raja, M.L. 2006. New dimension of medicinal plants as animal feed. Pakistan Veterinary Journal, 263, 144-148.