



Research Article

Effect of Marjoram Supplementation on Growth Performance and Some Immunological Indices in Broilers

Sherif Mohamed Shawky¹, Sahar Hassan Orabi^{2*} and Ahmed Dawod³

¹Department of Physiology, Faculty of Veterinary Medicine, University of Sadat City, Egypt

²Department of Biochemistry and Chemistry of Nutrition, Faculty of Veterinary Medicine, University of Sadat City, Egypt

³Department of Husbandry and Animal Wealth Development, Faculty of Veterinary Medicine, University of Sadat City, Egypt

*Corresponding author: saher977@yahoo.com

Article History: 19-684 Received: October 26, 2019 Revised: November 10, 2019 Accepted: November 15, 2019

ABSTRACT

This study aimed to explore the effects of Marjoram (*Origanum majorana* L.), on growth performance, carcass characteristics, and immunity in broilers. A sixty of one-day-old Cobb broiler chicks were randomly divided into 2 groups; Chicks of group 1 were fed on basal diet considered as a control group, chicks of group 2 were fed on an experimental ration containing 2% marjoram. The results showed that the Marjoram significantly increase ($P<0.05$) some growth factors as bodyweight after 3rd, 4th and 5th weeks, weight gain at 3th and 5th weeks, also significantly improved feed conversion ratio (FCR) at 3rd, 5th weeks in comparison with the control group. Also, Marjoram supplementation at the level of 2% caused a significant elevation ($P<0.05$) in gamma globulin, thus marjoram could be considered as an immunity enhancer for broilers. In conclusion, the present study proved that supplementation of the ration with Marjoram could improve growth performance and immunological state in broilers

Keywords: Marjoram, Growth performance, Immunity, Broiler

INTRODUCTION

Herbal plants have an important role to improve feed efficiency, stimulate bodyweight gain (BW) and have a positive effect on poultry health. *Origanum majorana* L. (Marjoram), was familiar to the ancient Greeks, Romans, and Egyptians (Tainter and Grenis, 1993). Marjoram is a medicinal plant known for its antifungal and antibacterial activities (Deans and Svoboda, 1990). Besides, Marjoram water extracts have a high antioxidant effect (Triantaphyllou *et al.*, 2001; Juliani and Simon, 2002). Several kinds of literature reported that essential oil components of Marjoram were terpinene-4-ol, gamma-terpinene, terpinolene, trans-sabinene hydrate, thujanol, thymol and linalool (El-Ghorab *et al.*, 2004). Thymol which is one of ingredient of Marjoram is considered as health-promoting ingredients (Shoji and Nakashims, 2004), also has an antimicrobial effect, and antifungal (Manou *et al.*, 1998). In traditional medicine, Marjoram is used for coughs, dizziness, depression, cramps, gastrointestinal disorders, nervous headaches and migraine (El-Ashmawy *et al.*, 2007). Also, Marjoram is used as an antiseptic, analgesic, bactericidal, laxative agent and antiviral (Ipek *et al.*, 2005). Marjoram also has a role in enhancing metabolism (Ahmed *et al.*, 2009). There is a little available studies on Marjoram.

Thus, this study was performed to assess the potential impact of supplementation of Marjoram as feed additives on hematological parameters, growth performance, and immunity status in broilers.

MATERIALS AND METHODS

All experimental procedures used in this experiment were agreed by the Animal Care Committee of the University of Sadat City.

Experimental design

A Sixty Cobb broiler chicks of one-day-old was obtained from the Arab poultry group. Chicks were placed on a suitable size floor. The first week of life temperature was (33°C), the temperature was Reduced by approximately (3°C) per week until (21°C) was reached. Artificial lighting provided 24 hours a day for the first few days to help newly hatched chicks begin to drink and eat. After 2 weeks one hour of darkness daily was applied. New castle vaccine (killed vaccine) was administered on the 7th day in drinking water and the Gambaro vaccine on the 14th day in drinking water. Broilers were randomly divided into 2 dietary treatments of 3 replicates as floor pens with 10 birds per

Cite This Article as: Shawky SM, SH Orabi and A Dawod, 2020. Effect of marjoram supplementation on growth performance and some immunological indices in broilers. Int J Vet Sci, x(x): xxxx. www.ijvets.com (©2020 IJVS. All rights reserved)

each and reared for 35 days. All chicks receive the starter ration at first two weeks then replaced by experimental ration from starting 15th days of age until the end of the experiment at 35 days (Table 1). Group 1 (control group): Chicks were fed on basal ration. Group 2 (Marjoram group): Chicks were fed on an experimental ration containing 2% Marjoram.

Determination of growth performance

Bodyweight was recorded on day 14, 21, 28 and 35, and feed consumption was recorded, weight gain, feed intake and FCR calculated according to the following equations: weight gain = Final body weight - Initial body weight (Nwanna, 2003), Daily feed intake = FC/ (m × n), FC is total feed consumption, m is the trial days of starter and grower period and n is the number of broiler chicks in each cage. FCR = feed intake (g)/ weight gain (g) (Hepher, 1988).

Organ weights

At 35th days, after weighing, 12 birds per treatment were randomly selected and scarified. The weights of livers, gizzard, hearts, spleens breast and thigh were recorded.

Collection of samples

Samples of blood were collected from each bird on day 35th by vein puncture from wing Vein. A blood sample was drawn into heparinized tubes for obtaining whole blood for blood pictures (Hb-PCV). The other blood sample was collected into a dry tube for separation of serum. Then serum quickly stored at - 20 °C until used for determination of protein, albumin level, kidney function test (urea and creatinine), liver biomarkers (ALT and AST), Ca, Ph, glucose, cortisol, and protein electrophoresis.

Biochemical analysis

Analytical kits produced by Diamond Diagnostics obtained from El-Gomhoria Company, Cairo, Egypt for determination of Hb, Urea, creatinine, ALT, AST, total protein, and albumin following the manufacturer's instructions. Estimation of glucose by kits obtained from Spinreact Company. Estimation of cortisol by kits obtained from Sigma Aldrich.

Hemoglobin concentration was measured by the Cyanomethemoglobin method (Pilaski, 1972). Packed cell volume was measured by a method described by Feldman *et al.* (2000). The activities of serum AST and ALT were estimated according to the method of Young (2001), Total protein, Calcium, and Glucose were estimated by the method of Tietz (1995), and Albumin was measured by method of Reinhold (1953). Urea was measured according to Patton and Croush (1977), creatinine was measured according to Young (2001), Phosphorus was determined according to Young (1991), Cortisol determined according to Mattingly *et al.* (1971).

Protein electrophoresis

Determined using kits produced by Helana laborites (Alper, 1974).

Statistical analysis

Analysis of the obtained results was statistically performed using a Paired t-test with SPSS software (SPSS version 16.0, IBM, Chicago, IL, USA).

RESULTS

As shown in Table 2. The Marjoram supplement significantly increased BW after 3rd, 4th and 5th weeks in comparison with the control group. There was a significant increase in weight gain at 3th and 5th week in the Marjoram supplement group in comparison with the control group. Also, the addition of Marjoram in the diet significantly improved FCR at 3rd, 5th weeks in comparison with the control group. Dietary supplementation with Marjoram not affected the weights of carcass parts (Table 3). The levels of albumin, gamma globulin showed a significant elevation (P<0.05) after the Marjoram supplement diet as compared to the control group (Table4). There is no significant difference in ALT, AST, Urea, Creatinine, Ca, cortisol, Hb and PCV between the marjoram supplement group and the control group while there is a significant increase in the Ph level in Marjoram supplement group compared to the control group (Table 5).

DISCUSSION

The findings of the current study showed that the supplementation of 2% marjoram significantly increases (P<0.05) some growth factors as BW after 3rd, 4th, and 5th weeks; a significant increase in weight gain at 3th and 5th week, also significantly improved FCR at the 3th and 5th week in comparison with the control group. Also, results suggested that the addition of Marjoram at the level of 2% resulted in a significant elevation (P<0.05) in gamma globulin, It also appears to have an impact effect on immune responses, and considered as an immunity enhancer for broiler chicks. These results were in line with that of Toghyani *et al.* (2010) who reported that the supplementation of Marjoram extract has a beneficial effect on immunity. Moreover, Osman *et al.* (2010) reported that dietary supplementation with a higher level of Marjoram (124.38%) have better economic efficiency as it improves carcass characteristics, immunological performance, and

Table 1: The components of basal ration

Components and composition (%)	Starter	Finisher
Corn	55.59	61.07
Soy bean meal	37.32	31.83
Soy oil	2.98	3.41
Lime stone	1.21	1.42
Dicalcium Phosphate	1.60	1.16
DL. Methionine	0.20	0.10
Vitamin and Minerals	0.60	0.60
Sodium chloride	0.23	0.18
Sodium bicarbonate	0.27	0.23
Chemical Analysis (%)		
Metabolizable energy (ME) kcal/kg	2950	3050
Crude Protein (%)	21.20	19.16
Lysine (%)	1.14	1.01
Methionine (%)	0.50	0.39
Methionine and Cysteine (%)	1.03	0.84
Available Methionine + Cysteine (%)	0.85	0.71
Calcium (%)	0.93	0.90
Available Phosphate (%)	0.44	0.35

Vitamins and minerals supplied per kilogram: vitamin A, 1,500 IU; cholecalciferol, 200 IU; vitamin E, 10 IU; riboflavin, 3.5 mg; pantothenic acid, 10 mg; niacin, 30 mg; cobalamin, 10 µg; choline chloride, 1,000 mg; biotin, 0.15 mg; folic acid, 0.5 mg; thiamine 1.5 mg; pyridoxine 3.0 mg; iron, 80 mg; zinc, 40 mg; manganese, 60 mg; iodine, 0.18 mg; copper, 8 mg; selenium, 0.15 mg.

Table 2: Effect of Marjoram 2% on bodyweight, weight gain, feed intake and FCR of broilers

Parameters	Control	Marjoram
Bodyweight (g)		
1-15d	579±3.6	600±6.4
15-21d	862.71±11.2 ^b	964.1±9.4 ^a
21-28d	1447.0±9.6 ^b	1500±14.3 ^a
28-35d	1873.5±22 ^b	1982±25.5 ^a
Weight gain(g)		
W2-W3	283.7±7.3 ^b	364.9±3.5 ^a
W3-W4	584.3±4.8	535±6.6
W4-W5	426.5±13.1 ^b	481.7±14.4 ^a
Total W G	1294.5±18.1 ^b	1382±19.6 ^a
Feed intake (g)		
At end W3	553	541
At end W4	773.6	729.8
At end W5	742.6	760.5
Total	2029.2	2031.3
Feed conversion ratio %		
At end W3	1.93±0.05 ^a	1.70±0.06 ^b
At end W4	1.26±0.01 ^b	1.42±0.02 ^a
At end W5	1.74±0.05 ^a	1.58±0.11 ^b
Total	1.57±0.02 ^a	1.47±0.02 ^b

The values are expressed as the mean±SE; carrying different characters in the same row are significant different.

Table 3: Effect of Marjoram 2% on carcass characteristic of broilers at 35 days of age

Parameter (g)	Control	Marjoram
Liver	43.7±5.8	43.5±6.5
Gizzard	41.2±1.4	40.2±1.4
Heart	11±1.5	10±1.2
Spleen	2.2±0.59	2±0.77
Breast	358±40.5	381±31.6
Thigh	209.2±11.5	212±24.0

The values are expressed as the mean±SE.

Table 4: Effect of 2% Marjoram on total protein, albumin, and globulin fractionation of broilers at 35 days of age

Parameter (g/dl)	Control	Marjoram
Total protein	2.6±0.17	2.8±0.23
Albumin	1.3 ±0.20 ^b	1.5±0.11 ^a
Alpha 1Globulin	0.16±0.54	0.16±0.54
Alpha 2Globulin	0.24±0.05	0.16±0.05
Gamma Globulin	0.48±0.08 ^b	0.58±0.04 ^a
Beta Globulin	0.44±0.05	0.38±0.13

The values are expressed as the mean±SE; Values carrying different characters in the same row are significant different

Table 5: Effect of Marjoram 2% biochemical parameter and hematology of broilers at 35 days of age

Parameters	Control	Marjoram
ALT (IU/L)	43±8.0	37±4.7
AST(IU/L)	207±16	187±32
Urea (mg/dl)	10.4±0.51	10.5±0.79
Creatinine (g/dl)	0.4±0.05	0.5±0.10
Ca (mg/dl)	8.6±0.29	9.2±0.82
Ph (mg/dl)	4.0±0.22 ^b	5.4±0.61 ^a
Hb (g/dl)	12.1±0.09	12.3±1.2
PCV%	32±2.0	33±1.7
Glucose (mg/dl)	122±13.5	137±23.6
Cortisol (ug/dl)	0.6±0.1	0.7±0.1

The values are expressed as the mean±SE; Values carrying different characters in the same row are significant different.

productivity. Also, feeding higher Marjoram (1.58 g feed/g gain) has a better feed conversion ratio, performance index values, and better protein efficiency ratio. Previous literature stated that Marjoram plants contain thymol and

carvacrol (Abd El-Hack *et al.*, 2016). The improvement in growth factors may be attributed to the presence of thymol and carvacrol which have a positive effect on the intestinal flora and antibacterial properties that can have an important role in stimulating growth (Ahmadifar *et al.*, 2011).

Conclusions

The present data conclusively proved that the administration of marjoram improves carcass characteristics, growth performance, and immunological state. There is no more available literature on Marjoram and its effect on immunity; it may need a future study.

REFERENCES

- Ahmadifar E, Falahatkar B and Akrami R, 2011. Effects of dietary thymolcarvacrol on growth performance, hematological parameters and tissue composition of juvenile rainbow trout, *Oncorhynchus mykiss*. *J Appl Ichthyol*, 27: 1057-1060.
- Ahmed LA, Ramadan RS and Mohamed RA, 2009. Biochemical and histopathological studies on the water extracts of marjoram and chicory herbs and their mixture in obese rats. *Pak J Nutr*, 8: 1581-1587.
- Abd El-Hack ME, Alagawany M, Farag MR, *et al.*, 2016. Beneficial impacts of thymol essential oil on health and production of animals, fish and poultry: a review. *J Essential Oil Res*, 28: 1-14.
- Alper CA, 1974. Plasma protein measurements as a diagnostic aid. *New Eng J Med*, 291: 287-290.
- Deans SG and Svoboda KP, 1990. The antimicrobial properties of marjoram (*Origanum majorana* L.) volatile oil. *Flav Frag J*, 5: 187-190.
- El-Ashmawy IM, Saleh A and Salama OM, 2007. Effects of marjoram volatile oil and grape seed extract on ethanol toxicity in male rats. *Bas Clin Pharm Tox*, 101: 320-327.
- El-Ghorab AH, Mansour AF and El-massry KF, 2004. Effect of extraction methods on the chemical composition and antioxidant activity of Egyptian marjoram (*Majorana hortensis* Moench). *Flav Frag J*, 19: 54-61.
- Ezzat Abd El-Hack M, Alagawany M, Farag MR, *et al.*, 2016. Beneficial impacts of thymol essential oil on health and production of animals, fish and poultry: a review. *J Essen Oil Res*, 28: 365-382.
- Feldman BF, Zinkl JG and Jain NC, 2000. *Textbook of Veterinary Clinical Medicine* 5th ed. Philadelphia: Williams and Wilkins pp: 21-100.
- Hepher B, 1988. *Nutrition of pond fishes*. Cambridge University Press.
- Ipek E, Zeytinoglu H, Okay S, *et al.*, 2005. Genotoxicity and antigenotoxicity of *Origanum* oil and carvacrol evaluated by Ames Salmonella/microsomal test. *Food Chem*, 93: 551-556.
- Juliani HR and Simon JE, 2002. In: Janick J and A Whipkey (ed.), *Antioxidant Activity of Basil*. Trends in New Crops and New Uses. pp: 575-9. Proceedings of the Fifth National Symposium, Atlanta, Georgia, USA, 10-13 November, 2001.
- Manou I, Bouillard L, Devleeschouwer MJ, *et al.*, 1998. Evaluation of the preservative properties of *Thymus vulgaris* essential oil in topically applied formulations under a challenge test. *J Appl Micro*, 84: 368-376.
- Mattingly IG, Liberman AM, T Syrdal AK *et al.*, 1971. Discrimination in speech and nonspeech modes. *Cogn Psychol*, 2: 131-157.
- Nwanna LC, 2003. Nutritional value and digestibility of fermented shrimp head waste meal by African catfish *Clarias gariepinus*. *Pak J Nutr*, 2: 339-345.

- Osman M, Yakout HM, Motawe HF *et al.*, 2010. Productive, physiological, immunological and economical effects of supplementing natural feed additives to broiler diets. Egypt. Poult Sci J, 30: 25-53.
- Patton CJ and Crouch SR, 1977. Spectrophotometric and kinetics investigation of the Berthelot reaction for the determination of ammonia. Anal Chem, 49: 464-469.
- Pilaski J, 1972. Vergleichendauntersuchungenwher den hemoglobinehalfdeshuhner and putenblutes in abhangigkeit. Voraiteundegshlecht. Arch Eflugelkunde, 37: 70.
- Reinhold JG, 1953. Total protein, albumin and globulin. Stan Meth Clin Chem, 1(S 88).
- Shoji Y and Nakashima H, 2004. Nutraceuticals and delivery systems. J Drug Targ, 12: 385-391.
- Tainter DR and Grenis AT, 1993. Spices and Seasonings: A Food Technology Handbook. VCH, Publishers, Inc, New York.
- Tietz NW, 1995. gases and electrolytes in: fundamentals of clinical chemistry, editor, Saunders, Philadelphia, 176: 903-908.
- Toghyani M, Mousavi SK and Modaresi M, 2010. Effect of water extract of marjoram (*Origanummajorana* L.) as an alternative to antibiotic growth promoter on immunity and serum lipid profile of broiler chicks. In 2010 2nd International Conference on Chemical, Biological and Environmental Engineering pp: 314-316. IEEE.
- Triantaphyllou K, Blekas G and Boskou D, 2001. Antioxidative properties of water extracts obtained from herbs of the species Lamiaceae. Inter J Food Sci Nutr, 52: 313-317.
- Young DS, 1991. Effects of drugs on.3ed ed, on clinical lab. Tests, AACC press, Washington (DC), Supplement No 1.
- Young DS, 2001. Effects of disease on clinical lab. Tests, 4th AACC.