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The role of peppermint (*Mentha piperita*) on performance in broiler diets

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ABSTRACT

This study was conducted to determine the performance of broilers fed diets supplemented with dry peppermint (*Mentha piperita L.*),which are among the alternative growth promoters. A total of 200 (Hubbard) broiler chicks were used in this study Five levels of whole peppermint, 0.00%, 0.25%, 0.5%, 1.0% and 1.5% were incorporated into the basal diet for six weeks . The feeding period for all groups lasted for 42 days. The results have appeared that there is an improvement in performance traits for all treated groups compared with the control group. However, the chicks feed with 0.50 % peppermint performed better than those fed with 1.5% peppermint concerning weekly body weight gain, feed conversion ratio and dressing percent, there was no significant effect was noticed on the addition of the peppermint to the diet on blood traits (PCV% , RBC , Hb% and WBC) , unless liver weight shows that were significant between treatments compared with control. For the H/L ratio shows significant difference between treatments compared with control.

Keywords: peppermint, performance, broilers,

INTRODUCTION

Antibiotics such as avoparcin, bacitracin, lincomycin, penicillin-G-procaine, chlortetracycline and virginiamycin promote growth, because of their effect on the microflora in the gastrointestinal tract , (Coates *et al.*,1963; De man ,1975).Throughout the world ,the use of these antibiotics are considered as dietary growth promotion purposes.

The phasing out of Antibiotic Growth Promoters (AGP) will affect the poultry and animal industry widly. To minimize the loss in growth, there is a need to find alternative to AGP. There are a number of non-therapeutic alternatives such as enzymes, inorganic acids, probiotics , prebiotics , herbs , immunostimulant and other management practices (Banerjee,1998).

Since ancient times , herbs and their essential oils have been known for their varying degrees of antimicrobial activity (Juven *et al*,1994,Change ,1995). One of these herbal plants used in this study is peppermint (*Mentha piperita*),

Mentha (Mint) mints are aromatic , almost exclusively perennial , rarely annual, herbs, that are widely distributed and can be found in many environments (Brickell,2002).

Menthol is a genus of about 25 species (and many hundreds of varieties) of flowering plants in the family lamiaceae (Mint family). Mentha (spicata) is an important raw material that has been used as a carminative , antispasmodic ,diuretic , and as a flavouring agent for confectionary ,chewing gums cosmetic , toothpastes and many other products (Colby *et al.*1993).

All mints prefer and thrive in cool moist spots in partial shade. They are fast growing , extending their reach along surfaces through a network of runners. Due to their speedy growth ,one plant of each desired mint ,along with a little care ,will provide more than enough mint for home use .

The leaf, fresh or dried, is the culinary source of mint. Fresh mint is usually preferred over dried mint when storage of the mint is not a problem .The leaves have a pleasant warm, fresh, aromatic , sweet flavor with a cool aftertaste.

Mint essential oil and menthol are extensively used as flavorings in breath fresheners, drinks, antiseptic mouth rinses, toothpaste, chewing gum, desserts and candies. The main medicinal action of the leaves and flowering the active of the mint depend on the abundant volatile oil, which has been found to contain a hydrocarbon, thymol and higher oxygenated compounds. It yields its virtues to boiling water, but particulary to alchol. Steam are antispasmodic, choleretic and carminative (Grieve, 1981, Chopra *et al.*, 1992).

The family of Labiate, which are rich in essential oil have commercial and medical values. They are widespread through the world. That are widely used in food, flavor, cosmetic and pharmaceutical industries (Savithri Bhat, *et al.*, 2002).

Mint is usually taken after a meal for its ability to reduce indigestion and colonic spasms by reducing the gastrocholic reflux (Spirling and Daniels, 2001).

The growing of aromatic and medicine plants in our country becomes more and more popular and requires selecting the most suitable plants (Viskelis *et al*.2003).

MATERIALS AND METHODS:

A total of 200 Hubbard broiler chicks were used in this study. One –day old chicks were obtained from a local hatchery and placed in closed house in the poultry farm veterinary collage, Baghdad University

The house was divided into five small pens. The weight of chicks were taken and randomly housed in floor pens with wood shaving. Artificial lighting is provided throughout the experiment. The temperature of the house and vaccination program applied based on broiler raisers recommendations. The ingredients and composition of the basal diet are presented in Table 1. It was formulated to meet nutrient requirement of broiler chickens (NRC,1994).The peppermint of leaves were purchased commercially as dried herb supplements.

On arrival at the site of the experiment, chicks were allocated at random into five groups of 40 chicks each. Birds in group 1 were only fed the basal diet and assigned as untreated control. Birds in group 2,3 ,4 and 5 were fed the basal diet that was supplemented with peppermint at 0.25%, 0.5%, 0.1% and 1.5% respectively. The chicks of each treatment were fed the respective diets and water was provided *ad libitum* throughout the six weeks.

The average live body weights, body weight gains, feed intake and conversion ratio were measured on a weekly basis. Mortality for each treatment were recorded. Birds were slaughtered by cutting the throat and jugular vein using a sharp knife near the first vertebra. From each replicate 10 birds were picked for eviscerating to calculate the dressing percent without the edible giblets (Heart, Liver and Gizzard). After recording their weight, two birds from each replicate were slaughtered and blood samples were collected from the bronchial vein to determine the RBC, WBC count, PCV and Hb. The blood samples were collected in test tubes with an anticoagulant (Sodium Eythllene Ditetra amino).

Data were analyzed by using the General Linear Model Procedure of SAS Institute (2001). The means were compared by the Duncan's Multiple Range Test at 5% probability (Steel and Torrie, 1980).

Table1: Composition of the basal diets used in the periods of the experiment.

Ingredients(%)	Finisher 1-21 day	Starter 22-42 day
Yellow corn	58.0	64.0
Soybean meal (45% protein)	38.0	32.0
***premix**	3.0	3.0
Oil(8900 Kcal/Kg)	0.5	0.5
Salt(NaCl)	0.3	0.3
Methionine	0.1	0.1
Lysine	0.1	0.1
Total	100	100
Calculated chemical anaylsis		
ME(kcal/Kg)	2850	2900
Crude protien (%)	22.4	20.2
Calcium	0.13	0.23
Avial. Pho.	0.17	0.16
Methionine+Cystine	0.80	0.75
Lysine	1.22	1.15

*Premix : (1%)provided the following (per Kg of complete diets) , 1400 IU Vit. A , 3000 IU Vit.D3 , 50 mg Vit.E , 4 gm Vit. K , 3 mg Vit. B6 , 6 mg Vit.B12 , 60 mg niacin , 20 mg pantothenic acid ,0.2 mg folic acid ,150 mg choline ,4.8 mg Ca , 3.18 mg P, 100 mg Mn , 50 mg Fe , 80 mg Zn,10 mg Cu , 0.25 mg Co. 1.5 mg Iodine .

Ref. : NRC,1994 .

RESULTS AND DISCUSSION

There was no clear effect of dry pepper mint on mortality and number of birds. Average body weight, body weight gain, feed intake and feed intake to gain ratio in broilers fed peppermint as growth promoter sources are presented in table 2.

In general, differences in body weight gain, feed intake or feed conversion ratio were observed in broiler fed the different experimental diets. 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 herbs, plant extracts yielded contradicting results (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).

Table (2): Effects of peppermint on the performance of broilers. Average body weight, body weight gain. feed

Measure / Treatments	3 weeks				6 weeks			
	Body wt.(gm)	Body wt. gain (gm)	Feed intake (gm)	Feed. Conversion	Body wt.(gm)	Body wt. gain (gm)	Feed intake (gm)	Feed. Conversion
Control T_1	860 ± 12.6^{c}	818±14.6^{c}	1450±21.9^{c}	1.77±2.9^{b}	2500 ± 41.3^{c}	2458±39.7^{c}	5653±56.2^{a}	2.3±1.91^{b}
0.25% T_2	1112± 17.4^{b}	1071±17.3^{b}	1632±32.4^{b}	1.52±1.9^{a}	2686± 32.7^{b}	2645±33.4^{b}	5475±47.3^{a}	2.07±1.87^{b}
0.50% T_3	1364±19.3^{a}	1225±21.3^{a}	1812±29.3^{a}	1.48±2.1^{a}	2957±48.8^{a}	2916±36.5^{a}	5132±51.3^{a}	1.76±1.74^{a}
1% T_4	1184±21.4^{ab}	1144±19.6^{b}	1842±24.3^{a}	1.61±1.7^{a}	2674±57.4^{ab}	2633±29.6^{ab}	4762±49.7^{ab}	1.88±1.49^{a}
1.5% T_5	1246±16.8^{a}	1150±18.3^{b}	1780±17.3^{a}	1.55±1.8^{a}	2750±64.8^{b}	2710±28.7^{a}	4489±38.7^{b}	1.72±1.56^{a}

abc, Means in the same column with no common superscript differ significantly, P≤ 0.05.

Table (3) Effect of pepper mint on mortality %, dressing % , liver %, gizzard % and heart % of broiler ±SE

Measure / Treatments	Mortality %	Dressing %	Liver %	Gizzard %	Heart %
T1 Control	8.9±2.72 c	72.1 ± 1.94 c	3.2 ± 1.11 a	2.7 ± 0.06 a	0.63 ± 0.05 a
T2 0.25% pepper mint	5.6±3.43 b	74.2 ± 1.82 b	2.8 ± 0.09 b	2.8 ± 0.06 a	0.58 ± 0.04 a
T3 0.50% pepper mint	2.3±4.33 a	76.8 ± 1.62 a	2.9 ±0.09 b	2. 7 ± 0.07 a	0.62 ± 0.03 a
T4 1% pepper mint	4.2 ±3.51 b	75.4 ± 1.91 ab	2.6 ±0.07 b	2.8 ± 0.05 a	0.66 ± 0.04 a
T5 1.5% pepper mint	4.9 ±2.42 b	74.7 ± 2.17 b	2.7±0.08 b	2.7 ± 0,05 a	0.67 ± 0.05 a

^{a,b,c} Means with different superscript in the same row differ significantly (P□0.05) .

Table (4) Effect of pepper mint on the blood characteristics broiler

Measure / Treatments	PCV %	RBC Cell/mm^3	Hb %	WBC Cell/mm^3	H / L Ratio	Albumin g/100ml	Globulin g/100ml
T1 Control	31.23 ±0.49a	3.38 ± 0.19a	8.79 ± 0.23a	23.45 ± 0.21	0.34 ± 0.02 c	2.61 ± 0.04	2.64 ± 0.05 c
T2 0.25% pepper mint	31.57 ±0.47a	3.41 ± 0.16a	9.23 ± 0.16a	23.61 ± 0.28	0.31 ± 0.07 b	2.57 ± 0.07	2.98 ± 0.55 a
T3 0.50% pepper mint	31.61 ±0.41a	3.49 ± 0.16a	9.29 ±0.19 a	23.54 ± 0.09	0.30 ± 0.04 b	2.54 ± 0.06	2.90 ± 0.49 a
T4 1% pepper mint	31.46 ±0.52a	3.43 ± 0.17a	8.98 ±0.24a	23.49 ± 0.31	0.32 ± 0.12 a	2.53 ± 0.052	2.75 ± 0.54 b
T5 1.5% pepper mint	31.48 ±0.38a	3.51 ± 0.21a	8.92±0.21a	23.53 ± 0.24	0.32 ± 0.14 a	2.51 ± 0.55	2.78 ± 0.35 b

^{a,b,c} Means with different superscript in the same row differ significantly (P□0.05) .

The higher body weight gain observed in broilers fed the peppermint diet may be related to the reported properties of menthol (Lovkova *et al*., 2001).The difference in body weight gain between the control and peppermint group was not reflected in the body weights of slaughter age. Such a case can firstly be explained by the fact that the old birds were better able to perform with finisher basal diet due to the fact that the nutrient requirements decrease with age (NRC, 1994). Also due to the development of the digestive tract and organs (Lilja, 1983). In fact, the effect of supplements was not significant on the relative weights of the edible organs.

Table (3) shows that the effect of peppermint on mortality, dressing, liver weight, heart weight and gizzard weight. It also shows that there was significant difference ($P < 0.05$) on mortality rate between treatments compared with the control group .Also it shows that the improvement in the mortality may be due to the role of herbal plant (peppermint) in the immune stimulating factor.

The same table shows that treatments T3 and T4 exhibit a significant increase in dressing percent compared with the control group. This result agrees well with Durrani *et al*., 2007 who reported that the use of 40 ml L^{-1} of wild mint infusion in drinking water had a significant ($P<0.05$) effect on mean dressing percentage , as compared with probiotic. While this result is not in agreement with (OCAK *et al*., 2008) who reported that the carcass weight and dressing percentage were not significantly affected by peppermint.

Mean weight of heart and gizzard showed no significant difference. liver weight of control group was higher than those of the other groups. A previous study carried out by the author using (anise and rosemary) led to similar finding.

In Table (4) the hematological parameter indicated no significant ($P<0.05$) between different treatments .The values are in correspondence with that of the normal range for healthy birds stated by Mitruka and Rawnley (1977). No significant difference were noticed in all types of WBC, No significant effect in H/L ratio among treatments but there was a significant different ($P<0.05$) between all treatments compared with the control group. Our results agreed with Al-Kassie (2008) who reported that the use of a source of probiotic and source of probiotic cause a significant decrease ($P<0.05$) in H/L ratio compared with control group. This inhibition may be due to the nutrition stress or any stress that causes the increase in H/L ratio .The stress could increase the stimulation of adrenal gland to produce some hormones such as estrogen which has a direct effect in analyzing a lymphatic cell which causes increase in H/L ratio (Gross and Siegol, 1983). Little increase was also noted in T4 (1 % peppermint) and T5 (1.5% peppermint). This may be due to the effects of the most important activities of essential plant oils which cause improvement in the endogenous enzymes secretion and stimulation of appetite, digestibility and nutrients absorption .Improvement of the microflora balance and the decrease of *E.coil* and *Clostiridium* population and stimulating of the *Lactobacillus spp* .Proliferation, were also involved in the advantage of these oils. Intestinal villi layer production, antibacterial, antiviral and anti diarrhea activity and stimulation of the immune system were also enhanced (Horobowicz, 2000 ; Jamroz *et al* ., 2004).

REFERENCES:

Acamovic T., Brooker J.D. (2005) :Biochemistry of plant secondary metabolites an their effects in animals Proc . Nutr .Soc., 64, 403-412.

Al- Kassie, G.A.M. (2008): The effect of anis and rosemary on broiler performance. Int. J. of poult. Sci., 7(3): 243-245

Alcicek A ., Bozkurt M., Cabuk M. (2004) : The effect of mixture of herbal essential oils , an organic acid or a probiotic on broiler performance .S .Afr. J. Anim . Sci., 34, 217-222.

AOAC, 1996. Association of Official of Analytical Chemist Methods of Analysis 13th Edn., Washington, DC., USA.

Bampidis V.A., Christodoulou V., Florou –Paneri P., Christaki E., Chatopoulou P.S., Tsiligianni T., Spais A.B. (2005): Effect of dictary dried oregano leaves on growth performance, carcase characteristics andserum cholesterol of female early maturing turkeys. Brit. Poult.Sci., 46, 595- 601.

Banerjee, G.C. 1998. A Text Book of animal Husbandry .2nd edition Indic Puplication, Delhi, India.

Botsoglou N.A., Christaki E., Florou –Paneri P., Giannenas I., Papageorgiou G ., Spais A.B. (2004) : The effect of a mixture of herbal essential oils or α tocopheryl acetate on performance parameters and oxidation of body lipid in broiler.S. Afr. J. Anim .Sci ., 34, 52-61.

Brickell,Chistopher ,Trevor Cole ,2002.The American Horticural Society of plants and flowers .New Yoork,NY,USA :DK Publishing ,Inc.pp.605.ISBN 07894 -8993-7.

Cabuk ,M., M. B ozkurt, A. Alcieck, S.Y. Akba and K. Kuckyilmaz , 2006 , Effect of a herbal essential oil mixture on growth and weight of broiler from young

and old breeder flocks . South Afr. T. Sci., 36(2) :135-141.

Chang,H.W.1995. Antibacterial effect of spices and vegetables .food Industries .27:53-61.

Chopra, R., S. Nayar and I Chopra, 1992. Second Glossary of Indian Medicinal Plants. Publications and information Directorate . New Delhi, India, P: 414.

Coates, M.E., R.Fuller, G.F.Harrison, M.Lev, and S.F.Suffolk, 1963. A comparison of the growth of chicks in the Gustafson germ –free apparatus and in a conventional environment, with and with out dietary supplements of Penicillin. Br. J. Nutr. 17: 141-150.

Colby, S.M, Alonso, W.R., Katahire, E.J., McGarrey, D.J., and Groteau.R. 1993. 45.Limonene synthase from the glands of spearmint (Mentha spicata): cDNA isolation, characterization, and bacterial expression of the catalytically active monoterpene cyclase. J. Biol Chem. 268: 23016-23024.

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 .Brit. Poult. Sci., 48, 496-506.

Deman, J.C.1975. The probability of most probable numbers. Eur. J. App. Microbiol. 1: 6778.

Demir E., Sarica S., Ozcan M.A., Suicmez M. (2003): The use of natural feed additives as alternatives for an Antibiotic growth promoter in broiler diets . Brit. Poult. Sci., 44, S44-S45.

Durrani, F.R., A.Sultan, M.L. Marri, N. Chand and Z. Durrani; (2007). Effect of wild mint (*Mentha longifolia*) infusion on the overall performance of brolier chicks. Pak. J. Biol. Sci., 10:1130 – 1133.

Grieve, M., 1981. A Modern Herbal .Penguin., UK, P:902.

Griggs J.P., Jacob J.P. (2005): Alternatives to antibiotics for organic poultry production J. Appl. Poult. Res.14, 750-756.

Gross, W.B. and H. S. Siegel, (1983). Evaluation of Hetrophil/Lymphocyte ratio as a measure of stress in chicken. Avian Diseases Vol. 27, No. 4 : 972 – 979.

Hernandez F., Madrid J., Garcia V., Orengo J., Megias M.D. (2004): Influence of tow plant extracts on broilers performance, digestibility, and digestive organ size. Poult. Sci., 83, 169-174.

Horbowicz, M., 2000. Wystpowanie, biosynteza, Wlaoeciwoeci biochemiczne flawonoli .Post. Nauk Rol., 2: 3-17.

Jamroz, D ., T . Wertelecki and M. Houszka, (2004). Influence of kind of grain andplant origin active substances on morphological and histochemical pattern of stomach and jejunum walls in chicken (in printing; J . Anim .Phys a.Nutr.).

Juven, B.J.,J Kanner;F.Schved, and H.Weisslowicz. (1994). Factors that interact with the ntibacterial action of thyme essential oils and its active constituents .J. Appl. Bacteriol. 76:626-631.

Lilja C., (1983). Compartive study of postnatal growth and organ development in some species of birds. Growth, 47, 317 - 329

Lovkova M .Y., Buzuk G.N., Sokolova S .M., Klimenteva N.I. (2001): Chemical of medicinal plants (a review) . Appl. Biochem . Microbiol ., 37, 229-237.

Mitruka, B.M. and H.M. Rawnsly, (1977). Clinical Boichemical and Hematological referance values in normal experimental Animal masson publishing USA., Inc.

National Research Council (NRC), 1994. Nutrient Requirements of Poultry 9th Edn. National Academy Press, Washington, DC. of Alletchs 10th Annual Symposium. Nottingham University Press, Nottingham, UK.

Ocak, N., G. Frener, F. Burak, A.K.M. Sungu, A. Altor and Spring, A. Ozmman, 2008. Performance of broilers fed diets with dry peppermint (Mentha piperita L.) or thyme (Thymusulgaris L.) leaves as promoter sourc.Anim. Sci., 53: 169-175.

SAS Institute, 2001. SAS/STAT User's Guide for Personal Computer. Relesse 6.12 SAS Institute, Inc., Cary, NC., USA.

Savithri Bhat, Priti Maheshwari, Sushil Kumar and Anil Kumar, 2002. Mentha species: In vitro Regeneration and Genetic Transformation Molecular Biology Today, 3 (1): 11-23.

Spirling, L.I., and Daneils, I.R. (2001). Botanical perspectives on health peppermint: more than just an after – dinner mint. JR Soc Health. 121: 62 -63.\

Steel, R and J. Torrie, (1980). Principles and procedures of statistics: A biomedical Approach. 2nd ed. McGraw – Hill Bock Company, Inc. New York.

Viŝkelis P, Bobinas Ĉ, Dambrauskiene E Sodininkyste ir darzininkyste, 2003;22 (4): 220-24.

W.H.O. 1997. The medical impact of the use of antimicrobial in food animals .Report of W.H.O. meeting . Berlin, Germany,13-17.