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Modification of productive performance and physiological aspects of broilers on the addition of a mixture of cumin and turmeric to the diet

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Abstract

A study was conducted to determine the performance of broilers fed diets supplemented with a mixture of cumin (*Cuminum cyminum*) and turmeric (*Curcuma longa*). A total of 300 (Arbor-Acres) day old chicks were used in this study. Five levels of a mixture cumin and turmeric at the rate of 0.00%, 0.25%, 0.50%, 0.75% and 1% were incorporated into the basal diet for six weeks. Feeding period for all groups was lasted for 42 days. Results revealed that the inclusion of cumin and turmeric mixture at levels of 0.75% and 1% in the diets improved body weight gain, feed intake and feed conversion ratio. At the same time the cumin and turmeric mixture of 0.75% and 1% depressed the cholesterol, Hb, RBC, WBC, and H/L ratio concentration. It was concluded that the use of mixture containing cumin (*Cuminum cyminum*) and turmeric (*Curcuma longa*) as feed additive at levels 0.75% and 1% enhanced the overall performance of broiler chicks.

Key words: Performance, Physiological, Broiler, Cumin, Turmeric

Introduction

Antibiotic growth promoter (AGP) in poultry industry has been seriously criticized by governmental policy makers and consumers, since the development of microbial resistance to these products and the potential harm on human health (Williams and Losa, 2001; Bostoglou et al., 2004). The phasing out AGP will affect the poultry and animal industry widely, to minimize the loss in growth. There is a need to find out the alternative to AGP, such as enzymes inorganic acids, probiotics, prebiotics, herbs, immunostimulant and some other management practices (Banerjee, 1998). Since ancient times, herbs and their essential oils have been known for their varying degrees of antimicrobial (Juven et al., 1994; Change, 1995).

The medicinal plant turmeric is commonly used as spices in cuisine dishes. Turmeric is a perennial herb and a member of *Zingiberacae* family. Turmeric grows to a highest of 3 to 5 feet and has oblong pointed leaves, which bears funnel shaped yellow flowers. The rhizome is partly used as spices and medicine. It is usually boiled, cleaned and dried, yielding a yellow powder (Durrani et al., 2006). Turmeric is a medicinal plant widely used and cultivated in tropical regions. Plant extracts obtained from turmeric were found to have antifungal and antioxidative properties. The active compounds found in turmeric are curcumin, demethoxcurcumin, bisdemethoxycurcumin and tetrahydrocurcuminoids (Osawa et al., 1995). Moreover, Soni et al. (1997) proved that the protective effect of turmeric feed additives on aflatoxin–induced mutagenicity and hepatocarcinogennicity.

On the other hand cumin as medical plant could be introduced in poultry among their diets as nutritional and medical sources for different purpose. Cumin contains most dietary nutrients such as carbohydrates, fats of both saturated and unsaturated fatty acids and proteins, in addition to minerals and vitamins. Cumin is the dried seed of the herbs *Cuminum cyminum*. Cumin grows to 30-50 cm (0.98-1.6 ft) tall. The flowers are small, white or pink and borne in umbels. Cumin seeds resemble *caraway* seed. Cumin seeds are used as a spice. Jazani et al. (2008) indicated the potential use of cumin essential oil for the control of some diseases caused by *Pseudomonas aeruginosa* infections. Chemically cumin contained carbohydrates 44.24g, sugar 2.25g, fiber 10.5g, fat 22.27 g, protein 17.81g and water 8.06g (Jonas et al., 2007). Nutritionally, inclusion of cumin seeds meal in broiler diets induces an increase in the weight gain of the birds. Also an improvement in the absorption process as a result of increasing diet fibers was also noticed (Mansoori et al., 2006). Other researchers proved that there is an increase in body weight, feed conversion ratio, with decreasing hematological values of some important blood

parameters using 2% of cumin in broiler diets (Ibrahim et al., 2007).

The literature is very rare related to the cumin and turmeric activities in poultry nutrition. The present experimental work was planned to investigate the effect of cumin and turmeric on the overall performance of broilers.

Materials and Methods

The experiment involved three hundred day-old mixed sexed chicks (Arbor-Acres). They were obtained from local hatchery and placed in closed house at the poultry farm of the Collage of Veterinary Medicine, University of Baghdad, Iraq. Chicks were fed with the starter diet (3000 Kcal ME/Kg, 21.3% CP as fresh matter basis) for the first three weeks of the experiment. Consequently they were fed on finisher diet (3086 Kcal ME/Kg, 19.5% CP as fresh matter basis) during 3-6 weeks of the experiment.

Chicks were weighted and the average weight and were assigned into 5 treatment groups of 3 equal replicates (20 chicks each). Chicks were reared in floor pens (1.25 ×1.25 m). Artificial lighting was provided throughout the experiment. Temperature of the house was maintained and vaccination program was applied based on broiler raisers recommendation.

Chemical composition of the basal diet is presented in Table 1. It is formulated to meet nutrient requirement of broiler chickens (NRC, 1994). The cumin and turmeric were purchased commercially as dried herbs supplements. Birds in group 1 were fed a basal diet and assigned as untreated control. Whereas groups 2, 3, 4, and 5 were fed a mixture of cumin and turmeric at 0.25%, 0.50%, 0.75% and 1% respectively in addition to group 1 diet. Chicks of each treatment were fed the respective diets. Water was provided *ad libitum* throughout the experimental period.

The average live body weight, body weight gain, feed intake, mortality percent and feed conversion ratio were measured on weekly basis. At the end of the experiment, birds were slaughtered and spotted for 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.

Meanwhile blood samples (5ml) were collected from the bronchial vein with an anticoagulant (Sodium Ethylene Ditetra amino) to determine the number of red blood cells (RBC), white blood cells (WBC), packed cell volume (PCV) and hemoglobin (Hb) percentage. 5 ml of the blood sample was collected from each bird and serum was separated to determine the concentration of cholesterol and uric acid measured according to the method described by Ellefson and Ganaway (1967).

Table 1: Chemical composition of the basal diet in different periods of the experiment

Ingredients%	Starter	Finisher
	1-21	22-42
Yellow corn	51.0	53.3
Soybean meal (45% soybean protein)	30.0	25.0
Wheat	13.8	15.0
Soybean oil	1.0	2.5
Premix*	2.5	2.5
Salt	0.3	0.3
Methionine	0.1	0.1
Lysine	0.1	0.1
Di-calcium phosphate	1.2	1.2
Total	100	100
Calculated chemical analysis		
ME(Kcal/kg)	3000	3086
Crude protein %	21.30	19.50
Calcium %	0.69	0.52
Available phosphate	0.74	0.69
Methionine	0.33	0.31
Lysine	1.19	1.08

∗Premix (2.5%) Provided the following (Per Kg of complete diets). Vit A. 367500 IU,133500 IU Vit. D_3, 1920 mg Vit.E, 84.42 Vit. K_3, 50 mg Vit. B_1, 150 mg Vit. B_2, 500 mg Vit. B_3, 177.5 mg Vit. B_6, 0.8 mg Vit. B_{12}, 600 mg Vit. PP, 24.5 mg folic acid, 27 mg biotin, 5767.5 mg choline, 2667 mg Fe, 333.75 mg Cu, 3334.06 mg Mn , 203 mg Co , 2334.38 mg Zn , 100.75 mg Ca , 10 mg Se, 65446.46 mg Ph, 36667.5 mg DL-Mithionine, 200.02mg, Ethoxyquin,50mg Flavophospholipol, 30g Fish meal, 1800g wheat bran

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

Results and Discussion

The effect of a mixture cumin and turmeric on the growth performance (body weight gain, feed intake and feed conversion ratio) of broiler was presented in table 2. Results showed significant effects ($P<0.05$) for chicks fed a mixture of cumin and turmeric for all treatments as compared with control group. These results showed that the inclusion of cumin and turmeric mixture in the diets improved body weight gain, feed intake and feed conversion ratio. This improvement may be due to the biological functions of cumin improve growth (Cowieson et al., 2003; Ghazalah et al., 2005; Al-Kassie, 2010), or that may be due to its role as stimulant, carminative, enhanced digestibility, anti-microbial properties and the prevention of gastric toxicity (Jones et al., 1997; El-Husseiny et al., 2002)

Table 2: Effect of adding a mixture of cumin (*Cuminum cyminum*) and turmeric (*Curcuma longa*) to the diet on performance of broiler

Treatments	3 weeks			6 weeks		
	Body wt. Gain (gm)	Feed consumption (gm)	FCR	Body wt. gain (gm)	Feed consumption (gm)	FCR
Control T1	698±13.3^{c}	1200±22.3^{c}	1.72±2.7^{b}	2290±41.3^{b}	4603±58.4^{a}	2.01±2.11^{c}
0.25% T2	863±16.2^{b}	1476±19.4^{b}	1.71±1.3^{b}	2379±38.9^{b}	4496±61.2^{b}	1.89±1.99^{b}
0.50 % T3	938±15.3^{a}	1566±23.4^{b}	1.67±2.7^{a}	2538±36.4^{a}	4543±64.3^{b}	1.79±1.92^{a}
0.75 % T4	998±16.7^{a}	1616±20.8^{a}	1.62±2.8^{a}	2608±35.4^{a}	4538±58.4^{b}	1.74±1.71^{a}
1.00% T5	988±14.1^{a}	1610±24.7^{a}	1.63±1.9^{a}	2568±42.1^{a}	4525±62.3^{b}	1.76±1.68^{a}

^{abc} means in the same column with no common superscript differ significantly (P≤0.05).

Table 3: Effect of adding a mixture of cumin and turmeric to the diet on mortality %, dressing and edible giblets %

Treatments	Mortality %	Dressing %	Edible giblets %		
			Liver	Gizzard	Heart
Control T1	5.8±4.7^{a}	73.4±1.7	4.1±0.3	3.8±0.06	0.74±0.04
0.25% T2	4.7±3.3^{b}	72.6±1.9	3.8±0.7	4.3±0.08	0.85±0.03
0.50 % T3	2.9±3.9^{c}	71.4±1.6	3.7±0.1	4.2±0.07	0.79±0.02
0.75 % T4	3.4±4.2^{c}	73.6±1.8	3.5±0.6	3.2±0.04	0.09±0.04
1.00% T5	3.9±3.8^{bc}	72.9±1.8	3.9±0.5	3.4±0.01	0.82±0.04

^{abc} means in the same column with no common superscript differ significantly (P<0.05)

Table 4: Effect of adding a mixture of cumin *(Cuminum cyminum*) and turmeric (*Curcuma longa*) to the diet on hematological and serum parameters

Treatment	Hb (g/dl)	RBC (10^6/mm^3	PCV (%)	WBC (cells/L)	H/L ratio	Cholesterol (mg/dl)	Uric acid (mg/dl)
Control T1	10.3±2.7^{a}	3.7±1.3^{a}	36.3±2.7^{a}	24.1±2.8^{a}	0.30±0.2^{a}	149.2±4.3^{a}	4.6±0.4^{a}
0.25% T2	9.9±2.3^{b}	3.6±1.1^{a}	36.1±2.8^{a}	24.0±2.6^{a}	0.28±0.1^{b}	148.3±3.8^{b}	4.7±0.3^{a}
0.50% T3	9.3±3.2^{c}	3.6±1.2^{a}	35.4±3.2^{b}	23.7±2.9^{a}	0.28±0.2^{b}	148.4±3.7^{b}	4.4±0.2^{a}
0.75% T4	8.9±3.2^{d}	2.8±1.9^{b}	33.1±3.0^{c}	21.7±2.8^{b}	0.26±0.3^{c}	145.6±2.9^{c}	3.8±0.2^{a}
1.00% T5	9.1±2.7^{cd}	2.9±1.4^{b}	32.2±3.3^{a}	21.5±2.4^{b}	0.26±0.2^{c}	145.4±2.8^{c}	3.6±0.1^{a}

^{abc} means in the same row with no common superscript differ significantly (P<0.05)

and to the activity of turmeric as a antioxidant that stimulate protein synthesis (Osawa et al., 1995).

Table (3) shows the effect of cumin and turmeric mixture on mortality, dressing and edible giblets percents. It showed that there was significant difference (P<0.05) on mortality percentages between treatments as compared with the control group. This may be due to the role of herbal plants (cumin and turmeric) on the immune stimulating factor (Al-Kassie, 2010). The same table showed that there was no significant difference (P<0.05) between treatments and control group in dressing % and edible giblets %.

Table 4, showed a depression in cholesterol level in groups 4 and 5 as compared with other groups as expected and this may be due to the inhibition of the active enzyme hepatic 3-hydroxyl-3 methyglutaryl coenzyme A(HMG-CoA) which is responsible for cholesterol synthesis in the liver (Crowell, 1999). Furthermore the reduction in blood cholesterol could be attributed in some cases to the reduction in the levels of some hormones secreted by the cortex of the adrenal glands, which decreases the secretion of fatty acids from the adipose tissue or as a result of fat oxidation process, leading to depression of levels of fatty acids including blood cholesterol (Ganong, 2005).

It was concluded that the use of mixture cumin (*Cuminum cyminum*) and turmeric (*Curcuma longa*) as fed additive at levels of 0.75% and 1% enhance the overall performance of broiler chicks.

References

Al-Kassie, G.A.M. 2010. Effect of feed cumin (*Cumin cyminum*) on the performance and some blood traits of broiler chicks. *Pakistan Journal of Nutrition*, 1:72-75.

Bangerjee, G.C. 1998. A Text Book of Animal Husbandry.2nd Ed. Indic Puplicalication, Delhi, India.

Botsoglou, N.A.E. Christaki, P., Florou-Paneri, I., Giannenas, G., Papageorgious and Spais, A.B. 2004. The effect of a mixture of herbal essential oils or tocopheryl acetate on performance parameters and oxidation of body lipid in broiler.

South African Journal of Animal Science, 34:52-61.

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

Cowieson, A.J., Acamovic, T. and Berford, M.R. 2003. Supplementation of diets containing pea meal with exogenous enzymes: Effect on weight gain, feed conversion, nutrient digestibility and gross morphology of the gastrointestinal tract of growing broiler chicks. *British Poultry Science*, 44:427-437.

Crowell, P.L. 1999. Prevention and therapy of cancer by dietary monoterpenes. *Journal of Nutrition*, 129:775 -778.

Durrani, F.R., Mohammad, I., Asad, A., Suhail, S.M., Naila, C. and Durrani, Z. 2006. Effect of different levels of feed added Turmeric (*Curcuma longa*) on the performance of broiler chicks. *Journal of Agricultural and Biological Science,* 1:11-16.

El-Husseiny, O., Shalash, S.M. and Azouz, H.M. 2002. Response of broiler performance to diets containing hot pepper and /or fenugreek at different metabolizable energy levels. *Egyptian poultry Science*, 22:387-406.

Ellefson, R.D. and Garaway, W.T. 1967. Lipids and lipoprotines. In: Fundamentals of clinical chemistry, Tietz, N.W. (Ed) Saunders, W.B. Company. Philadelphia, pp: 512-514.

Ganong, W.F. 2005. Review of medicate physiology. 16th Ed. Alange Medical Book. PP:336-338 .

Ghazalah, A.A, Abd El-Gawad, A.H., Soliman, M.S. and Amany Youssef, W.A. 2005. Effect of enzyme preparation on performance of broilers fed corn-soybean meal based diets. *Egyptian Poultry Science*, 25:295-316.

Ibrahim, I.A., Elbadwi, S.M.A., Bakhiet, A.O., Abdel Gadir, W.S. and Adam, S.E.I. 2007. A 9-week feeding study of *Cuminum cyminum.* and *Hibiscus sabdariffa. Journal of Pharmacology and Toxicology*, 2: 666-671.

Jazani, N.H., Zartoshti, M. and Shanhabi, S. 2008. Antibacterial effect of Iranian *Cumin cyminum* essential oil on Burn of *Pseudomonas aeruginosa*. *International Journal of Pharmacology*. 34:23-34.

Jonas, D. Skemaite, M. Kirkilaite, G. Vinauskiene, R. and Venskutonis, P.R. 2007. Antioxidant and antimicrobial properties of caraway (*Carum carvi L.*) and cumin (*Cuminum cyminum)* extracts. *Veterinarja IR Zootechnika T*., 40: 12-20.

Jones, N.L., Shabib, S. and Sherman, P.H. 1997.Capsaicin as an inhibitor of the growth of the gastric pathogen, *Helicobacter pylori*. *FEMS Microbiology Letter*, 146:223-227.

Juven, B.J., Kanner, J. Schved, F. and Weisslowicz, H. 1994. Factors that interact with antibacterial action of thyme essential oils and its active constituents. *Journal of Applied Bacteriology*, 76:626-631.

Mansoori, B. Mehrdad, M. and Mohammad-Mehdi, K.S. 2006.Cumin seed meal with enzyme and polyethelen glycol as an alternative to wheat bran in broiler diets. *Journal of Food Science and Agriculture*, 86:2621-2627.

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

Oswa, T. Sugiyama, Y. Lnayoshi, M. and Kawakisi, S. 1995. Anti-oxidative of tetrahydrocurcuminoids. *Biotechnology and Biochemistry*, 59:1609-1610.

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

Soni, K.B., Lahiri M., Chackrader, P., Bhide, S.Y. and Kuttan, R. 1997. Protective effect of food additives on aflatoxin–induced mutagenicity and hepatocarcinogenicity. *Cancer Letter*, 34:115-129.

Steel, R.G.D. and Torrie, J.H. 1980. Principle and Procedures of Statistics .2nd Edn.McGrow-Hill Book Co., Inc, New York.

Williams, P. and Lossa, R. 2001. The use of essential oils and their compounds in poultry nutrition. *World's Poultry Science*, 17:14-15.