

Use of turmeric (*Curcuma longa*) on the performance and some physiological traits on the broiler diets

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Summary

This study was conducted at the poultry farm ,Veterinary Public Health .,College of Veterinary Medicine, to study the effect of Tumeric (*Curcuma longa*) on broiler performance and some physiological traits .Two hundred fifty day-old (Rose308) broiler chicks were all located randomly to five treatments from 1-42 days of age, with tow replicate pens (25 birds /pen) per treatment .

Chicks were fed the following :- Diet (1)Using basal diet free from herbal plants kept as control , Diet (2) Basal diet + 0.25% of *Curcuma longa* (250 gm/100kg of feed) Diet (3) Basal diet + 0.50% of *Curcuma longa* (500 gm/100kg of feed).Diet (4) Basal diet + 1% Of *Curcuma longa* (1000 gm/100kg of feed).Diet (5) Basal diet plus 1.5 % of *Curcuma longa* (1500 gm/100kg of feed).Results revealed that the inclusion of turmeric at the levels of 0.50% in the diets improved body weight ,feed conversion ratio ,there were a significant difference in feed consumption . At the same time there was no significant difference for edible parts, were as found significant difference ($P < 0.05$) for dressing percent for all treatments treat with compare for control group . At the same time there was no significant difference in PCV, RBC, Hb, WBC while there was significant difference in H/L ratio, Albumin and globulin.

Key words: - turmeric, *Curcuma longa*, broiler, diets.

استعمال الكركم (*Curcuma longa*) في العليقة وتأثيره على الأداء الانتاجي وبعض الصفات الفسيولوجية لفروج اللحم

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الخلاصة

أجريت هذه الدراسة في حقل الدواجن التابع لفرع الصحة العامة البيطرية / كلية الطب البيطري /جامعة بغداد ، لدراسة تأثير الكركم (*Curcuma longa*) على الاداء الانتاجي وبعض الصفات الفسيولوجية لفروج اللحم . 250 فرخ لحم بعمر يوم واحد من نوع (Rose308) تم توزيعها بشكل عشوائي إلى خمس معاملات من عمر 1-42 يوم مع مكررين لكل معاملة وبواقع (25 طير / مكرر) ، غذيت الافراخ كالتالي: المعاملة الاولى (1) معاملة السيطرة وقدمت فيها للافراخ عليقة قياسية خالية من اي اضافة، المعاملة (2) عليقة قياسية +0.25% من مسحوق الكركم (250غم/كغم) ،المعاملة (3) عليقة قياسية +0.50% من مسحوق الكركم (500غم/كغم) ، المعاملة (4) عليقة قياسية + 1% من مسحوق الكركم (1000غم/كغم).المعاملة (4) عليقة قياسية + 1.5% من مسحوق الكركم (1500 غم / كغم علف). أظهرت النتائج أن أضافة الكركم على مستوى 0.50 ٪ ساهم في تحسين وزن الجسم ، كفاءة التحويل الغذائي ولا يوجد فروقات معنوية في استهلاك العلف في الوقت نفسه فانه لا يوجد فروقات معنوية في الأجزاء الصالحة للأكل ، بينما يوجد فروقات معنوية على مستوى معنوية ($P < 0.05$) لنسبة التصافي لكل المعاملات مقارنة مع مجموعة السيطرة .ولا توجد فروقات معنوية لصفات الدم الخلوية لكن هنالك فرق فقط في نسبة H/L وفي الالبومين والكلوبولين لمصل الدم.

الكلمات المفتاحية:- الكركم, عليقة, فروج لحم.

Introduction

A variety of feed additives are being included in poultry diet to derive maximum growth of broiler chickens. Use of in-feed-antibiotics not only increases the cost of production but

also leads to residues in meat and eggs (1) and develops antibiotic resistance in microbes (2). Turmeric powder (*Curcuma longa*) has long been used as antibacterial agent, antioxidant, growth stimulant etc for centuries in India.

Feed is responsible for about (65-70%) of overall poultry production costs, led to an increase number of studies on alternative dietary products that improves bird performance and lower production costs.

Since the 1950s, antimicrobial additives are the most frequently used as a performance enhancers in animal production and their positive results are observed even in high-challenge conditions. Since the 1990s, for a ban use of some antibiotics as growth promoters and the growing trend of the public to consume natural products, plant extracts have been selected as alternatives to antibiotic growth promoters.

First study that evaluated the antibacterial activities of plant extracts was carried out in 1881; however, they started to be used as flavors enhancers only during the next decades. With the emergence of antibiotics in the 1950s, the use of plant extracts as antimicrobial agents almost disappeared. Several studies in literature assessing the use of plant extracts, individually or in combination, as antimicrobials, antioxidants, or digestibility enhancers in animal feeds. Researches results on the factors affecting their action, such as plant variety, harvest time, processing, extraction, as well as the technology employed in synthesis commercial product and dietary inclusion levels show controversial results, warranted the need of further research and standardization for the effective use of plant extracts as performance enhancers, when added to animal feeds.

This article aims at presenting plant extracts as alternatives to antibiotics, Antioxidants, explaining their main modes of action as performance flavor, dig enhancer in broiler production.

Curcuma longa or turmeric is a medicinal plant widely used and cultivated in tropical regions. Plant extracts were found to have antifungal (3), immunomodulatory (4),antioxidative (5) and antimutagenic (6) activities.

Some of pharmacological activities of *Curcuma longa* as nematocidal (7), described by (8) and anti- inflammatory. Moreover, (6) proved the protective effect of *Curcuma longa* food additives on aflatoxin-induced mutagenicityand hepatocarcinogenicity.

Turmeric has been used as a coloring and flavouring agent and spice in many foods. Spices are the natural food additives contribute immensely to the taste and flavour of our foods. Smallpox, chickenpox, insect bites, as a food purifier and anthelmintic (9).

Turmeric has been subjected to chemical analysis which yielded essential oils (2.4-4%) and fatty oils (1.7-3.3%). Apart from curcumin, some other murcuminoids, fats, minerals, fibers, vitamins, proteins and carbohydrates, with total ash content of 4.7-8.2% (10 and 11). In spite of the fact that spices have been extensively consumed for centuries, occasional doubts have been expressed regarding the safety of some of them.

Fortunately the safety of turmeric and its yellow coloring agent, curcumin, are approved by many organizations and researcher (12); the joint FAO/WHO Expert Committee on Food Additives, JECFA,(13); Department of Biochemistry and Nutrition of Central Food Technological Research Institute of India, CFTRI (14 and 15).

Turmeric (*Curcuma longa*), a medicinal plant native to the Asian subcontinent, is known to possess antimicrobial and antioxidant properties. The curcuminoids, yellowish pigments present in turmeric powder, have shown protective effects against AFB1 (6). The most recent dietary approach to prevent mycotoxicoses in poultry is the combined use of antioxidants and adsorbents (16). The poultry industry has undergone remarkable change

and growth over the last 30 years, and it will continue to expand in the next coming years to meet a higher demand for low-cost, healthy and convenient products. In addition to the expanding market, commercial poultry is being genetically selected for ever increasing growth performance and efficiency. This selection for increased growth rate has resulted in changes in gastrointestinal development during growth of the animal (17). Apparently, young poultry are more susceptible to enteric pathogens today than they were 30 years ago. These pathogens have been of concern to the poultry industry because of lowered productivity, increased mortality, and contamination of poultry products for human consumption (18). The main purpose of this study was to evaluate the effect of turmeric *longa* L. on the performance and other physiological properties on broiler chicks.

Materials and Methods

This experiment was carried out in the poultry farm of veterinary collage ,Baghdad University .the experiment were lasted long continued for 42 days starting at 3-1-2010 to 14-2-2010 .(250) days old chicks (Rose 308) were divided randomly into 5 treated groups 50 bird .each ,chicks subdivided into 2 replicates of 25 birds each.

Chicks were fed the following :- Diet (1)Using basal diet free from herbal plants kept as control ,Diet (2) Basal diet + 0.25% of *Curcuma longa* (250 gm/100kg of feed) Diet (3) Basal diet + 0.50% of *Curcuma longa* (500 gm/100kg of feed).Diet (4) Basal diet + 1% Of *Curcuma longa* (1000 gm/100kg of feed).Diet (5) Basal diet plus 1.5 % of *Curcuma longa* (1500 gm/100kg of feed). Chicks were reared in (1.5m×1.5m) floor pens of a thick litter system of wood shavings about 7 cm the feeding program including starter diet that have been used until 21 days of age and a finisher diet processed to the end of 42 days .All diets were formulated with the same batch of ingredients within a period had the same composition .Diets were designed to meet or exceed requirements by the National Research Council (19) for broilers at this age.Feed and water was provided at ad-libitum during the experiment, two phase feeding program involved in supplying starter to the first 21 day of age diet to the chicks.

Table (1) The composition of the experimental basal diets

| Ingredient (%) | Starter 1-21 day | Finisher 22-42 day |
|------------------------------|------------------|--------------------|
| Yellow Corn | 51 | 53.3 |
| Soybean meal (45% protein) | 30 | 25 |
| Wheat | 13.8 | 15 |
| Oil | 1 | 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 |
| Calculated chemical analysis | | |
| ME(Kcal/kg) | 3000 | 3086 |
| Crude protein % | 21.3 | 19.5 |
| Calcium % | 0.69 | 0.52 |
| Avialable phosphore | 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)367500 IU, 133500IU Vit.D3,1920 mg Vit.E,83.42 Vit.K3,50mg Vit.B1,150 Vit B2, 500 mg Vit.B3,177,5 mg Vit.B6,0.8mg Vit B12,600mg Vit.PP,24.5 mg folic acid,27 mg Biotin,5767.5 mg choline,2667mg 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-Methionine ,200.02 mg Ethoxyquin,50mg Flavophospholipol, 30 g fish meal,1800 g wheat bran.

Chicks were vaccinated against Newcastle disease (ND) and infectious bronchitis (IB). Body Weight was determined through the above diets periods feed intake was recorded for the corresponding periods. At the end of the experiment, three chicks of each replicate were randomly selected and weighted to obtain live body weight. were slaughtered using sharp knife for complete bleeding , feather birds were plucked .Head ,viscera and shanks were removed .Carcass was left for an hour to remove excess water and allowed for overnight cooling at 4 ± 2 C then weighed . Dressing percentage was calculated free from giblets (Heart ,gizzard ,liver) and the weight of each organ was calculated as percentage of the carcass weight .blood sample were taken from the brachial vein using a syringe . Samples were used for the determination of various hematological parameters including (PCV, WBC and RBC counts, hemoglobin (Hb) concentrations and heterophile/lymphocytes ratio), glucose and cholesterol concentration. Data were analyzed using the General Linear Model Procedure of SAS,(20).Duncan multiple range test was used to detect the differences ($P<0.05$) among different group means.

Results and Discussion

Table (2) revealed the effect of adding Turmeric to the diet on the performance of broiler chickens (body weight gain, feed intake, feed conversion) for a six weeks age. It had been found that the higher body weight gain was observed in birds fed diet contained Turmeric at level (T3) followed by birds in (T5,T4) respectively as compared with treats (T1 and T2), feed intake showed a higher increase in (T3) as compared with other treats, on the other hands ,feed conversion (T4) birds was the best as compared to control group (T1) and other treats group .,the improvement in body weight gain ,feed intake ,feed conversion traits .during the (6) weeks of experiment were attributed to the presence of active compounds in turmeric, mainly antioxidant activity of it (5) that stimulates protein synthesis by bird enzymatic system.

In fact the above results are in agreement with (21) who observed a significant ($P<0.05$) increase in weight gain in broiler fed turmeric (1%) over those of control group .,on the contrary (22) stated that broiler fed with turmeric (0.25,0.50,0.75 and 1%) levels did not significantly affect body weight gain.

Table (3) showed the effect of turmeric on blood characteristics of broiler (PCV, RBC, Hb, WBC, H/L Ratio) and Albumin Globulin traits, it revealed that there are no significant differences among treats for (PCV, RBC, Hb, WBC) traits. H/L ratio, Level of albumin was significantly ($p<0.05$) lower in treats. group as compared with control group, it seems that various organs in treated group did not revealed any inflammatory reaction hence heterophillia in these groups may be as result of influx of granulocytes from marrow.

Thus heterophillia that appeared may be due to increase granulopiosis as result of Turmeric supplementation to the diet .,Further H/L constitute the first line of defense with efficient Chemotactic response, it suggested that birds of treated group were better equipped for the non –specific cellular response when invaded by foreign agents viable or innate .,on the other hands, lowered albumin level ,had no adverse effect on the colloidal state of blood as well as capillary permeability.

Significantly ($P<0.05$) higher level of globulin, suggested that birds of treated group had potential for better humeral immune status, as that in control group. Table (4) indicates the effect of turmeric in broiler diet on the giblets triats and mortality (i.e Dressing ,Liver

,Gizzard, Heart%) at (6)weeks of age ,results showed a reduced mortality percent of treated group as compared with control group ,this may be due to the action of active compounds in turmeric such as antioxidant ,antimicrobial, antimutagenic..... ect) that keep birds in good health condition, moreover, results in table(4) also showed no significant (P<0.05) differences in giblets of treated group as compared with control group.

Mainly in Gizzard, but clear decrease in dressing percent , increase in liver percent in control group as compared with the treated group, these results concur with (23) who reported that feeding broilers of turmeric did not alter the percentage of (liver, gizzard, heart) traits. The above results raised from this study on turmeric supplementation in the broiler diet could be attributed to turmeric effect on birds giblets organs, turmeric included in diet a maximum of (1.5%) might be the reason for no change in structure of body giblets organs that may be used as (Viz turmeric) an alternative to feed antibiotics for improving giblets organs in broiler and improve their performance.

Table (2) Effect of Turmeric (*Curcuma longa*) on the performance of broilers ±SE.

| Weeks Treatments | 3 weeks | | | 6 weeks | | |
|---------------------------|-----------------------|---------------------|-----------------|-----------------------|------------------|-----------------|
| | Body weight gain (gm) | Feed intake (gm) | Feed conversion | Body weight gain (gm) | Feed intake (gm) | Feed conversion |
| Control T ₁ | 874± 13.4 c | 1555.7± 43.6 c | 1.78± 2.7b | 2552± 41.6 c | 5359± 52.4 a | 2.1± 1.2 a |
| 0.25% T ₂ | 1126± 16.8 b | 1790.3± 52.7 b | 1.59± 1.8 a | 2743± 33.9 b | 5376± 47.5 a | 1.96± 1.9 a |
| 0.50% T ₃ | 1378± 18.7a | 2135.9± 51.9 a | 1.55± 2.3 a | 3011± 36.4 a | 5389± 49.7 a | 1.79± 1.7 b |
| 1% T ₄ | 1198± 19.6ab | 2012.6 ± 46.7 ab | 1.68± 1.8 a | 2848± 37.7 b | 5154± 51.8 a | 1.81± 1.6 b |
| 1.5% T ₅ | 1278± 20.8a | 2083.2± 42.8 a | 1.63± 2.1 a | 2885± 32.7 b | 5019± 58.6 a | 1.74± 1.7 b |

abc,Means in the same colum with no common supercript differ significantly , P<0.05.

Table (3) Effect of turmeric (*Curcuma longa*) on mortality , Dressing %,liver %,gizzard% and heart% of broiler ± SE.

abc, Means in the same Colum with no common superscript differ significantly , P<0.05

| Measures Treatments | PCV % | RBC Cell/mm ³ | HB g/100ml | WBC Cell/mm ³ | H/L Ratio | Albumin g/100ml | Globulin g/100ml |
|---------------------------|----------------------------|-----------------------------|-----------------|-----------------------------|-----------------|--------------------|---------------------|
| Control T ₁ | 31.4± 0.42 a | 3.42± 0.20 a | 8.94± 0.22 a | 23.40± 0.28 a | 0.35± 0.03 a | 2.63± 0.03 a | 2.71± 0.06 c |
| 0.25% T ₂ | 32.2± 0.31 ^a | 3.38± 0.17 a | 9.05± 0.16 a | 23.72± 0.31 a | 0.31± 0.02 b | 2.57± 0.04 b | 2.68± 0.07 c |
| 0.50% T ₃ | 31.5± 0.29 a | 3.41± 0.19 a | 8.95± 0.20 a | 23.31± 0.29 a | 0.31± 0.02 b | 2.54± 0.05 b | 2.84± 0.06b |
| 1% T ₄ | 31.7± 0.35 a | 3.42± 0.17 a | 8.94± 0.24 a | 23.45± 0.26 a | 0.30± 0.03 b | 2.54± 0.04 b | 2.91± 0.07 a |
| 1.5% T ₅ | 32.1± 0.29 a | 3.61± 0.22 a | 8.93± 0.31 a | 23.38± 0.23 a | 0.29± 0.04b | 2.51± 0.03 b | 2.78± 0.08 b |

Table (4) Effect of turmeric (*Curcuma longa*) on blood characteristics of broiler ±SE.

| Measures Treatment | Mortality % | Dressing % | Liver % | Gizzard % | Heart % |
|---------------------------|----------------|---------------|------------|--------------|------------|
| Control T ₁ | 7.9±2.6 a | 73.6±1.85 b | 3.4±1.2 a | 2.8±0.63 a | 0.03±0.44a |
| 0.25% T ₂ | 5.3±3.1 b | 74.6±1.92 a | 2.9±1.4 b | 2.7±0.04 a | 0.04±0.48a |
| 0.50% T ₃ | 2.9±2.7 c | 77.8±1.85 a | 2.8±1.6 b | 2.9±0.05 a | 0.01±0.45a |
| 1% T ₄ | 4.3±3.5 b | 75.7±2.1 a | 2.9±1.5 b | 2.8±0.04 a | 0.9±0.42a |
| 1.5% T ₅ | 4.8±3.2 b | 75.8±2.6 a | 3.0±1.4 b | 2.9±0.06 a | 0.03±0.44a |

A,b,c Means with different superscript in the same row differ significantly P<0.05.

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