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**EFFECT OF DIFFERENT LEVELS OF TURMERIC (CURCUMA LONGA ) SUPPLEMENTATION ON BROILER PERFORMANCE , CARCASS CHARACTERISTIC AND BACTERIAL COUNT**

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**ABSTRACT:** This experiment was conducted at the Poultry Farm, Animal Resources Dept., College of Agriculture , University of Baghdad ( 8 – 3- 2014 to 19 – 4 – 2014 ) to study the effect of inclusion different levels of turmeric (Curcuma Longa) powder on broiler performance , carcass characteristic and bacterial count. One hundred and twelve one- day old (Rose 308) broiler chicks were allocated randomly to four dietary treatment from 0 to 42 days of age with two replicate pens of (14 birds / pen ) . The experimental diets were as follow: control (T1) , 0.2 % turmeric powder (T2) , 0.4 % turmeric powder (T3) , 0.6 % turmeric powder (T4) . Results showed that final body weight and weight gain was significantly ( $P<0.05$ ) higher for T2 and T3 as compared to that the of the control group (T1) . Feed conversion ratio was significantly ( $P<0.05$ ) the best for 0.4 % turmeric powder as compared to the control group (T1). While, there was no significant ( $P>0.05$ ) effect of dietary treatment on feed intake , carcass characteristic , edible organ weight percentage , bursa of fabricius and spleen index . Lactobacillus count was significantly ( $P<0.05$ ) highest for all supplemented groups as compared to the control. From this study it could be concluded that supplementing broiler diets with 0.4 % curcuma powder improved significantly ( $P<0.05$ ) final body weight, weight gain and lactobacillus count and could be used as growth promoter.

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**Key Words:** Curcuma Powder; Broiler Performance , Lactobacillus

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## **INTRODUCTION**

The use of antibiotic as growth promoters in livestock has been banned due to concern about their residues in animal tissue and induction of bacterial resistance. Due to these concern researchers, it have evaluated alternative growth promoter such as probiotics and prebiotics, which benefits the health of digestive tract (Patterson and Burkholder, 2003). However, manufacturing these alternative is costly and time-consuming and their effects have not been clearly proven ( Sadeghi et al.,2012).

Some researchers have evaluated herbs and their essential oils. It has been shown that the dietary incorporation of herbs and their essential oils may provide beneficial effect on poultry performance and health due to the antimicrobial activity of their phytochemical components (Lee et al.,2004) .

Beneficial effects of bioactive plant substances in animal nutrition may include the stimulation of appetite and feed intake , the improvement in endogenous digestive enzyme secretion , activation of immune response and antibacterial , antiviral and antioxidant actions ( Toghiani et al., 2010 , 2011) .

Turmeric (*curcuma Longa* ) is a tropical plant . The main yellow bioactive substance of curcuma are curcumin , demethoxycurcumin and bisdemethoxycurcumin which is present to the extent of 2 – 5 % of the total powder ( Kiuchi et al.,1993 ; Ammon et al.,1993 and Osawa et al., 1995) . Curcumin is the main important bioactive ingredient responsible for the biological activity . Curcumin has been shown to have hypolipidaemic (Ramirez – Tortosa et al., 1999 ) , antioxidant activity (Igbal et al., 2003) and

anti-inflammatory (Holt et al., 2005) . Curcumin has also been studied as a chemo preventive agent ( Duvoix et al., 2005) . It is used in gastrointestinal and respiratory disorders ( Anwarul et al.,2006) . Studies have shown that supplementing broiler diets with turmeric enhance their performance (Al-Sultan.2003 and Durrani et al.,2006). However,Mehala and Moorthy (2008) demonstrated that 0.1 and 0.2 % turmeric powder used as feed additive had no significant effect on the performance and carcass yield of broiler chickens .

A number of studies have been conducted to evaluated its effects on broiler performance, and laying hens , however , the results have not been consistent . The current study was designed to evaluated the effect of different levels of turmeric powder on broiler performance, carcass yield and bacterial count .

## **MATERIAL AND METHODS**

This study was conducted at the Poultry Farms (8-3-2014 to 19-4-2014) , Animal Resources Department , College of Agriculture , University of Baghdad to study effect of supplementing different levels of turmeric (*Curcuma longa* ) powder on broiler performance , carcass characteristic and bacterial count (*Lactobacillie* and *E.coli* ). One hundred and twelve one-day old (Rose 308) broiler chicks were allocated randomly utilizing a complete randomize design (CRD) with four dietary treatment from 0 to 42 days of age with two replicate pens of (14 birds / pen). The experimental diets were as follow: control (T1) , 0.2 % turmeric powder (T2) , 0.4 % turmeric powder (T3) , 0.6 % turmeric powder (T4) . The experimental diets were formulated to be

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isocaloric according to NRC (1994). The diets were prepared freshly each week from 0 – 28 days (starter) and from 29 – 42 days of age were prepared twice a week . The ingredient and chemical composition of the diets is presented in Table (1) . Feed and water were provided ad-libitum. In

Mortality was recorded throughout the period of the study as occurs . At the end of the experiment two birds whose body weight close to the group average were selected from each replicate (4birds)/treatment ). Selected birds were leg banded (weight and slaughter ) for carcass evaluation . Pre slaughter weight , dressing weight were obtained to calculate dressing percentage and carcass cut for each birds .One gram of Jejunum content was weighted and transferred into test tube containing 9 ml of 0.1 peptone solution . The samples were mixed well and serial dilutions were prepared for Lactobacillus and E.coli count (Atlals et al ., 1995) . Data were subjected to analysis of variance

The effect of supplementing different levels of turmeric powder on average body weight gain is presented in Table 3 . At 2 weeks of age , birds consuming diet with 0.6 % of turmeric powder(T4) had significantly ( $P<0.05$ ) lower body weight gain as compared with other treatments .Final gain (at 42 days of age ) all supplemented groups had significantly

order to boost birds immunity, they were vaccinated against Newcastle and Gumboro diseases according to their age. Live body weight , weight gain , feed intake and feed conversion ratio (g.feed/g.gain) were measured at 14 , 28 and 42 days of age

(SAS, 2002) and significant means were separated by Duncan's multiple range test (Duncan , 1955) .

### **RESULTS AND DISCUSSION**

The effect of supplementing different levels of turmeric powder on live body weight is presented in Table( 2) . The results revealed that birds consuming 0.2% and 0. 4 % turmeric powder had significantly ( $P<0.05$ ) higher final body weight than those the control group, by 12.66 % and 12.85 % respectively. While , there was no significant ( $P>0.05$ ) differences in final body weight between T1 and T4 .

( $P<0.05$ ) higher average gain than that of the control group (T1). Overall gain ( 0 – 42 days of age ) showed that T2 and T3 had significantly(  $P<0.05$ ) highest overall gain by 12.87 % and 13.18 % respectively as compared to the control group (T1) . While, there were no significant ( $p>0.05$ )differences between T1 and T4 in overall gain (0 – 42 days).

**Table(1):** .Ingredients and composition of the experimental diets .

Ingredients	Starter 0 – 28 days	Grower 29 – 42 days
Yellow corn	50	45
Wheat	12	22
Soybean meal (48%)	30	24
Protein con. (40%) <sup>1</sup>	5	5
Sun flower oil	1	2
Dicalcium phosphate	1	1
Calcium carbonate	1	1
Calculated composition <sup>2</sup>		
Crude Protein %	21.94	20.07
Metabolized energy kcal/kg	2921.9	3038.2
Calcium %	1.20	1.20
Available phosphorus %	0.42	0.42
Lysine %	1.20	1.02
Meth. +Cys.	0.82	0.78

<sup>1</sup>protein concentrate contain ; Crude Protein 40% , Crude fat 7.5 % , Crude fiber 3 % , Calcium 12% , phosphorus(av) 4.8 % methionine 3.7% , meth + cys. 4.0 % , Lysine 3.9 % , sodium 2.2 % , Kcal ME/kg 2000 .<sup>2</sup> According to NRC ( 1994 ) .

**Table (2):** Effect of supplementing different levels of turmeric powder on live body weight (g) of broiler chickens .

Age Days	Control T1	Turmeric levels (%)			Level of significant
		T2(0.2%)	T3(0.4%)	T4(0.6%)	
0-14	337.71 <sup>a</sup> ± 13.2	347.75 <sup>a</sup> ±3.75	338.00 <sup>a</sup> ±4.00	276.19 <sup>b</sup> ±10.63	*
14-28	1315.70 ±15.68	1203.30 ±9.25	1310.80 ±10.83	1139.70 ±10.39	N.S
0-42	2180.70 <sup>b</sup> ±15.18	2497.00 <sup>a</sup> ±2.00	2505.70 <sup>a</sup> ±4.19	2317.20 <sup>ab</sup> ±10.00	*

A , b , c Mean in the same raw with different superscripts are significantly (P<0.05) different , N.S-No significant .

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**Table (3):**. Effect of supplementing different levels of turmeric powder on average gain (g) of broiler chickens .

Age Days	Control T1	Turmeric levels (%)			Level of significant
		T2(0.2%)	T3(0.4%)	T4(0.6%)	
0-14	296.71 <sup>a</sup> ±13.20	306.75 <sup>a</sup> ±3.75	297.00 <sup>a</sup> ±4.00	235.19 <sup>b</sup> ±10.63	*
14-28	978.00 ±14.47	855.5 ±10.00	972.80 ±6.83	886.00 ±8.25	N.S
28-42	865.05 <sup>b</sup> ±10.50	1293.75 <sup>a</sup> ±7.25	1194.86 <sup>a</sup> ±12.36	1155.00 <sup>a</sup> ±6.11	*
0-42	2139.70 <sup>b</sup> ±10.18	2456.00 <sup>a</sup> ±2.00	2464.70 <sup>a</sup> ±8.19	2276.60 <sup>ab</sup> ±10.5	*

A , b , c Mean in the same raw with different superscripts are significantly (p<0.05) different , N.S-No significant .

Feed intakes of different dietary treatments is presented in Table (4) . There were no significant (P<0.05) differences in feed intake value among different dietary treatments. Birds fed either T3 or T4 consumed less feed as compared to T1 and T2 .

**Table(4):** Effect of supplementing different levels of turmeric powder on feed intake (g) of broiler chickens .

Age Days	Control T1	Turmeric levels (%)			Level of significant
		T2(0.2%)	T3(0.4%)	T4(0.6%)	
0-14	444.55 ±5.72	462.96 ±27.04	495.23 ±29.77	422.57 ±14.93	N.S
14-28	1293.41 ±9.40	1355.91 ±42.27	1213.55 ±64.45	1190.80 ±57.80	N.S
28-42	1984.10 ±3.9	1939.80 ±35.23	1824.60 ±50.93	1868.00 ±36.00	N.S
0-42	3733.40 ±17.95	3758.70 ±50.46	3533.38 ±20.16	3481.37 ±38.86	N.S

N.S-No significant .

The effect of supplementing different levels of turmeric powder on feed conversion ratio (g.feed/g.gain) is presented in Table (5).

There were no significant ( $P>0.05$ ) differences in feed conversion values at 14 and 28 days among different groups , while feed conversion ratio was significantly ( $P<0.05$ ) better in all supplemented groups as compared to the control group at 42 days of age . Overall feed conversion ratio was significantly ( $P<0.05$ ) best for T3 as compared to the control group (T1).

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**Table (5 ):** Effect of supplementing different levels of turmeric powder on feed conversion ratio (g.feed/g.gain) of broiler chickens .

Age Days	Control T1	Turmeric levels (%)			Level of significant
		T2(0.2%)	T3(0.4%)	T4(0.6%)	
0-14	1.50 ±0.04	1.50 ±0.06	1.66 ±0.07	1.80 ±0.14	N.S
14-28	1.23 ±0.12	1.60 ±0.14	1.24 ±0.07	1.34 ±0.03	N.S
28-42	2.16 <sup>a</sup> ±0.10	1.50 <sup>b</sup> ±0.14	1.52 <sup>b</sup> ±0.04	1.61 <sup>b</sup> ±0.04	*
0-42	1.63 <sup>a</sup> ±0.05	1.53 <sup>ab</sup> ±0.19	1.43 <sup>b</sup> ±0.06	1.52 <sup>ab</sup> ±0.01	*

A , b , c Mean in the same raw with different superscripts are significantly (p<0.05) different , N.S-No significant .

Data on carcass characteristic is presented in Table(6) . In the present study carcass yield was not statistically (P>0.05) influenced by the dietary treatment . These results are in agreement with Nouzarian et al., (2011) who demonstrated that using turmeric powder at level of 3.3 , 6.6 and 10 g/kg diet as feed additive had no significant effect on carcass yield of broiler chickens.

**Table( 6):** Effect of turmeric powder supplementation on carcass yield , abdominal fat pad, edible organ , Bursa of fabricius and spleen index of broiler at 42 days of age .

Carcass traits	Turmeric levels %				Level of significant
	T1(control)	T2(0.2%)	T3(0.4%)	T4(0.6%)	
Carcass yield %	75.10 ±1.51	73.24 ±2.23	74.15 ±1.68	73.11 ±0.22	N.S
Breast %	37.96 ±3.68	37.60 ±3.63	35.45 ±1.91	36.91 ±0.06	N.S
Thigh %	29.10 ±2.31	28.33 ±1.53	29.25 ±2.06	30.33 ±0.75	N.S
Wing %	10.83 ±0.04	10.63 ±0.32	11.18 ±0.20	10.91 ±0.34	N.S
Back %	14.80 ±0.75	16.08 ±0.62	15.26 ±0.39	14.92 ±0.13	N.S
Neck %	5.66 ±0.36	5.32 ±0.69	6.18 ±0.14	5.57 ±0.43	N.S

N.S-No significant .

The effect of experimental treatments on average value of edible organ , abdominal fat pad , Bursa of fabricius and spleen index are presented in Table (7). In this study organ weight was not statistically ( $P>0.05$ ) influenced by the dietary treatment .However, inclusion of turmeric powder at level of 0.4 % cause a significant ( $P<0.05$ ) increase in gizzard relative weight as compared with other treatments group. While, there was no significant effect of dietary treatments on bursa of fabricius and spleen index. Mehala and Moorthy (2008) found that no significant difference in abdominal fat pad between treatment groups by inclusion of curcuma longa. It is likely that curcumin decrease the activity of the enzymes acting as rate limiting enzymes in lipogenesis such as acetyl-CoA , carboxylase , which is the rate limiting enzyme in fatty acid synthesis.



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**Table( 7):**Effect of turmeric powder supplementation on edible organ , abdominal fat ,bursa of Fabricious and spleen index at 42 days of age .

Carcass traits	Turmeric levels %				Level of significant
	T1 control	T2(0.2%)	T3(0.4%)	T4(0.6%)	
Abdominal fat %	1.01 ±0.33	1.38 ±0.32	1.9 ±0.10	0.96 ±0.01	N.S
Liver	2.88±0.45	3.14 ±0.04	3.57 ±0.32	3.18 ±0.11	N.S
Gizzard	2.27b ±0.01	2.05b±0.17	3.09a ±0.02	2.27b±0.16	*
Heart	0.69 ±0.11	0.69 ±0.12	0.58 ±0.04	0.56 ±0.07	N.S
Bursa of Fabricious index	0.12 ±0.04	0.19 ±0.03	0.22 ±0.01	0.23 ±0.01	N.S
spleen index	0.15 ±0.01	0.12 ±0.01	0.12 ±0.01	0.14 ±0.02	N.S

N.S-No significant .

These result desgreement with Nouzarian et al.,(2011) who reported that , inclusion of turmeric powder caused a decrease ( $P<0.05$ ) in relative weight of abdominal fat pad and relative weight of liver in comparison with control group.

The effect of dietary treatments of turmeric powder on logarithmic count of Lactobacilli and E.coli in jejunum of broiler chickens at 42 days of age is presented in Table( 8) . Dietary supplementation of turmeric powder caused a significant ( $P<0.05$ ) increase in Lactobacillus count compared with the control group.while dietary supplementation of turmeric powder did not have significant ( $P>0.05$ ) effect on E.coli count, However , E.coli count was numerically lower in all supplemented groups as compared to the control group.

**Table(8):** Effect of supplementing different levels of turmeric powder on logarithmic count of Lactobacillus and E.coli in jejunum of broiler chickens at 42 days of age .

<b>Treatment</b>	<b>Lactobacillus</b>	<b>E.coli</b>
T1(control)	13.99 <sup>b</sup>	14.60
T2(o.2%)	17.09 <sup>a</sup>	13.92
T3(o.4%)	17.03 <sup>a</sup>	14.46
T4(o.2%)	16.81 <sup>a</sup>	13.85
Significant	*	N.S

A , b , c Mean in the same raw with different superscripts are significantly ( $p<0.05$ ) different , N.S-No significant .

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According to previous reports , it appear that increasing turmeric supplementation in broiler diets reduces feed intake but in the present study , it did not differ significantly between the groups , Similar observation were made by Emadi and Kermanshahi (2006) and Durrani et al.,(2006) . The authors reported that feed intakes of bird supplemented with 2.5 and 10 g/kg turmeric was similar to that of control group. The result obtained on body weight are in concurrence with Kumari et al., (2007) who reported that turmeric meal supplementation at the rate of 1.0 g/kg improved growth performance of 42 day old broiler chickens. Durrani et al.,(2006) found that supplementation of 5.0 g/kg turmeric meal in the diets resulted in a significant improvement of body weight gain . In other study , Al-Sultan (2003) observed that supplementation of turmeric meal up to 5.0 g/kg increased body weight . It was concluded that the significant increase in body weight in this study my be due to optimum antioxidant activity of turmeric at the level of 0.2 % and 0.4 % that stimulate protein synthesis by enzymatic system. On the other hand, there were reports showed that turmeric

had the ability to stimulate digestive enzyme and pancreatic lipase (Platel and Srinivasan,2000). Rajput et al., (2012) reported that dietary supplementation of pure curcumin at the rate of 0.2 g/kg increased villus length and weight in the duodenum , jejunum and ceca of broiler chickens at 42 days of age. Therefore , there is a possibility to suggest that , the improvement of broiler performance due to dietary turmeric meal is attributed to the improvement in digestive system and better feed utilization. Furthermore , turmeric could control and limit the growth and colonization of numerous pathogenic and non-pathogenic species of bacteria in the chicken's gut resulting in balanced gut microbial ecosystem that leads to better feed utilization reflected by live body weight and weight gain.

Considering the results obtained in the current study, It could be concluded that dietary inclusion of turmeric powder at levels of 0.2% and 0.4% has the potential to improve body weight , weight gain and gut ecosystems by increasing lactobacillus count and could be used as growth promoter.

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تأثير اضافة مستويات مختلفة من مسحوق الكركم على اداء فروج اللحم ، صفات الذبيحة و  
الاحياء المجهرية

حنان عيسى المشهداني

كلية الزراعة ، قسم الثروة الحيوانية ، جامعه بغداد ، العراق .

اجريت هذه التجربة في مزرعه الطيور الداجنة ، قسم الثروة الحيوانية ' كلية الزراعة ، جامعه بغداد . لدراسة تأثير اضافة مستويات مختلفة من مسحوق الكركم على الاداء الانتاجي ، صفات الذبيحة و الاحياء المجهرية لفروج اللحم . مائة و اثنى عشر طير ( Ross 308) بعمر يوم واحد ، تم توزيعها عشوائيا على اربع معاملات لمدة ٤٢ يوما . بواقع مكررين ( ١٢ طير / مكرر) . و كانت معاملات التجربة كالآتي : T1= المقارنة ، T2 = ٠,٢% مسحوق الكركم ، T3 = ٠,٤% مسحوق الكركم ، T4 = ٠,٦% مسحوق الكركم . اظهرت النتائج وزن الجسم النهائي و الزيادة الوزنية انها كانت افضل معنويا في معاملتي اضافة مسحوق الكركم T2 و T3 مقارنة مع مجموعته المقارنة . كفاءة التحويل الغذائي كانت افضل معنويا للمعاملة T3 (٠,٤%) مقارنة بمجموعه المقارنة . لم يكن لمعاملات الاضافة تأثيرا معنويا في استهلاك العلف ، صفات الذبيحة ، الوزن النسبي للاجزاء الصالحة للاكل و دليل البرسا و الطحال . اعداد بكتريا lactobacillus كانت اعلى معنويا لجميع معاملات الاضافة مقارنة بمجموعة المقارنة .

يمكن الاستنتاج من هذه الدراسة بان اضافة مسحوق الكركم و بالنسبة ٠,٢ و ٠,٤% لهم تأثير ايجابي في تحسين الصفات الانتاجية و اعداد بكتريا lactobacillus لفروج اللحم و يمكن استخدامه كمحفزات نمو .

الكلمات المفتاحية : مسحوق الكركم ' اداء فروج اللحم ' اعداد بكتريا E.coli و lactobacillus .