EVALUATION OF DIETARY SUPPLEMENTATION OF TURMERIC POWDER ON ECONOMIC INDICATORS AND INTESTINAL HISTOLOGY OF BROILERS

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This study was conducted at the poultry Farm / Animal production department, Collage of Agricultural Engineering Science / University of Baghdad, during the period form 8-3-2014 to 19-4-2014 to evaluation of supplementing different levels of turmeric (curcuma Longa) Powders to Broiler diets on economic indicator and histological measurement of intestine. One hundred and twelve unsexed broiler chicks (Ross 308), one day, 41g its initial body weight. The birds were randomly distributed among Four treatments, each treatment contained 28 birds, with two replicates and each replicate contained 14 birds. The chicks of first treatment (T1) control without supplement, while T2, T3 and T4 treatment were fed a standard diet for broilers in addition to the turmeric powder at levels 0.2, 0.4 and 0.6% 100 kg diet respectively. The results obtained indicated that adding turmeric powder at three different levels in Feed conversion ratio were increase significant ($p<0.05$) in T3 and T4 compared with T1 while T2 similar with T1 there ware increase significant ($p<0.05$) in T3, T2 and T4 compared with T1 in Production Index and economic indicator in 42 days. There was increase significant ($p<0.05$) in the total intestinal wall thickness (duodenum, Jejunum. and ileum) in adding turmeric powder in treatments compared with control group, Villi length and crypts of Lieberkahan depth were higher value for supplemented groups as compared with control it could be concluded from this study that turmeric powder have beneficial effect on production index of broiler.

Keywords: ***curcuma longa,*** **production Index , Villi high , crypt depth**

مجلة العلوم الزراعية العراقية- 2025 :56 (2):720-726 **المشهداني**

تقييم اضافة مسحوق الكركم الى العلائق في بعض المؤشرات الاقتصادية والنسيجية للأمعاء لدى فروج اللحم

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المستخلص

اجريت هذه التجربة في حقل الطيور الداجنة/ قسم الانتاج الحيواني/ كلية علوم الهندسة الزراعية/ جامعة بغداد لدراسة تقييم اضافة نسب مختلفة من الكركم الى علائق فروج اللحم في قيمة بعض المؤشرات الاقتصادية وفي القياسات النسيجية للامعاء، للمدة 8-3 2014 الى 19-4-2014. وزع عشوائياً مائة واثنى عشر طير غير مجنس (ROSS 308) بعمر يوم واحد وبوزن ابتدائي 41 غم على اربع معاملات كل معاملة تضمنت 28 طيراً بواقع مكررين (14 طير / مكرر) وكانت المعاملة الاولى (T1) السيطرة خالية من اي اضافة بينما المعاملات T2 و T3 و T4 تم اضافة مسحوق الكركم بالنسب (0.2 و 0.4 و 0.6) % لكل 100 كغم على التوالي. واظهرت النتائج ان اضافة مسحوق الكركم بالنسب الثلاثة قد حسن معنوياً ($p<0.05$) من معامل التحويل الغذائي للمعاملتين T3 و T4 مقارنةً بمعاملة السيطره بينما لم يختلف T2عن T1 وكذلك وجد زياده معنويه($p<0.05$) في T3 و T2 و T4 مقارنة بمعاملة T1 في الدليل الانتاجي و المؤشر الاقتصادي عند عمر 42 يوماً.ايضاً هنالك زيادة معنوية ($P<0.05$) في سمك الجدار الكلي للامعاء لكل من (الاثني عشر ، الصائم واللفائفي)لمعاملات اضافة مسحوق الكركم مقارنة بمعاملة السيطرة . طول الزغابة وعمق الخبايا (لايبركان) كانت عالية القيمة لمعاملات الاضافة مقارنة بمعاملة السيطرة وعليه يمكن ان نستنتج من هذه الدراسة ان مسحوق الكركم له فوائد ايجابية في تحسن كل من المؤشرات الاقتصادية المدروسة والقياسات النسيجية للامعاء لفروج اللحم.

الكلمات المفتاحية: *Cucuma Longa*، الدليل الانتاجي، ارتفاع الزغابة، عمق الخبايا

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INTRODCUCTION

The genetic selection for fast growth and weight gain, egg production for broiler chicken and layers in the last few decades has cause these breeds to become more vulnerable to environmental factors and disease, these factor causes stress and discomfort in birds (23, 34, 36) . Antibiotic have been used for decades to boost productive performance of poultry and farm animals. As a result of using antibiotic for long time, microorganism develop resistant to antibiotic and their resides in food-chain of human (15, 24). Due to this side effect on human health, antibiotic has been band in European union since 2006. A wide range of spices, herbs, and their extract fare Known to exert beneficial effects on productive performance of poultry (2, 3, 4, 5, 6, 7, 14, 17, 18, 25) Several herbs and spice plant and extract have shown promising potential to enhance meat, egg production and protect health of birds, thus gain vital importance to be used as alternative to antibiotics in animal feed (10, 16, 24). One of these dietary supplementation is curcuma longa (turmeric). Curcuma longa is widely used in Asia and china as spice and medicinal plant. Chemical analysis of turmeric showed it contains 69.4% Carbohydrates, 6.3% protein, 5.1% fat, 3.5% minerals, 5 % the bioactive polyphenol (11, 38). Turmeric has been found to contain various active Compounds (dimethoxy curcumin , curcumioid and h bis-methoxy curcumine (38). Turmeric have a wide range of biological activity which include antioxidant (40, 41) , anti-inflammatory (15, 33) Natural growth promoter and safe alternative to antibiotics (1, 4, 19, 25), lipid metabolism (31), Antimicrobial (26).

MATERIALS AND METHODS

This study was conducted at the Poultry farms / Animal production department/University of Baghdad to study the Evaluation of Supplementing different levels of turmeric *(curcuma Longa)* Powders to broiler diets on economic indicator and histological measurment of intestine. One hundred and twelve day old (Ross 308) were allocated randomly to utilize a complete randomized design (CRD) to four dietary treatments with the replicate pens (14 birds / pen) from 1-42 days of age. The experimental treatments were as follows: T1 Control, T2 ,T3 and T4 were0.2%, 0.4% and 0.6% turmeric powder respectively. Diets were prepared freshly each week from 1-28 days of age (starter) and twice a week from 29-42 days of age. The experimental diets were formulated to be isocalaric and Isonitrogenic (Table 1) according to NRC (27) , Feed and water were provided ***Ad libtim***, throughout the study. At 42 days of age the experimental birds from each replicate (2 birds / treatment) were selected randomly with close live body weight after feed deprivation overnight. Birds were slaughtered and the small intestine were excised. The small intestine was divided into three Segment: doudenum (from gizzard outlet to the end of Pancreatic loop), Jejunum (from pancreatie loop to Meckel's diverticulum) and ileum from Mackel's diverticulum to the cecum junction. The content of these parts were emptied by gentile pressure then washed with saline solution. The samples were immediately fixed by formalin 10% for 24 hours. Standard dehydration and rehydration were applied (70-100%) (5, 9, 39) Data were subjected to analysis of variance (32) and significant treatment means were separated by Duncan's multiple range tests (13).

Table 1.Composition of experimental diets

Ingredient%	Starter 1 to 28 days	Finsher 29 to 42 days
Yellow corn	37	46
Wheat	28	22
Soyabean meal (48%)	28	24
Protein conc.(1) (40%)	5	5
Sun flower oil	1	2
Dicalcium phosphate	1	1
Calculated composition of the experimental diet according to NRC (1994)		
Crude protein %	21.94	20.07
Metabolized energy (kcal/kg)	2921.5	3128.2
Calcium %	0.84	0.84
Available phosphorus%	0.42	0.42
Lysin%	1.02	1.2
Meth+Lys%	0.82	0.78
Fiber%	2.846	2.708
C/P	131.55	150.38

(1) protein concentrate provide per kg: 40% crude protein; 2150 kcal. ME /kg; 4.1 methionine + cysteine; 5% Calcium; 4.65/ available phosphorus; 5% crude fat;28.3% 220000 IU vitamin A, 60000IU vitamin D3 ,600000mg vitamin E , 60 mg Vitamin B1, 140mg Vitamin B2, 80mg Vitamin B6, 700mcg Vitamin B12 ,2.000mcg Biotin,20mg Folic acid ,50mg Vitamin K3 ,d-pantothenic acid 320mg ,60mg nicine , 7.5mg choline chloride ,200mg Cu,1.600mg Mn,1.200mg Zn,1.000mg Fe ,20mg I, 5mg Se. which meet NRC (1994)

RESUITS AND DISCUSSION

Table (2) shows that the effect of adding different levels of turmeric powder to the diet on feed conversion ratio (Feed intake/weight gain) there was increase significant (P<0.05) in T3 and T4 compared with T1, while there was no significant with T2, the production index and economic indicator were increase significant (p<0.05) in 0.4%, turmeric powder compared with experimental treatment at the age of 42 days. In mortality we didn't notice any differ.in mortality we did not notice any differ.

Table 2. evaluate of supplementing different levels of turmeric (*curcuma longa*) on broiler performance at 42 days

		Turmeric %			
Characters	Control T1	0.2% T2	0.4% T3	0.6% T4	Level of Sig.
FCR	1.63 ± 0.05 a	1.53±0.19 ab	1.43±0.06 b	1.43±0.06 b	*
Production index	318.53±4.33 c	388.58±5.51 b	417.19±7.21 a	385.81±6.41 b	*
Economic indicator	318.53±4.12 c	388.58±4.41 b	417.19±5.33 a	385.81±5.22 b	*
Mortality%	0.00	0.00	0.00	0.00	N.S

a,b,c means with different letter in the same raw significantly (P<0.05) different.
N.S. Noun significant

The improvement in some productive parameters may be due to the presence of active compound curcumin which stimulates the secretion of intestinal enzymes such as (Maltase, surcease) and pancreatic enzymes amylase, Lipase and proteinase that work to digest and metabolize nutrients (8, 11, 16, 20, 22)

Table 3. evaluate of supplementing different levels of turmeric powder (*curcuma longa*) to broilers diets on intestinal mucosa layer and wall thickness (µm) at 42 days

		Turmeric %			
Characters	Control T1	0.2% T2	0.4% T3	0.6% T4	Level of Sig.
Dudenal mucosa layer	124.12±1.02 c	165.21±1.53 b	180.34±2.36 a	178.80±0.80 a	*
Intestinal wall thickness	150.20±0.68 b	192.29±3.22 a	208.34±4.41 a	204.44±3.44 a	*
Jejenum mucosa layer	104.36±1.33 c	145.41±1.45 b	150.36±0.51 a	151.30±1.01 a	*
wall thickness	116.22±1.22 b	166.29±1.91 a	171.89±1.01 a	171.55±2.03 a	*
Ileum Mucosa layer	67.86±1.77 c	81.44±2.31 a	83.61±3.11 a	78.4±2.21 a	*
Wall thickness	83.33± 1.22 b	101.92±1.04 a	102.44±1.21 a	98.32±2.03 a	*

a,b,c means with different letter in the same raw significantly (P<0.05) different

Table 4. evaluate of supplementing different levels of turmeric powder (*curcuma longa*) to broilers diets on intestinal villi heigh/crypt depth (µm) at 42 days of age

	Turmeric %				
Characters	**Control T1**	**0.2% T2**	**0.4% T3**	**0.6% T4**	**Level of Sig.**
Dudenams					
Villi height	**103.01±1.21 b**	**136.23±3.41 a**	**140.88±4.51 a**	**120.01±2.10 a**	*****
Crypt depth	**11.40±1.92 c**	**15.23±0.41 b**	**30.64±0.02 a**	**30.03±0.4 a**	*****
Villi height/ Crypt depth	**9.03±1.61a**	**8.88±1.41a**	**4.59±1.33 b**	**3.99±1.24 b**	*****
Jejenum					
Villi height	**85.21±4.21 b**	**96.01±5.51 b**	**115.31±7.22 a**	**121.44±3.11 a**	*****
Crypt depth	**13.11±0.80 b**	**14.51±0.89 b**	**16.41±0.20 a**	**17.03±0.03 a**	*****
Villi height/ Crypt depth	**6.49±1.31 a**	**6.61±0.45 a**	**7.02±0.80 a**	**7.13±0.22 a**	**N.S**
Ileum					
Villi height	**44.01±3.01 b**	**49.12±2.03 b**	**48.51±1.46 b**	**47.91±1.18 b**	**N.S**
Crypt depth	**6.21±0.91 b**	**5.81±0.47 b**	**8.11±0.11 a**	**9.21±0.22 a**	*****
Villi height/ Crypt depth	**7.17±0.88 a**	**8.45±1.23 a**	**5.98±0.72 b**	**5.20±0.25 b**	*****

a,b,c means with different letter in the same raw significantly (P<0.05) different
N.S. Noun significant.

The effect of supplementing different levels of turmeric powder on mucosa layer and wall thickness is presented in (Table 3) Data indicated a significant (p<0.05) between supplemented groups with control group. In duodenal and Jejunum mucosa Layers increase significant (p<0.05) in T3 and T4 respectively compared with T1 and T2 while wall thickness of duodenal and jejunum were increase significant (p<0.05) in T4, T3 and T2 respectively Compared with T1. ileum mucosa Layers and wall thickness were increase significant (p<0.05) in adding different levels of turmeric powder compared with control group without adding, because intestinal mucosa Layer play an important role in protecting epithelial surface against pathogen and maintaining appropriate environment for digestion, From our result it seems. That thickness of mucus is higher in the proximal part of the small intestine to the distal part of the gut reported that more than 90% of total nutrients absorption (carbohydrates, proteins and Lipids) Occur in the small intestine (12, 21) , also reported that physiological properties of mucus can regulate permeability of mucus Layer not only restrict the diffusion of bacteria but also allow transport of nutrient from the Lumen to the epithelium (12, 30, 35). The duodenal villi height and crypt depth of small intestine segment is presented in (Table 4), There was significant (p<0.05) differences with regard duodenal villi height between the supplemented turmeric Powder with control group was significantly (p<0.05) taller for T3. T2 and T4 respectively compared with Shortest height in T1, while the adding 0.4% and 0.6% of turmeric powder were significant (p<0.05) in T3 and T4 Compared with T2 and T2 in deeper crypt depth, villi height to crypt depth was significantly Lower(p<0.05) for T3 and T4 with mean value being 4.59µM and 3.99 µM respectively. Jejunal villi height and crypt depth of small intestines were significant (P<0.05) in all adding different levels of 0.6 and 0.4 (121.44 and 115.31) µM compared with 0.2% (96.01 µM) and T1 (85. 21 µM which is a shortest villi height. Crypt depth in jejeunal was significant (p<0.05) deeper in T4 and T3 than T2 and T1 respectively. Considering villi height and crypt depth birds had none efficient nutrient absorption in this experiment. In ileum villi height of broiler chicken fed. didn't notes significant, but there was significant (p<0.05) in 0.4% and 0.6% turmeric powder compared with T1 and 0.2%, respectively. there was significant decrease (P<0.05) in villi height/crypt depth in T3 and T4 Compared with T2 and T1. From above results it can be noted that the Supplemented groups with turmeric powder had tallest villi height than the control group, which may indicate that duodenal and Jejunum had more activity: absorptive cells and slow hung over

of Secretly cells, thus more efferent nutrient absorption, This may explain the improvement in feed Conversion ratio in T3 and T4 compared with T1 and T2. the result was in agreement with (28, 29). villi height morphology in duodenal and jejnum, it has highest villi height followed by the Jejunum because the duodenal is Largely responsible for digestion and absorption followed by jejunal. Thus the increased villi height due to increased activity in this segment for digestion and absorption capacity (25, 26, 37) for Jejunal and ileal segment of the small intestine which indicates that duodenum and jejunum efficiency in the digestion and absorption of major nutrients (1, 6, 7, 21, 28, 30, 37). Therefore it could be reason for significant increase in some productive index and histological measurement in (0.4 and 0.6) % of turmeric powder to the diets of broilers.

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