Research Article

BASRAH JOURNAL OF VETERINARY RESEARCH, 2021, 20(02):59-67
Journal homepage: www.basjvet.org

Study the effect of Different Levels of *Curcuma longa* on Some Physiological and Specific Egg Traits and Intestinal Environment for Quail

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Received: Nov15, 2021; Accepted: Dec. 25, 2021

ABSTRACT

The aim of the current study was to evaluate the effect of different levels of *Curcuma longa* on some physiological and biochemical parameters, as well as some egg productive and quality characters and the intestinal microflora of local quail. 240 one-day-old quail were distributed randomly into 4 groups (60 birds/group) with 3 replicates. The groups were as follows: 1st group (control) birds were reared on standard ration, the 2nd, 3rd and 4th groups birds were reared on standard ration supplemented with 3, 6 and 9 gm turmeric/kg ration respectively. The results revealed that the turmeric improve blood picture as represented by the significant increase of RBCs, Hb and PCV% specially in 3rd and 4th treatments. Also, the turmeric reduced significantly triglycerides and cholesterol compared with the control. *Curcuma longa* treatment improved the intestinal microflora represented by the significant decrease in the number of pathogenic flora (*Salmonella* and *E. coli*), and significant increase in the benefit flora (*Lactobacillus*). On the other hands treatments reduced significantly the age of 1st egg production and enhance the age of 50% egg production. In conclusion, *Curcuma longa* treatment induced ameliorative effects on some of physiological and productive performance of quail.

Keywords: **Blood picture, *Curcuma longa*, Intestinal microflora, Quail.**

Introduction

Medicinal and aromatic plants and herbs and their extracts have been used to treat many disease conditions in poultry [1] , and these medicinal plants and herbs differ from other plants in terms of containing substances with medicinal effects. The components of these effective plants and their extracts have been known whether from leaves, stem, flowers or roots [2] It has been shown that these plants improve growth and environment of the gastrointestinal tract and enhance immunity through their anti-bacterial and anti-fungal role [3]. One of these plants and herbs is turmeric (*Curcuma longa*), which belongs to the Zingiberaceae family. *Curcuma longa* is a tropical plant that contain the compound *Curcuma longa* [3] , it is incorporated in many medicines that used to treat the liver disease and loss of appetite [4] . *Curcuma longa* is also characterized by its anti-bacterial and anti-inflammatory properties and its effectiveness against some microbes such as *E. coli, Psedomononas, Staphylococcus aureus* [5 , 6]. *Curcuma longa* improves the immune system [7] , body weight, weight gain, feed conversion efficiency and reduced feed consumption [8 , 9] . The aims of the current study are to evaluate the effect of different levels of *Curcuma longa* on some physiological and biochemical parameters of quail, as well as, its impact on the egg productivity and its quality characteristics. Also, the status of the intestinal microflora of quail have been studied too.

Materials and Methods

This experiment was conducted in the poultry farm of the Animal Production Department, College of Agriculture and Forestry / University of Mosul, for the period 1/9/2019 to 15/10/2019. This study have been carried out from one day-old till the age of 42 days. Two hundred-forty birds, at one day-old age were distributed randomly into 4 groups (60 birds/group) with 3 replicates. 1st group (control) birds were reared on a standard ration, the 2nd, 3rd and 4th groups birds were reared on a standard ration supplemented with 3, 6 and 9 gm turmeric/kg ration respectively according to [10]. The components on standard ration were compound according to [11] . The Teurmeric powder was obtained from local herbs and mixed manially with a small amount of diets , then the amount was increase with the new mixture until reach the required homogeneity between the diets materials.

When the birds reached the age of egg production, egg production was studied on the basis of Hen Day Production (H.D.P) and egg weight and the following parameters were calculated: Egg quality, 10 eggs from each repeated and weighed and broken to calculates, height albumin, yolk height ,yolk dimension, yolk weight, shell thicken, shell weight and calculated shape index and yolk index using the following equations :

$$\text{Shape index} = \frac{\text{Egg length}}{\text{Egg width}}$$

$$\text{Yolk index} = \frac{\text{Yolk height}}{\text{Yolk dimension}}$$

Also measured the weight of the oviduct, ovary weight , length oviducyt , age of puberty , and weight of first egg and age of reach to 50% egg production. And selected 12 birds from each treatment estimate microbial content of intestines from bacteria *E.Coli*, *Salmonella* and *Lactobacillus* by method [12]. Account of the differential number of white blood cells, red blood cells according to [13], Hemoglobin concentration, Packed cell volume (PCV) according to [14] Mean Corpuscular Volume (MCV) , Mean Corpuscular Hemoglobin (MCH) Mean Corpuscular Hemoglobin Concentration (MCHC) . Also measured concentration of Cholesterol, triglyceride , glucose , total protein , albumin , globulin using kit ready made analysis of the company (Biolabo , Maizy , France) and calculated globulin/albumin ration . The statistical analysis was performed completely randomized design (C.R.D) one way analysis of variance differences between totals were determined using Duncan's Multiple Ranges test for all the measurement studied and level of statistical characterize was ($P \leq 0.05$) as described by [15] using [16] . program to analyses the data and using the following equation :

$Yij = \mu + ti + eij$.

Yij = Value of observation in the observation in the experimental .

μ = the general average .

ti = effect of treat .

Eij = effect of the experimental error .

Results

The result of the statistical analysis of the data show in table (1) a significant increase in number of red blood cells in the fourth treatment compared with the control treatment , and note significant differences ($P \leq 0.05$) in the level of hemoglobin in the second (3 mg Turmeric / kg ration) and third treatment (6 mg Turmeric / kg ration) compared with the control group , but no significant difference were PCV between all treatments . this result were agree with the result of [17 , 18] indicated ,if they did not notice significant differences in the Packed cell volume (PCV) , while they notice a significant increase in the level of hemoglobin when adding turmeric powder to the diet of quail.

In the table (2) illustrate some biochemical analysis that include a significant increase in the level of serum total protein of T_2, T_3 and T_4 treatments compared with the control treatment.

Table (1) : Effect of Adding Turmeric Powder on some Bloody Traits of Quail

Treatment / Parameters	T_1 (Control Treatment)	T_2(Turmeric) (3 gm / kg)	T_3(Turmeric) (6 gm / kg)	T_4(Turmeric) (9 gm / kg)
Red Blood Cells (RBCs) (10^6/mm^3)	3.56±0.13 b	4.14±0.24 ab	4.00±0.24 ab	4.43±0.37 a
Packed Cell Volume (PCV) %	34.80±1.24 a	37.80±2.95 a	40.80±1.24 a	39.80±2.20 a
Hemoglobin Concentration (g/dl)	10.78±0.69 c	13.00±0.20 ab	13.40±0.45 a	11.92±0.16 bc
Mean Corpuscular Volume (MCV) μ^3	98.17±4.78 a	93.76±11.98 a	103.63±8.01 a	93.23±11.53 a
Mean Corpuscular Hemoglobin (MCH) (Pg)	30.33±1.80 a	31.91±2.22 a	33.76±1.62 a	27.76±2.41 a
Mean Corpuscular Hemoglobin Concentration (MCHC) (g/dl)	31.09±2.12 a	35.32±3.06 a	32.91±1.16 a	30.27±1.50 a

The different letters horizontally indicate significant differences at the ($p \leq 0.05$).

Table (2) Effect of Adding Turmeric Powder on some Biochemical Parameters in Blood Serum of Quail

Treatment / Parameters	T_1 (Control Treatment)	T_2(Turmeric) (3 gm / kg)	T_3(Turmeric) (6 gm / kg)	T_4(Turmeric) (9 gm / kg)
Total protein	4.50±0.13 c	5.22±0.22 b	5.59±0.19 ab	6.05±0.24 a
Albumin	2.21±0.07 a	2.22±0.06 a	2.12±0.02 a	2.17±0.04 a
Globulin	2.28±0.15 c	2.99±0.22 b	3.46±0.20 ab	3.88±0.22 a
Globulin/ Albumin ratio	1.04±0.09 c	1.35±0.12 b	1.63±0.10 ab	1.78±0.08 a
Concentration of Glucose	328.65±47.1 a	225.52±16.7a	233.70±24.85 a	228.52±0.42 a
Concentration of Triglycerides	685.41±80.4 a	367.56±25.69 b	322.87±39.9 b	322.71±45.91 b
Concentration of Cholesterol	221.62±0.19 a	157.32±13.63ab	167.97±33.63 ab	146.43±14.41 b

The different letters horizontal indicate significant differences at the ($p \leq 0.05$) .

An increase in the level of globulin and globulin/albumin ratio in T_2, T_3 and T_4 compared with the control treatment. A significant reduction of triglycerides in T_2, T_3, and T_4, but the cholesterol level decrease in T_4 compared with the control treatment.

Turns out of the table (3) a significant decrease in the number of bacteria *Salmonella* and *E.coli* in the treatment of adding turmeric powder compared to the control treatment. But a significant increase in the number of bacteria *Lactobacillus* in the T_3 and T_4 compared to the control treatment and T_2 .

Table (3) : Effect of Adding Turmeric Powder on Number Bacterial (enteric ecosystem) of Quail.

Parameters / Treatment	*Salmonella*	*E.Coli*	*Lactobacillus*
T_1 (Control treatment)	15.16×10^4 ±0.47 a	14.16×10^4 ± 0.87 a	13.66×10^4± 1.05 b
T_2(Turmeric) (3 gm / kg)	12.83×10^4 ±0.83 b	13.00×10^4± 0.57 ab	16.83×10^4± 0.35 b
T_3(Turmeric) (6 gm / kg)	12.00×10^4±0.57 b	11.16×10^4± 0.35 c	20.33×10^4± 0.98 a
T_4(Turmeric) (9 gm / kg)	12.00×10^4±0.57 b	11.50×10^4±0.34 bc	21.50×10^4±0.84 a

The different letters in the same colum indicate significant differences at the ($p\leq0.05$) .

The result of the statistical analysis in table (4) indicate that there were a significant increase in the yolk diameter in the T_2 and T_3 compared with the control treatment and a significant weight yolk in the all treatment compared with the control treatment . Weight shell increase in the T_3 compared with the control treatment , and the Yolk index decrease in the T_2 compared with the control treatment, a significant decrease ($P \leq 0.05$) in the age of first egg laying and age to 50% egg production in the 2^{nd}, 3^{rd} and 4^{th} treatments compared with control treatment . The result were contrary to [23] found if no significant differences were observed in the weight shell , the result in agree with found [10] , if showed that there were significant differences in the Height yolk and weight shell, while it was in violation of the same research found , as he noticed that there were no significant differences in the yolk dimension and Yolk index when adding turmeric plant powder to the diet of quail .

Table (4) : Effect of turmeric powder on egg weight and egg quality .

Treatment / Parameters	T_1 (Control Treatment)	T_2(Turmeric) (3 gm / kg)	T_3(Turmeric) (6 gm / kg)	T_4(Turmeric) (9 gm / kg)
Weight egg (gm)	11.00±0.26 a	12.12±0.39 a	12.12±0.38 a	11.75±0.55 a
Weight albumen (gm)	5.17±0.21 a	5.59±0.24 a	5.93±0.33 a	5.82±0.25 a
Height albumen (mm)	4.12±0.08 a	4.37±0.22 a	4.33±0.16 a	4.54±0.27 a
Weight yolk (gm)	3.23±0.08 b	3.79±0.18 a	3.84±0.15 a	3.83±0.17 a
Height yolk (mm)	10.01±0.17 a	10.12±0.24 a	10.24±0.16 a	10.04±0.07 a
Yolk dimension (mm)	20.94±0.36 b	23.26±0.28 a	22.88±0.37 a	22.22±0.71 a
Egg Length(mm)	32.20±0.40 a	32.61±0.23 a	31.54±1.06 a	32.49±0.55 a
Egg width(mm)	24.35±0.25 a	25.37±0.40 a	25.01±0.41 a	25.24±0.46 a
Weight shell (gm)	1.54±0.16 b	1.77±0.08 ab	1.96±0.09 a	1.91±0.13 ab
Shell thicken (mm)	0.29±0.03 a	0.25±0.01 a	0.24±0.01 a	0.24±0.01 a
shell membranes thickness (mm)	0.01±0.003 a	0.02±0.002 a	0.02±0.002 a	0.01±0.02 a
Shape index	1.32±0.01 a	1.28±0.01 a	1.26±0.04 a	1.29±0.03 a
Yolk index	0.47±0.006 a	0.43±0.01 b	0.45±0.009 ab	0.45±0.01 ab
1st egg weight (gm)	10.00±0.65 a	10.37±0.46 a	10.25±0.52 a	9.87±0.29 a
age of first egg laying (day)	39.00 ±0.00 a	37.33±0.33 b	34.66±0.66 c	35.00±0.57 c
Age of 50 % production (day)	44.33±0.33 a	40.66±0.33 c	41.33±0.34 bc	42.33±0.33 b

The different letters horizontal indicate significant differences at the (p≤0.05) .

Discussion

The reason for the decrease in cholesterol and triglyceride may be due to the fact that the curcumin compound may have stimulated the secretion of bile, which works to reduce the level of cholesterol and triglyceride concentration from the blood serum , and thus will increase the digestion of fats [19] . These results agree with [20] if noticed that there were no significant differences in the concentration of glucose in the blood serum and a significant decrease in the concentration of cholesterol and triglycerides when adding turmeric tuber powder to broiler diets . The reason for the decrease in globulin/albumin ratio may be due is that turmeric acts as an antioxidant ,anti-bacterial and anti-inflammatory , and this reflected positive on the health of birds and improved the work of the immune system [3 , 21 , 22] .

The reason for the decrease of *Salmonella* and *E.coli* and the increase in the number of bacteria *Lactobacillus* is that turmeric is characterized by containing effective substances against microbes such as *E.coli* and *Staphylococcus* [5] . Which is

reflected on the health of the bird through the balance of the content of microorganisms digestive system . [24] indicated that the internal and external egg qualities such as egg weight, Yolk weight and yolk index were significant increase at the group fed (10 g/kg), this is may be due that turmeric may have positive effect on the site of calcium deposition in the uterus and hence increase shell weight and thickness [25] .

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دراسة تأثير مستويات مختلفة من مسحوق الكركم في بعض الصفات الفسلجية وبعض الصفات النوعية للبيضة وبيئة الأمعاء لطائر السمان

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الخلاصة

هدف الدراسة الحالية هو تقييم تأثير مستويات مختلفة من الكركم *Curcuma longa* في بعض الصفات الفسلجية والكيموحيوية، وكذلك بعض الصفات الإنتاجية والنوعية للبيض والمايكروفلورا المعوية لطائر السمان المحلي. وزع عشوائياً 240 طائراً بعمر يوم واحد في أربع مجموعات (60 طائرا/مجموعة) وبواقع 3 مكررات. كانت المجموعات على النحو الآتي: المجموعة الأولى (سيطرة) ربيت طيورها على عليقة قياسية، أما المجموعة الثانية والثالثة والرابعة فقد ربيت طيورها على عليقة مضافا إليها 3 و 6 و 9 غم مسحوق الكركم/ كغم علف على التوالي. تبين من النتائج أن الكركم قد حسن من صورة الدم، تمثل بالزيادة المعنوية لعدد خلايا الدم الحمر وخضاب الدم وحجم خلايا الدم المرصوصة ولاسيما في المجموعة الثالثة والرابعة. كما أن الكركم قلل بشكل معنوي الدهون الثلاثية والكولسترول مقارنة مع مجموعة السيطرة. أدت إضافة الـ *Curcuma longa* إلى تحسين الفلورا المعوية متمثلة بالانخفاض المعنوي في عدد الفلورا المرضية (*Salmonella* and *E. coli*) والزيادة الفلورا النافعة (*Lactobacillus*). ومن ناحية أخرى أدت المعاملة بالكركم إلى التبكير المعنوي في الوصول لوضع أول بيضة وفي الوصول إلى 50% من إنتاج البيض. نستنتج من ذلك أن المعاملة بـ *Curcuma longa* أدت إلى تأثيرات تحسينية في بعض الأداء الفسلجي والإنتاجي للسمان.

الكلمات المفتاحية: صورة الدم، *Curcuma longa* ،، مايكروفلورا المعوية، السمان