EFFECT OF ADDING ARTICHOKE LEAVES EXTRACTPOWDER (*CYnarascolymus* L.) TO THE DIET ON THE PRODUCTIVE PERFORMANCEOFBROILERS.

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ABSTRACT

This study was conducted at the poultry farm Animal Production Department, Abu Ghraib , College of Agricultural Engineering Sciences, University of Baghdad, during theperiod from 10/31/2020 to 12/11/2020. to study the effect of adding two different levels of artichoke leaves extracts powder to the diet and for different periods to rations on the productive performance of broiler chickens.One hundred thirty five unsexedcommercial hybrid broiler chicks (Ross 308), oneday old, 42.47 g/ its initial body weightwere used in this experiment, The birds were randomly distributed among three treatments, each treatment contained 45 birds, with three replicates, and each replicate contained 15 birds. The chicks of the first treatment (T1) were fed a standard diet for broilers free of addition, while the chicks of the T2 and T3 treatment were fed a standard diet for broilers in addition to the artichoke leaves extract powder at a levels 0.5 and 1 g/kg diet respectively. The results obtainedindicated that adding artichoke leaves extract powder at two different levels to broiler diets led to a significant (P<0.05) superiority (P<0.05) for treatment T2 and T3 in the productive performance of body weight rates compared to the control treatment. In the average cumulative weight gain 1-6 week compared to the control treatment (T1), the T3 treatment also recorded a significant (P<0.05)increase superiority (P<0.05) in the amount of cumulative feed consumption and feed conversion factor compared to the treatment T1, T2, In conclusion, the resultsindicate that supplementing artichoke leaves extractpowder to the diet showed a ssignificantin Improving in the productiveperformance of broiler.

Keywords: artichoke leaves extract powder, broiler meat, productive traits

تأثير إضافة مسحوق مستخلص أوراق نبات الخرشوف (*Cynara scolymus* L) للعليقة في الأداء الإنتاجي لفروج اللحم.

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المستخلص

أجريت هذه الدراسة في حقل الطيور الداجنة , قسم الانتاج الحيواني في منطقة أبو غريب ـ كلية علوم الهندسة الزراعية ـ جامعة بغداد , للمدة 31/10/2020 إلى 122020/ 12 / . لبيان تأثير أضافة مستويين من مسحوق اوراق نبات الخرشوف للعلائق في الاداء الانتاجي لطيور فروج اللحم. استعمل في هذه التجربة 135 فرخ فروج اللحم الهجين التجاري(Ross 308) غير مجنسة بعمر يوم واحد وبوزن ابتدائي 42.47 غم / فرخ, ووزعت الطيور توزيعاً عشوائياً على ثلاث معاملات احتوت كل معاملة 45 طير بواقع ثلاث مكررات احتوى المكرر الواحد على 15 طير.تم تغذية افراخ المعاملة الأولى (T1) على عليقة بدون إضافة بينما تم تغذية افراخ المعاملة T2 و T3 على عليقة تحتوي على مسحوق مستخلص أوراق الخرشوف بنسبة0.5 و 1غم / كجم علف على التوالي. اشارت نتائج الدراسة الحالية إلى اضافة مسحوق مستخلص اوراق نبات الخرشوف بمستويين مختلفين لعلائق فروج اللحم ادى الى التفوق المعنوي (P<0.05) للمعاملة T2 و T3 في الاداء الانتاجي لمعدلات وزن الجسم مقارنة بمعاملة السيطرة (T1), وايضاً تفوقت معاملتي الاضافة T2و T3 معنوياً (P<0.05) في معدل الزيادة الوزنية التراكمية (1–6) اسبوع مقارنة بمعاملة السيطرة (T1), كما سجلت معاملة T3 تفوقاً معنوياً(P<0.05) في كمية استهلاك العلف التراكمي ومعامل التحويل الغذائي مقارنة بمعاملة (T1)T2)).في الختام أشارت النتائج إلى أن إضافة مسحوق مستخلص أوراق الخرشوف إلى النظام الغذائي أظهر أهمية كبيرة في تحسين الأداء الإنتاجي للفروج.

الكلمات المفتاحية: مسحوق اوراق نبات الخرشوف, فروج اللحم, الصفات الانتاجية.

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INTRODUCTION

The tremendous progress towards intensive commercial production of poultry, and as a result of the increase in population numbers and the increase in demand for consumption of broilers, international companies specialized in the poultry industry began to produce new breeds of broilers characterized by high productivity specifications and a rapid growth rate and the accompanying high metabolic rate, which makes it more susceptible to the formation of free radicals, Therefore, recent research focused on adding natural antioxidants as an essential factor in poultry nutrition for its role in removing free radicals and thus improving production performance, maintaining high growth levels and increasing immunity for broilers(21,20). It is safer and cheaper and this is a good alternative to chemical antibiotics that were banned as by the European Union countries growth stimulants in poultry diets in 2006 (4,17). the artichoke plant, was used by the ancient Egyptians, Greeks and Romans in Diet and medication(5). Artichokes contain the main active substances such as cynarin(11), apigenin (10), and luteolin (14)and inulin (24)and provides a rich source of vitamins C and A and several minerals including calcium, potassium, sodium, phosphorous, and iron (9,3).It is one of the most important natural antioxidants and anti-inflammatory to eliminate free radicals caused by oxidative stress, It works to against cancer(19), and is useful in cure atherosclerosis(13) ,and it lowers cholesterol in the blood and cures diabetes(2), and has functional properties to protect the liver from toxins (8,9).The artichoke also acts as a prebiotic to increase the number and activity of beneficial bacteria and reduce the number of harmful bacteria(24).In view of the lack of research and studies that show the role of adding artichoke leaves extract powder (*CynaraScolymus* L) to broiler diets, the present study was conducted.

MATERIALS AND METHODS

Diets and management: This experiment was conducted at the poultry farm ,Animal Production Department,College of Agricultural Engineering Sciences, University of Baghdad -Abu Ghraib location, for the period from 10/31/2020 to 12/12/2020 (42 days), 135broiler chicks were distributed (Ross 308)unsexed, one day age, starting weight 42.47 g/chick,The chicks were randomly distributed into three treatments, with three replicates, each replicate containing 15chicks.The nutritional treatments have been divided as follows: control treatment T1 (without addition), treatment T2 and T3, adding artichoke leaves extract powder at a levels 0.5 and 1 g/kg feed, and feed and water were provided free during the experiment of time. The chicks were fed on a starter diet during its to 11 day old containing 3005.83 keal/kg diet and 23.03% crude protein, then the growing diet during 12-24 days containing 3105.47 keal/kg diet and 21.53% crude protein, then the finisher diet during 25-42 days, The basal diet was formulated for broiler chickens according to the provisions of the National Research Council (1994)to meet the nutrients requirements of broilers (Table 1), and artificial light was used in addition to normal daylight to provide a light period of 23 hours/day and 1 hour of darkness. The room temperature was controlled using the gas incubator and electric heaters to obtain a temperature of 34ºC during the first three days of the life, after which it was reduced to 33-32ºC until the end of the first week, and then gradually reduced until the end of the experiment period to settle at a temperature of -22 20ºC .The experiment lasted for 42 days and the productive traits were measured for each week of the experiment which included body weight, weight gain, feed consumption and feed conversion ratio (FCR).

Plant material: purchased from Prescribed For LifeCompany –United states. The chemicalcomposition and detection of phytochemical substance were determined by High performance liquid chromatography (HPLC) technique (Table 2,3).

Statistical analysis: The experiment data were analyzed using Complete Randomized Design (CRD) to determine the effect of treatments the effect of different levels of artichoke leaves extract powder in the studied traits, then the significant differences were compared between averages with the multiple range test (6) and used statistical analysis system (18).

Table1. Composition and calculated chemical analysis of diets in the experime

Component	Starter diet(1-10)	Grower diet (11-24)	Finisher diet (25-42)
Yellow corn	43.8	44.6	46.5
Wheat	14	15.4	16
Soybean Meal	32.7	29.1	26
Protein concentration(1)	5	5	5
Fat	2.2	3.5	4.4
Limestone	1.1	1.5	1.3
Dicalcium phosphate (DCP)	0.7	0.4	0.3
Salt	0.3	0.3	0.3
Vitamin-Mineral premix(2)	0.2	0.2	0.2
Total	100	100	100
Chemical composition(3)			
Crude protein%	23.03	21.53	20.27
Metabolic Energy keal/kg	3005.83	3105.47	3193.20
Lysine %	1.3	1.22	1.13
Methionine+ cystine%	0.88	0. 84	0.80
Calcium %	0.86	0.93	0.82
% Phosphors	0.52	0.46	0.44

(1)The protein concentrate (WAFI) type BROC0N-5Jebur, manufactured in the Netherlands, each kg contains:40% crudeprotein, 5% crude fat , 2.81% crude fiber, 3.14% Ca, 2.50 % sodium, 3.88% chloride, 3.85% Lysine,3.70% Methionine, 4.012% Methionine+ Cysteine, 2117 Kcal/Kg feed metabolism energy, also includingvitamin A 200000IU, vitamin D3 80000IU, vitamin E 600Mg, vitamin K3 50 mg, vitamin B1 60 mg, vitamin B2 140 mg,vitamin B6 80 mg, vitamin B12 700 mg, folic acid 20 mg, Niacin 800 mg, Butane 2 mg, iron1000 mg, copper 200 mg,manganese1600mg,(2)The vitamin and mineral mixture of colavita, each kg contains: 5000 IU Vitamin A, 600 IU D3,2 mg E, 2mg K3,2 mg B1, 2mg B2,2 mg B6, 5mg B12, 10 mg C, 15mg Niacin, 500 mg folic acid, 4.8 mg calcium, 3.18 mgp, 10 mg copper, 80 mgmanganese,80mg zinc,50mgiron,0.2 mgselenium,0.1mg cobalt,0.5mgIodine,100mgantioxidants. (3)CalculatedChemicalAnalysisofthedietaccording to NRC(1994

Table2. Chemical composition of artichoke leaves extractpowder (*Cynarascolymus L*) (g/100 g Dry matter).

Specification	Content %
Moisture	5.0
Crude protein	3.5
Crude fats	0.75
ash	2.5
Crud Fiber	1.3
Total carbohydrates	86.95

Table3. Detection Phytochemical Compounds artichoke leaves extractpowder (*CynarascolymusL.)*

Phytochemical compounds	Content
Total phenolic content (mg Gallic / gm)	44.8
Total flavonoid content (mg Rutin / gm)	37.2
Total alkaloid content %	3.6
Total tannin content %	12.8
Total terpinoid content %	6.9
Total Saponin content %	1.5
Active substance	**concentration ppm**
Cynarin	116.0
Apigenin	92.7
Inulin	104.6
Luteolin	97.6

RESULTS AND DISCUSSION

Table (4) shows the effect of adding artichoke leaves extract powder for 1-6 weeks on mean body weight to the significant (P<0.05) the T2 and T3 treatments excelled on T1 during the first week and the sixth week. While the excelled was significant (P<0.05) for T2, which recorded (443.20g) compared with T1 treatment in the second week, while T3 did not differ significantly with T1 and T2 in the same period. As for the third, fourth, and fifth weeks, we did not notice any significant differences between the experimental treatments compared to T1 in the average body weight. Table (4) shows the results of the effect of adding artichoke leaves extract powder to broiler diets on weekly weight gain (g) for 1-6 weeks. The results showed that the treatment of T2 and T3 was significantly (P<0.05) excelled on the treatment of T1 during the first week. The average cumulative weight gain is (1-6) and we did not notice any significant differences between the treatments at the second, third, fourth and sixth weeks. But at the fifth week, the T3 treatment recorded a significant (P<0.05) excelled compared to the T1 treatment .The results in table (5) showed the effect of adding artichoke leaves extract powder to broiler diets on the rate of weekly and cumulative feed consumption for 1-6 weeks.The results of the experiment showed that the treatment of T2 and T3 was significantly (P<0.05) compared with the treatment of T1 at the first and sixth weeks in the amount of feed consumption.The results also showed that there were no significant differences between the experimental treatments in the rate of feed consumption during the second, third and fourth week, respectively, but in the fifth week and in the amount of cumulative feed consumption (6-1 week) the superiority was significant (P<0.05, treatment T3 compared to treatment T1 and T2.The results in table (5) showed the effect of adding artichoke leaves to broiler diets on the feed conversion factor. The results of the experiment showed that there were non-significant differences between the experimental treatments compared to the T1 treatment during the first, third, fourth and sixth week.As for the second week, treatment T2 recorded a significant (P<0.05) excelled compared with treatment T1, while treatments of T2 and T3 did not differ significantly between them in the same period.In the fifth week and in the total food conversion ratio (6-1 week), the T2 and T3 treatments did not differ significantly from the T1 treatment, but the difference was between the experimental treatments, where the T2 treatment recorded a significant excelled (P<0.05) on the T3 treatment.

Table 4. Effect of adding different concentrations of artichoke leaves extract powder (*Cynarascolymus L.)* to the broiler diets on mean of live body weight and weight gain (g/ bird) (mean ± standard error).

body weight (g/ bird)							
	Week						
Treatments	1	2	3	4	5	6	1-6 week
T1	136.56 ± 3.59b	399.53± 1.80b	836.20± 9.35	1425.07± 9.69	2154.13± 14.70	2913.16±4.36b	
T2	162.57 ± 2.44a	443.20±14.81a	887.87± 28.09	1463.11± 46.39	2238.60± 37.81	3019.93± 12.07a	
T3	159.83 ± 3.77a	417.03± 5.71ab	859.20± 1.22	1457.67± 14.66	2235.83± 36.16	3035.00± 16.93a	
Sign.levels	*	*	N.S	N.S	N.S	*	
weight gain (g/ bird)							
T1	94.09± 3.59b	262.97±1.78	436.67±11.16	0.34±588.87	729.06± 5.00b	759.03±19.06	2870.69±4.36b
T2	120.10± 2.44a	280.63±12.61	444.67±13.83	18.41±575.24	775.49± 8.58ab	781.33±26.14	2977.46± 12.07a
T3	117.36± 3.77a	257.20±1.93	442.17±6.94	15.89±598.47	778.16± 21.49a	799.17±19.22	2992.53± 16.93a
Sign.levels	*	N.S	N.S	N.S	*	N.S	*

T1, T2 and T3 means control treatment 0, 0.5 and 1 g artichoke leaves extractpowder addition 1 kg diet.
a,bMeans within the same column with different letters are significantly different($p < 0.05$) respectively
N.S: no significant

Table 5 :Effect of adding different concentrations of artichoke leaves extract powder (*Cynarascolymus L.*) to the broiler diets on mean Feed intake and feed conversion ratio (g/ bird) (mean ± standard error)

Feed intake (g/ bird)							
Treatments	Week						
	1	2	3	4	5	6	1-6
T1	107.53± 8.73b	331.40±5.88	557.66±11.66	868.99±9.19	1175.06± 35.18b	1351.23± 13.49b	4391.87± 42.43b
T2	130.31± 3.22a	375.69±21.94	580.75 ±3.12	888.13±6.47	1158.35± 11.06b	1361.02± 16.44ab	4494.25± 50.64b
T3	134.33± 4.06a	337.20±4.23	565.66±2.34	887.39±11.35	1326.06± 6.57a	1402.19± 2.73a	4652.83± 21.15a
Sign.levels	*	N.S	N.S	N.S	*	*	*
feed conversion ratio (g/ bird)							
T1	1.13±0.04	1.26± 0.02b	1.28± 0.00	1.47±0.01	1.61± 0.06ab	1.78±0.02	1.53 ± 0.01ab
T2	1.08±0.00	1.33± 0.02a	1.30± 0.03	1.54±0.04	1.49± 0.02b	1.74±0.07	1.50 ± 0.01b
T3	1.14±0.00	1.31± 0.00ab	1.27± 0.01	1.48±0.02	1.70± 0.03a	1.75±0.03	1.55 ±0.00a
Sign.levels	N.S	*		N.S	*	N.S	*

T1, T2 and T3 means control treatment 0, 0.5 and 1 g artichoke leaves extractpowder addition 1 kg diet
a,bMeans within the same column with different letters are significantly different($p < 0.05$) respectively
N.S: no significant

The reason for the increase in the live body weight averages, which is mainly reflected in the weight gain of the body weight averages for T2 and T3 treatment, is the addition of artichoke leaves at a average of 0.5) and 1 g / kg) to the diet for 42 days of the birds' age to the role of artichoke leaves because they contain the active substance Cynarin specific to the artichoke plant belonging to the hydroxycinnamic acid group, where it has the strongest natural antioxidant activity with high effectiveness because it contains hydroxyl groups (OH-) that prevent the production of free radicals, the most important of which are hydroxyl radicals (•OH) and peroxyl radical (RCOO) and on the other hand protects proteins and DNA and prevents the breakdown of body proteins(15, 12) ,and then achieving body weight and weight gain in favor of the bird's body, and on the other hand.The reason for the significantly excelled increase in the rate of body weight and weight gain may be due to the role of the leaves of the artichoke plant because they contain phenolic substances represented by chlorogenic acid compounds, It improves growth performance effectively for its effective role as an antioxidant to prevent the production of inflammatory cytokines, which prevents damage to the structure of the mucosal layer lining the intestine, especially the ileum region, and thus enhances the health of the small intestine and on the other hand prevents oxidative stress, and growth performance (25) , In addition to the role of flavonoids represented by the active substances apigenin, which works to remove free radicals caused by toxins because it has antioxidant properties, where it stimulates enzymes (GSH, CAT and SOD) for its ability to remove toxins from the liver by binding to it and excreting it outside the body, which means preventing damage and damage that occurs in the membranes of hepatocytes (22) On the other hand, apigenin is characterized by the presence of a c-glucoside bond that stimulates the production of probiotic bacteria and as a result of the fermentation process increases the production of short-chain fatty acids, the most important of which are acetate, propionate, butyrate) absorbed by colon cells that regulate the production of prostaglandins (PG), which in turn enhances the secretion of tissue proteins in the epithelial lining of the intestine (Mucin).This provides protection for the mucous membranes and protects the intestinal lining from damage caused by infections, thus helping to absorb essential nutrients for the body and facilitating the growth of beneficial bacteria(23).Which improves the amount of feed consumed, which directly affects the weight gain and average body weight of broilers(1).

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