

Efficacy of licorice extract added to drinking water in improving productive efficiency and some qualitative traits of carcass for broilers.

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Abstract: *This study aimed to investigate the effect of adding different concentrations of licorice extract to drinking water in improving the productive performance of broilers, where 180 unsexed Ross-308 broilers were used at one day old, then the chicks were randomly distributed into 4 treatments that included each treatment of 3 replicates, 15 chicks for each replicate, and the rearing period was from one day age to 42 days age. The treatments included in the current study were: the first treatment T1, control (without adding), the second treatment (T2), the third treatment (T3), and the fourth treatment (T4), which included the addition of licorice extract in percentage (1.5,1,0.5)%. The results of the study indicated that treatment with licorice extract led to a significant increase ($P<0.05$) in live body weight, weekly and cumulative weight gain, main cuts (breast and thigh), and a significant decrease ($P<0.05$) in weekly and total feed consumption and Weekly and cumulative food conversion ratio, and there were no significant differences between all treatments with regard to secondary cuts (wing, neck and back) and some edible internal organs (liver, heart and gizzard). The results for all of these traits were in the third treatment (1%), followed by the fourth treatment (1.5%). We conclude from this that the birds that took water with licorice extract gave better production performance than those that were not fed with the extract.*

Keywords: *licorice, productive efficiency, qualitative traits, broilers.*

1. INTRODUCTION

Over the past few decades, there has been a significant increase in the number of studies on knowing the effect of using some plants for the purpose of improving the productive performance of many animals when added to the diets provided to them, including poultry (Tuker, 2002), The need for high levels of production and efficiency in feed conversion and maintaining the general health of the bird is the basis for the modern poultry industry (Mohammed, 2018), which can be achieved by using specific feed additives that have many beneficial effects such as controlling pathogenic microorganisms and promoting the growth of Beneficial Microorganisms (Khan and Iqbal, 2016), These food additives have gained increasing interest, particularly in poultry feed because they beneficially affect the gut microbiome ecosystem by controlling potential pathogens. Thus, improving the internal

environment of the digestive system and achieving microbial balance in the gut (Hashemi and Davoodi 2010), Among these plants is the licorice plant, which has been known to man since ancient times, and he has used it in a practical way in his daily life, and today it has become a contributor to many medical prescriptions. (Leung and Foster, 1996) The active and used part of the licorice plant is the roots, where they contain the active substance (glycerin), which is the root of this plant. It also includes a group of important mineral elements for building body tissues, including iron, zinc, cobalt, calcium, magnesium and phosphorous (Grieve 1995). Glycyrrhizin is one of the fatty compounds, and it is about 50 times sweeter than sugar (cane sugar), as this substance is the reason for the sweet taste of the licorice plant, Cantelli-Forti, 1994. glucuronic acid, It is believed that glycerin has antibiotic activity and that it has a strong effect similar to the mechanism of action of hormones of the adrenal cortex. It has been assumed that it does not produce hormones directly, but increases the activity of both mineralocorticoid and glucocorticoid hormones indirectly by inhibiting the metabolic activity of these hormones in the liver (Leung and Foster, 1996; Osol and Pratt, 1983). And it has been proven that licorice contains sugary substances such as glucose, fructose, maltose, starch, kinin, and mineral salts, the most important of which are potassium, calcium, magnesium, phosphate, and saponins such as (Licochalcone, Licuraside, Licoroside, Liqcoumarin, Liquiritigenin and Liquirazide), and this plant works in an indirect methods on stimulating bone marrow cells towards the formation of red blood cells, which helps in treating anemia and promoting the general health of the body (1988 et al. Tyler) Also, licorice root contains some volatile fatty acids and also contains a wide range of water-soluble vitamins such as B1, B2, B3, B6 (Blach and Phyllis, 1997). Based on the foregoing, this study was designed to investigate the effect of using licorice powder extract as one of the food additives in the drinking water of broilers, and to find the best diets that can be added and to study the extent of its impact on the productive performance and traits of the carcass.

2. MATERIALS AND METHODS

In this study, 180 unsexed Ross-308 broiler chicks of one day old were used, for the period from 1/3/2020 to 11/4/2020, the chicks were randomly distributed to four treatments (3 replicates for each treatment) and each replicate included 15 chicks. During which the effect of adding different levels of licorice extract to drinking water was studied to know their effect on the productive and some qualitative traits of broiler carcass. The chicks were fed on a starter diet at the age of (1-21) days and a final diet of (22-42) days of age. Table 1 shows the composition of the starter and final diets used to feed the chicks throughout the experiment period and the calculated chemical composition. Licorice extract was added to the chicks drinking water from the age of one day until the age of 42 days. The treatments were distributed as follows: the first treatment T1 control (without adding), the second treatment (T2), the third treatment (T3) and the fourth treatment (T4) included the addition of licorice extract in proportions (1.5, 1, 0.5)%. The following traits were estimated weekly: live body weight, weight gain, feed consumption rate and food conversion ratio. The average of these traits were estimated for each week of the 6-week experiment. At the end of the experiment period, 2 birds of each replicate were slaughtered, dressed and cut to calculate the percentage of main cuts (breast and thigh) and secondary cut (wing, neck and back), in addition to calculating the percentage of each of the liver, heart, and gizzard (Al-Fayadh and Naji, 1989). Completely randomized design was used to study the effect of different treatments on the studied traits, and the significant differences between the means were compared using Duncan's polynomial test (1955). The SAS (2012) statistical program was used to analyze the data.

Table 1: shows the composition of the starter and final diets used for feeding chicks throughout the experiment period

Feed material	Starter diet %(1-21 days)	Final diet%(42-22 days)
yellow corn	51	54
wheat	12.5	11.5
Soybean meal 44% protein	24	22
Protein Concentrate(1) *	10	10
Vegetable oil	1.5	1.5
limestone	0.7	0.7
salt	0.3	0.3
total summation	100%	100%
crude protein%	21.49	20
Represented energy (kilocalories/kg of feed)	2990.5	3150
Energy to Protein Ratio	139	158
Lysine	1.22	1.14
methionine + cysteine (%)	0.62	0.58
Calcium(%)	1.43	1.26
Total phosphorous (%)	0.90	0.81
available phosphorus (%)	0.67	0.57

***Protein concentrate BROCON-5 SPECIAL W: Chinese origin, each kg contains: 40% crude protein, 3.5% fat, 1% fiber, 6% calcium, 3% available phosphorous, 3.25% lysine, 3.90% methionine + cysteine Sodium, 2.2%, 2100 kcal/kg energy represented, 20,000 IU Vitamin A, 40,000 IU Vitamin D3, 500 mg Vitamin E, 30 mg Vitamin K3, 15 mg Vitamin B1+B2, 150 mg B3, 20 mg B6, 300 B12 mg, 10 mg folic acid, 100 mcg biotin, 1 mg iron, 100 mg copper, 1.2 mg manganese, 800 mg zinc, 15 mg iodine, 2 mg selenium, 6 mg cobalt, 900 mg antioxidant (BHT). The chemist for the liquor according to the NRC (1994.)**

3. RESULTS AND DISCUSSION

The results of the statistical analysis in Tables 2 and 3 show that there is no significant effect of the treatments on the average body weight and weight gain at the age of one week and at the age of two weeks a highly significantly excelled ($P<0.05$) is noted in favor of the fourth treatment on the rest of the other treatments, and no significant differences were found in the average body weight and weight gain Between the second and third treatments, In general, adding different concentrations of licorice powder in drinking water led to a highly significant increase in body weight and weight gain at ages 2,3,4 weeks, and at the end of the fifth and sixth week of the experiment, a significant increase ($P<0.05$) in weight was observed. In vivo of all birds of adding treatment compared to the first treatment, As for the weight gain in the sixth week, it was noticed that there were no significant differences between all laboratories. As for the total weight gain, a significant increase ($P<0.05$) was observed in favor of the birds of the second and third treatments. It appears from these results that adding licorice extract to broiler drinking water has a positive effect on the productive performance of broilers due to the extract's effective and positive properties. Grieve (1995)

indicated that licorice encourages digestion and stimulates appetite, as it increases the rate of blood flow in the mucous membranes lining the alimentary canal, thus increasing the efficiency of food utilization and thus increasing body weight. It was mentioned (Kumagi et al.1957) Glycerin and glyceric acid, which are components of licorice, have an effect similar to the effectiveness of steroid hormones, and Sturkie (1997) showed that steroid hormones are plant hormones that lead to increased protein synthesis and reduce their breakdown, thus increasing muscle and bone growth, and this leads to an increase in Body weight and overweight. As shown in this experiment. On the other hand, the glycerin compound stimulates the production of the corticosterone hormone when its production is less than the body's need and stimulates its catabolism when its production is more than the body's need (Langer, 1988).A study on humans showed that an increase in the concentration of licorice extract in drinking water led to an increase in body weight, and they explained that increased consumption of glycerine leads to a decrease in the conversion of cortisol to inactive cortisone, and thus leads to an increase in cortisol, and this increase leads to a decrease in the concentration of potassium in the blood serum. An increase in sodium concentration leads to water retention within cells, and thus an increase in water volume and weight gain (1957 et al. Kumagi)

Table 2. Effect of adding licorice extract to drinking water on the live body weight (g) of broilers at different ages (mean \pm standard error).

Treatments	age by weeks					
	first week	second week	third week	fourth week	Fifth week	sixth week
first treatment	160 0.99 \pm	447b 2.99 \pm	855 c 5.68 \pm	1472c 6.12 \pm	2023d 6.20 \pm	2662 b 25.31 \pm
second treatment	161 1.02 \pm	456ab 3.04 \pm	876 b 5.77 \pm	1542 b 2.51 \pm	2129 c 15.31 \pm	2794 a 34.67 \pm
Third treatment	160 0.87 \pm	455 ab 3.30 \pm	898a 3.87 \pm	1572a 2.73 \pm	2209a 3.15 \pm	2812a 31.72 \pm
Fourth treatment	162 0.99 \pm	462 a 4.12 \pm	896a 1.44 \pm	1541b 2.70 \pm	2159b 0.87 \pm	2734ab 31.13 \pm
significant level	N.S	*	*	*	*	*

* (P<0.05), N.S: Not significant.

Table 4 shows that the addition of licorice extract in drinking water led to no significant differences during the first five weeks of the experiment and for all treatments.

Treatments	age by weeks					
	first week	second week	third week	fourth week	Fifth week	cumulative
first treatment	117 0.99 \pm	287b 2.02 \pm	408d 2.71 \pm	617c 1.79 \pm	551 c 0.49 \pm	639 28.32 \pm
second treatment	118 1.02 \pm	295ab 2.04 \pm	420 c 2.88 \pm	666a 3.27 \pm	587 b 16.99 \pm	665 37.40 \pm
Third	117	295 ab	443a	674a	637a	603

treatment	0.87±	2.44±	1.90 ±	2.81 ±	0.45 ±	34.49±
Fourth treatment	119	300a	434b	645 b	618 a	575
	0.99±	5.03±	3.41 ±	2.17 ±	1.85 ±	31.93±
significant level	N.S	*	*	*	*	N.S

* (P<0.05), N.S: Not significant.

The effect of licorice extract began to appear after the end of the fifth week, as the amount of feed consumed by the treated birds (second, third and fourth) to which licorice extract was added to drinking water during the fifth week decreased compared to the control treatment. As for the total feed consumption (aggregate) during the total period (0-6) a week, we notice a significant decrease (P<0.05) in the total feed consumption for the birds of the third treatment compared with the other treatments with no significant differences between the birds of the second and fourth treatments. Table 5 shows that the use of licorice extract in drinking water led to a significant improvement in the feed conversion ratio. We note that there were no significant differences between all treated birds at 1, 2, and 6 weeks of age, while we noticed a significant decrease (P<0.05) in the conversion ratio. Food for all supplementation treated birds at 3, 4 and 5 weeks of age. While the birds of the second and third treatments gave the best cumulative food conversion ratio compared with the birds of the first and fourth treatments, flavonoids have an important biological role and they are found in licorice extract (Vaya et al. 1997). It works to make the maximum use of nutrients and their representation in the body. Accordingly, it is one of the important compounds in motivating birds to increase feed consumption and thus obtain an increase in nutrients that enter the body, which leads to a good weight gain in the bird and this is a reflection of the bird's efficiency in converting food and benefit from it (1998) et al. Haraguchi). The licorice extract contained (Flavonoids, Terpenoids, Coumarins, Isoflavonoids, volatile oils, vitamins, minerals, proteins and sugars) led to an improvement in the food conversion ratio (Langer, 1988).

Table 4. Effect of adding licorice extract to drinking water on average feed consumption (g) for broilers at different ages (mean ± standard error).

Treatments	age by weeks					
	first week	second week	third week	fourth week	Fifth week	cumulative
T1	145 1.28 ±	345 1.27 ±	695 1.26 ±	945 1.53 ±	1145 1.53 ±	1349a 1.33 ±
T2	148 1.37 ±	347 1.62 ±	697 1.69 ±	947 2.36 ±	1146 3.03 ±	1310b 10.09 ±
T3	146 3.59 ±	345 3.44 ±	695 3.52 ±	945 3.52 ±	1144 2.71 ±	1310b 7.64 ±
T4	149 2.53 ±	349 2.53 ±	698 1.22 ±	947 1.75 ±	1146 2.31 ±	1314b 8.72 ±
significant level	N.S	N.S	N.S	N.S	N.S	*

* (P<0.05), N.S: Not significant.

Table 5. The effect of adding licorice extract to drinking water on the feed conversion ratio (gm of feed/gm of weight gain) for broilers at different ages and total duration (mean \pm standard error).

Treatments	age by weeks					
	first week	second week	third week	fourth week	Fifth week	cumulative
T1	1.24 0.02 \pm	1.20 0.00 \pm	1.70a 0.01 \pm	1.53a 0.01 \pm	2.08a 0.00 \pm	2.11 0.10 \pm
T2	1.25 0.02 \pm	1.18 0.01 \pm	1.66b 0.01 \pm	1.42c 0.01 \pm	1.95 b 0.05 \pm	1.97 0.10 \pm
T3	1.24 0.02 \pm	1.17 0.01 \pm	1.57d 0.01 \pm	1.40c 0.01 \pm	1.80 c 0.00 \pm	2.17 0.13 \pm
T4	1.25 0.02 \pm	1.16 0.01 \pm	1.61c 0.00 \pm	1.47b 0.01 \pm	1.86 c 0.01 \pm	2.29 0.12 \pm
significant level	N.S	N.S	*	*	*	N.S

* (P<0.05), N.S: Not significant.

The results in Table 6 showed that there were no significant differences between all treatments with regard to the average relative weights of the secondary cuts of the carcass, which include (back, wing and neck).The results of the statistical analysis showed a significant increase in the relative weight of the Breast and thigh and the percentage of dressing for all addition treatments (second, third and fourth) compared with the first treatment (control), which was free of addition, noting that there were no significant differences between the second and fourth treatments with regard to the relative weight of the Breast .The moral improvement in the average live body weight was reflected in the increase in the relative weight of the main cuts, which include (thigh and Breast), and Mostaan (2011) mentioned the reason for the improvement in the purification ratio because licorice powder stimulates the pancreas by increasing secretions of digestive enzymes, which helps in digestion and absorption. Large quantities of food, such as amino acids, from the digestive system, and then improve the carcass qualities of broilers fed on diets containing powdered licorice roots.Table 7 indicates the effect of adding licorice extract on the weights of edible viscera, and the results showed a non-significant increase in liver, gizzard and heart weights between the treated groups and the control group.We conclude from this study that adding licorice extract to drinking water in broilers led to a significant positive improvement in the productive performance of broilers, as it improved live body weight, weight gain and feed conversion ratio,The fourth treatment (1.5%) achieved the best results with regard to the productive traits included in the current study. We conclude from this that the birds that were fed water with licorice extract gave better production performance than those that were not fed with the extract.

Table 6. Effect of adding licorice extract to drinking water on the Dressing percentage and average weights of carcass cuts (%) for broilers at 42 days of age (mean \pm standard error).

Treatments	Dressing percentage %	Breast weight%	Thigh weight%	Back weight%	Wing weight%	Neck weight%	Dressing percentage %
T1	70.22b ± 0.95	39.69b ± 0.35	26.97b 0.05±	14.31 ± 0.55	8.87 0.19±	5.30 ± 0.39	70.22b ± 0.95
T2	72.51ab ± 1.00	41.01ab ± 0.58	27.69ab ± 0.35	14.71 ± 0.36	8.75 ± 0.39	5.29 ± 0.28	72.51ab ± 1.00
T3	73.06a ± 1.84	41.62a ± 0.49	28.35a 0.32±	15.29 ± 0.37	8.99 0.44±	5.84 ± 0.54	73.06a ± 1.84
T4	73.31a ± 3.37	40.66ab ± 0.66	28.12a ± 0.40	15.23 ± 0.26	9.23 ± 0.26	5.88 ± 0.30	73.31a ± 3.37
significant level	*	*	*	N.S	N.S	N.S	*

* (P<0.05), N.S: Not significant.

Table 7. Effect of adding licorice extract to drinking water on average relative weights of edible internal organs of broiler carcass at 42 days of age (mean ± standard error).

Treatments	gizzard weight%	heart weight%	Liver weight %
T1	1.61 ± 0.14	0.46 0.02±	2.01 ± 0.07
T2	1.69 ± 0.16	0.44 ± 0.03	2.06 ± 0.04
T3	1.84 ± 0.06	0.47 0.04±	2.17 ± 0.04
T4	1.84 ± 0.10	0.47 ± 0.02	2.18 ± 0.05
significant level	N.S	N.S	N.S

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