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The Effect Of Adding Different Levels Of Alcoholic Extract Of Carrot Juice Waste To Drinking Water On The Productive Performance Of Female Quails

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Abstract
This study was conducted at the Poultry Research Station of the Agricultural Research Department of the Ministry of Agriculture in Abu Ghraib from 28/1/2024 to 28/3/2024. The study aimed to investigate the effect of adding different levels of alcoholic extract of carrot juice waste to drinking water on the productive performance of 45-day-old female quail. The study was divided into two periods (4 weeks per period) and was conducted at 45 days of age. Two hundred forty female quail were randomly distributed into four treatments (60 chicks per treatment) with three replicates (20 chicks per replicate). The females were fed a production diet containing 20% crude protein and metabolizable energy (ME) of 2948 kcal/kg feed, respectively. The alcoholic extract of carrot juice waste was added at levels of 0, 100, 300, and 500 mg/liter of drinking water to the four treatments, respectively. The addition treatments (T2, T3, and T4) showed highly significant (P<0.01) superiority in egg production (HD%), egg mass, and cumulative egg production, as well as a decrease in feed consumption and an improvement in the feed conversion ratio compared to the control treatment (1). This study concludes that adding the alcoholic extract of carrot juice waste to drinking water improved the productive performance of female quail.
Key words: *Productive performance, female quail, alcoholic extract of carrot juice waste , drinking water*

INTRODUCTION

The world has witnessed an increase in demand for poultry meat and poultry products, which are among the most important sources of animal protein with high nutritional value. This has led to the search for birds other than chicken that possess similar specifications, including Japanese quail, which are characterized by rapid growth, low feed consumption, and a small footprint. Their meat is characterized by containing higher quantities of essential fatty acids and lower cholesterol than chicken meat (24). However, this increase has been accompanied by some fundamental problems, such as oxidative stress, which causes oxidation through the production of free radicals and causes irreversible oxidative damage in the body (16), which is one of the stressors causing significant economic losses in the poultry industry (13). Modern research and studies have been directed towards finding solutions and alternatives to reduce these obstacles by using natural additives or active compounds such as carotenoids and carotenes (4), quinoa seed powder (2), tuber powder (11), or psyllium seed powder (18). They are safe compared to industrial ones, which are a source of concern for consumers (25), and for their positive role in enhancing productive performance and supporting the immune system of birds (19), in addition to their ability to inhibit the activity and effectiveness of free radicals (5) and reduce oxidation indicators in meat (13 , 12,3).One of the natural food additives is carrot juice residue (Daucus carota), as carrots belong to the Apiaceae family and are native to Europe, Asia, and North Africa. They are one of the most important sources rich in beta-carotene and a high level of dietary fiber, which is very beneficial for the digestive system and improves the intestinal performance in absorbing nutrients (28,26). They are also rich in many minerals and vitamins C, D, E, and K, as well as many plant nutrients such as lycopene, lutein, and zeaxanthin (9). They also contain the rare element molybdenum, which is rarely found in many vegetables and helps in the metabolism of fats and carbohydrates and is important for the absorption of iron. They are a source of magnesium and manganese, which are necessary for bones and protein, and are a cofactor for antioxidant enzymes, the formation of new cells, the activation of B vitamins, the relaxation of nerves and muscles, the prevention of blood clotting, energy production, and the secretion of insulin, which is responsible for the metabolism of carbohydrates and fats in the body (10). Sukarini (31) observed an increase in egg production (HD%) with an improvement in feed consumption for laying hens at the age

of 27 weeks. And fed on carrot extract in different proportions and fermented, and Samiento-Garcia et al. (27) showed that adding 0.1, 0.2, 0.3 or 4% of purple carrot powder to the diets of 22-week-old female quails did not affect egg production, body weight, egg mass or feed conversion ratio. Due to the global trend towards using extracts of plant and medical wastes and the lack of studies on quails and recommendations for conducting further research, this study was conducted to determine the effect of adding different levels of alcoholic extract of carrot juice waste to the drinking water of female quails on production performance.

MATERIAIS AND METHODS

This experiment was conducted at the Poultry Research Station of the Agricultural Research Department - Ministry of Agriculture in Abu Ghraib for the period from 28/1/2024 to 28/3/2024 to know the effect of adding different levels of alcoholic extract of carrot juice waste to drinking water on the productive performance of female quail at the age of 45 days for a period of 8 weeks divided into two periods (4 weeks/period). 240 female quails prepared from the hatchery of the same station were used and randomly distributed into four treatments (60 chicks/treatment) with 3 replicates (20 chicks/replicate). The chicks were raised in cages with dimensions of 2 x 1.5 m and lined with sawdust 3-5 cm thick. All appropriate conditions were provided for the experiment. Lighting was used for 16 hours/day and 8 hours of darkness throughout the experiment. The temperature was controlled in winter using electric incubators and the ventilation system available in the hall. Females were fed a production diet containing 20% crude protein and 2948 kcal/kg feed metabolizable energy, respectively (Table 1). Alcoholic extract of carrot juice waste was added at levels of 0, 100, 300 and 500 mg/L drinking water, respectively. Carrot juice waste was obtained from juice and soft drinks shops in different areas of Baghdad city to prepare the alcoholic extract as indicated in the laboratories of the Prevention Research Department of the Agricultural Research Department, Ministry of Agriculture. The egg production percentage (HD%), egg mass, feed consumption and feed conversion ratio were calculated according to Al-Fayyadh et al. (1) and the cumulative egg production according to Naji and Hanna (21). The data were analyzed using the ready-made statistical program SPSS® (30) and applying the completely random design in data analysis, and Duncan's multiple range test (8) was used to compare the significant differences between the means of the studied traits.

the components	%
yellow corn	45.3
wheat	15
Soybean meal 1	25
Protein 2	5
Sunflower oil3	2.6
Dicalcium phosphate	1
limestone	5.5
table salt	0.1
Total sum of components	100
Calculated chemical composition of feed ingredients 4	
Metabolic energy (kcal/kg feed(	2948
Crude protein%	20
Crude fat%	5.2
Crude fiber%	2.6
Calcium%	2.59
Available phosphorus%	0.39
methionine + cysteine%	0.75
Lysine%	1.11

Table 1. Proportions of feed ingredients in the production feed with calculated chemical composition

1.The soybean meal used in the feed is of Argentine origin and its metabolic energy is 2440 kcal/kg and its crude protein content is 48%. 2. The protein concentrate used is a product of the Dutch company (Laycon-s special W) and its metabolic energy is 2120 kcal/kg and its crude protein level is 40% and its ether extract content is 5% and calcium content is 3.5% and available phosphorus is 2% and the concentration of sulfur amino acids (methionine + cysteine) is 3.29% and lysine is 3.8%. 3. The metabolizable energy of sunflower oil is 8990 kcal/kg. 4. The chemical composition is calculated according to what was recommended in (22)

RESUITS AND DISCUSSION

Table (2) shows the effect of adding different levels of alcoholic extract of carrot juice waste to drinking water on the weekly average of egg production percentage based on (HD%). It is noted that during the first period (4 weeks) and the second period (8 weeks) there was a highly significant increase ($P<0.01$) in favor of all addition treatments (T4, T3, T2) compared to the control treatment (1). The same is the case for the total period (1-8 weeks days), as the values of this trait increased from 69.88 to 80.59%.Table (3) shows the effect of adding different levels of alcoholic extract of carrot juice residues to drinking water on the weekly average egg mass. A highly significant increase ($P<0.01$) in egg mass was observed during the first period (4 weeks) and the second period (8 weeks) for treatments T4, T3, and T2 compared to the control treatment. These results were similar to the total period (1-8 weeks), as egg mass increased from 55.88 to 67.59 (g/bird/day). Table (4) shows the effect of adding different levels of alcoholic extract of carrot juice residues to drinking water on the weekly feed consumption rate. During the first period of the experiment, there was a highly significant decrease ($P<0.01$) in the value of this trait, favoring the T2 supplementation treatment compared to the control treatment (T1). Similar to this effect were treatments T4 and T3, which did not differ significantly from the control treatment. During the second period, a highly significant decrease ($P<0.01$) was observed in the feed consumption rate for all T4, T3, and T2 supplementation treatments compared to the control treatment. Similarly, during the entire period, feed consumption decreased from 164.71 to 163.26 (g/bird/day).Table (5) shows the effect of adding different levels of alcoholic extract of carrot juice waste to drinking water on the weekly average of the feed conversion factor. In the first period, a highly significant improvement ($P<0.01$) was observed in the value of this trait in favor of the T4 addition treatment (500 ml/L) compared to the T1 control treatment. The effect was similar to the T2 addition treatment (100 ml/L), which did not differ significantly from the T3 addition treatment (300 ml/L), while the T2 and T3 treatments significantly outperformed the control treatment. In the second period, all addition treatments recorded a highly significant improvement ($P<0.01$) in the feed conversion factor compared to the control treatment. During the total period, all addition treatments also recorded the best value for this trait compared to the control treatment. Table (6) illustrates the effect of adding different levels of alcoholic extract of carrot juice waste to drinking water on the weekly cumulative egg production rate. A highly significant increase ($P<0.01$) was observed in cumulative egg production in treatments T4, T3, and T2, which had alcoholic extract of carrot juice waste added to their drinking water, compared to the control treatment T1, during the first and second periods of the experiment. For the total period (1-8 weeks), the results showed a highly significant increase ($P<0.01$) in favor of treatments T4 and T2, compared to the control treatment. Treatment T3 did not differ in effect from all other experimental treatments.The improvement in egg production, egg mass, cumulative egg production, and feed conversion ratio in favor of females whose drinking water was supplemented with carrot juice extract compared to the control treatment (T1) may be due to the activity of the active compounds and carotenoids present in carrot juice as an effective antioxidant that plays a major role in protecting cells, lipids, proteins, and DNA from free radical formation reactions resulting from metabolic processes, in addition to protecting tissues from damage and maintaining the protein level necessary for body growth and improving production performance (14, 17). Carrot juice also plays an effective role as an antibacterial against pathogens, thus increasing the presence of beneficial microorganisms in the intestinal flora and their spread within the digestive tract of birds, including lactic acid bacteria from the genera Lactobacillus, Streptococcus, and Bifidobacterium, to increase fermentation activity, which in turn increases the concentration of short-chain fatty acids (7), thus making the intestinal pH acidic, increasing the solubility and absorption of minerals, which contributes to the development of the digestive tract to maximize the utilization of nutrients. (33,15) Al-Shemery and others (20) previously indicated that adding 10 ml of alcoholic extract of jasmine leaves to each liter of drinking water for laying hens at the age of 50 weeks led to an increase in the weight of the eggs

produced, the mass of the eggs, and the cumulative egg production, with a decrease in the amount of feed consumed compared to the control treatment.The decrease in feed consumption of birds in the supplementation treatment is attributed to the birds' eagerness to drink water due to its clarity, shine and reddish colour after mixing it with carrot juice extract, which is a good source of energy needed by the bird, as it contains high energy estimated at 3414.66 kcal/kg and an amount of simple sugars estimated at 2.8 mg/100 g dry matter, in addition to its contribution to increasing the activity of beneficial microbial organisms in the digestive system of birds and the digestive enzymes they secrete, which leads to improving the rate of digestion and absorption and increasing the readiness of the nutritional elements in the feed, which is positively reflected in improving the efficiency of food conversion. Titcomb et al. (32) showed that adding orange carrot leaf powder at a rate of 0.35% or red carrot powder at a rate of 0.40% to the feed of laying hens at the age of 53 weeks contributed to a decrease in feed consumption and an increase in the efficiency of its utilisation compared to the control treatment. Siti and Bidura (29) indicated that laying hens at the age of Thirty weeks of feeding on three types of rations containing carrot leaf extract or carrot extract and their mixture contributed significantly to increasing protein digestibility, improving feed conversion ratio, egg production percentage (HD%), number of eggs produced and egg mass compared to the control treatment(22,23). Awahd and Zangana (6) also noted a significant increase in the weight of the Fabricia gland, its index and the volumetric standard of antibodies directed against Newcastle and Camporo viruses for birds fed on rations containing different proportions of astaxanthin powder, which led to improving their productive performance compared to the control treatment.

CONCLUSION

This study concludes that adding the alcoholic extract of carrot juice waste to drinking water improved the productive performance of female quail.

Table 2. Effect of adding different levels of alcoholic extract of carrot juice waste to drinking water on the weekly average egg production percentage HD (%) of female quail (means ± standard error

Duration (week)	(%) Egg production rate HD				significants
	Treatments (1)				
	T1	T2	T3	T4	
First (4 weeks)	b 64.58±0.73	a 76.61±0.37	a 75.06±0.57	a 77.56±0.36	**
Second (8 weeks)	b 75.18±0.10	a 84.35±0.43	a 84.58±0.39	a 83.63±0.51	**
(Total duration (1-8 weeks	b 69.88±0.31	a 80.48±0.19	a 79.82±0.44	a 80.59±0.16	**

Different letters between treatments within a single column indicate a significant difference between the means at a probability level of (P<0.01).

(1) Treatments include the following: T1, control treatment without any additions; T2, T3, and T4, treatment with 100, 300, and 500 ml of alcoholic extract of carrot juice waste added to each liter of drinking water.

Table 3. Effect of adding different levels of alcoholic extract of carrot juice residues to drinking water on the weekly average egg mass (g/bird/week) for female quail (means ± standard error)

Duration (week)	Average egg mass (g/bird/day)				significants
	Treatments (1)				
	T1	T2	T3	T4	
First (4 weeks)	b49.60±0.72	a62.12±1.49	a60.58±2.40	a63.17±1.11	**
Second (8 weeks)	b62.17±0.37	a71.82±0.83	a72.73±0.63	a72.02±1.03	**
Total duration (1-8 weeks(	b55.88±0.44	a66.98±0.83	a66.66±1.29	a67.59±1.06	**

Different letters between treatments within a single column indicate a significant difference between the means at a probability level of (P<0.01).

(1) Treatments include the following: T1, control treatment without any additions; T2, T3, and T4, treatment with 100, 300, and 500 ml of alcoholic extract of carrot juice waste added to each liter of drinking water**.**

Table 4. Effect of adding different levels of alcoholic extract of carrot juice residues to drinking water on the weekly feed consumption rate (g/bird/week) for female quail (means ± standard error)

Duration (week)	Feed consumption rate (g/bird/week)				significants
	Treatments (1)				
	T1	T2	T3	T4	
First (4 weeks)	a153.83±0.81	b151.75±0.32	ab152.38±0.44	ab152.69±0.34	**
Second (8 weeks)	a175.60±0.06	b174.54±0.07	b174.30±0.11	b173.84±0.08	**
Total duration (1-8 weeks)	a164.71±0.42	b163.15±0.13	b163.34±0.23	b163.26±0.13	**

Different letters between treatments within a single column indicate a significant difference between the means at a probability level of (P<0.01).

(1) Treatments include the following: T1, control treatment without any additions; T2, T3, and T4, treatment with 100, 300, and 500 ml of alcoholic extract of carrot juice waste added to each liter of drinking water.

Table 5. Effect of adding different levels of alcoholic extract of carrot juice waste to drinking water on the weekly average feed conversion ratio (g feed/g eggs/week) of female quail (mean ± standard error)

Duration (week)	Feed conversion ratio (g feed/g eggs/week)				significants
	Treatments (1)				
	T1	T2	T3	T4	
First (4 weeks)	a3.22±0.06	bc2.48±0.05	b2.57±0.09	c2.43±0.03	**
Second (8 weeks)	a2.85±0.02	b2.43±0.03	b2.40±0.02	b2.42±0.03	**
Total duration (1-8 weeks)	a3.04±0.03	b2.46±0.02	b2.48±0.05	b2.43±0.03	**

Different letters between treatments within a single column indicate a significant difference between the means at a probability level of (P<0.01).

(1) Treatments include the following: T1, control treatment without any additions; T2, T3, and T4, treatment with 100, 300, and 500 ml of alcoholic extract of carrot juice waste added to each liter of drinking water.

Table 6. Effect of adding different levels of alcoholic extract of carrot juice waste to drinking water on the weekly cumulative egg production rate (egg/female/week) for female quails (means ± standard error)

Duration (week)	Cumulative egg production rate (egg/female/week)				significants
	Treatments (1)				
	T1	T2	T3	T4	
First (4 weeks)	b4.52±0.05	a5.36±0.02	a5.26±0.04	a5.43±0.03	**
Second (8 weeks)	b5.26±0.01	a5.90±0.03	a5.92±0.03	a0.04±5.86	**
Total duration (1-8 weeks)	b4.89±0.02	a5.63±0.01	ab5.59±0.03	a5.64±0.01	**

Different letters between treatments within a single column indicate a significant difference between the means at a probability level of (P<0.01).

(1) Treatments include the following: T1, control treatment without any additions; T2, T3, and T4, treatment with 100, 300, and 500 ml of alcoholic extract of carrot juice waste added to each liter of drinking water.

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