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RESEARCH ARTICLE

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The use of Roselle flower powder compared to antioxidants [BHT] and its effect on the qualitative and biochemical characteristics of laying hens' eggs.

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ABSTRACT

The study was conducted at the poultry field in the College of Agriculture / Kirkuk University from 1/10/2023 to 15/12/2023. The purpose of the study was to evaluate the effects of using Roselle flower powder(Which is considered one of the natural antioxidants) compared to antioxidants [BHT] on the qualitative and biochemical characteristics of laying hens' eggs, A hundred twelve Lohmann birds were randomly assigned to 7 nutritional treatments with 4 replicates for each treatment [4 birds per replicate]. The birds had free access to the diet during the whole experiment, and it was based on the recommendations of the LOHMANN company. The treatments were assigned as follows: treatment one was the control treatment without any addition, treatment second contained 1 g of Roselle flower powder per kg diet, treatment third contained 1.5 g Roselle flower powder per kg diet, treatment forth contained 2 g Roselle flower powder per kg diet, treatment fifth contained 1 g Roselle flower powder + BHT per kg diet, treatment sixth contained 1.5 g Roselle flower powder + BHT per kg diet, treatment seventh contained 2 g Roselle flower powder + BHT per kg diet. All of the BHT additions were based on the company standard recommendations. The result of treatment 3 showed a higher significant effect Albumin index and the Haugh unit [H.U.] compared to treatments 4, 5, 6, and 7. There were no significant differences between the experimental treatments in relation to other studied traits.

***Keywords*:** Roselle, Roselle flower powder, laying hens, BHT.

INTRODUCTION

The poultry production, specifically in developing countries, is considered one of the fastest-growing agricultural sectors in the world. The poultry sector growth is increasing continuously because of the increasing demand for poultry production and the increase in population globally. When the breeders make a high-quality diet, they need to be precise because poultry production is easily affected by infectious diseases. Medicinal plants or medicinal herbs are good alternatives used as growth stimulants for poultry [1]. These plants were used in the past as treatment against infections or disorders in humans and animals. In addition, it was used as an antimicrobial, anti-inflammatory, anti-parasitic, and disinfectant. Nowadays, medicinal plants are used widely in animal production instead of the random use of antibiotics. Many studies have stated that plant probiotics in poultry diets improve growth, gut health, antioxidants, and immunity [2]. The Roselle flower powder is one of the medicinal plants used based on its importance in containing citric acid. Citric acid enhances the absorption of nutrients and enhances the intestinal flora by increasing the beneficial bacteria and inhibiting the harmful bacteria. The Roselle plant is considered a strong anti-oxidant since one of its essential functions is protecting the cells from destruction. That is because it contains the good anthocyanin, which reduces the incidence of cancerous diseases and increases the immunity of birds [3]. The flower cup leaves contain active materials such as phenols, hydrochloric acid, and glycosides [4]. Furthermore, it contains a good mix of amino acids; it is rich in beta-carotene and glucose. These active compounds have antioxidant effects, especially the phenol compounds, which can prevent fat oxidation [5].

Materials and Methods

The study was conducted at the poultry field in the College of Agriculture / Kirkuk University from 1/10/2023 – 25/12/2023 to evaluate the effect of using Roselle flower powder compared to antioxidant [BHT] on the qualitative and biochemical characteristics of laying hens' eggs. The experiment contained 112 LOHMANN birds at the age of 41 weeks. The birds were bred in cages containing three floors. The seven treatments were randomly assigned, with four replicates per treatment, and each replicate had four birds. Birds were weighed at 43 weeks of age and fed on the experimental diets for 15 days as a preliminary period to adapt to their new diet [Table 1]. Birds were randomly assigned to the experimental treatments: T1, control treatment without any addition; T2, adding 1 g of Roselle flower powder/kg diet; T3, adding 1.5 g Roselle flower powder/kg diet; T4, adding 2 g Roselle flower powder/kg diet; T5, adding 1 g Roselle flower powder/kg diet + BHT; T6, adding 1.5 g Roselle flower powder/kg diet + BHT; T7, adding 2 g Roselle flower powder/kg diet +

BHT. The BHT additions were based on the company's standard recommendations. Eggs were collected daily at 2:00 pm during the experiment. The completely randomized design [CRD] was used to study the effect of the treatments on the different characteristics. Also, the statistical analysis system program (SAS) [6] was used in the statistical analysis, and the significant differences between means were compared by using Duncan's multinomial test [7].

Table [1]. Nutrition table and percentages of ingredients.

Feed materials	%
Ground corn	41.40
Ground wheat	10.00
Soybean 47% crude protein	25.00
Sunflower oil	3.55
Barley	7.50
Limestone	8.50
Salt	0.25
Vitamins and minerals mixture*	2.50
DL-methionine	0.10
Di calcium phosphate	1.15
L-lysine	0.05
Total %	100
Calculated chemical composition**	
Metabolizable energy [Kilocalorie/kg[	2776
Crude protein %	17.50
Methionine %	0.44
Lysine %	80.8
Calcium %	4.00
Phosphor %	60.3

*1 kg of vitamins and minerals mixture provide 400000 IU Vitamin A, 100000 IU Vitamin D3, 1000 IU Vitamin E, 2000 IU Vitamin K3, 1500 mg B1, 500 mg B2, 200 mg B6, 8 mg B12, 50 mg Folic acid, 8000 mg Niacin, 4000 mg Calcium, 400 mg Manganese, 150 mg Zinc, 53 mg Iron, 43 mg Copper, 40 mg Colin.

**Based on the chemical composition of feed materials by the National Research Center [NRC, 1994].

*The diet requirement for laying hens is based on the company guidelines [LOHMANN, 2010].

Results and Discussion

Table 2 presents the effect of Roselle flower powder compared to antioxidant [BHT] on the qualitative characteristics of laying hens. The results showed no significant differences [$P<0.05$] between all the experimental treatments on yolk index. While treatments 2 and 3 showed significant differences in albumin index compared to 6, there was no difference between treatment 2 and 3 with treatment 4 and 5 for this trait. In addition, there were no differences between all treatments on yolk, albumin, shell weight, and shell thickness. The H.U. showed differences between treatments where treatments 3 were significantly superior compared to treatments 1, 2, 5, 6, and 7, While no significant difference was recorded between it and treatment 4. This difference in the qualitative characteristics (albumin and H.U.) may be due to the fact that the antioxidants present in Roselle flower powder it works in addition, these materials stimulate the secretion of LHRH hormone which stimulates the secretion of LH and FSH hormone [1]. The increase in estrogen and progesterone hormones have roles in egg production increase [8]. Estrogen hormone leads to the growth of the epithelial cells of the egg canal and increases the tubular cells in the magnum which is responsible on albumin secretion [9]

Table 2. The effect of Roselle flower powder compared to antioxidant [BHT] on qualitative characteristics [Mean ± Standard error]

Characteristics	Qualitative measurements of eggs						
Treatments	Yolk index	Albumin index	Yolk weight percentage	Albumin weight percentage	Shell weight percentage	Shell thickness	H.U.
T1	0.40 ± 0.02 a	0.09 ± 0.01 ab	24.28 ± 1.05 a	65.49 ± 2.19 a	12.21 ± 0.72 a	0.40 ± 0.04 a	86.75 ± 3.61 b
T2	0.43 ± 0.00 a	0.09 ± 0.01 a	24.69 ± 0.98 a	65.84 ± 1.53 a	12.15 ± 0.56 a	0.41 ± 0.03 a	87.02 ± 4.37 b
T3	0.44 ± 0.01 a	0.10 ± 0.00 a	24.81 ± 1.25 a	66.85 ± 1.52 a	12.52 ± 0.30 a	0.44 ± 0.06 a	89.49 ± 3.58 a
T4	0.40 ± 0.00 a	0.09 ± 0.00 ab	24.22 ± 0.67 a	65.07 ± 1.08 a	12.44 ± 0.55 a	0.48 ± 0.05 a	87.69 ± 2.00 ab
T5	0.42 ± 0.00 a	0.09 ± 0.00 ab	24.40 ± 1.12 a	65.56 ± 1.61 a	12.27 ± 0.34 a	0.40 ± 0.04 a	86.63 ± 2.73 b
T6	0.43 ± 0.00 a	0.09 ± 0.00 b	24.37 ± 0.92 a	64.40 ± 1.70 a	12.34 ± 0.61 a	0.47 ± 0.02 a	86.96 ± 3.28 b
T7	0.43 ± 0.00 a	0.09 ± 0.00 b	24.23 ± 0.75 a	65.19 ± 2.17 a	12.12 ± 0.72 a	0.45 ± 0.02 a	86.20 ± 1.71 b

*Different letters in one column refer to significant differences between treatments [$P<0.05$].

T1: control treatment, T2: adding 1 g of Roselle flower powder/kg diet, T3: adding 1.5 g Roselle flower powder/kg diet, T4: adding 2 g Roselle flower powder/kg diet, T5: adding 1 g Roselle flower powder/kg diet + BHT, T6: adding 1.5 g Roselle flower powder/kg diet + BHT, T7: adding 2 g Roselle flower powder/kg diet + BHT. The BHT addition is based on the company recommendations.

We note from Table No. 3 the effect of Roselle flower powder compared to antioxidant [BHT] on biochemical characteristics There is no significant difference between the experimental treatments in terms of the characteristics Mannualdehyde, glutathione pyridox, cholesterol, total protein, glucose, and uric acid. The result stated no differences between all the experimental treatments in all the biochemical characteristics. That could be related to the flower cup containing active materials such as phenols, hydrochloric acid, hepsin, and glycosides [4]. These active compounds have antioxidant effects, especially the phenol compounds, which can prevent fat oxidation [5]. Also, delays the production of peroxides and hydroperoxides, which reduce the malonaldehyde and relax nerves.

Table 3. The effect of Roselle flower powder compared to antioxidant [BHT] on biochemical characteristics [Mean ± Standard error]

Characteristics	Biochemical Characteristics					
Treatments	MDA	GSH	Cholesterol	Total Protein	Glucose	Uric Acid
T1	1.40 ± 0.04	0.42 ± 0.00	141.66 ± 3.52	5.46 ± 0.74	205.91 ± 4.93	4.61 ± 0.34
T2	1.38 ± 0.06	0.42 ± 0.02	142.33 ± 1.76	5.36 ± 0.85	204.54 ± 21.40	4.52 ± 0.24
T3	1.38 ± 0.08	0.42 ± 0.03	143.33 ± 10.89	5.54 ± 0.86	203.90 ± 26.66	4.21 ± 0.20
T4	1.40 ± 0.02	0.40 ± 0.01	141.00 ± 2.64	5.59 ± 1.24	204.61 ± 24.32	4.37 ± 0.81

T5	1.39 ± 0.06	0.42 ± 0.01	143.00 ± 17.21	4.95 ± 1.32	205.51 ± 17.25	4.43 ± 0.33
T6	1.37 ± 0.07	0.42 ± 0.02	142.33 ± 2.40	5.00 ± 1.09	206.18 ± 8.98	4.39 ± 0.43
T7	1.36 ± 0.03	0.42 ± 0.02	142.00 ± 2.51	5.59 ± 1.27	205.52 ± 5.94	4.40 ± 0.55

*Different letters in one column refer to significant differences between treatments [P<0.05].

T1: control treatment, T2: adding 1 g of Roselle flower powder/kg diet, T3: adding 1.5 g Roselle flower powder/kg diet, T4: adding 2 g Roselle flower powder/kg diet, T5: adding 1 g Roselle flower powder/kg diet + BHT, T6: adding 1.5 g Roselle flower powder/kg diet + BHT, T7: adding 2 g Roselle flower powder/kg diet + BHT. The BHT addition is based on the company recommendations.

Conclusion

Adding 1.5 g of Roselle flower powder per kg of diet showed a promising result regarding the qualitative characteristics such as albumin index, and Haugh unit [H.U.]. That could be related to Roselle and its containing of the compounds daidzein phytoestrogens and quercetin, Those compounds can attach to the estrogen receptors which can affect the physiological processes in the body, such as vitellogenin [9]. In contrast, the Roselle flower powder didn't show any significant effect on the biochemical characteristics.

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استخدام مسحوق زهرة الكجرات مقارنة بمضاد الاكسدة (BHT) وأثره في الصفات النوعية و الكيموحيوية لدجاج البياض.

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الخلاصة:

اجريت هذه الدراسة في حقل الطيور الداجنة التابعة لقسم الانتاج الحيواني كلية الزراعة / جامعة كركوك للمدة من 2023/10/1 ولغاية 2023/12/15 لغرض معرفة استخدام مسحوق زهرة الكجرات (الذي يعتبر من مضادات الأكسدة الطبيعية) مقارنة بمضاد الاكسدة (***BHT***) واثره في الصفات النوعية والكيموحيوية لبيض الدجاج البياض وذلك لدعم إنتاج بيض صحي وفقًا لإرشادات منظمة الصحة العالمية. وزعت عشوائياً 112 دجاجة نوع ***Lohmann*** على سبعة معاملات تغذوية و بواقع اربع مكررات لكل معاملة (اربعة طيور لكل مكرر) ، وغذيت الطيور تغذية حرة (عليقة حسب توصيات الشركة ***Lohmann***) طول مدة التجربة ، تم توزيع المعاملات على الاتي : المعاملة الاولى تمثلت بـ معاملة السيطرة اي بدون اضافات ، المعاملة الثانية اضافة مسحوق زهرة الكجرات بنسبة 1 غم/كغم علف ، المعاملة الثالثة تم اضافة مسحوق زهرة الكجرات بنسبة 1.5 غم/كغم علف ، المعاملة الرابعة تم اضافة مسحوق زهرة الكجرات بنسبة 2 غم/كغم علف ، المعاملة الخامسة اضافة مسحوق زهرة الكجرات بنسبة 1 غم/كغم علف + اضافة ***BHT*** حسب توصيات القياسية للشركة ،المعاملة السادسة اضافة مسحوق زهرة الكجرات بنسبة 1.5 غم/كغم علف + اضافة ***BHT*** حسب توصيات القياسية للشركة ، المعاملة السابعة اضافة مسحوق زهرة الكجرات بنسبة 2 غم/كغم علف + اضافة ***BHT*** حسب توصيات القياسية للشركة أظهرت النتائج تفوق معنوي أعلى للمعاملة الثالثة من حيث دليل البياض ووحدة الهو مقارنة بالمعاملة الرابعة والخامسة والسادسة والسابعة. في حين لم يكن هناك اي فروق معنوي بين معاملات التجريبية بنسبة لصفات المدروسة اخرى.

الكلمات المفتاحية : الكجرات ، مسحوق زهرة الكجرات ، دجاج البياض ، ***BHT***.