Plant Archives Vol. 18 No. 2, 2018 pp. 2656-2660 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

EFFECT OF ROSELLE (*HIBISCUS SABDARIFFA*) FLOWERS WATER EXTRACT ON SOME EGG PROPERTIES OF JAPANESE QUAIL

Mousa Ameen Hassan, Ali Husain Khalil, Jassim Kassim Menati and Aqeel Hajim Nasser

Animal production Departments, Agriculture College, Al-Muthanna University, Iraq

Abstract

This study was conducted at the Agricultural Research and Experimentation Station, Agriculture Faculty, Al-Muthanna University, from 22/7/2015 to 22/11/2015, 256 quail female were used, six weeks age, randomly distributed to four treatments, 64 birds per treatment, four replicates each treatment, 16 birds per replicate, the water extract of the Roselle flowers was added to drinking water at a rate of 25, 50, 75 ml/liter of water for the T1, T2 and T3 respectively, leaving T4 (control) without addition, the traits studied were egg production percentage, egg mass, eggs weight, yolk weight, albumin weight, Shell with membrane weight, shell thickness, yolk diameter, yolk High, yolk index, albumin high and Haugh Unit. The results indicate that the Roselle flowers water extract had a significant effect (P=0.05) on the improvement of studied traits of egg production, egg production, egg weight, egg mass, egg quality (Haugh Unit, saffron and shell thickness) compare with the control treatment.

Key words: Roselle (*Hibiscus sabdariffa*) flowers, water extract, egg properties, Japanese quail.

Introduction

Excessive use of chemical drugs has led to problems in the poultry industry, had a negative effect on the physiological status of birds, resulting in the use of medicinal plants, which have positive effects on human health compared to chemically manufactured drugs (Saad El-Din, 1986). These results prompted researchers to use medicinal plants or their derivatives (Al-Gharawi *et al.*, 2014). Medicinal plants in ancient civilizations have been used to treat diseases, improving the value and flavor of food, the properties of medicinal plants are anti-oxidant and anti-growth of pathogenic microorganisms, as well as contain important active compounds in the pharmaceutical industry (Meena and Pal, 2010). Medicinal plants are successful alternatives to antibiotics, containing different effective compounds, including flavonoids, sulfates, polyphenols, carotenoids and sapphones (Craig, 1999). The medicinal plant Roselle is called red tea, an important crop that can be cultivated in tropical and subtropical climates, the part used were the leaves that surround the flower, the color after drying is dark or light red (Hill, 2014), Contains a high percentage of vitamin C, reduces the effect of heat stress, helps digestion, eliminates pathogenic microorganisms, beneficial to high blood pressure (Kowalczyk *et al.*, 2003). Mazza and Miniti (1993) show that red tea leaves contain 3-4% of Citric acid and Tartaric acid, which improves gastric flora and thus improves nutrient uptake. Arora *et al.* (2000) noted that the effective medicinal substance of this plant is concentrated in the leaves of the pulp because it contains phenolic compounds and clicosides, Phenolic compounds are effective as antioxidants for their ability to inhibit lipid oxidation (Faraji and Hagi, 1999). The study aims to add different levels of water extract of Roselle flowers in the drinking water of Japanese quail on some qualitative characteristics of eggs.

Materials and methods

Design Experience

The experiment was conducted at the Agricultural Research and Experimentation Station, Agriculture Faculty, Al-Muthanna University, from 22/7/2015 until 22/11/2015. The aim of this study was the effect of Roselle flowers water extract in the drinking water of Japanese quail birds on some egg characteristics. A total of 256 Japanese quail birds obtained from the Abu Dhabi Public Authority for Agricultural Research at Abu Ghraib district, six weeks age, were used in this experiment. The birds

were randomly distributed to four treatments 64 birds each treatment (16 birds each replicate), in metal cages at 60 × 70 × 60 cm^2, the cages were placed inside a semi-enclosed house, 10 × 40 m dimensions. The water extract of the Roselle flowers was added to drinking water at a rate of 25, 50, 75 ml/liter of water for the T1, T2 and T3 respectively, leaving T4 (control) without addition.

Extract preparing method

The flower leaves were used from local market in Muthanna, was dry, clean, dry-skinned, free-flowing and dry berry bushes, grind and soak in warm distilled water at 50°C for 24 hours, The solution was t filtered by several layers of sterile medical gauze to be ready for use in the experiment (Hernandez *et al.*, 1994), and added to the drinking water (25 ml, 50 ml, 75 water) / liter of drinking water.

Traits studied

Egg production percentage

The eggs were collected every day from 9 am to 11 am. the duration of the experiment was calculated and the production per week was calculated for each repeater and on the basis of the number of hen females at the end of the period (Naji and Hana, 1999) according to the following formula:

$$Egg\ production\% = \frac{Egg\ number\ per\ replicate}{Duration(day) \times birds\ number}$$

Egg mass

The egg mass for each replicate was calculated for a period of one week according to the following formula:

Egg mass = Egg production % × egg weight average × duration (days)

(Al-Fayyad and Naji, 2012)

Eggs quality traits

Eggs weight

The eggs were weighed individually weekly with a sensitive balance, 10 eggs were taken from each replicate.

Egg components percentage

After breaking the egg and separating the yolk from the white with a special filter designed for this purpose, dried the shell, recorded the weights of the yolk and white and shell (with membranes), calculated the components percentage by following formula:

$$Yolk\% = \frac{Yolk\ weight}{Egg\ weight} \times 100$$

$$Albu\,min\% = \frac{Albu\,min\ weight}{Egg\ weight} \times 100$$

$$Shell\ and\ memberane\% = \frac{Shell\ and\ memberane\ weight}{Egg\ weight}$$

Yolk index

The diameter and height of the yolk were measured by a digital metronomic to determine the yolk guide, the index values were calculated according to Al-Fayyad and Naji (2012) in the following formula:

$$Yolk\ index = \frac{Yolk\ high}{Yolk\ daimeter} \times 100$$

Shell and membranes thickness

Shell and membranes thickness was measured from the central region of the egg separately by a micrometer, a reading rate was taken for each egg.

Haugh Unit

A Haugh unit was calculated according to Prasad (2000), in the following formula:

$H.U = 100\ Log\ (H + 7.57 - 1.7\ W^{0.37})$

H=Albumin hight.

W=Egg weight.

Statistical analysis

The experimental data were analyzed using complete randomized design (CRD). The differences were compared between the averages using the Duncan (1955) test, the SPSS program were used (SPP, 2010).

Results and discussion

Tables 1, 2 and 3 show significant increased (P=0.05) for the Roselle flower water extract in the total egg production ratio on the basis of H. for the Japanese quail, the results showed the significant improvement (P=0.05) in T2 and T3 treatment compare with the control treatment during the three periods of production, the first period recorded 13.33, 17.12, 17.60 and 13.00 respectively, and second period were 19.09, 18.63, 19.69 and 18.83 respectively, while in the third period of production were recorded 20.15, 22.27, 23.18 and 20.5 respectively. The results showed significant differences (P=0.05) in the Cumulative egg count (eggs / birds) in T2 and T3 compare with control treatment in the first and second stages, was recorded 399.9, 513.6, 528.0 and

390.0 respectively, recording 572.7, 558.9, 590.7 and 564.9, respectively. In the third stage, the coefficients of the addition (P=0.05) significantly exceeded the control treatment and recorded 604.5, 668.1, 695.4 and 615 respectively. The results showed significant differences (P=0.05) in the egg weight in the all Roselle flower extract addition in all the production stages compare with the control treatment. The results of the first stage were 11.40, 11.42, 12.28 and 8.10 respectively, and in the second stage were recorded 11.309, 11.46, 12.295 and 9.275 respectively. The results of the third phase recorded 11.353, 11.476, 12.29 and 11.121 respectively. The results showed a significant increase (P=0.05) in the egg mass in the all Roselle flower extract addition an all stages of the control treatment. The first stage was 4558.8, 5865.3, 6483.8 and 3159 respectively, while the egg mass rate in the second stage was 6476.66, 6567.15, 7262.65 and 5239 respectively. The results of the third phase were 6862.8, 7667.1, 8552.0 and 1919.4, respectively. T3 was significant increased (P=0.05) in shell with the membranes (%) for the first and second stages of the production on the first and second treatments compare with control treatment. There were no significant differences between T1 and T2 , recorded were 14.74, 14.81, 15.26 and 14.66 % respectively. In the second phase, the treatments were recorded 16.53, 16.66, 16.75 and 16.19 % respectively. In the third phase, the addition coefficients (P=0.05) significantly exceeded the control treatment and recorded 18.77, 18.82, 18.96 and 18.47 % respectively. The results showed that T3 was significantly higher (P=0.05) compare with T1 and T2. There was no significant difference between T1, T2 and T4 in the yolk percentage (%). The coefficients were 38.51, 38.63, 38.83 and 38.39 % respectively. The results of the third stage of production exceeded T3 significantly (P=0.05) compare with T1, T2 and T4 , were recorded 38.89, 38.97, 39.27 and 38.49 % respectively, and the third stage were recorded 38.94, 39.06, 39.14 and 38.55% respectively.

The results in Table 4. indicate that there is a significant improvement (P00.05) in Roselle flower water extract treatments in the qualitative characteristics in all the traits studied compared with the control treatment, which included the shell thickness, the yolk diameter, yolk height, yolk index, albumin height and Haugh unit. The shell thickness was 0.21, 0.22, 0.23 and 0.20 mm, respectively, the yolk diameter were recorded 24.2, 24.9, 24.99 and 22.70 mm, respectively, the yolk height were

Table 1: The effect of Roselle flowers water extract on egg production (%), Cumulative egg count (egg/bird), egg weight (g), egg mass (g), shell and membranes (%), yolk (%) and albumin (%) at first month of egg production of Japanese quail (means± standard error).

Treatments	Egg production (%)	Cumulative egg count (egg / bird)	Egg weight (g)	Egg mass (g)	Shell and membrane (%)	Yolk (%)	Albumin (%)
T1	13.33 b±1.45	399.9 b±1.05	11.40 b±0.20	4558.8 b±18.5	14.74 b±0.15	38.51 b±0.21	46.74ab±0.12
T2	17.12ab±1.63	513.6 a±0.50	11.42 b±0.10	5865.3 a±18.7	14.81 b±0.07	38.63ab±0.13	46.55b±0.09
T3	17.60 a±1.70	528.0 a±0.32	12.28 a±0.09	6483.8 a±16.2	15.26 a±0.14	38.83 a±0.11	45.90 a±0.11
T4	13.00 b±1.51	390.0 b±1.09	8.10 c±0.30	3159.11 c±20.1	14.66 b±0.03	38.39 b±0.07	46.93a±0.13
Sig.	*	*	*	*	*	*	*

T1:added 25 ml/ L water extract Roselle flowersin drinking water.**T2:**added 50 ml/ L water extract of Roselle flowers in drinking water.**T3:**added 75 ml/ L water extract of Roselle flowers in drinking water.**T4:**Control..*Different letters vertically indicate the existence of significant differences between the averages at the possibility of (0.05).

Table 2: The effect of Roselle flowers water extract on egg production (%), Cumulative egg count (egg/bird), egg weight (g), egg mass (g), shell and membranes (%), yolk (%) and albumin (%) at second month of egg production of Japanese quail (means± standard error).

Treatments	Egg production (%)	Cumulative egg count (egg / bird)	Egg weight (g)	Egg mass (g)	Shell and membrane (%)	Yolk (%)	Albumin (%)
T1	19. 29 a±1.42	572.7 b±0.55	11.31 b±0.10	6476.66 b±17.9	16.53a±0.09	38.89 b±0.08	44.57 b±0.09
T2	18.63b±1.61	558.9 b±0.52	11.46 b±0.09	6567.15 b±16.8	16.66a±0.06	38.97 b±0.12	44.36 b±0.05
T3	19.69 a±1.65	590.7 a±0.30	12.30 a±0.06	7262.65 a±15.7	16.70 a±0.07	39.27 a±0.11	44.03c±0.11
T4	18.83 b±1.54	564.9 b±0.53	9.28 c±0.40	5239.45 c±18.8	16.19 b±0.11	38.49 c±0.07	45.31a±0.13
Sig.	*	*	*	*	*	*	*

T1:added 25 ml/ L water extract Roselle flowersin drinking water.**T2:**added 50 ml/ L water extract of Roselle flowers in drinking water.**T3:**added 75 ml/ L water extract of Roselle flowers in drinking water.**T4:** Control..*Different letters vertically indicate the existence of significant differences between the averages at the possibility of (0.05).

Table 3: The effect of Roselle flowers water extract on egg production (%), Cumulative egg count (egg/bird), egg weight (g), egg mass (g), shell and membranes (%), yolk (%) and albumin (%) at third month of egg production of Japanese quail (means± standard error).

Treatments	Egg production (%)	Cumulative egg count (egg / bird)	Egg weight (g)	Egg mass (g)	Shell weight with membrane (g)	Yolk weight (g)	Albumin weight (g)
T1	20.15 a±1.43	604.5b±1.10	11.35 b±0.10	6862.8 b±17.3	18.77 a±0.08	38.94a±0.11	42.28b±0.22
T2	22.27ab±1.32	668.1 a±0.48	11.48 b±0.10	7667.1a±17.4	18.82 a±0.07	39.06a±0.12	42.11b±0.15
T3	23.18 a±1.14	695.4 a±0.30	12.29 a±0.07	8552.0 a±16.1	18.96 a±0.11	39.14a±0.09	41.89b±0.20
T4	20.50 b±1.22	615.0 b±1.11	11.12 c±0.20	1919.4 c±18.9	18.47 b±0.09	38.55b±0.13	42.97a±0.09
Sig.	*	*	*	*	*	*	*

T1:added 25 ml/ L water extract Roselle flowersin drinking water.**T2:**added 50 ml/ L water extract of Roselle flowers in drinking water.**T3:**added 75 ml/ L water extract of Roselle flowers in drinking water.**T4:** Control..*Different letters vertically indicate the existence of significant differences between the averages at the possibility of (0.05).

Table 4: The effect of Roselle flowers water extract on shell thickness (Mm), Yolk diameter (Mm), Yolk height (Mm), Yolk index, Albumin height (Mm) and Haugh unit of Japanese quail egg (means± standard error).

Treatments	Shell thickness (Mm)	Yolk Diameter (Mm)	Yolk height (Mm)	Yolk index (Mm)	Albumin height (Mm)	Haugh Unit
T1	0.21 b±0.005	24.2a±0.23	12.56a±0.13	0.519 a±0.001	4.95b±0.05	8.071 b±0.13
T2	0.22 a±0.004	24.9a±0.15	12.63a±0.15	0.507 a±0.007	5.83a±0.02	8.927 a±0.14
T3	0.23 a±0.009	24.99a±0.24	12.92a±0.09	0.517 a±0.006	5.9a±0.04	8.983 a±0.19
T4	0.20 b±0.005	22.70b±0.90	9.51b±0.11	0.418 b±0.005	4.45b±0.06	7.822 b±0.18
Sig.	*	*	*	*	*	*

T1:added 25 ml/ L water extract Roselle flowersin drinking water.**T2:**added 50 ml/ L water extract of Roselle flowers in drinking water.**T3:**added 75 ml/ L water extract of Roselle flowers in drinking water.**T4:** Control..*Different letters vertically indicate the existence of significant differences between the averages at the possibility of (0.05).

recorded 12.56, 12.63, 12.92 and 9.51 mm, respectively, the yolk index, which recorded 0.519, 0.507, 0.517 and 0.418, respectively, the albumin height was 4.95, 5.83, 5.90 and 4.45 mm, respectively, the Haugh unit were 8.071, 8.927, 8.983 and 7.822, respectively.

There was an improvement in most of the eggs traits studied in the Roselle flower water extracts, compared to control in Japanese quail, perhaps the reason for the presence of vitamin C in the Roselle flowers was important to improving the qualitative characteristics of the egg, the Roselle flower water extract contains citric acid, Tartaric acid, Malic acid and Tartaric acid, which is characterized by improved flora in the stomach leading to increased absorption of nutrients (Al-Khailani, 2009). Improvement of egg production rate when using the Roselle flower water extract because it contains vitamin C, which leads to inhibition of corticosteroids secretion of the adrenal cortex, which is reflected on increased thyroid activity and lead to a significant increase in the percentage of egg production (Tollba *et al.*, 2006), the addition of vitamin C to the drinking water of Japanese quail increases the shell thickness and improves the components of the egg internal, which helps in the transfer of calcium from the bones and the low blood calcium may be due to low effectiveness of the thyroid due to stress and high temperatures and thus low crust thickness (Ghazalah *et al.*, 2007).

Conclusions

The addition of 50% and 75% of the Roselle flower water extract to the drinking water of the Japanese quail were a significantly improved the egg production and egg in all the research periods.

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