University of Thi-Qar Journal of agricultural research

ISSN Onlin:2708-9347, ISSN Print: 2708-9339 Volume 11, Issue 2 (2022) PP 54-60

https://jam.utq.edu.iq/index.php/main *https://doi.org/10.54174/UTJagr.Vo11.N2/06*

Effect of omega-3 on some productive and eggs traits of Japanese quail

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Abstract

The study was conducted to determine the effect of adding omega-3 fatty acid to the quail's diet on some productive and egg quality traits. This experiment was conducted in the poultry field, Department of Animal Production, College of Agriculture and Marshes, University of Thi Qar, from 10/202021 to 02/14/2022. A total of 300 quail birds, 45 days age, were used, which was fed on three diet type, the first diet (control ration) without adding oil, the second ration was added to it with sunflower oil (0.01%), the third diet was added to omega-3 oil at a rate of (0.01%). The results showed that there were significant differences on the rate of egg production, egg weight and mass, feed conversion factor for egg production, egg shape index, yolk index, shell weight, yolk color and shell thickness for the treatment to which omega-3 oil was added in comparison with the rest of the treatments.

Keywords: ovo injecting, hatching eggs, omega-3, productive, eggs, Japanese quail.

I. INTRODUCTION

Recently, the light has been shed on the breeding and improvement of poultry birds, turned into an industry in itself after the demand for white meat increased, it is the most important and fastest means that can be used to fill the shortage of animal protein and, it is a source of meat and eggs, short capital cycle, high feed conversion efficiency and rapid sexual maturity, compared with other farm animals (Azeem *et al*., 2022). It is also a mainstay of the economies of many countries, contributed to bridging the gap in meat and egg products at the lowest possible cost and in the shortest possible time (Kudryashova and Kudryashov, 2022). The quail bird occupied a prominent position because it is one of the types of birds and the smallest in size (Abdulrazaq *et al*., 2020). It occupies little space per unit area, easy to handle, and short generation range, the hatching period ranges between (16-18) days (Karabayır *et al*., 2018). Nutrition is the backbone of the poultry industry because of its contribution to the processing of all the nutritional elements needed by birds, for growth, production and reproduction by providing balanced diets with nutrients for birds (Lazim and Abais, 2018). The addition of unsaturated fatty acids to quail diets has several benefits as it is a source of energy and growth stimulants (Kara *et al*., 2021). It works to increase disease prevention and improve egg production and egg quality (Gao *et al*., 2022). Absorption of vitamins and lowering of cholesterol in the blood, eggs and meat (Zotte *et al*., 2022). This experiment aimed to determine the effect of adding omega-3 oil and sunflower oil to quail diets on productive traits, egg production, feed conversion factor, and egg quality traits.

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II. MATERIALS AND METHODS

This study was conducted in the poultry field, College of Agriculture and the Marshes, University of Thi Qar, from 10/202021 to 02/14/2022. A total of 300 quail birds, 45 days old, were used, brought from a private hatchery in Shattra district, Thi Qar governorate, divided into three treatments, 90 birds for each treatment (30 birds each replicate). Modern methods have been followed in preparing the hall and equipping it with all the requirements of education, including feeders, wterers, and suitable temperature and humidity. The birds were fed for a week to accustom them to the ration on three rations, (Table 1): The first treatment T1 (control) without adding oil, The second treatment T2 added sunflower oil at a concentration of 0.01%, The third treatment T3 added omega-3 oil at a rate of 0.01%.

Table (1): Percentages of diet components and chemical composition for the final period.

Items	T1 Control	T2 Sunflower oil	T3 Omega-3 oil
Maize	40.00	39.99	39.99
Wheat	17.50	17.50	17.50
Soybean meal (48%)	30.00	30.00	30.00
Protein concentrate* (50%)	8.00	8.00	8.00
Premix** (6%)	0.30	0.30	0.30
Limestone	3.90	3.90	3.90
Salt	0.30	0.30	0.30
Oil	0.00	0.01	0.01
Total	100.00	100.00	100.00
Chemical analyze***			
Crude protein %	23.07	23.07	23.07
Metabolize energy (Kcal/ kg diet)	2857.50	2857.50	2857.50
C/P ratio	188.83	188.83	188.83
Fiber (%)	3.78	3.78	3.78
Calcium (5)	2.11	2.11	2.11
Available Phosphorus (%)	0.37	0.37	0.37
Lysine (%)	1.28	1.28	1.28
Methionine (%)	0.48	0.48	0.48
Methionine+ Cysteine (%)	0.94	0.94	0.94

*Protein concentrate: Produced by the Dutch Brocon Company, it contains 50% crude protein and 2500 (kcal/kg) representative energy, 6.5% calcium, 3% available phosphorous, 3.70% methionine, 0.66% cysteine, 3.85% lysine, 3.5 crude fibers. , 12.4% methionine and cysteine.

**The premix is produced by the Iraqi Laymix Company in Erbil governorate. It contains 6% crude protein and 4331.57 kcal/kg represented energy, 1.50% lysine, 5.90% methionine, 5.00% methionine and cysteine, 24.05% calcium, 10.20% phosphorous available.

***The chemical composition of the feed materials included in the composition of the rations was calculated according to the recommendations of the NRC . (1994).

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The trait study were feed intake, feed conversion factor into eggs, egg production rate, qualitative traits of the resulting eggs, egg weight (by a sensitive scale), yolk diameter (by vernia), yolk index as indicated by (Parmar *et al*., 2006) were studied. The height of the albumin by a triple-base micrometer, and the unit measurement is according to what was mentioned (Card and Nesheim, 1972), the weight of the crust (using a sensitive scale), and the thickness of the crust using the (Vernia apparatus).

The data were statistically analyzed using the Complete Randomized Design (CRD), and the differences between the means were compared using Duncan's multiple range test (Duncan, 1955) and the ready-made statistical program SAS (2012) version 9.1 was used. At the probability level 0.05.

III. RESULTS AND DISCUSSION

Table (2) shows the effect of adding omega-3 oil and sunflower oil to the Japanese quail's diet on the weekly feed intake, the results showed a significant decrease at the level of significance (P≤0.01) for the treatment to which omega-3 oil was added, the reason was due to the distinctive taste and smell of omega-3 oil because it contains fish oil, and this is consistent with what was stated (Al-Khalisi, 2011), when cod liver oil is added to the diet at a rate of (0.2 and 0.4)% for the two treatments, respectively, it was noted that the feed consumption of the oil-added treatment decreased compared to the control treatment, or, the reason may be that omega-3 fatty acid oil was a source of energy and is rich in compounds and nutrients, which provides the body with energy, vitamins and nutrients, supports growth so that birds are satisfied with eating small amounts of the ration to meet the needs of maintenance compared to the rest of the rations.

Table 2. Effect of Japanese quail parents' feeding and the resulting eggs being injected with omega-3 fatty acid and sunflower oil on the parents' feed consumption rate (mean ± standard error).

Treatments	Age (week)			
	1	2	3	4
T1	[a] 0.50±186.38	[a] 0.51±187.49	[a] 0.41±174.86	[a] 0.57±178.07
T2	[c] 0.66±166.62	[b] 0.87±167.05	[b] 1.95±166.24	[b] 1.10±167.43
T3	[b] 0.39±175.33	[b] 8.82±155.36	[c] 0.57±157.06	[b] 0.09±168.45
Sig.	**	**	**	**

Table (3) show that there was a significant superiority at the level of significance (P≤0.01) in treatment T3 compared to the control treatment and treatment T2, which amounted to 78.57%, the reason for the high rate of egg production (H.D) Hen Day was attributed to the treatment to which omega-3 oil was added, because of the improvement in the number of eggs produced during a certain period of time, the percentage of egg production depends in its calculation on the number of eggs produced during a certain period of time and the number of females present at the end of the same period (Al-Soufi and Younis, 2020), agreed with Mustafa and Younis (2016).

The reason for the increase in egg production is due to diets rich in omega-3 oil because they contain a high percentage of unsaturated fatty acids (linoleic acid and alpha-linolenic acid), these acids synthesize procalandins that regulate the

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secretion of hormones from the pituitary gland, especially ovulatory hormone (LH) and follicle-stimulating hormone (FSH), and stimulate the growth of ovarian follicles (FSH), it also works on the creation of steroid hormones in the ovaries (estrogen, progesterone and androgens), the presence of unsaturated fatty acids in the diet affects reproductive activities, these acids were used as an energy source during the development of ovarian follicles and during the stages of embryonic development, in addition to its role in the regulation of meiosis in the germ follicles (Al-Daraji *et al*., 2008).

Table 3. The effect of feeding Japanese quail parents with omega-3 fatty acid and sunflower oil on the egg production ratios and the feed-to-egg conversion factor (mean ± standard error).

Treatments	Traits		
	Egg production (H.D) %	Egg production (H.H) %	Feed conversion
T1	^{b} 2.07±62.38	1.48±61.66	0.11±1.97
T2	^{b} 3.78±64.47	3.36±67.23	0.18±2.24
T3	^{a} 2.86±78.57	1.59±66.81	0.13±2.09
Sig.	**	N.S	N.S

Table (4) show that there are no significant differences for egg weight, the reason was due to the high association with the high level of fatty acids, this results in a deficiency of triglycerides in the blood, reduces the availability of fats to make up the egg yolk, thus explaining the absence of significant differences in egg weight, agrees with the researcher who used flaxseeds in feeding laying hens, where no significant differences were observed for egg weight in agreement with (Nain *et al*., 2012) (Yassein *et al*., 2015), as for the characteristic of egg mass, a highly significant superiority was observed in favor of the T3 treatment, to which omega-3 oil was added to the ration by 0.01%, this height is considered normal because the mass of eggs was calculated by multiplying the egg weight rate by the number of eggs produced, the reason is due to the effectiveness of unsaturated fatty acids, especially omega-3 oil, which improved egg production and egg weight and thus led to an improvement in egg mass (Al-Mashhadani and Izzat, 2014).

Table 4. The effect of feeding Japanese quail parents with omega-3 fatty acid and sunflower oil on the external quality characteristics of the egg (mean ± standard error).

Treatment	Egg weight	Egg length	Egg width	Egg shape index	Shell weigh t	Shell thickness	Egg mass
T1	0.2±11.88 ^{a} 6	0.5±25.98 ^{a} 2	1±30.43 ^{a} .33	0.01±0.79 ^{a}	±1.24 ^{a} 0.10	0.00±0.28 ^{a}	2±454.53 ^{b} 3.84
T2	0.1±11.77 ^{a} 4	0.2±23.37 ^{ab} 1	0±30.53 ^{a} .36	0.00±0.76 ^{ab}	±0.28 ^{b} 0.00	0.00±0.28 ^{a}	0±491.93 ^{ab} .63
T3	0.2±11.77 ^{a} 2	1.4±20.57 ^{b} 9	0±26.54 ^{b} .92	0.02±0.71 ^{b}	±0.28 ^{b} 0.00	0.00±0.28 ^{a}	2±532.33 ^{a} 3.64
Sig.	N.S	**	**	**	**	N.S	*

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Table (5) show that the color of the yolk ranges from 7.53-8.98, and the dark color of the yolk is affected by the quality of the feed eaten, because poultry do not make yolk pigments, but rather absorb them from the feed at a rate of 20-60% of the feed dye, especially the carotene dye found in the ration (Hilmi *et al*., 2015; Amo *et al*., 2013). The presence of essential fatty acids in the diet affects the color of the yolk, as the color of the yolk becomes pale as a result of absorbing these acids, especially omega-3 and omega-6, and this is consistent with what was stated (Alagawany *et al*., 2019), When using wormwood blocks, he indicated a significant increase in the height and index of the yolk, or the superiority in the height and evidence of the yolk was attributed to the plant's containment of active substances that have a similar action to estrogen, it increases neutral fats, lipoproteins and free fatty acids, which was one of the basic ingredients of egg yolk, the addition of hemp seeds to the quail diet led to the production of a pale egg yolk color due to the presence of unsaturated fatty acids, the increase of seeds by 3% to the bush white chicken, leads to giving a red color of yolk and an increase in the yellow color, as it is considered undesirable by the consumer, as the tincture of the young ones depends on the ingredients of the ration consumed (Skřivan *et al*., 2019; Cufadar *et al*., 2022).

Table (5) The effect of feeding Japanese quail parents with omega-3 fatty acid and sunflower oil on the internal qualitative traits of the egg (mean ± standard error).

Treatment	Yolk hight	Yolk diameter	Yolk weight	Yolk index	Yolk color	Albumin hight	Albumin weght	Hough unit
T1	0.46±9.01 b	0.3±24.85 ab 3	0.±0.35 b 01	0.01±0.35 b	±9.00 a 0.28	0.06±4.17 ab	0.3±6.41 a 3	0.±86.51 a 82
T2	0.1±10.80 a 5	0.5±23.70 b 0	0.±0.43 a 01	0.01±0.43 a	±6.00 b 0.28	0.28±3.71 b	0.2±6.01 a 6	8.±75.46 a 38
T3	0.1±10.69 a 5	0.6±25.69 a 4	0.±0.41 a 01	0.01±0.41 a	±5.22 b 0.22	0.11±4.41 a	0.1±4.41 b 1	0.±88.92 a 69
Sig.	**	*	**	**	**	*	**	N.S

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