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Effect of different methods of using blackseed (Nigella sativa L.) to the diet and drinking water on productive traits of laying hens.

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Abstract:

This experiment was carry to demonstrate the effect adding of powder, oil, aqueous and alcoholic solutions of blackseed (*Nigella sativa*), separately, on prodctive triat of ISABrown hens. 75 laying hens (ISABrown) of 43 weeks of age were used, distrebuted into five pen treatments, the pen for each treatment group was partition into 3 equal parts (5 birds). The treatments were as follows: T1 (control treatment): I give the usual diet without any additives. T2: Add 10% Nigella sativa (Nigella sativa) powder to the feed. T3: 10% of the alcoholic extract of blackseed (Nigella sativa) is added to the drinking water. T4: 10% aqueous extract of blackseed (Nigella Sativa) is added to drinking water. T5: Add 10% Nigella Sativa (Nigella sativa) oil to the feed. The results indicated that all coefficients of adding blackseed (Nigella sativa) increased by 10%, led to a significant improvement on the productive performance of laying hens. The administration of blackseed (Nigella sativa) extracts in drinking water gave the best productive performance compared to its addition in the feed. T3 treatment, represented by adding the alcoholic extract of the blackseed in the drinking water, gave the best results significantly compared to the rest of the treatments.

Keywords: Methods, blackseed (Nigella sativa L.), productive traits, laying hens.

Introduction:

Medicinal plants and herbs were used at the emergence of human civilizations, *Nigella sativa* was discovered in the tomb of Tutankhamun (Nooruddin, 2003). Burits and Bucar (2000) referred to Nigella sativa as one of the medicinal plants that were used in the treatment of many diseases in the time of the Sumerians (2500 BC), especially during the reign of the Assyrian king Ashurbanipal. Dioscordis record, Greek physician from the first century (Al-Najjar, 1997).

Feeding laying hens (Hisex) with a diet containing blackseed at a rate of 4% led to a significant improvement in egg production (Hassan and Alaqil, 2014). Japanese quail feed on diets containing blackseed powder at a level of 50 g/kg feed improved egg productivity compared to diets containing both 0 and 20 g/kg feed (Szczerbinska *et al*., 2020). The addition of blackseed powder at a rate of 5% significantly improved the percentage of egg production for local laying hens compared to the addition of garlic and lettuce and the control treatment (Mohammed et al., 2021). The addition of blackseed powder at a level of 2%, in addition to adding its oil at a rate of 0.5%, significantly improved the egg productivity of laying hens (Laudadio et al., 2005).

The aim of this study was to provide the blackseed by either a crushed or oil form in the feed or as an aqueous and alcoholic extract in the drinking water, to find out its effect on the productive performance of ISA Brown hybrid laying hens.

Materials and Methods

Experiment design

This experiment was conducted in a laying hens field at the Agricultural Research and Experiment Station affiliated to the College of Agriculture, Al-Muthanna University for the period from 10/15/2022 to 1/7/2023 for a period of 12 weeks. During which, the effect of adding blackseed powder, blackseed oil, and an aqueous and alcoholic solution of black seed, each separately, was studied on the hen production. 75 layinghens (ISA Brown) at 43 weeks of age, were used, it was distributed among five treatments distributed over five coops (3 x 3 m) and each coop was divided into three equal sections so that each section contains 5 laying hens (15 laying hens/treatment):

T1: control treatment.

T2: 10% blackseed powder was added to the feed.

T3: 10% of the alcoholic extract of the blackseed was added to the drinking water.

T4: 10% of the aqueous extract of the blackseed was added to the drinking water.

T5: 10% blackseed oil was added to the feed.

2.2 Preparing and preparing the blackseed in the experimental treatments

Blackseed seeds were obtained from the local market in the required quantities, to be used in the experiment, as well as Blackseed Crush, alcoholic extract, aqueous extract and Blackseed Oil.

Productive traits

EggProduction Percent: (North, 1984):

$$Egg\ production\ (\%) = \frac{\text{Egg produced during 14 days}}{\text{Duration (days)} \times \text{Birds number}} \times 100$$

Egg Weight

The egg weight was taken for replicate, the egg weight mean per replicate of the treatments during each period of the experiment was determined, according to the average cumulative egg weight for each replicate and for every two weeks.

Feed intake during two weeks:

Provide the feed at a rate of 115 g / bird per day.

Egg mass:

The eggmass can be clculated by eggs No. produced by each hen by egg weight according to Al-Fayyad and Naji (1989):

Mass of eggs produced = eggs produced number during x egg weight (gm)

Feed Convrsion Coeficient:

The total feed convrsion factor was calculated by converting a gram of feed into a gram of eggs, according to the equation mentioned by Ibrahim (200):

$$Feed\ Conversion = \frac{\text{Feed intake}}{\text{Egg mass}}$$

Results and discussion

Different methods of by blackseed (*Nigella sativa* L.) in feed and drinking water for bird on HD(%) during (43-54 weeks) (Table 1). No-significant differences among all experimental treatments at 43-44 weeks of age of laying hens. At week 45-46, a significant increase ($P \leq 0.05$) was noted for T3 (adding alcoholic extract of blackseed

powder to drinking water at a rate of 10%) compared to T2 (adding 10% of crushed blackseed to the feed) and T5 (adding 10% of blackseed oil to the feed) and T1(control treatment). No- differ among T3 and T4, T2 and T4, T2, T4 and T5, and T1, T2 and T5. As for the 47-48 week, increased for T3 compared to T4 and T5 compared to T1. No-differ between T4, T5 and T2 and between T2 and T1 treatments. In week 49-50, increased was noted for T3 compared to T4, which increased significantly (P≤0.05) compared to T2 and T1. No-differ between T4 and T5, as well as between T5 and T2. As for the 51-52 weeks, a significant increase (P≤0.05) between T3 compared to T4, which in turn increased significantly (P≤0.05) compared to T2 and T1. No-significant differ between T4 and T5 and T5 and T2. As for the 53-54 weeks, a significant increase (P≤0.05) is observed in treatment T3 compared to treatment T4, and T4 in comparison to T2 and T1. No-differ between T4 and T5 and between the T5 and T2.

Table (1): Impactof different methods of using blackseed (*Nigella sativa* L.) in deit and drinking water for layinghens on HD (%) during the weeks of production (43-54 weeks) (mean± standard error).

Treatments	Age (Week)						Total
	44-43	46-45	48-47	50-49	52-51	54-53	
T1	0.19±86.12	0.56±85.43 c	0.02±85.10 c	0.07±84.74 d	0.05±84.46 d	0.06±84.08 d	0.06±84.99 d
T2	0.11±85.95	0.17±85.75 bc	0.15±85.57 bc	0.15±85.38 c	0.16±85.14 c	0.17±84.89 c	0.12±85.45 c
T3	0.20±86.01	0.40±87.02 a	0.29±86.73 a	0.27±86.57 a	0.26±86.33 a	0.25±86.21 a	0.21±86.48 a
T4	0.11±85.85	0.20±86.33 ab	0.15±86.12 b	0.12±85.99 b	0.13±86.79 b	0.14±85.60 b	0.14±85.95 b
T5	0.19±86.00	0.12±85.95 bc	0.09±85.77 b	0.08±85.59 bc	0.07±85.40 bc	0.07±85.16 bc	0.09±85.65 bc
Sig	N S	0.05	0.05	0.05	0.05	0.05	0.05

Table No. (2) shows the effect of different methods of using blackseed (Nigella sativa) in feed and drinking water for laying hens on the average egg weight during the weeks of production (43-54 weeks). No statistically differences among all experimental treatments at 43-44 weeks of age in laying hens. At week 45-46, there was increase in T3 compared to T2. There were no significant differences between T3, T4 and T5. At week 47-48, there was increase for T3 compared to T1 and for T5 compared to T1. No statistically differences between T3, T4, T5, and T2 treatments, as well as between T2 and T1 treatments. At week 49–50, there was increased for T3 compared to T2 and for T2 compared to T1. No statistically differences between T3, T4, and T5, as well as between T5 and T2 treatment. At week 51–52, there was a significant increase (P≤0.05) for T3 compared to T5 and for T2 compared to T1. There were no significant differences between T3 and T4 treatments, as well as between T4 and T5 treatments. At week 53–54, there was a significant increase (P≤0.05) for T3 compared to T4 and T2 compared to T1. No statistically differences between T5 and T2 treatments.

Table (2): Effect of different methods of using black cumin seeds (*Nigella sativa* L.) in feed and drinking water for laying hens on the average egg weight (gm) during production weeks (43-54 weeks) (mean ± standard error).

Treatments	Age (Week)						Total
	44-43	46-45	48-47	50-49	52-51	54-53	
T1	0.27±61.83	0.14±62.90 c	0.35±65.17 b	0.44±67.47 c	0.21±68.90 d	0.13±70.12 d	0.04±66.06 c
T2	0.09±61.98	0.21±64.19 b	0.12±65.89 ab	0.02±68.38 b	0.16±70.10 c	0.15±70.92 c	0.06±66.91 b

T3	0.25±61.71	0.33±65.10 a	0.22±66.50 a	0.21±69.79 a	0.18±71.12 a	0.31±72.84 a	0.20±67.83 a
T4	0.08±61.83	0.32±65.47 a	0.24±66.29 a	0.29±69.54 a	0.06±70.68 ab	0.11±72.18 b	0.11±67.67 a
T5	0.27±61.72	0.18±65.11 a	0.17±66.03 a	0.19±68.97 ab	0.12±70.20 bc	0.16±71.13 c	0.10±67.20 b
Sig.	N.S	0.05	0.05	0.05	0.05	0.05	0.05

Table No. (3) shows the effect of different methods of using black cumin seeds (Nigella sativa) on the feed and drinking water for laying hens on the egg mass during the production weeks (43-54 weeks). No statistically differences between all experimental treatments at 43-44 weeks of age in laying hens. At week 45-46, there was a significant increase (P≤0.05) for T3 compared to T5, as well as T2 compared to T1. No statistically differences between T3 and T4, and T4 and T5. At week 47-48, there was increase (P≤0.05) for T3 compared to T5 and for T2 compared to T1. No statistically differences between T3 and T4 treatments, aswell as between T4, T5 and T2 treatments. At week 49-50, there was a significant increase (P≤0.05) for T3 compared to T5, as well as T2 compared to T1. No statistically differences between the treatments of T3 and T4, T4 and T5, T5 and T2. At week 51–52, a significant increase (P≤0.05) occurred in T3 compared to T4, as well as between T2 and T1. No statistically differences between T5 and T2. At week 53-54, there was a significant increase (P≤0.05) for T3 compared to T4, as well as T2 compared to T1. No statistically differences T5 and T2.

Table (3): Effect of different methods of using black cumin (*Nigella sativa* L.) seeds in feed and drinking water for laying hens on egg mass during production weeks (43-54 weeks) (mean ± standard error).

Treatments	**Age (Week)**						**Total**
	44-43	**46-45**	**48-47**	**50-49**	**52-51**	**54-53**	
T1	0.17±53.25	0.14±53.73 d	0.28±55.46 c	0.42±57.18 d	0.19±58.19 d	0.07±58.96 d	0.00±56.13 e
T2	0.09±53.27	0.15±55.05 c	0.10±56.38 b	0.11±58.38 c	0.18±59.69 c	0.18±60.20 c	0.06±57.16 d
T3	0.21±53.08	0.03±56.66 a	0.00±57.68 a	0.13±60.42 a	0.06±61.40 a	0.08±62.79 a	0.06±58.67 a
T4	0.13±53.09	0.40±56.52 ab	0.31±57.09 ab	0.22±59.80 ab	0.14±60.64 b	0.09±61.79 b	0.18±58.16 b
T5	0.35±53.08	0.08±55.96 b	0.21±56.64 b	0.22±59.03 bc	0.14±59.95 c	0.15±60.58 c	0.13±57.54 c
Sig.	N.S	0.05	0.05	0.05	0.05	0.05	0.05

Table No. (4) shows the effect of different methods of using black cumin seeds (Nigella sativa) in feed and drinking water for laying hens on the feed conversion factor during the weeks of production (43-54 weeks). No statistically differences between all experimental treatments at 43-44 weeks of age in laying hens. At week 45-46, there was a significant improvement (P≤0.05) for T3 compared to T5, as well as T2 compared to T1. There are no significant differences between T3 and T4 treatments, as well as between T4 and T2 treatments. At week 47-48, there was improvement (P≤0.05) for T3 compared to T5, and also between T2 compared to T1. No statistically differences between T3 and T4 treatments as well as between T4, T5 and T2 treatments. At week 49-50, there was a significant improvement (P≤0.05) for T3 compared to T5, as well as T2 compared to T1. No statistically differences between T3 and T4 treatments as well as between T4 and T5 and T5 and T2 treatments. At week 51–52, there was a significant improvement (P≤0.05) for T3 compared to T4 and for T5 compared to T1. No statistically differences between T5 and T2. At week 53–54, there was a significant improvement (P≤0.05) for

T3 compared to T4 and for T5 compared to T1. No statistically differences between T5 and T2 treatments.

Table (4): Effect of different methods of using black cumin seeds (Nigella sativa L.) in feed and drinking water for laying hens on the feed conversion factor during production weeks (43-54 weeks) (mean ± standard error).

Treatments	Age (Week)						Total
	44-43	46-45	48-47	50-49	52-51	54-53	
T1	0.006±2.065	0.005±2.047 d	0.010±1.983 c	0.014±1.924 D	0.006±1.890 d	0.002±1.865 d	0.005±1.96 e
T2	0.003±2.064	0.005±1.998 c	0.003±1.950 b	0.003±1.884 C	0.005±1.842 c	0.005±1.827 c	0.002±1.928 d
T3	0.008±2.072	0.001±1.941 a	0.002±1.906 a	0.004±1.820 A	0.001±1.791 a	0.002±1.751 a	0.002±1.887 a
T4	0.005±2.072	0.013±1.946 ab	0.010±1.926 ab	0.006±1.839 Ab	0.004±1.813 b	0.002±1.780 b	0.006±1.896 b
T5	0.014±2.072	0.002±1.965 b	0.007±1.942 b	0.006±1.863 Bc	0.004±1.834 c	0.0042±1.815 c	0.004±1.915 c
Sig.	N.S	0.05	0.05	0.05	0.05	0.05	0.05

The obtained results indicate a significant improvement in all productive traits of laying hens

Represented by each of HD, averages egg weght, egg mass and feed conversion factor for all treatments of adding blackseed to diets and drinking water for laying hens. The addition of 10% of the alcoholic extract of blackseed powder to the drinking water of laying hens gave the best results compared to the othres.

The addition of alcoholic and aqueous extract to drinking water, were significantly superior compared to the addition of both crushed and blackseed oil to the feed, it may be due to ensuring that the blackseed extracts reach the birds through drinking water compared to adding it to the feed, which was used at very low levels and which may have a low rate of access to birds, in addition to the effective compounds contained in blackseed powder, the most important of which are thymoquinone and nickelone, which have a major role in stimulating the work of digestive enzymes to benefit greatly from nutrients, these two compounds are one of the most important components of the volatile oil in the black seed

Which improves the digestion of both protein and fat, by the secretion of alimntary duct digest juices in the, achieves the highest benefit from the food intake (Zakir et al., 2022; Mohammed and Al-Gharawi, 2022). Some elements, the most important of which is calcium, are also stimulated, enters many metabolic pathways, which increases the permeability of cell membranes, facilitates the process of absorption in the small intestine, facilitating the passage of nutrients into cells, Phosphorus, which participates in calcium in stimulating thyroid activity, is also stimulated, increases the metabolic rate within the body, which improves performance (Kaim et al., 2022; Osowiecka and Myszkowska-Ryciak, 2023). In addition to its role as a natural antioxidant, as it stimulates the action of some enzymes, the most important of which is glutathione peroxidase, which has an important role in protecting the cells and tissues of the body from the danger of peroxides, educes or prevents the process of breaking down body proteins and thus improving productive performance (Malik et al., 2023; Al-Gharawi et al., 2018). Flavonoids may be, which has a similar structure to steroid hormones, that stimulate the secretion of gonadotropin-releasing hormones, the most

important of which are FSH (Follicle Stiulating Hormone) and LH (Luteinizing Hormone), which works to increase the stimulation of egg production (Al-Gharawi and Al-Ebadi, 2020: Alaee et al., 2023). Zaazaa *et al*.(2020) indicated that blackseed contains protein of good quality, by containing essential amino acids, the most important of which is methionine, which plays a big role in increasing the size of eggs.

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