

Impact of E-Sel supplementation on egg production, fertility, and hatchability in Japanese Quail (*Coturnix japonica*)

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Abstract

Dietary deficiencies, particularly in vitamins and minerals, are critical issues in poultry nutrition, often leading to reduced egg production, fertility, and hatchability. This study aimed to evaluate the effects of Vitamin E, selenium, and zinc supplementation on egg production, fertility, and hatchability of Japanese Quail (*Coturnix japonica*). The study was conducted in a Private facility in Rahim Yar Khan (Punjab) from February 2022 to May 2022 to explore the effects of supplementations (E-SEL, Albovit Selenex Plus) on egg production, fertile eggs and hatched chicks of Japanese quail kept under captivity. The birds were categorized into two groups, i.e., a control and an experimental group, each consisting of one male and three females. It was observed that the supplementations showed significant effects on fertility at $P < 0.05$ with maximum egg fertility of 91%, and increased egg production and hatchability of 86% were noticed in the experimental group. It was concluded that supplementation has good impacts on egg production, fertility, and hatchability of Japanese Quail.

Keywords: Supplementations, Japanese Quail, egg productions, fertility, hatchability

Introduction

Japanese quail was considered a culinary dish in the early 1900s before transitioning into a subject for scientific study in the mid-20th century focused on egg production. Initially recognized as a warbler, the Japanese quail became domesticated during the 11th century. Due to its ease of handling, it is deemed an ideal research subject and is predominantly originated in E. Asia (Anthony et al., 1996; Lukanov and Pavlova, 2020). Japanese quails are simpler to

manage and inexpensive, and they can be sold once they reach 5 weeks old, starting to reproduce and hatch eggs by the age of 6 weeks (Randall & Bolla, 2008). They were mainly bred in Japan for consumption purposes, with the original farming activities dating back to 1595 (Priti & Satish, 2014). According to Lukanov (2019), a review study provides roughly 10% of the world's table eggs, and their meat accounts for 0.2% of all poultry produced worldwide. The population of domestic quails produces meat and eggs and makes up around 11.8% of all productive birds, ranking them second only to laying hens. Leading nations in the world for quail farming are China, Spain, France, Italy, Brazil, the United States, and Japan.

These feathered creatures were initially bred for their melodious songs and were known to have frequently joined singing contests. Japanese breeders began utilizing selective breeding techniques to enhance egg production in chickens during the early 1900s. The demand for quail eggs skyrocketed by 1940. However, due to the impact of World War II, almost all quail breeds engineered for egg yield and those cultivated for their musical abilities were completely wiped out. The surviving quails were employed to revive the post-war industry, and all current commercial and research breed strains are believed to trace their origins back to this group of quails today (Kirkwood & Hubrecht, 2010; Mills et al., 1997).

The unique and specific mating behavior of Japanese quails is quite distinct. The male initiates the mating process by gripping the female's neck before mounting her. Following this, the male arches his back to expand his cloaca and achieve cloacal contact with the female. The presence of foam in the female's cloaca indicates successful insemination. Post-mating, the male typically engages in a noticeable strut. Females can assist in mating by remaining still and lowering themselves to facilitate the male's access to their cloaca. Alternatively, they may impede mating by standing upright and avoiding the male. It has been proven that male aggression towards females during mating reduces the chances of successful copulation (Correa et al., 2011).

It was detected that selenium is used as a supplement in Quail's sexual behavior and reproductive capabilities boosting male testosterone levels and increasing female egg production (El-Kazaz et al., 2020). The stored selenium and vitamin E in the Quail diet boosted the albumen levels and caused decreased weight loss in these eggs. The inclusion of Vitamin E and Selenium, especially Sel-Plex, in their diet improved the egg production of quails (Nemati et al., 2020). Feeding Japanese quail (*Coturnix japonica*) with selenium and vitamin E has been shown to elevate their selenium levels, protein content, and antioxidant properties. This supplementation also reduces fat and cholesterol levels in their eggs and yolks (Łukaszewicz et al., 2007). Research was also conducted to evaluate the effects of micro ZnO (Zinc Oxide), revealing that sets of quails with micro ZnO had relatively thicker eggshells, along with increased egg surface

and weight (Abbasi et al., 2022). This research aimed to observe the effects of supplementation of Vitamin E, Selenium, and Zinc on egg production, fertility, and hatchability of Japanese quail.

Material and methods

Experimental Site, Categorization, and Placement of Japanese Quail

The present study took on the Japanese Quail (*Coturnix japonica*) in a Private area in Rahim Yar Khan under captivity. The research study was conducted for four months, from February 2022 to May 2022. A total of 16 Japanese quails were selected for the research study. Quails' male and female were selected based on their sexual maturity. These 16 Japanese quail were distributed into groups labeled Group I as the control group and Group II as the experimental group. Each group had an equal number of quails (1 male : 3 Females), and groups were kept in replicates. Both control (Group I) and the experimental groups (Group II) were housed in different labeled cages for four months (February, March, April, and May). During this period the experimental group was supplemented with E-sell (Albovit Selenex Plus) into their drinking water 2 mL/L while the control group was kept without a supplementary diet. Supplementation was only provided to the experimental group to see the differences in egg production, fertility, and hatchability among the two groups (ur Rehman et al., 2023).

Enclosure Design and Feed

The quails' cages were typical house-shaped structures made of iron 20 inches in length, 15 inches in width, and 18 inches in height. The doors of the cages were also made of steel and present on the front side. Inside the cage, there was a plastic tray at the bottom. Each cage has its water pot and feeding tray. Every day, the quails get their meals from Asia Poultry Feeds Pvt Ltd. The food comes as crumbling small pieces made from bigger pellets that got broken. This feed was balanced with grains, protein meals, vitamins, minerals, and amino acids. In each of the four cages, feeding trays were utilized to add fresh feed daily and remove leftover feed. The supplementation used for the study was named Selenex Plus (VITAMIN E, SELINUM, and ZINC) of Albovit. This product consists of vitamin E 200, 000 mg, selenium 1000 mg, and zinc 400 mg in 1000 ml of oral liquid.

Collection of Eggs

The breeding season of the quail started in the middle of March and the quail started laying eggs. Eggs from both experimental and control groups were collected daily in the morning before changing the feed and drinking water in each cage.

Incubation and Candling

The incubation period of quail is 21 days. The incubation temperature was 100.1 °F, and humidity was 65% for the first 17 days; humidity was changed to 70 % for the last 4 days. The total incubation period of eggs was 17 days and the candling after 10 days of incubation was performed by the man-made candling box to note the fertility results in both the experimental and control groups. After candling, the fertile eggs were kept in the incubator and the remaining or unfertile eggs were removed. After the 21-day incubation period, the hatched eggs of the experimental and control groups were recorded to find the fertility and hatchability ratios.

Brooding

After hatching of quail chicks, they were added to a 500-chick capacity designed brooder. Hatched eggs of experimental and control groups were kept in the brooder for the first 8 weeks with the water and starter feed. Initially, in the first week, the temperature was at 95 degrees, and then every week, 5 degrees was decreased. A Screen lid was added to the brooder to check the jumping of quail chicks. The brooder provided the quail chicks plenty of room to grow and remain active. The total period of brooding quail chicks was 8 weeks, during which they developed feathers, and after developing feathers at the end of the 8th week of brooding, they were shifted to the cages in their permanent house.

Results

The basic purpose of this research work was to improve the egg-laying capacity, fertility, and hatchability of quails by giving supplementations (E-sel).

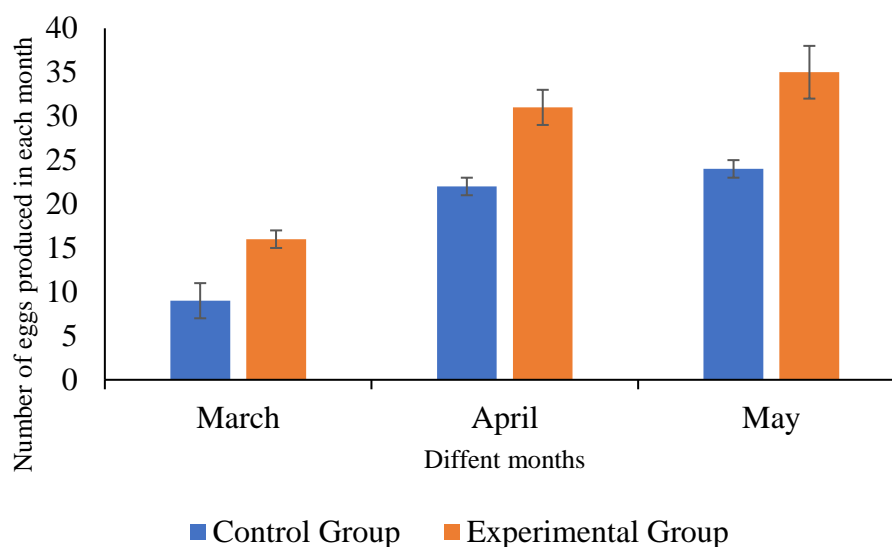


Figure 1. Monthly comparison of egg production in control and experimental groups

After egg production, eggs were candled on the 10th day of incubation to observe their fertility.

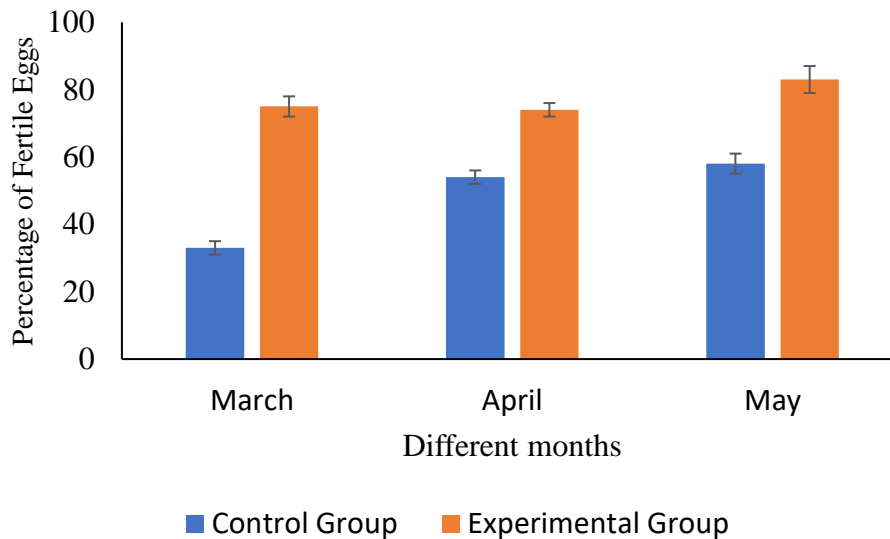


Figure 2. Monthly comparison of egg fertility percentage in control and experimental groups. Then, after 21 days of incubation, the hatching was observed to compare the differences between the control and experimental groups.

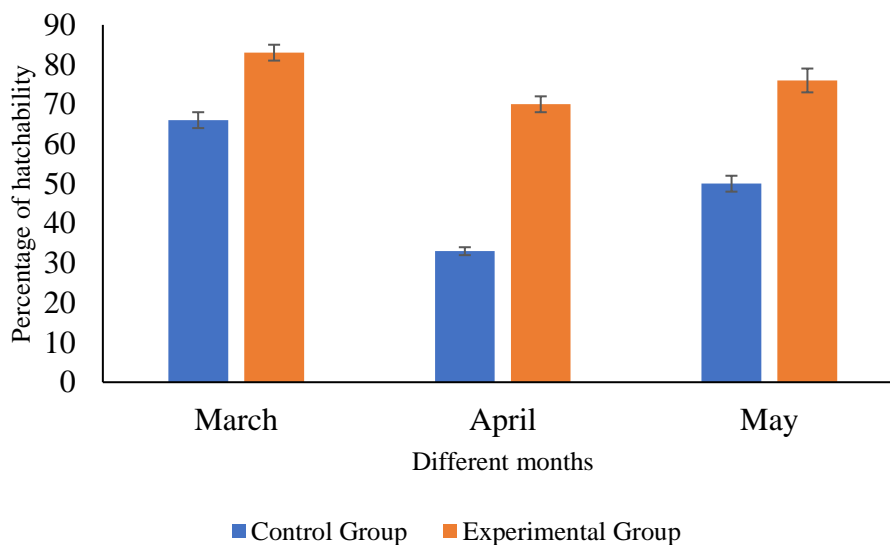


Figure 3. Monthly comparison of hatchability percentage in control and experimental groups

Discussion

A small effect of supplementation was noticed for the mean egg production in the quail between the control and experimental groups. Our results were closely related to the results of Puthongsiriporn et al. (2001) who reported levels of nutritional selenium have influenced egg production. The study was also compared with Rengaraj et al. (2015), who described

hens treated with the vitamin E and selenium-enhanced eating routine and showed a superior exhibition in egg production and egg mass. According to Mohiti-Asli et al. (2008) and Chitra et al. (2013), consideration of selenium or vitamin E in the eating regimen has fundamentally increased the production of eggs. Urso et al. (2015) inferred that the dietary supplementation of zinc, selenium, and vitamin E (120 mg/kg feed) could be utilized to increase the egg production and brooding reaction. Sahin et al. (2006) analyze the effects of dietary supplementation with vitamin E (dl- α -tocopheryl-acetate), lycopene, and their combination on egg production, egg quality, and concentrations of vitamin E, A, and cholesterol in serum and egg yolk were examined in Japanese quails. Each supplementary group produced more eggs and had a higher Haugh unit as compared to the control group. However, the results of Aghaei et al. (2017) were controversial to our findings.

(Deeming et al., 2002) reported fertility of eggs is one of the main considerations deciding the hatchability of each egg set. (Nawab et al., 2018) the mechanism of vitamin E and its potential impacts on reproduction functions in chicken species are better understood thanks to the crucial scientific knowledge he provided. Several factors, including food, minerals, vitamins, climate change, and others, can impact fertility. Animals and poultry birds become more fertile because of vitamin E's anti-inflammatory and disease-resistance-boosting effects on infectious agents in animals. Numerous studies have documented how low vitamin E levels affect fertility in both human and avian species.

In the present study, there was a significant effect of supplementations on the percentage of egg fertility ($p < 0.05$) observed between two groups. The present study results were closely related to (Ali et al., 2013), who studied the impact of vitamin E-Selenium supplementation on quails. The study agreed that supplementation has a huge impact on the fertility and hatchability of quails. Most noteworthy fruitfulness (88%) and hatchability (81%) were recorded in 1:1 mating subgroup enhanced by means of Vitamin E-Selenium. Mating gathering of 1:1 and 1:3 is suggested for superior richness and hatchability and monetary viewpoint. Our results are closely related to the results of (Ali et al., 2013), fertility within the Vitamin E - Selenium enhanced gatherings be all together ($p < 0.05$) upper than the controls. Also, fertility can influence hatchability during the cycle of brooding and incubating (Farooq et al., 2001).

There was also affect of supplementations on eggs hatchability of quails were observed in the present study. We observed the maximum hatchability with 86%. Statistically, the mean minimum percentage of hatchability was observed in March then April and then

The maximum hatchability percentage was recorded in the month of May in both groups. Our results are somehow similar and related to the results of (Adebiyi et al., 2014) reported that the rate of hatchability is fundamentally upper for birds lying on T4 (91.67%). From the examination it tends to be closed that enhancing guardian turkey go on a diet with nutrient E and selenium at 125 mg/kg and 0.15 mg/kg of the eating routine separately further developed rate hatchability and rate survivability of their poults. The results of the present study are more significant than results in hatchability of Ali et al. (2013). The Quails enhanced among Vitamin E - Selenium have altogether higher hatchability (71%) as compared with control bunch (68%). The huge relationships between the incubation components and the hatchability of eggs is gotten (Koenig et al., 1982). Our outcomes were in dissimilarity to the examination performed by (Hossain et al., 1998), who revealed that fertility and hatchability were not influenced by Vitamin E-Selenium supplementation within oven reproducer hens. The results of current study showed similarity to findings of several literature studies that vitamin E and zinc supplements, both organic and inorganic, significantly impacted the quantity, quality, and hatchability of Japanese quail eggs under various dietary conditions (Ahmadian et al., 2020; Ameen et al., 2022; Nasar et al., 2022).

Conclusion

It was concluded that the Japanese quail egg productions, fertility and hatchability improved with the supplement as all studied parameters were found higher in experimental group than control group. So, it was found that the supplementations have the greater impact on the breeding potential of Japanese quail.

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