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Research Article

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 East 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 the 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 were 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 broader 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 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).

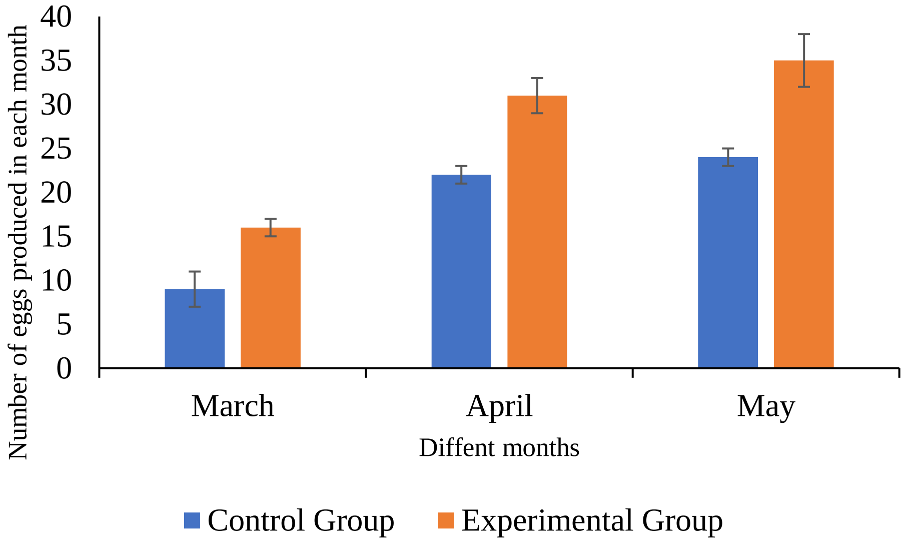

Figure 1. Monthly comparison of egg production in control and experimental groups

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

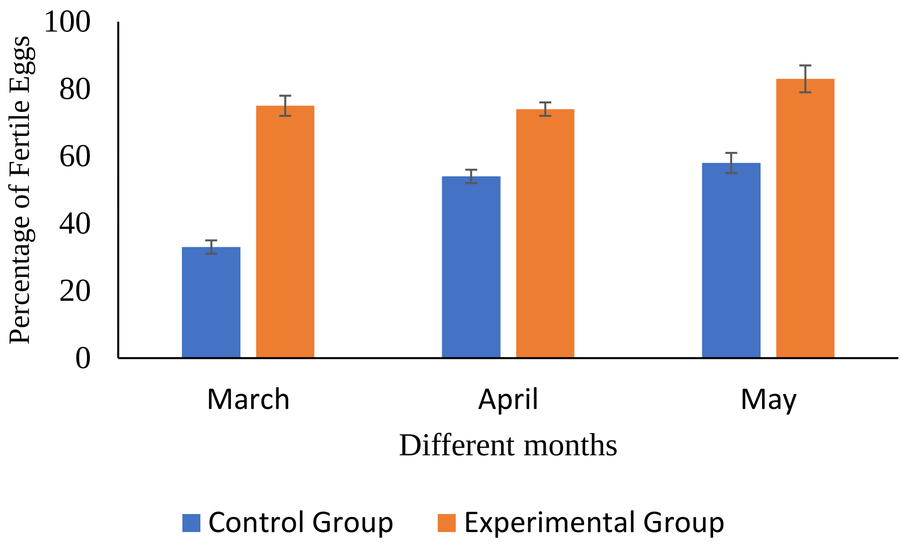

Figure 2. Monthly comparison of egg fertility percentage in control and experimental groups

Then, after 21 days of incubation, the hatching was observed to compare the differences between the control and experimental groups.

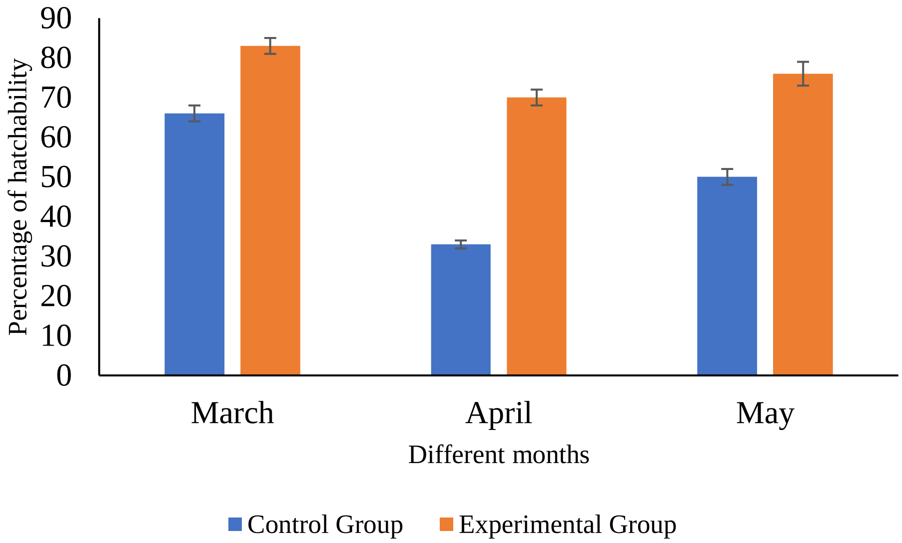

Figure 3. Monthly comparison of hatchability percentage in control and experimental groups

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 Puthpongsiriporn 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 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 theproduction 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-a-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 higherHaugh 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 vitaminE and its potential impacts on reproduction functions in chicken species are better-understoodthanks 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 andhatchability of quails. Most noteworthy fruitfulness (88%) and hatchability (81%) were recorded in 1:1 mating subgroup enhanced by means of Vitamin E-Selenium. Matinggathering 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 theVitamin E - Selenium enhanced gatherings 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 an affect of supplementations on eggs hatchability of quails observed in the present study. We observed the maximum hatchability at 86%. Statistically, the mean minimum percentage of hatchability was observed in March then April, and then the maximum hatchability percentage was recorded in 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 higher for birds lying on T4 (91.67%). From the examination, it tends to be closed that enhancing guardian turkeys go on a diet with nutrient E and selenium at 125 mg/kg and 0.15 mg/kg of the eating routine separately further developedrate hatchability and rate survivability of their poults. The results of the present study are more significant than the results in the 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 examinationperformed 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 improvedwith the supplement as all studied parameters were found higher in experimental group thancontrol group. So, it was found that the supplementations have the greater impact on the breeding potential of Japanese quail.

References

Abbasi, M., Dastar, B., Afzali, N., Shargh, M. S., & Hashemi, S. R. (2022). The effects of nano and micro particle size of zinc oxide on performance, fertility, hatchability, and egg quality characteristics in laying Japanese quail. Biological Trace Element Research, 200(5), 2338-2348.

Aghaei, A., Khosravinia, H., Mamuoei, M., Azarfar, A., & Shahriari, A. (2017). Effects of dietary supplementation of zinc and α-tocopheryl acetate on performance and zinc concentrations in egg and tissues of Japanese quails.

Ahmadian, H., Nemati, Z., Karimi, A., Safari, R., Sheeikhlou, M. R., & Besharati, M. (2020). Effect of Selenium with Vitamin E on Production Performance, Immune Response and Blood Metabolites of Laying Japanese Quail. Iranian Journal of Animal Science Research, 12(3), 337-349.

Ali, U., Khan, S., Rafiullah, N.C., Shah, Z.A., Akhtar, A., & Tanweer, A.J. (2013). Effect of male to female ratio and vitamin-E Selenium on fertility, hatchability and hatched chick weight of quail breeders. Sarhad Journal of Agriculture, 29(3).

Ameen, M. H., Wahhab, M. A., & Kareem, M. T. (2022). Influence of Dietaries Combined Vitamin E and Selenium Powder on Eggs' Fertility and Hatchability in Japanese Quail. Journal of Zankoy Sulaimani-Part A, 24(2), 115-122.

Anthony, N. B., K. E. Nestor, and W. L. Bacon. 1986. Growth curves of Japanese quail as modified by divergent selection for 4-week body weight. Poult. Sci. 65:1825–1833.

Chelmonska, B., Jerysz, A., Lukaszewicz, E., & Kowalczyk, A. (2007). The effect of proctodeal gland foam, and depth and frequency of artificial insemination on fertility and hatchability of Japanese quail (Coturnix japonica). Turkish Journal of Veterinary & Animal Sciences, 31(3), 171-178.

Chitra, P., Edwin, S. C., & Moorthy, M. (2013). Dietary inclusion of vitamin E and selenium on egg production, egg quality and economics of Japanese quail layers. Tamilandu Vet Anim Sci, 9, 51-60.

Correa, S. M., Horan, C. M., Johnson, P. A., & Adkins-Regan, E. (2011). Copulatory behaviors and body condition predict post-mating female hormone concentrations, fertilization success, and primary sex ratios in Japanese quail. Hormones and behavior, 59(4), 556-564.

Deeming, D.C., & Wadland, D. (2002). Influence of mating sex ratio in commercial pheasant flocks on bird health and the production, fertility, and hatchability of eggs. British Poultry Science, 43(1): 16-23.

El-Kazaz, S. E., Abo-Samaha, M. I., Hafez, M. H., El-Shobokshy, S. A., & Wirtu, G. (2020). Dietary supplementation of nano-selenium improves reproductive performance, sexual behavior and deposition of selenium in the testis and ovary of Japanese quail. Journal of advanced veterinary and animal research, 7(4), 597.

Farooq, M., Aneela, K., Durrani, F. R., Muqarrab, A. K., Chand, N., & Khurshid, A. (2001). Egg and shell weight, hatching and production performance of Japanese broiler quails.

Hossain, S. M., Barreto, S. L., Bertechini, A. G., Rios, A. M., & Silva, C. G. (1998). Influence of dietary Vitamin E level on egg production of broiler breeders, and on the growth and immune response of progeny in comparison with the progeny from eggs injected with Vitamin E. Animal Feed Science and Technology, 73(3-4): 307-317.

Khan, M. M., Hossain, M. N., Baset, M. A., & Uddin, M. N (2018). Effect of organic selenium supplementation on productive and reproductive performances of Japanese quail. J. Sylhet Agril. Univ. 5(2):113 – 119.

Kirkwood, J., & Hubrecht, R. C. (2010). The UFAW handbook on the care and management of laboratory and other research animals. John Wiley & Sons.

Lukanov, H. (2019). Domestic quail (Coturnix japonica domestica), is there such farm animal?. World's poultry science journal, 75(4), 547-558.

Lukanov, H., & Pavlova, I. (2020). Domestication changes in Japanese quail (Coturnix japonica): a review. World's Poultry Science Journal, 76(4), 787-801.

Mills, A. D., Crawford, L. L., Domjan, M., & Faure, J. M. (1997). The behavior of the Japanese or domestic quail Coturnix japonica. Neuroscience & Biobehavioral Reviews, 21(3), 261-281.

Mohiti-Asli, M., Shariatmadari, F., Lotfollahian, H., & Mazuji, M.T. (2008). Effects of supplementing layer hen diets with selenium and vitamin E on egg quality, lipid oxidation and fatty acid composition during storage. Canadian Journal of Animal Science, 88(3): 475483.

Nasar, M. A., Rajput, N., Memon, A., & Mahmud, A. (2022). Impact of Organic Zinc and Vitamin-E Supplementation on Production Performance, Egg Quality and Hatching Traits of Japanese Quail. Pak-Euro Journal of Medical and Life Sciences, 5(2), 495-510.

Nawab, A., Ibtisham, F., Li, G., Kieser, B., Wu, J., Liu, W., ... & An, L. (2018). Heat stress in poultry production: Mitigation strategies to overcome the future challenges facing the global poultry industry. Journal of thermal biology, 78, 131-139.

Nemati, Z., Ahmadian, H., Besharati, M., Lesson, S., Alirezalu, K., Domínguez, R., & Lorenzo, J. M. (2020). Assessment of dietary selenium and vitamin E on laying performance and quality parameters of fresh and stored eggs in Japanese Quails. Foods, 9(9), 1324.

Priti, M., & Satish, S. (2014). Quail farming: an introduction. International Journal of Life Sciences, 2(2), 190-193.

Puthpongsiriporn, U., Scheideler, S. E., Sell, J. L., & Beck, M. M. (2001). Effects of vitamin E and C supplementation on performance, in vitro lymphocyte proliferation, and antioxidant status of laying hens during heat stress. Poultry science, 80(8): 1190-1200.

Randall, M., & Bolla, G. (2008). Raising Japanese quail. Primefacts, 602, 1-5.

Rengaraj, D., & Hong, Y. H. (2015). Effects of dietary vitamin E on fertility functions in poultry species. International journal of molecular sciences, 16(5): 9910-9921.

Sahin, K., Onderci, M., Sahin, N., Gursu, M. F., & Kucuk, O. (2003). Dietary vitamin C and folic acid supplementation ameliorates the detrimental effects of heat stress in Japanese quail. The Journal of nutrition, 133(6), 1882-1886.

ur Rehman, A., Rafi, U., Yasmeen, R., & Fayyaz, M. (2023). Effects of nutritional supplement E-Sel on the Egg production, Fertility, and Hatchability of Indian peafowl. Journal of Wildlife and Biodiversity, 7(4), 90-100.

Urso, U.R.A., Dahlke, F., Maiorka, A., Bueno, I.J.M., Schneider, A.F., Surek, D., & Rocha, C. (2015). Vitamin E and selenium in broiler breeder diets: Effect on live performance, hatching process, and chick quality. Poultry science, 94(5), 976-983.

von Koenig, C. H. W., Finger, H., & Hof, H. (1982). Failure of killed Listeria monocytogenes vaccine to produce protective immunity. Nature, 297(5863), 233-234.