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Effects of nutritional supplement E-Sel on the Egg production, Fertility, and Hatchability of Indian peafowl

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Abstract

Indian Peafowl is distributed in India, Pakistan, and Sri Lanka and its population is declining for a few decades due to fragmentation, habitat loss, poaching, contaminated feed, etc. Deficiency in dietary requirements such as vitamins and minerals are key issues in poultry nutrition which ultimately results in poor egg production, fertility, and hatchability. The present research work was designed to see the effects of E-Sel a supplement on egg production and general behavior (calling, feeding, and standing time) of the Indian peafowl. The study was conducted in the wildlife Park Rahim Yar Khan (Punjab) from Nov-2020 to May 2021 on Indian peafowl that was kept in captivity. Birds were categorized into two groups i.e., control and experimental. Each group was further composed of 3 males and 9 females in 1:3 ratios. Body weights of birds and trail size in males were also recorded at the start and end of the study period. It was observed that the supplementations have very significant effects ($P<0.05$) on egg production and maximum egg fertility and hatchability of 91% was noticed in the experimental group as compared to the control. The behavior of the two groups was also monitored during this period and no changes were seen in the feeding time of males of both groups while females of the experimental groups spent more time feeding as compared to the control group. However, in standing activity time no differences were noticed in both groups and in calling activity experimental group showed obvious differences from the control. A significant difference in body weight and male tail or train size was also recorded. It was concluded supplements have good impacts on body weight and male tail size, egg production, fertility, and hatchability.

Keywords: Egg productions, fertility, general behavior, hatchability, Indian peafowl, Supplementations

Introduction

Birds breeding success is very important to their viability (Ahmadi and Naderi, 2020). The breeding success is also related to the quality of the eggs. Peafowl is a typical name used for three bird species in the genera *Pavo* and *Afropavo* of the family *Phasianidae.* Peafowl is a collective term for birds in which males are known as peacocks while females are known as peahens but most commonly, they are called peacocks. There are three kinds of peafowl in the world which are green peafowl, Congo peafowl, and blue or Indian peafowl. The two Asian species are the Indian peafowl and green peafowl while one African peafowl is the Congo peafowl (Kabir and Hawkeswood, 2021; Naseer et al., 2018).

The distribution range of Indian Peafowl is India, Pakistan, Sri Lanka as well as Northern spaces in Bangladesh (Praveen et al., 2019; Rajashekara et al., 2019; Samour et al., 2010). The Indian peafowl is the major of bird and is recognized as the public ornamental bird in India (Ali et al., 1987; Yenilmez, 2020). In Pakistan, it is well known with the name of blue peafowls (Khan et al., 2020). Indian Peafowl is omnivorous and eats everything such as grain and green crops, insects, little reptiles, and creatures (Johansingh et al., 1980; Anitha et al., 2020; Gofur, 2020). Peafowl breed during the rainy season and most breeding starts from the month of April to the month of August (Fukuhara et al., 2022; Naseer et al., 2018). Peafowl normally arrives at sexual maturity at 2 years old to 3 years old (Al-Obaidi and Al-Shadeedi, 2020; Yenilmez et al., 2020). The peak season of breeding in southern India is April to May, January to March in Sri Lanka, and June in northern India. The females regularly mate with the Peacock who has the most eyespots on their fans and the biggest presentations. Peafowl may likewise to welcome a female in a type of romance taking care of (Stokes et al., 1971; Dakin and Montgomerie, 2009; Girard and Endler, 2014). They lay three to six buff white eggs inside the home. The peahen lays one egg for one day. The female only broods the eggs, which incubate in 28-30 days (Najar, 2018). The eggs of peafowl have additionally been seen hatched by different birds, for example, hen (Petrie and Williams, 1993).

The reason to do this study was the eggs laid every year during the breeding season by the peafowl were mostly wasted or remained unfertile which leads to a decrease in the population of birds and their status may enter the endangered species. So, the egg laying, fertility, and hatchability of peafowl are directly proportional to the population and status of the peafowl. As in previous studies, peafowl status declined and Green Peafowl have undergone a substantial decline throughout East Asia since the turn of the century and are now reported only from a few widely

scattered localities in several countries. Its plight was highlighted in the IUCN Pheasant Action Plan where it was one of the highest priorities for conservation action. The species is extinct in Peninsular Malaysia and almost lost in Bangladesh and northeast India. Species are thought to be in danger of extinction in Laos. China and Indonesia hold the smallest and scattered populations although the latter does contain two large protected populations (Mcgowan et al., 1998). The present study was designed to see the effects of supplements on egg production, fertility, hatchability, body weight, and tail or train size of peafowl.

Materials and methods

Study site, design, and allocation of peafowl

Present research work was conducted on peafowl in the research center of Wildlife Park Rahim Yar Khan. The research study was conducted for seven months from mid of November 2020 to mid of May 2021. A total of 24 Indian peafowls of 2-3 years old and sexually mature were taken in a 1:3 male and female ratio. All selected Indian peafowl were further distributed into two groups and labeled as control and experimental group. All males and females of Indian peafowl of both groups were kept in four separate cages for the first three months (December, January, and February). During this period the experimental group was supplemented with E-sell in drinking water 5ML/L while the control group was kept without a supplementary diet. At the start of the month of March 2021, all the 12 Indian peafowls of the experimental group were placed in the same cage for breeding purpose and they were continuously fed with supplements during the study period.

Enclosure design

Each cage was made-up of brick walls from the posterior side and from the lateral and front sides they were covered with net wire and a door was also made up of net wire. Each cage was provided with the hanging bamboo, water pot, and feeding tray. Poultry feed (Asia poultry feeds Pvt Ltd) was provided to the Indian peafowl on daily basis at the rate of 200g/peafowl. The poultry feed was in the form of crumbles which were prepared from entire pellets, which were splintered or rolled into small size pieces. Feeding trays were changed on daily basis for adding fresh feed and removal of residual feed in both groups. **E-SEL-16** (VITAMIN E, SELENIUM, and ZINC AND

VITAMIN A) of Westmont pharmaceuticals Industry mini industrial Estate, G. T. Road, Gujar Khan, district Rawalpindi was used as a supplement.

Collection of eggs

The breeding season of the peafowl started in the mid of March and the peafowl started laying eggs. Eggs from all experimental and control groups were collected and labeled on daily basis and placed into the incubator on weekly basis. The total incubation period was 28 days. Incubation temperature and humidity were kept at 100.1°F and 65% respectively for the first 25 days.

Candling of eggs

Candling of eggs saw performed after 10 days of incubation. After candling, the fertile eggs were kept in the incubator while unfertile eggs were removed from the incubator. After the completion of 28 days incubation period, the hatched eggs of both the experimental group and control group were recorded.

The general behavior of Indian peafowl

General behavioral activities of peafowl such as feeding, walking, standing, and calling were recorded at dawn and dusk for half an hour in both experimental and control groups. The body weight of both male and female Indian Peafowl and, the tail length in male peacocks were also noticed at the start and end of the study in both experimental and control groups.

Results and discussion

In the present study to improve the egg laying capacity, fertility, and hatchability of the Indian peafowl they were fed E-Sel-16 a supplement. A significant outcome in egg production at $P<0.05$ in peafowl was observed in the experimental group as compared to the control (Figure 1).

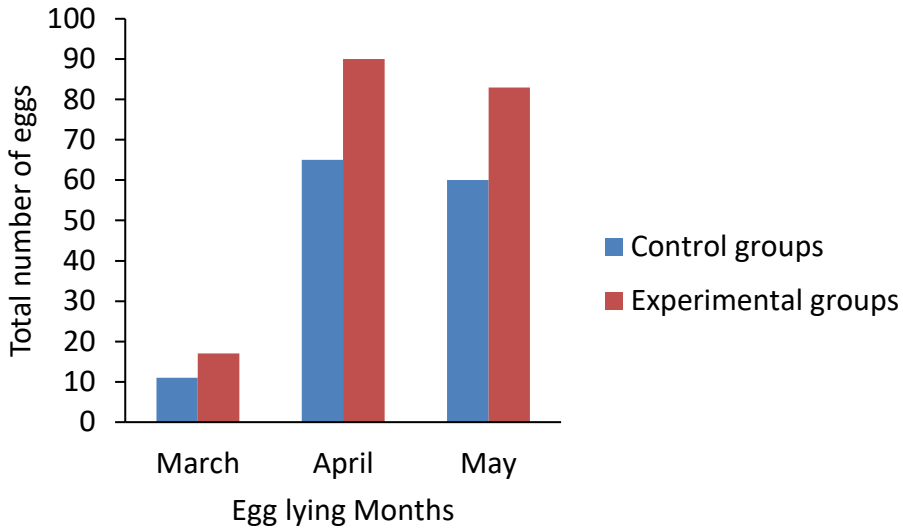

Figure 1. Total number of eggs in different months of the breeding season

After egg production on the 10th day of incubation, the fertility of eggs was checked by the candling in both groups for the purpose of fertility results. There was a significant effect of E-sel supplement on egg fertility ($P<0.05$) in the peafowl observed (Figure 2).

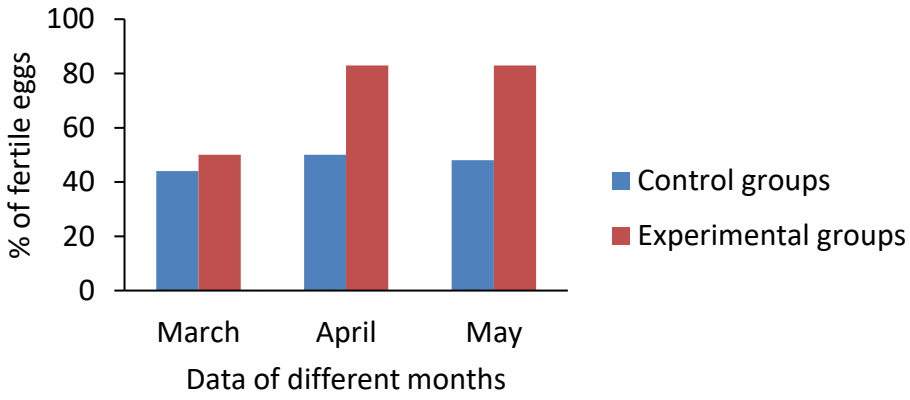

Figure 2. Percentage of fertile eggs in different months of the breeding season

Then after 28 days of incubations, the hatching was observed and there was a significant effect of supplementations was observed on the egg hatchability ($P<0.05$) in the peafowl (Figure 3).

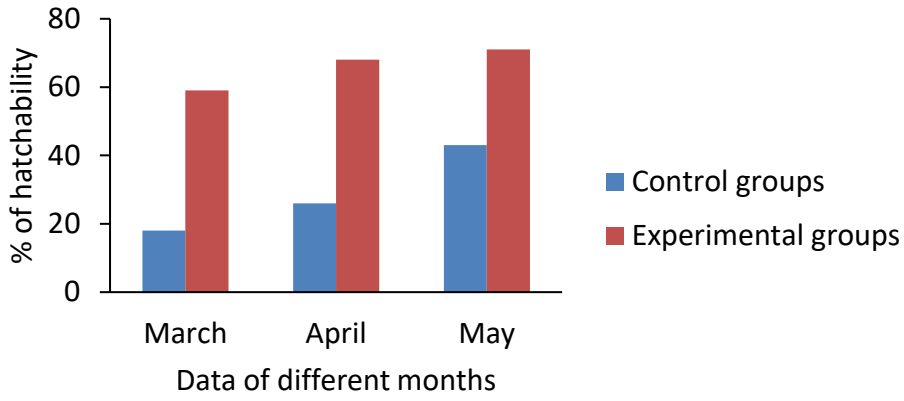

Figure 3. Percentage of hatched eggs in different months of the breeding season

The general behavior such as feeding time, standing, and calling activity of Indian peafowl was also recorded for both groups. The feeding time in males was higher as compared to females. It was noticed males of both experimental and control groups spent 5 minutes while females of the control group spent 2 minutes as compared to the experimental group that spent 4 minutes in feeding activity. In standing activity time was noticed same for both control and experimental groups While males spent more time almost 4 minutes as compared to females that spent only 3 minutes. In the calling activity, in the control group males spent an average time of 1 minute as compared to females spent an average time of half a minute while in the experimental group male spent 2 minutes and females spent 1 minute (Table 1).

Table 1. The general behavior of Indian peafowl recorded in minutes in control and experimental groups

Behavioral parameters	Control		Experimental	
	Male	Female	Male	Female
Feeding	5	2	5	4
Standing	4	3	4	3
Calling	1	0.5	2	1

Body weight of both the male and females of the control groups were compared with the experimental groups and high body weight was recorded in males and females of the experimental groups. Similarly, the train size of males was measured at the end of the study in

both control and experimental groups, and a significant increase in length was noticed in the experimental group (Table 2).

Table 2. Monitoring of physical parameters of Indian peafowls in control and experimental groups

Physical parameters	Control		Experimental	
	Male	Female	Male	Female
Body weight	4-5 kg	2.5-3.5 kg	5-7 kg	3-4.5 kg
Tail length	121.92-128.016 cm	-	152.4-166.784 cm	-

A significant effect of supplementations ($P<0.05$) was recorded on egg production in Indian peafowl at wildlife park Rahim Yar Khan and our findings were closely related to the findings of Scheideler et al. (2010) who reported that the level of nutritional selenium has a significant influence on egg production at $P<0.03$. In another study, Susmita et al. (2020) treated hens with vitamin E and selenium which showed enhanced egg production. Mohiti-Asli et al. (2008) have considered selenium or vitamin E in the eating regimen that fundamentally increased the concentration of the egg. Urso et al. (2015) inferred that the dietary supplementation of Zinc, Selenium, and vitamin E could be utilized to increase egg production.

The fertility of the peafowl depends upon the total number of eggs produced. In the present study, there was a significant effect of supplementations on egg fertility ($P<0.05$) in the peafowl which was closely related to the results of Ali et al. (2013). Likewise, Vitamin E-Selenium supplementation has a huge ($P<0.05$) impact taking place fertility and hatchability of quails. In the present study, the fertility percentage was recorded maximum of (91%) and our results were related to more than Mushtaq-ul-Hassan et al. (2013) who observed the maximum percentage of fertility at 81% in Indian peafowl.

In the study due to supplementations, a similar relationship was observed between fertile eggs and hatchability percentages as the higher the percent of fertile eggs the higher the percent of hatchability was found. Deeming and Wadland, (2002) described fertility of eggs as solitary of the main considerations deciding the hatchability of each and every egg set. A significant effect of supplementations on the percentage of egg hatchability ($P<0.05$) in the peafowl was observed. The percentage of hatchability was less observed in the month of March than in April with a maximum hatchability percentage (91%) recorded in the month of May in the experimental group. Our results were with the similar findings of Mushtaq-ul-Hassan et al. (2013) who recorded the maximum

hatchability of (61%) in Indian peafowl. Our results are very similar and related to the results of Adebiyi et al. (2014) rate of hatchability is The present study results were more significant than the results in hatchability of Ali et al. (2013) The Quails enhanced among Vitamin E - Selenium have altogether higher hatchability (71%) as compared to control group (68%). However, our outcomes were in dissimilarity to Hossain et al. (1998), who revealed that fertility and hatchability were not influenced by Vitamin E-Selenium supplementation within oven reproducer hens.

It was observed during the study that Indian peafowl spend more time in feeding activities than other activities of daily life. Feeding time spent by males in both control and experimental groups was 5 minutes while in the control group female 2 minutes and experimental group females spent 4 minutes. Our study is closely related to Kaur et al. (2017) who reported that males used to spend an average time of five minutes in feeding activity. The most common activity of Indian Peafowl was feeding followed by standing and walking. Females spent an average time of 3.8 minutes. Standing activity time spent in both groups' males and females remain the same with 4 minutes by males and 3 minutes by females observed. Results were exactly matching to Kaur et al. (2017) who observed that males spent above an average time of four minutes and females spent an average time of three minutes in standing activity. During the calling activity in control, group male showed 1 minute and the female for about half a minute while in the experimental group male showed up for 2 minutes and the female 1 minute. Our observations were similar to the observations of Kaur and Kler (2017) who reported that the activity of calling seemed to alarm their flock members and they used to spend an average time of two minutes. Females spent an average time above one minute in calling activity. There was a noteworthy difference in the weight of the control group and experimental group birds. Control group the males' body weight measured was about 4-5 kg while the female's weight was 2.5-3.5 kg. While in the experimental group male's body weight was 5-7 kg and females were 3-4.5 kg. our results were related to Sahin and Kucuk (2001) who recorded the body weight in Japanese quails and stated that the interaction between vitamin E and Se for feed intake ($p=0.03$), final body weight change ($p=0.03$). The observed train size of males in the control group was measured at about 121.92- 128.016 cm while the male of the experimental group measured was about 152.4-166.784 cm at the end of the study which makes a large wingspan. Our results are somehow related to the observations of Choct et al. (2004) who reported that Vitamin E played no role in the feather coverage of the birds when scored on day 37. However, Selenium did a positive role in feather improvement.

Conclusion

Indian peafowl breeding season started in the mid of March and has fewer egg productions, fertility, and hatchability in March and May as compared to the month of April. It was concluded that the E-Sel supplementations have a greater impact on the body weight, male's tail size, egg production, fertility, and hatchability along with the general behavior of Indian peafowl. So, there is a need to add supplements to the feed of wild avifauna to score their races.

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