EFFECT OF MALE TO FEMALE RATIO AND VITAMIN-E SELENIUM SUPLEMENTATION ON EGG PRODUCTION AND EGG WEIGHT OF JAPANESE QUAIL

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ABSTRACT: The aim of this study was to examine the effect of mating ratio (male: female) and vitamin E -Selenium supplementation on egg production and egg weight of quail breeders. Total 720 Japanese quails of ten weeks of age with an average of 50% egg production were divided into four groups A, B, C and D having male: female mating ratio of 1:1, 1:2, 1:3 and 1:4 respectively. All the four groups were further sub-divided into vitamin E -Selenium supplemented (at the rate of 1ml/6 liters of drinking water) and control sub-groups. Each sub-group was further replicated three times with 30quails/replicate. Egg production was significantly ($P<0.05$) affected by mating ratio and vitamin E -Selenium supplementation. The egg production was highest (72 %) in ratio 1:4 while the least (52 %) in 1:1 ratio. The egg production with the supplementation of vitamin E -Selenium was highest (77 %) in ratio 1:4 while the least (52 %) in 1:1 ratio. Egg weight was significantly ($P<0.05$) affected by mating ratio but vitamin E -Selenium supplementation had no significant ($P<0.05$) effect on egg weight. The highest egg weight was (12.2g) for 1:3 mating group while least was (10.25gm) for 1:1 mating group.

Key words. Male to female ratio, vitamin E -Selenium, egg production, egg weight, quails.

INTRODUCTION

Japanese quails have been used as a best source of meat and egg, and sometimes being used for research purpose that is the reason they are extensively spread in diverse regions of the world. Efficient growth rate in Japanese quails results in rapid and early maturity at the age of six weeks (Wilbor *et al.*, 1959).

Vitamin E plus Selenium are essential elements for the growth of quails. For proper survival of quail, diets containing amino acids and d-alpha-tocopheryl acetate (100 mg /kg) is required to be added to 0.1 mg Selenium (Thompson and Scott, 1967). Vitamin E supplementation (100 or 150 ppm) to laying hens during a hot period did not have a decline in egg production (Scheideler *et al.,* 2010). Stress increases mineral and vitamin mobilization from tissues and their excretion, thus may exacerbate a marginal vitamin and mineral deficiency or an increased mineral and vitamin requirement (Siegel, 1995). Some studies have shown that vitamin E tends to maintain or increase egg production in chickens exposed to heat stress.

Vitamin E, one of the most powerful antioxidants, have been included into poultry feed to improve performance and quality of meat and egg and to increase the vitamin E content of food of animal origin and thus increase the vitamin E intake of man (McDowell, 1989; Sunder *et al*., 1997; Flachowsky, 2000). Incorporation of vitamin E into poultry diets has been shown to provide oxidative stability and increase the quality of their eggs and reduce then development of off-flavors while increasing egg production (Ajuyah *et al.,* 1993; Buckley *et al*., 1995; Cherian *et al*., 1996). It has been observed that supplemental vitamin E significantly alleviates the heat stress-related decrease in the performance of growing Japanese quails suggesting that additional vitamin E supplementation may be necessary under heat stress conditions (Sahin and Kucuk, 2001).

Selenium is an essential trace element in animal nutrition (Kim and Mahan, 2003). The required amount of Se necessary for animals ranges from 0.15 to 0.3 mg/kg depending on the animal species and the levels of vitamin E in the diet (Girling *et al*., 1984). Selenium requirement for laying hens ranges from 0.05 to 0.08 mg/kg for the maintenance of optimal health and egg production (NRC, 1994; Choct *et al*., 2004). Most of previous studies supplemented Se in the experimental diets of laying hens ranged from 0 to 1 mg/kg, however, Payne *et al*., (2005) used Se from sodium selenite or Se-enriched yeast upto 3.0 mg/kg in the diets. A study in Chicken suggested that supplemental Se was beneficial to pullets, even if the diet contained upto 0.15 ppm Se. Birds receiving 2ppm Se had less mortality through a 76 weeks period. Although there was no effect from 2ppm level of Se on egg production, the Se content of tissues and eggs was increased (Thapar *et al*.,1969) The increasing Se level up to 0.40 ppm significantly increases both egg weight and egg mass compared with those in

hens fed the control diet (Attia *et al*.,2010). Considering the importance of mating ratio and vitamin E -Selenium, the present study was conducted to study the effect of male to female ratio and vitamin E -Selenium supplementation on egg production and egg weight in Japanese quails.

MATERIALS AND METHODS

Experimental quails and design: Present study was conducted at Quails Breeding Unit, Khyber Pakhtunkhwa Agricultural University Peshawar. Total 720 quail breeders of 10 weeks age with an average of 50% egg production were selected and divided into four mating groups A, B, C and D. Each group was further sub-divided in to two sub-groups (V_0 and V_1). V_1 represented the sub-groups provided with vitamin E -Selenium supplementation at the rate of 1ml/6 liters of drinking water, Whereas V_0 represented the controls. All sub-groups were replicated into three replicates (R1, R2 and R3) each comprised of 30 quails (Table 1). The study was continued for eight weeks. The experimental flock of Japanese quails was reared in cages with male to female ratio as given in the Table 1. The flock was provided with breeder ration @ 28gm/ bird/ day. They were provided with a photoperiod of 16 hours per day (Erensayin, 2002). The study was planned in factorial arrangement (4 x 2 x 3), of male to female ratio (4), level of vitamin E -Selenium supplementation (2) and each group with three (3) replication as shown in Table 1.

Eggs collection: Eggs from all the experimental groups were collected thrice a day and were examined for egg shell intactness, weight and size. The egg production of each group was recorded on weekly basis and mean egg production per week was calculated as;

$$\text{Egg Production} = \frac{\text{Total number of eggs per week}}{\text{Initial number of birds (Males+Females) in the cage}}$$

Egg weight: The eggs were weighed with electronic balance. Ten eggs were individually weighed from each replicate to calculate average egg weight.

Statistical analysis: The data were analyzed by using two factorial design (4 x 2 x 3) and statistical difference among different treatment means were compared (Steel et al., 1997).

RESULTS AND DISCUSSION

Effect of mating ratio and vitamin E -Selenium supplementation on egg production: Mating ratio and Vitamin E -Selenium supplementation had significant ($P<0.05$) effect on egg production (Table 2). The 1:4 mating ratio had highest (68%) egg production among all the groups followed by 1:3 (64%), 1:2 (60%) and 1:1 (51%) respectively. There was significant ($P<0.05$) difference among mating groups with and without supplementation of vitamin E and Selenium. The mating ratio 1:4 had highest (77%) egg production followed by 1:3 (66%), 1:2 (60%) and 1:1 (52%) with supplementation. Hence the overall means of 52, 60, 65 and 72 of mating ratio and vitamin E -Selenium supplementation differed significantly ($P<0.05$). The results are in agreement with past studies conducted by Davtyan *et al*., (2006), Leeson *et al*., (2008) and Moyle *et al*., (2010). Our findings are in agreement with Gjorgovska and Filev (2011), who stated that Hens' performances as egg production intensity were significantly($P<0.01$) different between the groups where vitamin E was supplemented at the level of 100 mg/kg, and the groups on the other hand where vitamin E was supplemented at the level of 200 mg/kg. Our results are in agreement with Abd El-Latif (1999), who observed higher values of egg production with Japanese quail birds which received vitamin E (25 and 50 mg / kg diet). Our results are contrary to the results published by Maziar *et al*., (2008). The present findings do not agree to that of Hughes *et al.,* (1980) and Utterback *et al*., (2005) , who stated that there was no significant effect on both productive and reproductive traits in Japanese quail among three mating ratio i.e. 1:1, 1:2 and 1:3. Our results are also contrary to Chantiratikul *et al*.,(2008), who reported that egg production and egg weight of laying hens were not affected ($P<0.05$) by Se supplemental levels. Our results are not in agreement with Attia *et al*.,(2010),who stated that the egg production percentage for the whole experimental period of hens was not significantly affected by the level and source of Se. The highest egg production was due to increasing number of females in 1:4 mating group. A distinct decline tendency was recorded in productivity with increasing numbers of males per cage.

According to antioxidant theory, when the concentrations of antioxidants decreases, lipid peroxidation increases in the plasma and tissues leading to damage of cell membranes (Gallo-Torres, 1980; McDowell, 1989). Causing oxidative damage on membrane of hepatic cells, stress has been shown to decrease plasma egg yolk precursor proteins, vitellogenin and triglyceride (Bollengier-Lee *et al*., 1998). It was reported that these negative effects can be diminished via dietary vitamin E supplementation by the elevation of concentration of these precursor proteins (Puthpongsiriporn *et al*., 2001).

Effect of mating ratio and vitamin E -Selenium on egg weight of quail breeders: Table 3 shows the mean egg weight produced in different mating groups with and without supplementation of Vitamin E -Selenium. Significant ($P<0.05$) effect of mating ratio was observed on egg weight among different groups. Mating ratio 1:3

had highest (12.2g) egg weight followed by 1:2 (11.8g), 1:4 (11.5g) and 1:1 (10.25g). The effect of supplementation of Vitamin E -Selenium on egg weight was non-significant. The results are on analogy of Sahin *et al*., (2001), Seker *et al*., (2004) and Petek *et al*., (2005). Similar results were shown by Puthpongsiriporn *et al*., (2001), who reported that supplementation of vitamin E - Selenium had neither improved nor had any adverse effect on egg production and egg weight. In contrast, Ciftci *et al*., (2005) reported that egg weight was increased with vitamin E supplementation. Our results are also contrary to Abd El-Latif (1999), who observed higher values of egg weights with Japanese quail birds which received vitamin E (25 and 50 mg / kg diet). Our results are also contrary to Gjorgovska and Filev (2011),

Table 1. Experimental layout

Group	Sub group	Vitamin E - Selenium supplementation	No of birds in Replicates		
			R1	R2	R3
A	AV_1	Yes	30	30	30
	AV_0	No	30	30	30
B	BV_1	Yes	30	30	30
	BV_0	No	30	30	30
C	CV_1	Yes	30	30	30
	CV_0	No	30	30	30
D	DV_1	Yes	30	30	30
	DV_0	No	30	30	30

V0 =No vitamin E -Selenium supplementation
V1= Vitamin E -Selenium supplementation 1ml/6 liter

Table 2. Effect of mating ratio and vitamin E - Selenium supplementation egg production

Egg Production %				
Group	Mating ratio (Male : Female)	V_0	V_1	Overall mean
A	(1:1)	51	52	52^{d}
B	(1:2)	60	60	60^{c}
C	(1:3)	64	66	65^{b}
D	(1:4)	68	77	72^{a}

Main effect
Vitamin E -Selenium supplementation
V_0 60.5^{b}
V_1 63.8^{a}
Probability of greater F-value in ANOVA
Mating ratio P<0.05 = 0.00
Vitamin E-Selenium P<0.05 = 0.01
Mating ratio x vitamin P>0.05 = 0.06
^{abcd} Means in the same column with different superscript differ significantly.
V_0 =No vitamin E -Selenium supplementation
V_1= Vitamin E -Selenium supplementation 1ml/6 liter

who reported significant (P<0.01) differences in egg weight of hens supplemented with100 mg or 200 mg vitamin E /kg of the diet. Similarly other findings by various researchers Leeson *et al*., (2008), Utterback *et al*., (2005) and Jiakui and Xialong (2004) reported that there was no effect of Se supplementation on egg weight of laying birds. In contrast to our results, Payne *et al*., (2005) reported that egg weight was linearly increased in laying hens by selenium yeast.

Selenium forms the active center of Glutathione Peroxidase (GSH-Px) that plays a role in relieving severe oxidative stress. Saito *et al.,* (2007) demonstrated that the oxidative stress induced by selenium deficiency induced lipid and cholesterol peroxidation in cultured cells, but plasma cholesterol is much resistant to oxidation.

Table 3. Effect of mating ratio and vitamin E - Selenium supplementation egg weight

Mean egg weight				
Group	Mating ratio (Male : Female)	V_0	V_1	Overall mean
A	(1:1)	10.25	11.10	10.68^{c}
B	(1:2)	11.80	11.60	11.68^{a}
C	(1:3)	12.20	11.90	12.07^{a}
D	(1:4)	11.50	11.80	11.66^{b}

Main effect
Vitamin E -Selenium supplementation
V_0 11.44^{a}
V_1 11.60^{a}
Probability of greater F-value in ANOVA
Mating ratio P<0.05 = 0.00
Vitamin E-Selenium P<0.05 = 0.26
Mating ratio x vitamin P>0.05 = 0.04
^{abc} Means in the same column with different superscript differ significantly.
V_0 =No vitamin E -Selenium supplementation
V_1= Vitamin E -Selenium supplementation 1ml/6 liter

Conclusion: It is concluded that mating ratio and Vitamin E -Selenium supplementation has significant effect on egg production in Japanese quails. Similarly mating ratio has significant effect on egg weight while Vitamin E -Selenium supplementation has no significant effect on egg weight in Japanese quails.

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