EFFECT OF MALE TO FEMALE RATIO AND VITAMIN-E SELENIUM ON FERTILITY, HATCHABILITY AND HATCHED CHICK WEIGHT OF QUAIL BREEDERS

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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 fertility, hatchability and hatched chick 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 in to 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 30 quails/ replicate. Mating ratio and vitamin E -Selenium supplementation had significant (P<0.05) effect on fertility and hatchability. The highest fertility (79 %) and hatchability (78 %) were observed in 1:1 group A, while the lowest fertility (70 %) and hatchability (62 %) were observed in 1:4 group D. Fertility and hatchability with the supplementation of vitamin E -Selenium, the highest fertility (88 %) and hatchability (81 %) were recorded for 1:1 group A, while the least fertility (75 %) and hatchability (64 %) for the 1:4 group D was recorded. Hatched chick weight was significantly (P<0.05) affected by mating ratio while vitamin E -Selenium supplementation had no significant (P<0.05) effect on hatched chick weight. The highest hatched chick weight was (8.16 g) for 1:3 group C while least (7.41g) was for 1:2 group B. It was concluded that 1:1 mating ratio alone and in combination with vitamin E-Selenium supplementation has highest fertility (79%) and hatchability (78%) in Japanese quails. While hatched chick weight was the highest in 1:3 mating group.

***Keywords*: Mating ratio, vitamin E -Selenium, fertility, hatchability, hatched chick weight, quail breeders**

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INTRODUCTION

The chicken, pheasant and Japanese quail are species belonging to the same sub family (Phasianidae) but to different genera, determined on the basis of proportion of common antigens that chicken and quail are immunologically remote from each other as well as from other gallinaceous species (Mainordi *et al.,* 1966).

Japanese quails have extensively spread in diverse regions of the world. They have been used as a best source of meat and egg, and sometimes being used for research purpose. Efficient growth rate resulted in rapid and early maturity at the age of six weeks (Wilbor *et al.,* 1961).The greatest mating performance of Japanese quails has been reported at the age of 70 -210 days (Sefton *et al.*, 1973). Woodard and Alplanalp (1967) reported that fertility and hatchability of fertile eggs were between 48-94% in Japanese quail, 8 to 52 weeks of age. In another study, best fertility rate has been reported at 12-14 weeks of age in Quails (Narahari *et al*., 1988). Fertility and hatchability decreases and chicks death increases with parental ages (Novo *et al.,* 1997). It is important to find out the optimum male to female ratio of quail for optimum fertility and production of suitable eggs for hatching (Erensayin, 2002). Fertility of incubated eggs and hatchability of fertile eggs in quail were found 73.78% -95% (Woodard and Alplanalp, 1967).

Wilson and Holland (1974) reported that there was no significant difference between mating ratios of male:females (1:2 and 1:3) on fertility and hatchability of incubated eggs as well as on hatchability of fertile eggs in quails. The best mating ratio of male and females was 1:3 for optimum fertility and hatchability of fertile eggs (Baser *et al.,* 2002).

An insufficiency of vitamin E causes an ailment of the nervous disorder in chicks acknowledged as 'crazy hatchling disease. Importance of Vitamin E for quail was confirmed by various researchers (Price, 1968; Shim *et al*., 1983). Diets which are deficient in vitamin E in semi-purified form, containing starch and soybean protein did not affect body weight, feed consumption, and egg production in quail. Though, it resulted into male's aridity that could be prohibited by providing 40 I.U. of vitamin E per kg to the feed for a period of two weeks. Vitamin E plus Selenium are essential elements for the growth of quails (Sahin and Kucuk, 2001). Supplementation of selenium and vitamin E increase fertility and hatchability in quails (Fitri *et al*., 2012). Quails provided with diet low in both vitamin E and Selenium from hatching to maturity resulted in poor reproduction, however, fertility and oviposition rate were not affected. But the hatchability, capability of male and female and survivability of hatched chicks were declined. The available information is not enough to answer the query of low hatchability in quails. So the present study was designed to study the effect of male to female ratio and Vitamin E -Selenium supplementation on fertility, hatchability and hatched chick weight of Japanese quail.

MATERIALS AND METHODS

Experimental Design

The 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 into 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 (Table 2) at the rate of 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.

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

V_0 =No vitamin E -Selenium supplementation

V_1= Vitamin E -Selenium supplementation 1ml/6 liter

Table 2. ***Ingredient Composition of Quail Breeder Diet***

Ingredients	Quantity percent
Yellow Corn	63.47
Soybean Meal, 48%	25.93
Limestone	6.59
Dicalcium Phosphate	2.67
Salt	0.44
Feed Fat	0.39
dl-Methionine	0.11
Bacitracin	0.05
Vitamin Premix	0.25
Mineral Premix	0.10

Eggs Collection

Eggs from all the experimental groups were collected thrice a day and were examined for egg shell intactness, weight and size. Eggs with standard weight and shell quality were selected for setting in incubator after collection of 200 eggs per group.

Incubation and Hatching

Eggs were incubated in automatic incubator with a temperature of 99.5° F, and relative humidity of 60%. Egg turning was stopped three days before hatching and eggs were transferred to the hatcher with a temperature of 98^{o} F and 70% humidity conditions.

Fertility and Hatchability of Eggs

Two hundred eggs from each replicate were placed in incubator. The usual recommended humidity and temperature were followed by turning during incubation period. The fertility assessments were performed by two ways. The first method was breaking half of the eggs set at the 5th day of incubation which determined the presence of embryo and the second method all the eggs were broken at the end of experimental period (18 days). Fertility and hatchability of eggs were calculated as;

$$\text{Fertility \%} = \frac{\text{Total number of fertile eggs}}{\text{Total number of eggs set}} \times 100$$

$$\text{Hatchability (on fertility) \%} = \frac{\text{Number of hatched chicks}}{\text{Number of fertile eggs}} \times 100$$

Hatched Chick Weight

The chicks were weighed with electronic balance on the day of hatch .Ten chicks from each replicate were weighed to calculate average chick 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 and Torrie, 1980).

RESULTS AND DISCUSSION

Effect of Mating Ratio and Vitamin E -Selenium on Fertility of Quail Breeders

Mating ratio and Vitamin E -Selenium supplementation had significant ($P<0.05$) effect on fertility (Table 3). The 1:1 mating ratio showed highest (79%) fertility among all the groups followed by 1:2 (74%), 1:3 (70%) and 1:4 (70%) respectively. Similarly fertility in the Vitamin E -Selenium supplemented groups was significantly ($P<0.05$) higher than the controls. Present findings are in agreement to the results of Dogan *et al*. (2013) who reported highest fertility in 1M:1F and 1M:2F mating groups as compared to 1M:4F and 1M:5F mating groups. Similarly Ipek *et al*. (2004) reported significant effect of sex ratio on fertility of Japanese quails. The finding of our research are similar to Narahari *et al.* (1988), who reported a significant effect of male to female ratio on fertility. Gebreil (2002) studied the effect of sex ratio on reproductive performance in quail and stated that for optimum fertility ratio of Japanese quails, required male-female ratio must be between 1M:1F and 1M:3F. Our results were in contrast to Uluocak and Okan (1993), who reported lowest fertility rates from the mating groups of 1M:1F in their study. However, our results are contrary to the findings of Mandour *et al.* (1993) who reported non significant effect of mating ratio from 1M:1F to 1M:4F on fertility in quail. However fertility was significantly affected when quail breeder ration was supplemented with vitamin E- Selenium in the same mating ratio. It might be due to the fact that vitamin E - Selenium supplementation affected the males by maintaining sperm quality for longer time. Our results were in contrast to findings of Barreto *et al.* (1997) and Hossain *et al.* (1998), who reported that fertility and hatchability were not affected by Vitamin E-Selenium supplementation in broiler breeder hens.

Table 3. ***Effect of mating ratio and vitamin E -Selenium supplementation on fertility***

		Mean fertility (%)		
Group	**Mating ratio (Male: Female)**	**V_0**	**V_1**	**Overall mean**
A	(1:1)	79	88	83.50^{a}
B	(1:2)	74	82	77.75^{b}
C	(1:3)	70	81	75.50^{b}
D	(1:4)	70	75	72.25^{b}

Main effect

Vitamin E -Selenium supplementation

V_0 82^{b}

V_1 88^{a}

Probability of greater F-value in ANOVA

Mating ratio	P<0.05 = 0.00
Vitamin E-Selenium	P<0.05 = 0.00
Mating ratio x Vitamin E-Selenium	P>0.05 = 0.035

^{ab} 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

Effect of Mating Ratio and Vitamin E -Selenium on Hatchability of Quail Breeders

Mating ratio and Vitamin E -Selenium supplementation had significant (P<0.05) effect on hatchability (Table 4). The mating ratio 1:1 had highest hatchability percent among the other groups. Quails supplemented with Vitamin E -Selenium had significantly higher hatchability (71%) as compared to control group (68%). Generally, it has been observed that hatchability is increased by increasing the number of males in the mating ratio. Our results were similar to the results of the studies by Seker *et al*. (2005), who found statistically higher effect of mating ratio in terms of hatchability. The current study results were in agreement with that of the work performed by Mandour *et al.* (1993), who reported Vitamin E- Selenium supplementation to the same mating ratio had significant effect on the fertility and hatchability. It might be due to the fact that vitamin E- Selenium supplementation firstly affected the breeder performance which resulted in to higher number of viable chicks and lower mortality of embryos during incubation and secondly it affected the males by maintaining sperm quality for longer time. Our results were in contrast to the study performed by Barreto *et al.* (1997) and Hossain *et al.* (1998), who reported that fertility and hatchability were not affected by Vitamin E- Selenium supplementation in broiler breeder hens.

Table 4. ***Effect of mating ratio and vitamin E -Selenium supplementation on hatchability***

		Mean hatchability (%)		
Group	**Mating ratio (Male : Female)**	**V_0**	**V_1**	**Overall mean**
A	(1:1)	78	81	79.38[a]
B	(1:2)	67	70	68.50[b]
C	(1:3)	63	70	66.63[b]
D	(1:4)	62	64	62.75[b]

Main effect

Vitamin E-Selenium supplementation

V_o 68[b]

V_1 71[a]

Probability of greater F-value in ANOVA

Mating ratio	P<0.05 = 0.00
Vitamin E-Selenium	P<0.05 = 0.05
Mating ratio x vitamin	P>0.05 = 0.67

[ab] 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

Effect of Mating Ratio and Vitamin E –Selenium Supplementation on Hatched Chick Weight

A significant (P<0.05) effect of mating ratio on hatched chick weight was observed (Table 5). Mating ratio 1:3 had highest chick weight (8.16 g) followed by 1:1 (7.65 g), 1:4 (7.53 g) and 1:2 (7.41 g). Vitamin E -Selenium supplementation had no significant effect on chick weight. Similar to our results, Seker *et al*. (2004) found that mating ratio had a significant (P<0.05) effect on the egg weight which ultimately affected the chick weight. In another study similar study was conducted on domestic fowl by Wilson (1991), who reported that a positive parallel correlation exists between egg weight and hatched chick weight. A similar study was performed by O'Connor (1984), who reported that weighty chicks have got high value nutrition set aside and they prove high live rate. North and Bell (1991) observed remarkable differences in the egg weight due to aging. No significant increase was observed on egg weight with the supplementation of vitamin E -Selenium which ultimately did not affect hatched chick weight.

Table 5. ***Effect of mating ratio and vitamin E-Selenium supplementation on hatched chick weight***

		Mean chick weight		
Group	**Mating ratio (Male : Female)**	**V_0**	**V_1**	**Overall mean**
A	(1:1)	7.83	7.48	7.65^{b}
B	(1:2)	7.68	7.14	7.41^{c}
C	(1:3)	8.19	8.13	8.16^{a}
D	(1:4)	7.39	7.68	7.53^{b}

Main effect

Vitamin E-Selenium supplementation

V_o 7.77^{a}

V_1 7.61^{a}

Probability of greater F-value in ANOVA

Mating ratio	P<0.05 = 0.00
Vitamin E-Selenium	P<0.05 = 0.17
Mating ratio x vitamin	P>0.05 = 0.11

^{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

CONCLUSION AND RECOMMENDATIONS

Male to female ratio had a significant (P<0.05) effect on fertility, hatchability and hatched chick weight of quails. Fertility (79%) and hatchability (78%) were the highest in 1:1 mating group, while lowest in 1:4 mating group. Hatched chick weight was the highest (8.16g) in 1:3 mating group. Similarly, vitamin E-Selenium supplementation had significant (P<0.05) effect on fertility and hatchability of quails. Highest fertility (88%) and hatchability (81%) were recorded in 1:1 mating subgroup supplemented with vitamin E-Selenium. Mating group of 1:1 and 1:3 is recommended for better fertility and hatchability and economic perspective.

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