

Short communication

EFFECTS OF MATING PERIOD ON EGG FERTILITY AND EGG CHARACTERISTIC OF JAPANESE QUAIL

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Abstract

The effects of mating period on egg fertility and characteristic of Japanese quail was studied in a fifteen (15) day experimental period. Adult quails in sex ratio 1:1 were used in a completely randomized design. The male quails were withdrawn from the females and the eggs collected. There was a significant increase ($p < 0.05$) in egg number between the first and the 15th day. Hen Day Production (HDP) and Hen House Production (HHP) also increased significantly ($p < 0.05$) from day one to 15th day. Egg fertility significantly decreased ($p < 0.05$) from day one to 10th day of egg collection. It was concluded that egg fertility in quail was at peak between the 3rd and the 5th day. Also, fertile eggs can be laid up to the 10th day after the withdrawal of male.

Key word: quail, sex ratio, fertile egg, Hen Day Production (HDP), Hen House Production (HHP).

Introduction

Generally, birds have Uterovaginal Junction (UVJ) that functions as Sperm Storage Tubules (SSTs). After mating, the sperm ascend the vaginal and enter the SSTs (Froman *et al.*, 1994, Bakst, 2011, Froman *et al.*, 2011). The periods of sperm storage on the SSTs defer from one species to the other (Christensen and Bagley 1989). Brillard (1993) reported that chickens have ability to store sperm for up to three weeks, while turkeys can store sperm for ten weeks in the sperm storage tubules. The difference in the sperm storage ability may be related to the varying number of SSTs present on the UVJ. Turkeys have about twenty to thirty thousand SSTs whereas chickens have only five to thirteen thousand SSTs (Brillard and Moller 1992 and Bakst *et al.*, 2010). Although, Brillard *et al* (1998) suggested that the number of SSTs may be positively correlated to fertility but different strains of broiler with the same number of SSTs exhibited different levels of egg fertility. The recent increasing interest in Japanese quail for commercial egg in Nigeria and other tropical countries has necessitated the need to maximize the available space in favour of the female. Male quails are not well reared except for breeding purpose. Fertility is the most critical consideration in

poultry production. This is combination of male and female factor. The male factor includes semen quality and storage. However the storage potential of semen in female quail has had little information and attention hence, the need to investigate the period over which fertile and viable eggs can be collected after the withdrawal of male from female of Japanese quail.

Materials and Methods

This experiment was carried out at the Poultry Unit of Department of Animal Production and Animal Production Laboratory, Faculty of Agriculture, University of Ilorin, Ilorin. Kwara State, Nigeria.

The pavilion was properly cleaned and disinfected with izal before the commencement of the experiment.

A total of seventy two (72) adult Japanese quails (thirty six (36) male and thirty six (36) female) of six (6) weeks age were used for this study. A diet of 19.5% crude protein and 2800Kcal/kg energy was offered based on the nutrient requirement for quail (Ojo *et al* 2014) (Table 1). The male and female were randomly allotted to a cage in a ration 1:1 (male: female) for ten days after which all the males were withdrawn.

Eggs laid were collected and incubated daily for fifteen days. Egg fertility was carried out at the fifth day of incubation

using candling machine. The eggs were later cracked and the yolk observed in a glass ware petri dish to confirm the fertility of the eggs.

The percentage fertility was determined as follows:

% Fertility =

$$\frac{\text{Number of fertile egg}}{\text{Number of egg set}} \times 100$$

Also, Hen Day Production (HDP) and Hen House

Production (HHP) were calculated as:

HDP

$$= \frac{\text{number of eggs laid in a day} \times 100}{\text{number of hen alive}}$$

HHP

$$= \frac{\text{number of eggs laid in a day} \times 100}{\text{number of birds originally housed}}$$

All data obtained were subjected to statistical analysis using the analysis of variance (ANOVA) procedure following a completely randomize design model (SAS 1999) and the levels of significance ($p < 0.05$) were separated using Duncan multiple range test (Duncan 1955).

Table 1: composition of experimental diet

Feed Ingredients	Quantity (%)
Maize	55.00
Soya bean meal (SBM)	24.00
Fish meal	2.00
Groundnut cake (GNC)	4.00
Wheat Offal	6.00
Bone Meal	2.00
Limestone	6.00
Salt	0.30
Vitamin Premix	0.25
Methionine	0.30
Lysine	0.15
Total	100.00
Nutrients composition on dry matter basis:	
Crude protein (%)	19.55
Metabolizable energy ME (Kcal/Kg)	2810.60
Calcium	2.99
Phosphorus	0.80
Crude fibre	3.46

To provide the following per kg of feed: Vitamin A, 10000 iu; vitamin D , 2000iu; Vitamin B , 0.75mg; Nicotinic acid, 312.5mg; Calcium pantothenate, 12.50mg; Vitamin B , 2.5mg; vitamin K , 2.3mg; Vitamin E, 2.5mg; Cobalt, 0.40mg; 123 Biotin, 0.50mg; Folic acid, 1.00mg; Choline chloride, 25mg; Copper, 8.00mg; Manganese, 64mg; Iron, 32mg; Zinc, 40mg; iodine, 0.8mg; Flavomycin, 100mg; Spiromycin, 5mg; DL-Methionine, 50mg; Selenium, 0.16mg and L-Lysine, 120mg.

Table 2: Effects of post withdrawal period of male quail on laying performance, egg fertility and characteristics

DAYS PARAM ETERS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	SEM
E.L	22 ^a	21 ^a	25 ^b	26 ^b	31 ^b	30 ^b	29 ^b	27 ^b	31 ^b	31 ^b	29 ^b	25 ^b	28 ^b	29 ^b	35 ^c	0.58
I.E	4 ^a	4 ^a	4 ^a	3 ^a	4 ^a	24 ^{cd}	9 ^b	9 ^b	24 ^{cd}	29 ^e	29 ^e	25 ^d	28 ^e	29 ^e	35 ^f	0.58
Fertility(%)	82 ^f	82 ^f	84 ^g	88 ^h	87 ^h	67 ^e	20 ^c	20 ^c	23 ^d	6 ^b	0 ^a	0 ^a	0 ^a	0 ^a	0 ^a	0.58
HDP(%)	61 ^b	58 ^a	69 ^c	72 ^d	86 ^g	83 ^f	75 ^e	75 ^e	86 ^g	86 ^g	81 ^e	69 ^c	78 ^d	81 ^e	97 ^h	0.58
HHP(%)	61 ^b	58 ^a	69 ^c	72 ^d	86 ^g	83 ^f	75 ^e	75 ^e	86 ^g	86 ^g	81 ^e	69 ^c	78 ^d	81 ^e	97 ^h	0.58

^{a-j} Means in the same row having different superscripts differs significantly ($p < 0.05$). E.L, I.E, HDP, and HHP means Egg Laid per day, Infertile eggs laid per day, Hen Day Production and Hen House Production respectively.

Result and Discussion

There was significant ($p < 0.05$) increase in hen day production (HDP) with increase in days of egg collection. About 97% HDP was recorded on the 15th day showing that quail has high reproductive potential.

Egg fertility increased significantly ($p < 0.05$) between day 1 and day 4 but significantly ($p < 0.05$) decreased between day 5 and day 10 of egg collection. This suggests that quails may have smaller sperm storage tubules that could store sperm for 10 days. This study is in agreement with the report of Birkhead and

Moller, (1992) that female birds can store viable sperm in their SST for a period between 6 and 45 days depending on their species.

According to Brillard, (1993), chicken has tubules that could store sperm for three weeks while turkey could store sperm for 10 weeks. The small storage capacity of quail could be due to its size. Quail is relatively small compared to chicken and turkey. The highest percentage fertility (on day 4) obtained in this study suggests that the spermatozoa are best capacitated at this period. This corroborates

the report of Suarez (2008) that sperm undergoes a biochemical transition process called capacitation that allowed motility hyperactivation of sperm in the SSTs to fertilize oocyte in mammals.

It has been reported that reduction in fertility of birds is associated with reduction in the

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- capacity to retain sperm in the SST and a decrease in sperm volume transported into the fertilization site (Santos *et al.*, 2013). The observed reduction in egg fertility from day 5 to day 10 (87-6%) may be as a result of factors identified above.
- It can therefore be concluded that Japanese quail has the capacity to store sperm cells in female reproductive tract for about 10 days. However, fertile eggs are better collected between day 1 and day 6 post withdrawal of male. Female quail need not be daily mated and the male can be separated until they are needed to be introduced for production of fertile eggs. In contrast to egg fertility, HDP in this study increased with day of collection which may suggest that the stress of mating may result in reduction of total egg collected.
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