Ovulation and oviposition patterns in quail (*Cortunix Cortunix Japonica*)[1]

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ABSTRACT: An experiment was conducted for 28 days in order to provide information on ovulation-oviposition intervals, and the movement of the ovum through the oviduct using quail which had been selected for aspects of growth and breast meat yield. A total of 120 quail females were sampled from the population at twelve weeks of age. The birds were placed in individual cages, and given 16 h of light per day with the light period from 04.00 to 20.00 h. It was found that the majority of eggs were laid by the quail in the afternoon between 14.00 and 17.00 h. It was also found that fifteen out of 26 females had ovulated 15-45 min after oviposition. The ova of two individuals ovulating within 15 min after lay were found in the posterior magnum, each contained a sizable amount of thick albumen.

Key words: ovulation, oviposition, quail

INTRODUCTION

Species or sub-species of the genus cortunix are native to all continents except America. One of the sub-species, *Cortunix cortunix Japonica*, is generally referred to as Japanese quail, and is also known by other names, e.g., common and Asiatic quail (Woodard et al., 1973). According to Panda and Singh (1990), quail is the smallest avian species farmed for meat and egg production. The use of quail meat for food is becoming increasingly important in many countries (Yalcin et al., 1995). Commercial quail farming is becoming more popular and is being increasingly promoted in a number of Asian countries including Japan, China, North and South Korea, Hong Kong, Taiwan, Singapore, the Philippines, India and Saudi Arabia (Panda and Singh, 1990; Sugiyama, 1991; Nitsan, 1992).

Quail have the ability to produce 3 to 4 generations per year in a breeding programme. Depending on day length, some females start lying at 35 days of age (average 40 days) and are in full production by 50 days of age. They produce well with appropriate nutrition in a suitable environment with an average of 250 eggs per year. Eight to 10 quail can occupy the same space as one chicken and they are relatively inexpensive to maintain (Woodard et al., 1973). The same authors also stated that the quail are similar in sexual development and egg production to high-producing strains of chickens. For instance, egg production can be altered by manipulating the length of the daily photoperiod. Optimum egg production of quail requires 14-18 h of light daily. Thus, quail have proven to be a good model for chickens in physiological and genetic studies.

However, quail are themselves an important commercial species also and it is worth studying their reproductive physiology for this reason. Studies have shown that ovulation in quail usually occurs within 15 to 30 min following oviposition (Woodard and Mather, 1964; Arrington et al., 1962). The present study was designed to provide information on, ovulation-oviposition intervals, and the movement of the ovum through the oviduct using quail which had been selected for aspects of growth and breast meat yield.

MATERIALS AND METHODS

A total of 120 quail females were sampled from the population at twelve weeks of age. The birds were placed in individual cages, and given 16 h of light per day with the light period from 04.00 to 20.00 h. A crumbled layer diet containing 11.7 MJ ME and 170 g CP/kg was provided *ad libitum.* Oviposition interval was determined by continuous inspection of each bird over a 10 day period from

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09.00 to 17.00 h, since quail mostly lay their eggs in the afternoon. Oviposition time was recorded after each bird laid an egg. All the data collected was subjected to the SPSS procedure described by SPSS Inc. (1990). Data from the lines was combined due to a small numbers of birds per line. The proportion of birds with ova at a particular stage over time was modelled using Probit analysis (Finney, 1971). The mean time to reach each stage and its standard error were calculated using Fieller's theorem (McCullagh and Nelder, 1989).

RESULTS AND DISCUSSION

Oviposition Time

Unlike chickens which mostly lay eggs in the morning, turkeys which typically lay around midday, or ducks which lay egg shortly after first light in the morning, it was found that the majority of eggs were laid by the quail in the afternoon between 14.00 and 17.00 h. Approximately 24% of the eggs were laid between 18.00 and 09.00 h the following day as shown in Table 1.

Table 1. Distribution of time of lay of quail

Period	Duration, h	Percentage of eggs laid in the designated period, %
09.00 - 13.00	4	6
13.00 - 14.00	1	1
14.00 - 15.00	1	37
15.00 - 16.00	1	19
16.00 - 17.00	1	10
17.00 - 09.00	16	26

The observation that most eggs are laid in the afternoon from this species essentially agrees with earlier reports by Wilson and Huang (1962) and Arrington et al. (1962). Although the results shows essentially the same pattern as described by Wilson and Huang (1962), there are some differences in the laying pattern and the percentage of birds laying eggs in the afternoon (66 % cf. 80 %). There are a number of factors which may be responsible for these observed differences, which include genetic and photoperiodic differences between the American and our studies. This study used a population of quail selected for different aspects of growth and breast meat yield, whereas the American study used birds from a line selected for egg production. The American study was undertaken in early Winter (late May to June) and the birds were exposed to artificial light for 14 h per day (from 05.00 to 19.00 h) whereas the present work was conducted in mid Spring (September) and the birds were given 16 h light-8 dark cycle per day with the light period from 04.00 to 20.00 h.

Oviposition Interval

Observation on time of ovulation and rate of ova movement through the oviduct in relation to time of oviposition are given in Table 2. Fifteen out of 26 females had ovulated 15-45 min after oviposition. The ova of two individuals ovulating within 15 min after lay were found in the posterior magnum, each contained a sizable amount of thick albumen. The actual interval between oviposition and ovulation was within the range of 15-30 min reported for quail by Wilson and Huang (1962), Arrington et al. (1962) and Woodard and Mather (1964). However, it was found that two of the seven quails autopsied averaged less than 24 h between successive eggs and as shown in Table 3. The yolk reached the ostium 7.1 min after oviposition of the previous egg, suggesting that they had actually ovulated before laying the preceding eggs. Eggs were found in the isthmus two hours after the previous egg was laid.

According to Woodard and Mather (1964), the infundibulum and isthmus of quail are proportionally longer than those in chickens, and the developing egg spends more time in the isthmus (1.5-2.0 cf. 1.25 h). This may account for the thicker shell membrane of quail eggs compared to that of chickens. The yolk of the birds in the present study was estimated to stay 2.2 h in the isthmus as shown in Table 3. About 5 h after lay all the ova from the birds sampled had reached the uterus and

stayed there on average 20.6 h (Table 3). This result is essentially similar to that of Woodard and Mather (1964) who found that the egg remains in the uterus for 19 to 20 h. The eggshell is formed in the uterus and the process involves the combining of calcium carbonate which makes up much of the egg shell. The architecture of the shell is complex and the process takes considerable time. Table 3 shows the estimates of times of ovulation and entry of the follicle into each part of the oviduct relative to oviposition. The data reveals that oviposition interval ranged from 23.6 to 25.6 h with an average of 24.6 h and standard deviation of 54 min.

Table 2. Record of observations on ovulation and location of ovum in the oviduct following oviposition of the previous egg.

	Minutes after oviposition							
Item	0	15	30	45	60	120	240	360
No. of birds examined	7	8	6	5	5	6	6	7
Location of ovum								
Ostium	2	1	2	1				
Infundibulum	1	3	1	1	4	1		
Magnum		2	1	1	1	3		
Isthmus						2	5	
Uterus							1	7
Proportion ovulated, %	42	75	66	60	100	100		
Proportion in the uterus, %							20	100

Table 3. Estimates of mean time (min) spent by the follicle in the different parts of the oviduct.

Interval	Mean	SEM
Oviposition to ostium (1)	7.1	26.0
Oviposition to infundibulum (2)	46.3	14.4
Oviposition to magnum (3)	79.2	13.3
Oviposition to isthmus (4)	129.2	8.8
Oviposition to uterus (5)	259.2	10.7
Oviposition to next oviposition (6)	1494	0.1
Time in body cavity (2-1)	39.2	-
Time in infundibulum, magnum and isthmus (5-2)	212.8	-
Time in uterus (6-5)	1234.8	-
Time in oviduct (6-2)	1447	

Oviduct Weight and Length

Oviduct weight ranged from 6.2 to 20.4 g with an average of 12.8 g and standard deviation of 3.1 g, whereas oviduct length ranged from 28 to 41 cm with an average of 34.3 and standard deviation of 3.5 cm. This result essentially agrees with the finding of Woodard and Mather (1964), who found the average oviduct length in a line of quail to be 31.3 cm. Differences in selection history, body size and age no doubt contribute to the relatively small difference between the two findings.

CONCLUSIONS

The majority of eggs were laid by the quail in the afternoon between 14.00 and 17.00 h.

Fifteen out of 26 females had ovulated 15-45 min after oviposition, the ova of two individuals ovulating within 15 min after lay were found in the posterior magnum, each contained a sizable amount of thick albumen.

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