

The Effect of Storage Period on Hatchability Characteristics of Rock Partridges (*Alectoris graeca*)

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Abstract: In this study, the effects of storage period of rock partridge eggs on hatchability characteristics and embryonic deaths were examined. In the study, a total number of 752 eggs which were obtained from a herd of rock partridges at 41 weeks of age were used. In different storage periods (1-14 days), no significant effect of storage period on hatchability performances of the partridge eggs was observed. Long storage time did not affect the hatchability of partridge eggs. It was observed that embryonic deaths in late period were more (not statistically significant) than early or medium periods. The least embryonic deaths were observed at early periods. As a result, it can be stated that, 14 days of partridge egg storage have no negative effect on hatchability results.

Key words: Rock partridges, storage period, hatchability characteristics

INTRODUCTION

In intensive production of winged animals, it is very important to store the eggs in suitable conditions before hatchability. Embryonic deaths in various periods of hatchability occur, if the eggs are not stored in suitable conditions. Determining the amount and period of deaths is very important in commercial facilities. Generally the criteria which are concerned in hatchability facilities are fertility, hatchability and machine efficiencies. Besides, embryonic deaths are observed superficially, the ratios of death periods are not generally determined. It is also well known by many researchers that, embryonic deaths are affected by egg storing period, position and pre-heating operations as well as fertility, hatchability and machine efficiencies (Fasenko *et al.*, 1992; Lapao *et al.*, 1999; Mayes and Takeballi, 1984; Meijerhof, 1992; Meijerhof *et al.*, 1994; Obioha *et al.*, 1986; Reinhart and Hurink, 1976; Reis *et al.*, 1997; Scott and Mackenzie, 1993; Yoo and Wientjes, 1991).

It is stated by some researchers that storing period affects embryonic deaths in various periods of hatchability and that storage period extension is directly proportional with embryonic deaths (Brake *et al.*, 1997; Fasenko *et al.*, 1992; Mayes and Takeballi, 1984; Obioha *et al.*, 1986; Reinhart and Hurink, 1982). Fasenko *et al.* (1992) stated that the blastodisks of eggs in hatchability that were laid earlier, have less living strength and that embryonic deaths will be observed more

in these eggs, due to their follicular structure and differentiation in their yolk structure but they will develop faster.

Storage of eggs at hatcheries simplifies the routine, with fully loaded incubators that produce batches of chicks at the end of hatchability (Fasenko *et al.*, 2001). During storage of unincubated eggs, environmental conditions are maintained within certain limits to keep the embryo in the best condition to resume development when hatchability begins (Ar and Gefen, 1998). However, hatchability falls as storage time increases (Fasenko *et al.*, 2001). Furthermore, the optimum storage time for a given species is not fixed because the length of time and conditions to which eggs are exposed in the nest prior to collection and during storage also affect hatchability (Brake *et al.*, 1997; Fasenko *et al.*, 2001).

Breeding of rock partridges (*Alectoris graeca*) in Turkey provides birds for release for hunting, but breeding of partridges for meat has become more popular in recent years. Although some research into the factors affecting egg production has been carried out (Kirikçi *et al.*, 1999; Kirikci *et al.*, 2004) future commercial development of partridge breeding requires basic research into the factors affecting hatchability.

Effect of storage time on hatchability in domesticated species such as fowl, turkey, goose, pheasant and ostrich (Labaque *et al.*, 2004) has been shown, but whether this applies in the rock partridge is unclear. Woodard and Morzenti (1975) stored 1-7, 8-14, 15-21 and 21-28 days

chukar partridge egg and they reported that hatchability rates as 60.2, 62.8, 62.4 and 52.7%, respectively. Kirikci *et al.* (2004) reported that Rock Partridge eggs at the extremes of initial egg mass had lower fertility and embryonic mortality.

This study was conducted to determine the effects of the length of the storage period on the hatchability of artificially incubated rock partridge eggs as well as describing the relationship between egg storage time and hatchability characteristics.

MATERIALS AND METHODS

Eggs were obtained from rock partridge (*Alectoris graeca*) breeding in an indoor colony at the Veterinary Faculty Farm of Firat University, Turkey. From 30 weeks of age, the birds were maintained as breeding trios (1 male: 2 female) in metal wire cages measuring 30×40×30 cm (W×D×H). During the production period they were fed on a ration containing 24% crude protein, 2.801 MJ kg⁻¹ ME. When the hens were 41 weeks of age, a total of 752 eggs were selected for incubation on the basis that was clean with a normal shape according to laying days. Prior to incubation, the eggs were stored for 1-14 day in a room maintained at 14°C and 75% relative humidity.

Eggs were fumigated with formaldehyde before setting into a Sektav incubator set at 37.5°C and 60% RH. Then, each egg was put in linen bag before transferred into Hatcher baskets to allow for pedigree hatching in a VGS Hatcher set at 37.5°C and 75% RH. At day 24 post-setting, hatched chicks were removed from the bags and counted. Unhatched eggs were opened to determine infertility and the number of dead embryos. Data were analyzed using SPSS version 11.0 (Kutsal *et al.*, 1990).

RESULTS AND DISCUSSION

Hatchability characteristics of partridge eggs at different storage times are shown in Table 1. Percentages of embryonic dead of partridge eggs at different storage times are shown in Table 2.

As mentioned in Table 1, storing in various periods does not affect the hatchability characteristics of partridge eggs, in other words long storage periods have no negative effect on hatchability of partridge eggs. This finding is a contradiction to the results that were obtained from other winged animals such as chicken (Reinhart and Humik, 1976) quail (Ozbey and Ekmen, 2002; Saylam, 1999; Wilson *et al.*, 1984) ostrich (Fasenko *et al.*, 2001) and pheasant (Woodard and Morzenti, 1975). However this finding supports the statements of Woodard and

Table 1: Hatchability characteristics of partridge eggs at different storage times

Storage time (day)	N	Hatchability (%)	Fertility (%)	Hatchability of fertile eggs (%)
1	48	80.52	87.30	92.42
2	49	74.11	78.68	93.06
3	45	78.31	87.60	89.95
4	45	82.34	90.04	91.25
5	67	80.23	87.65	91.60
6	48	76.20	88.53	85.91
7	51	73.06	91.11	79.33
8	56	79.63	86.68	92.20
9	64	88.09	94.44	93.10
10	44	68.05	80.06	84.17
11	67	79.22	87.88	90.39
12	56	79.75	90.00	87.76
13	55	78.74	85.21	92.86
14	57	88.17	93.53	94.64
SEM*		1.77	1.34	1.34
P		-	-	-

*: Standard errors of the means

Table 2: Percentages of embryonic dead of partridge eggs at different storage times

Storage time (day)	Early	Middle	Late
1	0.00	2.78	4.01
2	1.79	2.50	2.78
3	0.00	2.50	6.79
4	0.00	0.00	7.69
5	0.00	1.32	6.10
6	0.00	6.12	4.29
7	1.67	3.75	9.31
8	0.00	1.79	5.26
9	1.39	1.79	4.56
10	3.13	6.25	5.77
11	0.00	2.79	8.58
12	1.67	5.26	3.33
13	1.67	5.12	4.69
14	0.00	6.36	0.00
SEM*	0.33	0.71	3.33

*: Standard errors of the means

Morzenti that storing the eggs of partridge (Woodard and Morzenti, 1975) pheasant and bantam chickens (Harvey, 1993) for one week does not have a negative effect on hatchability results however if this period exceeds 2 weeks, eggs that are 10% fertilized, will be spoiled.

Studies about storage period are mostly concentrated on poultry such as chicken, turkey and goose that are commercially and intensively produced. Various researchers state that if eggs of these animals are stored up to 7 days before hatchability, hatchability results will be much better (Aksoy, 1994; Brake *et al.*, 1997; Chahil and Johnson, 1974; Obioha *et al.*, 1986; Reis *et al.*, 1997).

In various studies made about storing period, it was stated that best storage period for the eggs of winged animals other than chicken is 5-15 days (Brake *et al.*, 1997; Chahil and Johnson, 1974; Gonzalez-Alonso *et al.*, 1999; Merritt and Clarridge, 1959; Sittmann *et al.*, 1971; Woodard and Morzenti, 1975; Woodard, 1982). This period is 1 week for pheasant, 10 days for ostrich and 2

weeks for partridge (Gonzalez-Alonso *et al.*, 1999; Howman, 1993; Woodard and Morzenti, 1975; Woodard, 1982).

It is stated that partridges normally have a long egg laying interval in natural environment, they start brooding in a period more than 3 weeks, their eggs are stored in this period and this situation does not affect the hatchability results negatively (Robbins, 1998).

Woodard (1982) in a study about hennaed partridges, classified the eggs in 6 groups according to storage period as 1-7, 8-14, 15-21, 22-28, 29-35, 36-42 days and found the hatchability efficiencies as 78.4, 77.1, 79.4, 66.0, 37.7 and 22.3%, respectively. These data support the findings of the current study.

Different storage times of partridge eggs have no effects on any of the hatchability characteristics (Table 1). Of the 752 eggs used in this study; 83 (11.04%) were infertile, 73 (10.4%) contained dead embryos and 596 (79.26%) eggs hatched. Fertility and hatchability values obtained here were within the expected range cited for Partridge reared under captive conditions (Kirikçi *et al.*, 1999, 2004). However, hatchability values were higher than those reported by Woodard and Morzenti (Woodard and Morzenti, 1975) who stored 1-7 and 8-14 days chukar partridge egg and reported the hatchability rates as 60.2 and 62.8, respectively.

It is recommended that partridge eggs should be stored for about 2 weeks before placed in the machine hatchability (Cetin and Kirikçi, 2000; Embury, 1997; Kirikçi *et al.*, 1999). Some researchers state that the hatchability and machine efficiencies of eggs stored for 2 weeks are higher when compared with the eggs that are stored for a shorter or longer period (Cetin and Kirikçi, 2000; Embury, 1997; Kirikçi *et al.*, 1999).

It seems in Table 2 that different storage times of partridge eggs have no effects on the percentage of embryonic deaths.

Although no difference was observed regarding embryonic deaths during storage period, late period embryonic deaths (3.33%) were more than early or medium period embryonic deaths (0.33 and 0.71%).

Reinhart and Hurnik (1976) in a study on chicken eggs, stated that early and late embryonic deaths were observed to be higher when eggs were stored for more than 3 weeks. In another study, it was stated that early embryonic deaths at a ratio of 11-21% occurred in eggs that were stored for 22-28 days and that this was caused by the genotype variety of the eggs and different storage conditions (Reinhart and Hurnik, 1982).

It is well documented that storing time fertile, domestic avian eggs decreases hatchability (Fasenko *et al.*, 2001). In Ostrich (Labaque *et al.*, 2004) the highest hatchability was in eggs stored for a few days.

As a result, it is understood that, storing at different periods have no effect on hatchability performances of partridge eggs, in other words storing for long period does not have a negative effect on the hatchability of the partridge eggs. Although no significant difference can be observed during storage period regarding the embryonic deaths, late embryonic deaths were more than embryonic deaths in early and medium periods. The least embryonic deaths were observed in early period. Embryonic deaths in early period were much less than other periods when storage period was 1-7 days.

The data obtained at the end of the study shows that hatchability characteristics are not much affected by the storage period. Storage period also seems to be not significantly effective on embryonic deaths in early, medium and late periods. In partridge breeding facilities in which the stud herd is not so big, sufficient amount of eggs should be gathered for hatchability. This may extend the storage period. While the people, who are involved in this field of stockbreeding, are planning their production, they should keep in mind that if the storage period, that may effect hatchability results, is about 14 days just like in this study, it does not have a negative effect on the hatchability results and embryonic deaths.

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