

Effects of Pre-incubation Storage Time and Position on Some Hatching Results of the Rock Partridge (*Alectoris graeca*) Eggs ^{[1][2]}

Alper YILMAZ *  Cafer TEPELİ *

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* Selçuk Üniversitesi, Veteriner Fakültesi Zootečni Anabilim Dalı, Konya - TÜRKİYE

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Summary

The effects of pre-incubation storage time and position on some hatching results of the rock partridge (*Alectoris graeca*) eggs were investigated. In total, 2420 partridge eggs were used in the study. All eggs were stored in storage rooms with 12.8°C temperature and 70-75% relative humidity. The pre-incubation egg storage periods were 1-7, 8-14, 15-21 and 22-28 days. Each storage group was divided into three eggs position groups which were 45° angle tilt twice daily, not turning egg (-) and turning egg (+) daily according to egg position. As a result, hatch of fertile eggs of 8-14 days and turning egg (+) groups were better than the results of other groups.

Keywords: Storage time, Storage position, Hatching results, Rock Partridge (*Alectoris graeca*)

Kaya Kekliği (*Alectoris graeca*) Yumurtalarında Kuluçka Öncesi Depolama Süresi ve Pozisyonunun Bazı Kuluçka Sonuçlarına Etkisi

Özet

Çalışmada, Kaya Kekliği (*Alectoris graeca*) yumurtalarında kuluçka öncesi depolama zamanı ve pozisyonunun kuluçka sonuçları üzerine etkileri araştırıldı. Toplam 2420 adet keklik yumurtası çalışmada kullanıldı. Tüm yumurtalar 12.8°C sıcaklık ve %70-75 nem içeren depolama odasında saklandı. Kuluçka öncesi yumurta depolama periyotları 1-7, 8-14, 15-21 ve 22-28 günler için oluşturuldu. Her bir depolama grubu üç yumurta pozisyon grubundan (günde iki sefer 45° açıyla eğme, alt-üst edilmeyen yumurtalar ve alt-üst edilen yumurtalar) oluşturuldu. Sonuç olarak, 8-14 gün depolanan ve alt-üst edilen yumurtalar diğer gruplardaki yumurtalardan çıkım gücü bakımından daha iyi kuluçka sonuçları gösterdi.

Anahtar sözcükler: Depolama zamanı, Depolama pozisyonu, Kuluçka sonuçları, Kaya Kekliği (*Alectoris graeca*)

INTRODUCTION

Egg storage conditions prior to incubation have an influence on hatching results; therefore, they are very important to commercial hatchery practice ¹. Several studies were performed to define the optimum conditions for hatching egg storage which would yield maximum hatching results ²⁻⁵. However, these studies mostly concentrate on poultry breeds such as chicken, quail, turkey and waterfowl ^{2,3,6-12}.

Woodard ¹³ investigated influence of length of storage time on hatching results of chukar partridges. He reported that storing partridge eggs at 7, 15 and

21 days had same hatchability values. It has been well documented that optimum hatching results could be obtained from partridge eggs stored at 15 days ^{5,14-17}.

Many researchers suggested that different egg positions during the storage time influenced hatching results of galliformes' eggs ^{8,18-24}. Tilki and Saatçı ²⁵ reported that partridge eggs showed a resistance to storage time, much better than other domestic poultry such as chicken. Limited investigations on egg position during the storage in partridges have been conducted ^{5,13}.



İletişim (Correspondence)



+90 332 2232702



ayilmaz@selcuk.edu.tr

The objective of this study was to investigate effects of pre-incubation storage time and position of partridge (*Alectoris graeca*) eggs on hatching results.

MATERIAL and METHODS

This study was conducted in Game Birds Units at the Selcuk University, Faculty of Veterinary Medicine, Turkey. Totally, 2420 partridge eggs were used in the experiment. The study groups are summarized in *Table 1*.

Eggs were obtained from the birds after 32 weeks of ages. The birds were housed as 1 male and 2 females in metal wire cages measuring 30 x 40 x 30 cm (wide x depth x high), and they were exposed to a 16 hour light period throughout laying season. During the production period partridges were fed on a ration containing 16.47% crude protein and 2.928 kcal/kg metabolic energy.

Egg storage rooms

Two storage rooms were used in the study. The first one was small and sized 100 x 82 x 195 cm (wide x depth x high). The room had two stables and two turning shelves which could be tilted to 45° angle twice a daily, and the temperature could be adjusted to desired degree. The other storage room was bigger with dimensions of 190 x 82 x 195 cm (wide x depth x high). This room had five stables and four turning shelves which could be tilted to 45° angle twice a daily. The conditions were 12.8°C and 70-75% relative humidity during 28 days.

Egg collection and disinfection

The eggs obtained from partridges were gathered once daily between at 3.00 p.m. and 5.00 p.m.; and placed small end down on egg flats. Immediately after this process, the eggs were placed in a disinfection chamber and fumigated for 20 min by mixing 20 g potassium permanganate into 40 ml 10% formalin solution per m³ of chamber ²⁶.

Egg position groups

Each day the eggs were divided equally into 3 main groups which were 45° angle tilt twice daily, not turning egg (-) and turning egg (+) daily according to egg positions.

Application 1

In this stage, eggs were placed in the small storage room. The temperature of the room was gradually decreased from 21°C to 12.8°C in 120 min. Then all eggs

were put into the large storage room allowing 12.8°C stable temperature and 70-75% relative humidity. During these applications, eggs to be turned for each day were kept in a position of small-end down for one day and small-end up for the other day in large storage room. Additionally, eggs to be 45° angle tilted were automatically turned by the room twice a daily.

Egg Storage Time

Eggs gathered in the first, second, third and fourth weeks constituted 22-28, 15-21, 8-14 and 1-7 days of storage groups of the experiment, respectively.

Egg Storage Group

First group (22-28, 15-21, 8-14 and 1-7 days) eggs were collected in May and second group eggs collected in June and at the beginning of July. First group eggs were belong to mid season of the laying period. However, the second group eggs were obtained at the end of the laying season. Period for collection of the eggs was put an end 1-7 days. Therefore, first group were constituted from the eggs collected between 22-28, 15-21, 8-14 and 1-7 days while the other group were from 22-28, 15-21 and 8-14 days. This plan enabled us to observe how the storage time and positioning of the eggs affected collected eggs that have been collected in different time points of the laying season.

Table 1. Study plan

Table 1. Deneme planı

Storage time	Positions	1 st group (n)	2 nd group (n)
1-7 days	A	128	-
	B	126	-
	C	129	-
8-14 days	A	120	80
	B	126	80
	C	126	81
15-21 days	A	116	127
	B	110	129
	C	116	126
22-28 days	A	96	136
	B	99	138
	C	102	129
Total (n)	-	1394	1026

n: eggs quantity in the positions

A: 45° angle tilt twice daily, **B:** Not turning egg (-), **C:** Turning egg (+) 180° rotation once daily

Application 2

After 28 days, the temperature of the large storage room was gradually increased from 12.8°C to 21°C as 0.5°C every 30 min. As the last step, all eggs in the groups

were set into incubator which was 37.8°C and had 60% relative humidity. At 21 days of incubation, the eggs were transferred to separate places according to groups. After hatching, all unhatched eggs were opened and examined macroscopically for evidence of fertility²⁷⁻²⁹.

Statistical analyses

The experimental analyses of the data were carried out by Chi-square test³⁰. Statements of the significance were based on $P < 0.05$. The analyses were accomplished by using a statistical analyses system configured for computer (SPSS 13.0).

RESULTS

Hatching results of treatments are presented in *Table 2*. According to the positions and storage time, group of 8-14 days and turning eggs (+) was found to hatch better than the others in the 1st group. In the 2nd group didn't seen such a condition. The main effects of the treatments according to fertile eggs are presented in *Table 2* ($P < 0.05$). However the other crucial points which could effect hatchability performance are as follow: female age, collection time of eggs in the laying period and eggs' inner alteration which is connected with structure of both pores and shell. This condition is reported in *Table 2* in the 1st and 2nd group hatching results.

DISCUSSION

The results indicate that storing partridge eggs for 8-14 days is required to obtain optimum hatching results. This is in agreement with the results of Woodard and Morzenti⁵, Çetin and Kırıkçı¹⁴, Embury¹⁵, Kırıkçı et al.¹⁶, Woodard et al.¹⁷. Partridges normally lay large clutches of eggs in the wild and have no trouble in storing them. The first eggs laid can often be well over three weeks of age before the hen starts to sit, yet hatch just as well as the last egg laid³¹. As a result, it can be said that partridge eggs can be stored around 15 days to obtain maximum hatching performance. Some other factors such as maternal age, time in which egg samples taken in the laying season and also some criteria regarding external and internal structures of the egg could effect hatchability performance.

When the different positions were compared, treatments with turning eggs (+) provided superiority on other treatments regarding hatching results in 8-

Table 2. Some hatching results of treatments

Tablo 2. Çalışmada belirlenen bazı kuluçka sonuçları

Storage time	Positions	1 st group			2 nd group		
		HCN	FE	HFE (%)	HCN	FE	HFE (%)
1-7 days	45°	70	105	66.67 ^b			
	(-)	65	98	66.33 ^b			
	(+)	65	105	61.90 ^c			
significance				-			
8-14 days	45°	83	97	85.57 ^{ab}	16	58	27.59 ^f
	(-)	85	102	83.33 ^{ab}	16	53	30.19 ^f
	(+)	98	104	94.23 ^{aa}	14	65	21.54 ^f
significance				*			-
15-21 days	45°	74	97	76.29 ^b	42	102	41.18 ^e
	(-)	65	87	74.71 ^b	37	97	38.14 ^e
	(+)	73	90	81.11 ^b	35	100	35.00 ^e
significance				-			-
22-28 days	45°	51	76	67.10 ^b	65	110	59.09 ^d
	(-)	40	66	60.60 ^b	61	109	55.96 ^d
	(+)	50	83	60.24 ^c	63	103	61.17 ^d
significance				-			-
General significance	45°			*			*
	(-)			*			*
	(+)			*			*

*: Significance ($P < 0.05$), -: Non significance ($P > 0.05$)

a,b,c,d,e,f: Differences between the means of groups denoted by different letters within the same column and position group are significant ($P < 0.05$). **A,B:** Differences between the means of groups denoted by different letters within the same column and storage time group are significant ($P < 0.05$). **FE:** Fertile egg in groups, **HCN:** Hatch of chick numbers, **HFE (%):** Hatch of fertile eggs

14 days. Turning eggs in position of small-end down for one day and small-end up for the other day may have positive effect on egg weight loss and CO₂ diffusion^{19,32-35}. Therefore, this effect may be beneficial because it keeps the yolk near the centre of the albumen and this gives the dormant embryo greater protection from dehydration and adhesion to the inner shell membrane^{4,18,36}. Studies on turning partridge eggs during storage generally are mostly related to 45° angle tilt in standard position. While 45° angle tilt during storage had positive effects on hatching results in mentioned studies^{5,13,15,17}, turning eggs in a position of 45° angle had not important effects on treatments groups in this study.

It can be concluded that 8-14 days pre-incubation storage time and turning eggs in position of small-end down for one day and small-end up for the other day are needed to get optimum hatching results in partridge eggs.

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