RESEARCH ARTICLE

Effects of storage length on the hatchability of ostrich (*Struthio camelus*) eggs

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Özet

Ograk YZ, Altinel A. Depolama süresinin devekuşu (*Struthio camelus*) yumurtalarında kuluçka performansı üzerine etkileri. **Eurasian J Vet Sci, 2014, 30, 1, 30-34**

Amaç: Çalışma, özel devekuşu işletmelerden elde edilen yumurtaların depolanma sürelerinin kuluçka performansı üzerine etkilerini belirlemek amacı ile yapılmıştır.

Gereç ve Yöntem: Mart ve Eylül ayları arasını kapsayan bir üretim sezonunda elde edilen devekuşu yumurtaları, numaralandırılıp, tartılarak yumurtlama tarihleri ve 1-15 gün arası depolanma süreleri ile birlikte kayıt edildi. 14. günde döllüsüzlüğü saptanan yumurtalar kuluçkadan çıkartıldı. İnkübasyonun 38. günündeki ikinci tartımları ile ağırlık kayıpları ölçülen yumurtalar, çıkım makinesine nakledildi. Çıkımı gerçekleşen civcivler de tartılmış, kuluçkaya konan yumurtalar ve döllü yumurtalar için kulakça randımanı belirlendi.

Bulgular: Bu çalışmada ortalama kuluçka süresi 43.58 gün oldu. Depolanma süresine göre yapılan gruplar (Kısa, orta ve uzun depolama) için kuluçka süresi ortalamaları arası farklılıklar istatistikî olarak önemli (P<0.05) bulundu. İnkübasyon boyunca ortalama ağırlık kaybı %13.70 olarak gerçekleşti. Çalışma sonunda ortalama kuluçka randımanı ve çıkım gücü sırasıyla %57.90 ve %75.00 olurken, depolanma süresi grupları için ortalamalar arası farklılıklar önemli (P<0.05) bulundu.

Öneri: Yapılan bu çalışma ile depolama süresinin 10 günü aşması, çıkım gücü ve kuluçka randımanını olumsuz etkilediğini işaret etmektedir. Bu nedenle kuluçka amacıyla depolanacak devekuşu yumurtalarında 10 günlük sürenin aşılmaması tavsiye edilebilir.

Anahtar kelimeler: Devekuşu yumurtası, depolama süresi, kuluçka, Afrika Karası

Abstract

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Aim: This study was carried out in order to determine the effects of storage length on the hatchability of ostrich eggs obtained from private ostrich farms.

Materials and Methods: The eggs, which were collected from ostriches in one season, lasting from March to September, were numbered, weighed, recorded with laying date and stored for 1-15 days. On the 14th day of incubation, infertile eggs were determined and removed from incubation. On the 38th day of incubation, eggs were weighed for the second time, and following weight losses measurement, the eggs were transferred to the hatching machine. The hatched chicks were weighed and hatchability of fertile egg, hatchability of egg set and chick weight results were determined.

Results: Average incubation period was 43.58 days. In terms of incubation period, differences between groups that were classified according to storage periods (short, medium and long) were significant (P<0.05). Average egg weight loss of during incubation was 13.70%. Mean hatchabilities of egg set and fertile egg were 57.90% and 75.00%, respectively and differences between the groups of storage period were statistically significant (P<0.05).

Conclusions: The storage period more than ten days has the potential to negatively affect the incubation results of ostrich eggs. So, it could be recommended that for storing ostrich eggs, 10 days of storage shouldn't be exceeded.

Keywords: Ostrich egg, storage length, hatchability, African Black

Introduction

Recommended storage period for the eggs of many poultry is 7 days or less (Wilson et al 1997, Sahan et al 2003, Sarica et al 2003). But there are differences among species. For instance, while storage for 14 days affects fertile egg hatchability of chicken egg, it doesn't affect bobwhite quail and rock partridge eggs (Wilson et al 1997, Caglayan et al 2009). Similar to many bird species, extension of storage time decreases fertile egg hatchability of ostrich egg (Wilson et al 1997). Prolonging storage time too much, on the other hand, cause deaths during hatching and delaying of hatching. Existence of eggs stored for short and longer times in incubator prolongs hatching length. Prolonging of hatching for 40 minutes decreases the number of hatched chicks to 0.5-1.2%. Early embryonic deaths occur at light controls of eggs that are stored at very low or high temperatures instead of 15-18°C, which is the proper temperature (Wilson 1994).

It is a common practice to store ostrich eggs for 7 days by eliminating bacteria under ultraviolet lamp. Continuation of approximately 35% low feed values and 17-21°C heat is significant (Cooper 2000). In natural life, waiting time of eggs, which are laid in a nest and reach 22 in number is 2.5-4 weeks (Wilson et al 1997, Sebei et al 2009). Wilson et al (1997) in two experiments incubated 62 and 274 fertile eggs which they collected from local ostrich producers, in the University of Florida and grouped them at 13-16°C up to 15 days; at the end of the study, they recommended storage for 7 days or less for maximum hatching. Gonzalez et al (1999), stated in their study on 73 ostrich eggs that, storage for 10 days at 18°C and 69% relative humidity doesn't affect weight loss and fertile egg hatchability during incubation. They compared storages less than 5 and for 5-10 days, they obtained relatively %63.2 and 74.3% fertile egg hatchability. Galip (2001) determined that fertile egg hatchability of ostrich eggs, which are stored up to 10 days in two production seasons, decreased after 5 days. In a study on 150 eggs Nahm (2001) stated that storage period up to 19 days at 15.5°C doesn't affect fertile egg hatchability. It has been determined that; for maximum hatching, storage temperature should be 21°C or lower and egg storage position don't have an effect on embryo vitality at another study (Sahan et al 2003) conducted on 229 eggs at three different temperatures and positions for 7 days of storage periods. While Hassan et al (2005) recommended that incubation of ostrich egg stored for shorter than 15 days increases hatchability, Schalkwyk et al (1999) stated that the effect of stored ostrich eggs vertically (air sac under or above) or horizontally on embryonic deaths is not significant.

This study was carried out in order to determine possible effects of storage length on the hatchability of ostrich eggs obtained from private ostrich farms in the central Anatolian Turkish cities of Sivas and Kayseri.

Materials and Methods

Study area and samples

Animal material of the research is 10 female and 5 male African Black ostrich between the ages of 3.5-5; these ostriches were raised as trio groups including 2 females, 1 male in private ostrich farms in central Anatolian cities of Sivas and Kayseri. 544 of 586 eggs, which were collected from these two private farms in 2002 production season, lasting from March to September, were used in the study.

Care and feeding

Same maintenance, feeding and administration conditions have been provided in the farms during the research. Adult breeding ostriches in two farms were placed into approximately 1000 m^2 separated paddocks that have feeders that are closed with approximately 10 sq m shelters and fed exactly the same. Breed ostrich feed was paddle type and included 18% crude protein, 16% crude cellulose and 2450 Kcal/kg ME. Besides the concentrate feed, given twice a day -morning and evening-, totally 2 kg, approximately 3 kg clovers were given in the afternoon. There was always an open water source nearby.

Data collection

Right after laying, eggs were collected on the every same day, lying date and farm was written on the egg and they were weighed; after being registered, they ware placed into cool storage sections at 12-20°C whose humidity rate was not under control. Eggs stored for maximum 15 days were placed into safe parcels with wood flour and transported to the establishments where incubation will be carried out. At the end of transportation, before placing eggs into development machines; they were rested for 8-10 hours. Incubation of eggs, were made in digitally controlled full automatic development machines with 140 eggs capacity. Eggs that were placed in development machines vertically in a way that airspace was on top were automatically rotated 90° around their own axis once in two hours. Heat in the development machine that had electronic mechanism was 36.5°C, relative humidity was 25%. On the 14^{th} day of the incubation, eggs were examined with lamp mechanism for progeny testing; eggs that were determined to be addled were not put into the machine. Eggs kept incubation machine for 38 days were taken from there, their developments were analyzed with light controls, weighed with electronic scale and placed in hatching machines. Again, in electronically controlled three capacity hatching machine, heat was arranged to be 36°C and humidity rate was arranged to be 40%. After weighing chicks, they were left to dry for 8-10 more hours in machines and then placed in particular sections. With incubation, storage lengths, infertile eggs, their weights on 38^{th} day, incuba-

Table 1. The effect of different storage period on the hatchability of ostrich eggs.

	Storage Length			P value
	Short <6 days	Medium 6-10 days	Long >10 days	
Incubated eggs (n)	241	245	58	-
Infertility (%)	23.7	22.9	19.0	NS
Incubation period, d (mean±SE)	42.58^{c}±0.165	44.10^{b}±0.157	46.09^{a}±0.449	***
Egg weight loss (%)	13.64	13.67	14..28	NS
Chick weight, g (mean±SE)	1043.69±7.5	1036.99±8.1	1001.83±21.9	NS
Fertile hatchability (%)	74.5^{a}	82.0^{a}	48.9^{b}	**
Total hatchability (%)	56.8^{a}	63.3^{a}	39.6^{b}	**

$^{a, b, c}$: The differences between the average values indicated by different letters within the same row are statistically significant (P<0.05). NS: Non significant (P>0.05), ** P<0.01, *** P<0.001.

tion lengths, embryonic deaths, hatched chick number and chick weights were recorded.

Statistical analysis

For descriptor statistics and between-group tests of data obtained in the research, chi-square test was used; SPSS 14.0 (SPSS Inc., Chicago, IL.) package program was used in the analysis of variance analysis. P<0.05 level was accepted as statistically significant.

Results

Average storage period of eggs, which were used in the study and whose storage periods lengthened up to 15 days, were 6.12 days. Eggs according to storage periods were grouped as; short storage for 5 days or less, medium storage for 6-10 days and long storage for more than 10 days. Values of infertility rate according to storage period before incubation, incubation length, and egg weight loss rate, chick weight, fertile egg hatchability and hatchability of egg set are presented in Table 1.

According to Table, effects of storage length on incubation length, fertile egg hatchability and hatchability of egg set were found to be statistically significant (P<0.05); on the other hand, its effects on infertility, egg weight loss and chick weight were found to be insignificant (P>0.05). But effects of storage up to 10 days (short and medium length) on fertile egg hatchability and hatchability of egg set was found to be statistically insignificant (P>0.05). The effects of the storage length on the embryonic deaths that shaping hatchability is shown in Figure 1.

Distribution of eggs according to incubation length is presented in Figure 2. As shown in Figure 2, incubation length clearly prolongs in parallel with the storage time.

When relationship between storage period and incubation data are analyzed, it can be seen that there are linear correlations coefficient with incubation length (r=0.548, P<0.01) and % weight loss level (r=0.112, P<0.05).

Discussion

In this research, eggs were discussed in three groups in terms of storage period, and lowest hatchability of egg set was obtained from eggs that were stored for more than 10 days (long storage length). While generally it is thought that storing ostrich eggs for 7 days (Wilson 1997, Wilson et al 1997, Cooper 2000), different results were also obtained in various studies. Hassan et al (2005) in their study, 314 eggs were stored up to 24 days, and higher hatchability was obtained from stored ≤10 days, however hatchability of egg stored ≤10 days was not different from egg stored between 10-15 days or 15-24 days. Nahm (2001) stored totally 150 eggs; although 2 of them for 17 days and 4 of them for 19 days, 100% hatching ratio; on the other hand, the lowest hatching ratio was obtained from 6 eggs that were stored for 5 days (55% ratio).

Normally, affected incubation of ostrich eggs is accepted to be 42 days (Kreibich and Sommer 1995, Sarica et al 2003, Dzoma 2010). In this research, it was determined that average incubation period was 43.58. This value is little higher than the mean stated in the literature. But it is accepted that race or individual factors, egg weight, environment temperature, humidity of environment and storage length also affect incubation length (Wilson 1994, Reiner and Dzopa 1995, Brand et al 2008). On the other hand, difference between the averages incubation length of eggs which are grouped as short, medium and long according to storage length, were found to be statistically significant; in parallel with the increase in storage length, incubation length prolonged. This result is similar with findings of researchers (Wilson 1994, Galip 2001).

In current research, average fertile egg hatchability was 75.00%. This average fertile egg hatchability is similar with the studies of Horbanczuk et al (1999), Rizzi et al (2002) and Schalkwyk et al (2000). But average fertile egg hatchability of this research is higher than the values of Deeming (1995 and 1996), Deeming et al (1993), More (1996) and Schalkwyk et al (1999), and it is higher than the value determined by Galip (2001). On the other hand, this average value is lower than one of the groups in the study of Ak et al (2003), and higher than the other group their study. In the study, average hatchability of egg set of all of the eggs placed into incubation machine was 57.90%. While this value is in parallel with some of the other literature statement (Yalcin and Tuncer 1998, Schalkwyk et al 2000), it is lower than Deeming et al (1993) and Galip's (2001) results; and higher than the results obtained by Deeming (1995), Ipek and Sahan (1999), Rizzi et al (2002), Deemig (1996), Horbanczuk et al (1999). It is already stated in the studies that many factors including heritage, feeding, hygiene, egg size, pore number in eggs, egg shell thickness, egg position during incubation and rotation frequency, incubation heat and humidity and ventilation are effective on hatchability of egg set and fertile egg hatchability (Wilson 1994, Wilson 1997, Gonzalez et al 1999, Schalkwyk et al 2000).

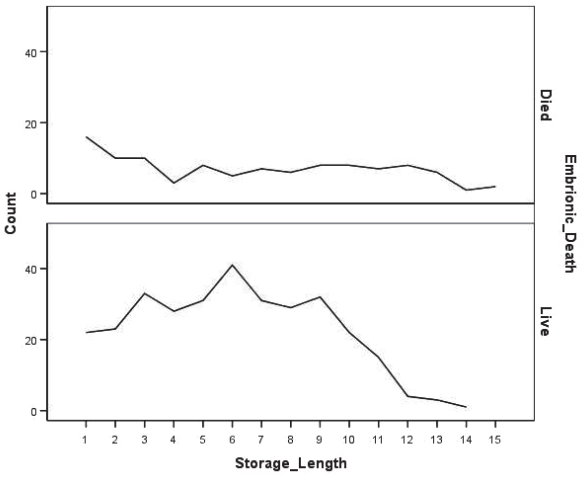

Figure 1. Some body measurement points on Tarsus Çatalburun dog.

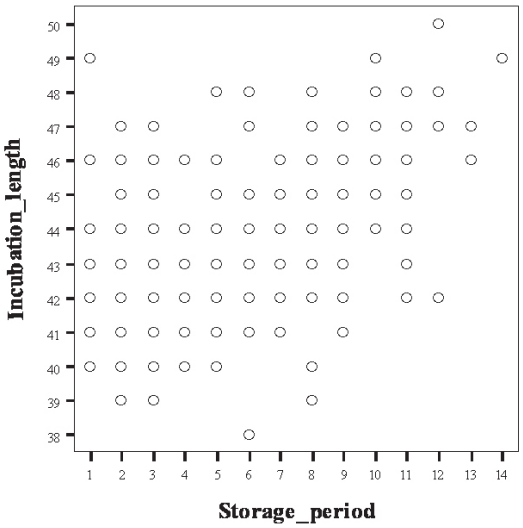

Figure 1. Some body measurement points on Tarsus Çatalburun dog.

Conclusion

In this research, it is mentioned that storage length's exceeding 10 days negatively affected hatchability of egg set and fertile egg hatchability. It could be recommended that for storing ostrich eggs, 10 days of storage shouldn't be exceeded. More studies are needed to determine optimal conditions for maximum hatchability of ostrich eggs.

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