Effect of egg storage time on internal egg quality, egg v hatchability embryonic mortality and subsequent g performance in Japanese quail

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Abstract

A total of 1000 incubating eggs produced by a commercial Japanese qu flock were used to determine the effect of storage duration (3, 7 and days) on internal egg quality traits, egg weight, hatchability of fertile eg fertility, embryonic mortality, chick weight, weight gain and relative grow rate during first 4 weeks. Albumen height, Haugh unit, yolk height and yo index decreased with increased storage time while yolk diameter w increased with storage time. The difference between eggs from 3-day a 7-day storage groups was statistically non significant (P>0.05). Egg weig loss (1.01 %) was statistically non significant ((P>0.05) in the 3-day stora group, and significant (P<0.05) in 7-day storage group (2.13 %) while was highly significant ((P<0.01) in 14-day storage group. Eggs stored fo days showed higher hatchability (83.3%) and fertility (83.56%), than a lower embryonic mortalities (early 5.7%, late 5.32 %) than those observ in those stored for 7 or 14 days (hatchability 77.98%, 71.25%, ferti 80.75%, 77.67%, early dead 9.17%, 12.95%, late dead 7.95%, 10.93 respectively). Weights of 1-day, 2-weeks and 4-weeks old chicks we higher (P<0.05) for chicks from 3-day storage group than those form 7-d or 14-day storage groups. However body weight gain and relative grow rate from hatch to 2-weeks, from 2-weeks to 4-weeks and from hatch to weeks of age were significantly reduced by storage of eggs. It w concluded that egg storage alters incubation egg quality, and the effec are manifested at different stages of chick development such as at hat (hatchability and 1-d-old chick quality and weight) and at different stages post hatch growth

Key words: *Quail, Egg storage, Hatchability, Egg quality, Body weight*

Introduction

The performance potentiality of poultry depends, in part, on egg quality. Eg is an important parameter for embryogenesis as well as for 1-day-old chick (al., 2003). Although egg storage is a normal practice after egg collection and necessity in commercial incubation, it negatively influences egg quality and development (Mirosh and Becker, 1974, Muambi et al., 1980, Samli et al., 200 and Dikmen, 2006). Storage of eggs for more than a week is known to inc increase embryonic abnormalities and mortality due to the degradation of vis egg albumen and thereby increase the probability of failure to hatch (Whitehea

1985, Yoo and Wientjes 1991, Scott and Mackenzie, 1993,Van de Ven, 2004) time appear to be one of the most crucial factors affecting egg quality. Acc many studies, the Haugh unit, egg weight, yolk index, shell weight, shell thick shell membrane thickness are affected by storage time (Imai, et al., 1987, Al 1997, Tilki and Saatci, 2004, Tona et al., 2004 and Samli et al., 2005). Som effects of extended storage on hatchability and the subsequent performan domestic fowl. These adverse effects include reduced hatchability of the st and increased mortality and decreased chick weight of the chicks hatched f which had been subjected to extended preincubation storage (Becker, 1960, al., 1961, Kosin, 1964, Arora and Kosin 1966 and Ipek et al., 2006) Inf number of storage days before incubation on early embryonic mortality embryonic mortality has been assessed among fertile eggs (Yoo and Wien Scott and Mackenzie, 1993). As the number of storage days the proportio embryonic mortality increased (Yoo and Wientjes 1991). Furthermore weight of age and relative growth of chicks from eggs stored for 3 days was higher th chicks from eggs stored for 18 days (Tona et al., 2003). Therefore this aimed to investigate the effect of egg storage duration at 13-15 °C and 75-80 humidity on egg weight and internal egg quality before setting, hatchability pe embryonic mortality and chick weight at hatch, 2 weeks and 4 weeks of age weight gain and relative growth rate.

Materials and methods

Incubation management

A total of 1000 incubating eggs produced by a commercial Japanese quail used. Eggs were stored for 3, 7 and 14 days at 13-15 °C and 75 to 80% humidity. Experiments were carefully planned such that egg collection ar were timed to the exact setting period. Eggs of 14-day, 7-day and 3-day st collected 14, 7 and 3 days, respectively, previous to setting. Eggs we incubation in a forced-draft incubator at a specific dry-bulb temperature of 3 wet-bulb temperature of 29 °C. At 14 days of incubation eggs were transf turning trays to hatcher baskets at 37.0 °C dry bulb temperature and 31° temperature.

Studied traits:

1. Egg characteristics: All eggs of the 3 storage group were weighe electronic scale balanced at 0,01 g precision before and after storage pe end of storage period a random sample of 10 eggs from each group were w broken and the height of thick albumen and yolk were measured. The al yolk were separated and only yolk was weighed. Haugh units (HU) were from the HU formula: HU=100 log (H-1.7W0.37+7.57 (H=albumen heigh weight) (Haugh, 1937). The yolk indices were calculated as follows: Yolk i height/yolk width.

2. Hatchability and embryonic mortality: At the end of hatching, eggs th hatch were opened out and the contents macroscopically observed and c either apparently infertile or apparently fertile (when blood islet or e observed). The approximate time of death of the embryo was estimated as blood islet or very small embryo with very large yolk sac was observed) or l

fully formed embryo with a completely, or almost completely absorbed yolk s observed) or dead at piping (Elibol et al., 2002). Hatchability of fertile eggs eggs was calculated as the number of chicks hatched per fertile or total eggs 1998).

3. Body weight, gain and relative growth: The newly hatched chicks from al were floor reared under the standard growing conditions. Individual body we chicks were measured at hatch, 2-weeks and 4-weeks. Body weight ga measured from hatch to 2-weeks, 2 to 4 weeks and hatch to 4 weeks. Relative rate was calculated using the formula: RG= 100 x (W2-W1)/W1 (Tona et al., 20

Statistical Analysis:

Egg characteristics, body weight, gain and relative growth data were analy ANOVA. Duncan's multiple mean comparison test was used to compare tr means. T-test was used to compare egg weights before and after storag hatchability and embryonic mortality traits were analyzed using chi-square independence to determine the relationship between these traits and storage (Snedecor and Cochran, 1989). All tests were performed using SPSS® co software 10.00 (SPSS®, 1999).

Results and Discussion

Effect of egg storage time on internal egg quality:

Results of the effect of storage time on egg quality are presented in Table 1. demonstrated that increasing egg storage time depressed all studied param internal egg quality. Albumen height, Haugh unit, yolk height and yolk index dec with increased storage time while yolk diameter was increased with storage tin difference between eggs from 3-day and 7-day storage groups was statistica significant (P>0.05). A highly significant difference (P<0.01) was observed in egg quality traits between 3-day storage group and 14-day storage grou negative effect of increasing storage time on internal egg quality traits is in acc with the observations of Imai, et al., 1987, Altan et al., 1997, Tilki and Saatc Tona et al., 2004 and Samli et al., 2005. Most of these changes in internal egg were attributed to water loss by evaporation through the pores on the shell a escape of carbon dioxide from albumen (Hinton, 1968, Shenstone, 19 Robinson, 1987). The net effect of these changes is a progressive loss in egg and in a continual decline in internal egg quality (Williams, 1992).

Effect of egg storage time on egg weight:

Means and their standard errors for egg weight before and after storage i storage group and the relative weight loss (RWL) for each group are shown in T Eggs presented continuous egg weight loss with storage length. Egg weight los %) was statistically non significant ((P>0.05) in the 3-day storage group, and sig (P<0.05) in 7-day storage group (2.13 %) while it was highly significant ((P<0.01 day storage group. Similar results were obtained for many poultry species by al., 1987, Altan et al., 1997, Tilki and Saatci, 2004, Tona et al., 2004, Samli et a and Romao et al. 2008). The progressive loss in egg weight with the storage tir be attributed to water loss by evaporation through the pores on the shell ((1968, Shenstone, 1968 and Robinson, 1987).

Effect of egg storage time on hatchability, embryonic mortality and fertilit
The effect of storage time on hatchability of fertile eggs, embryonic mort fertility are presented in table 3. It was found that increased storage negatively affect hatchability, embryonic mortality and fertility. Eggs stored fo showed higher hatchability (83.3%) and fertility (83.56%), than and lower e mortalities (early 5.7%, late 5.32 %) than those observed in those stored fo days (hatchability 77.98%, 71.25%, fertility 80.75%, 77.67%, early dea 12.95%, late dead 7.95%, 10.93%; respectively). These results were ex accordance with previous reports on quail and other species related to eg (Whitehead et al., 1985; Yoo and Wientjes, 1991; Scott and Mackenzie, Romao et al. 2008). They reported that the increase in the number of stor elevates embryo mortality rate during storage and incubation, and thereby the probability of failure to hatch. Also an evidence of necrosis and regressive in the blastoderm have been reported even at storage temperatures of 13 and Kosin, 1966; Mather and Laughlin, 1979), as well as shrinking of the blas 10°C (Funk and Bieller, 1944; Mather and Laughlin, 1979).

Effect of egg storage time on chick weight, weight gain and relative gr during the first 4 weeks of age:

Chick weights, absolute body weight gain and relative growth rate form h weeks of age are presented in Tables 4, 5 and 6; respectively. Weights of weeks and 4-weeks old chicks were higher ($P<0.05$) for chicks from 3-da group than those form 7-day or 14-day storage groups. However body weigh relative growth rate from hatch to 2-weeks, from 2-weeks to 4-weeks and fro 4-weeks of age were significantly reduced by storage of eggs. The negative increasing storage time on chick weight, weight gain and relative grov accordance with the observations of Becker, 1960, Bohren et al., 1961, Kc Arora and Kosin 1966, Tona et al., 2003 and Ipek et al., 2006. These effects may be explained by the deterioration of the egg internal quality during stora et al., 1978, Tona et al., 2002). In fact, during incubation, albumen proteins the amniotic fluid and are swallowed by the embryo. Because these protein either digested in the gut or transferred into the yolk sac where they can after hatching (Deeming, 1989), the potential performance of day-old depend on the quality of the albumen in the incubating egg at this stage.

Conclusion: This study demonstrates that egg should not be stored for long storage alters incubation egg quality, and the effects are manifested at diffe of chick development such as at hatch (hatchability and 1-d-old chick weight) and at different stages of post hatch growth. Further studies are establish the effect of storage on internal constituents of incubating eggs potential growth performance.

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Table1: Means ± Standard error for egg quality traits in different storag

Group	Albumen height (mm)	Haugh unit	Yolk diameter (mm)	Yolk height (mm)
3-day	4.08± 0.16[a]	87.87± 1.01[a]	21.12±0.59[b]	9.56±0.21[a]
7-day	3.84± 0.32[a]	83.73±2.16[ab]	22.66±0.57[ab]	9.4± 0.008[a]
14-day	3.07± 0.16[b]	80.85±1.34[b]	23.82±0.64[a]	8.63±0.26[b]

Means within the same column having different letters are significantly diffe (P<0.05)

Table 2: Effect of storage time on egg weight (g)

Group	N	Egg weight before storage	Egg weight after storage	RWL %	t-value
3-day	296	12.529±0.008	12.4024±0.009	1.01	1.14 NS
7-day	260	12.15±0.0068	11.89±0.0067	2.13	2.53 *
14-day	437	11.76±0.0046	11.49±0.0046	2.30	4.197 *

NS = non significant * = significant **= highly significant

RWL = (Egg weight before storage – egg weight after storage) / Egg weight before storage

Table 3: Effect of egg storage time on hatchability, embryonic mortality and fertility:

	3-d storage	7-d storage	14-day storage
Hatchability %	83.2	77.98	71.25
Early dead %	5.7	9.17	12.95
Late dead %	5.32	7.95	10.93
Piped dead %	5.74	4.90	4.85
Fertility %	83.56	80.75	77.67

Table 4: Means ± Standard error for body weight at hatch, 2 weeks and 4 w of age in different storage groups

Group	Hatch weight (g)	2-weeks weight (g)	4-weeks weight
3-day	8.99±0.12^{a}	55.94±0.98^{a}	110.50±2.3^{a}
7-day	7.78±0.08^{b}	50.83±0.60^{b}	86.15±1.59^{b}
14-day	7.65±0.05^{b}	48.86±0.97^{b}	77.35±1.49^{c}

Means within the same column having different letters are significantly different (P<0.05)

Table 5: Means ± Standard error for body weight gain from hatch to 2 weel weeks to 4 weeks and hatch to 4weeks of age in different storage groups

Group	Hatch-2 weeks	2-weeks – 4 weeks	Hatch-4wee
3-day	46.87±0. 98^{a}	54.36±2.49^{a}	101.30±2.3
7-day	43.06±0. 60^{b}	35.32±1.75^{b}	78.40±1.6
14-day	40.86±0. .97^{b}	29.50±1.91^{c}	69.32±1.5

Means within the same column having different letters are significantly different (P<0.05)

Table 6: Means ± Standard error for relative growth from hatch to 2 weeks weeks to 4 weeks and hatch to 4weeks of age in different storage groups

Group	Hatch - 2 weeks	2-weeks – 4 weeks	Hatch - 4we
3-day	525.85±15.14^{ab}	100.34±5.81^{a}	1140.29±33
7-day	560.23±10.64^{a}	71.29±3.99^{b}	1024.54±27
14-day	514.86±14.57^{b}	63.15±4.85^{b}	871.86±22

Means within the same column having different letters are significantly different (P<0.05)