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EFFECT OF USING DIFFERENT PRE-STORAGE INCUBATION WARMING TIMES AND STORAGE PERIODS ON HATCHABILITY OF JAPANESE QUAIL EGGS AND SUBSEQUENT GROWTH OF CHICKS

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Abstract:*This study was conducted to determine the effects of different pre-storage incubation warming (PRESI) times 0 as (control), 7 and 10 hrs and different storage periods 2, 4 and 6 days on hatchability percentages, embryonic mortality at different periods of incubation (1-7, 7-14 and 14-17days), and growth performance of Japanese quail chicks from 1- 42 days of age. A total number of 1350 Japanese quail eggs were collected from a flock at the hen age of 15^{th} weeks, and divided into storage treatments of 2,4 and 6 days. Prior to storage, the eggs were further divided into pre-storage incubation times (PRESI) 0 as (control), 7 and 10 hrs treatments. A 3x3 factorial arrangement comprising 9 treatments with three replicates of 50 eggs each. Eggs at different PRESI treatments were exposed to heat at standard dry –bulb temperature of 34.0^{o}C (± 0.5^{o}C). All eggs were stored after heating for 2, 4 and 6 days in a room at 18.0^{o}C (physiological zero of poultry eggs) and 75.0 % relative air humidity as average. After storage periods the eggs were incubated in a commercial setter and hatcher for 17.0 days at 37.5^{o}C and 65.0% relative air humidity as average. After the incubation and at the hatch all chicks were counted and weighed. All unhatched eggs were broken and examined to determine fertility and embryonic mortality at different stages of embryonic development.*

The obtained results indicated that warming quail eggs at 34^{o}C for 7 hrs improved hatchability percentages. Also the best hatchability percentages was observed for groups of eggs stored for 4 days as compared with other storage periods 2 or 6 days. However warming eggs for 7 hrs significantly ($P \leq 0.05$) reduced embryonic mortality during the three incubation periods. The lower embryonic mortality was observed for eggs stored for 2 days during 7-14 and 14-17 days of incubation, while insignificant differences was observed for embryonic mortality during 1-7 days of incubation. Concerning growth performance of progeny *insignificant differences were detected among PRESI treatments for body weight at1, 21 or 42 days of age, while body weight was significantly ($P \leq 0.05$) higher for chicks hatched from eggs stored for 2 days as compared with those stored for 4 or 6 days at 42 days of age. Weight gain was insignificantly affected by PRESI treatments, while gain was higher for chicks resulted from eggs stored for 2 days as compared with those stored for 4 or 6 days. Insignificant differences were observed for feed consumption due to PRESI or egg storage periods, whereas the best significant ($P \leq 0.05$) ratio of feed conversion was recorded for chicks produced from group of eggs stored for 2 days, followed by chicks resulted from groups of eggs stored for 6 or 4 days respectively. Mortality rate was reduced when eggs exposed to 7 hrs PRESI as compared with control group or group of eggs exposed to 10 hrs, while mortality rate increased when storage periods increased from 2 to 6 days. It is concluded that 7 hrs PRESI does not have a detrimental effect on the hatchability of eggs and may even increase hatchability percentages and storing the eggs for 4 days realized the best results of hatchability percentages.*

INTRODUCTION

It is well known that hatching eggs are often stored in farms or hatcheries to minimize transportation costs or to provide for enough egg available to fill large incubators ***(Petek and Dikmen 2006).*** A common practice in most commercial breeder farms and hatcheries is to store eggs from one to fours days to obtain the amount of eggs required for the normal flow of the incubation process. However, the storage of eggs for more than a week is known to increase embryonic mortality and abnormalities due to the degradation of viscosity of egg albumen ***(Van de Van, 2004).*** However, ***Tona et al. (2003)*** showed that longer storage led to longer incubation, impairing embryo development and livability, hatchability and chick quality and weight. The results obtained by ***Laurens (2002)*** indicated that pre heating of poultry eggs before storage resulted in more live chicks and a lower level of embryonic mortality compared to eggs that were not heated. ***Petek and Dikmen (2004)*** indicated that pre-heating eggs for 8 hrs significantly improved the hatchability of quail eggs (82.6% as a total) compared with control group (79.7%).Pre-storage incubation of hatching eggs is an effective method of reducing loss of hatchability in eggs stored for long period. Early embryonic mortality was reduced when eggs were heated before storage for three and six hrs.

In recent study, ***Cameron (2008)*** indicated that eggs of chickens can be warmed at incubation temperature (37.5^{o} C) for 15 hrs without negatively affecting hatchability. However, relatively little information is known concerning the effect of pre heating warming of quail eggs. The objective of this study was to determine if pre-storage incubation warming times (PRESI) and periods of egg storage would improve the hatchability and reduce the embryos motility of layer quail eggs. While, the second objective was to study the effect of the mentioned treatments on growth performance of hatched chicks from 1 to 42 days of growing period.

MATERIALS AND METHODS

This study was conducted at Experimental Poultry Research Station belonging to Al-Azhar University, Naser city Cairo, Egypt. The main objective of this study was to investigate the effect of pre- storage warming (PRESI) times (0, 7 or 10 hrs) and storage egg periods (2,4 or 6 days) as methods to improve the hatchability percentages and reducing embryos mortalities of layer quail eggs. The second objective of this study aimed to investigate the growth performance of progeny chicks from 1 to 42 days of fattening period. A Total number of 1350 fertile eggs produced at 15th weeks old of layer Japanese quail, and transported to the experimental hatchery. Both eggs and hatchery were firstly disinfected by simple fumigation according to methods described by ***Silva et al. (2008).*** The numbers of eggs were distributed in a completely randomized experimental design in a 3x 3 factorial arrangement, comprising 9 treatments with 3 replicates of 50 eggs each. Eggs at different PRESI treatments were exposed to heat at standard dry bulb temperature of 34.0^{o}C (± 0.5^{o}C) for 0 (unheated eggs), 7 and 10 hrs.

Also, out of the 1350 eggs obtained for each collection, 25 eggs were randomly taken to evaluate some internal and external egg quality traits at 2,4 and 6 days i.e., egg weigh, yolk weight, albumen weight and shell weight and their percentages. Also specific gravity, egg shape index and egg shell thicknesses were determined. After heating, the eggs were stored in a room at 18.0^{o}C (physiological zero of poultry eggs) and 75.0% relative air humidity for 2, 4 and 6 days. Afterwards, the eggs were incubated in an Avimatic ® incubator for 336 hours (14.0 days) at 37.5^{o} C average temperatures and 65.0 % relative air humidity. During incubation period eggs were turned once per 4 hours (6 times per day). At 15 days of incubation all eggs were transferred to an Aviamatic ® hatcher at 37.0^{o}C and 75.0 % air relative humidity for 3 days (72 hrs). Total hatching percentages were determined at the end of 17.0 days of incubation. The hatchability of fertile eggs (number of eggs hatching / number of fertile eggs set x 100) or total eggs (number of egg hatching / number of egg set x 100) was calculated ***(Taylor, 1998).*** Afterthat, the hatched chicks were removed and counted. All unhatched eggs were removed and broken for identification of infertile or embryonic mortality. All embryos mortalities were classified as early (1-7days of embryo development), intermediate (7-14 days of embryo development) and late (14 -17 days of embryo development). The layer Japanese quail and their chicks were fed on a diet containing 20.0 and 24.0%CP and 2900 ME Kcal/ Kg of diet according to ***NRC (1994)*** as showed in Table (1). Individual body weights of quail chicks were measured at hatching (1day), 21days and 42 days of the growth period. The chicks were housed in batteries with raised wire floors. Feed and water were offered *ad libitum* and mortality rate was recorded daily and removed to adjusting feed conversion ratio. Also, feed conversion ratio (FCR= grams of feed intake per grams of body weight gain) was calculated from 1-42 days of age. FCR of chicks in all groups were corrected for mortality by calculating the average individual feed intake for each week.

All collected data (hatchability and growth performance)were analyzed by ANOVA with 3 levels of PRESI (0,7 and 10 hrs) and 3 levels of egg storage periods (2, 4 and 6 days).When an interaction was significant, Duncan's multiple mean comparison test ***(1955)*** was used to compare treatment means. All data in percentages were transferred using arcsine square root transformation prior to the analysis ***(Snedecore and Cochran, 1989).***The statistical analysis for measured traits were calculated on the basis of the replications. All tests were performed using SPSS® computer software ***10.0(SPSS ®, 1999).*** The PRESI treatments and the length of storage periods were the main effects. The main treatments as well as the interaction were analyzed for significant at the 5.0% level.

RESULTS AND DISSCUSION

Some egg quality traits at different periods of storage.

Data of some external and internal egg quality traits of Japanese quail eggs at 2, 4 and 6 days are given in Table 2. The analysis of variance indicated that insignificant differences were detected among the three different days, which evidences consistence and that days did not directly or indirectly affect the evaluated parameters. These results are in harmony with those obtained by ***Fasenko et al. (2001)*** reported that fresh egg weight, albumen weight, dried shell weight and specific gravity were not significantly influenced by the egg collection day of broiler breeder chickens. Also, ***Silva et al*. *(2008)*** who indicated that internal and external egg quality of broiler breeder eggs were not significantly affected by different collection time of eggs. While ***Vieira and Moran(1989)*** indicated that with increases day of broiler breeder collection time influence internal and external egg quality as egg weight and yolk percentages increase and albumen and egg shell percentages decrease and these changes effects embryo development.

Hatching evaluation in relation to applied PRESI and storage periods:

Fertility percentages.

Fertility results are shown in Table 3. The analysis of variance indicated that there were insignificant differences due to PRESI, storage periods and their interaction. Fertility percentages had not affected by the two main factors or by their interaction. These results are in agreement with those reported by ***Fasenko et al. (2001)*** who showed that fertility of broiler breeder eggs have not been affected by the interaction as fertilization would or would have not occurred before the eggs were exposed to the pre storage incubation(0,12 or 18 hrs) or by storage periods (4 or 14 days).But the lower percentage fertility of the eggs stored for 14 days and PRESI for 18 h occurred as a results of an underestimation of fertility ;germinal discs that were actually fertile ,but had died very early during development were likely misclassified as infertile. This overestimation of infertility occurred because of the difficulty in distinguishing between fertile germ and embryos that died at very early stages of development. ***Petek and Dikmen (2004)*** found that the PRESI treatments or the interaction with the duration of the storage period did not significantly affect apparent fertility.

Hatchability of fertile or total eggs set.

The data of the hatchability of fertile eggs or total eggs set indicated that there were significant ($P \leq 0.05$) differences of both traits due to PRESI times, storage periods or their interaction between PRESI x storage periods. The results showed that higher percentages of both hatchability of fertile or total eggs set were observed for group exposed to PRESI (7 hrs) time and 4 days egg storage periods, therefore warming the quail eggs for 7 hrs before storage may be considered as a good practice to improve hatchability parentage of eggs stored for 4 days, because PRESI decreases incubation length and embryo mortality. Also warming eggs for 7 hrs allows the complete formation of hypoblast. However, hatchability was reduced by increase of PRESI times or storage periods. Therefore, the exposure eggs to 7 hrs PRESI prior to storage significantly ($P \leq 0.05$) improved the hatchability of fertile or total eggs. These results are in accordance with the reports in the different species of poultry related to egg storage and PRESI ***Laurens (2002), Fasenko (1997) Fasenko et al (2001) and Silva et al***

(2008) they indicated that hatchability percentages improved by pre incubation warming eggs. Also, ***Petek and Dikmen (2004)*** found that hatchability percentages of the total quail eggs significantly improved by exposure eggs to a prestorage incubation of 8 hrs (82.6%) compared to the control (79.7%). While, no significant differences were observed for the hatchability due to the length of storage. In other study, ***Silva et al (2008)*** reported that hatchability of Cobb broiler breeder eggs, when stored for 4 days and heating for 6 and 12 hrs promoted higher hatchability percentage as compared to non heated eggs.

Embryonic mortality.

Results of embryonic mortality at different stages of incubation periods (1-7, 7-14 and 14-17 days) are given in Table 3.The obtained data indicated that fresh egg weight that were subjected to PRESI for 7 hrs had lower embryonic mortalities through periods of incubation as compared with those subjected to 10 hrs or unheated eggs (0 hrs). However embryonic mortality at 1-7 days was not significantly affected by egg storage periods. While embryonic mortality at later periods (7-14 or 14-17 days) significantly ($P\leq 0.05$) increased as the storage periods of eggs increased from 2 to 6 days. The total mortality rates of embryos were lower for groups of eggs exposed to 7 hrs and PRESI did reduce embryo mortality. The highest embryo mortality was detected for group exposed to 0 or 10 hrs PRESI or 4 and 6 days of storage period. A significant interaction ($P\leq 0.05$) was observed between the experimental factors on embryonic mortalities during 1-7, 7-14, 14-17 days or total period of incubation. Embryo stages are not changed by storage periods, when storage temperature is below development physiological zero ($18.0^{o}C$). However, due longer storage period, blasotderm degenerates presenting vacuole in the zona pellucida and stains in the yolk ***(Fasenko et al. 1992).***In this connection, ***Silva et al. (2008)*** showed that storage extended for 14 days markedly impaired incubation results due to higher egg weight loss during incubation. ***Petek and Dikmen (2006)*** indicated that total embryonic mortality rate during incubation were significantly affected by PRESI and egg storage periods. Embryonic mortality of eggs in the 4 and 8 hrs PRESI treatments was significantly increased compared to the non- heated group. Most of the deaths were in eggs stored for 15 days vs. those stored for 5 days. However ***Petek and Dikmen (2004)*** showed that total mortality rate of embryos of quail eggs did not significantly differ according to the duration of storage. Furthermore, PRESI did reduce mortality significantly by a third 0.0 PRESI (10.96%) vs.8 hrs (7.72%). Also, ***Laurens (2002) and Petek and Dikmen***

(2005) observed that pre-heating of poultry eggs before storage resulted in more live chicks and in a lower level of embryonic mortality.

Growth performance of Japanese quail chicks from 1 to 42 days of age.

The data of subsequent growth performance of quail chicks hatched from eggs subjected to different PRESI and different storage periods are presented in Table 4. The obtained data indicated that at hatching the body weight of chicks subjected to different PRESI were insignificant, where the average body weight was ranged between 8.65 to 8.96 g. However, significant differences was observed for body weight of chicks due to egg storage periods treatments ,where the group of eggs stored for 2 days produced larger chicks weight, (9.88 g) compared with those stored for 4 and 6 days (8.87 vs. 8.30g) respectively. On the other hand, insignificant differences were observed for interaction between PRESI x egg storage in chicks' weight at start. The weight of chicks at 21 days indicates that insignificant differences were detected due to PERSI treatments, egg storage periods or their interaction between PRESI treatments and egg storage periods. At 42 days of age (end of growing period) the analysis of variance indicted that insignificant differences were observed for body weight due to PERSI treatments. While, there was a significant difference due to egg storage period, where the group stored for 2 days resulted higher chick's body weight as compared with other egg storage periods. There were insignificant interactions between PRESI X egg storage periods for body weight at 42 days of age.

Concerning gain in weight from 1 - 42 days of growing period the analysis of variance showed that insignificant differences were observed for body weight gain due to PRESI treatments, while significant differences were detected due to egg storage periods, since group of egg stored for 2 days resulted higher gain of chicks compared with egg stored for 4 or 6 days. Regard with feed consumption during the growing period 1 - 42 days of age, insignificant differences were observed for feed consumption due to PRESI or storage periods, where the average of feed consumption ranged between 536.0 to 590.0 g per bird through 42 days of age. The data of feed conversion ratio showed that insignificant differences was detected due to PRESI treatments, while it significantly ($P \leq 0.05$) improved for chicks hatched for group of eggs stored for 2 days as compared with those stored for 4 or 6 days. While, there were insignificant interactions for feed conversion ratio of chicks during 1-42 days of age. Mortality rate of chicks was significantly ($P \leq 0.05$) reduced when eggs exposed to 7 hrs as compared with 0 or 10 hrs. A longer storage period significantly ($P \leq 0.05$) increases mortality rate. Also, significant interaction for mortality rate was observed due to PRESI x egg storage periods.

These results are in agreement with those obtained by ***Yannakopoulos and Tserveni-Gousi (1987)*** who showed that egg storage for 15 days significantly depressed body weight of quail probably due to increases of second grade chicks at hatch after prolonged storage time. ***Petek and Dikmen (2004)*** reported that no significant differences was observed for subsequent growth performance of quail progeny by the tested main effects (PRESI and egg storage period) except, for storage treatments ,since at 42 days of age chicks hatched from storage period 5 days give higher body weight compare to eggs stored for 15 days. Feed conversion ratio not affected by PRESI, but FCR was best for 5 days as compared with 15 days. ***Petek and Dikmen (2006)*** found that neither time of PRESI treatments (0, 4, 8 hrs) nor egg storage (5 and 15 days) insignificantly affected the subsequent growth performance of quail except for the egg storage on feed conversion ratio. Since chicks hatched from eggs stored for 5 days had best feed conversion ratio as compared with chicks hatched form eggs stored 15 days.

In general conclusion it can be recommended that warming quail eggs for 7 hrs before storage improves hatchability percentage as it decreases mortality rate. Also, storing eggs for 4 days and pre-heating for 7 hrs improves hatchability results and therefore could be recommended.

Table (1): Formulation and diet composition of layer and grower Japanese quail.

Ingredients*	Layer diet (%)	Grower diet (%)
Ground yellow corn (8.5 %).	60.00	55.0
Soybean meal (44.0 %).	20.00	32.1
Wheat bran (15.7 %).	02.10	1.00
Layer concentrate (50.0 %).	11.70	-
Broiler concentrates (52.0 %).	-	10.0
Calcium carbonate ($Caco_3$).	4.00	0.05
Sodium chloride (Nacl).	0.20	0.25
Sun flower oil.	1.69	1.20
Pre-mix*.	0.250	0.40
L-lysine.	0.06	-
Total (Kg)	100.00	100.00
Calculated diet composition:		
Crude protein %.	20.15	24.15
Metabolizable energy Kcal/Kg.	2906.00	2910.00
Lysine %.	01.00	01.32
Methionine + Cystine%.	0.74	0.83
Calcium %.	2.53	0.80
Available phosphorus.	0.37	0.41
Analyzed:		
Crude protein %	19.96	23.98

*Based on Table of feed composition of NRC (1994).
** Each 3 Kg of mixture contains: Vit A 12.000.000IU; Vit. D3 20000.000 ICU; Vit E 10000 mg; Vit K 1000mg ;Vit B1 1000 mg;Vit B2 5000mg;Vit B6 1500;Vit B12 10 mg ;Bant.Acid 10000mg;Fol. Acid 1000mg;Biotin 50mg;Niacin 20000mg,F2 3000 mg;Mn 60000 mg;Zn 30000mg;Cob.100mg and Sel.100mg.

Table (2): Internal and external egg quality traits of Japanese quail eggs at different periods of storage.

Storage Periods(days)	Egg weight g	Traits of internal egg quality						Traits of external egg quality		
		Albumin		Yolk		Shell		ESI*	SG** (g/m H2o)	EST*** (mm)
		g	%	g	%	g	%			
2	13.69±0.65	7.53	55.00±0.33	4.77	34.84±0.11	1.39	10.15±0.06	0.66±.0.02	1.076±0.08	0.21±0.001
4	13.74±0.89	7.89	57.42±0.36	4.57	33.26±0.12	1.28	9.32±0.09	0.65±0.05	1.080±0.01	0.22±0.003
6	13.67±0.91	7.63	55.82±0.38	4.64	33.94±0.14	1.40	10.24±0.07	0.63±0.02	0.084±0.02	0.20±0.002

* ESI=Egg shape index.
** SG=Specific gravity.
*** EST=Egg shell thickness.

Table (3): Effect of pre-storage incubation warming times (PRESI) treatments and egg storage periods on breeder Japanese quail eggs.

Main treatment effects	Traits						
	Fertility %	Hatchability % of		Embryonic mortality during incubation			
		Fertile eggs	Total eggs	I (1-7 days)	II (7-14days)	III (14-17 days)	Total
PRESI Times(hrs)							
0	81.69	71.69b	66.30b	4.77a	2.33a	4.15b	11.25a
7	82.25	79.58a	74.60a	2.33c	1.68b	2.78c	06.79b
10	83.25	72.50b	62.00c	3.56b	2.09a	5.08a	10.73a
Egg storage periods(days)							
2	82.69	72.12b	61.30b	4.25	2.45b	2.07c	08.31c
4	83.48	76.27a	73.90a	4.56	1.99c	4.60b	11.61b
6	81.58	71.81c	60.60b	4.00	3.78a	5.78a	13.56a
Interaction effects							
0x2	82.19	71.90c	63.80d	4.51a	2.39c	3.11c	10.01c
0x4	82.59	73.98b	70.10b	4.67a	2.16d	4.38b	11.20b
0x6	81.64	71.75c	63.45d	4.39a	3.05a	4.97b	12.41a
7x2	82.47	75.85b	67.95c	3.29c	2.07d	2.43d	07.78f
7x4	82.87	77.93a	74.25a	3.45c	1.84e	3.69c	08.97e
7x6	81.92	75.70b	67.60c	3.17c	2.73b	4.28b	10.18c
10x2	82.97	72.31c	61.65e	3.91b	2.27c	3.58c	9.75d
10x4	83.37	74.39b	67.95c	4.06b	2.04d	4.84b	10.94c
10x6	82.42	72.16c	61.30e	3.78c	2.94a	5.43a	12.15a
ANOVA							
PRESI	n.s	0.05	0.05	0.05	0.05	0.05	0.05
Storage	n.s	0.05	0.05	n.s	0.05	0.05	0.05
PRESIx Egg storage	n.s	0.05	0.05	0.05	0.05	0.05	0.05
SME	1.99	1.36	1.66	0.38	0.42	0.48	0.61

a,b,c……Means within columns with no common superscript differ significantly($P \leq 0.05$).
I, II and III=Ist , 2nd and 3 rd periods of embryonic developments.
Fertility= (No. of fertile eggs /No. of egg set)x100.
Hatchability:
Fertile eggs = (No. of egg hatching / No. of fertile egg set) x 100
Total= (No of egg hatching / No of egg set) x 100.

Table (4): Effect of pre-storage incubation warming times (PRESI) treatments and egg storage periods on growth performance of Japanese quail chicks from 1 to 42 days of age.

Main treatment effects	Traits						
	Body weight (g)			Gain 1-42 days	Feed consumption (g)	Feed conversion ratio	Mortality rate %
	1 day	21 days	42days				
PRESI Times(hrs)							
0	8.68	91.0	181.40	172.72	590.0	3.41	4.17a
7	8.96	99.0	183.30	174.34	589.0	3.38	2.93b
10	8.65	100.0	179.80	171.15	588.0	3.43	4.58a
Egg storage periods(days)							
2	9.88a	90.0	196.30a	186.42a	536.0	2.87b	3.50c
4	8.87b	91.0	187.60b	178.73b	538.0	3.01a	5.00b
6	8.30b	98.0	188.00b	179.70b	539.0	2.99b	6.50a
Interaction effects							
0x2	9.28	93.00	188.85	179.57	536.0	3.14	3.84c
0x4	8.78	93.50	184.50	175.73	564.0	3.21	4.59b
0x6	8.49	97.00	184.70	176.21	564.0	3.20	5.34a
7x2	9.42	94.50	189.80	180.38	562.0	3.12	3.22c
7x4	8.92	95.00	185.45	176.54	563.0	3.19	3.97c
7x6	8.63	98.50	185.65	177.02	564.0	3.21	4.72b
10x2	9.27	95.00	188.05	178.79	562.0	3.15	4.04b
10x4	8.76	95.50	183.70	174.94	563.0	3.22	4.79b
10x6	8.48	99.00	183.90	175.43	564.0	3.21	5.54a
ANOVA							
PRESI	n.s	n.s	n.s	n.s	n.s	n.s	0.05
Storage	0.05	n.s	0.05	0.05	n.s	0.05	0.05
PRESIx Egg storage	n.s	n.s	n.s	n.s	n.s	n.s	0.05
SME	0.05	3.46	6.53	5.11	2.33	0.19	1.04

a,b,c……Means within columns with no common superscript differ significantly($P \leq 0.05$).

REFERANCES

Cameron,B.W.H.(2008).*Hatchability of post-peak egg production broiler breeder eggs as influenced by pre-incubation warming. Thesis Msc. Faculty of the Louisiana. State Univ.and Agricultural and Mechanical College.*

Duncan's, D. B. (1955). Multiple ranges and multiple F-tests. Biometrics, 11: 1-42.

Fasenko,G.(1997).*How are embryo and poultry ?Viability,hatchability, and growth affected by storage turkey eggs for long periods, Alberta Poul. Res.Centre News 6(1).*

Fasenko,G.M.;F.E.Robinson; A.I.Whelan; K.M. Kremeniuk and J.A. Walker (2001). *Prestorage incubation of long –term stored broiler eggs. I. Effects on hatchability. Poul. Sci., 80:1406-1411.*

Fasenko,G.M.; F.E. Robinson;and R.T.Hardin (1992).*Viability in preincuation embryonic development in domestic fowl.2. Effects of duration of egg storage period.J.Morphol.,217:2129-2132.*

Laurens,S.(2002).*Heating of hatching eggs before storage improves hatchability. World Poultry 18:24-25.*

National Research Councils (N.R.C.) (1994). *Nutrient requirements of Poultry 9th rev. ed. National Academy Press Washington, DC., USA.*

Petek, M. and S. Dikmen (2004).*The effect of prestorge incubation of quail breeder eggs on hatchability and subsequent growth performance of progeny.Anim.Res.,53:527-534.*

Petek, M. and S. Dikmen (2005). *The effects of prestorage incubation on hatching success of poultry and game bird eggs. Incubation and Fertility Research Group. In .WPSA working group 6(Reproduction),Meeting 6th - 7th September 2004, University of Lincoln.*

Petek, M.and S.Dikmen (2006). *The effect of prestorage incubation and length of storage of broiler breeder eggs on hatchability and subsequent growth performance of progeny. Czech J.Sci., Vol.51,(2):73-77.*

Silva,F.H.A.; D.E Faria; K.A.A. Torres; D.E. Faria Filho; A.D.D. Coelho and V.J.M. Savino(2008).*Influence of egg pre-storage heating period and storage length on incubation results. Brazilian Journal of Poul. Sci. Vol.10, (1):17-22.*

Snedecore,G.W. and W.G. Cochran (1989). *Statistical methods.8th ed. Iowa State University Press, Ames, IA, USA.*

SPSS®. (1999). *Computer Software 10.00, SPSS Inc., Headquarters. Wacker Drive, Chicago, Illinois 60606, USA.233pp.*

Taylor,G.(1998).*Eggs handling technique,2nd ed., Medina, Ohio, USA,4-10.*

Tona,K; F.Bamelis; de-B. Ketelaere;V.Bruggeman; V.M.B.Moraes;J. Buyse; O.Onagbesan and E. Decuypere (2003). *Effect of egg storage time on spread of hatch, chick's quality, and chick juvenile growth. Poul. Sci., 82:736-741.*

Van de Van,L.(2004). *Storage of hatching eggs in the production process. Int. Hatch. Pract., 18:27-31.*

Vieire,S.L. and J.R Moran (1998).*Eggs and chick from broiler breeders of extremely different age. J. of applied Poul. Research 7:239-346.*

Yannakopoulos,A.L and A.S.Tserveni-Gousi (1987).*Effect of breeder quail eggs and egg weight on chick weight. Poul. Sci.,66:1558-1560.*

الملخص العربى

تأثير استخدام التدفئة لمدد زمنية مختلفة قبل تخزين البيض، وفترات التخزين على الفقس فى بيض السمان اليابانى والاداء الانتاجى للنمو فى الكتاكيت الناتجة

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كلية الزراعة ، جلمعة الازهر ،مدينة نصر-القاهرة-مصر

اجريت هذة التجربة بهدف دراسة تاثير تدفئة البيض باستخدام درجات حرارة مختلفة قبل التخزين لمدة(صفر، ٧ ،١٠ ساعات)، وكذلك دراسة تاثير فترات مختلفة من التخزين (٢،٤ ،٦ يوم) على نسبة الفقس وموت الاجنة عند فترات مختلفة من التحضين (١-٧،٧-١٤،١٤-١٧ يوم) ، وكذلك قياس الاداء الانتاجى للكتاكيت من عمر ١ -٤٢ يوم.استخدم فى هذة الدراسة عدد ١٣٥٠ بيضة سمان تم جمعها من قطيع عمرة ١٥ اسبوع وتم تقسيم هذا العددالى ثلاث معاملات للتخزين (٢،٤،٦ يوم) وقبل التخزين تم تقسيم البيض الى ثلاث معاملات تم خلالها تعريض البيض للتدفئة على درجة ٣٤م(±٠.٥) لمدد زمنية مختلفة (صفر معاملة الكونترول ،٧، ١٠ ساعات). واحتوت كل معاملة على ثلاث مكررات بحيث تحتوى كل مكررة على ٥٠ بيضة.وكانت درجات الحرارة المستحدمة فى التدفئة ٣٤.٠ م (± ٠.٥ م). بعد ذلك تم تخزين البيض لمدد زمنية مختلفة(٢،٤،،٦ يوم) فى حجرة على درجة حرارة ١٨ م (الصفر الفسيولوجى لبيض الدواجن) ونسبة رطوبة ٧٥ % .وبعد انتهاء مدة التخزين تم تحضين كل البيض فى مفرخ لمدة ١٧ يوم على درجة حرراة ٣٧.٥ م، ٦٥ %رطوبة نسبية.وبعد انتهاء مدة التحضين وعند الفقس تم عد كل الكتاكيت الناتجة وتم وزنها، كما تمرتقديرنسبة الاجنة النافقةوكل البيض الذى لم يفقس تم كسرة وفحصة لتقدير نسبة الخصوبة ونفوق الاجنة عند المراحل المختلفة من النمو الجنينى

والنتائج المتحصل عليها اشارت الى ان تعريض البيض للتدفئة على درجة ٣٤ م لمده ٧ ساعات ينتج عنها تحسن معنوى فى نسبة الفقس .كما لوحظ ايضا ان احسن نسبة للفقس كانت لمجموعة البيض المخزن لمدة اربعة ايام مقارنة بفترات التخزين الاخرى .كما ان تعريض البيض للتدفئة لمدة ٧ ساعات يقلل من نسبة الاجنة النافقة اثناء الفترات الثلاثة من التطور الجنينى .كما لوحظ ايضا ان اقل نفوق جنينى فى البيض والذى تم تخزينة لمدة يومين فقط اثناء الفترات ٧-١٤،١٤- ١٧يوم من التطور الجنينى بينما لم يلاحظ هناك تاثير معنوى على النفوق الجنينى اثناء الفترة الاولى (١-٧) يوم من التطور الجنينى . اما فيما يتعلق بالاداء الانتاجى للنمو فلقد لوحظ ان هناك تاثير غير معنوى بين المعاملات و التى تم تعريض البيض فيها للتدفئة لمدد زمنية مختلفة على وزن الجسم عند عمر ٤٢،٢١،١ يوم من العمر. ولكن لوحظ ان وزن الجسم كان اعلى معنويا للكتاكيت الناتجة من البيض والذى تم تخزينة لمدة يومين بالمقارنة بالبيض المخزن لمدة ٤،٦ يوم. كما ان الزيادة فى وزن الجسم الم كتسب لم تتاثر معنويا بتعريض البيض للتدفئة لمدد زمنية مختلفة.ولكن لوحظ ان هناك زيادة معنوية فى وزن الجسم المكتسب للكتاكيت الناتجة من البيض والذى تم تخزينة لمدة يومين بالمقارنة بالبيض المخزن لمدة٤ ،٦ يوم. كما لم تلاحظ هناك اختلافات معنوية فى الغذاء المستهلك نتيجة تعريض البيض للتدفئة لمدد زمنية مختلفة او بتخزين البيض لفترات زمنية مختلفة. لوحظ ان معامل تحويل الغذاء كان افضل معنويا للكتاكيت الناتجة من البيض والذى تم تخزينة لمدة يومين تلاة البيض المخزن لمدة٦ ، ٤ يوم.انخفضت نسبة النفوق معنويا عندما تم تعريض البيض للتدفئة لمدة ٧ ساعات مقارنة بالبيض الغير معامل (معاملة الكنترول) او البيض الذى تم تعريضة لمدة١٠ ساعات.وزادت نسبة النفوق بزيادة فترة التخزين من٢ الى ٦ يوم.

ونستخلص من هذة الدراسة انة بتعريض البيض الى التدفئة لمدة٧ساعات قبل عملية التخزين ينتج عنهاتحسن معنوى فى نسبة الفقس كما ان احسن فترة لتخزين بيض السمان كانت ٤ايوم.