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IMPACT OF STAR CRACK EGGSHELL TYPE AND LAYER BREEDER AGE ON EGGSHELL TRAITS, EMBRYONIC MORTALITY, HATCHABILITY AND CHICK QUALITY

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ABSTRACT: Hatching eggs from Hy-Line W-36 strain were obtained from two layer breeder flocks differed in age (46 and 60 weeks). Eggs were randomly taken to evaluate impact of star cracks eggshell compared with normal eggs and layer breeder age on eggshell traits, embryonic mortality, hatchability and chick quality. Egg weight loss in star-cracked eggs was significantly higher than in normal eggs ($P < 0.0001$), the results indicated that egg weight loss increased with advancing breeder age. Hatchability percentage of chicks hatched from star-cracked eggs had lower in comparison with chicks from normal eggs. Percentage of hatchability decreases with advancing of breeder age for normal eggs (91.8 and 81.3 % at 46 and 60 wks of age, respectively), but this percentage remains almost constant with advancing of breeder age from star-cracked eggs (53.7 and 53.8 %, respectively). There were no significant differences among hatching egg type in terms of chick weight and percentage. The embryonic mortality had differed with different breeder's age. Highly increase in overall mean of embryonic mortality was observed in star crack eggs obtained from the two flocks. Chick length and shank length of chicks hatched from star-cracked eggs was significantly lower than those of chicks from normal eggs. Tona score as a quality indicator was significantly higher in chicks hatched from normal eggs (99.60 %) than those from star-cracked eggs (91.10 %). Blood biochemical parameters were not significantly differed in hatched chicks, except the plasma level of AST was significantly higher in hatched chicks from star crack eggs. Conversely, Cholesterol level was significantly higher in hatched chicks from normal eggs. Finally, This study showed that practically we can benefit from star-cracks eggs, because there is no significant difference between star-cracks and normal eggs for most eggshell characterstics, absolute & relative chick weight, and slightly difference for chick quality.

Keywords: Star-cracked eggs, breeder age, hatchability, embryonic mortality.chick quality.

INTRODUCTION

The main function of the eggshell in the domestic fowl is to provide an incubation environment in which a new chick can develop and to allow for adequate movement of water vapor and respiratory gases. The eggshell is a part of the respiratory structure of the embryo. The shell must be thick and strong enough to protect the developing embryo against adverse environmental conditions and physical damage (Narushin and Romanov, 2002).

Many factors can affect eggshell quality including genetics, age, nutrition, viral diseases, environmental conditions, egg handling (Coutts and Wilson, 2007; Butcher and Miles, 2009).

Singh et al. (2009) revealed that most eggshell damage at the studied farm consisted of straight cracks and star cracks. Coutts and Wilson (2007) showed the incidence of complete breakage, hairline cracks and star cracks may differ between 1-5%, 1-3% and 1-2%, respectively. Eggs with completely broken shells are often removed from incubation because of the high possibility of egg dehydration and to prevent the contamination of microorganisms (Mertens et al., 2006). Star cracks are clear cracks radiating outwards from a central point of impact, which is often slightly indented. The incidence varies with flock age but is usually 1 to 2% of total production. Tona et al. (2001) stated that the age of layer and broiler breeders is an important to be taken into account by the hatchery manager. They also demonstrated that eggs produced by young or older breeder do not hatch as well as the eggs from the breeders of 40 to 42 weeks of age.

Egg quality is an important parameter for optimum embryogenesis, chick quality and growth. Also it is an important criteria for hatchery success and also profitability of producers. In hatcheries, the necessary goal is to maximize hatchability with a large number of high quality, saleable chicks that are required by producers for their high viability and performance (Decuypere and Bruggeman, 2007).

Chick quality at hatch dependent on many factors that can be related to numerous factors icluding egg breeder age, strain, health, hatching eggs quality, egg handling and storage and incubation environment (Peebles et al., 2001; Tona et al., 2003; Decuypere and Bruggeman, 2007).

A few researches had been investigated on the deleterious effect of shell breakage especially star cracks in hatching eggs. Therefore, the objective of this study was to determine the impact of star cracks of eggshell and layer breeder age on eggshell traits, embryonic mortality, hatchability, chick quality and blood biochemical parameters that related to chick viability of hatched chicks.

MATERIALS AND METHODS

This experiment was carried out at the hatchery of EL-Mansouria Poultry Misr Company situated at October Governorate. Hatching eggs from Hy-Line W-36 strain were obtained from two layer breeder flocks aged (46 and 60 weeks). Eggs were stored for 3-7 days at 15°C and 80% relative humidity in vertical position (narrow end is up) until incubation. After delivering the eggs to the hatchery, eggs were checked and sorted. A total of 200 hatching eggs (50 eggs that had star crack egg shell and 50 eggs that had normal eggshell) from each folck age were used in this experiment. Before incubation, eggs from each egg shell type from the two flocks were individually weighed to the nearest 0.01 g using an electronic digital balance, before hatching and again at 18th days of incubation. Egg weight loss percentage during the first 18 days of incubation period was calculated according to the following equation:

Egg weight loss (%) =

Egg wt. at the begining of incubation – Egg wt. at 18 days of incubation / Egg weight at the begining of incubation x100

Fertility and hatchability percentages

Eggs were candled at 7th days of incubation. Fertility percentage was calculated using the following equation:

Fertility (%) = Number of fertile eggs / Number of settable eggs x100

Hatchability percentage was calculated according to the following equation:

Hatchability (%) = Number of hatched chicks / Number of fertile eggs x100

Egg and eggshell traits

Length and width of egg were individually recorded by using a digital caliper. Shape index, then, was calculated by (width / length) x100.

The wet eggshell weight (to the nearest 0.01 gram) was measured after hatching and the shell percentage was calculated by dividing (wet eggshell weight / egg weight) x100.

Number of pores in eggshell was calculated using the following equation:

Pores number (N) = 304 $M^{0.767}$ was calculated according to Rahn and Paganelli (1990)

Where: M = Egg weight.

Eggshell surface area (SA) was calculated according to Fathi and El-Sahar (1996) equation:

$SA = 9.07\ (\text{Egg length x Breadth})^{0.63}$

Shell index (g/100 cm^2) was calculated according to following quation of Sauveur (1988):

SI = [Shell weight / shell surface area] x 100

Egg volume (EV) was calculated depending on Narushin (1997) equation:

$EV = 0.496 \times L \times B^2$

Where: L= egg length, B= egg breadth.

Embryonic mortality

After hatching, all unhatched eggs were opened to determine the embryonic mortality stages: early (1 to 7 d), mid (8 to 14 d) and late (15 to 21 d) were detedcted.

Chick quality tests

After hatching all chicks were removed at 21.5 day of incubation and the chick quality tests were determined to measure the quantitative and qualitative score factors of chicks.

Quantitative scored factors of chicks

Individually chick weight at one day old was recorded. Shank length (the distance from leg pad to the tarsus bone) was individually measured using a digital caliper. Chick length (the distance from the beak to the middle top (nail excluded) of leg was also individually measured by ruler.

Qualitative scored factors of chicks (Tona score)

Chicks were examined macroscopically in order to identify the different characteristics that can be associated with good, average or poor quality chicks. Based on varying physical appearances of day-old chicks. Chick quality was determined according to Tona et al., (2003).

Blood parameter

At hatch, 40 blood samples (10 chicks from each eggshell type of the two flocks) were collected by heart puncture using 3 ml/suringe 23 G with heparin and centerfuged at 3000 rpm for 15 min., then plasma samples stored at -20˚C until analysis. Total protein, globulin, cholesterol, alkaline, ALT and AST were determined by specrophotometery method.

Statistical analysis:

Data were analyzed using two-way analysis of variance for egg type and layer breeder age and their interaction using the General Linear Model (GLM) procedure of SAS (2002) as following model;

$Y_{ijk} = \mu + T_i + A_j + (TA)_{ij} + e_{ijk}$

Y_{ijk} = Trait measured,

μ= Overall mean,

T_i = Egg type effect (i= 1, 2),
A_j = Layer breeder age (j= 1, 2),
$(T A)_{ij}$ = Interaction between egg type and age,
e_{ijk} = Experimental error.
When significant differences among means were found, means were separated using Duncan's multiple range tests.

RESULTS AND DISCUSSION

Egg weight and egg weight loss

The overall mean of egg weight was significantly heavier in normal egg type and old flock (63.12 and 63.13 g) than star crack egg type and young flock (61.43 and 61.43 g) respectively (Table 1). The overall mean of egg weight loss (%) during the first 18 days of incubation was significantly higher (14.52 %) in star crack eggs and gradualy increased in old flock (13.82 %) followed by young flock (12.29 %). The minimum percentage of egg weight loss was recorded in normal eggs collected from young flock (11.39 %). These data are in agreement with those reported by Baumgartner et al. (2007), Lukáš Zita et al. (2008) and Rayan (2013) they pointed that the egg weight increased with the hens' age. Also, Khabisi et al. (2012) indicated that egg weight loss during incubation was increased with advancing breeder age. Barnett et al. (2004) found that egg weight loss percentage (23.96 %) in star crack eggs of 51 weeks of broiler breeder flock compared with (11.4 %) in normal egg. The evaporation of water from pores of the eggshell increased in the presence of cracks that cause an increase in the space area for evaporation. The relative humidity during the incubation period (65 %) is more fit for normal egg than crack eggs, that need more humidity to decrease the water loss during incubation and prevent the egg dehydration.

Fertility and hatchability percentages

The fertility and hatchability percentages of normal and star-cracked eggs for different layer breeder ages are shown in Table (2). The normal eggs had better fertility at studied ages in comparison with star-cracked eggs. Similar trend was observed for hatchability trait, hatchability percentage of chicks hatched from star-cracked eggs was lower in comparison with chicks from normal eggs. Khabisi et al. (2012) reported that hatchability percentage was decreased with cracks in 36 week old Ross strain and recorded about 34.46 % in star cracks. Percentage of hatchability decreases with advancing of breeder age for chicks hatched from normal eggs (91.8 and 81.3 % at 46 and 60 wks of age, respectively), but this percentage remains almost constant with advancing of breeder age for chicks hatched from star-cracked eggs (53.7 and 53.8 %, respectively). Abudabos (2010) stated that hen's age affected hatchability and there was reduction of hatchability with advance age.

Egg and Eggshell traits

Data summarized in Table (3) indicated that the overall means of shape index, shell weight and shell percentage were significantly higher in younger flock (79.25, 5.84 and 9.55) than old flock (78.06, 5.23 and 8.36), respectively. Eggshell type had no significant effect on these traits. Total number of pores on egg surface was significantly affected by eggshell type and flock age. The total number of pores was higher in normal type of young flock (7277) and old flock (7326), while it was decreased in star cracks of young flock (7025) compared with (7276) in old flock. Eggshell surface area, shell index and egg volume were affected only by shell type without any effect for Layer breeder age.
Gunlu et al. (2003) and Brand et al. (2004) pointed that shape index of the eggs decreased with age because shape index is directly proportional to egg width and it is inversely related to egg length, which implies that with increasing age, the rate at which eggs becomes longer is faster than rate of being wider. Silversides and Scott (2001), Rayan (2013) noticed that the shell

percentage decreases gradually with advancing of hen's ages.

Embryonic mortality stages

Table (4) clarifies percentages of embryonic mortality stages of normal and star-cracked eggs for different layer breeder ages. The embryonic mortality had differed with different breeder's age. Total embryonic mortality in normal eggs and star-cracked was 8.2 % and 41.5 % at 46 wks and 16.7 % and 33.3 % at 60 wks of age, respectively. Generally, the embryonic mortality had differed among different layer breeder's age. Similar trend was observed by Fairchild et al., (2002), who stated that embryonic mortality differs between different hen ages in a commercial strain. Kuurman et al. (2003) revealed that the embryonic mortality in chicken is not uniformly distributed over the incubation period, almost 65% of embryonic mortality occurs in two phases, an early at about day 4 of incubation, and a late phase at about day 19 of incubation.

Eggs from old flock showed high embryonic mortality in normal eggs compared with normal eggs in young flock. opposite results recorded in embryonic mortality of star cracks of old flock (33.3 %) compared with young flock (41.5 %). The rate of evaporation and dehydration in star crack eggshell with the increased permeability and porosity caused by cracks led to egg contaminated with bacterial exposure that increase the digestion of the shell membrane by proteolytic enzymes secreted by the bateria and led to embryonic death (Barnett et al. 2004).

Chick quality

Day-old chick quality measurements of normal and star-cracked eggs at different layer breeder ages are summarized in Table (5). Either eggshell type or flock age had no significant effect on chick weight at hatch or relative chick weight. These result are in agreement with those reported by Khabisi et al. (2012). Chick length and shank length of chicks hatched from star-cracked eggs were significantly lowered than those from normal eggs. Such result agrees with those reported by Khabisi et al. (2012), they pointed that the Cracks decreased chick length compared to the control eggs ($P < 0.001$). With respect to breeder age effect, it could be observed that chick length significantly increases with advancing of breeder age. On the other hand, the present results showed that Tona score as a quality indicator was significantly higher in chicks hatched from normal eggs (99.60 %) than those from star-cracked eggs (91.10 %). The obtained result corroborates the previous results of Khabisi et al. (2012), they pointed that Pasgar scores were significantly lower for hairline cracks than in the other groups ($P < 0.01$). However, no differences were found between the star-cracked eggs and the control group. The present results showed that Tona score increased as the layer breeder age progressed. Shank length of chicks and Tona score were significantly affected by interaction (T*A) between egg type and layer breeder age. That means the expression of these traits was different based on egg type and layer breeder age.

Blood parameter

The overall means of globulin, ALT, total protein and alkaline phosphatase in the plasma of hatched chicks were not significantly affected by either eggshell type or breeder age (Table 6). Conversely, plasma level of AST was significantly higher in the plasma of hatched chicks from star cracks eggs compared with normal eggs. Cholesterol level was significantly higher in hatched chicks from normal eggs compared to counterparts of star cracks eggs.

Only, cholesterol level in the plasma was significantly affected by interaction (T*A) between egg type and layer breeder age. The data revealed that, chick viability indicated by blood biochemical parameters that related to normal metabolic pathways in chicks was similar to that obtained by

Tona score.

Finally, This study showed that practically we can benefit from star-cracks eggs, because there is no significant difference between star-cracks and normal eggs for most eggshell characterstics, absolute & relative chick weight, and slightly difference for chick quality.

Table (1): Egg weight and egg weight loss of normal and star-cracked eggs at different layer breeder ages (Means ± SE).

Trait	**Egg type (T)**	**Layer breeder age (A)**, wk		**Overall**
		46	**60**	
Egg weight, g (0 day)	Normal shell	62.83 ± 0.50	63.40 ± 0.60	63.12[a]
	Star cracks	60.03 ± 0.65	62.85 ± 0.76	61.43[b]
	Overall	61.43[b]	63.13[a]	
Egg weight, g (18 days)	Normal shell	55.67 ± 0.55	55.53 ± 0.65	55.60[a]
	Star cracks	51.90 ± 0.74	53.11 ± 1.04	52.49[b]
	Overall	53.95	54.45	
Egg weight loss, g (0-18 days)	Normal shell	7.12 ± 0.17	7.76 ± 0.34	7.44[b]
	Star cracks	8.00 ± 0.30	9.84 ± 0.55	8.89[a]
	Overall	7.52[b]	8.69[a]	
Egg weight loss, % (0-18 days)	Normal shell	11.39 ± 0.29	12.28 ± 0.52	11.83[b]
	Star cracks	13.38 ± 0.50	15.72 ± 0.91	14.52[a]
	Overall	12.29[b]	13.82[a]	
		Prob.		
	T	**A**	**T*A**	
Egg weight, g (0 day)	0.01	0.01	NS	
Egg weight, g (18 days)	0.0001	NS	NS	
Egg weight loss, g (0-18 days)	0.0001	0.001	NS	
Egg weight loss, % (0-18 days)	0.0001	0.01	NS	

[a and b] Means within the same main effects with different letters are significantly differed (P≤o.o5), NS= Non-significant.

Table (2): Fertility and hatchability percentage of normal and star-cracked eggs for different layer breeder ages.

Trait	Egg type (T)	Layer breeder age (A), wk		Overall
		46	60	
Fertility, %	Normal shell	98	96	97
	Star cracks	82	78	80
	Overall	90	87	
Hatchability, % from fertile eggs	Normal shell	91.8	81.3	86.6
	Star cracks	53.7	53.8	53.8
	Overall	72.8	67.6	

Table (3): Egg and eggshell traits of normal and star-cracked eggs at different layer breeder ages (Means ± SE).

Trait	Egg type (T)	Layer breeder age (A), wk		Overall
		46	60	
Shape index, %	Normal shell	79.30 ± 0.27	77.64 ± 0.40	78.47
	Star cracks	79.20 ± 0.30	78.48 ± 0.38	78.84
	Overall	79.25[a]	78.06[b]	
Shell weight, g	Normal shell	5.91 ± 0.10	5.20 ± 0.13	5.60
	Star cracks	5.69 ± 0.18	5.28 ± 0.16	5.48
	Overall	5.84[a]	5.23[b]	
Shell percentage	Normal shell	9.51 ± 0.16	8.33 ± 0.21	8.99
	Star cracks	9.63 ± 0.27	8.42 ± 0.24	9.01
	Overall	9.55[a]	8.36[b]	
Total pores per egg	Normal shell	7277.10 ± 44.56	7326.60 ± 53.40	7302[a]
	Star cracks	7025.18 ± 58.41	7276.47 ± 67.40	7150[b]
	Overall	7151[b]	7302[a]	
Eggshell surface area, mg/cm^2	Normal shell	69.33 ± 0.27	69.96 ± 0.32	69.64
	Star cracks	68.88 ± 0.35	70.11 ± 0.38	69.49
	Overall	69.10[b]	70.04[a]	
Shell index, $g/100\ cm^2$	Normal shell	8.56 ± 0.14	7.48 ± 0.17	8.09
	Star cracks	8.33 ± 0.24	7.56 ± 0.21	7.94
	Overall	8.49[a]	7.51[b]	
Egg volume	Normal shell	56.07 ± 0.52	56.68 ± 0.56	56.37
	Star cracks	55.21 ± 0.66	57.32 ± 0.70	56.25
	Overall	55.64[b]	56.99[a]	
Prob.				
	T	**A**	**T*A**	
Shape index	NS	0.001	NS	
Shell weight	NS	0.0001	NS	
Shell, %	NS	0.0001	NS	
Total pores	0.01	0.01	NS	
Eggshell surface area	NS	0.005	NS	
Shell index	NS	0.0001	NS	
Egg volume	NS	0.03	NS	

[a and b] Means within the same main effects with different letters are significantly differed (P≤o.o5)
NS= Non-significant.

Table (4): Percentages of embryonic mortality stages of normal and star-cracked eggs for different layer breeder ages.

Egg type	**Mortality stage**	**Layer breeder age (A)**, wk		**Overall**
		46	**60**	
Normal shell	Early (1 to 7 d)	0	6.3	6.3 %
	Mid (8 to 14 d)	0	4.1	4.1 %
	Late (15 to 21 d)	8.2	6.3	14.5 %
	Pipped	0	0	0 %
	Overall	8.2 %	16.7 %	
Star cracks	Early (1 to 7 d)	14.6	5.1	19.7 %
	Mid (8 to 14 d)	9.8	17.9	27.7 %
	Late (15 to 21 d)	17.1	7.7	24.8 %
	Pipped	0	2.6	2.6 %
	Overall	41.5 %	33.3 %	

Table (5): Day-old chick quality measurements of normal and star-cracked eggs at different layer breeder ages (Means ± SE).

Trait	Egg type (T)	Layer breeder age (A), wk		Overall
		46	60	
Chick weight, g	Normal shell	40.74 ± 0.54	40.38 ± 0.48	40.57
	Star cracks	38.61 ± 1.09	40.90 ± 1.01	39.73
	Overall	40.02	40.57	
Relative Chick weight	Normal shell	65.62 ± 1.03	64.49 ± 0.73	65.10
	Star cracks	64.55 ± 1.28	65.18 ± 1.03	64.85
	Overall	65.26	64.74	
Shank length, mm	Normal shell	28.92 ± 0.37G	28.33 ± 0.30	28.63[a]
	Star cracks	26.63 ± 0.43	28.47 ± 0.21	27.55[b]
	Overall	27.78	28.40	
Chick length, cm	Normal shell	16.70 ± 0.30	17.55 ± 0.25	17.13[a]
	Star cracks	15.70 ± 0.21	17.00 ± 0.11	16.35[b]
	Overall	16.20[b]	17.28[a]	
Tona score, %	Normal shell	100.00 ± 0.01	99.20 ± 0.53	99.60[a]
	Star cracks	85.00 ± 4.58	97.20 ± 1.69	91.10[b]
	Overall	92.50[b]	98.20[a]	

	Prob. T	Prob. A	Prob. T*A
Chick weight	NS	NS	NS
Relative chick weight	NS	NS	NS
Shank length	0.003	NS	0.001
Chick length	0.002	0.0001	NS
Tona score, %	0.001	0.03	0.01

[a and b] Means within the same main effects with different letters are significantly differed (P≤o.o5), NS= Non-significant.

5Table (6): Blood plasma constituents of hatched chicks from normal and star-cracked eggs at different layer breeder ages (Means ± SE).

Trait	**Egg type (T)**	**Layer breeder age (A)**, wk		**Overall**
		46	**60**	
Globulin (mg/ dl)	Normal shell	192.7 ± 2.67	194.33 ± 24.5	193.50
	Star cracks	193 ± 4.73	179.33 ± 7.06	186.17
	Overall	192.83	186.83	
ALT (µ/L)	Normal shell	166 ± 9.54	183.33 ± 10.48	174.67
	Star cracks	164.33 ± 11.05	183 ± 6.43	173.67
	Overall	165.17	183.17	
AST (µ/L)	Normal shell	11.67 ± 0.88	11.67 ± 0.88	11.67^{b}
	Star cracks	44.33 ± 13.04	22.33 ± 2.33	33.33^{a}
	Overall	28	17	
Cholesterol (mg/ dl)	Normal shell	331.67 ± 5.33	268 ± 4.93	299.83^{a}
	Star cracks	257.3 ± 21.42	274 ± 16.46	265.67^{b}
	Overall	294.5	271.0	
Total Protein (mg/ dl)	Normal shell	2.40 ± 0.12	2.53 ± 0.03	2.47
	Star cracks	2.57 ± 0.03	2.50 ± 0.29	2.53
	Overall	2.48	2.52	
Alkaline phosphates (µ/L)	Normal shell	1364.7 ± 207.9	1514 ± 104.54	1439.3
	Star cracks	1109.7 ± 246.6	1531.7± 174.9	1320.7
	Overall	1237.2	1522.8	
		Prob.		
	T	**A**	**T*A**	
Globulin(mg/ dl)	NS	NS	NS	
ALT (µ/L)	NS	NS	NS	
AST (µ/L)	0.01	NS	NS	
Cholesterol	0.04	NS	0.02	
Total Protein	NS	NS	NS	
Alkaline	NS	NS	NS	

[a and b] Means within the same main effects with different letters are significantly differed (P≤o.o5), NS= Non-significant.

REFERENCES

Abudabos, A. 2010. The effect of broiler breeder strain and parent flock age on hatchability and fertile hatchability. Int. J. Poult. Sci., 9 (3): 231-235.

Barnett, D.M.; Kumpula, B.L.; Petryk, R.L. and Robinson, N.A. 2004. Hatchability and early chick growth potential of broiler breeder eggs with hairline cracks. J. Appl. Poult. Res.,13: 65-70.

Baumgartner, J.; Benková J. and Peškovicová, D. 2007. Effect of line, age and individuality on yolk cholesterol content and some other egg quality traits in Leghorn type yolk cholesterol selected hens. XVIII European Symposium on the quality of poultry meat and XII European Symposium on the quality of eggs and egg products, September 2 - 5. Prague, pp. 35-36.

Brand, H.V.D.; Parameter, H.K. and Kemp, B. 2004. Effects of housing system cout door vs cages and age of laying hens on egg characteristics. Br. Poult Sci., 45: 745-752.

Butcher, G.D. and Miles, R. 2009. Concepts of Eggshell Quality. University of Florida, Gainesville. Florida.

Coutts, J.A. and Wilson, G.C. 2007. Optimum Egg Quality: A Practical Approach. Revised Version. 5M Publishing, Sheffield, UK. Florida.

Decuypere, E. and Bruggeman, V. 2007. The endocrineinterface of environmental and egg factors affecting chick quality. Poult. Sci., 86: 1037-1042.

Fairchild, B.D., Christensen, V.L., Grimes, J.L., Wineland, M.J. and Bagley, L.G. 2002. Hen age relationship with embryonic mortality and fertility in commercial turkeys. J. of Appl. Poult. Res., 11: 260–265.

Fathi, M. M. and El-Sahar, E. A. 1996. Determining the strength of eggshell by using an appropriate apparatus and an equation to calculate egg surface depending on its dimensions. Egypt. Poult. Sci. J., 16: 285-303.

Gunlu, A.; Kiriki, K.; Cetin, O. and Carip, M. 2003. Some external and internal quality characteristics of patridge (A. graeca) eggs. Food Agri. Environ., 1: 197-199.

Khabisi, M.M.; Salahi, A. and Mousavi, S.N. 2012. The influence of egg shell crack types on hatchability and chick quality. Turkish J. Vet. and Anim. Sci., 36: 289-295.

Kuurman, W.W., Bailey, B.A., Koops, W. J. and Grossman, M. 2003. A Model for failure of a chicken embryo to survive incubation. Poult. Sci., 82: 214-222.

Lukáš Zita, Eva Tůmová and Ladislav Štolc 2008. Effects of Genotype, Age and Their Interaction on Egg Quality in Brown-Egg Laying Hens. Acta Vet. Brno 78: 85–91.

Mertens, K., Bamelis, F., Kemps, B., Kamers, B., Verhoelst, E., De Ketelaere, B., Bain M., Decuypere, E. and De Baerdemaeker, J. 2006. Monitoring of eggshell breakage and eggshell strength in different production chains of consumption eggs. Poult. Sci., 85:1670-7.

Narushin, V. G. 1997. The avian egg: geometrical description and parameters. J. Agric. Eng. Res., 68: 201-205.

Narushin, V.G.. and Romanov, M.N. 2002. Egg physical characteristics and hatchability. World’s Poult. Sci. J., 2002; 58: 297-303.

Peebles, E.D.; Doyle, S.M.; Zumwalt, C.D.; Gerard, P.D.; Latour, M.A.; Boyle, C.R. and Smith, T.W. 2001. Breeder age influences embryogenesis in broiler hatching eggs. Poult. Sci., 80.272-277.

Rahn, H. and Paganelli, C.V. 1990. Gas fluxes in avian eggs: Driving forces and the pathway for exchange. Comparative Biochemistry and Physiology 95A: 1-15.

Rayan, G.N. 2013. Genetic differences of productive performance and immuncompetence in two commercial layer strain of chickens. Ph.D. Thesis, Ain Shams University. Cairo, Egypt.

SAS institute 2002. SAS/STAT User's Guide statistics Ver. 9.1; SAS institute Inc., Cary, NC.

Sauveur, B. 1988. Reproduction des volailles et production d'aufs (Paris, INRA Editions).

Silversides, F. G. and Scott, T. A. 2001. Effect of storage and layer age on quality of eggs from two lines of hens. Poult. Sci., 80: 1240–1245.

Singh, R.P.; Beura, C.K.; Mahapatra, A.S.; Bathla, H.V.L.; Jha, G.K.; Singh, P.K.and Kumar, D. 2009. Assessment of quantitative losses of eggs between farm and household consumer. Ind. J. Poult. Sci., 44: 239-242.

Tona, K., Bamelis, F.; Coucke, W. ; Bruggeman, V. and Decuypere, E. 2001. Relationship between broiler breeder's age and egg weight loss and embryonic mortality during incubation in large-scale conditions. J. Appl. Poult. Res., 10: 221-227.

Tona, K.; Bamelis, F., De Ketelaere, B.; Bruggeman,V.; Moraes, V.M.B.; Buyse, J.; Onagbesan, O. and Decuypere, E. 2003. Effects of egg storage time on spread of hatch, chick quality and chick juvenile growth. Poult. Sci., 82: 736-741.

الملخص العربى

تأثير الشروخ النجمية لقشرة البيض وعمر أمهات الدجاج البياض على صفات القشرة، النفوق الجنينى، نسبة الفقس، وجودة التاكيت الناتجة

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فى هذه التجربة تم الحصول على بيض التفريخ لسلالة هاى لاين W-36 من قطيعان مختلفين فى العمر (46 ، 60 أسبوع). تم أخذ البيض عشوائيا لدراسة تأثير كل من الشروخ النجمية لقشرة البيض بالمقارنة مع البيض الطبيعى، وعمر أمهات الدجاج البياض على صفات القشرة، النفوق الجنينى، نسبة الفقس، وجودة التاكيت الناتجة. وكانت أهم النتائج المتحصل عليها ما يلى:

زادت نسبة الفقد فى وزن البيض بصورة معنوية (P < 0.0001) للبيض ذو الشروخ النجمية مقارنة بالبيض الطبيعى، يزداد الفقد فى وزن البيض مع تقدم عمر الأمهات. كانت نسبة الفقس للكتاكيت الفاقسة من البيض ذو الشروخ النجمية أقل بالمقارنة مع مثيلتها الفاقسة من البيض الطبيعى. تقل نسبة الفقس مع التقدم فى عمر الأمهات وذلك للبيض الطبيعى حيث بلغت (% 91.8 and 81.3) وذلك عند 46، 60 أسبوع على التوالى، لكن هذه النسبة تبقى ثابتة تقريبا مع تقدم عمر الأمهات وذلك للبيض ذو الشروخ النجمية (% 53.7 and 53.8) على التوالى. لم يلاحظ وجود فروق معنوية بالنسبة لنوع البيض المُفرخ وذلك لكل من وزن ونسبة الكتاكيت الفاقسة. وجد أن النفوق الجنينى يختلف بإختلاف عمر الأمهات. فيما لوحظ وجود زيادة كبيرة فى متوسط النفوق الجنينى بالنسبة للبيض ذو الشروخ النجمية وذلك لكلا القطيعان. وجد أن طول عظمة الساق وطول الكتاكيت الفاقسة من البيض ذو الشروخ النجمية كانت أقل معنويا من مثيلتها الفاقسة من البيض الطبيعى. أما فيما يخص مقياس Tona Score كدليل على جودة الكتاكيت، وجد أنه أعلى معنويا للكتاكيت الفاقسة من البيض السليم (% 99.60) مقارنة بمثيلتها الفاقسة من البيض ذو الشروخ النجمية (% 91.10). ومن ناحية أخرى لم يلاحظ وجود أى إختلافات معنوية بالنسبة للقياسات البيوكيميائية فى الدم للكتاكيت الفاقسة، ما عدا مستوى البلازما من AST والذى كان مرتفع معنويا للكتاكيت الفاقسة من البيض ذو الشروخ النجمية. وعلى العكس بالنسبة لمستوى الكوليسترول والذى كان مرتفع معنويا للكتاكيت الفاقسة من البيض السليم.

وأخيرا، أظهرت هذه الدراسة أننا نستطيع من الناحية العملية أن نستفيد من البيض ذو الشروخ النجمية، وذلك نظرا لأنه لا يوجد فروق معنوية بينه وبين البيض السليم بالنسبة لمعظم صفات القشرة، وزن الكتاكيت المطلق والنسبى، ووجود فرق بسيط بالنسبة لجودة الكتاكيت الناتجة.