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Hatching Characteristics of Abnormal Eggs

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Abstract: This study was aimed to determine the hatchability traits of abnormal eggs. A total of 1620 breeding eggs obtained from the parental stock of ATAK-S Brown layers aged 60 weeks developed at Poultry Research Institute were used. Eggs were allocated into 3 groups (normal, body checked and rough eggs) with respect to their shape abnormalities. While the hatchability, hatchability of fertile eggs, discard chick ratio and early, mid and late embryo mortality were found different between the groups ($p<0.01$, $p<0.05$), the fertility was not different ($p>0.05$).

Key words: Abnormal egg, hatchability, hatchability of fertile eggs, discard chick ratio

INTRODUCTION

Nutrition, genetic factors, age of breeding flock, illnesses, egg quality, high altitudes, egg storage and hatching conditions all affect the hatchability and chick quality. Nearly 6% out of hatchery eggs are obtained from breeding flocks together with normal shaped eggs. There are 15 kinds of abnormal shaped eggs and the hatchability of fertile eggs is nearly 48.9% for these eggs (Türkoğlu and Sarİca, 2004).

Some factors such as heritability, environment, nutrition, hormones, pathology, flock management, low albumen quality, stress and infectious illnesses might lead to abnormal egg formation. Higher ration Ca levels, deformation of shell segregation gland, age, genetic and illnesses lead to formation of rough shelled eggs. Outer forcing or excessive physical forcing during shell formation lead to formation of body checked eggs (Dhawale, 2008; Durmuş *et al*., 2007).

Cherms and Wolff (1968) reported that race and management factors had significant role on ratio of abnormal eggs.

Study by taking into account the specific gravity, low specific gravity with the highest levels of egg weight loss, embryo mortality and low levels hatchability have been reported (McDaniel *et al*., 1979).

Egg shell quality has a significant role on hatchability. Many factors affect the shell formation. These factors affect the shell quality prior to laying and egg color and shape might be changed due to these factors (Koelkebeck, 2009).

Mroz *et al*. (2007) found the embryo mortality and hatchability of fertile eggs as 63.6, 67.9 and 70.3% and 92.54, 85.08, 72.93, respectively, in their studies in which normal, rough and abnormal colored turkey eggs were used. The differences among the groups were significant ($p<0.01$).

Nearly 4.5% of eggs obtained from ATAK-S parent stocks produced at Poultry Research Institute were determined to be abnormal shaped. There are limited studies related to the hatching characteristics of these abnormal shaped eggs.

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This study was aimed to determine the economical losses arose from abnormal eggs at hatcheries.

MATERIALS AND METHODS

The research material was 1620 eggs obtained from ATAK-S breeding layer flock aged 60 weeks developed at Poultry research Institute. This study was done in 2009. The chemical compositions of feed materials used in the parent stocks of study are presented in Table 1.

This study was conducted in randomized block parcels design with 6 replicates. Parents stocks were grown in house which are windows, mechanical ventilated and apartment-type cages. Daily lighting was 16 h. Feeding was made as *ad-libitum*. Eggs were allocated to 3 groups: control, body checked shelled and rough shelled. Eggs collected from breeding flock for 14 days were stored at 12°C and relative humidity of 80%. Trays were taken as replicates and 90 eggs were put in each tray. Egg trays were randomly allocated to hatchery trolley. Eggs were exposed to preheating in a chamber (24°C and 75% relative humidity) for 8 h and then were put into the incubator.

- **Hatchability:** (Alive hatched chick numbers/Placed eggs into hatching machine)×100
- **Hatchability of fertile eggs:** (Alive hatched chick numbers/Placed fertile eggs into hatching machine)×100
- **Fertility:** (Fertile eggs/Placed eggs into hatching machine)×100
- **Early embryonic mortality:** (Dead embryos during the period of 0-6 days of hatching/Fertile eggs)×100

Table 1: Chemical compositions of feed materials fed to parent stocks in the study

	Weeks				
Nutrients	0-3	4-10	11-16	17-40	41-64
Dry matter, min (%)	88	88	88	88	88
Crude ash, max (%)	8	8	8	8	8
Crude protein, min (%)	19	18	16	18	17
Metabolic energy, min (kcal kg^{-1})	2900	2800	2700	2800	2700
Calcium, min-max (%)	1-1.2	1-1.1	0.9-1	3.5-4	3.8-4.2
Available phosphorus min (%)	0.45	0.42	0.40	0.40	0.37
Lysine, min (%)	1.15	0.98	0.72	0.75	0.75
Methionin, min (%)	0.55	0.47	0.35	0.47	0.42
Methonin+cystein min (%)	0.85	0.76	0.58	0.78	0.72
Triptophan, min (%)	0.20	0.19	0.17	0.20	0.19
NaCl, min-max (%)	0.35-0.50	0.35-0.50	0.35-0.50	0.35-0.50	0.35-0.50
Crude cellulose, max (%)	4.5	5	6	6	6
Linoleic acid, min (%)	1.5	1.25	1.0	1.7	1.5
A vitamin (IU kg^{-1})	13 000	13 000	10 000	12 000	12 000
D_3 vitamin (IU kg^{-1})	3 000	3 000	2 000	2 500	2 500
E vitamin (mg kg^{-1})	20	20	20	20	20
K_3 vitamin (mg kg^{-1})	2	2	2	2	2
B_2 vitamin (mg kg^{-1})	5	5	5	5	5
B_{12} vitamin (mg kg^{-1})	0.02	0.02	0.01	0.01	0.01
Niacin (mg kg^{-1})	60	60	30	25	25
Mangan (mg kg^{-1})	100	100	100	60	60
Zinc (mg kg^{-1})	70	70	70	40	40
Iron (mg kg^{-1})	40	40	40	40	40
Cupper (mg kg^{-1})	7	7	7	7	7
Selenium (mg kg^{-1})	0.2	0.2	0.2	0.2	0.2
Cobalt (mg kg^{-1})	0.5	0.5	0.5	0.5	0.5

- **Mid period embryonic mortality:** (Dead embryos during the period of 7-18 days of hatching/Fertile eggs)×100
- **Late period (under shell) embryonic mortality:** (Dead embryos during the period of 19-21 days of hatching/Fertile eggs)×100
- **Discard chick ratio:** (Placed eggs into hatching machine/Discard chick number)×100

Statistical Analysis

Data were assessed by using Minitab 14 and MSTAT pocket programmes. Differences among means were determined using variance analysis (Düzgüneş *et al*., 1987). Significant differences among means were declared by using Duncan (1955) multiple comparison test.

RESULTS AND DISCUSSION

The findings found in the present study are given in Table 2. Fertility was not different between the groups ($p>0.05$). Nonexistence of difference among the groups in terms of fertility indicates that egg shape has no influence on fertility. Fertility occurs in infundibulum and the shape of the egg is determined in uterus. For this reason, existence of difference in fertility is evaluated as an expected case.

There were significant differences among the groups in terms of hatchability, hatchability of fertile eggs, mid and late period embryo mortality ($p<0.01$). Hatchability was found as 79% for normal shaped hatching eggs (control group) with respect to the age of breeding flock. This ratio was 85-90% for young flocks. Egg abnormalities (body checked and rough eggs) negatively affect the hatchability and hatching characteristics. Also, hatchability of fertile eggs, early, mid and late period embryo mortality are affected negatively by egg abnormalities.

Higher hatchability and hatchability of fertile eggs and lower late period embryo ratio were found in normal shaped eggs compared to the other groups. Mid period embryo mortality were found higher in rough eggs compared to those found in other groups ($p<0.01$).

Early and mid period embryo mortality were found higher in rough eggs compared to those found in other groups ($p<0.01$).

Discard chick ratios were found significantly different among the groups ($p<0.05$). Rough egg group had higher early period embryo mortality compared to other groups ($p<0.05$).

There were 0.019 and 0.370 % ratios of discard chick in rough group and body checked group, respectively. Body checked egg group had higher discard chick ratio compared to the other groups ($p<0.05$).

Roughness seems to increase the early and mid period mortality. This is in consistence with findings of Mroz *et al*. (2007). Higher early and mid period mortality in rough and

Table 2: Hatching characteristics of normal and abnormal shaped eggs and discard chick ratios

	Hatching characteristics						
Groups	Fertility	Hatchability	Hatchability of fertile eggs	Early period embryo mortality	Mid period embryo mortality	Late period embryo mortality	Discard chick ratio
	(%)						
Normal	96.84±0.55	79.00±2.11a	81.44±1.84a	8.20±0.91a	0.58±0.14a	9.06±0.85a	0.00±0.00b
Body checked	95.76±0.63	70.25±1.07b	73.45±1.32b	8.24±0.79a	0.56±0.21a	16.90±1.45b	0.37±0.13a
Rough	95.65±0.46	67.52±2.28b	70.44±2.10b	10.76±0.42b	2.19±0.22b	15.19±1.75b	0.19±0.10ab

Data is expressed as Mean±SE. Values with different letter(s) are significantly different

body checked eggs might be attributed to the facts that the rough and body checked eggs have thicker shell and lower Haugh unit compared to normal eggs. Another reason is the accumulation of excess Ca on the shell which affects respiration negatively.

Abnormal shaped eggs are obtained from breeding flocks. Ratio of abnormal shaped eggs differs among the flocks and leads to economical losses. This study indicates that it is possible to obtain chicks from abnormal shaped eggs and thus economical losses can be reduced to some extent.

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