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Analysing the Impact of Broiler Line and Egg Preservation Durations on Immunoglobulin Levels and Some Egg Quality Indicators

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ABSTRACT: The basis of the poultry industry is the presence of parent flocks, and the lack of this causes the eggs to be transported for long periods and long distances, reducing the quality of hatching eggs and producing poor-quality, low-weight chicks. Therefore, the current study investigates the effect of different storage periods for different types of broiler chickens on the internal immunity of the egg and some qualitative characteristics of stored eggs. Three lines of broiler were used from three hatcheries (Ross 308-1: Ross 308-2: Cobb 508); these lines of eggs were imported from Türkiye and the Netherlands to Iraq, and all eggs were storage for four periods (15, 20, 25 and, 30 days) at seven c°. The results showed a significant ($P \leq 0.05$) increase for (line- 2) in total IgY at 25 days, and line three increased significantly ($P \leq 0.05$) in the HU unit at 25 days too. Meanwhile, there is no significant difference between periods in egg weight loss (Table 2), albumin pH, relative albumin weight, and yolk weight. It is concluded from the study's results that any storage duration may affect the egg's internal immunity and its qualitative characteristics. Thus, it may negatively affect the hatching rate and characteristics of the hatched chicks.

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KEYWORDS: broiler line, egg preservation durations, immunoglobulin, egg quality indicators.

INTRODUCTION

Storing hatching eggs, regardless of the level of storage temperature, leads to the deterioration of the quality traits of the eggs and, thus, the deterioration of the hatching rate and the quality of the hatched chicks. This results from the lack of availability of broiler breeder stock in Iraq, which forces the owners of fields and hatcheries to import eggs from outside Iraq, which causes them to be stored for long periods, which made many studies address early nutrition to improve the level of nutrients within the eggs and increase their availability to the embryo, which improves the weight and quality of the hatched chicks (Kadhim et al., 2021: Zaki and Al-jebory, 2021: Al-Saeedi et al., 2022: AL-ASEEDI et al., 2023: Al-Jaryan et al., 2023: AL-JEBORY et al., 2024). Therefore, using the proper technique while storing eggs is crucial to maintaining their quality; eggs are degraded mainly by temperature, humidity, air movement, handling, and length of storage (Bell, 1996; Samli et al., 2005). Because quality deterioration happens more quickly at hot temperatures than cold temperatures during storage, regulating storage temperature can significantly delay the decline of interior quality in eggs (Zeidler, 2002). The pH and quality of the albumen are the primary differences between fresh and preserved eggs (Walsh et al., 1995). The egg albumen's pH rises during storage, which is connected to the albumen's declining quality or Haugh unit (Jones et al., 2002). An AA egg has a robust and thick albumen, a tiny air cell, and no meat or blood stains in the yolk or albumen. The fresh albumen has the weakest buffering capacity between pH 7.0 and 9.0. Additional parameters influencing the rise in albumen pH are temperature, length of storage, gaseous conditions in the storage room, and eggshell conductivity (Akter et al., 2014). Inadequate levels of IgY in the egg yolk are likely to heighten the susceptibility of the hatching chick to infections. Conversely, extended periods of egg storage will lead to a reduction in immunoglobulin content in the yolk as a consequence of chemical alterations in the egg. IgY is transmitted from the hen to the egg to safeguard the offspring from infections until the chick's immune system has reached a level of maturity that permits the young animal to produce adequate quantities of antibodies (Carlander et al., 2003). Thus, the objective of the present work was to investigate the alterations that take place in hatching eggs throughout various storage durations and for different lines of broiler breeds.

MATERIALS AND METHODS

In this study, eggs were collected from three sites (hatches): Ross 308-1 (first local), Ross 308-2 (second local), and Cobb 508 (third local). The laboratory work was conducted in the College of Agriculture/Al-Qasim Green University's laboratory from 1 February until the end of April. Studied traits were the total IgY according to (Carlander et al., 2003). Egg weight loss and albumin pH according to (Akter et al., 2014). The HU unites and relative weight of albumin and yolk, according to (Aljebory and Naji, 2021). The SAS (2012) was used for data analysis, and the Duncan multiple ranges test (Duncan, 1955) by model $Yij = \mu + Ʈi + Ɛij$.

RESULTS AND DISCUSSION

The effect of study in yolk total IgY shown in (table 1), noted a not significant difference between periods except for at (25 days) significant ($P \leq 0.05$) increase for (line- 2) compared to (line- 3), in the same period (table 3) the line three increase significantly ($P \leq 0.05$) compared to line one and two in HU unit. There was no significant difference between periods in egg weight loss (Table 2), albumin pH (Table 4), and relative albumin weight (table 5) and, relative yolk weight (table 6).

From the hen to the egg, IgY is actively transported (Rose & Orlans, 1981), according to Bollen and Hau (1997), there is a continuous transfer of IgY from serum to yolk during oocyte development, as evidenced by the consistent IgY concentration in the growing yolk, there is also a movement in feed to use fewer antibiotics, which could raise the risk of illness, this study found a continuous decrease in IgY over time, since the yolk is the chicken's primary source of antibodies, it is likely that chicks hatched from eggs with low IgY concentrations will have less protection, moreover, vaccination of the hens is likely to be unsuccessful and result in poor protection for the chick, these animals have the potential to infect the rest of the flock after contracting the virus, our findings indicate that there are differences in IgY concentrations between individual eggs in the first and second lines as well as between lines, the decrease in the level of immune antibodies may be due to chemical changes that occur over the period of storage and due to the transfer of albumin to yolk and from yolk to albumin, which causes a deterioration in the egg's immunity (Scottand Silversides, 2000: Samli et al., 2005: Akyurek and Okur, 2009). Variations in temperature can influence the pH of egg albumen, leading to increased levels of evaporation from the eggs. Further studies by Moula et al. (2009) and Silversides and Budgell (2004) have also documented this rise in albumen pH during storage. In contrast, our investigation did not observe a statistically significant impact on pH over various storage durations (Table 4). Furthermore, the storage of eggs resulted in elevated pH levels compared to fresh eggs. This phenomenon can be attributed to the process of evaporation and diffusion of carbon dioxide from eggs. The Haugh unit of eggs declined after 25 days of storage, indicating that storage temperatures might exert an influence on egg HU. Increased storage temperatures promote the breakdown of the ovomucin-lysozyme complex, resulting in a reduction in the HU of the stored eggs (Morais et al., 1997).

Table 1: Effect of line broiler on total IgY in different storage periods

Storage Periods				
Line	Fifteen days	Twenty days	Twenty five days	Thirty days
Ross- 308- 1	2.41± 0.28	1.95± 0.06	1.45 ± 0.03 ab	1.16± 0.03
Ross 308- 2	2.47± 0.38	1.79± 0.21	1.57± 0.12 a	1.08± 0.08
Cobb 508- 3	1.62± 0.01	1.56± 0.03	1.41± 0.02 b	1.14± 0.15
Significant	NS	NS	*	NS
NS: Not significant. Means with different litter significantly at level * ($P \leq 0.05$).				

Table 2: Effect of line broiler on egg weight loss in different storage periods

Storage Periods				
Line	Fifteen days	Twenty days	Twenty five days	Thirty days
Ross- 308- 1	1.46± 0.03	2.47± 0.06	3.11± 0.01	3.83± 0.20
Ross 308- 2	1.46± 0.08	2.50± 0.13	3.17± 0.03	3.73± 0.04
Cobb 508- 3	1.32± 0.09	2.46± 0.01	3.01± 0.01	3.76± 0.04
Significant	NS	NS	NS	NS
NS: Not significant.				

Table 3: Effect of line broiler on HU unite in different storage periods

Storage Periods				
Line	Fifteen days	Twenty days	Twenty five days	Thirty days
Ross- 308- 1	79.61± 0.49	73.85± 0.27	70.69± 0.39 b	65.77± 0.53
Ross 308- 2	79.62± 0.93	74.59± 1.53	70.08± 0.17 b	65.45± 2.13
Cobb 508- 3	80.12± 0.02	76.59± 1.37	73.12± 0.57 a	68.02± 0.13
Significant	NS	NS	*	NS
NS: Not significant. Means with different litter significantly at level * (P≤0.05).				

Table 4: Effect of line broiler on albumin pH in different storage periods

Storage Periods				
Line	Fifteen days	Twenty days	Twenty five days	Thirty days
Ross- 308- 1	8.48± 0.17	8.89± 0.02	8.87± 0.02	8.85± 0.11
Ross 308- 2	8.41± 0.27	8.82± 0.06	8.73± 0.16	8.80± 0.12
Cobb 508- 3	8.51± 0.05	8.75± 0.19	8.73± 0.02	8.89± 0.01
Significant	NS	NS	NS	NS
NS: Not significant.				

Table 5: Effect of line broiler on relative albumin weight in different storage periods

Storage Periods				
Line	Fifteen days	Twenty days	Twenty five days	Thirty days
Ross- 308- 1	56.72± 1.39	55.04± 1.37	53.24± 1.88	52.65± 1.90
Ross 308- 2	58.23± 1.98	57.20± 1.42	55.56± 1.31	54.06± 1.08
Cobb 508- 3	56.94± 2.16	54.32± 2.15	53.34± 1.78	52.63± 1.79
Significant	NS	NS	NS	NS
NS: Not significant.				

Table 6: Effect of line broiler on relative yolk weight in different storage periods

Storage Periods				
Line	Fifteen days	Twenty days	Twenty five days	Thirty days
Ross- 308- 1	21.16± 0.99	22.78± 0.91	23.14± 1.09	23.71± 0.92
Ross 308- 2	20.77± 0.59	21.56± 0.43	22.46± 0.49	22.83± 0.27
Cobb 508- 3	21.57± 059	22.09± 0.22	22.99± 0.90	24.01± 0.85
Significant	NS	NS	NS	NS
NS: Not significant.				

CONCLUSION

Previous literature has shown a significant change in all quality egg traits. However, under conditions of high temperature, we also have an arithmetic change in the studied characteristics and a significant decrease in antibodies and Hu unit. All of this negatively affects the hatching rate, the weight of the hatched chicks, and their qualitative characteristics, and this effect continues when the chicks are transported. The breeding halls and the breeder are harmed because of the poor vitality of the chicks; it also results in the chicks not responding to the vaccine programs due to the deterioration of their immune status. Therefore, it is recommended that hatching eggs should be stored for at most five days at a maximum.

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