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THE EFFECT OF COATING MATERIALS AND STORAGE TIME ON INTERNAL QUALITY OF CHICKEN AND QUAIL EGGS UNDER REFRIGERATED STORAGE: 3 – Gelatein

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ABSTRACT

The functional properties of foods can be preserved when they are coated with edible films, especially when the moisture and the transport of O_2 and Co_2 are reduced. The objective of this work was to study the effect of coating chicken and quail eggs with gelatein and storage time (0,10,20 and 30 days) on internal quality of chicken and quail eggs. In this research, 900 fresh chicken and quail eggs were used. The eggs for each kind were divided into 5 groups (four coated - with gelatein - groups and one control groups for chicken and quail, respectively)

The percentage of weight loss and pH increased when storage period increased, but it was decreased for coated eggs (1,2,3and4) comparable with non-coated (0). Hu decreased when the storage increased for two kind of eggs, and it was a lower decreased for coated eggs. Quail eggs coated had good internal quality during storage comparable with chicken eggs.

These results suggest that gelatein coatings (0/12) can be used to reduce changes in eggs during storage.

Key words: Egg quality, Gelatein, coating, chicken, quail, weight loss, Haugh unit,.

INTRODUCTION

Eggs have been classified as natures original function of food (Hasler, 2000). In the last years, it has been observed in the poultry breeding that the quails were benefited as much as hens both for their meat and eggs, therefore, commercial quail breeding have became widespread (Altinel et.al, 1996). In the egg processing enterprises, the weight of egg shell, albumen and the yolk that form the egg as well as their rates affect the amount and price of the product (Altan, et al., 1998).

In Iraq, especially in the recent years, the increasing number of quail breeding activates led the need for examining some issues such as internal and external quality traits of the quail eggs and their storage time. The advantages of edible film and coating utilization can be justified since they maintain the functional properties of foods by decreasing moisture loss and gas transport (O_2 and Co_2), and also, by delaying volatilization of aromatic components (Kester and Fennema, 1986). The application of coatings an eggs reduces weight loss and maintains their internal measured such as weight loss , egg white pH and Haugh units.

Early studies examined chicken eggs coated with Zein–based, egg albumen, soybean protein isolate, wheat gluten and mineral oil and a crylonitril (Li, et al., 1985) and whey protein concentrate (Wong, et al., 1996) , and Chitosan (Bhale, et al., 2003) and black seed oil (AL-Hajo et. al.,2009) .

Considering two new egg storage alternatives are essential to maintain the internal quality of egg coated with gelatein and evaluate the application of this type means of preserving the desirable qualities of this product.

The objective of this work was to study the application of gelatein coating fresh eggs on weight loss, internal quality like as Haugh units and albumen pH and other adjectives during 30 days of storage in refrigerator.

MATERIALS AND METHODS

Nine hundred fresh chicken eggs and quail eggs were used in this study. 30 eggs were selected, from each group, and separated from the rest of the group for Haugh unit and albumen pH determination, eggs were sanitized with a 1% sodium hypochlorite solution for 30s (Aileoni and Antunes, 2004). The eggs were divided

into four groups, each chicken eggs and quail eggs were coated with gelatein, while the fife group did not coated (control).

To prepare the film of gelatin and methyl cellulose ,gelatin (G) and methyl cellulose (MC) concentration of films solution was fixed at 6% (w/ v) and added of glycerol as plastizeir 10% / dry weight of (G) and (MC) .

Solution A: Methylcellulose (6 g) were mixed with 50 ml of hot distilled water (90ºC) and stirred until a uniform suspension was obtained. Further, added of glycerol as plastizeir 10% / dry weight of (G) and agitated for approximately 15 min to form solution .Then complete the volume solution to 100 ml.

Solution B: Gelatein (6g) were mixed with 50 ml of hot distilled water (70ºC) and stirred until a uniform suspension was obtained. Further, added of glycerol as plastizeir 10% / dry weight of (G) and agitated for approximately 15 min to form solution .Then complete the volume solution to 100 ml .

To study the effect of variety concentration of G/MC on eggs characterizes after time storage .Solution A and B were mixed in a ratio of G/MC (11/1,10.2,9/3 and12/0)(v:v) for 1, 2, 3 and 4 . A new solutions homogenized at 13.000 rpm for 2 min and allowed to stand for 12 hr before coating of eggs.

Eggs coating at 32ºc by dipping it in film solution and let control sample without coating, and storage them 10, 20 and 30 days at 4-5 ºc.

Egg internal quality measured with a high precision micrometer that determines albumen height system uses the Haugh unit formula (Haugh , 1937) as follows:

$$Hu = 100 \text{ Log } (H + 7.57 - 1.7\ w^{0.037})$$

Where: Hu= Haugh units; H= thick egg white height (mm); w= egg weight (g) using calculator program (Roush, 1981) .

The eggs were broken on table with a glass coer in order to measure the albumen length and the albumen height (Tyler, 1961).

Weight loss (%) of whole eggs during storage was calculated as:

[Initial egg weight (g) – egg weight after storage (g)] / Initial egg weight (g) X100

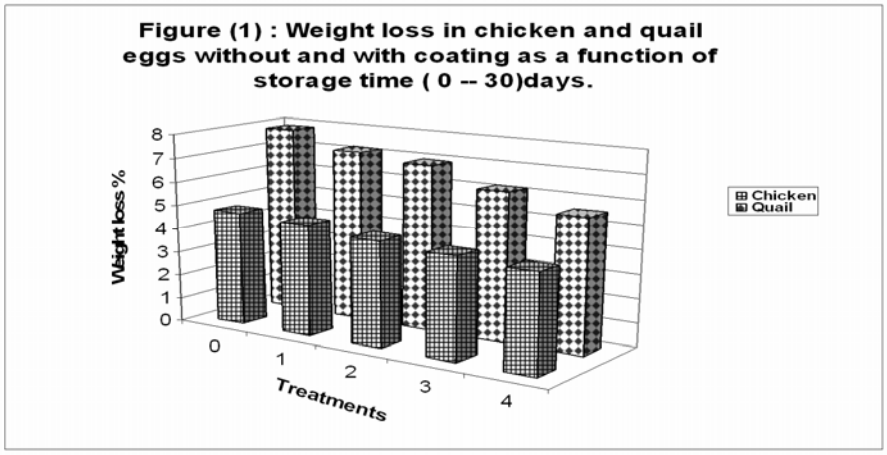
Statistical analysis: The data were analyzed using Complete Randomized Design. the calculation was preformed by the SAS

package programmers (SAS, 2001). LSD test was used to determine significant differences

RESULTS AND DISCUSSION

The percentage of weight loss was affected by gelatein coated and by storage time. In chicken eggs (Figure, 1) the percentage of weight loss was affected by gelatein, it was 4.78,4.64,4.42,4.24 and 4.08% respectively for non-coated (Control 0)and coated (0,1,2,3,and 4) eggs. Both coated and non-coated increased during storage (0 --30) days for chicken and quail eggs. A greatest weight losses in both non-coated and coated quail eggs occurred on the 30 days of storage, their values was (7.86,7.19,6.95,6.20 and 5.56)% respectively. We can see that weight loss (%) for quail eggs have a higher value comparable with chicken eggs ,that because of thickness of quail eggs shell ranged (0.21 – 0.19)which lower than chicken eggs shell (0.40 – 0.33) when we calculated .

Figure (1) : Weight loss in chicken and quail eggs without and with coating as a function of storage time (0 -- 30)days.



Wong, et al., (1996) measured a 4.2, 6.5 and 9.2% weight loss in egg coated with wheat gluten, soybean protein isolate and minerd oil respectively after 28 days of storage. Alleoni and Antunes (2004) notice that the weight loss was decreased for coated eggs with whey protein concentrate for 3, 7, 10, 14, 21 and 28 days at 25 ˚C.AL-Hajo et. al. (2009) notice that the weight loss (%) was decrease for coated chicken & quail eggs with black seed oil for 10,20, and 30 days at 4 ˚C

We can concluded from figure (1) that treatment 4 had the lowest degree of weight loss for two kind of eggs.

The albumen pH (Table1) in coated chicken and quail eggs was lower than in non-coated eggs, for all storage periods. pH for non-coated chicken eggs ranged from 7.27 (one day old eggs) to 8.74 (30–day old eggs). Ahn, *et al.,* (1999) found that the albumen pH was increased after seven days (to be pH 9.36) of storage, but remained unchanged until 21 days of storage (pH 9.27) at refrigeration temperature. Allenoni and Antunes (2004) reported that Albumen pH increased unit values for non-coated and coated eggs .

Table (1): the effect of coating and storage (0,10,20 and 30) days on pH of chicken eggs .

Storage time / Treatment	0	10	20	30
0	Ca 7.27± 0.08	BCa 7.43 ±0.13	Ba 7.60 ± 0.06	Aa 8.74 ± 0.06
1	Aa 7.24± 0.05	Aa 7.22±0.15	Aa 7.43 ± 0.21	Aab 7.46±1.20
2	Aa 7.22±0.08	Aa 7.27±0.13	Aa 7.31±0.13	Ab 7.40±0.12
3	Aa 7.18±0.18	Aa 7.23±0.03	Aa 7.29±0.02	Ab 7.33±0.02
4	Aa 7.20±0.09	Aa 7.20±0.03	Aa 7.25±0.03	Ab 7.32±0.02

- Dissimilar superscripts at the same row means significant (P<0.01, capital letters, P<0.05, small letters).

Table (2): the effect of coating and storage (0,10,20 and 30) days on pH of quail eggs .

Storage time / Treatmen	0	10	20	30
0	Ca 7.25±0.09	Ca 7.56±0.06	Ba 8.18±0.03	Aa 9.35±0.21
1	Aa 7.24±0.09	Ab 7.31±1.12	Ab 7.40±0.54	Ab 7.45±1.12
2	Aa 7.24±0.08	Ab 7.28±0.54	Ab 7.34±0.05	Ab 7.38±0.54
3	Aa 7.23±0.08	Ab 7.25±1.12	Ab 7.28±0.54	Ab 7.32±1.12
4	Aa 7.21±0.08	Ab 7.23±0.54	Ab 7.25±0.07	Ab 7.28±0.06

- Dissimilar superscripts at the same row means significant (P<0.01, capital letters, P<0.05, small letters).

pH for coated chicken eggs ranged from 7.24 (one day old eggs) to 7.32 (30 day old eggs), while quail eggs (Table 2) in non-coated eggs ranged from 7.25 (one day old eggs) to 9.35 (30 day old eggs) and in coated egg ranged from 7.24 (one day old eggs) to 7.28 (30 day old eggs), and thus because of the albumen increases as the egg losses Co_2 (Burley and Vadehra, 1989) and as the fine layer of albumin could be a primary barrier for gas diffusion and it also have albumen quality, which could prevent the free diffusion of Co_2 under long storage periods (Silversides and Scott, 2001). Silversides and Scott (2001) suggested that albumen pH should be considered of quality because it is not affected by the age or by the line of the hens. The gelatein coating had an important effect controlling the pH of eggs , its reduced Co_2 loss during storage. Table (3 and 4) showed a decreased in egg internal quality of Hu in both non-coated and coated for chicken and quail eggs. The variation of in Hu in coated chicken eggs ranged from 97.81 to 84.65 for treatment 4, while the non-coated chicken eggs was raged from 96.81 – 78.12, while the variation in coated quail eggs (treatment 4) (Table 4) ranged from 95.96 to 87.39, however, non-coated (control) was ranged from 95.43 to 80.22, which means that gelatein coated reduced changes in eggs .

Table (3): The effect of coating and storage (0,10, 20,30) days on HU of chicken egg .

Storage time / Treatment	0	10	20	30
0	Aa 96.81±0.93	Ba 91.44± 1.23	Bab 88.85± 1.28	Cb 78.12±0.65
1	Aa 96.55±1.12	Aa 92.18± 1.73	Cb 86.77± 1.28	Ca 79.77± 1.00
2	Aa 97.25± 1.12	Aa 94.08 ±1.73	Bab 89.73± 1.25	Ca 84.79± 0.54
3	Aa 97.25±0.86	Ba 94.08± 1.67	Aab 89.73± 0.83	Ca 84.79± 0.54
4	Aa 97.81± 0.93	Ba 91.44± 1.23	Ba 91.92±0.83	Cb 84.65± 0.70

- Dissimilar superscripts at the same row means significant (P<0.01, capital letters, P<0.05, small letters)

Excellent quality eggs, according to the North–American standard, present a HU value of 72 (Morais, *et al.*, 1997; Li, *et al.,* 1985) obtained 60 Hu for eggs coated with mineral oil and stored at refrigeration temperature, during storage period.

Table (4) the effect of coating and storage (0,10,20 and 30) days on HU of quail eggs

Storage time / Treatment	0	10	20	30
0	Aa 95.43±1.87	Bb 91.60±1.28	Cc 83.28±0.35	Cb 80.22±1.10
1	Aa 95.63±1.38	Ab 91.86±1.67	Ab 90.11±0.54	Bb 81.19±0.06
2	Aa 95.63± 1.31	Aa 95.44±0.54	Aab 92.24±1.67	Ba 86.71±0.54
3	Aa 95.94± 1.25	Aa 95.80±1.67	Aab 92.36±0.06	Ba 87.24±1.67
4	Aa 95.96± 0.68	Aa 95.03± 1.28	Aa 94.56± 0.35	Ba 87.39±0.54

- Dissimilar superscripts at the same row means significant (P<0.01, capital letters, P<0.05, small letters).

Finally, it could be concluded that these results suggest that gelatein coatings (0/12) can be used to reduce changes in eggs during storage up to 30 days in refrigerated conditions.

REFERENCES

AL-Hajo, N. N.,AL-Mashhadany,H.A.,al-Baghdadi,M.F.,AL-Fayadh,H.A. 2009 .The effect of coating material and storage time on internal quality of chicken and quail eggs under refrigerated storage: 1- Black seed oil . J. Biol. Chem.Environ. Sci., 2009,Vol. 4(4): 283-291 (www.acepsag.org)

Ahn, D.U., Sell, J.L., charmrus pollert, M. and Jeffrey, M., 1999. Effect of dietary conjugated linoleic acid characteristics of chicken eggs during refrigerated storage. J. Food Sci., 78(9-).

Alleoni, A.C.C. and Antunes, A.J., 2004. Internal quality of eggs coated with whey protein concentrate. Sci. Agric. (Piracicaba, Braz.) Vol.61 no. 3 Piracicaba.

Altan, O., Dguz, l. and Akbas, y., 1998. Effect of selection for high body weight and age of hen on egg characteristics in Japanese quail (cotumi & cotumix japouica). Turk. J. Vet. Anim. Sci., 22:67-473.

Altinel, A., Guneb, H., Kinmizibayrak, T., Corekci , S.G. and Bilal , T., 1996. The studies on egg quality characteristics of Japanese quail. J. Fac. Vet. Univ. lstanbul, 22(1): 203-213.

Bhale, S. Prinyawiwatkul,w.Farr,A.J.Nadarajah K. and Meyers ,S.P.2003.Chitosan coating improves shelf life of eggs .South Korea (E.mail: wprinya@lsu.edu) .

Burley, R.W. and Vadehra, D.V., 1989. The avian chemistry and biology. New York : John Wiley & Son.

Hasler, C.M., 2000 . The changing face of functional food. J. Amer. Col. Nutr., 19: 4995- 5065.

Haugh, R.R., 1937. The Haugh unit for measuring egg quality. United States Egg Poultry Magazine, P:355.

Kester, J.J. and Fennema, O.R., 1986. Edible Films and Coatings: A Review. Food Technology: 40-47.

Levie, A., 1970. The Meat Hand Book. The AVT Publishing Co. INC. West Port Connect Ictus.

Lee, T. G., Williams, S.K., Slaon, D. and Little, R., 1997. Development and evaluation of a chicken breakfast sausage manufactured with mechanically debond chicken meat. Poultry Sci., 76:415-421.

Li, L.Y., Lai, C.C. and Gilbert, S.G. 1985. Keeping quality of packaged in acryonitrile pouches . Journal Processing and Preservation, v.9 , p: 179-187.

Morais, C.F.A., Campos, E.J. and Silva, T.J.P., 1997. Qualidade interna de ovos comercializados em difer. Supermercados na cidade de Uberlandia . Arquivo Brasileiro de Medicina Veterinaria e Zoot.(Cited by Alleoni and Antunes , 2004)

Roush , W.B. 1981. TI 59 calculator program for Haugh units Calculation. Poultry Sci., 60: 10-20 .

SAS. 2001. SAS / stat users Guide. SAS. Inst., IMC. Gart NC. U.S.A.

Silversides , F.G. and Scott , T.A., 2001. Effect of storage and layer age on quality of eggs from two line. Poultry Science, 80: 1240–1245.

Tyler, C., 1961. Shell strength. Its measurement and its relationships to other factors . Br. Poult. Sci., 2: 3-19.

Wong, Y.C., Herald, T.J. and Hachmeister, K.A., 1996. Evaluation of mechanical and barrier properties coating on shell eggs. Poultry Sci., 75: 917-442 .

تأثير التغليف و فترة الخزن على النوعية الداخلية لبيض الدجاج و السمان عند الخزن بالثلاجة: 3– استعمال غلاف الجيلاتين

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أجريت التجربة في مختبر تكنولوجيا منتجات الدواجن التابع لقسم الثروة الحيوانية – كلية الزراعة – جامعة بغداد - العراق، وتهدف التجربة إلى معرفة تأثير التغليف بالجيلاتين و فترة الخزن على النوعية الداخلية لبيض الدجاج و السمان عند الخزن على فترات صفر ، 10 ، 20 ، 30 يوم ، حيث بالامكان المحافظة على النوعية الداخلية للغذاء عندما يغلف بأنواع من الأغلفة المأكولة، إذ تعمل الأغلفة على تقليل فقد كمية الرطوبة و الأوكسجين و ثاني اوكسيد الكاربون من البيضة. تم تقسيم 900 بيضة طازجة من بيض الدجاج و السمان بالتساوى (450 بيضة من كل نوع) الى خمسة مجموعات متساوية: المجموعةالأولى للمقارنة و المجاميع الباقية 1 و 2 و 3 و 4 لمعاملة التغليف بالجيلاتين (1/11 ، 2/10 ، 3/9 و 0/12) لبيض الدجاج و السمان على التوالى.

لوحظ من النتائج : ازدياد نسبة الفقدان بالوزن و درجة الـpH بزيادة فترة الخزن، وقد انخفضت نسبة الفقدان و درجة الـ pH للبيض المغلف (المعاملة) مقارنة بالبيض الغير مغلف (المقارنة). وقد انخفضت أيضا وحدة الهو (HU) بزيادة فترة الخزن لنوعي البيض (الدجاج و السمان) معنوياً ($P< 0.05$) وقد كان الانخفاض اقل للبيض المغلف معنوياً ، وقد حافظ بيض السمان المغلف على نوعيته الداخلية الجيدة ، وقد حصلت معاملة التغليف بالجيلاتين (معاملة رقم 4) على احسن النتائج .

يستنتج من البحث إمكانية استخدام الجيلاتين (بنسبة 12/0) لتقليل التغييرات بنوعية البيض خلال فترة الخزن لمدة 30 يوماً .