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EFFECTS OF HEN AGE, STORAGE PERIOD AND STRETCH FILM PACKAGING ON INTERNAL AND EXTERNAL QUALITY TRAITS OF TABLE EGGS

EFECTUL VÂRSTEI GĂINILOR, A DURATEI DE DEPOZITARE ŞI A AMBALĂRII CU FOLIE ELASTICĂ ASUPRA ÎNSUŞIRILOR CALITATIVE INTERNE ŞI EXTERNE ALE OUĂLOR DE CONSUM

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The effects of hen age, storage time and packaging with stretch film applications to the internal and external egg quality of table eggs were investigated. A total of 1680 table eggs were used and collected with two commercial layer stocks (Lohmann White) 28 and 80 weeks old age. A half of the table eggs packaged with stretch film and all eggs were stored 0, 15, 30 and 45 days at 22 ºC ve 45 % RH . Egg weight, shape index, albumen index, fracture strength, albumen index, yolk index Hauhg unit, yolk color, shell weight, shell thickness, shell weight per unit surface of shell and shell density were examined in the study. Egg weight, egg weight loss, shell weight, albumen index, yolk index, Haugh unit, shape index, shell strength, shell thickness, shell density values were found as higher in the young hen flocks' eggs. Egg weight loss, shell strength, shell thickness, egg weight, shell density increased and egg weight, albumen index, yolk index and Haugh Units and shell weigh decreased as storage time increased. Packaging eggs with stretch film reduced the internal quality losses resulted from prolonged storage.

Keywords: table egg, hen age, storage time, stretch film, quality

Introduction

Egg quality is affected by such factors like genotype, feeding, health status, season, housing and storage conditions age of the flock, (3, 4, 5, 14, 18, 19, 20, 21). It was reported that as egg weight is increased and shell thickness is decreased (8, 15) albumin and yolk ratios are changed (1, 12, 23), albumen height and Haugh unit are decreased (13, 18, 19, 20, 22) with hen age. Internal egg quality is lost during extended storage (2, 3, 4, 9). It was decelerated that storage of eggs in plastic bags decreased of quality lost (11, 16, 17). Becker (5) stated that egg weight

lost increases linearly with prolong storage. As shelf life of table eggs is short, egg quality was affected seriously by many factors in its travel "farm to fork" (5, 6, 10).

Packing of all foods offered to consumption is obligation of according Turkish Food Codex. A common materials using for packing of foods is transparent stretch film in the sector. In respect of Communiqué of the Turkish Food Codex on Egg and Egg Products (2000/11) and humidity standards as 8-15ºC, 70-80% in storage and maximum 12ºC at market of table eggs. There are many markets couldn't have had this standards and a important portion of fresh table eggs are marketing and storage from farm to table in room condition in Turkey. This study was aimed to examine the effects of hen age, storage time and packaging with stretch film applications to the internal and external egg quality of table eggs.

Material and Methods

The experiment was conducted in Department of Animal Husbandry, Faculty of Veterinary Medicine, Afyon Kocatepe University from February to May 2007.

A total 1680 eggs were used from young (28 weeks old) and old (80 weeks old) flocks. Eggs were laid in the morning (9.00-10.00 h) on a single day, collected and placed into viols and transported to the laboratory in a closed vehicle. A half of the table eggs packaged with stretch film and all eggs were stored 0, 15, 30 and 45 days at 22ºC and 45% RH. Egg weight, shape index, albumen index, fracture strength, albumen index, yolk index Haugh unit, yolk color, shell weight, shell thickness, shell weight per unit surface of shell and shell density were examined.

The effect of hen age, storage period and condition on different traits was analyzed by the method of least-squares using the following model:

$$Y_{ijklm} = \mu + HA_i + SP_j + SC_k + e_{ijk},$$

where,

Y_{ijklm}=the month observation in the i^{th} hen age, j^{th} storage period and k^{th} storage condition

μ= the over all mean;

HA_i= the effect of i^{th} hen age (i=1, 2);

SP_j= the effect of storage period group (j=1…4);

SC_k= the effect of k^{th} storage condition group (k=1,2);

e_{ijklm} = random error $N(0,\sigma^2)$.

Data were analyzed by using GLM and Duncan options of SPSS computer program and differences among the means were partitioned using Duncan's multiple range procedure. Significance level was set at $P<0.05$(7, 24).

Table 1

The effects of different factors on internal egg quality

Factors	n	Albumen index	n	Yolk index (%)	n	Haugh Unit	n	Yolk color
μ		1.945		31.914		37.039		10.195
Hen age		**		**		**		-
1 (young)	839	2.630[a]	839	33.750[a]	839	50.855[a]	839	10.184[a]
2 (old)	816	1.261[b]	816	30.079[b]	816	23.302[b]	816	10.206[a]
Storage period		**		**		**		**
1 (0 day)	239	5.675[a]	239	43.231[a]	239	75.132[a]	239	10.936[a]
2 (15 days)	479	1.064[b]	479	33.660[b]	479	47.091[b]	479	10.383[b]
3 (30 days)	471	0.361[b]	471	27.473[c]	471	20.332[c]	471	9.923[c]
4 (45 days)	466	0.681[b]	466	23.293[d]	466	5.760[d]	466	9.538[d]
Storage condition		*		**		**		**
1 (packing with stretch film)	839	1.967[a]	839	31.637[b]	839	43.317[a]	839	10.262[a]
2 (storage in air)	816	1.924[b]	816	32.191[a]	816	30.841[b]	816	10.128[b]
R^2		0.846		0.907		0.76		0.267

**P<0.01 *P<0.05 -: P>0.05 non-significant

a-d: Means in the same column with no common superscript differ significantly (P< 0.05)

Table 2

The effects of different factors on external egg quality

Factors	n	Shape index (%)	n	Fracture strength (kg/cm^2)	n	Shell weight (g)	n	Shell thickness ($mmx10^2$)	n	Shell weight per unit surface (g/cm^2)	n	Shell density (g/cm^3)
μ		76.025		0.473		5.562		0.500		77.191		0.039
Hen age		**		**		**		**		*		**
1 (Young)	830	76.960^{a}	238	0.697^{a}	830	5.236^{b}	830	0.516^{a}	830	77.138^{b}	830	0.040^{a}
2 (Old)	832	75.089^{b}	239	0.248^{b}	832	5.888^{a}	832	0.484^{b}	832	77.245^{a}	832	0.037^{b}
Storage Period		-		*		**		**		**		**
1 (0 day)	240	75.992^{a}	120	0.360^{b}	240	5.660^{a}	240	0.483^{b}	240	75.325^{d}	240	0.036^{d}
2 (15 days)	480	76.142^{a}	120	0.478^{ab}	480	5.560^{b}	480	0.502^{b}	480	76.537^{c}	480	0.039^{b}
3 (30 days)	474	76.042^{a}	119	0.477^{ab}	474	5.530^{b}	474	0.488^{b}	474	77.576^{b}	474	0.038^{c}
4 (45 days)	468	75.924^{a}	118	0.575^{a}	468	5.498^{b}	468	0.527^{a}	468	79.325^{a}	468	0.042^{a}
Storage Condition		-		-		-		**		**		**
1 (packing with stretch film)	830	75.977	237	0.487^{a}	830	5.560^{a}	830	0.511^{a}	830	78.005^{a}	830	0.040^{a}
2 (storage in air)	832	76.152	240	0.459^{a}	832	5.563^{a}	832	0.488^{b}	832	76.378^{b}	832	0.037^{b}
R^2		0.115		0.192		0.339		0.033		0.073		0.045

**P<0.01 *P<0.05 -: P>0.05 non-significant

a-d: Means in the same column with no common superscript differ significantly (P< 0.05)

Results and Discussion

Egg Weight Lost and Internal Egg Quality

Internal quality were significantly (P<0.01) affected by hen age. Older hens laid bigger eggs, these eggs lost more weight during storage (P<0.01) as much as egg stored in the air (Table 1). The eggs stored in stretch film lost 3.58 g less weight then the eggs stored in air and it was thought that packing of the eggs with stretch film could have prevented gas movement from pores in the shell (5, 9, 11, 17).

Egg weight lost and internal egg quality were significantly (P<0.01) affected by hen age. Significant effect of hen age on inner quality of eggs was consonance with the findings of Scott and Silversides (21), Lapao et al. (13) and Cunningham et al. (6) reported that the eggs from older hens have had poor inner quality and affected more negative during storage in a such storage condition like as low humidity (Figure 1).

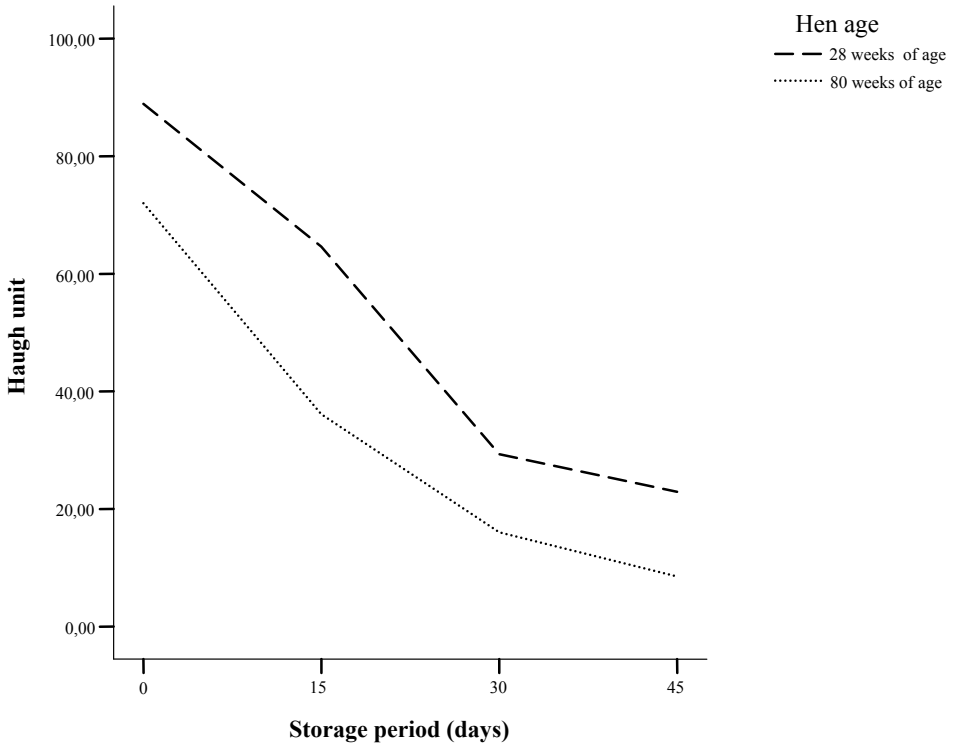

Figure. 1. The effects of hen age x storage period interaction on Haugh unit

As storage period extended internal egg quality was decreased. These losses were lower in eggs stored in stretch film at extended storages (Figure 2). These results were expected due to storage in stretch film decreases the loss of water and CO_2 via prevented of gas exchange by pores and inevitable result of this

phenomenon is the increases in albumen pH. This finding indicated that the shelf life of commercial eggs could be escalated without more loss in quality (5, 11, 12).

External Egg Quality

Shell thickness, shell density decreased and shell weight and shell weight per unit surface increased with advancing age in hens ($P<0.01$) (Table 2). Age had no significant effect on and shell density. Shell thickness, and shell weight per unit surface and shell density were high and this results can not explained completely.

The results of this study indicated that some factors such as hen age, storage condition and period significantly influence the quality of egg, .Egg weight loss, shell strength, shell thickness, egg weight, shell density increased and egg weight, albumen index, yolk index and Haugh Units and shell weigh decreased during prolonged storage. Packaging eggs with stretch film reduced the internal quality losses resulted from prolonged storage.

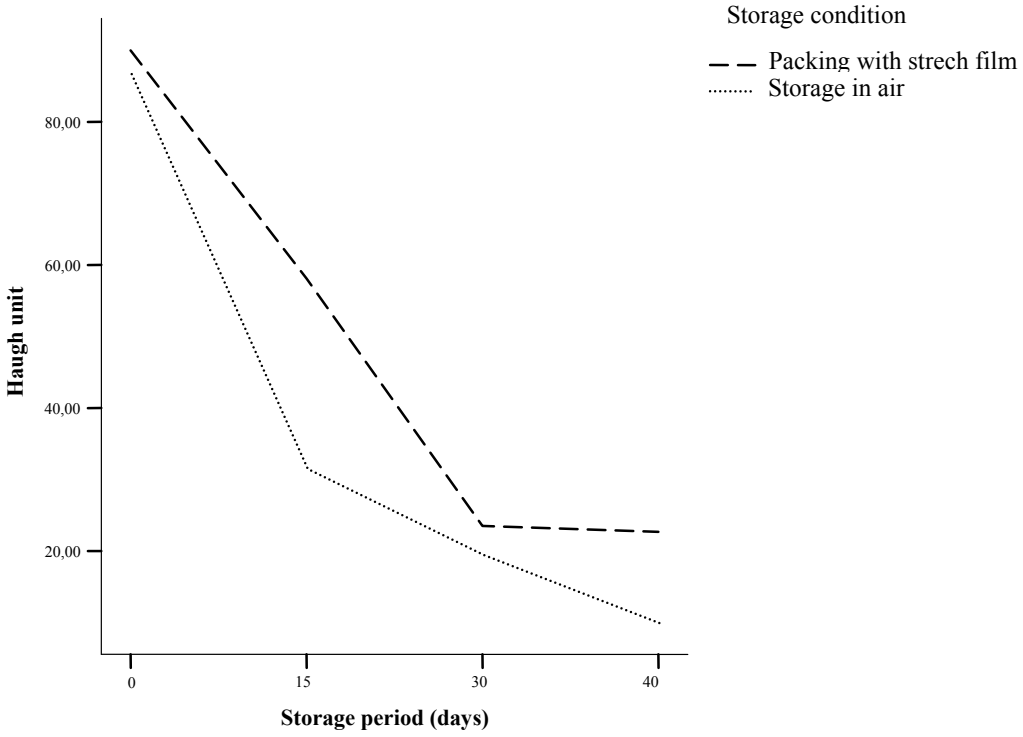

Figure 2. The effects of hen age x storage condition interaction on Haugh unit

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