

Comparison of Village Eggs and Commercial Eggs in Terms of Egg Quality

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Abstract: Eggs are highly important food because of their high value of protein and richness of vitamins and minerals. Similarly to other types of food, eggs have become subject of discussions about food safety. Intensive production techniques, in which several chemical additives are used, are put into question by consumers. In this context, village eggs, whose production is characterized by abandonment of intensive agriculture in rural areas have become as a symbol of a natural product more and more popular with consumers. In this study, village eggs are compared with commercial eggs, which are produced under conditions of intensive agriculture in terms of egg quality characteristics. For this reason, village eggs from 9 villages around the city of Kahramanmaraş/Turkey and commercial eggs produced in 4 different facilities of factory farming were analyzed. According to the results, significant differences were found in weight; shell thickness was higher in village eggs; there were also significant differences in yolk colour. For statistical analysis the statistics program SPSS 15 was used.

Key words: Egg, village egg, commercial egg, food safety, egg quality, analyzed, facilities

INTRODUCTION

It is apparent that consumers awareness of food safety and healthy nutrition has risen in recent times. Differences in nutrition can be stated according to economic and social status. However, there is an increasing demand for healthy food independent of economic and social status. This means that conventional methods of food production are called into question (Browne *et al.*, 2000). As a result of this challenging the demand for natural products has become quite common. Village chicken and egg production as a form of non-intensive agriculture in rural areas meets the demand for producing natural food as well as contributes to the development of the economical and social structure in rural areas (Kondombo *et al.*, 2003). Worldwide 80% of the chickens are village chickens (Alabi *et al.*, 2006). This figure proves the importance of village chicken production for rural development and feeding. In Turkey, 6-7% of the egg production and 30% of the meat production come from rural areas (Uras, 2004). According to data of the Ministry for Agriculture, 20 million village chickens, 3 million turkeys and 2 million geese are grown in Turkey (Yildiz, 2007). Village eggs are perceived as natural food. Food products from villages, which are particularly advertised as natural and fresh, are in the focus of consumers' preferences (Tugcu, 2006). However, there have not been carried out studies sufficiently in order to examine differences in egg quality characteristics between village and commercial eggs. There is no doubt that eggs are important food, especially for children.

Oncel *et al.* (2006) showed that the risk of getting megaloblastic anemia is higher for children who consume eggs insufficiently. Besides, the positive effects of eggs, eggs which are not produced under suitable conditions or are not consumed, when they are fresh can cause severe health problems (Avan and Alisarli, 2002). In this respect, egg quality characteristics are of high importance. In analyzing egg quality, different internal and external egg quality characteristics have to be analysed (Silversides and Scott, 2001).

Of internal egg quality characteristics, thick albumen is quite an important measure for the freshness of an egg. The longer an egg is stored, the more the height of the thick albumen decreases (Toussant and Latshow, 1999).

The second important factor in measuring freshness is examining the air cell. However, because of the upcoming difficulties in measuring mostly measuring of thick albumen is carried out.

This study targets to compares egg quality of village eggs, which are regarded as natural and safe food, with egg quality of commercial eggs.

MATERIALS AND METHODS

For this study, 35 eggs from randomly chosen 9 villages around Kahramanmaraş and 35 commercial eggs produced on 4 farms using intensive agricultural production were analyzed. The eggs were analyzed for internal and external egg quality characteristics at the same day they were received.

Egg quality analysis: Firstly, the eggs were weighed with an analytical balance with 0.01 g precision. Secondly, a specific force was applied onto an egg that was positioned in a tool in order to determine shell strength. Short diameter of albumen, long diameter of albumen and diameter of yolk were measured with a digital caliper with a precision of 0.01 mm. Albumen and yolk height were measured with a tripod micrometer and after removing the inner membrane shell thickness was measured with a micrometer of 0.01 mm precision. Yolk colour was determined according to the CIE standard colorimetric system with a yolk colour fan of Roche company.

After determining the internal and external quality characteristics yolk and albumen indices were calculated according to the equation (Yamakopolus and Tserveni-Gousi, 1986):

$$\text{Yolk index} = \frac{\text{Yolk height (mm)}}{\text{Yolk diameter (mm)}} \times 100$$

$$\text{Albumen index} = \frac{\text{Albumen height (mm)}}{\text{Average of albumen length and width (mm)}} \times 100$$

Haugh unit: Haugh unit is a unit developed by Haugh (1937) that is based on the albumen height and egg weight. Haugh unit is calculated with the formula as:

$$\text{Haugh unit} = 100 \times \log (\text{Albumen height} + 7.57 - 1.7 \times \text{egg weight } 0.37)$$

Statistical analysis: In order to find out if there are significant differences in egg quality characteristics between village eggs and commercial eggs, a Variance Analysis (One-Way ANOVA) was conducted. In case of differences between the groups t test was applied (Petrie and Watson, 1999). Statistical analysis was conducted with SPSS 15.0 program.

RESULTS AND DISCUSSION

Seventy pieces of village and commercial eggs were analysed in terms of internal and external egg quality on the day they were received. Data for some internal and external egg quality characteristics and differences between the groups are given in Table 1 and 2.

It was found that commercial eggs were heavier than village eggs. While, the average weight for commercial eggs was 64.21 g, it was 52.24 g for village eggs. This difference in weight between commercial and village eggs was statistically significant ($p < 0.05$). The break strength is a criterion for determining the stability of an egg.

Table 1: External quality characteristics in village and commercial eggs (average±SD)

Characteristics	Breeding system		
	Village egg	Commercial egg	Sig.
Egg weight (g) (n = 35)	52.34±1.26	64.21±0.77	0.000*
Break strength (%) (n = 35)	1.76±0.14	1.91±0.08	0.385
Shell weight (g) (n = 35)	5.35±0.15	6.53±0.11	0.000*
Shell thickness (mm) (n = 35)	0.37±0.006	0.34±0.003	0.000*

Table 2: Internal quality characteristics in village and commercial eggs (average±SD)

Characteristics	Breeding system		
	Village egg	Commercial egg	Sig.
Yolk weight (g) (n = 35)	16.05±0.50	18.07±0.26	0.001*
Yolk colour (n = 35)	11.94±0.34	7.8±0.32	0.000*
Yolk index (%) (n = 35)	45.3±0.52	43.9±0.94	0.209
Albumen index (%) (n = 35)	9.27±0.39	8.64±0.37	0.249
Haugh unit	85.82±1.56	82.64±1.60	0.161

$p < 0.05$

According to this characteristic there was no statistical difference between the 2 egg groups. The shell weight of village eggs was 5.35 g on average, while it was 6.53 g for commercial eggs. This difference in shell weight was statistically relevant between the two groups ($p < 0.05$).

Another significant difference between village and commercial eggs in terms of external egg quality was in shell thickness. The shell is a material that in particular contains calcium carbonate. It is related directly with nutrition in chicken. What is of high importance in the observation during this study is the fact that the shell thickness of village eggs, which were by 1.18 g lighter than commercial eggs, was higher than that of commercial eggs. While that shell thickness of village eggs was 0.37 mm on average, it was 0.34 mm in commercial eggs. There was statistically seen a significant difference in shell thickness between village and commercial eggs ($p < 0.05$).

Village and commercial eggs were compared according to the internal egg quality characteristics yolk weight, yolk colour, yolk index, albumen index and Haugh unit. While the average yolk weight of village eggs was 16.05 g, it was 18.07 g for commercial eggs. This difference was statistically significant ($p < 0.05$). Yolk colour of village and commercial eggs was determined with Roche yolk colour fan. According to this examination, the yolk of village eggs was darker than that of commercial ones. In this characteristic, a statistically significant difference was found ($p < 0.05$). Yolk colour changes depending on how chickens are fed. The yolk index of village eggs was 45.3% and the yolk index for commercial index was 43.9%. These values were statistically not significant from each other ($p > 0.05$). There was also, no statistical significance in albumen index. It was 9.27% for village eggs and 8.64% for commercial eggs. The Haugh unit, which is based on albumen height and egg weight, was 85.82 for village eggs

and 82.64 for commercial eggs. The differences in Haugh unit between village eggs and commercial eggs were statistically not significant ($p>0.05$).

While, of external egg quality characteristics differences in egg weight, shell weight and shell thickness were found statistically significant, differences in break strength were not. Of internal characteristics differences in yolk weight and yolk colour were statistically significant, while differences in yolk index, albumen index and Haugh unit were not statistically significant between village eggs and commercial eggs.

Village farming is in many countries in terms of maintenance for people living in rural areas of high importance. It provides them not only with food but also offers the opportunity of economical support, often at considerable amount. While, in the past these products were primarily consumed by people living in rural areas, now also people in other areas tend to consume those products. The reservation, which all food is approached with has lead to increasing popularity of products coming from villages. There is no doubt that among these products village eggs rank first due to the fact that eggs are important in nutrition for all ages, an important iron source for children and a low-calorie and easy to digest nutrition for adults, in other words an indispensable food in the lives. This constitutes the target of this study to examine differences in egg quality between village eggs and commercial eggs.

Some internal and external egg quality characteristics are effected by differences in feeding and breeding techniques. A characteristic that was examined in this study was egg weight; the average egg weight of village eggs was 52.34 g. Mwalusanya *et al.* (2002) determined a value of 44.1 g in their study. The average egg weight of commercial eggs in this study was 64.21 g. Monira *et al.* (2003) found the same value (64 g) in their study. They also, found that village eggs were lighter than commercial eggs. It is known that egg weight is effected by factors such as age of the bird, genotype and feeding. It can be assumed that the lower weight of the village eggs in this study is caused by these factors. One of the characteristics of external egg quality is break strength. Monira *et al.* (2003) stated a break strength of 2.2 in their study, while Cetin and Gürcan (2006) found break strengths of 1.81 and 1.44. The values for break strength in this study was similar to those of the studies mentioned (1.76-1.91). Senkoylu (2001) reported a weak relation between shell thickness and break strength. The organic and inorganic structure of the egg shell is very important for the break strength (Butcher and Miles, 2005). While in the study, break strength of commercial eggs was higher, shell thickness was lower than in village eggs. The shell is a structure that contains calcium. Therefore, the calcium rate in the fodder that birds are fed

with effects shell thickness and weight (Boltumelo, 2004). In this study, the weight of shell in village eggs was lower of that in commercial eggs. This result is dependent on the determined low egg weight. The fact that shell thickness was high in village eggs, which had a low value for shell weight shows that village birds are fed with more calcium than commercial ones. The results about shell weight correspond to the results in the studies of Ahammad *et al.* (2005) and De Farla *et al.* (2000).

In this study, yolk weight, yolk colour, yolk index, albumen index and Haugh unit were examined as characteristics of inner egg quality. It was found that yolk weight was higher in commercial eggs. Increase in yolk weight can be observed with increasing age (Fletcher *et al.*, 1983). Dark yellow, which is a preferred colour by consumers, is provided by the circumstance that birds on small farms in villages stroll around outside, eat herbage, insects and dung (Kirkpinar and Erkek, 1999). Now-a-days birds in factory farming do not have the opportunity to stroll around so that the colour of yolk has changed to a lighter yellow. It is also reported in other studies that the yolk colour in village eggs is darker than in commercial eggs. The yolk index was similar for both village eggs and commercial eggs. The average values for both groups were 45.3 and 43.9, respectively. Akbas *et al.* (1996) reported similar results in their study (43.65). Albumen index is a criterion that is achieved on the basis of albumen height. The albumen index is an instrument to check freshness of eggs. The most important protein that effects albumen height is ovomuci, a protein of the group of albumen proteins, which is characterized by a viscous structure (Toussant and Latshaw, 1999). In short, eggs with a high albumen height are evaluated as fresher eggs. Village eggs are demanded by consumers particularly as a symbol of freshness. In the study, the results supported these ideas. The albumen was higher in village eggs (9.27). The albumen index for commercial eggs was 8.64. In the study, also the Haugh unit was examined to find differences in egg quality between both groups. Haugh unit is a formula calculated on basis of albumen height. High albumen in eggs leads to a high value of Haugh unit. Even though, the differences were not statistically significant, higher values for Haugh unit in village eggs were found.

CONCLUSION

The research on differences in egg quality between village eggs and commercial eggs is insufficient. This study tries to make a contribution to the question in how far there are differences in egg quality between village eggs, which are considered as a symbol of nature and freshness and commercial eggs. Especially, regarding to yolk colour and shell thickness, which play a role for

consumers' preferences, village eggs achieved good results. High values for albumen index, which is an important criterion for freshness, proved that village eggs were fresher than commercial eggs.

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