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EVALUATION OF EGG QUALITY CONDITIONS IN OMDURMAN LOCALITY

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ABSTRACT

This study was carried out to assess the extent of quality deteriorations of eggs sold at Sabrin market, Omdurman and to determine their suitability for human consumption. Hundred eggs produced by Bovans white breed (fifty eggs from the farm and another fifty eggs from an ordinary shop in Sabrin market) in Omdurman North locality were collected and divided into 5 groups each containing 20 eggs. Group one was tested at the time of collection. Each of the rest 4 groups was further subdivided into 2 groups, one stored in a refrigerator and the other under room temperature. Eggs in each group were subjected to quality measurements at the end of week one, two, three and four. Egg weight, shell strength, albumin height and Haugh unit were the parameters measured to test the effects of storage on table egg quality. Results showed significant differences between eggs obtained from the poultry farm and those collected from Sabrin market in egg weight, albumen height and Haugh unit during the different period of storage. No difference in egg shell strength between treatments was seen. The study concluded that eggs sold at open markets such as Sabrin market may have low quality questioning their suitability for human consumption.

Key words: Egg quality, egg storage, Omdurman locality, Sabrin market.

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INTRODUCTION

Egg quality can be considered both from internal and external quality factors with the former focusing on the egg content and the latter focusing on the egg shell **(Van Niekerk, 2014).** Egg quality can be affected by the environmental conditions such as temperature, humidity and storage time. Storage can modify some characteristics of the egg including loss of water, carbon dioxide and a subsequent increase in the pH **(Decuypere, *et al.*, 2001).** The internal quality of eggs starts to decline as soon as eggs are laid by hens **(Rovana and Usturoi, 2012).** The major difference between freshly laid eggs and stored eggs are linked with internal egg qualities and albumen quality, a standard measure of egg quality is influenced by genetic and environmental factors such as temperature, time and humidity of storage **(Rovana and Usturol, 2012).**

In the Sudan there are no proper handling and storage of eggs under proper temperature that are necessary for maintaining the original quality of eggs from the production area to consumption centers. These may result in egg quality deterioration due to improper handling or microbial contamination. Personal observations of the author indicated that some eggs are sold against low prices at local markets such as Sabrin market in North of Omdurman City which may mean that these eggs are of low quality. Other researcher **Elmardi, (2018)** reported egg quality deterioration and contamination in Khartoum State. Another study showed that eggs from a high proportion of farms and layer houses contained antimicrobial residues **(Sirdar, 2014).**

Unfortunately, people purchasing eggs from these places are not concerned about egg quality and hence purchase without attention. The improper storage situations found in these markets may lead to faster deterioration of egg quality and may lead to disease problems. The possible disease risks of feeding on deteriorated eggs are enteritis, salmonellosis and colienteritis **(Chittick, 2006).** Few works have been done in Sudan to determine the extents of this problem and to assess the quality conditions of eggs been sold in these market places. Such knowledge is very important to evaluate the situation and to propose possible solutions.

The objectives of this study were to assess the extent of quality deteriorations of eggs sold at Sabrin market, Omdurman and to determine their suitability for human consumption.

MATERIALS AND METHODS

Location and Study

This study was conducted in Omdurman City, Khartoum State, Sudan; during the period from 30 October 2018 to 30 December 2018 to asses egg quality conditions of eggs sold at Sabrin market in Omdurman City.

Analysis of egg samples

Hundred eggs produced by commercial layer hens (Bovans white strain, 28-week-old) were collected from two places inside Omdurman City, fifty eggs from the farm and another fifty eggs from an ordinary shop in Sabrin market place after three days of receive from the distributing agent. Ten eggs from each carton of table eggs were randomly selected. The collected eggs of each source were labeled and then divided into five groups each containing 20 eggs.

The collected eggs were then subjected to external and internal egg quality measurements to determine egg quality as follow: group one at the time of collection and then each of the other 4 groups were divided into 2 groups, one of these 2 gropes were stored at a refrigerator at 4 C^0 and the others group was stored under room temperature. Quality measurement was carried out and recorded at day one and then at the end of week one, two, three and four for respective groups. Parameters tested were egg weight and shell strength as external quality factors, albumin height and Haugh unit as internal quality factors.

Statistical Analysis

Data obtained were analyzed using Factorial design and Tukey's test was used for means separation.

RESULTS

Table 1. Egg weight of eggs collected from two sources in Omdurman City[1]

Storage time /Days	Farm		Market		L.S
	Room	Ref.	Room	Ref.	
Fresh	69.5[a]		60.3[b]		* *
7	6o.8[a]	61.9[a]	50[b]	51.5[b]	
14	60.1	60.8	48.2	51.4	
21	60	60.2	46	50.4	
28	58	59.1	45	48	
Mean	59.7	60.5	47.3	50.3	
Source mean	59.61[a] (Farm)		50.862[b] (Market)		***
L.S	*** (0.000)				
Temp. mean	54.44 (room)		56.032 (Ref.)		N.S
L.S	N.S (0.114)				

Table 2. Shell strength of eggs collected from two sources in Omdurman City[1]

Storage time /Days	Farm		Market		L.S
	Room	Ref.	Room	Ref.	
Fresh	6.1		5		N.S
7	4.4	4.8	4.3	4.2	
14	4.2	4.6	4.2	4.2	
21	4	4.3	4	4.1	
28	4	4	3.8	4	
Mean	4.1	4.4	4.0	4.1	
Source mean	4.25 (Farm)		4.05 (Market)		N.S
L.S	N.S (0. .407)				
Temp. mean	4.05		4.25 (Ref.)		N.S
L.S	N.S (0.282)				

Table 3. Albumen height of eggs collected from two sources in Omdurman City[1]

Storage time /Days	Farm		Market		L.S
	Room	Ref.	Room	Ref.	
Fresh	7		6		***
7	6.8	6.9	6.0	6.6	
14	5.3	6.8	5.0	5.4	
21	5.1	6.7	4.9	5.2	
28	4.9	5.8	4.8	5.0	
Mean	5.5	6.6	5.1	5.5	
Source mean	5.932 (Farm)		5.828 (Market)		***
L.S	N.S (0.637)				
Temp. mean	5.604^{b} (room)		6.156^{a} (Ref.)		**
L.S	* (0.014)				

Table 4. Haugh unit of eggs collected from two sources in Omdurman City[1]

Storage time /Days	Farm		Market		L.S
	Room	Ref.	Room	Ref.	
Fresh	78		70		***
7	80.5	81.8	75.7	76.2	
14	76	77	71.3	74	
21	65.9	75.2	66.9	70.0	
28	65.5	74.3	62.8	64.2	
Mean	71.97	77.o7	69.17	71.1	
Source mean	74.5 (Farm)		70.138 (Market)		N.S
L.S	N.S (0.051)				
Temp. mean	70.52^{b} (room)		74.08^{a} (Ref.)		**
L.S	** (0.003)				

1= Values are means of five eggs

a ,b values with different superscript letters are significantly different

LS = Level of Significance.

** = Highly significant difference

N.S = Not Significant

DISCUSSION

Egg weight

Egg weight of eggs collected from two sources in Omdurman City and stored in room and refrigerator for four consecutive weeks are shown in table (1). The table indicates that egg weight of eggs collected at day one from Sabrin market is significantly lower than the weight of eggs collected from the farm. This can be attributed to improper handling and storage conditions prevailing in this market place. The table also indicates that egg weight deteriorated with the increase in time of storage in both room and refrigerator in the eggs collected from the two sources; however, eggs kept under room temperature showed the worse result compared to those kept inside refrigerator in both sources.

In addition, table (1) indicates that eggs collected from Sabrin market significantly scored the lowest values in all weeks. These results accord well with **Jones and Musgrove (2005)** who reported a decrease in weight of eggs with storage leading to decreased egg weight. Another researcher **Samli *et al.*, (2005)** observed a decrease in egg weight within 10 days of storage. The rate of weight loss of stored eggs is dependent on the temperature and humidity, with weight loss being greatest at higher temperature and lower humidity **(Washburn, 1998).** These results are similar to that reported by **(Abonajmi *et al.*, 2010)** who found deterioration in all quantitative parameters especially the weight in eggs stored at room temperature.

Shell strength

Shell strength of eggs collected from two sources in Omdurman City and stored in room and refrigerator for four consecutive weeks are shown in table (2). The table indicates that shell strength of eggs collected at day one from Sabrin market is insignificantly lower than the shell of eggs collected from the farm which can be attributed to bad handling and storage conditions. In addition, only slight decrease in shell strength was seen between treatments. Similar result was suggested by **Abdelrahman *et al*, (2018)** and **Elmardi, (2018)** who found no difference in shell strength between eggs collected from a supermarket and a small shop in bahri area of Khartoum City. These results revealed that shell strength is poorly affected by storage and temperature.

Albumen height

Albumen height of eggs collected from two sources in Omdurman City and stored in room and refrigerator for four consecutive weeks are shown in table (3). The table indicates that albumen height of eggs collected at day one from Sabrin market is significantly lower than the weight of eggs collected

from the farm. The table also indicates that albumen height significantly deteriorated with the increase in time of storage in both room and refrigerator in the eggs collected from the two sources. Rapid decrease was observed at the end of week two and then a slight decrease was seen afterwards and eggs kept under room temperature in both sources showed the worse result compared to those kept inside refrigerator in both sources.

In addition, table (3) also indicates that eggs collected from Sabrin market scored the lowest values in all weeks. This result confirms the role of temperature on the preservation of albumen height. Similar results were reported by **(Elmardi, 2018).** This result can be attributed to the fact that, once eggs are laid, they lose water by evaporation (this will lead to a decline in albumen height) Similar results were reported by **(Kato, *et al* 1994).**

Haugh unit

Haugh unit of eggs collected from two sources in Omdurman City and stored in room and refrigerator for four consecutive weeks are shown in table (4). The table indicates that Haugh unit decreased with the increase in time of storage in both room and refrigerator in the eggs collected from the two sources. However, eggs kept under room temperature showed significantly lower values as compared to those kept inside refrigerator in both sources. This result confirms the negative effect of temperature on the preservation of Haugh unit. With reference to the decreased Haugh unit observed in eggs kept at room temperature, similar results were reported by **Villa, (1990)** who observed a significant differences ($p < 0.05$) between the average values of Haugh unit for the eggs stored in the refrigerator (86.34) and at room (83.70).

Results of Haugh unit have also shown the decrease in the Haugh unit according to the increase in the storage duration. This is because of the weight decrease and the increase of whiteness that eventually lead to decreased Haugh unit. This result confirms the negative effect of temperature on the preservation of Haugh unit. Similar results were reported by **Elmardi, (2018) and Abdelrahman, *et al*, (2018).** Likewise, the small value of high unit obtained from eggs collected from Sabrin market is similar to **Vivian, *et al* (2017)** who reported that Haugh unit decrease in eggs when stored at 4°C for 28 days without refrigeration.

CONCLUSION

Certain extension messages should be developed to increase the general public awareness about egg quality and its deterioration due to bad handling and improper storage. Further studies with larger sample size and testing more egg quality parameters are to be done to confirm the results of this study.

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