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METHODS OF PREPARING HARD COOKED EGGS

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The experiment was conducted to find out the best cooking method for hard cooked eggs keeping in view the incidence of shell cracks, greatest ease of peeling and minimum development of ferrous sulfide ring. It was observed that hot water boiling methods were superior to the cold water boiling methods in all respects. Out of boiling water methods, Irmiter's method (1970) was the best where eggs were lowered in boiling water and as soon as the lowering was completed the heat was reduced to simmering temperature of 85°C for 18 minutes.

INTRODUCTION

An egg hard cooked in the shell should rate high in the criteria that shell does not break during cooking, shell peels off easily and does not adhere to the coagulated egg albumen and the yolk does not have any dark ring. Several factors, i.e., temperature of the egg, pH of albumen, temperature of heating medium and length of cooking period etc., may influence how the peelability of hard cooked eggs can meet these criteria. The cooking procedure required to give optimum results for one criterion may not produce optimum results when judged by another criterion. However, extremely fresh egg seems to be associated with increased difficulty in the removal of shells from hard cooked eggs and it has put salad makers and house wouldveis i nble. Further more salad plates prepared in large institutional kitchens lose certain aesthetic appeal when the hard cooked eggs are torn and ragged looking. The dark circle around the yolk of hard cooked eggs is caused by the formation of ferrous sulfide (Tinklar and Soar, 1920). The ring can be prevented by minimizing cooking time and immediately cooling the cooked eggs by immersion in running cold water. It is difficult to suggest a superior method of cooking, unless comparative evaluation trials are conducted. Different methods already used and recommended were included in this study to evaluate which of the methods give lowest incidence of shell cracking during cooking, greatest ease of peeling and minimum development of dark yolk rings.

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MATERIALS AND METHODS

All the eggs used in this study were obtained from White Leghorn flocks maintained on commercial feed at Poultry Experiment Station, University of Agriculture, Lyallpur. These eggs were of good quality and uniform large size (24 oz/doz.) and were collected within 8 hours of lay. These were nest clean and free from cracks.

COOKING METHODS

Six cooking methods were used. In first three methods, eggs were put in cold water whereas in the other methods, the eggs were placed in boiling water.

The following were the cold water methods:

1. Fry's Method: The eggs were placed in water at 18.5°C and then the water was brought to boil. After the cooking prodedure was over, they were allowed to stand for 20 minutes covered in the same pan without heat, and then chilled in ice water for 10 minutes (Fry *et al.*, 1966).

2. Fuller's methods: The cooking was performed by placing the eggs in water heated to 55°C and then water was brought to boil. The boiling was continued for 7 minutes and at the end, eggs were removed and cooled rapidly under running cold tap water at 17°C (Fuller and Angus, 1967).

3. Irmiter's Method: The eggs were placed in water at 20°C and then brought to boil. Soon the boiling started, the pan containing eggs was removed from the flame immediately and placed at room temperature for 25 minutes. Later the eggs were submerged in cold running water for 5 minutes (Irmiter *et al.*, 1970)

The following were the hot water cooking methods:

1. Margaret's Method: The eggs were cooked in 235 ml. of water in a pressuremat under 15 PSI pressure for 7 minutes and then cooled for 10 minutes under running tap water (Margaret *et al.*, 1963).

2. Irmiter's Method: The water was brought to boil first then the eggs were lowered in the pan. As soon as lowering is completed heat was reduced to simmering temperature (85°C) for 18 minutes. The eggs were then cooled under running cold water for 5 minutes (Irmiter *et al.*, 1970).

3. Common Method: The eggs were lowered into boiling water for 8 minutes then were removed from the pan and cooled for 5 minutes under tap water.

EXAMINATION OF EGGS

After cooling, the eggs were examined for cracks which developed in the shell. The cooked eggs were peeled off and the ease of peeling was evaluated on the basis of rating scale (Table 1). The outside appearance of the peeled eggs was also evaluated on the basis of rating scale shown in Table 2. Albumen thickness was measured with the help of vernier caliper

TABLE 1. *Scale showing ease of peeling in hard cooked eggs*

Egg peelability grades	Scores
Superior	7
Excellent	6
Good	5
Fair	4
Poor^{+}	3
Poor^{-}	2
Very poor	1

TABLE 2. *Scale showing cleanness after peeling in hard cooked eggs*

Characteristics	Scores
Eggs peeled free of nicks	0
Eggs peeled with 1/8" or less surface affected	1
Eggs peeled with 1/8" to $\frac{1}{4}$" surface affected	2
Eggs peeled with $\frac{1}{4}$" to $\frac{1}{2}$" surface affected	3
Eggs peeled with $\frac{1}{2}$" to $\frac{3}{4}$" surface affected	4
Eggs peeled with $\frac{3}{4}$" to all surface affected	5

RESULTS AND DISCUSSION

1. *Shell cracks :* The incidences of shell cracks as influenced by various cooking treatments are shown in Table 3. There were more cracked eggs when hard cooked by the cold water methods than hot water methods. This may have been due to an increased tendency of the eggs to lump around in the pan as the water was brought to boil in the cold water methods Both incidence and severity of cracked shells influence appearance and ease of peeling of hard cooked eggs.

2. *Ease of peeling :* The data on ease of peeling revealed that the eggs cooked by hot water boiling methods were easier to peel than the eggs hard cooked by the cold water methods. The eggs cooked by the hot water methods got an average score of 3 (poor+). The good peelability score in hot water methods seems to be due to less incidence of cracks, which make peeling defficult. Out of hot water methods, Irmiter's method was the best. Possible explanation for superiority of this method over the other boiling water methods may be due to the less cooking time.

TABLE 3. *Effect of cooking methods on the peelability and physical characteristics of hard cooked eggs.*

Methods	Incidence of shell crack.	Ferrous sulfide ring	Average albumin thickness (nicks)	Av. ease of peeling	Av. cleanness after peeling
Fry's method	Present	Present	0.28	2.29	4.57
Fuller's method	—do—	—do—	0.27	2.29	4.57
Irmiter's method I	—do—	—do—	0.23	2.57	4.14
Cold water methods	—do—	—do—	0.26	2.38	4.40
Margaret's method	Absent	Absent	0.20	3.71	4.00
Irmiter's method II	—do—	—do—	0.13	3.29	3.43
Common method	—do—	—do—	0.17	3.00	3.71
Hot water methods	—do—	—do—	0.17	3.00	3.70

Cleanness after peeling : The appearance of the hard cooked eggs after shell removal was closely associated with the ease of shell removal. When the shell was easily removed, the peeled eggs had a good appearance and vice versa. The average appearance score for eggs cooked by the hot water method was 3.7. This revealed that hot water methods were better than cold water methods. Irmiter's method was again superior to the other hot water methods having an average score of 3.43 These results confirm the observations made by Irmiter's *et al.* (1970), that ease of peeling is closely associated with cleanness after peeling.

Ferrous sulfide Ring : The presence or absence of dark ring of ferrous sulfide which is formed by the interaction of hydrogen sulfide and sulfur, released from albumen and yolk (Baker *et al.*, 1967) was noted in this study.

It was observed that this was present in eggs cooked by the cold water methods and absent in eggs cooked by hot water methods. The reason of its formation in cold water methods seems to be long cooking time. It was also noted that its presence or absence had no effect on peeling ease, which is in confirmation with Irmiter *et al.* (1970). However, the findings contradict the findings of Reinke and Spencer (1964) and Fuller and Angus 1967.

Albumen thickness : Albumen thickness is also an index of peeling. More the thickness less is the peeling ease and vice versa. The data revealed that the thickness averaged 0.17 cm. in hot water methods and 0 26 cm. in cold water methods. Out of hot water methods, this thickness was 0.23 cm. in case of eggs cooked by Irmiter's method. These observrtions are in harmony with the observation in case of peeling ease; cleanness after peeling and formation of ferrous sulfide ring. From the findings of experiment, it is confirmed that the hot water method used by Irmiter *et al.* (1970) was the best. This was also recommended by Poultry and Egg National Board (Anonymous, 1966).

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