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# Evaluation of the effect of crude groundnut oil and on internal quality characteristics of white leghorn hen egg at room and refrigeration temperatures

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**ABSTRACT :** A total of 164 infertile eggs of a single strain of white leghorn of same age and reared in cages under identical conditions of feeding and management were procured from Central Avian Research Institute Izatnagar, Bareilly (U.P.).Remaining 164 eggs were divided into four groups, each comprising of 41 eggs.Initial qualities of egg in respect of albumen index, yolk index, Haugh unit were recorded.Both oiled and untreated eggs were kept at room and refrigeration temperatures. Crude groundnut oil proved good and superior to control at both the atmospheric conditions under observations.The crude groundnut oil treated eggs increased shelf-life to 28 days at room temperature and 75 days at refrigeration temperature while the control eggs have the shelf life of 14 days at room temperature and 60 days at refrigeration temperature.

**KEY WORDS :** Albumen index, Yolk index, Haugh unit

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## INTRODUCTION

Poultry production has emerged as an important and fastest growing sector of our livestock economy. Poultry farming has become very encouraging enterprise for small farmers, landless labours, educated un-employed youths as well as for big entrepreneurs.It now recognised as an organised and scientifically based industry with tremendous potential for employment, supplementary income generation etc. and a source of highly nutritious animal protein to the people in the form of eggs and meat. Egg is a rich source of high quality animal protein and is often used as standard for measuring the quality of the other food proteins. It is an important source of unsaturated fatty acids, minerals specially iron and phosphorus and almost all the vitamins. It is well balanced amino acid profile and easy digestibility makes it a valuable protective food in human diet. Egg being very useful in human diet requires proper preservation to ensure its acceptibilities for a longer period.Oil coating is one of the most important methods for preserving eggs. The oil seals the pores of the shell which prevents the evaporation of moisture, entry of micro-organisms, odours and escape of gases. This maintains the good internal quality for longer period because some of the physio-chemical changes in the egg contents are being retarded. Keeping aforesaid points in view, the present investigation was undertaken with the following objective: To access and compare efficacy crude groundnut oil and refined groundnut oil for prolonging the shelf –life of egg at room and refrigeration storage and to evaluate the changes in the internal quality of oil coated and uncoated eggs held at room and refrigeration temperatures.

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## MATERIAL AND METHODS

A total of 164 freshly laid, infertile eggs of a single strain of white leghorn of same age and reared in cages under identical conditions of feeding and management were procured from Central Avian Reasearch Institute Izatnagar, Bareilly (U.P.) India. They were divided in four groups containing 41 eggs each and were designated as $T_1$-Dipping in crude groundnut oil and kept at room temperature.$T_2$-Untreated eggs used as control at room temperature $T_3$-Dipping in crude groundnut oil and kept at refrigeration temperature$T_4$-Untreated egg kept at control at refrigeration temperature.The candling was done at the time of procurement and before the start of the experiment for selecting the sound eggs. Albumen index was determined by the method of Heimen and Carver (1936)while the yolk indices was determined by the method of Funk (1948) respectively. The haugh unit was measured according to Haugh (1937). The room temperature was 30+8$^0$C and relative humidity was 40-75 per cent. The refrigeration temperature was 8+1$^0$C and relative humidity was75-80 per cent. The data were analysed statistically as per the methods given by Panse and Sukhatme(1957).

## RESULTS AND DISCUSSION

The results of the present study as well as relevant discussions have been presented under following sub heads:

**Albumen index :**

The reduction in albumen index was rapid at room temperature in comparison to those eggs that were kept in refrigerator. The highest reduction was found in $T_2$ it was 0.0918 to 0.0406 while in $T_1$ it was 0.0918 to 0.0528 (Table 1). While in the statistical difference among the treatments was not found significant. At lower temperature *i.e.* under refrigerated storage the lowest reduction in albumen index was observed in refined soybean treated eggs after 60 days of storage. In $T_3$ It ranged from 0.0918 to 0.0578 $T_4$ it went down from 0.0918 to 0.0386 (Table 2). The statistical differences between the treatments was not found significant ($P<0.05$). Romanoff and Romanoff (1949) also reported similar findings. Better albumen index of oil dipped egg was believed to be due to effective sealing of shell pores which helped in retardation of carbon-di-oxide loss from egg. Rapid loss of $CO_2$ and increase in albumen PH of untreated egg probably hastened the process of albumen thinning which affect albumen index adversely (Froning and Swanson (1962) and Hill and Hall (1980). The variation observed is protective efficacy of different oil coating media used in present study might be due to difference in their viscosity and relative shell-pore sealing ability.

**Yolk index :**

At room temperature significantly highest reduction in the yolk index from 0.4485 to 0.1277 was observed in $T_2$ after 14 days of storage. The minimum reduction was noticed in $T_1$ it went down from 0.4485 to 0.2919 under refrigeration conditions (Table 3). The yolk index was also found significantly lowest in control after sixty days of storage. At refrigeration temperature the reduction in yolk index was found slow in $T_3$ It reduced from 0.4485 to 0.3178 while in $T_4$ it was 0.4485 to 0.2749 in control, respectively after 60 days of holding period (Table 4).Yolk index decrease as the egg grows older at rate determined by the holding temperature. The decrease in yolk index is retarded by low temperature. These finding are in conformity with the finding of Romanoff and Romanoff (1949); Pandey and Mohapatra (1982); Singh *et al*. (1984). Decline in yolk index during storage can be attributed to the migration of water from albumen to yolk resulting in increase weight of yolk with consequent stretching and weakening of viteline membrane and thus a decrease in yolk index due to flattening of yolk.

**Haugh unit:**

The extent of reduction was minimum in refined groundnut oil treated eggs whereas maximum reduction was obtained in control. In $T_1$ the Haugh unit got reduced from 82.57 to 62.69 in 14 days of storage whereas during the same period it reduced from 82.57 to 51.45 in $T_2$ (Table 5). These treatment did not differ significantly from each other at 5 per cent level of significance. Under refrigeration condition refined groundnut oil maintained the better albumen quality in terms of Haugh unit. In $T_3$ It ranged from 82.57 to 61.83 but and in significantly highest decline was observed in control. However, and in $T_4$ it ranged from 82.57 to 50.25 (Table 6). The decline was faster at higher temperature than at lower temperature of storage. Slower rate of decline in haugh unit under refrigerated storage could be due to complimentary effect of egg coating oil and low storage

**Table 1 : Changes in albumen index of eggs in storage at room temperature**

| Treatments | Days of storage | | | Overall mean |
|---|---|---|---|---|
| | $D_1$ (0 day) | $D_2$ (7 days) | $D_3$ (14 days) | |
| $T_1$ | 0.0918 | 0.0617 | 0.0528 | 0.0688 |
| $T_2$ | 0.0918 | 0.0757 | 0.0406 | 0.0694 |

**Table 2 : Changes in albumen index of eggs in storage at refrigeration temperature**

| Treatments | Days of storage | | | | | Overall mean |
|---|---|---|---|---|---|---|
| | $D_1$ (0 day) | $D_2$ (15 days) | $D_3$ (30 days) | $D_4$ (45 days) | $D_5$ (60 days) | |
| $T_3$ | 0.0918 | 0.0825 | 0.0756 | 0.0646 | 0.0578 | 0.07446 |
| $T_4$ | 0.0918 | 0,0815 | 0.0728 | 0.0691 | 0.0386 | 0.07076 |

**Table 3 : Changes in yolk index of eggs in storage at room temperature**

| Treatments | Days of storage | | | Overall mean |
|---|---|---|---|---|
| | $D_1$ (0 days) | $D_2$ (7 days) | $D_3$ (14 days) | |
| $T_1$ | 0.4485 | 0.3769 | 0.2919 | 0.3724 |
| $T_2$ | 0.4485 | 0.2684 | 0.1277 | 0.2815 |

**Table 4 : Changes in yolk index of eggs in storage at refrigeration temperature**

| Treatments | Days of storage | | | | | Overall mean |
|---|---|---|---|---|---|---|
| | $D_1$ (0 day) | $D_2$ (15 days) | $D_3$ (30 days) | $D_4$ (45 days) | $D_5$ (60 days) | |
| $T_3$ | 0.4485 | 0.3956 | 0.3847 | 0.3275 | 0.3178 | 0.3748 |
| $T_4$ | 0.4485 | 0.3791 | 0.3256 | 0.2845 | 0.2749 | 0.3425 |

**Table 5 : Changes in Haugh unit of eggs in storage at room temperature**

| Treatments | Days of storage | | | Overall mean |
|---|---|---|---|---|
| | $D_1$(0 day) | $D_2$ (7days) | $D_3$ (14 days) | |
| $T_1$ | 82.57 | 80.97 | 62.69 | 75.410 |
| $T_2$ | 82.57 | 73.90 | 51.45 | 69.307 |

**Table 6 : Changes in Haugh unit of eggs in storage at refrigeration temperature**

| Treatments | Days of storage | | | | | Overall mean |
|---|---|---|---|---|---|---|
| | $D_1$ (0 day) | $D_2$ (15 days) | $D_3$ (30 days) | $D_4$ (45 days) | $D_5$ (60 days) | |
| $T_3$ | 82.57 | 74.67 | 69.57 | 65.27 | 61.83 | 70.782 |
| $T_4$ | 82.57 | 77.71 | 64.72 | 55.46 | 50.25 | 66.142 |

temperature in minimizing liquefaction of thick white Sachdev and Verma (1979); Sunder and Siddiqui (1986) also reported similar observations.

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