L-584

Loss of Carbon Dioxide Affects

MARKET VALUE OF EGGS

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THE AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS
TEXAS AGRICULTURAL EXTENSION SERVICE
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LOSS OF CARBON DIOXIDE AFFECTS MARKET VALUE OF EGGS

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When eggs are laid, they contain carbon dioxide, most of which is found in the albumen. This gas begins to diffuse immediately through the shell. Carbon dioxide loss is greatest during the first 1 to 2 days. However, under normal conditions, the egg contents will give off this gas for several months during storage. As carbon dioxide is lost, the egg contents become more alkaline. This increase in alkalinity is accompanied by a breakdown of the thick albumen and normally results in quality loss. Treatments to retard loss of this gas from the egg can help maintain egg quality. *Oil processing* and *overwrapping of egg cartons* are two treatments commonly used along with refrigeration.

OIL PROCESSING

Although the value of oiling eggs as a means of maintaining quality has been known for more than 100 years, progress in its use has been slow. Only in the last few years has this method been used widely as a means of retaining egg quality. Causes for this include small volume of eggs produced per farm, time elapsed from lay until oiling, methods used in oiling, costs and consumer acceptance.

Until recently, eggs were placed in baskets or special holders and then immersed in a lightweight, colorless, odorless and tasteless mineral oil for approximately 1 minute. Some operators used oil without heating; others heated the oil 100 to 120 degrees F. Sometimes various diluting solvents were added to the oil. This process usually took place at a central point, such as a buying station where eggs were bought from many producers. Usually several days elapsed from the time eggs were laid until they were oiled.

After World War II, commercialization of the egg industry grew and eggs were produced on a more uniform volume each month of the year. Thus, fewer eggs were put into storage during the spring months when eggs were a surplus commodity. This caused a decline in the interest of oiling eggs.

About 1955 greater interest began to develop in quality egg programs that would make eggs available to consumers with as much of their original quality as possible.

Three problems needed to be overcome: 1. Under the usual process of oiling, the eggs had a shine which was easily detected by and objectionable to consumers. 2. It was difficult to keep the oil clean, odorless and free from contamination. 3. Eggs lost much of their quality because too much time elapsed from the time they were laid until oiled.

Recent research has made available a process by which eggs can be sprayed with oil. This procedure uses only clean oil that is odorless and tasteless. It is free of contamination and leaves a minimum amount of shine on the eggs.

What Does Oiling Do?

Proper oiling of eggs aids in preventing the escape of carbon dioxide, evaporation and the thinning of albumen. It also causes the air cells to remain small and it seals the pores in egg shells.

Oiled eggs can better withstand variations of temperature and humidity under usual transportation procedures. *Oil or the oiling process does not improve egg quality.* It is one means of *retaining* the quality already present.

How and When to Apply Oil

Use a clear mineral oil that is colorless, tasteless and odorless. It should have a specific gravity of .835/.845 at 120 degrees F. and a Saybolt viscosity of 65/75.

Eggs should be dried after cleaning before being sprayed or dipped in oil. Apply oil to eggs before they have had time to lose quality. The recommended practice is to gather, clean, cool and oil. Do this within 24 to 36 hours after eggs are laid.

Oil may be applied with a hand sprayer or motor driven commercial-type applicators. The equipment used varies according to volume of eggs oiled and personal preferences. See Figures 1, 2, 3 and 4.

Spray or dip eggs as they are being cased after they have been cleaned, dried and cooled to about 55 degrees F. Some producers and other handlers spray the eggs in the carton immediately after cartoning. Be sure all eggs are placed in flats or cartons with small ends down before spraying. Oil

Figure 1. One kind of commercial applicator used in spraying eggs. One worker applies oil and the other places flats in egg cases.

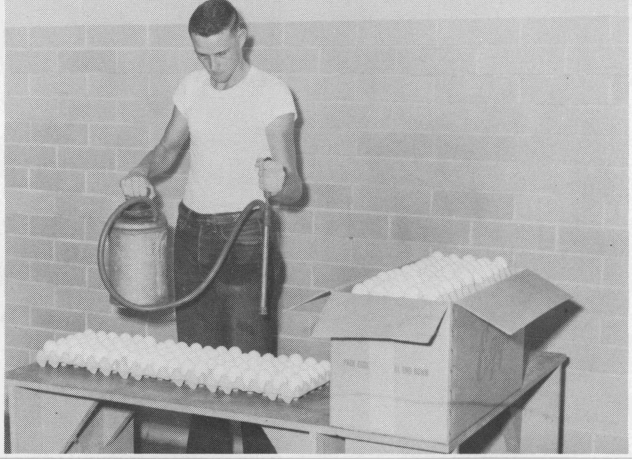

Figure 2. Two-gallon hand pressure sprayer is used to apply oil.

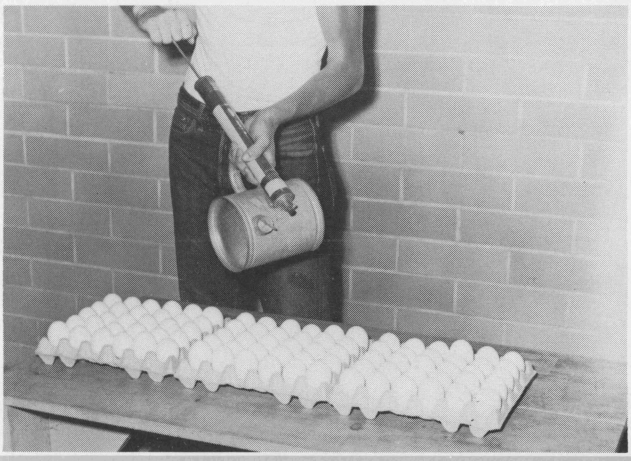

Figure 3. Hand sprayers such as this one are commonly used to spray a small volume of eggs.

Figure 4. One kind of commercial equipment used to dip eggs in oil.

treating eggs is not intended to replace good management and housing practices and proper refrigeration.

Costs

The cost of materials for oil-treated eggs will vary from 3 to 5 cents per 30-dozen case. Labor and equipment needed should be included to obtain a complete cost for each method used in oiling. Volume of eggs oiled and efficiency of labor also will be factors in total cost for each 30-dozen case.

Results

Research by the Texas Agricultural Experiment Station shows that oil-treated eggs maintain AA quality for 21 days and eggs not oiled decline to Grade A after 3 days. All eggs were held at temperatures from 45 to 55 degrees F. The benefits realized from oiling in quality maintenance can be shared by producers, handlers and consumers.

OVERWRAPPING

Overwrapping the egg carton with a plastic film also retards the loss of carbon dioxide from eggs.

Materials

Various transparent materials have been used for this purpose rather extensively during the past 3 years. Cellophane recently came into more general use. The material used should have chemical and physical properties which will result in the following:

(1) Easy sealing
(2) Complete sealing
(3) Maximum retention of carbon dioxide gas
(4) Ease in unrolling

Egg carton overwrapping machines may be purchased or rented. They are motor driven and can be operated by one or two persons. Electrical heating elements are built in so as to seal the overwrapping material. Automatic and semi-automatic machines are now in use.

Method

If overwrapping is to be employed as a means of preventing quality loss in eggs, it should take place within 24 to 36 hours after eggs are laid. Allowing adequate time for gathering, cleaning, cooling and grading likely will require 24 hours following lay. Even this short period allows some carbon dixoide to escape from the egg. The overwrapping machine usually is installed adjacent to the turntables at the end of the egg grading and

Figure 5. Operator puts cellophane around the carton before placing it on a belt which will take it to a hot plate for sealing cellophane on bottom side.

Figure 6. Carton passes over hot plate and to a point where ends of cellophane are folded. It then goes through a section of the machine where two hot plates on either side seal the ends.

Figure 7. Cartons of eggs with overwrap job completed are carried on another belt to a revolving table where they are removed and put into 15 or 30-dozen egg cases.

cartoning line. Eggs are sized, candled, placed in cartons and closed in the usual manner. From the turntable they go directly into the automatic overwrapping machine. After the carton has been overwrapped and sealed, it is returned by a belt to the turntable for casing. Wrapping material is unrolled, positioned and sealed on the carton automatically by the fully automatic machine.

Semi-automatic machines require some manual operations in the process. The operator places cellophane that has been cut previously to proper size around the carton before putting it on the belt which carries it through the machine. See Figure 5.

The carton passes over a hot plate which seals the material on the bottom of the carton. The machine then folds the ends of the cellophane and pushes it by two hot plates which seal the ends; thus, the sealing of the overwrap is completed. See Figure 6.

The carton is then returned by a belt to the turntable for casing. See Figure 7.

Regardless of the type of machine used, it must provide a complete seal of the overwrapping material. Otherwise, carbon dioxide will continue to be lost and the objective defeated.

Market Value of Overwrap

Egg quality retention based on weight change, Haugh units and candled grade is most efficient at relatively high storage temperature. Overwrapped eggs compared to eggs not overwrapped showed very little difference in quality loss when held 5 to 7 days at 55 degrees F. When the two groups were held at 73 degrees for the same length of time, the quality retention was considerably greater in the overwrapped eggs. Overwrapping, however, should not be employed to replace refrigeration.

The overwrapping idea has been adopted by some concerns more for the purpose of stimulating egg sales than for the retention of quality. Housewives in one Texas city were asked to give their opinions concerning overwrapped egg cartons. A summary of their replies indicated that 56 percent of those interviewed associated overwrapping with cleanliness, being more sanitary, a safe way to carry eggs home, fresher, better or fancy grade.

Some investigators found varying degrees of loss because of mold growth in eggs which had been overwrapped. However, mold growth in overwrapped eggs has not been established as a definite problem. It does seem advisable in view of these studies that overwrapped eggs should not be held longer than 15 to 20 days for best results.

Cost of Overwrap

The volume of eggs to be overwrapped is a definite factor of cost. The volume should be of a quantity to justify the use of the most efficient type machines and a volume to make full and complete use of the additional labor necessary for the operation.

According to present quotations, overwrapping film costs run approximately ½ to ¾ cent per carton. Such costs are subject to change and depend on the volume of eggs involved in the operation. Equipment costs other than overwrapping machines are not great. Some egg handlers may prefer renting such machines.

In some instances, it may be possible to utilize the labor of the person or persons working the turntable at the end of the packing line for the overwrapping procedures as well. This depends on the layout of the system and whether the machine is fully or semi-automatic and, to some extent, on the volume of eggs being packed per unit of time. Estimates so far indicate that the entire overwrapping operations cost from 1¼ to 1¾ cents per carton if reasonable efficiency is obtained. This cost should be added to the wholesale and retail value of the eggs. This means that consumers normally will be paying this much more per dozen.

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20M—11-62