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STORAGE LIFE OF INDIVIDUALLY FROZEN PACIFIC OYSTER MEATS GLAZED WITH PLAIN WATER OR WITH SOLUTIONS OF ASCORBIC ACID OR CORN SYRUP SOLIDS[1/]

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ABSTRACT

Pacific oyster meats frozen by conventional methods adhere together as a block. If the oysters could be separated individually without prior thawing, the convenience of the product would be greatly improved. Experiments were conducted to determine if freezing oysters individually, glazing them, bulk packaging them in bags, and storing the bags in cartons at 0° F. would produce individually separable oysters with a satisfactory storage life. As part of the experiment, three groups of individually frozen oysters were glazed respectively with (1) plain water, (2) a solution of corn syrup solids, and (3) a solution of ascorbic acid in water in order to test whether such glazes would increase the resistance of the individually frozen oysters to rancidity.

INTRODUCTION

Often, for both the retail and the institutional trades, Pacific oysters (Crassostrea gigas) are frozen in hermetically sealed cans. The results is a frozen block of oyster meats in each can. Thus, before the oysters can be used, the entire contents of the can must be thawed so that the oysters can be separated. Thawing the oysters takes time. Furthermore, the thawed product must be used immediately.

If frozen oysters were processed in such a manner that they could be removed singly from the package while still frozen, the convenience of the product would be greatly improved.

Attempting to produce such a product raised a number of questions: How should the oysters be frozen? Should they be glazed? If so, what kind of a glaze should be used? How should the product be packaged?

Several investigators have studied methods of freezing oysters individually. Schwartz and Watts 1959, found that individually frozen oysters (Crassostrea virginica) from the Gulf of Mexico glazed with a 0.5-percent or a 1.0-percent solution of ascorbic acid had unsatisfactory storage life due to the development of rancidity. Fieger, Novak, and Bailey

Fig. 1 - Packaging individually frozen ice-glazed Pacific oysters.

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1959, and Schwartz and Watts[2/] again using oysters from the Gulf of Mexico found the immersion freezing did not improve the quality of the frozen oysters. Studies at the Seattle Technological Laboratory, Dassow and Nelson 1959, in which Pacific oysters (Crassostrea gigas) were frozen by immersion in sodium chloride brine and in sodium chloride brine with corn syrup solids added showed that Pacific oysters could not be frozen satisfactorily in that manner.

Blast freezing at the commonly used temperature of -20° F. appeared to be the simplest method of freezing. From experience with such other products as salmon and halibut, it also appeared that glazing would probably add significantly to storage life by reducing rancidity. Experience further indicated that adding ascorbic acid (Tarr 1946 and 1947) or corn syrup solids (Dassow and Nelson 1959) to the glaze might provide added protection against rancidity.

Fig. 2 - Individually frozen ice-glazed Pacific oysters packed in a polyethylene bag.

Fig. 3 - Package of individually frozen ice-glazed Pacific oysters opened for examination.

Packaging the oysters in bags made of a plastic, such as polythylene, and holding the bags of oysters in fiberboard cartons in storage at 0° F. appealed to the investigators as a convenient way of packing and storing. That method would simplify processing and reduce production costs if plain water could be used in the glaze or if the glaze could be omitted altogether.

The objectives of the experiments described in this report therefore were to determine:

1. If freezing oysters individually in a blast freezer at -20° F., ice-glazing them, bulk-packaging them in polyethylene bags, and then storing the bags in fiberboard cartons at 0° F. would result in individually separable oysters with a satisfactory storage life.
2. If glazing is necessary.
3. If so, whether a glaze made from a solution of ascorbic acid or of corn syrup solids would add significantly to the storage life as compared with a glaze made from plain ice.

EXPERIMENTAL

Fresh shucked Pacific oysters (Crassostrea gigas) were placed on metal trays individually and frozen at -20° F. in a blast freezer for 15 minutes. After the oysters were frozen, they were divided into four groups: (1) control (packaged without further treatment), (2) glazed with water, (3) glazed with a solution containing 2-percent corn syrup solids, and (4) glazed with a solution containing 1-percent ascorbic acid. Glazing was accomplished by dipping the frozen oysters twice, for 10 seconds each time, in the glazing solution, which previously had been cooled to about 33° F The controls and the glazed oysters were bulk-

2/Schwartz, Mark G., and Watts, Betty M. "Freezing Preservation of Raw Oysters and Oyster Stews." Unpublished report in Bureau of Commercial Fisheries files.

packaged in polyethylene bags (figs. 1 and 2), and then packed into fiberboard cartons and stored at 0° F.

The samples were examined at intervals of 2 months. Criteria used for judging the quality of the oysters were color, odor, general appearance, and flavor.

RESULTS

After 2 months at 0° F., the oysters that were not protected with a glaze began to show deterioration (see table). After 4 months, they exhibited definite effects of oxidative change in that they had a very slight rancid odor and were slightly dark on the surfaces. They now were considered to be on the borderline of acceptability. After 6 months, they showed yellow discoloration, had a rancid odor, and were unacceptable.

All of the glazed oysters retained their original quality up to 4 months of storage. After 6 months, a minor loss of ice glaze was apparent on the edges of the oysters, especially a-

Results of Examinations of Individually Blast-Frozen, Glazed Pacific Oysters Stored at 0° F.

Storage Period	Type of Glaze											
	None (Control)			Ice			1-Percent Ascorbic Acid			2-Percent Corn Syrup Solids		
	Color	Odor	Remarks	Color	Odor	Remarks	Color	Odor	Remarks	Color	Odor	Remarks
Months 2	Normal	Normal	Fair appearance; slight dehydration	Normal	Normal	Very good appearance	Normal	Normal	Very good appearance	Normal	Normal	Very good appearance
4	Slight darkening of oyster surfaces	Very slightly rancid	Poor to fair appearance; borderline acceptability	Normal	Normal	Good appearance	Normal	Normal	Good appearance	Normal	Normal	Very good appearance
6	Moderate yellow discoloration and darkening	Slightly rancid	Poor appearance; unacceptable	A few areas slightly discolored	Normal	Slight loss of glaze in a few areas; good appearance otherwise	A few areas slightly discolored	Normal	Slight loss of glaze in a few areas; good appearance otherwise	A few areas slightly discolored	Normal	Slight loss of glaze in a few areas; good appearance otherwise
8	Entire surface dark yellow discoloration	Rancid	Inedible	A few areas slightly discolored	Normal	Slight loss of glaze; good appearance otherwise	A few areas slightly discolored	Normal	Slight loss of glaze; good appearance otherwise	A few areas slightly discolored	Normal	Slight loss of glaze; good appearance otherwise
10	Entire surface dark yellow discoloration	Extremely rancid	Inedible	A few areas of yellow discoloration	Normal	Slight loss of glaze; fair to good appearance; borderline acceptability	A few areas of yellow discoloration	Normal	Slight loss of glaze; fair to good appearance; borderline acceptability	A few areas of yellow discoloration	Normal	Slight loss of glaze; fair to good appearance; borderline acceptability

long the mantle. Very slight discoloration was noted in those areas. The odor of the oysters was normal. No differences in the condition of any of the glazed oysters were apparent except that, in general, the oysters glazed with the solution containing 2-percent corn syrup solids had a slightly lighter color. After 8 months, the glazed oysters still were normal in odor and of good appearance. The slight discoloration and loss of ice glaze, however, was more apparent than at the 6-months examination. After 10 months, the sublimination of ice glaze and the development of discoloration were more noticeable and caused the samples to be rated at the limit of acceptability. Cooked oyster samples had very good flavor except in the discolored areas, which tasted slightly rancid.

DISCUSSION

In previous work, we found that frozen Pacific oysters packaged in hermetically sealed cans had a storage life of approximately 8 months at 0° F. (Osterhaug and Nelson 1957). The

oysters in the present test compared favorably in storage life to those frozen in the cans.

The major advantages of freezing the oysters individually are that (1) they can be removed singly from the container (fig. 3), (2) they thaw rapidly, and (3) they retain their natural shape and, when packed in transparent containers, look attractive (figs. 2 and 3).

The major disadvantages of freezing oysters individually are: (1) they must be held at freezing temperatures at all times, for if they are allowed to warm above freezing, they thaw around the edges and, if the temperature again falls sufficiently, refreeze in a mass; (2) considerable weight (about 10 percent) is added in glazing; and (3) they require more freezer space because the individual oysters do not pack tightly together. The author believes, however, that for many purposes, the advantages outweigh the disadvantages.

Adaptation of commercial methods to the production of individually frozen oysters would be fairly simple. A blast freezer, plate freezer, or tunnel freezer could be used for freezing. A metal mold such as a tray with oblong depressions stamped in it could best be used for freezing. Use of this tray would permit two rounded sides in the frozen product.

CONCLUSIONS

1. Freezing oysters individually in a blast freezer at -20° F., ice-glazing them, bulk-packaging them in polyethylene bags, and storing the bags in fiberboard cartons at 0° F. produced individually separable oysters having a frozen storage life of about 8 months.

2. Glazing was necessary to protect the product, as unglazed controls had a storage life of not longer than 4 months.

3. There was no marked difference in storage life whether the glaze was made from water only, from a solution of 1-percent ascorbic acid, or from a solution of 2-percent corn syrup solids.

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