The Use of Food Coatings for the Preservation of Fish and Shellfish

ARTHUR F. NOVAK, J. A. LIUZZO AND R. M. GRODNER
Department of Food Science and Technology
Louisiana State University
Baton Rouge, Louisiana

Abstract

The paper is concerned with the chemical, physical, organoleptic, and microbiological changes occurring in fish and shellfish protected during refrigeration by a food coating. The procedures employed for coating the products and preparing them for consumption after storage will be discussed. Applications involving the effects and use of radiation and cryogenics with the coated foods will be described.

VARIOUS TYPES OF FOOD COATINGS have been studied for increasing the storage life of fresh fishery products. The success of any coating would be dependent upon certain properties revolving around economics, microbiology, toxicology, F.D.A. regulations, and consumer acceptance.

An acceptable food coating must be applied at a reasonable cost, and must not result in allowing any detrimental chemical or bacteriological changes to occur during refrigerated storage, or preparation for consumption. Before such a compound can be used commercially, laboratory evidence must be accumulated to prove the technical feasibility of the process and that no health hazards exist or are created by its employment.

This paper reports on Flavor-Tex, which is an edible polysaccharide supplied by Food Research, Inc., Hollywood, Florida (formerly Davie Research Park, Inc.). Results of the following studies indicate that Flavor-Tex fulfills most of the requirements described above for fishery products.

EXPERIMENTAL MATERIAL

Products employed in these experiments were obtained fresh, and were of known history. All of the shellfish were less than 72 hours out of the water at the time the coating was applied.

Shrimp were obtained from a shrimp boat off Grand Terre, Louisiana. They were caught in nets in the early morning, separated from the trash fish, washed with sea water, and headed, shelled and deveined. The product was packed in crushed ice in Arctic hampers and transported to the laboratory in Baton Rouge, where they arrived within 24 hours after being caught.

Oysters were dredged during the early morning hours, and brought to New Orleans in a refrigerated truck (40F). They were shucked in a commercial packing plant by professional shuckers, washed and drained according to F.D.A. regulations, and packed into gallon cans. These oysters were transported to Baton Rouge packed in crushed ice in Arctic hampers.

Fresh fish caught under supervision were purchased from fishermen,

packed in crushed ice and immediately shipped to the laboratory. They were cleaned within a few hours and cut into fillets. The fish were coated immediately.

COATING OF PRODUCTS

Shrimp, oysters, and fish fillets were divided into equal portions. Half of each product was retained as the untreated control, and the other half was coated with Flavor-Tex, which was applied by dipping the products into two gallon stainless steel pots containing the coating solutions. The coating formed a thin film around the foods which could be controlled in thickness by adjusting the length of time in the dips.

The coated products and uncoated control samples were frozen at —10C and retained at this temperature until removed for chemical bacteriological, physical, and organoleptic testing. Examinations were made on the initial unfrozen samples and on the frozen foods at 1- and 3-month intervals.

BREADED PRODUCTS

Additional studies were made on breaded shrimp. All of the shrimp were breaded according to the "Standards and Definitions" for frozen, raw, breaded, and lightly breaded shrimp, under the Federal Food, Drug and Cosmetic Act. (Federal Register, July 6, 1963; 28 F.R. 6915.) They included coated and uncoated, breaded and unfried; and coated and uncoated, breaded and fried. All of the samples were frozen after treatment and withdrawn for testing.

The results are presented in the tables.

GENERAL CHARACTERISTICS OF OYSTERS
COATED WITH FLAVOR-TEX
Oysters (Frozen - 15 days)

	Organoleptic Scores (59 people)	Bacterial Count orgs./gm.	General Appearance	% Gain or Loss from original weight
1. Uncoated.	5.2	427,000	Poor	Loss 3-12
2. With coating, fried, breading.	7.2	96,000	Good	Loss 1-4
3. With coating, breading, not fried	7.0	146,000	Good	Loss 1-3

GENERAL CHARACTERISTICS OF OYSTERS
COATED WITH FLAVOR-TEX
Oysters (Frozen - 30 days)

	Organoleptic Scores (72 people)	Bacterial Count orgs/gm.	General Appearance	% Gain or Loss from original weight
1. Uncoated.	2.0	635,000	Bad	Loss 8-22
2. With coating, fried, breading.	5.0	249,000	Fair	Loss 3-7
3. With coating, breading, not fried.	5.2	300,000	Fair	Loss 3-6

ORGANOLEPTIC SCORES OF FLAVOR-TEX COATED FROZEN OYSTERS

SAMPLE TREATMENT	Scores After Listed Storage Period		
	Initial	1 Month	3 Months
Uncoated Oyster	9.2	6.2	4.3
Flavor-Tex coated Oyster	9.2	7.8	5.9

Organoleptic Scores

Values are averages for participants on taste panel for the attributes of odor, appearance, flavor and texture.

CODE OF SCORES:

(10) No change from fresh product of highest quality.
(8) First noticeable slight change in attributes.
(6) Moderate degree of changed attribute: increased in intensity and occurrence from score of 8.
(4) Definite or strong degree of changed attribute.
(2) Extreme degree of changed attribute.

GENERAL CHARACTERISTICS OF SHRIMP COATED WITH FLAVOR-TEX

Shrimp (Frozen - 15 days)

	Organoleptic Scores (59 people)	Bacterial Count orgs/gm.	General Appearance	% Gain or Loss from original weight
1. Without a coating and no breading.	6.7	381,000	Good	Loss 2-5
2. With coating, breading, unfried.	8.1	165,000	Good	Loss 1-2
3. With coating, breading, fried.	7.8	143,000	Very Good	Loss 1-3
4. With breading, fried.	7.3	207,000	Fair	Loss 2-6
5. With breading, unfried.	7.4	216,000	Fair	Loss 2-5

GENERAL CHARACTERISTICS OF SHRIMP COATED WITH FLAVOR-TEX

Shrimp (Frozen - 30 days)

	Organoleptic Scores (72 people)	Bacterial Count orgs/gm.	General Appearance	% Gain or Loss from original weight
1. Without a coating and no breading.	4.9	763,000	Poor	Loss 5-8
2. With coating, breading, unfried.	6.8	208,000	Good	Loss 2-3
3. With coating, breading, fried	6.7	177,000	Good	Loss 2-4
4. With breading, fried.	5.2	594,000	Poor	Loss 5-12
5. With breading, unfried.	4.8	638,000	Poor	Loss 5-10

ORGANOLEPTIC SCORES OF FLAVOR-TEX COATED FROZEN SHRIMP

SAMPLE TREATMENT	Scores After Listed Storage Period		
	Initial	1 Month	3 Months
Uncoated Shrimp	9.6	7.2	5.0
Flavor-Tex coated Shrimp	9.6	8.4	6.5

Organoleptic Scores

Values are averages for participants on taste panel for the attributes of sweetness, odor, appearance, flavor and texture.

CODE OF SCORES:

(10) No change from fresh product of highest quality.
(8) First noticeable slight change in attributes.
(6) Moderate degree of changed attribute: increased in intensity and occurrence from score of 8.
(4) Definite or strong degree of changed attribute.
(2) Extreme degree of changed attribute.

DISCUSSION

Flavor-Tex offers certain advantages as a food coating for fishery products. The compound is safe to eat, and does not alter the natural flavors of any of the products tested. Such a coating is easy to apply and does not result in any change in appearance, since it is clear. Most panelists made the comment that Flavor-Tex actually improved the general overall quality of the product. It is easy to apply and the application can be performed on a mechanical basis. The coated products retain moisture and do not dry out as rapidly as uncoated fish and shellfish.

Tests for pathogenic microorganisms failed to demonstrate the presence of coagulase, Botulism toxin, Type E., Salmonella sp., or hemolytic streptococci. If any health hazards develop, it is likely that the contamination would have been present regardless of whether or not the foods had been coated with Flavor-Tex.

In conjunction with these attributes, it can be stated that food coatings of this nature have a definite function in the preservation of fishery products.