

## QUALITY ISSUES WITH CONVENIENCE FISHERY PRODUCTS

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### **Introduction:**

Convenient foods are becoming popular among all classes and ages of people across world. Convenience foods has reduced the preparation time which can be eaten directly or using some heating process. Some of the popular convenient foods include Masala Oats, Corn flakes, canned soup, frozen foods, baked products etc. Most of the convenience foods take very less time to cook. They are often prepared and packaged well for quick and easy thawing or heating the food.

Fish and shellfish convenient products are becoming more popular because of added advantages of human health significant factors. Although this is perishable commodity but they are generally designed so that their tastes remain with long shelf-life. Most of the convenience foods have become very popular because they can be served as a quickie snack or meal. Convenience foods availability on the shelves in super markets has reduced time in the kitchen with less preparation time, fewer leftovers and easy clean up.

The seafood market size was valued at \$159,311.9 million in 2019. The fish segment was the highest contributor to the market, with \$101,526.2 million in 2019. Based on the application, the retail segment was the leading segment in the seafood market. Asia-Pacific holds the maximum share of the seafood market. The growth of the seafood market can be attributed awareness of the health benefits of seafood and change in lifestyle of consumers. Worldwide per capita fish consumption is 20.5 kilograms per year.

### **Types of Convenient foods:**

The convenient products are generally classified into following 04 types of products

- 1) Convenience products
- 2) Shopping products
- 3) Specialty products

4) Unsought products

**Advantages of Convenience foods:**

- Less preparation time and easy presentation and
- Easy cleaning up and hardly get any leftovers remains
- No storing, buying or planning of ingredients.
- Various types of food items especially for inexperienced cooks can be relished.
- Less spoilage and waste occur with packaged convenience foods products.
- Transportation of packaged foods is cheaper especially in concentrated form.
- Cost efficient for mass production and distribution.

**Disadvantages of Convenience foods:**

- Specific need of individual as of homemade may be missed.
- Cooking time is sometimes increased for thawing or longer baking time.
- Control fat, salt and sugar content may be difficult.
- Cost per serving is generally higher than homemade.
- Convenience may lack freshness of fish
- They tend to lack fibres.

**Driving factor for Convenience Foods**

A busy lifestyle due to work, people doesn't have a lot of time to prepare food at home. As there are greater time constraints from work, commitments, and commutation, an individual often prefer for convenience foods. Convenience foods are defined as types of foods that save time in procurement, preparation, and cleanup. Although these convenience foods save time, they tend to have lower nutritional values and can be more expensive.

There are few factors which results people for convenience foods include

- time constraints due to work pressure
- Increased purchase power

- Better food preparation environment, and
- Better healthy options availability on shelves

### **Convenience Fishery Products**

As per FSSAI (India), Convenience Fishery Products are tertiary food products made of fish, which are in ready to eat form and also includes snack based items prepared from fish and fishery products meant for direct human consumption such as extruded fishery products, fried items namely fish wafers, crackers, fish cutlets, fish burgers and other such products. These products can be consumed directly after minimal handling and processing.

This category includes Sous-vide cooked products, surimi-based products cooked (in-pack), pasteurized crab meat, pasteurized molluscs which are distributed as refrigerated, but meant for direct human consumption with minimal or no cooking.

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### **Changes in Physicochemical Properties and Sensory Quality in Seafood Products**

- Color changes that may occur during cooking are mainly attributed to protein denaturation
- Textural changes occurred during sous-vide cooking and non-optimized process

### **Changes in Nutrients and Phytochemicals Seafood Products**

- Loss of macro and micronutrients along with other significant nutritional factors like antioxidants.
- Loss of aromatic volatile compounds
- Loss to juiciness and tenderness which may affect the overall sensory attributes of seafood.

### **Microbiological Concerns of Sous-Vide Seafood Product**

Microbiological deterioration in perishable products such as seafood occurs rapidly due to neutral pH, high water activity, and nutritional composition. Considering seafood safety pathogenic bacteria can be classified into three groups.

- (i) Natural inhabitants of the consumed species, such as *Vibrio* spp., *Clostridium botulinum* and *Aeromonas* spp.
- (ii) Environment bacteria such as *Listeria monocytogenes*, *Clostridium botulinum* and *Clostridium perfringens*
- (iii) Inhabitant of man or animals such as *Salmonella* spp., *Shigella* spp., *Escherichia coli*, and *Staphylococcus aureus*.

### **Mitigation measures to prevent quality issues:**

Protein denaturation in cooking results in color changes can be prevented by optimizing time and temperature. High pressure processing (HPP) can be an alternative use of moderate pressures significantly influenced the texture and color of seafood products.

Plastic foil can prevent the loss of aromatic volatile compounds and water that may retain juiciness and tenderness of the products, and hence sensory attributes enhanced.

Heat is known to be lethal to microorganisms, but different species has its own particular heat tolerance, and there are many factors affecting their thermal resistance. The process is dependent both on the exposure time and on temperature required to achieve the desired death rate. Therefore, it is essential to determine the thermal death kinetics (D and z-values) of target bacteria in different food substrates and to characterize the time durations. Insufficient heat treatment is the major problem which can be combined with the use of natural antioxidants to improve the efficiency of cooking process in terms of food safety during storage.

Fresh or minimally processed foods of high quality with the minimum amount of additives, nutritious healthy and microbiologically safe, are in demand among consumers. Hurdle technology advocates the deliberate combination of existing and novel preservation techniques in order to establish a series of preservative factors (hurdles) that microorganisms are unable to overcome. The most important hurdles used in food preservation are temperature (high or low), water activity

(aw), acidity (pH), redox potential (Eh), preservatives (e.g. nitrite, sorbate etc.) and competitive microorganisms (e.g. lactic acid bacteria).

**Regulatory requirement for Convenience Fishery Products (FSSAI, 2021)**

Microbiological specification for Convenience Fishery Products have been mentioned in Food Safety and Standards (Food Products Standards and Food Additives) Regulations, 2011. Item No. 15 of Microbiological Requirements for fish and fishery products need to be considered which are mentioned as follows:

**a. Hygiene Indicator Organisms**

Aerobic Plate Count		Coagulase positive Staphylococci		Yeast & mold count		Stage where criterion applies	Action in case of unsatisfactory results
Sampling Plan	Limits	Sampling Plan	Limits	Sampling Plan	Limits		
5/2	1x10 <sup>3</sup> / 1x10 <sup>4</sup>	5/2	1x10 <sup>2</sup> / 1x10 <sup>3</sup>	-	-	End of Manufacturing process	Improvement in hygiene; Time Temperature control of batter mix
IS: 5402/ISO 4833		IS 5887 : Part 2 or IS 5887 Part 8 (Sec 1)/					

**b. Safety Indicator Organisms**

<i>E. coli</i>		<i>Salmonella</i>		<i>V. Cholerae</i> (O1 and O139)		<i>L. monocytogenes</i>		<i>C. botulinum</i>	
Sampling Plan	Limits	Sampling Plan	Limits	Sampling Plan	Limits	Sampling Plan	Limits	Sampling Plan	Limits
5/2	1/10	5/0	Absent/ 25 g	5/ 0	Absent/ 25 g	5/ 0	Absent/ 25 g	-	-

IS: 5887 Part 1 or ISO 16649-2	IS: 5887 Part 3/ ISO 6579	<i>Vibrio</i> , Bacteriological Analytical Manual, Chapter 9. USFDA BAM Online, May	IS: 14988, Part 1&2/ISO 11290-1 &2		
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### European Chilled Food Federation (ECFF)

ECFF Recommendations provide guidance on process design and hygienic principles related to the manufacture of chilled prepared foods (hereafter referred to as chilled foods), with emphasis on those procedures designed to control the risks associated with bacteria that cause food-borne diseases.

The safety, with respect to *Clostridium botulinum*, of chilled foods that have been mildly heated in hermetically sealed packages or heated and packed without recontamination can be assured by:

- A minimum heat process and strict limitation of chill shelf life or, for longer life products, by storage below 3°C,
- Heat treatment sufficient to deliver a 6 log reduction in numbers of spores of psychrotrophic strains of *C. botulinum* and storage below 10°C, or
- Intrinsic preservation factors shown to be effective in modeling or inoculated pack/challenge tests.

### Cooking and Pasteurization (Cooking Model)

<b>Cooking</b>	Pathogenic bacteria survival	Minimum cook time: 2.5 minutes	<ul style="list-style-type: none"> <li>• Scientific study establishing the thermal process (process validation)</li> <li>• Check the data logger for accuracy and damage and to ensure that it is operational before putting into operation; check it daily, at the beginning of operations; and calibrate it once per year</li> </ul>
		Minimum cook temperature: 210°F (98.9°C)  Note: To achieve a 6D reduction of <i>L. monocytogenes</i>	
		Maximum shrimp size: 40 count/pound	

			<ul style="list-style-type: none"> <li>• Calibrate the scale monthly</li> <li>• Review monitoring, corrective action and verification, records within 1 week of preparation</li> </ul>
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Source:

### COOKING AND PASTEURIZATION (PASTEURIZATION MODEL)

<b>Batch pasteurization</b>	Pathogenic bacteria survival	Minimum initial product temperature: 37°F	<ul style="list-style-type: none"> <li>• Process establishment</li> <li>• Check the temperature- recording device and dial thermometer for accuracy and damage and to ensure that they are operational before putting into operation; check it daily, at the beginning of operations; and calibrate it once per year</li> <li>• Review monitoring, verification, and corrective action records within 1 week of preparation</li> </ul>
		Minimum length of pasteurization cycle: 120 minutes	
		Minimum water bath temperature: 189°F	

### EU regulations (COMMISSION REGULATION (EC) No 2073/2005 of 15 November 2005 on microbiological criteria for foodstuffs)

Food category	Micro-organisms/their toxins, metabolites	Sampling-plan (1)		Limits (2)		Reference methods	Stage where the criterion applies
		n	c	m	M		
<b>Ready-to-eat foods able to support the growth of L.</b>	<i>Listeria monocytogenes</i>	5	0	100 cfu/g		EN/ISO 11290-2	Products placed on the market during their shelf-life

<b>monocytogenes, other than those intended for infants and for special medical purposes</b>		5	0	Absence in 25 g		EN/ISO 11290-1	Before the food has left the immediate control of the food business operator, who has produced it
<b>Cooked crustaceans and molluscan shellfish</b>	<i>Salmonella</i>	5	0	Absence in 25 g		EN/ISO 6579	Products placed on the market during their shelf-life
<b>Live bivalve molluscs and live echinoderms, tunicates and gastropods</b>	<i>Salmonella</i>	5	0	Absence in 25 g		EN/ISO 6579	Products placed on the market during their shelf-life
<b>Live bivalve molluscs and live echinoderms, tunicates and gastropods</b>	<b>E. coli</b>	1	0	230 MPN/100g of flesh and intra-valvular liquid		ISO TS 16649-3	Products placed on the market during their shelf-life
<b>Fishery products from fish species associated with a high amount of histidine</b>	Histamine	9	2	100 mg/kg	200 mg/kg	HPLC	Products placed on the market during their shelf-life
<b>Fishery products which have undergone enzyme maturation treatment in</b>	Histamine	9	2	200 mg/kg	400 mg/kg	HPLC	Products placed on the market during their shelf-life



brine, manufactured from fish species associated with a high amount of histidine							
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**EU regulations (COMMISSION REGULATION (EC) No 2073/2005 of 15 November 2005 on microbiological criteria for foodstuffs)**

**2.4. Fishery products**

Food category	Micro-organisms/their toxins, metabolites	Sampling-plan (1)		Limits (2)		Reference methods	Stage where the criterion applies	Action in case of unsatisfactory results
		n	c	m	M			
<b>2.4.1. Shelled and shucked products of cooked crustaceans and molluscan shellfish</b>	E. coli	5	2	1 cfu/g	10 cfu/g	ISO TS 16649-3	End of the manufacturing process	Improvements in production hygiene
	Coagulase-positive staphylococci	5	2	100 cfu/g	1000 cfu/g	EN/ISO 6888-1 or 2	End of the manufacturing process	Improvements in production hygiene

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