

QUALITY ISSUES IN FISH MINCE AND MINCED BASED PRODUCTS

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Introduction

Fish mince is finely ground paste of fish meat / mechanically deboned fish meat. It is a commercially important commodity locally referred as 'keema'. The most common way of separating edible flesh from waste is by filleting, but a greater amount of flesh can be recovered in the form of a coarse mince by putting either the unfileted fish, or the waste left after filleting, through a bone separator. Minced meat is generally stored at – 18 °C as frozen blocks. The minced meat can be further processed to produce many products like surimi, sausages, fish ball, fish cutlet, fish burgers, fish fingers, nuggets etc. Imitated analogue products like crab stick, shrimp analogue etc were also developed from mince which have commercial importance.

'Surimi' is a commercially important intermediate product prepared from fish mince. Surimi is stabilized myofibrillar proteins obtained from mechanically deboned fish flesh that is washed with water and blended with cryoprotectants. It has received considerable attention in development of imitation / analogue products. The main species utilized for the production of surimi is Alaska pollock (*Theragra chalcogramma*). Many varieties fishes like croakers, ribbon fish, threadfin bream, lizard fish, Big eye, snapper etc are available from the Indian waters are commercially utilized for surimi production. Fishes namely Alaska pollack, Pacific whiting, blue whiting, threadfin bream, menhaden etc are mainly used for surimi production in temperate region. Surimi products are manufactured by manipulating the gel forming capacity of fish myofibrillar protein myosin. Hence, the suitability to be raw material for surimi production is determined by the functionality of fish myofibrillar protein called 'gelation' which are generally greater in white-fleshed fish than in dark fleshed fish. Fatty fishes such as sardines, herrings and mackerels are difficult to process due to higher content of dark muscle, high lipid content and poor gel forming ability. Surimi is graded depending upon gelation property, whiteness of meat and moisture level.

Preparation of fish mince

The steps involved in the preparation of fish mince are pre-processing, meat picking / bone separation and storage. During pre-processing fishes are gutted, beheaded or filleted and the temperature should be maintained between 0 to 4 °C. Minced meat is added with cryoprotectants and antioxidants, frozen in plate freezers and stored at -18°C. Headless gutted fish has higher yield than with filleting alone. When the fish are first filleted, an additional 8-12 per cent flesh can be separated from the filleting waste.

Surimi processing

Surimi is Fish meat that has been washed of lipids, water-soluble or sarcoplasmic proteins, and other impurities. The various steps involved are

- Beheading and gutting
- Mincing / deboning
- Water washing and dewatering – enhances gel forming ability
- Refining – remove connective tissue, scales (Cylindrical screen)
- Dehydration using screw press
- Addition of cryoprotectants – polyphosphates, sugar, salt (Silent cutters)
- Packing, freezing and storage

Raw material should be kept below 4°C and process as early as possible. Wash water should be maintained 10 °C or below for adequate separation of water-soluble proteins. pH of wash water should be near 7.0 and total hardness of 100 mg/kg or below, de-watering aids can be added (less than 0.3% salt) in the final stage. Food grade enzyme inhibitors (e.g. egg white, beef protein plasma) should be used for species that exhibit high levels of proteolytic enzyme activity such as Pacific Whiting. Cryoprotectants are effective in protecting physical, functional and structural properties of myofibrillar proteins during frozen storage of surimi. Sucrose, sorbitol, polydextrose, lactitol, maltodextrin, sodium lactate, trehalose and phosphates are among the most-studied cryoprotectants used in the storage of surimi. Sucrose, sorbitol and polyphosphate

are used at 4, 4, and 0.3% respectively for extended frozen storage. These antifreezing agents reduce viscosity, improve moisture retention and enhance the protein stability during frozen storage.

Quality categories of surimi

- High quality surimi has high gel strength, low impurities and white color
- There are mainly **three quality categories** of surimi with various grades
- First category has four grades – **SA, FA, A, AA** (Most common category)
- Second category – two grades, **KA, KB** (produced from meat recovered after second refining)
- Third category – two grades, **RA, RB** (produced from meat recovered after third refining step, include meat from collar cuts and frames)

Quality problems in fish mince and surimi

Major quality problems in fish mince are dehydration, presence of foreign matter, parasites, bones, odour and flavour, flesh abnormalities and bacteriological hazards.

Major quality problems in surimi are parasites, scombrototoxin, heavy metals, foreign matter, decomposition, residual water-soluble protein, misuse or erroneous quantity of food additives and denaturation of surimi protein.

Quality attributes of frozen surimi

- **Moisture content** - Best quality surimi has moisture of 77 -79%
- **Gel strength and deformability** - The gel forming ability of surimi is an important attribute in quality evaluation which can be tested by two methods depending upon the buyer namely puncture test and torsion test.
- **Colour** - Whiteness using colourimeter
- **Impurities** - Presence of scales, fins, bones, foreign matter (hair, filth, metal pieces).

As per Food Safety and Standards (Food Products Standards and Food Additives) Regulations, 2011 in regulation 2.6 relating to “Fish and Fish Products” (Version 8 9 2020) has given the requirements of frozen fish mince

- The products shall conform to the requirements specified in the table below

Table 1. Requirements for Frozen minced fish meat

S.No.	Characteristics	Requirement
1	Colour of minced fish meat	Characteristic of the species
2	Texture of the minced meat	Characteristic of the species
3	Odour	Characteristic of the species, free from rancid, putrid or foreign odour
4	Flavour	Characteristic of the species, sweetish and pleasant, free from spoilt or foreign flavor
5	Bone content, % by weight, Max	1.0

Table 2. Microbiological Requirements for Fish Mince/Surimi and Analogues

Sl. No.	Parameter	n	c	m	M
1	Aerobic Plate Count	5	2	1×10^5	1×10^6
2	Coagulase positive <i>Staphylococci</i>	5	2	1×10^2	1×10^3
3	<i>Escherichia coli</i>	5	0	20	
4	<i>Salmonella</i>	5	0	Absent in 25 g	
5	<i>Vibrio cholera</i>	5	0	Absent in 25 g	
6	<i>Listeria monocytogenus</i>			Absent in 25 g	

Sampling Plan:

The terms n , c , m and M used in this standard have the following meaning:

n = Number of units comprising a sample.

c = Maximum allowable number of units having microbiological counts above m .

m = Microbiological limit that may be exceeded number of units c .

M = Microbiological limit that no sample unit may exceed.
