BHARATHIDASAN UNIVERSITY

Tiruchirappalli- 620024,
Tamil Nadu, India.

Programme: M.Sc., Marine Biotechnology

Course Title :Marine Product and Processing

Course Code: 21EC2a

Unit-V
Fish Products for Human Consumption, Value Addition HACCP

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UNIT V-

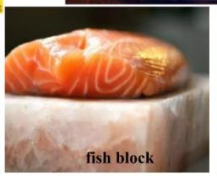
FISH PRODUCTS FOR HUMAN CONSUMPTION

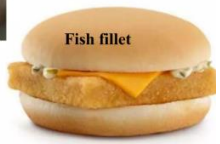
IndiaMART
Tuna Fish Crackers ...

Flipkart
Hikari Micro Wafers...

Indian Aquari... · In stock
Hikari 21202 Micro Wa...

Ubuy India · In stock
Hikari Tropical Sinki...





Fish Skin

FISH FINGERS

- **Fish fingers, also known as fish sticks** is a processed food made using a white fish, which has been battered or breaded.
- They are commonly available in the frozen food section of supermarkets.
- They can be baked in the oven, grilled, shallow fried, or deep-fried.
- The fish used may be either fillets cut to shape or minced/groundfish reformed to shape.
- ***Those made entirely from fillets are generally regarded as the higher quality products and will typically have a prominent sign on the box stating that the fish is 100% fillet.***
- Minced fish is more commonly used in store brand economy products.
- They may have either batter or breadcrumbs around the outside as casing, although the coating is normally bread crumbs.
- **In addition to white fish, fish fingers are sometimes made with salmon.**

Preparation of fish fingers

- Fish is washed in chilled water.
- It is weighed and meat is separated to a size of 1 x 1 x 5 cm.
- It is again washed in chilled water, soaking with 3% salt and lemon juice for 1 hr.
- Drain for 10 minutes, Pierce thin bamboo needle or stick from coconut leaves. Then batter (prepared by mixing egg, corn flour, wheat flour, Bengal gram, dal powder, salt ginger, garlic, kashmiri chilly power etc.) is prepared.
- It is breaded and quickly frozen for storage. Fry in oil before serving.

FISH CUTLET

This product is prepared from minced fish meat. Fish cutlet is a highly acceptable consumer product. They can be flash fried and kept stored up to 6 months.

Preparation of fish cutlets

•Cook the fish and separate the meat.

•Cook the potatoes, peel, mash and add the cooked fish mince, salt, turmeric powder, kashmiri chilly powder, pepper powder, masala and fried chopped onion, ginger and curry leaves.

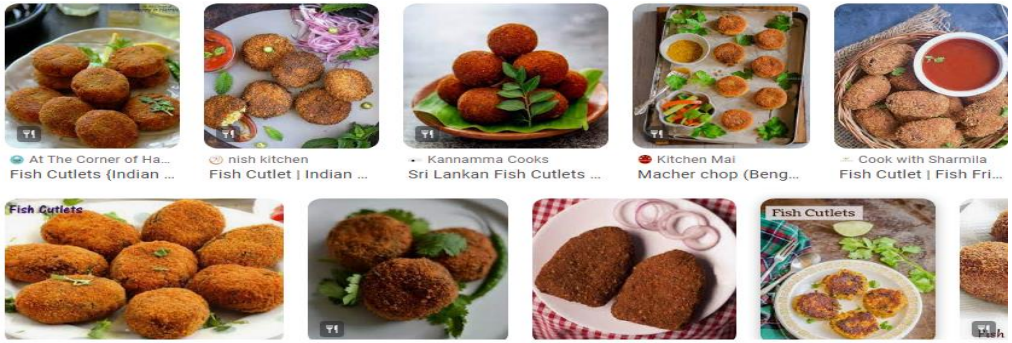
• Mix them well. Mould the mixture into round shape and dip in batter and rolled over bread crumps.

•This is flash fried in vegetable oil maintained at 160-170°c for 5 seconds.

•They are then packed in consumer packets and kept stored at -20°c.

•Cutlets are deep fried prior to consuming.

•Storage life is 6 months at -20°c.



FISH WAFERS: Dried, ready-to-fry and ready-to-serve wafers, with carbohydrate as main base and incorporating salt and several other ingredients with or without spices are very popular in most parts of the country. Cheaper varieties of fishes like thread fin breams, sciaenids, cat fish etc. can be used for the preparation of this product

•Preparation of fish wafers

•The dressed and cleaned fishes are cooked in water for 30 minutes. It is then cooled and edible meat alone is separated.

•Homogenize the processed fish meat with 1 litre of water for 10 minutes in a mechanical grinding machine.

•Add corn flour, tapioca starch, salt and water; blend the whole mass for one hour.

•Spread the homogenised mass uniformly in aluminium trays in a thin layer of 1-2 mm thickness and cook in steam for 3-5 mins. Cool to room temperature.

•Cut the cooked material into desired shapes and dry under sun or preferably ***in artificial dryer (at 45° C to 50° C) to a moisture content below 10%.***

•Pack suitable lots of the dried product in sealed polythene bags or glass bottles and store it in a cool and dry place till marketing. ***The product can be stored in good condition for two years.***

•Permitted food colours can be incorporated, if needed, at the time of mixing the other ingredients with the processed fish meat in order to get desired colour.

•***Generally, this type of product is used as side dish after frying in oil.***

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DRIED PRAWN PULP

Usually small sized prawns are used for making dried prawn pulp. Prawn is cooked in salt water until it turns pink in colour. Dry in sunlight. Beating in gunny bags. Winnowing to separate shell. The pulp is collected and packed properly.

MASMIN FLAKES

An innovative value added product is prepared by smoking and drying tuna meat. Minced tuna meat ***is mixed with salt and liquid smoke, made into a paste and stuffed inside a stainless steel mould,*** after which blocks are ***cooked and dried till the moisture reaches below 15%.*** Using a flaking machine***, Masmin flakes are produced and dried again to get the product moisture content below 10%.*** Flakes are then packed in polyester/polythene laminated pouches and stored at room temperature. ***Masmin flakes prepared by improved method has superior biochemical qualities compared to traditional masmin. The lower moisture of masmin flakes assures higher shelf life. Nutritional profiles such as protein content and lysine content are high.*** It shows higher levels of PUFA especially EPA, DHA and ***can play a vital role in attracting consumer health consciousness to this product.***

FISH SOUP POWDER

White flesh of many low value fish like ***threadfin bream, Sciaenids, perches, etc. can be used to prepare fish soup powder.*** This product has high consumer acceptability and is now produced by several manufacturers.

Preparation of Fish Soup Powder

- The fresh fish is de-skinned and de-boned after cooking.
- The fried onion is added to this meat and ground to a fine paste.
- Then coriander powder, cassava starch, sugar, pepper powder, garlic, ascorbic acid, carboxy methyl cellulose and mono sodium glutamate are ground to a fine paste.
- Mix with ground paste.
- Spread to a thin layer, dry under vaccum, pulverise and sieve.
- Mix with milk powder and pack in laminated pouches.

Imitation products

❖Several value added imitation products are made from surimi (water washed mince). ***These include imitation of shrimp lobster tails breaded scallops, imitation breaded crab claws, sushi products, sushi sticks, imitation crab shreds, minced sticks, filament sticks and others.***

❖These seafood analogs possess the ***accepted texture, flavour and appearance of the authentic products.***

❖For ***production of seafood analogs, the surimi blocks are chopped to create a paste.***

❖The paste is combined usually ***with additional amounts of cryoprotectants and other additives*** such as salt, soy protein, starch, egg white, alginate etc to promote cohesion among the protein molecules and ***thereby to improve the texture and flavour of the finished product.***

❖For chopping the frozen blocks, ***it is ideal to use a vacuum mixer, which helps to disintegrate the mince and make the proteins available for binding the ingredients.***

❖A vacuum mixer also removes any air that could be introduced in the chopped product, which can result in uneven heating during cooking.

❖ ***The chopped paste is extruded as a flat sheet (approximately 1-2 mm thick) molded into desired shapes and set by placing on a cooking belt where it is heated.***

❖***Heating is done at 90-93ºC for 30- 100 sec on a stainless steel belt, drum***.

❖Final texture is developed during thermal pasteurization, ***which is performed after bundling, cutting and packaging.***

❖***The pasteurization step eliminates bacterial pathogens that might grow during the storage of the product.***

❖***Generally surimi seafood should be cooled from 6ºC to 21.1ºC or below within 2 h and to 4.4ºC or below within 4h and should be held at 4.4ºC or below at all times during storage and distribution***.

VALUE ADDITION OF FISH PRODUCTS

What Is Value addition?

- **Adding value means:**
  - employing processing methods,
  - adding specialized ingredients
  - novel packaging to enhance the nutrition,
  - Sensory characteristics,
  - shelf life and
  - convenience of food products
- **Why value addition**
  - Consumers are time starved
  - Consumers are demanding fish

Ways of value addition in sea food

1. Innovation
2. Differentiating the products
3. Better marketing

Food by products

- Shark fins, rays and cartilage
- Fish extract
- Fish entrails
- Pet foods

Non food by products

- Fish body and liver oils
- Fish glue
- Leather
- Artificial pearl
- Pharmaceutical and biochemical products
- Fish albumin
- Swim bladder
- Fertilizers and fish silage

Fish Oil or Shark Liver Oil

Fish or shark liver oils are important as

- Food material (omega -3 fatty acids)
- Feed material (Animal feed..)
- Industrial purposes (paints, lubricants,)

Fish contained 1 – 20 % of oil, shark liver contained 20 – 65% of oil

Fish Silage

- Extraction of natural biopolymers out of marine waste / Production of Chitin and Chitosan

Uses : Cosmetic industry, purification of industrial effluents

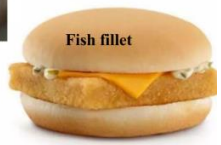
- manufacturing of functional thin film Biodegradable polymers

Raw materials: Skeleton of shrimp, prawn, squid and crabs

Fish Skin

Delicatessen Products

- Fish sauce
- Tuna ham
- Fish balls
- Fish meal
- Fish cake
- Fish biscuit
- Fish nuggets
- Fish soup
- Fish sausages
- Fish fingers
- Fish noodles



Chitin and Chitosan

Chitin is the second most abundant biopolymer on earth next only to cellulose. It is a white, hard, inelastic nitrogenous polysaccharide extensively used for several purposes. In India, the single largest source of chitin is the shrimp shell waste.

Chitin is produced from the shell waste by deproteinisation and demineralization. Chitosan is produced by the deacetylation of chitin. Chitosan has several industrial and medicinal uses.

Chitosan is used

- growth promoter in animals and birds, used as an ingredient in their feed.
- clarifying agent of fruit juices
- purification of drinking water
- treatment of waste water and sewage effluents
- sizing agent in textiles and paper
- pharmaceutical and cosmetic industry

Fish body oil

The main source of fish body oil in India **is oil sardine.**

A survey of the oil industry reveals that the extraction is **done on a cottage scale** in isolated places near the leading centers and is not well organized.

The method of extraction followed is cooking the fish in iron vessels and pressing and separating the oil.

Apart from sardine oil, fish body oil ***is also obtained from the fish meal plants*** operating in the country. ***In India oil sardine is a fishery which exhibited wide fluctuations from as low as 1% to as high as 32% of the total landings.***

The seasonal variation in oil content is predominant in Kerala and Karnataka coast. ***During the peak season fish has oil content of 17%.***

Fatty acid composition of oil revealed that they contain high amounts of polyunsaturated fatty acids (PUFA).

At present the medicinal values of fish oils are well known.

Fish liver oil

The therapeutic value of fish liver oil was discovered in 18th century and fish liver oil becomes ***a common medicinal product especially for Vitamin A and D***.

Cod, shark and haddock livers are the important sources of Vitamin A and D. ***The weight of liver, fat content and presence of vitamins*** are dependent on a number of factors like ***species, age, sex, nutritional status, stages of spawning, and area*** from where it is caught.

In cod (*Gadus collarius), coal fish (Pollahius vireus) and haddock (Melanggrammus aenglefinus*), ***the weight of liver normally amount to 4-9% of whole fish and livers contain*** **about 45% to 67% oil.**

The species of shark such as dog fish (*Squalus acanthias), Greenland* shark (*Somniosus microcephalus) and barking shark (Certrohinus maximus)* **have large fatty livers weighing up to 10-25% of the whole fish containing 60-75% oil. But halibut, tuna, and whale have 1% liver having 4 to 25% oil with high vitamin A & D content.**

Depending on the oil content and vitamin A potency fish livers are generally classified in to three groups.

- Low oil content - high vitamin A potency
- High oil content - low vitamin A potency
- High oil content - medium vitamin A potency

Processing

The processing procedures of fish liver without affecting the quality of the oil extracted can be summarized as (1) steaming (2) solvent extraction and (3) alkali/enzyme/acid digestion. The process selected should depend on the vitamin and oil content of the livers.

Certain species of shark contain high oil content with high hydrocarbon content, viz. squalene. Squalene a highly unsaturated aliphatic hydrocarbon is present in shark liver oils, mainly of the family squalidae, cod and some vegetable oils like olive oil, wheat gum oil, and rice bran oil.

Presentation and storage

Vitamin oils are stored in rust free, well washed and dried air tight drums. The head space should be kept minimum to avoid oxidation. ***It is advisable to fill head space with inert gas such as nitrogen***. If properly processed and stored the oil will remain in satisfactory condition without the use of preservative. ***Small amounts of antioxidants like BHA, tocopherol, BHT, NDGA can be used to preserve the oil for longer periods***.

Pearl essence

Guanine is deposited in the epidermal layer and on the scales of most of the pelagic fishes. Since those crystalline guanine are suspended in a suitable solvent the product is called pearl essence. The scales are soaked in gasoline to separate pearl essence from protein and water. The pearl essence is transferred into gasoline where it floats to the surface. The separated pearl essence is then filtered to obtain the fine particles of pearl essence.

Uses

•Artificial pearl

•Shiny coatings in ash trays, fishing rods, book covers, textiles, jewellery boxes, umbrella handles and electric light switches.

Fish maws and isinglass

`The world isinglass is derived from the Dutch and German words, which have the meaning sturgeon‘s air bladder or swimming bladders.

Not all air bladders are used for this preparation. The air bladder of deepwater hake is most suitable for production of isinglass.

In India air bladders of eel and catfishes are used for the production of isinglass. The air bladders are separated from fish and temporarily preserved in salt during transport.

On reaching the shore they are split open, washed thoroughly, outer membrane is removed by scraping and then air dried. Cleaned, desalted, air dried and hardened swimming bladders (fish maws) are softened by immersing in chilled water for several hours. They are mechanically cut into small pieces and rolled or compressed between hollow iron rollers that are cooled by water and provided with scraper for the removal of any adhering dried material.

The rolling process converts the isinglass into thin strips or sheets of 1/8 to ¼‖ thickness.

There are processes for the production of isinglass in powder form also.

Isinglass / Fish maws

❖Dried air bladders (swim bladders) of catfish, carps, eels, polynemids, sciaenids, sea bass, etc. is called Fish maws.

❖They are rich in collagen and used as delicacy in Chinese soups. The bladders are first removed from the selected fish and blood and adhering fat materials are scraped off. They are then cut open and washed thoroughly in running water. Then the outer black membrane is removed by scraping.

❖Subsequently the bladders are cut into pieces and are dried in an artificial drier or in sun and stored in suitable containers.

❖ Isinglass, so prepared is used for clarifying beverages like wine, beer and vinegar. Isinglass also reduces 2 to 0.05% of the suspended solids in beer and increases filtration rate from 3000 to 11,000 liters.

❖It can also be used as an adhesive base and in confectionery product, Indian ink and as an efficient adhesive for glass, pottery and leather. Products with less than 8% moisture content are however, preferred for industrial purposes.

- Isinglass dissolves readily in most dilute acids or alkalis, but is insoluble in alcohol.
- In hot water isinglass swells uniformly producing opalescent jelly with fibrous structure in contrast to gelatin.
- It is used as a clarifying agent for beverages like wine, beer, vinegar etc. by enmeshing the suspended impurities in the fibrous structure of the swollen isinglass.
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- India exports dried fish maws, which form the raw material for the production of isinglass and other such products.
- Process has been developed to produce the finished products from fish maws.

12.4.1 Advantages and Disadvantages

- Value added products meet changing consumer life-style requirements.
- Offers better utilization of different low value fishes as well as by-catches.
- Facilitates incorporation of other ingredients for culinary benefits, quality and economy.
- Promotes employment, entrepreneur ventures and exports and also minimizes imports.
- Provides greater convenience to consumer through decreasing preparation time and minimizing preparation steps.
- In general, returns out of value added products are always greater than fresh fish/ shell fishes.

There are some disadvantages as well:

- Value addition increases the cost of product.
- Requires skilled technology, attractive packing and refrigerated storage etc.

But the advantages are more.

HACCP in Safe Product Production

Introduction

•Food standards have been introduced on a ***national and international level to protect the consumer's health and ensure fair practices in food trade.***

•The formulation of standards for fish and fish products became necessary ***to attain a minimum standards of cleanliness and hygiene in fish handling, processing and exporting.***

•In order ***to assure the quality of sea foods various inspection systems are in use.***

•The guideline by these ***inspection agencies ensures that marine products are safe*** to consume and are produced under hygienic conditions.

National Standards:

❖**Government of India** through an act of parliament passed **a legislation on the Export (quality control & inspection) Act in 1963.**

❖Based on this act an **Export Inspection Council (EIC)** was set up on January 1964 to conduct quality control and pre shipment inspection.

❖ The EIC is assisted by **Export Inspection Agency (EIA)** established by the Government under section of the act.

❖**Five such EIA were established**, one each at Mumbai, Kochi, Kolkatta, Delhi and Chennai.

Bureau of Indian standards (BIS)-initially known as Indian Standards Institution (ISI)

The Food Safety and Standards Authority of India (FSSAI)-Act, 2006 /various Ministries and Departments

International standards

Codex Alimentarius Commission-The codex documents include proficiency in respect of good hygiene, contaminants and food additives, labelling, presentation and sample selection.

ISO 9000- established in 1946 with headquarters at Geneva, Switzerland.

USFDA-enforced by US Government for the safety of general public.

Hazard Analysis Critical Control Point (HACCP)

Hazard Analysis Critical Control Point (HACCP)concept was proposed by USFDA has been taken as ***a standard process control system for assuring food safety by international bodies.***

This concept offers possibilities to secure the safe production of food**.** It helps the processors ***to perform the analysis and control the process to prevent known hazards*** that are likely to occur.

It is a preventive strategy, based on thorough analysis of the prevailing conditions in the processing factory. ***It is a study related to the prevention of contamination and growth of micro organisms in all stages of food chain.*** Through this system, the hazards that may occur at different stages of processing are identified and prevent it or reduce it to ***an acceptable or safer level by the implementation of Good Manufacturing Practices, Good Hygienic Practices, Sanitation Standard Operating Procedures etc.***

Hazard: A hazard is a biological, chemical, physical or economical factors with potential to cause an adverse effect on health and wealth.

Biological hazard: This includes pathogenic bacteria, viruses and parasites. These hazards can come from raw materials or from food processing steps.

Physical hazard: It includes any physical substances like sand, stones, glass pieces, insects etc. Decomposition, adulteration and economic fraud also come under physical hazard.

Chemical Hazard: Naturally occurring chemical hazards including histamine poisoning, ciguatoxin, PSP, DSP, ASP, unintentionally added chemicals like pesticides, fungicides, intentionally added chemicals like antibiotics in aquaculture, sulphites used to prevent melanosis in shrimp etc.

Control point: Control point is any step in a manufacturing process of ***a product at which a biological, physical or chemical hazard can be controlled.***

Critical Control point: Critical Control point is **anystep in a manufacturing process of a product which if not controlled properly may result in the occurrence of a risk** so that the products are unwholesome or cause of economic fraud.

Principles of HACCP:

•Conduct a hazard analysis, identify, list the hazards and specify the control measures.

•Identify the CCPs in the process.

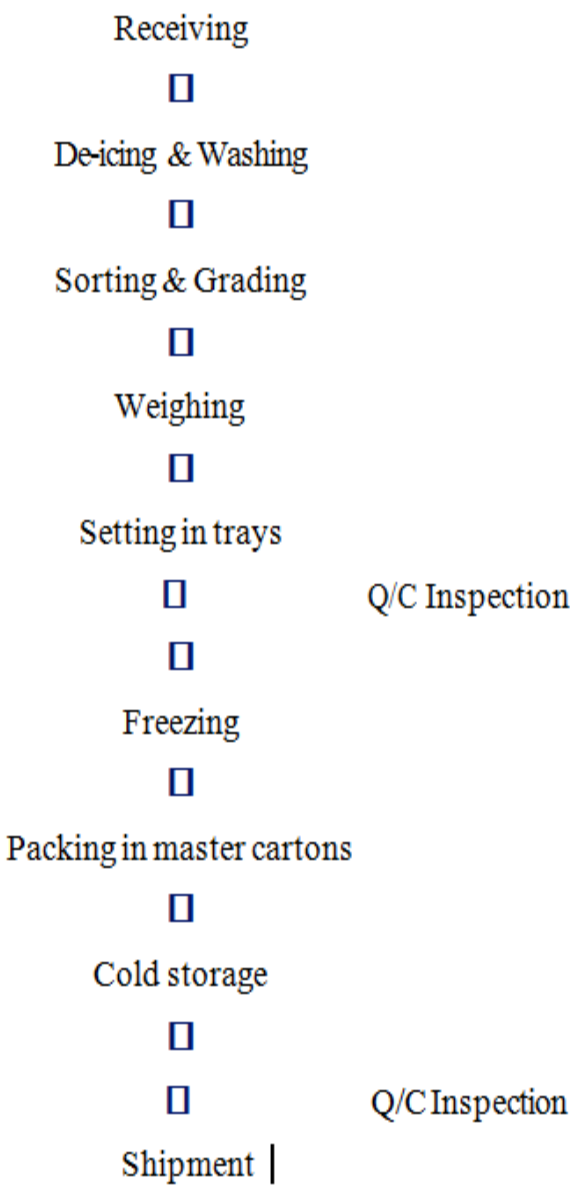
•Establish the conditions necessary to control hazards at each CCP.

•Establish monitoring system to ensure control of CCPs

•Establish corrective action or preventive measures to be taken while monitoring, indicates that a particular CCP is moving out of control.

•Establish verification procedure which include supplementary tests together with a review which confirms HACCP is working properly.

•Establish a documentation system.



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•Marine Fisheries and Sea food Processing, VHSE, SCERT, Kerala.
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