

Quality Problems in Seafood Industry

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Our seafood products can broadly be divided into two – Export products and Domestic products. The quality of the products in both these cases has to be good. Some of the most common quality problems usually encountered in these products are detailed below :-

Poor quality raw materials

We notice wide variations in the quality of raw material received in the seafood processing plant. This problem is dependent on size of the fishing craft, facility for icing and storage of fish on board the fishing vessel, facilities for further preservation and storage at the landing centre, sanitary conditions on board the vessel, pre-processing and processing centres etc. Attention is needed in the primary processing centre to see that (1) sand adhering to the whole prawns is washed off before starting any processing (2) the beheading operation has been satisfactorily carried out (3) peeling and deveining operations are complete (4) broken pieces are separately kept (5) the raw material temperature is never allowed to exceed 2°C (6) good quality water and ice are used for processing and (7) strict hygienic and sanitary conditions are maintained the processing unit.

Black spots in shell - on shrimp

Black spot formation or “melanosis” is a major problem in prawn freezing industry. This is an enzymatic reaction and requires access to oxygen in addition to the presence of heavy metals like copper and iron. Melanin pigments are produced by an oxidative reaction by tyrosinase on tyrosine. By this discolouration the eating quality is not lost, but it masks the appearance. These prawns can be packed as peeled meat. But this will diminish the unit value. One method of prevention of melanosis is cutting off access to oxygen. This can be done by keeping the material in ice and water with a layer of water above the material. As the enzyme is

more concentrated on the head portion, removal of head immediately after catch and subsequent icing will prevent black spot formation. *M. affinis* is most susceptible to black spot formation followed by *P. indicus*, *M. dobsoni* and *P. stylifera*. Treatment with potassium metabisulphite (0.2 - 0.5% for 1 to 2 minutes) is beneficial to reduce black spot formation. But higher levels of sulphite cause bleaching of the shell colour. By treatment, the level of sulphite as SO₂ should not exceed 100 ppm in raw meat and 30 ppm in cooked meat. The maximum black spot permitted is 10% by count in shell - on types and 5% by count in peeled type.

Weight loss during thawing

On thawing, frozen seafoods lose some weight as thaw drip consisting of water containing soluble nutrients and flavour bearing components. The weight loss due to drip is 5% in headless, 10-15% in peeled and deveined and 7 to 10% in cooked shrimp. It also depends on size : bigger the size, smaller the loss. It is also dependent on species (*M. dobsoni* and *P. stylifera* recorded highest.) It increases with pre-freezing ice storage period. Drip loss is prevented by treatment with polyphosphate. The maximum residual phosphate permitted is 5gm / kg as P₂O₅.

Dehydration in frozen products

Dehydration is evident as white patches on the frozen fish. Proper packaging with exclusion of air pockets, sufficient glazing, maintenance of constant storage temperature and relative humidity are important to reduce dehydration. The maximum dehydration allowed in shrimp for export from India is 20% by count.

Bacterial contamination

In addition to good organoleptic characteristics, frozen prawns / fish have to be free from excessive numbers of bacteria. Some types of bacteria, for eg. coliforms, *E.coli*, *Staphylococcus* etc. shall be present only in very limited numbers and some types for eg. *Salmonella*, *V. cholerae*, *Listeria* etc. shall be totally absent. Precautionary sanitary practices like chlorination of water supplies both for use in processing and ice manufacture, application

of regular cleaning schedules, strict enforcement of workers' hygiene etc are very important to keep down bacterial contamination.

Bacterial problems in canned products

All canned products are to be commercially sterile. Bacterial problem may be due to (1) insufficient sterilization and (2) post process contamination from cooling water. Contamination can also take place through faulty seams, as also normal seams. Seams, though normal, can always allow sucking in of water at the time of cooling because of strain on the seams due to temperature and pressure differences.

Excessive water content in oil packs

Fish canned in oil shall not contain more than 10% water in the drained liquor. More water will lower the shelf-life considerably by corroding the can and causing deterioration of the contents. This defect is due to insufficient pre-cooking and can be prevented by proper pre-cooking and draining of the cook'drip.

“Struvite” formation

The formation of magnesium ammonium phosphate hexahydrate (struvite) crystals is frequently found in canned crustaceans. Although these crystals have no taste or odour and are otherwise quite harmless, they are often mistaken for glass fragments by the consumer.

Magnesium (usually from water used) combines with ammonia generated from the fish muscle to form struvite. This resultant compound gradually crystallises. The pH is important, the phosphates being soluble in small amounts below pH 6.5 and in larger amounts below pH 4.

Honey - combing

Honey - combing is often encountered in canned tuna. It consists of pits in the fish tissue, usually between the meat layers and is seen after pre-cooking. Sometimes the pits are also seen on cut surfaces. A cross section of extensively pitted tissue has an appearance of an empty honey-comb. It is always considered as a sign of advanced decomposition.

Blue / black and brown discolouration in frozen lobster tails

As in prawns, black spot development occurs in lobster tails also. This can be prevented by keeping the lobsters alive upto the time of processing. Brown discolouration develops during frozen storage at the cut end of the meat portions probably by reaction of the enzymes. Proper glazing, wrapping and low temperature storage are remedial measures.

Discolouration in squid and cuttle fish

The important problem in frozen squid and cuttle fish is the yellow discolouration of the tubes and fillets. Bleeding immediately after catch and removal of appendages, inksac and gut contents followed by washing prevents yellowing. The semi-dressed material has to be stored in ice and water. Treatment with a solution of salt and citric acid is found to improve colour and texture of the squid and cuttle fish.

Foreign materials (filth)

Materials like flies, cockroaches (whole or body parts), hairs, fibre pieces, bits of paper and excessive sand can often be encountered in frozen shrimp depending upon hygienic conditions. These, in general, are termed as filth. There has been some rejection of Indian shrimp in USA due to filth. Careful washing and packing of the raw material and exclusion of flies, rodents etc. in the processing premises will solve the problem of filth to a large extent. The avoidance of peeling on floor and use of potable water for washing and proper washing of whole prawns with good quality water can reduce sand content.

Poor quality packaging materials

The packaging material used for packing processed seafoods shall be able to withstand the stress and strain of transportation and storage under cold conditions.

Pink and dun in cured products

A common type of spoilage in cured fish usually encountered in tropical countries like India is the formation of pink slimy patches on their

surfaces emanating unpleasant odour in advanced stages. This is caused by several species of coloured halophilic bacteria present in the salt used for curing.

Dun is another type of spoilage which manifests itself as chocolate brown spots caused by the growth of a halophilic mould *Sporendonema epizoum* giving an unpleasant appearance.

The climatic conditions prevailing in tropical countries are favourable for the growth of this mould. Dun can be prevented by dusting the dried product at the time of packaging with a mixture of 3 parts of sodium propionate and 97 parts of sodium chloride at the rate of 10% by weight.

Contamination with heavy metals

Heavy metals have been recognised as serious pollutants of the aquatic environment. They include metals like chromium, mercury, cadmium, cobalt, nickel, copper, zinc, lead and tin and metalloids like arsenic and selenium. The levels of these metals are within the limits in fishes. But cadmium has been reported to be above the limit in samples of whole squid/cuttle fish. Studies have shown that cadmium is mainly concentrated in the liver part and this problem can be avoided by careful removal of liver.

Decomposition and indole in shrimp

Decomposition is another serious problem in seafoods. Seafood spoils very quickly if proper care is not taken during its processing, storage and transportation. The maximum decomposition permitted in frozen shrimp is 5% by count. Decomposition is judged by various chemical quality indices such as indole, TVN, hypoxanthine etc. Some of the importing countries have fixed tolerance levels for indole. The maximum permitted limit of indole in shrimp is 25 microgram / 100gm.

Histamine in fish

In scombroid fishes like tuna, mackerel etc., histamine is formed during spoilage. Histamine is formed by bacterial action on the amino acid,

histidine present in scombroid fishes. Above certain levels, histamine causes food poisoning. The maximum permitted level of histamine in fish is 20mg / 100gm.

Pesticide residues

In recent years, aquaculture is given greater importance in our country. As most of the aquaculture is carried out either in paddy fields or adjacent areas, the problem of pesticide accumulation in these cultured fishes cannot be ruled out. Some of the most important groups of chemicals widely used as insecticides are DDT and its derivatives (DDE, DDD, or TDE), aldrin, dieldrin, benzene hexa chloride (BHC) and polychlorinated biphenyl (PCB).

Most of the countries which import seafoods have specified the maximum permissible limits of certain pesticides in the seafoods. The limits prescribed by USFDA are 0.3 ppm for Dieldrin and Endrin, 5.0 ppm for DDT, DDE and TDE and 0.3 ppm for Heptachlor.