

QUALITY PROBLEMS IN FISH PROCESSING

R. BADONIA, A. RAMACHANDRAN AND T.V. SANKAR

Veraval Research Centre of CIFT (Gujarat) 362 265.

ABSTRACT

Various problems associated with the quality of the fishery products like spoilage, discolouration, microbiological problems, etc., have been outlined. The reasons thereof and remedial measures are discussed. The importance of proper handling, processing and hygiene has been underlined.

INTRODUCTION

Seafoods are highly perishable in nature. Unpredictability of catch, uncontrolled harvesting, inadequate handling, processing and storage add up to the quality problems. The quality has to be maintained although the various stages till fish reaches the consumer. The quality problems arise mainly due to poor quality of raw material, ice and water, microbiological contamination; presence of heavy metals and storage aspects. In the export market the buyers insist on high quality and due to Modified Inplant Quality Control (MIPQC) the situation is improving. But in the domestic market the quality of fresh, dried and cured fish remain yet to be improved. The important quality problems in the field of fish preservation and related aspects are discussed in this article.

MAINTENANCE OF FRESHNESS

The intrinsic quality of fish varies with season, age, sex, maturity and many other factors. After the catch proper handling of fish is very important. The use of refrigerated sea water (R.S.W.) or chilled sea water (C.S.W.) is restricted to valued items like shrimp. Icing is prevalent for quality fish and ratio of ice varies with season and duration of fishing. With proper use of ice, shelf life of fish can be upto 8-10 days.

Enough care should be taken onboard by keeping the deck and fishhold clean and keeping the fish in shed. Major contamination takes place at the landing centre due to landing on unclean beach, dirty jetty, throwing the fish around, use of bamboo baskets and fish handlers. Gutting of bigger fishes onboard and bleeding will improve the quality.

BLACK SPOT, PINK/YELLOW DISCOLOURATION

Melanosis or black spot formation in shrimp and lobster is due to oxidative, enzymatic reaction, in which the amino acid tyrosine present in the material is oxidised to melanin by the enzyme tyrosinase. The eating quality is not affected but the poor appearance reduces the price. As the enzyme is concentrated in the head, beheading is useful. Keeping the material at chilled temperature and removing the oxygen or creating inert gas atmosphere control melanosis. Chemicals like ascorbic acid, sulphite and cysteine reduce black spot formation. Dip treatment for 2 minutes in 3000 ppm sodium or potassium meta bisulphite prevents black spot formation. Residual level of SO_2 in muscle should not exceed 100 ppm.

Pink or yellow discolouration takes place in squid and cuttle fish due to processing delays. Immediate icing, gutting, removal of ink sac, proper handling, thorough washing and storage in ice will reduce discolouration. Pomfret and nilsa on frozen storage develop yellow discolouration which may be due to oxidation of fat and lipid protein interaction during storage. Proper handling onboard, icing, gutting, glazing and antioxidant treatment reduce discolouration.

MAINTENANCE OF QUALITY IN FROZEN FISH

The quality of the frozen fish mainly depends on the quality of raw material, handling, processing time and storage conditions. Fish must be landed as fresh as possible, with icing. During processing also fish should be kept under ice. Filletting the fish in pre-rigor gives higher fillet yield, less drip loss and gaping. Handling of post-rigor fish is easy and uniform quality is maintained. Frozen fish stored for long period shows soft texture, loss of flavour and toughness upon cooking. Due to denaturation of protein, water holding, emulsifying and lipid binding capacity of the muscle is reduced. Drip loss upon thawing is considerable if the raw material used is not fresh. Polyphosphate treatment to reduce drip loss is not permitted. To maintain frozen fish

quality fresh raw material must be frozen rapidly giving proper glaze and wrapping in polythene sheet. The storage should be at the lowest temperature with constant temperature and humidity control. In the frozen products objectionable matter like sand, fibers, paper, flies, excess shell and veins and antennae, hair and other filth should be removed during processing. Thus general quality problems like excess drip loss, non-confirmity of grade, freezer burn and filth etc., can be avoided by proper care.

MICROBIOLOGICAL QUALITY

Fresh fish contains various types of microorganisms which are usually harmless to man. Bacteria are present in large numbers in fish in the slime, gills and gut. Initially the fish muscle is free from bacteria. Fish get contaminated on deck, landing centres, processing centres during transportation and storage. Bacteria that contaminate fish are mostly of human origin and include *Escherichia coli*, Fecal streptococci, Coagulase positive staphylococci, *Salmonella typhi*, *S. paratyphi*, *Vibrio cholerae*, etc. Other pathogens that contaminate fish may include *Clostridium botulinum*, *Bacillus cereus*, *Vibrio parahaemolyticus*, *Shigella dysenteriae*, and *Listeria monocytogenes*, etc.

E. coli, Fecal streptococci and other coliforms indicate fecal contamination. *Salmonella* contamination makes the fish unfit for human consumption. These organisms generally do not grow below 0°C. *Salmonella* is heat sensitive and is destroyed at temperature above 60°C. Some detentions of frozen sea food consignments were done due to *Salmonella*. Presence of *V. cholerae* have also been detected in sea foods. Crab meat and canned product can have *C. botulinum* toxin, which is quite hazardous. Recently *Listeria monocytogenes* has been detected by USDA from prawn and crab meat besides dairy products. This organism can survive boiling water temperature for 1-10 minutes and causes abortion in human and animals.

Bacterial contamination can be minimised by observing proper care in fish handling and strict hygiene during all the stages. Sanitary condition on benches, landing centres and processing units must be improved. Pollution of sea water with untreated sewage and effluents must also be prevented. Another problem in microbiological analysis is that conventional methods (colony counting) take long time.

Some rapid methods like spiral plate count, direct epifluorescent filter technique (DEFT), enrichment serology and enzyme

immunoassay have been found to be useful and should be adopted in this field.

PRESENCE OF HEAVY METALS

Presence of higher concentration of heavy metals like mercury, cadmium and copper etc., causes serious problems. Fortunately higher concentration is mostly in the intestine and in some cases in muscle. Higher quantity of mercury in some species of shark and tuna have been reported. Sword fish has been put under automatic detention by USFDA due to high mercury in fresh and frozen form. The tolerance limit for mercury is 1 ppm. The presence of cadmium upto 300 mg/kg was found in the intestine of cuttle fish and squid by the authorities of Italian Health Service. The limit for cadmium in edible portion is 2 mg/kg. Now the export to Italy is allowed after the removal of intestine. The oysters, clams and mussels have the tendency to accumulate heavy metals from the polluted encirons. The dumping of the untreated industrial waste into the sea is the main reason and strict control and monitoring is necessary to keep Indian waters free from heavy metal pollutions.

PROBLEMS IN CURED PRODUCTS

Quite large quantities of fish is preserved in the form of cured products mostly for domestic consumption. Beside traditional salted and dried products a new semidried product (Intermediate Moisture Product) I.M.P. has become quite popular. This IMP has moisture upto 40-50% with good texture and flavour but with shorter shelf life of 2-3 months. The main problems in this field relate to insect infestation, mites, fungus, presence of sand, excess salt, rusting (brown discolouration), pink and yellow discolouration etc. These defects lead to the loss of quantity and quality of product. The use of 3 ppm sodium propionate in salt can improve the quality. Drying on raised platforms, use of quality salt, avoiding flies, proper packaging and fumigation during storage will improve the quality of cured products.

WATER AND ICE QUALITY

Quality of water and ice used in fish processing is very important in maintaining overall quality. The requirement of

water to process 1 kg shrimp is 12 litres and 5 litres for fishes. The ice requirement is generally 1 : 1. The total plate count (TPC) for water and ice should not exceed 100/ml and coliforms (MPN) should be less than one 100/ml, Many times the water is not upto this quality and proper chlorination must be done. Chemical qualities of water like chloride over 1000 ppm and high total hardness also adversely affect the quality of finished product. Poor quality water and ice can be potential source of secondary contamination.

CONCLUSION

For improvement in quality awareness, training and demonstration among fisherman, fish handlers and others associated with trade and industry should be provided. More infrastructural facilities like ice making both onboard and shore, cold storage facilities and refrigerated transportation are required. The urgent need to update and frame standards for many new items in fresh, frozen fish and intermediate moisture products (IMP), is felt since long. Balanced induction of machines for ice crushing, peeling, grading, etc., will also be helpful. The care to protect our seas from pollution should be utmost in our mind.