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# Methods of fish preservation

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## ABSTRACT

Fish as a whole is considered to have a great potential for food and thus can be expected to provide relief from malnutrition. Fish, however, is very susceptible to microbial and chemical deterioration like lipid oxidation, hydrolysis and protein denaturation etc. Moreover, the high ambient temperature of our country favours the rapid microbial growth, hence there is a need to properly handle and preserve the fish, so as to increase its shelf life. Also, fish in a fresh state is not always available due to seasonal fishing and the far location of major fishing grounds from cities and consuming centres. Hence, updated methods of long term preservation are required which include icing, salting, drying, smoking, canning etc. these methods are applied as per the seasonal requirement or the stage and type of species.

**KEY WORDS:** fish, preservation, salting, smoking, icing, freezing and canning.

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## INTRODUCTION

A major contribution to the protein requirement of the world population is fulfilled by fish and hence plays an important role in alleviating the prominent problems of malnutrition. Fish is also an excellent source of polyunsaturated fatty acids (PUFAs) of n-3 family, lipid soluble vitamins and minerals. Besides acting as a brilliant source of nutrition, it also provides substances necessary for the human body and also reduces the risk of various diseases[1, 2]. For example, the omega-3 acid it contains when consumed on a regular basis, reduce the risk of heart disease, strengthens the immune system, reduces blood pressure by small but significant amounts and improve blood clotting regulation. But, however, fish is highly perishable commodity, more than cattle, sheep and poultry. Various changes take place in the fish the moment it is taken out of water leading to its spoilage. Spoilage is brought about by the action of bacteria, enzymes and also due to the autoxidation processes occurring in fish. Spoiled fish, due to the various physical and biochemical changes is less acceptable to consumers. Hence, to maintain the quality and acceptability of fish, proper preservation methods are required before it is disposed off. Common preservation methods employed for enhancing fish shelf life include:

### 1. *Icing:*

It is the most efficient and cheapest preservation method which involves lowering the temperature of fish by the use of ice. It is a highly effective short term preservation method as required during transport of landed fish to the nearby markets. Icing does not prevent spoilage but controls it. Ice cools the fish by absorbing heat and thus reducing the bacterial growth. Also, the melted ice carries away a good proportion of bacteria from its surface[3,6]. However, this melted water also carries away with it a considerable percentage of soluble proteins, salts and other nutrients.

While spreading fish and ice it should be ensured that ice is spread evenly over the fish and around the edges. A layer of ice is spread over the bottom of bottom of the pound followed by a layer of fish and the process is repeated until the height of fish and ice together reaches upto50 c.m with a layer of 5c.m of ice above the top of fish. Further, increase in height above 50c.m is not recommended as it leads to excessive pressure on the fish lying at the bottom causing its quick spoilage[3].

### 2. *Drying:*

It is one of the oldest and least expensive methods of preservation of food. It involves removal of water from the body of fish. It is based on the principle that as drying removes water from the body, it therefore, retards or totally inhibits all microbial and autolytic activities resulting in preservation.

Traditionally, the term 'drying ' is used in context to Sun drying where the evaporated water is carried out by flowing air. Hence the efficiency of this process remains at the mercy of elements of nature. Recently, with the development of artificial driers, the important operational parameters like temperature, air velocity and humidity can be controlled and the term Dehydration is used instead. However, the terms drying and dehydration are being used now a days without much specificity.

Drying may be-

**2.1** ***Natural*** – It involves solar and wind energies which yields very stable products. Temperature ranging between 35-40$^{o}$C and sufficiently low RH is essential for natural drying. Use of raised platforms is necessary as it allows better air movement. It is cost effective.

It also involves the solar drying. Example- The use of solar tent drier which works on the principle that black surface of absorbs sun's heat and hence when heated air is passed to black polythene tent drier, it passes through the fish, dries it and then escapes through the vent at top. However, it is advantageous over sun drying as it involves shorter drying periods and no contamination from dust and insects.

**2.2** ***Mechanical Drying***- It may be done in two ways. In one way by the transfer of hot air to the product through the use of kiln drier, tunnel drier etc. The water vapor exchange takes place at the point of contact point of hot air with the product.Generally, a kiln drier consists of two story building. The material to be dried is spread in upper story and the furnace producing hot air is kept on lower floor from where hot gases pass through the product. The material being dried has to be turned and stirred frequently to ensure uniform drying.

In the second type, heat is transferred to the product through a solid surface. Eg.Use of Drum drier for drying fluid material. The food material in the form of slurry is deposited as a thin film on the drum which is then heated through steam and rotated. It can be done in open atmosphere or in vacuumed chamber[4].

**3.** ***Salting***-It is a widely practiced, simple and inexpensive method of fish preservation used as such or in combination with drying and smoking. The salted products have reasonably good nutrient content with enhanced shelf life. Presence of salt at 4-10% level in fish flesh is known to prevent the action of most spoilage bacteria (*Pseudomonas*, *Achromobacter*, *Clostridium botulinum*) as well as decomposition process[4, 5]. The salt used may be solar salt produced from evaporating sea water or grounded rock salt mined from natural deposits. Before salting, the fish is split open to provide greater surface area for salt to come in contact with. Bigger fishes are eviscerated, gills and backbone removed and cut into thin fillets. Skinning and scaling is

preferred for proper salt penetration. Very small fishes are salted as such. The common methods employed for salting include:

**3.1** ***Dry salting***- Here dressed fish is mixed with crystalline salt in alternate layers with the proportion of salt increasing upwards. A solution of salt so formed due to water exuded from will act as self brine. Fish will be allowed to remain in brine for 2-3 days after which it is taken out and dried or disposed as such.

**3.2** ***Kench salting***- It is a method of dry salting except that the salt brine so formed is drained off.

**3.3** ***Brine salting***- Here fish is kept immersed in brine of desired concentration for the required time. It is generally a preliminary step to smoking and canning. As the initial brine becomes diluted after some time, it must be replaced by strong one if a strong cure is required.

**3.4** ***Mixed salting***- It is also called as pickle curing. Here the large sized fish is mixed with dry salt, packed in watertight containers with salt sprinkled between each layer and then topped with saturated brine. Thus, it is a quick salting process as fish is surrounded with brine right from the beginning.

**4.** ***Smoking***-It is an ancient method of fish preservation which is usually performed by following main methods:

**4.1** ***Cold smoking***- It is a conventional smoking method carried out in traditional chimney kilns. It is carried out at temperature not exceeding 40$^{o}$C and duration of smoking extends from 36 to 72 hours. It is actually flavoring the fish with smoke and not cooking it. The highest quality of product is achieved when temperature, relative humidity and the amount of ventilated smoke are kept at correct proportion. Relative humidity if above 70-80% will slow down drying and smoking process and hence to control it flame dampers are kept open to provide good draught whenever required.

**4.2** ***Hot smoking***- Here the fuel is burnt either directly inside the kiln or movable trolleys or in an external hearth located near the tunnel. In hot smoking, fish is dried and cooked before it is smoked. Drying is done in an intense draught of hot air at 75-80$^{o}$C produced by burning fire. The skin of fish becomes dry while the flesh becomes cooked as well. Now, the fish is ready for smoking which is produced by burning logs with saw dust and the temperature is maintained at or above 100$^{o}$C[4].

5. ***Freezing***- it involves cooling to very low temperature such that the water in the fish is converted into ice. Lowering the temperature will reduce the enzymatic, microbial and chemical autolytic processes. Freezing begins usually at -1 to -2$^{o}$C. freezing methods commonly employed are –Freezing in air (Blasting), Indirect contact freezing (by keeping in contact with refrigerated metal surface), Using Liquid refrigerant like dichlorodifluoromethane, Immersion freezing by spraying refrigerant aqueous solutions of Glycol, Glycerol, Sodium chloride, mixtures of sugars and salts etc. or Cryogenic freezing using freezants like boiling nitrogen and boiling or subliming carbon dioxide.
6. ***Canning***-It involves heat treatment of fish in sealed containers made of tin plates, aluminium cans or glass, until the product has been fully sterilized[6].During caning, heat treatment should be sufficient to destroy all heat sensitive bacteria and spores, inactivate the enzymes and cook the fish so that the product remains acceptable to the consumers after prolonged storage. Further, the canned food fish stored in airtight packet to prevent contamination from pathogens[7]. If heat treatment is properly carried out, canned fish may remain in storage for several years without refrigeration[8].Also, the canned fish must be in first class condition and must be in in hygienic condition with reduced microbial load. Poor quality fish will produce canned fish with offensive odour and flavour, poor quality[9].

## CONCLUSION

Knowing the perishability of fish, preservation becomes an important aspect of aquaculture industry. It not only maintains odour, flavour, taste and nutritive value but also enhances the shelf life of fish. Better preservation techniques depending upon the specie type will fetch greater economic gains and hence, Govt. must invest more on the research in this field as much work is not done in this field.

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