

## Unit – II: Methods of Fish Preservation

### 2.1 Traditional Methods of Fish Preservation

Fish preservation is one of the oldest practices used by fishing communities to prevent spoilage and to ensure availability of fish during seasons of scarcity. Traditional preservation techniques depend largely on environmental conditions such as sunlight, temperature, humidity, and availability of salt or smoke. Though simple, these methods are effective and economical, especially for small-scale and artisanal fisheries.

#### Sun Drying

Sun drying is the most ancient and widely practiced method of fish preservation. In this process, freshly caught fish are cleaned, gutted, and spread out in open areas under direct sunlight. The heat of the sun and the movement of air remove moisture from the fish tissue, reducing the water activity and thereby inhibiting the growth of microorganisms. Drying reduces the weight of the fish and enhances its shelf life for several months. However, the quality of dried fish depends on weather conditions and hygienic handling. Exposure to dust, insects, and high humidity may reduce product quality, so the use of raised drying racks or solar dryers is preferred.

#### Salt Curing

Salt curing is a simple and inexpensive method based on the principle of osmosis. Salt draws water out of the fish tissue and creates a highly concentrated brine that prevents microbial activity. There are three common techniques of curing—dry salting, wet salting, and brine curing. In dry salting, layers of fish and salt are alternated, while in wet salting, fish are soaked in concentrated brine solution. The process reduces moisture and produces a characteristic salty flavour. Cured fish can be stored for a long time if kept in dry conditions. Salt-cured fish products are common in tropical regions and are used for both domestic consumption and export.

#### Pickling

Pickling is another traditional technique in which fish are preserved in acidic or saline media such as vinegar, acetic acid, or brine, often along with spices and oil. The acid lowers the pH and prevents bacterial growth. Pickled fish develops a distinctive flavour and soft texture. The method is widely used for small species such as anchovies and mackerel. Pickling requires good-quality raw material and hygienic conditions to avoid contamination. Proper sealing of containers ensures longer shelf life and maintains the aroma of spices and acids used.

## Smoking

Smoking is a method that combines drying, heating, and the deposition of chemical compounds from smoke onto the surface of fish. The process not only removes moisture but also adds flavour, colour, and aroma. Smoke contains phenols, aldehydes, and organic acids that possess antimicrobial and antioxidant properties. There are two main types of smoking—hot smoking (60–80°C) and cold smoking (30–40°C). Hot smoking cooks the fish and produces a ready-to-eat product, while cold smoking partially dries the fish for further storage. Traditionally, hardwoods such as coconut husk, cashew, or mango wood are used for smoke generation. Smoking improves palatability and enhances the shelf life of fish in humid coastal regions.

Traditional preservation methods continue to play an important role in fish processing, particularly in rural and coastal communities, because they are simple, energy-efficient, and require minimal investment.

## 2.2 Advanced Methods of Fish Preservation

With modernization and the development of the fishing industry, advanced preservation methods have evolved to maintain high-quality fish products suitable for both domestic and international markets. These methods rely on scientific control of temperature, pressure, and processing conditions to extend shelf life while preserving the nutritional and sensory characteristics of fish.

### Chilling or Icing

Chilling involves lowering the temperature of fish to near 0°C without freezing it. Ice, in the form of crushed or flake ice, is used to maintain the temperature of fresh fish during handling, storage, and transport. The cold environment slows down bacterial activity and enzymatic reactions. Chilled fish retains its natural texture, taste, and appearance for several days. Icing is especially useful for short-term preservation on fishing boats, at landing centres, and in retail markets. Continuous drainage of meltwater is essential to avoid bacterial growth.

### Refrigerated Sea Water (RSW)

In this technique, fish are stored in tanks containing chilled seawater maintained at around –1°C to 0°C. The uniform cooling of the entire fish surface ensures better preservation than ordinary icing. RSW systems are installed on large fishing vessels and provide longer storage life for high-value fish such as tuna and mackerel. The saline nature of the cooling medium prevents freezing and keeps the fish firm and fresh for several days before landing.

### Freezing

Freezing is the most widely used modern method of long-term fish preservation. The temperature is reduced to –18°C or below, converting the water in the fish tissues into ice

crystals. Microbial activity and enzyme action are practically halted under such conditions. Quick freezing methods such as blast freezing, plate freezing, or individual quick freezing (IQF) preserve the natural structure and appearance of the fish. Frozen fish retains nutritional quality for several months if stored under consistent low temperature. Proper packaging and cold-chain maintenance are essential to prevent freezer burn and dehydration.

### **Canning**

Canning involves heating cleaned and processed fish in sealed, airtight containers to temperatures of 115–121°C under pressure. The high temperature destroys spoilage organisms and inactivates enzymes, making the product shelf-stable for a year or more without refrigeration. Common canned fish varieties include tuna, sardines, mackerel, and salmon. The process includes steps such as washing, cutting, precooking, filling, adding brine or oil, sealing, and sterilizing. Canned fish are convenient, nutritious, and safe for long-term storage and transport.

### **Irradiation**

Irradiation, also called cold sterilization, uses controlled doses of ionizing radiation such as gamma rays to destroy microorganisms, parasites, and insects present in fish. Unlike heat treatments, irradiation causes minimal changes in texture, colour, or flavour. It can be used either alone or as an adjunct to refrigeration to enhance shelf life. The technique is approved by international food safety agencies and is particularly useful for export products that require long transit times.

### **Accelerated Freeze Drying (AFD)**

Accelerated freeze drying is an advanced method that combines freezing and vacuum drying. In this process, fish are first frozen and then exposed to reduced pressure so that ice sublimates directly into vapour without melting. This technique retains the natural shape, flavour, and nutritional properties of the fish while producing a lightweight, porous product that can be rehydrated easily. AFD products have very long shelf life and are ideal for military, space, or emergency rations. Though expensive, this method ensures premium-quality preserved fish with minimal loss of nutrients.

Advanced preservation methods ensure better quality control, hygiene, and consumer safety. They play a key role in the global seafood trade by maintaining the freshness, texture, and nutritive value of fish even after extended storage and transportation.