SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution

Coimbatore – 35

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DEPARTMENT OF FOOD TECHNOLOGY

19FTE402 &
MEAT, FISH AND POULTRY PROCESS TECHNOLOGY

TOPIC – Preservation- Canning and smoking operations, Salting and drying of fish, pickling

Introduction

- The traditional methods of processing fish by salting, drying, smoking pickling etc. are collectively known as Curing. Curing is the oldest method of fish preservation.

- Though traditional it is still widely practiced in developed and developing countries. Though produced in coastal areas, cured fish is usually consumed in the interior markets and hilly areas.

- This is the cheapest method of preservation also, since no expensive method or technology is used. About 20 % of the fish caught annually is used for curing in India. It is also an important form of export.

The process

- Curing is a process by which the fish is preserved by sun drying, salting, pickling, smoking, artificial drying etc. This can be done either by any single method or acombination of these methods.
- Traditionally, simple sun drying was practiced widely. Here preservation was achieved by removing the water in the fish, thereby retarding the activity of bacteria and fungi.
- The heat was able to destroy the bacteria to a certain extent. Later on it was a combination of both salting and then drying or salting, smoking and drying.
- In the current market situation both wet and dry cured fishery products have commercial importance.

Methods

- Drying
- Wet curing
- Dry curing
- Smoking
- Mona curing
- Colombo curing

Drying

There are basically two methods of drying fish. The common one is by utilising the natural heat available from the sun. This is known as sun drying. The other is by using artificial means like mechanical driers for removal of moisture from the fish.

Sun drying

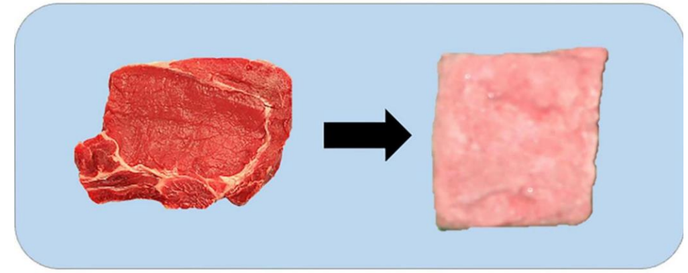
- This is the simplest method of drying fish . The fishes dried in this way are small, lean ones, which are available in plenty during the glut season.
- They are usually spread out on the seashore as whole with little preprocessing. Sometimes they are given a washing in the seawater.
- Drying takes place usually by the removal of moisture from the surface and later from the interior of the fish. Depending on the relative humidity, temperature, air velocity, the removal moisture takes place continuously.

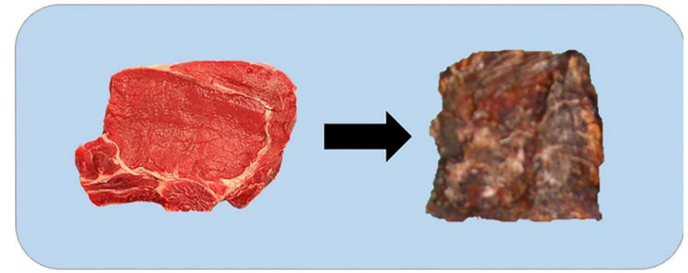
Drying

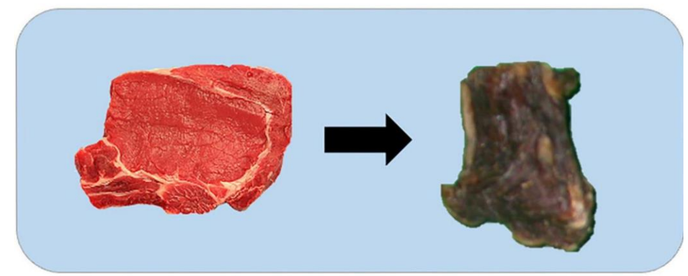
Factors, which affect the rate of drying, are:

- Size of the material, larger fish takes a longer time to dry where as smaller ones lesser
- Surface area, large surface area will increase the rate of drying.
- Temperature, the higher the temperature the faster will be the rate of drying
- Relative humidity, the lower the RH the faster will be the drying
- Air velocity, the greater the speed of the air, the faster the drying
- Fat Content, fatty fishes will take a longer time to dry than lean fishes
- Water content, the higher the water content the faster is the drying

Colour changes in dried meat







Drying

- Fish is also conventionally dried on coir mats, cement platforms, bamboo mats and jute sacks. Often this sort of drying gives a product, which is contaminated with sand, and other foreign matters. The fish dried on cement platform gets partially dried due to the excessive heat.
- It becomes necessary that the fish is turned over often to ensure a uniform dried material. The advisable method for drying fish is drying them on rack.
- Here the fish is dried on a raised platform above the ground. This can be made by tying old webbing to poles made of locally available materials like casuarinas, bamboo etc.
- which are fixed at regular intervals. Here the main advantages are that there is a circulation of air from both top and bottom. There is no contamination of the product, hence a quality product is assured.

Drying

Solar Drying

This is a method by which the sun's heat is converged and utilized for drying. Converging of solar heat can be effected by using a black surface which absorbs heat far more effectively than a light coloured one. Solar tent driers and cabinet driers work on this principle.

Mechanical driers

- In mechanical driers the removal of water from fish requires an external input of thermal energy. This is brought about by burning fuel. This is an expensive method since there is need for fuel for heating and maintenance of the temperature.
- The drying chamber consists of a long tunnel in which the product is placed on trays or racks. A blast of hot air is passed over the material to be dried. After the required degree of drying the product is removed from drier and packed.

Dry Curing

- This is the most widely used method of fish curing. All types of fishes except fatty fishes big or small are cured by this method. Here, the fish is gutted, beheaded or ventrally split open and the viscera removed.
- The fish is then washed clean. Larger fishes are dorso-ventrally split open and cleaned thoroughly. Scores are made along the thick flesh portion for better penetration of salt. Salt is then applied in the ratio 1:3 to 1: 10 (salt to fish) depending upon the size of the fish.
- The fish is then salted in cement tanks or containers. The bottom of the tank is covered with salt and a layer of fish is placed. Both fish and salt are alternately placed in the tank and wooden planks are over put down on the top and weighed down.
- The salt draws out the water in the fish and the weight placed keeps it under pressure. The fish is kept in this condition for 24-48 hours. After this the fish is taken out, washed in brine solution to remove adhering salt and drained. It is then dried in the sun to required level of moisture. Yield of the product by this method is about 35-40%. This product has a shelf life of 6-10 weeks.

Dry Curing

- The initial stages of processing and salting are the same as for dry curing. Once the fish is put into the tank it is allowed to remain in the self-brine. The fish is not dried at all.
- The wet fish is then drained and packed in Palmyra leaf baskets or coconut leaf baskets and taken to the market. The fish is taken out only when there is demand. This method is particularly suitable for fatty fishes.
- This is mainly done for fishes like oil sardines, mackerels, and ribbon fishes etc. wherein the fat gets oxidised on exposure to air during exposure to air. That is why it is not dried. When immersed in the tank there is no contact with outside air.
- These products have moisture content of 50-55% and the salt content around 25%. They are most susceptible to fungal attacks, bacterial degradation and general putrefaction. They have a very short shelf life.

Smoking

- Smoking is another traditional method of `preservation of fish. Smoking is generally a combination of salting, and drying. Smoking is usually done in a kiln or a room, which is specially prepared for it.
- The source of smoke is wood or sawdust or coconut husk, depending on the particular flavour required. The fish that is salted and partially dried is used for smoking.
- Smoking can be cold, hot or liquid. If the temperature is below 35 °C, it is cold and which is 70 to 80°C it is hot. In a tropical country like ours hot smoking processes is preferable.

Smoking

- Hot smoked products are partially cooked due to the heat of smoke. The preserving effect of smoking on fishery products is attributed to a combination of surface drying, salting and deposition of phenolic and other anti microbial constituents of smoke on the fish.
- Both salted and unsalted fishes are smoked. Small fishes are smoked whole whereas larger ones are smoked as fillets or chunks. Freshness of the fish is an important factor determining quality of smoked product.
- Smoked fish have the potential danger of containing certain carcinogenic compounds of smoke such as 3-4, bensopyrine harmful due to the presence of carcinogenic compounds.

Salting

- Salting is a process where the common salt, sodium chloride, is used as a preservative which penetrates the tissues, thus checks the bacterial growth and inactivates the enzymes.
- Some of the factors involved in salting of fish which play an important role are purity of salt, quantify of salt used, method of salting and weather conditions like temperature, etc.During the process the small fishes are directly salted without being cleaned.
- In the medium and large sized fish the head and viscera are removed and longitudinal cuts are made with the help of knives in the fleshy area of the body. Then the fish is washed and filled with salt for uniform penetration through flesh. Large fishes like sharks are cut into convenient sized pieces. Generally, sardines, mackerels, seer fishes, cat fishes, sharks and prawns are used for salting.

Salting

Dry salting and wet salting and are the methods employed in salting of fish.

a) Dry salting

In this process the fish is first rubbed in salt and packed in layers in the tubs and cemented tanks. The salt is applied in between the layers of fishes in the proportion of 1:3 to 1:8 salt to fish. The proportion of salt to fish varies with the fish since the oily fish require more salt. At the end of 10 - 24 hours the fishes are removed from the tubs and washed in salt brine and dried in the sun for 2 or 3 days.

Salting

b) Wet salting

The cleaned fish are put in the previously prepared concentrated salt solution. It is stirred daily till it is properly picked. With large sized fishes, longitudinal slits are made in the flesh to allow penetration of salt. After pickling for 7-10days, the salty water that oozes out from the fish is allowed to drain off. This can be stored upto 3-4months.

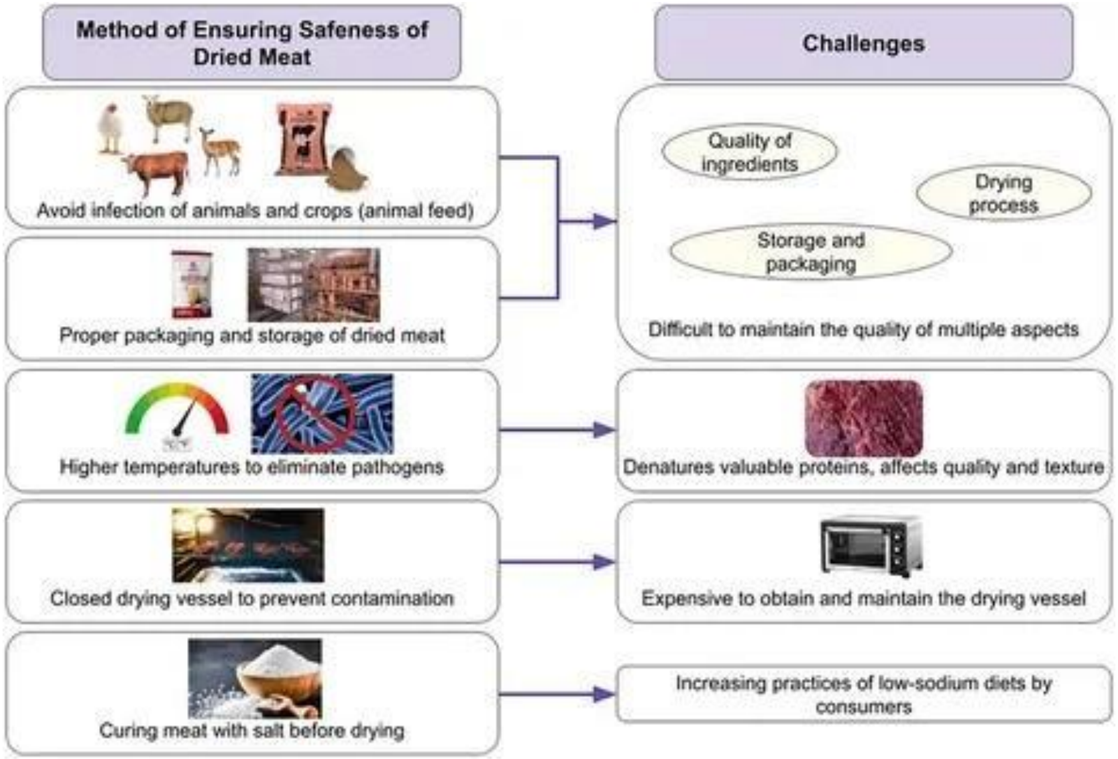
Salting

Precautions to be taken before salting:

- The fish used for salting should be as fresh as possible. It should be borne in mind that fresher the fish the better will be the end product.
- The water used for washing and brining should be potable and should not be coloured or contaminated.
- Salt used should be of good quality and should not contain high amounts of Magnesium and Calcium chlorides. These being hygroscopic in nature will delay the drying process.
- While dressing the fish care should be taken to clean and wash the same. The intestine should not be ruptured since this will contaminate the flesh

Salting

- All utensils and tanks used for drying and allied purposes should be cleaned properly and dried before use
- Cement tanks should be scrubbed scrupulously and kept clean
- Workers engaged in drying should be free of illness and should have an idea about handling practices
- No waste should be left unattended; the waste should be disposed off properly.
- Drying racks should be kept clean.



Fish Canning

Canning is relatively modern process, which enable food to be preserved in an edible condition under a wide range of storage condition for long period (from a few months to several years). There are three different stages to the process:

- Hermetically sealing the food in a container
- Heat ‘sterilizing’ the sealed unit and
- Cooling it to ambient temperature for subsequent storage.

Fish Canning

• Although the fish canning industry is more developed in the industrialized countries of the northern hemisphere, a number of tropical countries produce a variety of cannedfish product.

• Mexico and Brazil, for example, produce large quantities of canned fish, a large proportion of which is sold on the local market.

• Morocco is reported as the largest producer of canned sardines in the world and Thailand is now a producer of large quantities of canned tuna.

• Tuna is also canned in countries such as the Solomon Island and Fiji.

Fish Canning

Canning industry should be considered only if the following are available-

- A regular supply of large quantities of suitable fish (and other materials e.g. salt, oil, etc.) at a reasonable price.
- An adequate supply of cans at an economic price.
- Adequate manpower.
- Suitable infrastructure (energy, water, transport etc.)
- A market for the finished product.

Fish Canning

Definition of Canning

• Canning may be defined as packaging of food in a hermetically sealed container and obtaining commercial sterility through the use of heat processing.

•Commercial sterility may be defined as the degree of sterility necessary to destroy all harmful bacteria without changes in food quality.

• Canning is long-term preservation method storage range from 2-10 years with maintaining more or less same quality

Fish Canning

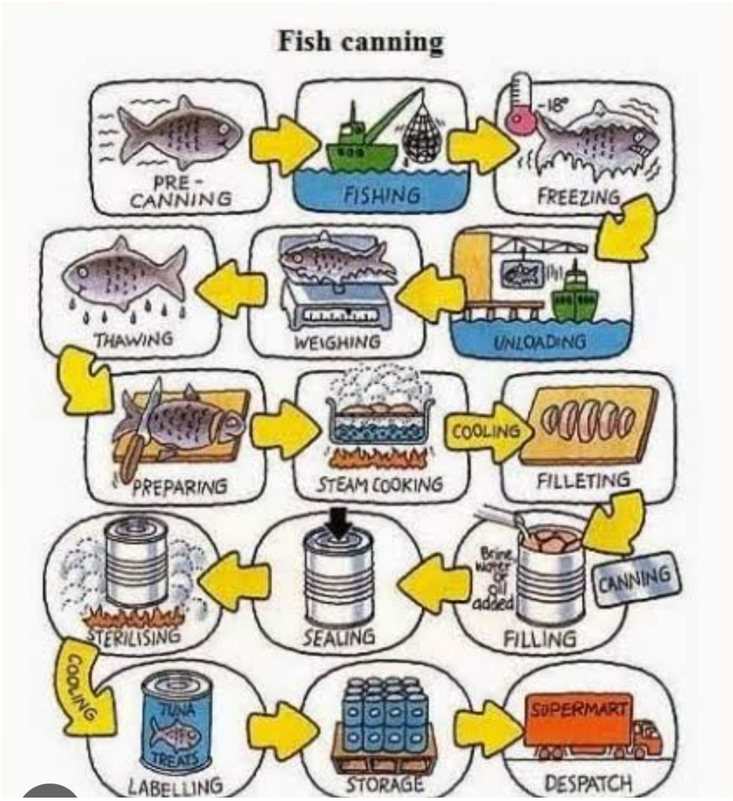
Principles of canning:

- To obtain commercial sterility
- To preserve the fish in a hermetically sealed container by subjecting to require heat processing.
- Maintenance of bacteriological principles.
- Maintenance of anaerobic condition within the can.

Fish Canning

Steps of fish canning:

1. Selection of raw materials
2. Treatment before canning. 1. Nobbing 2. Washing and de-scaling
3. Brining
3. Packing/ filling the can
4. Exhausting.
5. Closing the can
6. Washing.
7. Heat processing/ retorting.
8. Cooling.
9. Labeling and boxing.



Fish Canning

1. Selection of raw materials:

• Mature, pre-spawning fish and medium fatty fish are better for canning. Eventually fish with the following characteristics are used for canning-

– Excess bone

– Taste less

– High fishy odour

– Fish with hard and farm muscle.

– Available Eg: Sardine, Hilsa, Salmon, Herring etc

Fish Canning

2. Treatment before canning:

• Nobbing: In the case of larger fish, such as herring and pilchard, the head and gut are removed, but not the roe or milt. This process of removing head and gut in one operation is called nobbing.

• Washing and de-scaling: The next operation is de- scaling; remove fins, viscera from the raw materials and washing. Nobbing releases blood that must be removed because it causes brown staining in the processed fish. Washing also removes surface slime and dirty materials from fish.

• Brining: The fish are immersed in a concentrated solution of common salt for a predetermined length of time. Salt is absorbed by the flesh and imparts a desired flavour to the finished products in which a salt content of about 2 % is acceptable.

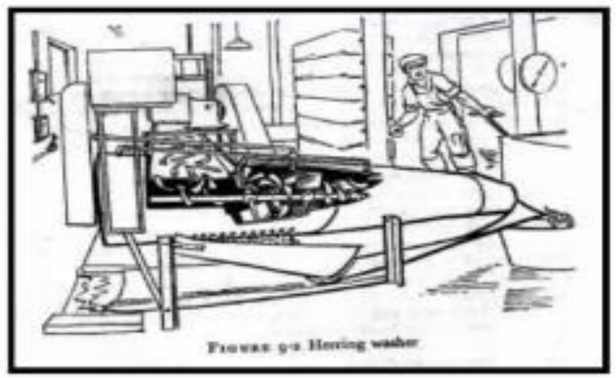


FIGURE 9.9 Herring washer

Fish Canning

3. Packing/ filling the can

• The above treated fishes are filled in the can either by manually or mechanically usually a small top space is left which is also called head space and generally filled with inert gas.

• The fishes are arranged inside the can as compact as possible.

• Necessary additives (Salt, Tomato sauce, Starch, Sugar etc) may be used to develop characteristics flavour and improve keeping quality.

Fish Canning

Exhausting is done by the application of heat. By this the gas inside the headspace and between two fish pieces will be removed and a partial vacuum will be formed.

Exhausting is done to prevent-

- Bulging of can
- Oxidation of the food
- Inside erosion of the tin plate.

Fish Canning

5. Closing the can: All fish cans prepared in this country are closed by the double-seaming method and the operation is usually called seaming. A seal must be achieved that will prevent passage of contaminating material, carried either in air or water, into the can a er it has been sterilized. Proper care and maintenance of seaming is vital and its performance should be checked at frequent intervals throughout the working day.

Fish Canning

6. Washing: • Washing of can is done by the hot water spray to remove adhering materials.

7. Heat processing:

• It is the most important step during the whole canning procedure.

• It is done for predetermined time at the respective temperature.

• To fulfill the canning objectives 32 minutes are required at 1100 C or 2.5 min is required at 1210 C. • The temperature of the can is determined a recorder which is called thermo couple.

• Heat processing is done in a special instrument called retort and so the process is called retorting.

Fish Canning

8. Cooling: • Cooling is done as quickly as possible a er retorting. Otherwise o flavour may produce because considerable changes may take place during heat processing

9. Labeling and boxing:

• After cooling, cans of large fish such as herring and pilchards are stored for a period of weeks before labeling.

• Cans of small fish are usually labeled directly, since thest are not so susceptible to damage.

• Ingenious machines are available for labeling dingley cans, and are capable of fixing the lid label, placing a key on this, and wrapping the whole in a greaseproof wrapper.

• Larger cans may have the top label pasted on by hand, and the side label by machine.

• Many canners label by hand, making use of female labour during off -season period.

• In recent years, the introduction of decorated lids has cut down the use of paper labels

Preparation of fish pickle

- Pickling is one of the safest means of preservation of fish. Pickles prepared from fish are gaining acceptance in recent days, since they add to the palatability to starch based bland tasting Asian dishes; besides being nutritious.
- Fish pickles are good appetizers too. At present there is an expanding export and domestic market for fish pickles.
- It is prepared by cutting the edible portion of the fish into small pieces, followed by deep frying in vegetable oil and are subsequently mixed with vinegar and salt for preservation, along with fried condiments and species for flavour development.
- The material is then generally kept for a minimum of 24 hrs for maturing before packing. This is a traditional product of the country and is now gaining popularity.

Preparation of fish pickle

Raw material

↓

Washing

↓

Filleting

↓

Size cutting

↓

Frying

↓

Mixing Ingredients

↓

Maturation

↓

Packing

↓

Sealing

↓

Labeling and Storing at room temperature

Mince the peeled garlic, ginger, cleaned green chilies into paste

↓

Frying (Fry fenugreek, cumin seed, mustard, asafoetida and powdered)

→ Mixing Ingredients

THANK YOU