Handling and preprocessing of fish for drying

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Fish is highly perishable because of their chemical composition, it is therefore, necessary to preserve fish after harvest if not consumed or disposed immediately. Hence, fish preservation has been practiced long before for storing the fish without spoilage. These gave household food security as well as optimum market value. It was reported that Asia is the largest producer of the cured fish products. About 20 % of the fish caught annually is used for curing in India. The main countries to which it is exported are China, Singapore, Middle East, Sri Lanka etc.

Drying

Earlier, simple sun drying was practiced. Here preservation was achieved by removing the water in the fish, thereby retarding the activity of bacteria and fungi. Drying of the fish is done in two ways. The common one is drying the fish under sun by using the solar energy. 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. Usually small, lean fishes are dried under this method. They are usually spread out under sun as a whole with minor preprocessing. Sometimes they are given a washing in the seawater or brine solution. Initially drying takes place by the removal of moisture from the skin surface and later from the interior of the fish. Depending on the relative humidity, temperature, air velocity, the removal moisture takes place continuously.

Factors, which affect the rate of drying, are:

1. Size of the material, larger fish takes a longer time to dry whereas smaller ones lesser time
2. Surface area, large surface area will increase the rate of drying.
3. Temperature, the higher the temperature the faster will be the rate of drying
4. Relative humidity, the lower the relative humidity the faster will be the drying
5. Air velocity, the greater the speed of the air, the faster the drying
6. Fat Content, fatty fishes will take a longer time to dry than lean fishes
7. Water content, the higher the water content the faster is the drying

Fish is also conventionally dried on coir mats, cement platforms, bamboo mats and jute sacks. Main disadvantage of this type of drying is that it can be contaminated with sand and 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 most accepted method for drying fish is drying them on rack. Here the fish is dried on a raised platform above the ground. Old webbing can be tied to the poles made of locally available materials such as casuarinas, bamboo etc. which are fixed at regular intervals. The main advantage of drying in raised platform is that there is a circulation of air from both top and bottom.

Dry Curing

Dry curing is the most common method of curing. Here the fish is thoroughly washed followed by gutting, beheading and ventrally split open to remove the viscera and finally cleaned. Dorso-ventral opening is given to the larger fishes which are then cleaned well. Vertical scores are given to the body of larger fishes in order for the better salt penetration. Salt is then applied in the ratio 1:3 to 1:8 (salt to fish) depending upon the size of the fish. Proper salting is given to the fish which are placed in cement tanks or containers. Initially bottom of the tank is covered with salt and then a layer of fish is placed above that. This fashion of alternate salt and fish is followed and finally large wooden planks are placed over it. Water oozes out of the fish as salt gets penetrate into it. The fish kept undisturbed for 24-48 hours. Fishes are then removed, washed well in brine solution to remove the adhered salt and drained well. The fishes are then sundried to the accepted moisture level. The yield obtained for the product by drying by this method is 35-40% and the product shelf life is 6-10 weeks.

Wet Curing

In this method of curing the initial steps are similar to that of dry curing. Once the salt penetrates inside the fish water oozes out where the fish is remained in the self-brine. Here the fish is not allowed to dry instead it is taken out and drained. This type of curing is generally followed for fatty fishes. This is mainly done for fishes like oil sardines, mackerels, and ribbon fishes etc. wherein the fat gets oxidized on exposure to air during exposure to air. In order to avoid the direct contact with fish, it is not dried and kept immersed in tank. The moisture content of the fish product will be high compared to that of dry cured products. Around 50-55% is the moisture and the salt content is around 25%. These products are having short shelf life period and are susceptible to fungal attacks, bacterial degradation and putrefaction.

Smoking of fish

Smoking is a very traditional method of fish preservation. It includes the combination of both salting and smoking. It remains still popular because of the flavor which it imparts on to the fish such as tuna, salmon, trout, sturgeon etc. it is done in two different steps where the

fish is initially dipped in brine or covered with dry salt followed by smoking and drying. The smoke is a colloid and comprises a collection of airborne solid and liquid particulates and gases emitted when a material undergoes combustion or pyrolysis, together with the quantity of air that is entrained. Wood when burns at 100-150°C, produces gases, vapour (H_2O), and volatile matters (2%) and at 150-200°C it produces volatile matters, CO_2 and CO.

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. Smoking can be cold, hot or liquid. If the temperature is below 35 °C, it is cold and when it is 70 to 80°C, it is hot smoking.

In a tropical country like India hot smoking processes is preferable. 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. Smoked fish have the potential danger of containing certain carcinogenic compounds of smoke such as 3-4, benzopyrine.

Improved Method developed for salt drying of fish by CIFT

- The fresh fish landed is immediately washed in clean sea water to remove slime, adhering dirt, etc.
- These are then taken to the fish curing yard where very strict care is to be taken to maintain hygienic conditions and quality of material. Unlike in the traditional method, all further processing work should be done on carefully cleaned tables to avoid contamination with sand, dirt etc.
- It is advisable to use chlorinated water (10 ppm) for all these cleaning operations.
- On the processing tables, the fish is dressed, removing the viscera. In the case of fishes like sardines etc. it is advisable to remove the scales also to improve the appearance of the final cured product. The viscera should be immediately removed to the waste baskets kept under the tables. In the case of small fishes, where this is not practicable commercially, fish is salted directly after cleaning it well.
- The dressed fish is then washed in good quality water and the water is allowed to drain completely. This can be easily done in perforated plastic containers.
- After complete draining, the fish is taken to the salting table where good salt is applied to the fish uniformly by hand. Care must be taken to keep the hands of workers clean for this operation. In general, the salt-to-fish ratio can be 1:3 (one part salt to four parts fish).
- After salting, the fish is stacked in very carefully cleaned cement tanks and kept for at least 24 hours in these tanks. After this, the fish is taken out and just rinsed in fresh water to remove excess solid salt adhering to its surface.

- The salted fish is then dried in clean drying platforms. These can be either clean, raised cement platforms or bamboo lattices. If these are not available, drying can be done on clean bamboo mats, but in this case, fish must be dried to moisture content of 25% or below.
- At every stage, extreme care must be taken to maintain proper standards of hygiene.

Drying of shrimp

- Wash and clean the sample
- Weigh the sample
- Take 1:1 water and heat it to 80°C
- Add 3% salt to it
- Give a dip in the water until the sample colour changes to pink
- Dip the sample in 0.1% citric acid
- Drain the water and keep it for drying

Advantages of the CIFT method

- The method is very simple and can be easily adopted by the common man.
- It prevents contamination with harmful bacteria and enhances the storage life of the cured fish considerably.
- It is comparatively a very cheap method. Considering the enhanced shelf life and increased price that can be realised by curing fish by this method, the slight increase in the cost of production can be treated as negligible.

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