



Solar Dryers - Designed by ICAR-CIFT

Flow diagram for hygienic salt drying of fish

Dressing of fish

(Butterfly style-Fresh fish is split open by a cut from dorsal side along the vertebral column and remove the entrails and gills, scoring of large sized fish)

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Thorough washing of dressed fish in potable water and draining of excess water

Salting of fish

(Salting is done as layer, not less than 1:7 salt to fish ratio. Salting to be done for a period of 16-18 h)

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After salting, fishes are to be taken out of brine, dip in potable water to remove undissolved salt

Drying of fish

(drying of fish in solar or mechanical dryer at temperature not more than 55°C to moisture content less than 30%)

Packing of Dried fish

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Cool the fish to room temperature and pack hygienically in bulk or retail packets

PACKAGING OF DRIED FISH PRODUCTS

Type of packaging and surrounding atmospheric conditions influence the quality of dried fish. Commonly used gunny bags are easy for the entry of insects, rodents and pests and spoil the product. Packaging materials having poor barrier properties exposes the product to adverse conditions such as oxygen, moisture, light and aerobic microorganisms. Materials like waxed corrugated cartons, deal wood or plywood boxes are suitable for bulk packaging of dried fish. Gusseted bags made of HDPE and LDPE laminates are found more suitable for bulk dry fish packaging. For consumer packs, LDPE or polypropylene are commonly used. However, laminated film of LDPE or polypropylene with polyester gives better water proof property.

Quality requirements of Dried Fish

Characteristics	Requirements
Water activity at 25°C	Less than 0.78
Salt content (% Sodium chloride) (Only for Dry Salted Fishes)	Not less than 12%
Histamine content (Max) (Only for Scombroid Fishes)	200 mg/kg
Acid insoluble ash (sand) on dry basis	Not more than 1%

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HYGIENIC DRYING OF FISH



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Fish drying is a major economic activity of fisherwomen in the coastal states of India. However, the quality of traditionally produced dry fish is very poor as it is processed under unhygienic conditions (open sun drying on sand, road, and cement platforms), causing contamination and loss of quality. Adoption of hygienic practices and standard operating procedures helps in attaining high-quality products with enhanced shelf life.

Selection of raw materials

The selection of fresh quality raw material is a necessary requirement for making high-quality dried fish products. Instead of using unsold fish, very fresh fish without any signs of spoilage should be selected for making dried fish intended for human consumption. Fishes that are in the early stages of spoilage can be used for making dried fish intended for animal feed development. Spoiled fishes should not be selected for drying purposes.



Salting process

Salting is preferred for bigger-sized fishes to improve the storage life of dried fish. Salt used to produce salted fish shall be clean, free from foreign matter, show no visible signs of contamination with dirt, oil, bilge or other extraneous materials. Fresh fish is split open by a cut from dorsal side along the vertebral column and eviscerated. For bigger sized fishes, scores are made along the thick flesh portion for better penetration of salt. The dressed fish is washed thoroughly and drained to remove excess water on the surface of fish. Salt is then applied in a salt: fish ratio 1:3 (bigger fish) to 1:7 (smaller fish) depending upon the size of the fish. Salting is done as layer by layer in a container, preferably a plastic or cement tank. Wooden planks are placed on the top and weighed down. Salting is done for period of 16-18 h, preferably overnight.



Dry salted fish



Fish after salting

Drying

Traditionally, very small fishes are dried whole without salting to a moisture content of less than 25%. Brine salted fish can be dried up to a moisture content of 30-35%.

The salted or unsalted fishes are dried by sun drying or mechanical drying

Sun drying

Sun drying is simple and economical but often ends up with poor-quality products. The selection of a drying site for open sun drying is very crucial in determining the quality of the final product. Entry of birds and street animals to the drying site should be prevented. It is always advantageous to dry the fish in a hygienic way on racks than on the sand or floor. Better circulation of air is ensured if the fish is kept at 1m above the ground. Racks designed with a sloping top allow easy removal of surplus water oozing out from fish at the beginning of drying. The fish need to be turned occasionally to facilitate quicker and even drying. Solar tent dryers also facilitate faster drying. Fishes like ribbon fish, Bombay duck and lizard fishes can be hanged from poles using hooks.



Mechanical drying

The process is totally controlled and yields a better quality product with longer shelf life compared to sun drying. In a mechanical dryer, the drying shelves need to be interchanged for attaining uniform drying. Mechanical drying may be done at a temperature of 50-60°C. Solar dryers of different capacities are developed and commercialized by ICAR-CIFT including hybrid solar dryer with LPG/ Biogas/ electricity as alternate back up heating source for continuous hygienic drying of fish even under unfavorable weather conditions.