

## Advance in Fish Drying

Disha Chavan

Assistant Professor, College of Agriculture, Sonai (M.S.)

### SUMMARY

Different drying methods are available for the drying of fish and each has its own advantages and disadvantages. Natural drying is a simple process but low efficiency and longer drying period. The drying of product with minimum cost and simple technologies. Combination drying with an initial conventional drying process followed by microwave/ vacuum or simultaneously two methods hot air with infrared/microwave/vacuum has proven to reduce drying time with improved product quality and minimizing energy requirements. The main reason for drying fish is to reduce water content (moisture content) so that the fish can be stored for future use without the need for refrigeration because, as is well known, dry fish can be stored safely for long periods. For this reason, this study evaluates traditional and artificial fish drying systems in order to encourage food storage and preservation. Traditional drying methods having technical problems and inadequacies associated with drying of food. So here it should be concluded that recent advance method of drying likes microwave drying, vacuum drying, heat pump drying, osmotic dehydration, super critical co2 drying etc. are used single or with combination with each other has effectively proven best to reduce the drying time and improve the product quality.

### INTRODUCTION

Fish is very perishable commodity and having very high post-harvest losses. Fish body contains mainly 60 to 90% water so it gets perish easily. So, drying is very important operation that can preserve or enhance the nutritional status of the fish. Drying helps in maintain the quality of fish for longer time. Prevent spoilage and decomposition and makes the storage and transportation easier. Drying operation is one of the oldest methods of preservation of food commodity. Drying basically remove the moisture from fish up to the certain limits to prevent them from microbial growth. There are two main drying methods are mostly used are natural drying and artificial drying. Natural drying is associated with contamination and damage by micro-organism, dirt, insects, rodents and other animals and birds.



### Mechanism of Drying:

Drying basically comprises of two fundamental and simultaneous processes: (i) heat is transferred to evaporate liquid, and (ii) mass is transferred as a liquid or vapour within the solid and as a vapor from the surface. The factors governing the rates of these processes determine the drying rate. The different dryers may utilize heat transfer by convection, conduction, radiation, or a combination of these. However, in almost all solar dryers and other conventional dryers heat must flow to the outer surface first and then into the interior of the solid, with exception for dielectric and microwave drying.

**Fish species used for drying: -**

Sr. No	Scientific name	Common name
1	Harpodon nehereus	Bombay duck
2	Lepturacanthus savala	Ribbon fish
3	Coilia dussumieri	Gold spotted Anchovy
4	Megalaspis cordyla	Horse mackerel
5	Rastrelliger kanagurta	Indian Mackerel
6	Chirocentrus dorab	Silver bar
7	Acetes indicus	Jawla shrimp
8	Cynoglossus lingua	Sole fish
9	Scoliodon laticaudas	Indian dog shark
10	Scomberoides commersonianus	Queen fish
11	Otolithes cuvieri	Croaker
12	Sardinella longiceps	Oil sardine
13	Solenocera crassicornis	Mud shrimp
14	Terapon jarbua	Jarbua terapon
15	Saurida tumbil	Greater lizard fish
16	Saurida undosquami	Brush tooth lizard fish
17	Dasyatis zugei	Pale-edged sting ray
18	Arius thalassinus	Giant catfish
19	Carax para	Golden scad
20	Zebrias quagga	Zebra Sole
21	Ilisha megaloptera	Big eye ilisha
22	Lactarius lactarius	White fish
23	Mene maculates	Moon fish
24	Scoliodon laticaudus	Spadenose shark
25	Hilsa toil	Toil
26	Eupleurogrammus muticus	Small head hair tail
27	Epinephelus diacanthus	Reef cod
28	Sphyraena obtuata	Barracuda

(International Journal of Fisheries and Aquatic Studies 2020; 8(1): 129-131)

**Methods of drying: -**

- Natural drying
- Artificial drying

**Natural / Traditional drying: -**

- Drying traditionally using the sun light is the oldest preservation technique of agricultural and marine produce worldwide which dates to human civilization. (Hussein et al., 2017)
- Drying was done by open sun under the open sky. This process is can only be carried out when bright sunlight is available.
- Slow process.
- Reduction in product quality due to insects and micro-organisms growth.

- Spoilage of product due to rain, wind, moist, dust, birds & animals, fungal growth.
- Long duration required. Sometimes under unfavorable operational parameters it takes several days to complete which affects the quality of final product.
- Requires large area

**Artificial Methods of Fish Drying - :**

Several types of mechanically powered driers have been developed and used commercially in different parts of the world. Fish are dried in a fan driven air-stream; the air is usually heated and, in some cases, the air can be recirculated to control the relative humidity. Mechanical fish dryer was found to be attractive compared to the traditional systems after assessing the drying performances like its organoleptic characteristics, dehydration rate, nutritional quality and production cost of the dried fish products.

**Classification of different types of mechanical/artificial dryers:-**

- A. Solar drying
  - a) Tent dryer
  - b) Box dryer
  - c) Seesaw Dryer
  - d) Hybrid Solar Dryer
  - e) Green house dryer
  - f) Natural green house dryer
  - g) Solar fish dryer
  - h) Solar Dryer with LPG back-up
  - i) Solar tunnel dryer
- B. Cabinet dryer
- C. Freeze drying
- D. Fluidized bed dryers
- E. Infrared Drying
- F. Vaccum drying
- G. Superheated steam drying
- H. Supercritical co2 drying
- I. Heat pump dryingDielectric drying
- J. Hybrid/combinated drying
- K. Osmotic dehydrationSonic drying
- L. Reducing atmosphere drying
- M. Refractance window drying
- N. Microwave drying

**Table 1. Application of solar dryer in fish drying**

Sr. No.	Name of solar dryer	Type of fish	References
1	Low-cost solar dryer	Prawns	Sengar <i>et al.</i> (2009)
2	Solar tunnel dryer	Silver jew fish	Bala and Mondol (2001)
3	Solar tunnel dryer	Bombay Duck	Bala and Janjai, (2005)
4	Solar tunnel dryer	Tilapia fish	Kittu <i>et al.</i> (2010)
5	Hybrid solar dryer	Salted silver jewfish	Fudholi <i>et al.</i> (2016)

**Uses of Solar dryers:**

- Solar drying of agricultural crops and products.
- Food processing industries for dehydration of fruits and vegetables.
- Solar drying of marine products like fish, prawns, etc.
- Solar drying in dairy industries to produce milk powder.
- Solar drying for seasoning of wood and timber.
- Solar drying in textile industries for drying of textile materials.

**Advantages of solar dryers:**

- Solar dryers are useful from energy conservation point of view.
- They occupy less area.
- Solar dryers help to improve quality of product.
- They protect the product from environment.

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