

**STUDIES ON FISH PRESERVATION METHODS OF MEGA AQUA FOOD PARK, TUNDURRU, WEST GODAVARI DT****¹Dr. P. Y. V. Satyanarayana and ²Ms. K. S. S. V. N. Lakshmi**¹Reader & HOD and ²Lecturer^{1&2}Department of Zoology, Sri Y N College (A)
Narsapur, Andhra Pradesh, India**Introduction**

Union Minister of Food Processing industries Harsimrat kaur Badal on February 12, 2019 commissioned Godavari Mega Aqua Food Park at Tunduru Village in Bhimavaram mandal, West Godavari District, Andhra Pradesh. The Park is promoted by Godavari Mega Aqua Food Park Pvt. Ltd. It will be the first Mega Aqua Food Park Operationalized exclusively for fish and marine Products processing in the state of Andhra Pradesh as we know that fish is an easily available source of protein. It is highly nutritious and easily digestible. In India, edible fishes are abundantly available from sea, rivers, lakes, ponds and marshes. Fish is also an item of export trade. Fish body contains proteins, fats, minerals, vitamins, amino acids, iodine, phosphorus and large amount of water. Thereafter dead fishes get spoiled by the process of decomposition and hence proper fish preservation techniques or methods are essential. Moreover, fishes are also provided with a variety of bacteria which immediately attack on the various body constituents of fish after death. In this light, preservation of fishes is an essential process. There are several different methods or techniques generally practiced in our country as well as abroad for fish preservation. Preservation techniques are needed to prevent fish spoilage and lengthen shelf life. They are designed to inhibit the activity of spoilage bacteria and the metabolic changes that result in the loss of fish quality. Spoilage bacteria are the specific bacteria that produce the unpleasant odors and flavors associated with spoiled fish. Fish normally host many bacteria that are not spoilage bacteria, and most of the bacteria present on spoiled fish played no role in the spoilage. To flourish, bacteria need the right temperature, sufficient water and oxygen, and surroundings that are not too acidic. We have to manage strong and peculiar method preservation. So that its frequency of spoiling can be greatly decreases. For the preservation of fish spoilage. There are many types of process in which some are very popular methods of preservation like, drying, canning, icing, etc. All this process is categorized under physical and chemical method of fish preservation and they are as following.

Fish Preservation Methods**A. Chilling or refrigeration**

- In this method, the basic idea is to preserve the fish at 0°C which prevents the spoilage for short period. At this temperature, the rate of decomposition of body tissue is drastically reduced and fish is preserved. For this purpose, ice is the best material used. Alternate layers of fish and ice are kept in closed vessels to maintain the temperature at 0°C. Sometimes for the preservation of large sized fishes, the ice pieces or cubes are also kept in the abdominal cavity of gutted fishes. This is cheaper and convenient method of fish preservation and widely used for fish transport from one place to another of short distance.

B. Deep freezing

- This method of fish preservation is used for large periods of preservation. It is more effective but costly process. Before freezing, fishes are washed properly and kept at a temperature of -18°C for longer period. For this process, only the fresh fish in good condition are deep frozen. Prior to keep the fish in this process the heads of large fishes are removed and they are also gutted and washed. This process is without spoilage and fishes can be kept for a longer period.

C. Freeze drying

- This process is lengthy as well as expensive and used for the presentation of only good quality of frozen at -20°C by keeping them in freezing chamber. As soon as freezing is over, the frozen fishes are kept in trays and are transferred to the cabin containing horizontal heating plates for drying in vacuum. The fishes are well dried due to hot plates and then they placed in air-conditioned chamber.

D. Salting

- Salting is very old and common practice used in fish preservation in India and other parts of the world. Salting is nothing but the partial dehydration of fishes by osmosis with sodium chloride. Due to intense salting, microbes are killed and diastasis is stopped. In this process before salting, the heads of the fishes are removed, gutted and washed and then salted as soon as possible. There are different methods of salting such as dry salting, cold salting, light or strong salting.

a) Dry salting

- In this method, alternate layers of fish and salt are placed. This is called dry salting.

b) Wet salting or brine

- In this process, the fishes are dipped in salty water called brine. The brine or salt water is used of two different concentrations. In light brine salt concentration is 16% and strong brine is used containing 25% salt. After this salt water treatment, the fishes are dipped in salt.



E. Cold salting

- Strong Salting process is performed at the normal room temperature. Salting is very common practice adopted by fishermen near sea shores. The small sized fishes are sun dried and preserved for longer period.

F. Drying

- This is also a very old common practice of fish preservation adopted by tropical countries like India, Japan, China and others where sun rays are very powerful to dry the fishes easily. Sunlight is the cheapest and abundant source of heat energy used for drying purpose. By this method small sized fishes are dried. The fishes are kept for dehydration on a mat or anything for 3 to 5 days and during this period turning over the fishes is continued. After complete dehydration, the dry fishes can be stored. These dried fishes are also used for making fish fertilizer. The larger fishes are cut into pieces for easy drying. However, this method is not perfect for longer preservation.

a) Sun curing

It is a little bit advanced method over simple sun drying in which body of fish is opened from the ventral side and viscera and gills are removed. Then the fish is washed and salted in ratio of 1:3 to 1:8 (salt: fish) which is related with the size of fish.

b) Mona curing

It is similar to sun curing but difference is that no incision is, made in the body of the fish to remove the intestine and gills. These organs are directly removed from mouth. Further such eviscerated fishes are cleaned, salted and dried as earlier.

c) Wet curing

It is also like sun curing with the only difference in the packing of salted fish as such. This method is used only for fatty fishes.

G. Canning

- Canning is expensive of fish preservation and hence it is not commonly used. However, it is widely used in advanced countries like America, France, Japan and Spain. This is lengthy, complicated but very advanced process of preservation. In this process, the best quality fishes are selected and their heads and viscera are removed. Then these eviscerated fishes are treated with brine (salt water), washed, dried and cooked in olive oil. This process is used to remove excess of water for 2 to 5 minutes. Then the cooked fishes are packed in olive oil in tins and sealed and sent to markets.

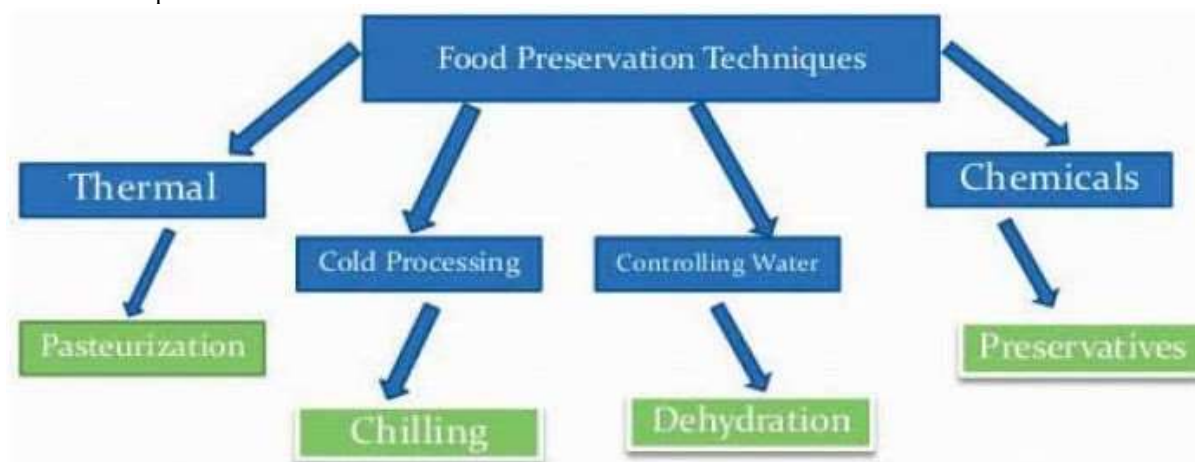


Fig: Fish- food Preservation Techniques

Fish Products

- Value addition is one of the most practical ways to increase the profitability in fish processing and sale in domestic as well as international markets. It is also becoming a market requirement as the wholesale traders, retail outlets and finally the consumers are on the lookout for fish products that require minimum preparation.
- Some of the value-added fish products, fish pickles, fish flakes, wafers, fish noodles.
- Fish sausage is the ground fish meat with various ingredients (additives) like salt, sugar, starch, spices, fat, chemicals, etc., packed in a synthetic casing, properly scaled, boiled and cooled product. In other words, fish sausage is a ready to eat proteinacious food which is heat processed. (Table: Fish sausage ingredients)



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Fish sausage Ingredients

Ingredients	Percentage
1 Minced fish meat	70.0%
2. Salt	2.0%
3. Sugar	1.5%
4. Polyphosphate	2.0%
5. Spices	1.0%
Coriander	0.3%
Chili powder	0.3%
Pepper	0.2%
Garlic	0.1%
Ginger	0.1%
6. Mono Sodium Glutamate	0.2%
7. Preservatives	0.2%
8. 5% color solution	0.13%
2% of carmosine	
3% of ponceau	
9. Starch	9.0%
10. Cold water	10.0%
11. Fat/ Vegetable Oil	5.0%

ECONOMIC IMPORTANCE OF FISH PRESERVATION

Fishes are one of the most important group of vertebrates serving as food for human. They possess a great economic, nutritional, medicinal, industrial, aesthetic and religious values as well as providing employment for millions of people in the world. They contribute to food security in many regions of the world, providing a valuable supplement for diversified and nutritious diets. Consumption of fish has several health. Nutritional, environmental and social advantages.

- I. **Food Value:** Fish serves as an important food for human. Edible tissue of fish is appreciably greater than that in chicken, pig and sheep/goat. For example, approximately 65% of the raw weight of finfish is eaten, compared with 50% of chicken and pigs, and 40% of sheep/ goat; fish are supported by water but terrestrial animals and birds require comparatively strong bones so they spend their substantial energy into the growth of the bones, which cannot be consumed as food. The total estimated fish production of the world in 2012 was 158 million metric tons with a per caput consumption around 19.2kg.
- II. **Nutritive value:** Fish is highly nutritious. It provides tasty, low-calorie meal but is a good source of high-quality protein. Fish is an almost zero carbohydrate food, good for diabetes and other such patients. The protein content in fishes varies from 15-30% on wet weight basis and 60-80% on dry weight basis. The protein of food highly digestible and with well- balanced amino acids. Fish are low in fat and cholesterol. Fish is a good source of vitamins – A, B and D and also offers a good source of calcium, iodine, fluorine, magnesium and zinc. Fish are rich in poly- unsaturated fatty acids containing omega -3. Two poly – unsaturated fatty acids present in fish, eicosa pentaenoic acid (EPA) and docosa hexaenoic acid (DHA), collectively known as Omega-3, are essential fatty acids. They cannot be produced in human body, but are essential in the diet.
- III. **Medicinal value:** Fish is low fat, high in protein and an excellent source of omega -3 fatty acids. Regular consumption of fish can reduce the risk of various diseases and disorders. Some research findings indicate the following:

Asthma: Children who eat fish are less likely to develop asthma.

Brain and eyes: Fish rich in Omega- 3 fatty acids can contribute to the health of brain tissue and the retina of eyes. The IQ level of children whose mother consumed about 340 g fish per week during pregnancy was found higher than non – fish eaters. Similarly, breastfed babies whose mother eat fish have better eyesight, perhaps due to the Omega – 3 fatty acids transmitted in breast milk.

Cancer: The Omega -3 Fatty acids in fish reduce the risk of many types of cancers by 30 to 50 percent, especially of the oral cavity, esophagus, colon, and breast, ovary and prostate.

Cardiovascular disease: Eating fish every week reduces the risk of heart disease and stroke by reducing blood clots and implementation, improving blood vessel elasticity, lowering blood pressure, lowering, blood fats and boosting good cholesterol.



Dementia: Elderly people who eat fish or seafood at least once a week may have a lower risk of developing dementia, including Alzheimer's disease.

Depression: People who regularly eat fish have a lower incidence of depression. Depression is linked to low levels of Omega - 3 fatty acids in the brain.

Diabetes: Fish may help people with diabetes to manage their blood sugar levels.

Prematurity: Eating fish during pregnancy may help reduce the risk of delivering a premature baby.

Further, it is observed that different fishes are used as Ayurvedic medicines which help in treatment of duodenal ulcers, skin disease, night blindness, weakness, loss of appetite, cough and cold, Bronchitis, Asthma, tuberculosis, etc.

IV. Fish products

- a. **Fish Meal:** The dried and ground preparation of unused or trash fish is called fish meal and is a highly nutritive product that makes an excellent feed for poultry, pig, cattle and fish. Fish meal contains about 60-70% crude protein, 2-15% oil and 10-20% minerals. The protein of fish meal is highly digestible and contains all amino acids.
- b. **Fish oil:** Fish oil of two kinds, body oil and liver oil. The oil extract from the whole body of the fish is called fish body oil. For the extraction of body oil, the fishes are minced, steamed, and then pressed for oil recovery, then subject to filter for refine. It is very rich in iodine. The fish body oil is mostly used in manufacture of paints, varnishes, soaps, lubricants, candle, printing inks etc.
- c. **Fish silage:** Fish silage is a liquid or semi liquid product made from whole are part of the fish that are liquefied by the action of enzymes in the fish in the presence of an added acid (hydrochloric or sulfuric acid). The enzymes down fish Proteins into smaller soluble units, and the acid helps to speed up their activity while preventing bacterial spoilage.
- d. **Fish flour:** Fish flour is made up of dried and powder fish. It is a superior quality of fish meal which is used for human consumption. It is considered an ideal protein source to supplement diet. It can be mixed with wheat or maize flour and used for enriching the nutritive value of bread, biscuits, cakes etc.
- e. **Fish manure and guano:** Low grade, inedible fish and offal from the fish canning factories, fish salting plants, fish – filleting plants and other fish processing industries are utilized to prepare the fish manure. These reduce are dried, ground, mixed with ash and converted into manure.
- f. **Fish glue:** The gelatinous adhesive material obtained from the connective tissues of skin and bones of certain fish, principally cod fish, is called fish glue. It is used in gummed tape, letterpress printing, plates, blue print paper and adhering the wood, leather, glass, etc.
- g. **Isinglass:** Isinglass is a substance obtained from the dried swim bladders of fish. It is a high – grade collagen used mainly for the clarification of wine, beer and vinegar. It can also be cooked into a paste for specialized gluing purposes.
- h. **Fish leather:** The coarse scaly skins of several fishes are used for manufacturing, polishing and smoothing materials in place of sand paper. The dried and processed skin is also used for preparing high quality shoes, moneybags, suitcases, belts, phone cases, etc.
- i. **Fish fin:** The fins of the sharks and rays are used to make tasteful sauce and soups. It is a popular soup item of Chinese usually served at special occasions such as weddings and banquets, or as a luxury item in Chinese culture.
- j. **J. Fish pearls:** The material obtained by scraping the silvery coating of the scales of Certain fishes is used for polishing the hollow glass beds. These beds Are then filled with wax and marketed as artificial pearls which are used as jewelry.

V. **Biological control:** Many species of carnivorous fishes' prey upon insects and their larvae in water. These fishes can be used to control harmful insects, mosquito larvae, etc. *Gambusia affinis* is a well-known fish for mosquito fish.

VI. **Sports and games:** Sport are recreation fishing is the fishing for pleasure or competition. Sport fishing can be done in a variety of ways. The most common form of sport fishing is done with a rod, line and hooks with baits, called angling. The most common sport fishes of Nepal are sahar, asla and rainbow trout.

VII. **Decorative value:** Many species of colored fish are kept in aquarium, ocenarium, ponds and lakes for decoration or ornamentation. The common ornamental fish species kept in an aquarium in Nepal are gold fish, gourami, zebra fish, guppy, fighting fish, koi, etc.

VIII. **Employment opportunity:** Fisheries and Aquaculture sector provide, either directly or indirectly, a great employment opportunity, for millions of people around the world. In 2012, about 500 million people were directly engaged in the world, part time or full time, in production of fish either by fishing or in aquaculture.



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