

## QUALITY ISSUES IN FISH PICKLE

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### **Introduction**

Pickling is one of the oldest and safest methods of fish preservation. Pickling preserves fish by keeping it in brine and or vinegar over a period without refrigeration (Fellow, 1997). Pickling suppresses the growth of spoilage and pathogenic bacteria and provides desirable and characteristic changes in flavour, texture and colour in fish. Recently, fish pickles have been gaining popularity like other pickles and demand for these products is also increasing. The quality, safety and mass production concern were the challenging factors faced by the food producers.

According to FAO and WHO 2020, Pickling is the process whereby primary fatty fish is mixed with suitable salt (which may contain vinegar and spices) and stored in watertight containers under the resultant pickle that forms by the solution of salt in the water extracted from the fish tissue. They may be added to the container, and pickled products remain in a brine solution. Pickles are classified into two types based on their fermentation aspects: unfermented pickles and fermented pickles. Unfermented pickles are made either by using concentrated brine (up to 16% salt) and or vinegar followed by pasteurization or refrigeration. Pasteurization essentially destroys spoilage bacteria and inhibits enzymatic activity, preventing pickle softening. The average shelf life of pasteurized fish pickles is 1-2 years. In fermented pickles, the raw materials are kept immersed in dilute brine (2-5% salt) for 1-2 weeks. Naturally occurring bacteria will grow and produce lactic acid, which preserves the pickle for an extended period. The shelf life depends on the proper acidity, salt concentration, temperature and sanitary conditions.

### Method of preparation

The best fish pickles are usually made from high fatty fishes. The species used for fish preparation differs according to places: shad, salmon, herring, shrimp, shellfish, tuna, anchovies, sardines, striped bass, and black cod are some of the examples. The different species require different preparation techniques, but the basic steps to be followed are outlined below:

Requirements:

- Raw material;
- Edible fish/ shrimp/mollusc
- Spices and condiments such as ginger garlic, chillies, curry powder;
- Edible common salt;
- Preservation media; Vinegar (4 % acetic acid); and
- Edible vegetable oils.

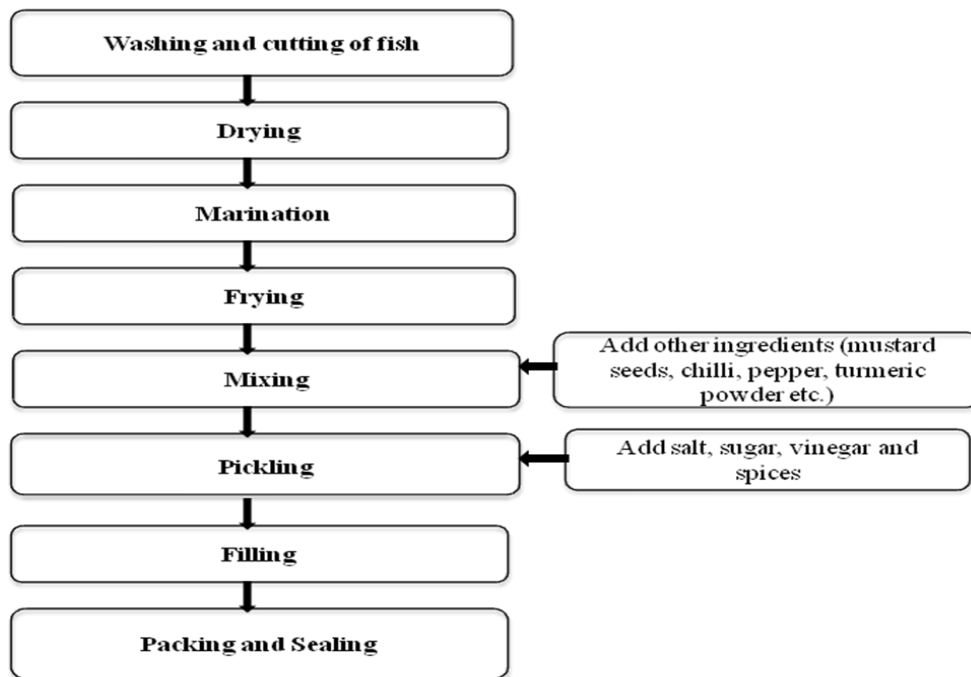


Fig: 1. General flowchart for fish pickle preparation

### **Quality criteria for fish pickle.**

Pickle is the major forms of fish preservation in many countries because of its desirable organoleptic qualities and requires less mechanical energy input. Pickling if done under hygienic conditions by adding an adequate quantity of salt, spices and preservatives like acids, would have an extended shelf life. The raw materials and other ingredients used to prepare pickles should be fresh and free from contaminants. The required quality criteria for fish pickle are given below:

- Fish pickle should have desirable and characteristic colour, flavor, texture, and appearance free of defects and visible fungal growth.
- Meat particles should be well integrated, not too hard, and have no indications of softening.
- No artificial colouring matter and firming agents other than edible common salt and vinegar in fish pickle
- The pickle should have characteristic pleasant aroma and should be free from any objectionable off-taste smell or odour
- Sodium chloride in the pickle should be of
  - 12-16% on weight basis.
- The pH of a fish pickle should be maintained in the range of 4-4.5
- The fluid portion of the fish pickle should be a maximum of 40% by weight.
- Acidity as acetic acid of fluid portion in fish pickle should have a maximum of 2.5 to 3 by weight.
- The amount of salt, sugar and spices should be standardized according to the quality of fish. It should be measured or weighed and well distributed in the container.
- All fish should be well immersed in the resulting pickle before the container is closed.
- During curing, fatty fish should always be covered with a pickle.

### **Quality problems in fish pickle**

Pickling imparts unique and characteristic taste, flavor and texture to fish, but the changes occur during storage should be carefully monitored. The selected problems which affect the quality of pickle are listed in table.1

<b>Problem</b>	<b>Causes</b>
Soft, slippery slimy pickles (discard pickles, spoilage is occurring)	Hard water, acid level too low, cooked too long or at too high a temperature, bacteria not destroyed, jars not airtight, jars in too warm a resting place
Shriveled, tough pickles	Pickles overcooked, syrup too heavy, too strong a brine or vinegar solution
Dark, discolored pickles	Iron utensils used, copper, brass, or zinc cookware used, Hardwater, Metal lid corrosion, High quantity of powdered and dried spices used.
There is white sediment on the bottom of the jar	Harmless yeasts have grown on the surface and then settled to the bottom, Additives in table salt
Pickles have a strong, bitter taste	Spices were old, they were cooked too long in the vinegar or the quantity was excessive, vinegar used was too strong, salt substitutes contain potassium chloride, which is naturally bitter

Source: Behera (2020)

### **Other quality issues in fish pickle**

Another quality and safety concern in a fish pickle is the synthesis of biogenic amines by microbial decarboxylation of amino acids. The biogenic amines mainly reported in fish pickles are histamine, tyramine, tryptamine, putrescine, cadaverine, spermidine and spermine. Some of the histamine forming bacteria is halotolerant (salt-tolerant) or halophilic (salt-loving) and they can produce histamine in pickled fish products. Histamine forming bacteria can also form histamine even at elevated acidity (low pH). Therefore, histamine formation can be found in

pickled products. Refrigeration or low-temperature preservation should be necessary to inhibit histamine formation during processing and storage. The limits of histamine are shown in the table.2. In fermented pickles, starter culture or probiotic strains (e.g., *L. plantarum*, *L. casei*, *E. faecium* and *Pediococcus* sp.) may reduce the biogenic amine formation. The outbreaks of foodborne pathogens such as *E. coli* O157:H7 and *Salmonella* sp. in acidified foods (pH < 4.5) were also reported recently. In pickled products, *E. coli* O157:H7 is the greatest pathogen concern because of its low infectious dose and high acid tolerance (Medina Pradas, *et al.*, 2017).

*Clostridium botulinum* is another food born pathogen of concern in pickled products. Botulism caused by *Clostridium botulinum* is a serious disease and an essential apprehension in all food preservation processes. By controlling the pH level to 5 or below, salt to 5% wps(water phase salt) or more, moisture (water activity) to 0.97 or below, or some combination of these barriers, in the finished product sufficiently to prevent the growth of *C. botulinum*. Other microbiological requirements are listed in table 2.

The raw fish used for pickle preparation should be ensured that there is no live parasite Pickling can reduce parasite hazard in fish but cannot eliminate it. For example, nematode larvae can survive for 28 days in 21% salt by weight (FDA, 2020).

<b>Parameters</b>	<b>n</b>	<b>c</b>	<b>m</b>	<b>M</b>
<b>Histamine Level ( mg/kg)</b>	<b>9</b>	<b>2</b>	<b>200</b>	<b>400</b>
<b>Microbiological Requirements</b>				
<b>Aerobic plate count (cfu/g)</b>	<b>5</b>	<b>0</b>	<b>10<sup>3</sup></b>	
<b>Coagulase positive Staphylococci(cfu/g)</b>	<b>5</b>	<b>1</b>	<b>10<sup>2</sup></b>	<b>10<sup>3</sup></b>
<b>Yeast &amp; mold count (cfu/g)</b>	<b>5</b>	<b>0</b>	<b>100</b>	

<i>E coli</i>	5	0	20
<i>Salmonella</i>	5	0	Absent/25g
<i>Vibrio cholerae</i>	5	0	-

Table 2. Histamine limits and microbiological requirements of fish pickle.

### Packaging and Labeling

Fish pickles shall ordinarily be packed in glass containers or in food grade polyethylene pouches as may be found suitable so as to protect it from deterioration.

### Reference

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