

APPENDIX IV

PROPOSED DRAFT CODE OF PRACTICE FOR PROCESSING OF FISH SAUCE

(at Step 5 of the Procedure)

This *Code of practice for processing of fish sauce* has been developed primarily to be used as a guideline to improve the processing practices of fish sauce to meet international requirements. The application of GMP, HACCP and DAP for this traditional product should be promoted to ensure consumer health and safety as well as fish sauce quality. Fish sauce is a translucent and not turbid liquid product with salty taste and fish flavour obtained from the fermentation of a mixture of fish and salt at an appropriate ratio. In general, the size of fish used as raw material in fish sauce processing is small, not greater than 12 cm in length. Traditional fish sauce fermentation relies on endogenous enzymes and indigenous bacteria of raw materials. For non-traditional fermentation other ingredients or processing aids may be added to assist the fermentation process. Salt is an essential ingredient in fish sauce production in order to control the types of microorganisms and prevent defective fermentation. The quality characteristics of colour, clarity, aroma (odour) and taste are used to determine the end of the fermentation process.

General considerations of hazards and defects**Hazards**

Fish sauce is the product obtained from the fermentation of a mixture of fish and salt. The raw material used in the fermentation to make fish sauce could be both freshwater and marine fish such as mackerel, sardines or anchovies. Anchovies are one of the fish type most preferably used to make high quality fish sauce with the characteristic aroma and reddish brown colour. However, the use of those mentioned marine fish might pose a risk of histamine. Some marine fish might be contaminated by bacteria, especially *Clostridium botulinum*, which depend on their type, size and harvest area. Pelagic and small marine fish would have a slight chance of contamination. In fish sauce producing process, it is therefore necessary to have Code of Practices for controlling raw material quality on the harvest vessel in compliance with Section 3 and 4 of Code of Practice for Fish and Fishery Products in place.

Harvest vessel quality control of fish could be achieved either by controlling fish temperature or by delaying fish decomposition. Practically, salt is commonly used to maintain fish quality and freshness for delaying the decomposition after the harvest rather than temperature control. The reason is if the fish temperature is too low, the salt will be slowly absorbed and resulted in the extension of fermentation period.

In fish sauce processing, a large amount of salt are used. Fish sauce therefore has the salt content higher than 20% (Water Phase Salt > 10%) which could inhibit and delay the growth of bacteria.

Defects

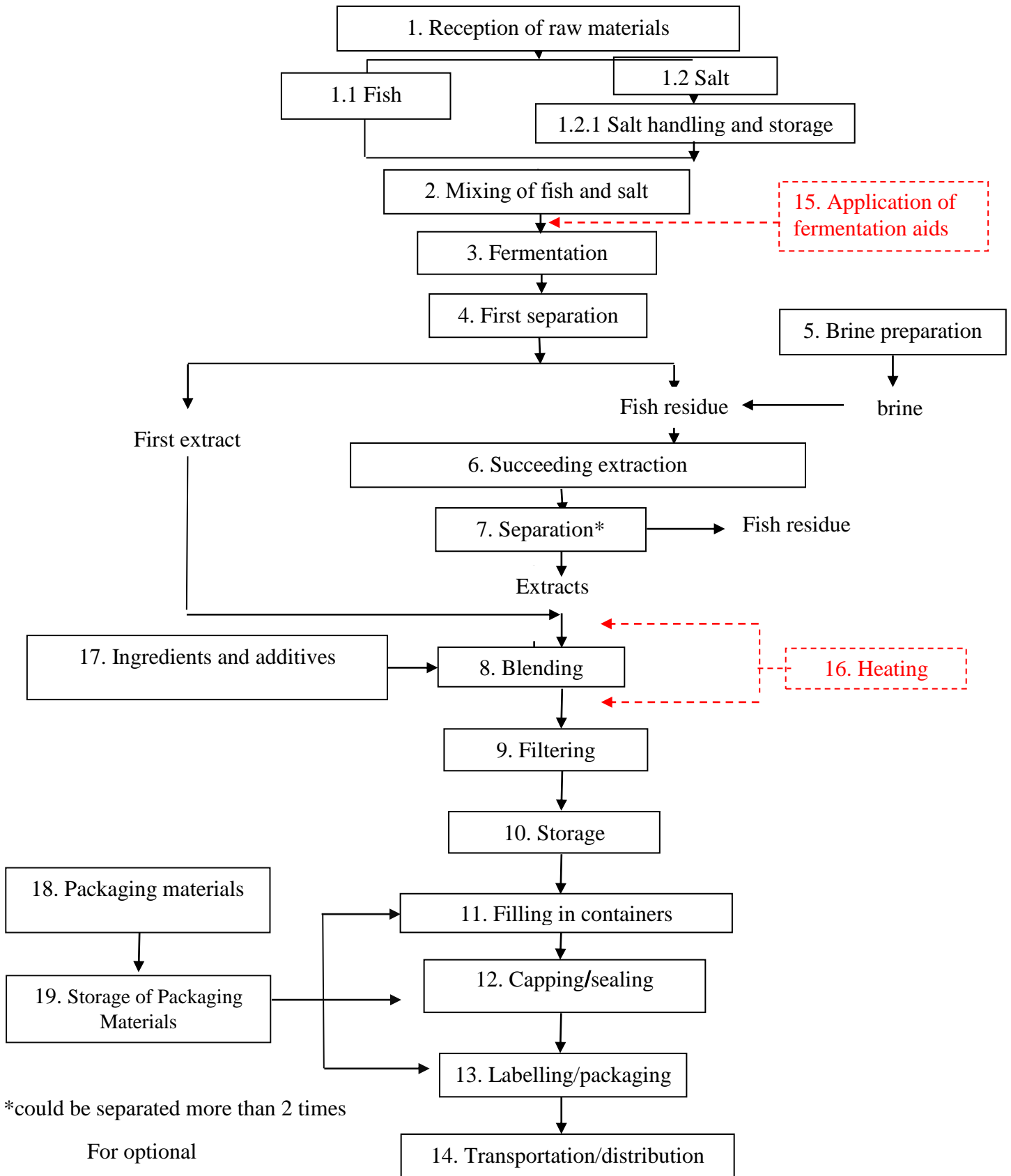
Odour and taste of fish sauce depend on the free amino acid generated from fermentation process. The level of free amino acid varies according to type of fish used in the fermentation, ratio of fish to salt and appropriate fermentation time. Hence, the controls of these factors are necessary in order to obtain fish sauce products with desirable odour and taste.

This Code will address the general processing steps and technical guidance to be employed by fish sauce manufacturers which could vary from country to country. Potential hazards and defects at each processing step starting from reception of raw material and ending with final product distribution will also be identified. In addition, each processing step will include technical guidance for controlling the identified hazards and defects that help ensure consumer safety and product quality.

Example of a flow chart of fish sauce processing

This flow chart is for illustrative purpose only. For in-factory implementation of HACCP principles. A complete and comprehensive flow chart has to be drawn up for each product.

References correspond to relevant Sections of the Code.



*could be separated more than 2 times

For optional

1. Reception of raw materials

1.1 Fish

Potential hazards: histamine, microbiological contamination biotoxins, chemical contamination (including pesticides), physical contamination, heavy metals

Potential defects: decomposition, foreign matter

Technical Guidance:

- For fish or parts of fish, raw materials specifications could include the following characteristics:
 - As appropriate, harvest vessel, transportation and storage records documenting that the fish were rapidly chilled and maintained at 4 ° C or below;
 - As appropriate, harvest vessel and transportation records documenting that the fish were adequately salted to achieve the target water activity within the target time;
 - organoleptic characteristics, such as appearance, odour, texture;
 - chemical indicators of decomposition and/or contamination, for example, total volatile basic-nitrogen (TVBN), histamine, heavy metals, pesticide residues, nitrates;
 - microbiological criteria (to prevent the processing of raw material containing microbiological toxins) for fish with risk;
 - veterinary drug residues (when the raw fish material is from aquaculture);
 - foreign matter.
- Skills should be acquired by fish handlers and appropriate personnel in sensory evaluation techniques to ensure that raw fish meet essential quality provisions of the appropriate Codex Standard and sorting of fish species that pose a risk of biotoxins such as ciguatoxin in large carnivorous tropical and subtropical reef fish.
- Fish greater than 12 cm in length that required gutting on arrival at the processing facility should be gutted efficiently, without undue delay and with care to avoid contamination.
 - Gutting is considered complete when the intestinal tract and internal organs have been removed.
 - Clean seawater should be used.
- Fish should be rejected if it is known to contain harmful, decomposed or extraneous substances unable to be reduced or eliminated to an acceptable level by normal procedures of sorting or preparation.
- Information about the harvesting area should be recorded.

1.2 Salt requirements

Potential hazards: chemical and physical contamination

Potential defects: incorrect composition

Technical guidance:

- Salt used should be food grade as indicated in the *Standard for Food Grade Salt* (CODEX STAN 150-1985).
- The composition of salt differs according to the origin. Mine salt and solar salt of marine origin contain several other salts such as calcium sulphate, magnesium sulphate and chloride as impurities. Solar salt may be stored at least 2 months before using to obtain a good taste of fish sauce.
- Salt used should be inspected to ensure that it is clean, not used before, free from foreign matter and foreign crystals, and shows no visible sign of contamination with dirt, oil, bilge or other extraneous materials.
- The size of the salt granules used should be carefully considered. Medium size salt crystal should be used. Use clean salt without contaminants. If small size salt is used, the outer skin of fish

will rapidly lose moisture and salt burn can occur which will prevent salt penetration into the fish. Consequently, inner of fish can be spoiled. In case of too large salt crystal, it can slowly penetrate, thus fish might be spoiled before preservation effect of salt occurs.

1.2.1 Salt handling and storage

Potential hazards: chemical and physical contamination

Potential defects: unlikely

Technical guidance:

- Salt should be transported and stored dry and hygienically covered in salt bins, storerooms, containers or in plastic sacks.

2. Mixing of fish and salt

Potential hazards: histamine, microbiological contamination (*Clostridium botulinum* and *Staphylococcus aureus* toxins), metal fragments

Potential defects: decomposition, physical contamination

Technical Guidance:

- Fish and salt should be mixed thoroughly by trained personal or machines to ensure the proper contact of salt to fish so as to prevent the growth of pathogens and decomposition during fermentation.
- All the apparatus used to mix fish and salt should be easily cleanable, rust-free and resistant to salt. Mechanical mixers should not introduce unapproved substances, or metal fragments.
- In order to prevent spoilage and growth of pathogenic bacteria, the concentration of salt should not be less than 20% by weight. The common ratios of fish to salt by weight are 3:1, 5:2 and 3:2.
- Fish should attain 10 percent water phase salt, or water activity below 0.85, within 24 hours of mixing, as measured in the centres of the largest fish.
- Salt burn should be avoided by using right type of salt.

3. Fermenting

Potential hazards: physical and chemical contamination

Potential defects: undesirable odour and taste

Technical Guidance:

- Care should be taken to ensure the cleanliness of the fermentation area and tanks. Fermenting tanks should be made from non-hazardous material and be able to prevent product contamination.
- Fermentation period should range from 6-18 months to achieve good quality of fish sauce from natural fermentation in a tropical zone. When fermentation aids are used, the period can be varied.

4. First separation

Potential hazards: unlikely

Potential defects: incorrect separation (e.g. objectionable matter, turbidity)

Technical Guidance:

- All utensils should be clean
- Liquid and solid (fish residue) should be completely separated.
- First extract (liquid) should be translucent solution

5. Brine preparation

Potential hazards: unlikely

Potential defects: undesirable odour and taste

Technical Guidance:

- Brine, preferably saturated, added to fish residues should be prepared from potable water and food grade salt for succeeding extraction.

6. Succeeding extraction*Potential hazards:* unlikely*Potential defects:* undesirable odour and taste*Technical Guidance:*

- Succeeding brine extraction of the fish residues could be carried on as long as desirable extracts are obtained.

7. Separation

Refer to Step 4: First Separation

8. Blending*Potential hazards:* microbiological contamination*Potential defects:* Ingredient measurement errors, unauthorized food additives*Technical Guidance:*

- Total Nitrogen (TN) of fermentation extract batches should be analyzed before blending. Total nitrogen and amino acid nitrogen content in the final product must be in compliance with the *Standard for Fish Sauce* (CODEX STAN 302-2011).
- To achieve good quality fish sauce, ingredients should meet the required characteristics and appropriated concentrations.
- All utensils should be clean.
- Food additives and levels used need to be in compliance with the *Standard for Fish Sauce* (CODEX STAN 302-2011). Food additives used need to be identified with names and identification numbers which comply to *Class Names and the International Numbering System for Food Additives* (CAC/GL 36-1989).
- Before mixing, chemical properties, essential quality factors should be monitored, and the results should be recorded.

9. Filtering*Potential hazards:* chemical contamination from a cleaning or disinfection agent*Potential defects:* foreign matter and turbidity*Technical Guidance:*

- Filtering system should be cleaned and kept in an appropriate environment to prevent contamination.
- An appropriate filtering system should be checked regularly.

10. Storage*Potential hazards:* physical and chemical contamination*Potential defects:* unlikely*Technical Guidance:*

- The storage tanks with lid should be clean, resistant to rust and salt, located in an appropriated area.
- The product should be stored properly and kept from any source of contamination.
- The batches, or lots, in storage should be identified for trace back purposes.

11. Filling in containers

Potential hazards: residual chemical cleaning agent, physical contamination such as glass fragments.

Potential defects: foreign matter, incorrect volume, defective and unclean bottles and containers

Technical Guidance:

- Containers should be randomly and regularly checked for defects and cleanliness.
- Filling machines should be kept clean to prevent contamination.
- Defective containers should not be used.
- The containers should be made with material that is high salt content resistant and will not release any harmful substances for human health.

12. Capping

Potential hazards: unlikely

Potential defects: loose plastic matter, broken caps, foreign matter

Technical Guidance:

- Caps should be checked before capping.
- After capping foreign matter should be checked.

13. Labelling/packaging

Potential hazards: unlikely

Potential defects: incorrect labelling

Technical Guidance:

- Refer to Sections 8.2.3

14. Transportation/distribution

Potential hazards: unlikely

Potential defects: contaminated and damaged containers and cartons

Technical Guidance:

- Cartons should be clean, dry, durable and suitable for the intended use.
- Cartons should be handled with care to avoid the damage of containers.
- Also refer to Section 17.4

15. Application of fermentation aids

Potential hazards: microbiological contamination

Potential defects: unlikely

Technical Guidance:

- Fermentation aids should be stored at appropriate temperature in order to avoid deactivation of fermentation aids.
- When enzymes and bacterial cultures are used as fermentation aids they should be handled to minimize the microbiological contamination.

16. Heating

Potential hazards: microbiological contamination

Potential defects: over heating

Technical Guidance:

- Adequate temperature and time combination should be applied.

- The temperature and heating time should be monitored and recorded.

17. Ingredients and additives

Potential hazards: chemical, physical and microbiological contamination

Potential defects: depends on ingredient

Technical guidance:

- Ingredients and additives should be stored appropriately in terms of temperature and humidity.
- Ingredients and additives should be stored in a dry and clean place under hygienic conditions.
- Ingredients and additives should be properly protected and segregated to prevent cross-contamination.
- Defective ingredients and additives should not be used.

18. Packaging materials

Potential hazards: chemical and physical contamination

Potential defects: unlikely

Technical guidance:

- Labels should be verified to ensure that all information declared meets, where applicable, the *General Standard for the Labelling of Prepackaged Foods* (CODEX STAN 1-1985) and labelling provisions of the *Standard for Fish Sauce* (CODEX STAN 302-2011) and/or other relevant national legislative requirements.
- Packaging materials should be examined to ensure that they are intact and not contaminated.

19. Storage of packaging materials

Potential hazards: chemical and physical contamination

Potential defects: unlikely

Technical guidance:

- Packaging materials should be stored in a dry and clean place under hygienic conditions.
- Packaging materials should be properly protected and segregated to prevent cross-contamination.
- Defective ingredients and packaging materials should not be used.