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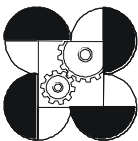
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SMOKED FISH PRODUCTION



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‘Our Business is Industry...’

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SMOKED FISH

DEFINITION OF SMOKED FISH

Smoked fish is a product prepared from either whole or filleted fish that has been cured and/or cooked with salt and subjected to smoke produced by combustion of wood or other smoking materials.

MARKET FORMS OF SMOKED FISH

- ❑ **Whole-uneviscerated** – no part of the fish is removed.
- ❑ **Whole-eviscerated** – whole fish, in which the entrails and gills are removed. Appropriate for fishes like *bangus* (*Chanos chanos*), *hasahasa* (*Rastrelliger brachysomus*), *galunggong* (*Decapterus macrosoma*) and *tilapia* (*Tilapia mossambica* or *nilotica*).
- ❑ **Split fish with backbone** – butterfly filleted fish with the backbone intact. Splitting is done to facilitate salt intake.
- ❑ **Split fish without backbone** – butterfly filleted fish with the backbone removed.
- ❑ **Split, deboned** – butterfly fillet with all the bones removed. This is suitable for deboned *bangus*.

RAW MATERIAL REQUIREMENTS

The quality of fish, salt, water and smoking material to be used in the production of smoked fish product.

- **Fish** – should be fresh or freshly chilled without physical damage
- **Salt** – maybe coarse or fine; clean; food grade
- **Water** – clean and potable

- **Smoking materials** – sawdust and shavings from hardwoods from furniture and sash factories are suitable; *palochina* sawdust and shavings are ideal; coco lumber sawdust and shavings, and rice husks are unsuitable as they produce a lot of fly ash; bagasse or sugar cane stalk residues may also be used

EQUIPMENT/TOOLS

- smoking trays
- smokehouse
- kitchen utensils – knife, basin, *carajay*, etc.
- water sprinkler
- mechanical/cabinet type dryer
- salinometer (Baumé hydrometer)
- weighing scale
- soaking tank
- dial thermometer
- cooking baskets
- packaging materials (plastic bags – made of single film, polypropylene and/or polyethylene and laminates)

PACKAGING OF SMOKED FISH

Smoked fish is packaged either in bulk or retail packs.

- **Bulk Packaging**
Bulk packaging refers to those intended for wholesale or institutional distribution. The pack could contain 25 kg or more.

Procedure for bulk packaging of smoked fish:

1. Sort cooled smoked fish according to size and appearance.
2. Pack or transfer smoked fish in bulk packaging material by arranging the fish in a manner that heads and tails are in uniform or alternately opposite direction.
3. Weigh the whole pack (container and smoked fish) to check product unit weight per pack. Total weight minus weight of container will give the weight of the smoked fish. Standard unit weight per pack should be within ± 10 g per pack.
4. Seal the pack and store at chilled temperatures (3° - 5°C) or at frozen temperature (-18°C to lower).

- **Retail Packaging**

Retail packs are individual packs of the products intended for the ultimate end-user or consumer. The use of polyethylene films of 0.001 – 0.002-inch thickness is recommended for retail packaging of smoked product. Other packaging materials such as laminates or a combination of two or more flexible packaging materials or plastics may also be used but these are rather more expensive.

Smoked fish may be vacuum packed in vacuum packaging materials provided it is kept in refrigerated or frozen conditions.

Procedure for retail packaging of smoked fish:

1. Sort the fish according to sizes and appearance after cooling.
2. Pack the smoked fish in plastic bags at either unit weights of 250g, 500g, or 1 kg per pack.

3. Seal the filled packs using either a portable desk top model or a foot-operated model of an impulse type plastic sealer.
4. Transfer packed products into a bulk packaging material, seal and store at refrigerated temperatures to maintain the quality of the smoked fish.

STORAGE OF SMOKED FISH

Smoked fish products are quite perishable when improperly stored. They contain a high percentage of moisture (70 – 80%) thus making them susceptible to spoilage. They should be distributed or sold as soon as possible after being produced or otherwise kept chilled or frozen.

The storage stability or shelf-life of the product is limited by the storage temperature. When processed properly, they would remain good as follows:

STORAGE	SHELF LIFE
28° – 32°C [Room Temperature]	2 - 3 days
5° – 10°C [Chilled]	2 weeks
0° – 4°C [Frozen]	3 – 6 months
-10° to – 18°C [Frozen]	13 months

NOTE: Addition of preservatives may be used to prolong the shelf life.

However, the shelf life extension is not significant enough to warrant the additional cost of the preservative. The preservative may be added during the brining stage prior to cooking in brine. Potassium sorbate may be added at a level of 0.1 – 0.15% of the brine.

TABLE 1. COMPARATIVE CHARACTERISTICS OF FRESH AND SPOILED FISH

(adopted from Tressler and Lemon, 1951)

Fresh Fish	Stale Fish
a. Scales adhere strongly	a. Scales are loose
b. Skin and colors are bright	b. Skin is dull, spotted, or slimy; colors is pale or bleached
c. Eyes clear and not sunken or wrinkled	c. Eyes cloudy, wrinkled, sunken
d. Gills are red	d. Gills are yellowish, gray, brown
e. Flesh is firm and elastic; finger impression do not remain when pressed	e. Flesh is flabby and soft; finger impression remain when pressed
f. Smell is fresh, at exterior and gills	f. Smell is stale or sour, especially on the gills
g. Little slime on skin (usually slime present but clear on halibut)	g. Skin is slimy (usually). In some species the slime is coagulated or lumpy; in halibut, the slime leaves the fish
h. Body rigid or stiff	h. Body flabby or limp
i. Fish sink in water (usually) although some will float if gassy	i. Fish floats in water (if very bad)

Table 2. Recommended appropriate brine concentration and soaking time for different fishes prior to cooking and smoking

FISH SPECIES	BRINE CONCENTRATION* (% w/w)	SOAKING TIME (hours)
1. Alumahan, striped mackerel (<i>Rastrelliger chrysozonus</i>)	25.0	0.5-1.0
2. Banak, mullet (<i>Mugil vaigiensis</i>)	20.0	1.0-2.0
3. Bangus, milk fish (<i>Chanos chanos</i>)	20.0	1.0-2.0
4. Galunggong, round scad (<i>Decapterus macrosoma</i>)	25.0	0.5-1.0
5. Hasahasa, short-bodied mackerel (<i>Rastrelliger brachyosomus</i>)	25.0	0.5-1.0
6. Kapak, lizard fish (<i>Saurida tumbil</i>)	25.0	0.5
7. Lapad, deep-bodied herring (<i>Sardinella perforata</i>)	25.0	0.5
8. Matangbaka, big-eyed scad (<i>Caranx crumenophthalmus</i>)	25.0	0.5-1.0
9. Tamban, Indian sardines (<i>Sardinella longiceps</i>)	25.0	0.5-1.0
10. Tanguigue (fillet), Spanish mackerel (<i>Cybium commerson</i>)	25.0	0.5
11. Tunsoy, fimbriated sardine (<i>Sardinella fimbriata</i>)	25.0	0.5

* BRINE CONCENTRATION FOR SOAKING MAY BE REDUCED TO 20 OR 15% DEPENDING ON THE SALTINESS DESIRED.

Table 3. Approximate Ratio of Salt (coarse, unrefined) to water to prepare required salinity of Brine Solution		
% Brine	Salt (part by weight)	Water (part by weight)
15	1	4
20	1	3
25	1	2

PROCEDURES FOR THE SMOKING OF FISH

1. SMOKED SARDINES (*Navotas-Malabon Method)**

Materials

fresh fish – *tunsoy, tamban, silinyasi, lapad*
 salt – coarse or fine coarse salt

Procedure

1. Wash the fish well to remove dirt.
2. Soak the fish for 30 minutes in 25% brine (approximately 1 part coarse salt to 2 parts water) at the proportion of 1 part fish to 1 part brine. Drain and transfer in cooking trays or baskets.
3. Cook the fish in 15% brine (approximately 1 part coarse salt to 4 parts water) solution for 2-3 minutes (vigorous boiling) or until eyes turns white.
4. Drain cooked fish and arrange in smoking trays. Rinse lightly by sprinkling with water to remove surface salt.

* For the **Salinas, Cavite Method**, follow the same procedure but omit step 2.

5. Dry the surface the fish either under the sun or preferably in a suitable dryer for 15-30 minutes.
6. Hot smoke the fish at 60° to 90°C until a glossy golden brown color is attained.
7. Cool the smoked fish to room temperature (28° - 30°C).
8. Pack the smoked product in either polypropylene (PP) or polyethylene bags at least 0.002-inch thickness.
9. Store the smoked fish at room temperature or at refrigerated conditions (3° - 5°C) for longer shelf life.

2. SMOKED MACKEREL / ROUND SCAD AND TILAPIA

Materials

fresh fish – *hasahasa, alumahan, galunggong, matang-baka, tilapia*

coarse or fine solar salt

Procedure

1. Wash the fish, eviscerate and wash thoroughly to remove remaining blood and entrails. Drain.
2. Soak the fish for 30 minutes in 25% brine at the proportion of 1 part fish to 1 part brine. Drain and transfer on to cooking trays or baskets.
3. Cook the fish in 15% salt solution for 3-4 minutes (vigorous boiling). Drain.
4. Arrange or lay cooked fish on smoking trays, sprinkle with water to rinse and remove surface salt.
5. Hot smoke the fish in a smoke house at a temperature of 60° - 90°C until a golden brown color is attained.
6. Cool the smoked fish to room or ambient temperature (28° - 30°C).

7. Pack the smoked product in plastic bags [either polypropylene (PP) or polyethylene bags of 0.002-inch thickness].
8. Store the packed smoked fish at room temperature (28° - 30°C) or at refrigerated condition (3° - 5°C) for longer shelf life.

3. SMOKED MILKFISH OR *BANGUS*

Materials

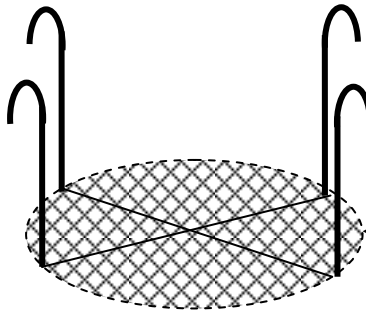
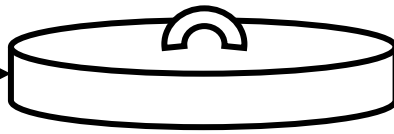
fresh milkfish or *bangus*

coarse solar salt

Procedure

1. Make a slit (3-4 cm long) on the belly and remove gills and internal organs carefully.
2. Wash thoroughly to remove blood and remaining entrails.
3. Make a slight cut along the backbone and soak in 22.5% brine (approximately 1 part salt to 2.5 parts water) for 30 minutes. Drain.
4. Cook in boiling 20% brine until eyes turn white or opaque. Cool to room temperature.
5. Rinse the surface of the cooked fish by using a water sprinkler or *rigadera*. Drain.
6. Dry the fish either under the sun or preferably in a mechanical dryer until the skin no longer feels wet.
7. Arrange the fish on smoking trays and hot smoke at smoking temperature of 70° - 90°C for at least 30 minutes or more or until a glossy, golden brown color is attained.
8. Cool the smoked product and pack in plastic bags (polyethylene bags of 0.002-inch thickness).

Galvanized iron sheet cover with holder than can fit to the drum with a diameter 1-1.5 inches greater than the diameter of the steel drum



Round smoking tray made of chicken wire mesh with hooked handles to serve as holders and support for the smoking tray. The smoking tray diameter is about 2 inches less than the inside diameter of the steel drum. (In strict compliance with GMP, the smoking tray materials of construction that is in direct contact with the fish must be stainless steel.)

Half of a steel drum open at both ends with two reinforcing bars bored side to side at a height of 1 foot from the bottom to serve as support for smoking tray

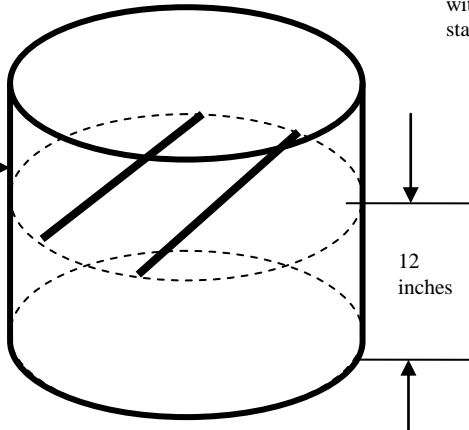


Figure 1: An Improvised Drum Type Smokehouse
($\frac{1}{2}$ STEEL DRUM or rolled up gauge 18 galvanized iron sheet)

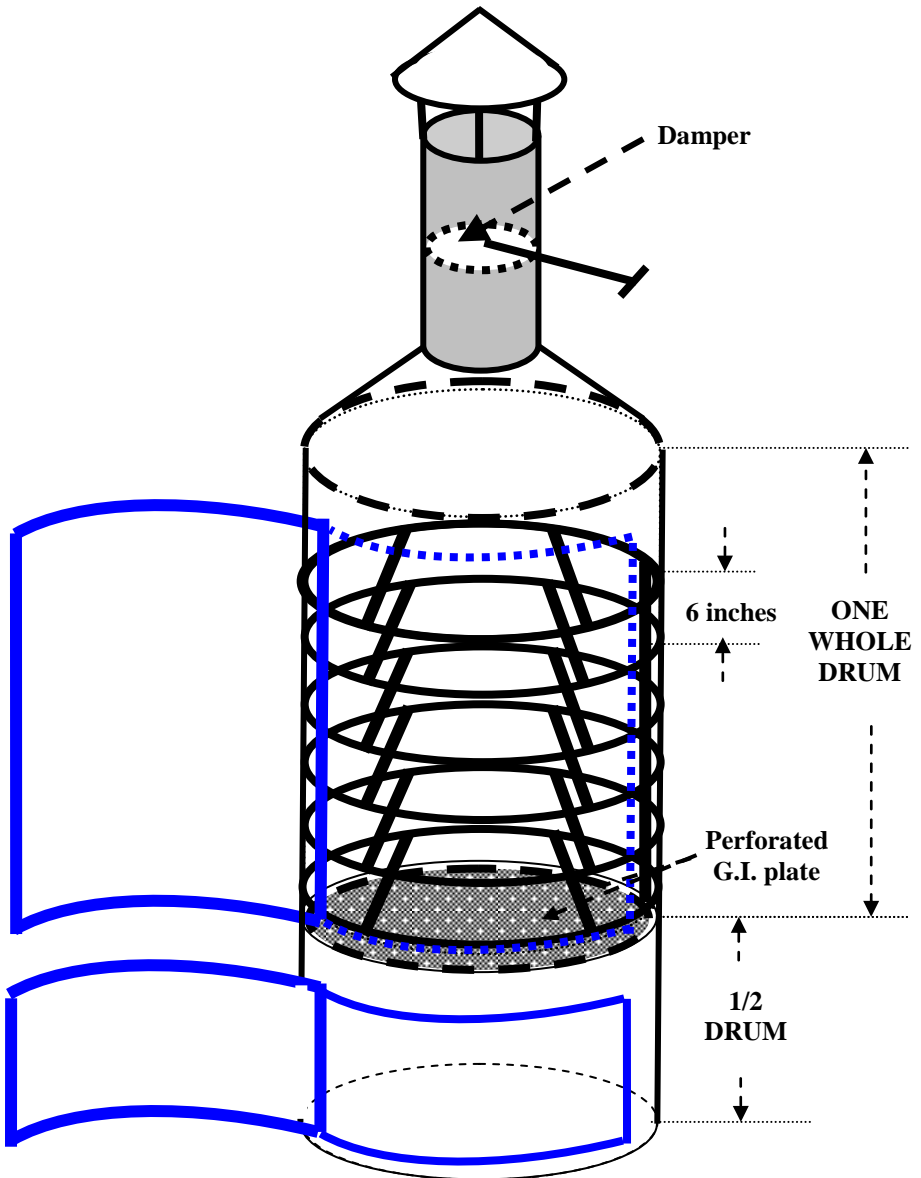


Figure 2. A smokehouse design from 1½ steel drums (or fabricated from rolled up and welded galvanized iron sheet gauge 18)

SMOKED FISHES



Smoked Bangus



Smoked Galunggong



Smoked Tilapia