# THE USE OF ALCOHOL IN EXTENDING THE SHELF-LIFE
# OF INDONESIAN PRESSURED BOILED SALTED MILKFISH
### (Studi pemanfaatan alkohol dalam upaya memperpanjang umur simpan produk pindang bandeng presto)

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**Abstract**

Bandeng presto is a kind of Indonesian traditional fish product made from milkfish (Chanos chanos) with soft bones.  The main problem occurred in this product is the limitation of shelf-life at room temperature (28°C), as 2-3 days, which cause the shortage in its distribution area.  Bandeng presto is originally produced in Semarang (Central Java) and being one of the famous traditional fish product in Indonesia.

The main purpose of this research was to extend the shelf-life of non-vacuum pressured boiled salted fish at room temperature through the use of alcohol solution  with different concentrations and time length of soaking.  Two kinds of pressured boiled salted fish products were used in this experiment for comparison, IPB laboratory-made and JUWANA factory-made.  Two kinds of alcohol methods were used in preserving pressured boiled salted fish, such as : alcohol spraying and alcohol soaking.

In the preliminary experiment, the three different spraying volumes of 50 % alcohol solution (10, 20, and 30 ml); and three different soaking time (30, 60, 90 seconds) of 50 % alcohol solution were executed on both of IPB laboratory- and JUWANA factory-made pressured boiled salted fish products.   Different concentrations of alcohol solution were further used in the main experiment, as 30, 50, and 70 %.  The product was stored in the incubator 28°C for up to 15 days.  Total microbes (TPC), total volatile base (TVB),  and organoleptic test (appearance, flavour, taste, texture) were analyzed periodically during the storage time.  Alcohol residue test was also observed during the first 7 storage days.

Based on results achieved by total microbe analysis test used, the soaking of 70 % alcohol solution was able to extend the shelf-life of JUWANA factory-made boiled salted fish product up to 10 days at room temperature, but only 2 days for control.  Further, both of alcohol spraying (20 ml, 70%) and alcohol soaking (30 second, 70%) showed the similar effectiveness in maintaining the physico-chemical properties of IPB laboratory-made boiled salted fish product up to 15 days of storage time at 28°C with organoleptically acceptable up to 11 storage days.  The alcohol residue in boiled-salted fish product were ranged in 2-4 %, respectively.

**Keywords**: Juwana,  boiled salted fish, alcohol, alcohol spraying , alcohol soaking, total plate count, total volatile base, consumer preference test, alcohol residue test

## I.    INTRODUCTION

Indonesia is well known as the largest marine biodiversity consisting of highly diverse genetic, species, and ecosystem diversity. Bandeng (milkfish, *Chanos chanos*) can be classified as follow :

Phylum     : Chordata
Class      : Pisces
Ordo       : Malacopterygii
Family     : Chanidae
Genus      : Chanos
Species    : *Chanos chanos*

Milkfish can be described as a fish with crossing tail, long and slim body, scale-free head, back-fin is far from gill, and whole body is covered with small scales. Milkfish lives at seashore and at the river-estuary located at tropical areas. It has an euryhaline condition (which can lives at the waters with widely salinity variation), therefore it can also be cultivated in freshwater area. Milkfish can grow up to 1.8 m length, with weight about 4.5 – 8.5 kg. In natural waters, milkfish prey on microscopic plants (e.g. *Foraminifera, Famelibranchiopoda, Copepoda,* blue-green algae).

In Indonesia, milkfish can be easily found at south Sumatera, east and south Borneo, north Java, south and central Sulawesi, Mollucca, and south-east islands. The quality of water that is needed for cultivating milkfish as follow :

- salinity : 20-30 ppt
- temperature : 27-31 C
- pH : 7.5-8.5
- oxygen >3 ppm
- alkalinity >150 ppm
- brightness : 20-40 cm
- free from pollution

Table 1. The Optimally Water Quality in Milkfish Cultivation

| Factors | Minimum | Maximum | Optimum |
|---|---|---|---|
| Dissolved Oxygen (mg/l) | 2,0 | - | Saturated |
| Amonia (mg/l) | 0,0 | 1,0 | 0 |
| Sulphur (mg/l) | 0,0 | 0,001 | 0 |
| Total organic Materials (mg/l) | 10,0 | 50,0 | 20,0-25,0 |
| PH | 7,5 | 9,0 | 8,0-8,5 |
| Temperature (C) | 26,0 | 32,0 | 29-30 |
| Salinity (ppt) | 0,0 | 60,0 | 15-25 |
| Transparency (cm) | 30,0 | 50,0 | 35,0-40,0 |

For decades, fish processing industries throughout the world have been dominated by traditional technology as the cheapest and the simplest way in food preservation, mainly salting, drying, smoking as well as fermentation. In 1999, the production of Indonesian traditional fish products were reached 36.2 % from total processed fish products, which was 4.7 % from those were processed in the form of the fermented product. The dried-salted fish products were still leading among others, by possessing 78.2 % from total traditional fish products. Some fermented fish products available in Indonesia are shrimp paste, peda fish, fish sauce, bekasam, fish silage, fish protein hydrolyze.

*Bandeng presto* is a kind of Indonesian traditional boiled salted fish product made from milkfish (*Chanos chanos*) with soft bones caused by pressured cooking method. The main problem occurred in this product is the limitation of shelf-life at room temperature (28C), as 2-3 days, which cause the shortage in its distribution area. This very short shelf-life of the product, is being the weakness of this product, may be caused by the inappropriate application of sanitation and hygiene in factories, re-contamination in products caused by the high levels of contamination occurred during processing stages or storage period, and also the inadequate packaging system towards on the Milkfish product. Some experiments have ever been conducted in extending the shelf-life period of pressured boiled-salted fish products, by using both of natural and artificial preservatives. *Bandeng presto* is originally produced in Semarang (Central Java) and being one of the famous traditional fish product in Indonesia. JUWANA bandeng presto has been being widely known as the represented pressured boiled salted fish product of Semarang.

Up to present, from the technology point of view, there are almost no new innovations on traditional fishery products. One of the greatest challenges for the development of traditional fish processing in Indonesia up to present is improvement of quality, hygiene and packaging to enable these products to play a role in an international market. In this regard, the application of HACCP (Hazard Analysis Critical Control Point) principle is becoming imperative, as well as the fully obedience in using food additives and preservatives among traditional food producers. This is also due to the increasing awareness towards healthy foods particularly seafood which cause the increase in consumer demand for high quality seafood, in fact. Further, this research was expected to searching of a new innovation in improving the product's quality and overcame the problem in the limitation of product shelf-life, by using alcohol as a food preservative.

The main purpose of this research was to extend the shelf-life of non-vacuum boiled salted fish at room temperature through the use of alcohol solution with different concentrations and time durations. Two kinds of boiled salted fish products were used in this experiment for comparison, laboratory-made

and factory-made.  Two kinds of alcohol methods were used in preserving boiled salted fish, such as : alcohol spraying and alcohol soaking.

## II.    EXPERIMENTAL METHODOLOGY

### 2.1.   Material
Fresh Bandeng fish (*Chanos chanos*) purchased at local market in North Jakarta, non-vacuum pressured boiled-salted fish received from the JUWANA factory located at Semarang (Central Java), packaging plastic HDPE, commercial alcohol solution (70%), highest grade chemicals available for chemical and microbiological analysis.

### 2.2.   Analysis
Chemical analysis (proximate, total volatile base, pH, alcohol residue)(AOAC, 1978), microbiological analysis (total plate count)(AOAC, 1978), and sensory evaluation for 20 semi-trained panelists (appearance, flavor, texture, and taste)(Rahayu, 1992).

### 2.3.   Experimental Design
- ***Preliminary Experiment :***
  The three different spraying volumes of 50 % alcohol solution (10, 20, and 30 ml); and three different soaking time (30, 60, 90 seconds) of 50 % were executed on both of IPB laboratory- and JUWANA factory-made boiled salted fish products. pH and Total Plate Count (microbiological) were used to observe the effectiveness of alcohol as the preservative towards on the product stored non-vacuum at room temperature (28ºC) within a week.
- ***Main Experiment :***
  The optimum spraying volume and soaking time of alcohol solution reached in preliminary experiment were used in the main experiment.  Different concentrations of alcohol solution were further used, as 30, 50, and 70 %.  The product was stored in the incubator 28°C for up to 15 days.  Some analysis that were done in this main experiment, such as: chemical (Total Volatile Base, proximate, alcohol residue), microbiological (Total Plate Count), and consumer preference test (hedonic test) involves: appearance, color, flavor, taste, and texture.  All analysis were done once in every 2 days.

The procedure to make pressured boiled salted Milkfish were as follow : Fresh Milkfish was headed and gutted prior to be soaked in 3% brine solution for 20 min.  Then some spices (garlic, curcumin, salt) were added onto the surface of fish.  After remaining for 10 min at the ambient temperature, the fish is boiled in pressure cooker at 136°C, 1.6 atm for 1 hour, prior to be dried in an oven at 60°C for 5-10 min.  Then, the fish is getting ready to be consumed or packaged for the market (in JUWANA factory) or for further analytical analysis (in IPB laboratory).

## III.    RESULTS AND DISCUSSION

- The spraying of 20 ml of 50% alcohol gave the more effectively killer effect on microbes than those of 10 and 30 ml of 50% alcohol based on the result obtained in Table 1.
- The soaking of 50% alcohol in 30 seconds gave a stronger effect in reducing the amount of microbes than those of 50% alcohol solution in 60 and 90 seconds, consider the results showed at Table 2.
- The spraying of 70% alcohol solution gave the more effectively effect in reducing the amount of microbes in LABORATORY-made Milkfish products; but gave no significant effect in JUWANA-made Milkfish product as shown at Table 3 and 4.
- The alcohol spraying method is being more effectively than that of soaking method in reducing the amount of microbes of product, as shown at Table 5 and 6.
- Total volatile base content in JUWANA-made Milkfish products, even treated with alcohol 70% (spraying and soaking methods) were still higher than those of LABORATORY-made Milkfish products, as shown at Fig 1.
- The alcohol residue in LABORATORY-made Milkfish product is lower than JUWANA-factory made, and tends to be reduced with the extend of storage time, as shown at Fig. 2.
- The use of alcohol could improve the acceptance of consumer towards on Milkfish products, both produced by LABORATORY and JUWANA factory, and this was in line with the higher concentration of alcohol used since of the stronger antiseptic effect possessed, as shown at Fig. 3 and Fig. 4.

- The consumer could accept the LABORATORY-made Milkfish product for up to 11 days with the use of 70% alcohol, mainly judged from its flavor (Fig. 5 and 6) and taste (Fig. 7 and 8); but only 2-3 days for control.
- The consumer could accept the JUWANA-made Milkfish product for up to 7 days with the use of 70% alcohol, mainly judged from its taste and flavor; but only 2 days for control.
- Texture and appearance criterions of Milkfish product with 70% alcohol were keeping better and being more acceptable for consumers than those of control and the lower alcohol concentrations used.
- Therefore, it can be concluded that alcohol can be used as the food preservative in order to extend the shelf-life of Milkfish product to enlarge its market areas.
- The more appropriate cooking method is needed to be searched, in order to reduce the alcohol residue amount in the product, so the product will be able to meet the expectation of Moslem people.
- By using alcohol solution as the preservative, the pressured boiled salted milkfish product is able to distributing in a wider market area and consumed by the non-Moslem people.

## IV.  CONCLUSION

- Alcohol is possible to be used as the safe food preservative in extending the shelf-life of pressured boiled salted Milkfish
- Alcohol spraying method gives the more effective way than its  soaking method in extending the shelf-life of a non-vacuum pressured boiled salted fish stored at room temperature (28°C)
- By using 70% alcohol solution as the preservative, the availability of *laboratory-made* pressured boiled salted milkfish has been improved for up 11 days for human consumption; but only 3 days for the control.
- By using 70% alcohol solution as the preservative, the availability of *Juwana-made* pressured boiled salted milkfish has been improved for up 7 days for human consumption; but only 2 days for the control.
- Alcohol spraying method gave the lesser residue in the product than that of soaking method
- The appropriate cooking method must be applied on alcoholized fish product to meet the need of Moslem consumers, such as: dried heating (oven, microwave)
- With the improving of shelf-life period, this fish product will be able to distribute in a wider market area.

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Lampiran-lampiran


TVB Content in JUWANA Milkfish Product with Alcohol Spraying Method


TVB Content in Laboratory Milkfish Product with Alcohol Spraying Method


TVB Content in JUWANA Milkfish Product with Alcohol Soaking Method


TVB Content in Laboratory Milkfish Product with Alcohol Soaking Method


ALCOHOL SPRAYING METHOD: APPEARANCE OF JUWANA PRODUCT


ALCOHOL SPRAYING METHOD: APPEARANCE OF LAB'S PRODUCT


ALCOHOL SOAKING METHOD: APPEARANCE OF JUWANA PRODUCT


ALCOHOL SOAKING METHOD: APPEARANCE OF LAB'S PRODUCT


ALCOHOL SOAKING METHOD: FLAVOR OF JUWANA PRODUCT


ALCOHOL SOAKING METHOD: FLAVOR OF LAB'S PRODUCT

ALCOHOL SPRAYING METHOD:
FLAVOR OF JUWANA PRODUCT



ALCOHOL SPRAYING METHOD:
FLAVOR OF LAB'S PRODUCT



ALCOHOL SPRAYING METHOD:
TEXTURE OF JUWANA PRODUCT



ALCOHOL SPRAYING METHOD:
TEXTURE OF LAB'S PRODUCT



ALCOHOL SOAKING METHOD:
TEXTURE OF JUWANA PRODUCT



ALCOHOL SOAKING METHOD:
TEXTURE OF LAB'S PRODUCT



ALCOHOL SPRAYING
METHOD:TASTE OF JUWANA
PRODUCT



ALCOHOL SPRAYING METHOD:
TASTE OF LAB'S PRODUCT



ALCOHOL SOAKING METHOD:
TASTE OF JUWANA PRODUCT



ALCOHOL SOAKING METHOD:
TASTE OF LAB'S PRODUCT

ALCOHOL SOAKING METHOD: COLOR OF JUWANA PRODUCT



ALCOHOL SOAKING METHOD: COLOR OF LAB'S PRODUCT



ALCOHOL SPRAYING METHOD: COLOR OF JUWANA PRODUCT



ALCOHOL SPRAYING METHOD: COLOR OF LAB'S PRODUCT



DESCRIPTIVE TEST ON JUWANA PRODUCT TASTE (Soaking)



DESCRIPTIVE TEST ON LAB PRODUCT TASTE (Soaking)



DESCRIPTIVE TEST ON JUWANA PRODUCT TASTE (Spraying)



DESCRIPTIVE TEST ON LAB PRODUCT TASTE (Spraying)



DESCRIPTIVE TEST ON JUWANA PRODUCT APPEARANCE (Soaking)



DESCRIPTIVE TEST ON LAB PRODUCT APPEARANCE (Soaking)

**DESCRIPTIVE TEST ON JUWANA PRODUCT APPEARANCE (Spraying)**

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**DESCRIPTIVE TEST ON JUWANA PRODUCT FLAVOR (Soaking)**

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**DESCRIPTIVE TEST ON LAB PRODUCT FLAVOR (Spraying)**

**DESCRIPTIVE TEST ON JUWANA PRODUCT TEXTURE (Soaking)**

**DESCRIPTIVE TEST ON LAB PRODUCT TEXTURE (Soaking)**

**DESCRIPTIVE TEST ON JUWANA PRODUCT TEXTURE (Spraying)**

**DESCRIPTIVE TEST OF LAB PRODUCT TEXTURE (Spraying)**

ALCOHOL RESIDUE IN JUWANA MILKFISH PRODUCT (Spraying)



ALCOHOL RESIDUE IN LAB MILKFISH PRODUCT (Spraying)



ALCOHOL RESIDUE IN JUWANA MILKFISH PRODUCT (Soaking)



ALCOHOL RESIDUE IN LAB MILKFISH PRODUCT (Soaking)