

## Symposium Proceedings

### Standardization and sensory evaluation of bottled smoked Indian oil sardines (*Sardinella longiceps*)

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#### Abstract

This study attempts to assess the influence canning method on the quality smoked bottled sardines, taking into consideration the possibility of its introduction as a new product into the market for canned goods. The smoked Sardines fish packed in 8 once or 240 ml bottles was processed sterility in a pressure cooker. Laboratory trials were conducted to determine the appropriate process and proportion of all ingredients. Four (4) products were Treatment 1 was the control were the sardines does not undergo smoking process. Treatment 2, 3 and 4 was smoked fish before bottling at 30, 45, 60 minutes respectively. The products were subjected to multiple comparison test were panelist to compare against the known Reference. A total 30 persons evaluated the products using the 7-point scale such as: 7) extremely better than R. 6) much better than R 5) slightly better than R 4) no difference 3) slightly inferior to R 2) much inferior to R. 1) extremely inferior R. Generally, the products were rated Just About Right processed in 60 and 90 minutes while the processed in 75 minutes was rated just right. The result for ANOVA implied that smoked sardines can be processed at 60, 75, and 90 minutes are acceptable and recommended that product should be subjected to shelf life analysis because storage time can affect the keeping quality of the produce.

Key words: bottled smoked sardines, red pepper

## INTRODUCTION

Canning or thermal process is of great technological importance in many countries of the world particularly in the Philippines. Canning or bottling smoked fish requires a processing time of 110 minutes in home pressure canner to destroy *Clostridium botulinum* spores and guarantee safety. This lengthy heating time means that the quality of fish will differ from that of home-canned fish that has not been canned. Canning tends to cause moisture loss from the fish, alter its color, and intensify the smoked flavor<sup>[1]</sup>. Furthermore, canning belongs to the most important means of fish preservation<sup>[2-4]</sup>. Many marine species produce excellent canned products, supporting an important role in the field of human nutrition<sup>[5]</sup>. During the canning process, both enzymes and bacteria should be permanently inactivated by heat and, provided re-infection does not occur and no negative

interaction with the container is produced, heat-processed fish keeps for a very long time. However, several detrimental effects have been encountered during canning (loss of essential nutrients, formation of undesirable compounds, browning development and lipid and protein damage) that can strongly influence the shelf life of canned fish products<sup>[6-9]</sup>.

Indian oil sardines or "tunsoy" in local name are abundantly caught not only in Bicol Region but all over the Philippines. These fish is not commonly used for direct consumption because of its being delicate, spiny and oily in appearance. Some villagers in Bicol Region say that if the fish is in season these fishes are abundantly caught every day. When fishes were not sold during these days, these were salted or dried. During rainy season when drying cannot be done sometimes they are just thrown or buried in the sand<sup>[10]</sup>.

Sardines (*Sardinella longiceps*) known as "Laolao or Turay" in Camarines Sur was used in this study. This species

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was chosen because of its availability and throughout the year in the Philippines and limited studies on it. Sardines in the Philippines is more known for its canned product-form in tomato sauce rather than part of the fresh fish commodities, when people refer to the word sardines (sardinas) it almost always refer to those in cans sold in almost all stores in the Philippines from the sari-sari community stores to the high end big supermarkets in the metropolis.

Sardines make up a significant part of the catch of small-scale fishers in the Philippines. In Bicol during the annual glut season large amounts are dumped back into the sea due to an inability of fishers and processors to cope with such a volume. To address this situation and to help enhance the livelihoods of small scale fishers and their families, the Coastal and Wetland Center (CWC) of Partido State University would like to look into the possibility to preserve the sardines applying canning procedures and also to investigate its microbiological load of the processed products. This study attempts to assess the influence canning method on the quality smoked bottled sardines, taking into consideration the possibility of its introduction as a new product into the market for canned goods.

## OBJECTIVES

### General objectives

To assess the quality attributes of Bottled smoked Sardines.

### Specific objectives:

1. To determine the length of smoking suited for bottling smoke sardines.
2. To determine the suitability of the different processing time at different level of temperature.
3. To compare the quality attributes of the bottled smoked sardines to the bottled sardines without smoking.

## MATERIALS AND METHODS

### Raw materials

50 kilos of Sardines were bought directly to fisherman this is to ensure that the product are still fresh. The fish was packed in a cooler with chilling temperature.

### Smoking process

Immediately after reaching to the fish processing laboratory of PSU Sagnay Campus the fish was immediately smoked at 100°C different period of time (30, 45, 60 minutes).

The smoking was done in a conventional smoking facility with temperature control. The smoke was produced from the saw dust. The temperature will be maintained at 100°C. Before smoking the sardines was first in concentrated salt solution using Tamarind or “Sampalok” juice (boiled the 1 kilo Tamarind or “Sampalok” leaves to 10 liters of water).

### Preparation of the filling media

The filling media was formulated into four (4) varied amount of the Pili nut. The formulation is presented Table 1. The concentrations or the formulation were boiled at 15 minutes.

**Table 1.** The concentrations of filling media.

Ingredients	Trial 1	Trial 2	Trial 3	Trial 4
Smoked sardines		160 grams	160 grams	160 grams
Fresh sardines	160 grams			
Carrots	5%	5%	5%	5%
Garlic	3%	3%	3%	3%
Pickles	5%	5%	5%	5%
Black pepper	5 pcs/bottle	5 pcs/bottle	5 pcs/bottle	5 pcs/bottle
Red pepper (labuyo)	2 pcs	2 pcs	2 pcs	2 pcs
Salt	¼ tsp	¼ tsp	¼ tsp	¼ tsp

### Bottling process

After smoking, smoked fish will be packed vertically into 8 oz jars, leaving 1inch headspace between the pieces and the top of the jar. Carrots, pickles Red and black pepper, garlic will also be added to enhance the flavor of the product. Vegetable oil was added as filling media. The jars were processed at 60, 75 and 90 minutes at 121°C (Pressure 15 psi) with a process lethality (F<sub>0</sub>) of 5 minutes.

### Sensory evaluation

Preference testing and just about right: The preference test of three products was subjected for preference test by 30 untrained panels consisting Faculty and Fishery students. Each sample was served with fresh water for rinse after tested. The product characteristics such as color, salinity, spiciness, tomato sauce flavor, garlic flavor, pepper flavor. The overall liking was also determined using the 9-point hedonic scale (1-dislike extremely, 5-neither like nor dislike and 9-like extremely). The just about right scale (1-not enough, 3-just about right or JAR and 5-too much) was tested to evaluate the Saltiness, spiciness, garlic flavor, chili flavor, smoky flavor, color, and firmness of bones.

## Research procedures

The researchers formulated three four (4) products and was replicated into three. Treatment 1 was the control were the sardines does not undergo smoking process. Treatment 2, 3 & 4 was smoked fish before bottling at 30, 45, 60 minutes respectively. This preferred formulation was used to process three (3) samples of Bottled smoked sardines at 121° C (Pressure 15 psi) with a process lethality ( $F_0$ ) of 5 minutes in varying processing time such as: 60, 75, and 90 minutes. The finished products were then subjected for sensory evaluation, chemical analysis and commercial sterility.

## RESULTS AND DISCUSSION

### The most preferred length of smoking suited for bottling smoked sardines

Laboratory trials were conducted to determine the appropriate process and proportion of all ingredients. Four (4) products were Treatment 1 was the control were the sardines does not undergo smoking process. Treatment 2, 3 & 4 was smoked fish before bottling at 30, 45, 60 minutes respectively. The products were subjected to multiple comparison test were panelist to compare against the known Reference. A total 30 persons evaluated the products using the 7-point scale such as: 7) extremely better than R. 6) much better than R 5) slightly better than R 4) no difference 3) slightly inferior to R 2) much inferior to R. 1) extremely inferior R. The results cited in Table 2. The chosen proportion was used in manufacturing products at same temperature but of different processing / cooking time; 60 minutes, 75 minutes and 90 minutes respectively. The products were then subjected to sensory evaluation specifically the descriptive evaluation and preference test.

Table 2 showed the summary of mean scores on the sensory attributes of Treatments of processing bottled smoked sardines. It indicates that taste and texture of Treatment 3 was rated extremely rated (1.2, 1.9) than the known reference. Previous studies explained that the texture of the fish muscle depends on numerous intrinsic biological factors related to the density of the muscle fibres, as fat and collagen content of the fish<sup>[11,12]</sup>. Previous research has shown a firmness decrease in chilled fish by increasing the chilling storage time<sup>[13]</sup>. Heating has been shown to convert the translucent, jelly-like cellular fish mass into an opaque and firmer<sup>[14]</sup>.

Generally, Treatment 1 & 4 were rated slightly better than the reference. Hence, the sardines smoked for 45 minutes at 100°C is the best sample to be bottled or canned.

### Sensory evaluation of bottled smoked sardines at varying temperature

The results of the sensory evaluation on the descriptive test on the different attributes are presented in the succeeding tables likewise the result of the Analysis of Variance (ANOVA) or F – test.

Sensory evaluation is the most important method for freshness and quality assessment in the fish sector<sup>[15]</sup>. Sensory inspection of processed fish used in the fish industry to find defects that have occurred during handling and processing<sup>[16]</sup>. The various sensory characteristics, such as outer, appearance, odor and color are still very important in the quality system in fish processing industry. Sensory methods are fast, simple, sensitive and objective but they rely on human judgment and proper training of panels<sup>[17-18]</sup>. Sometimes sensory tests are also perceived to be inherently subjective<sup>[19]</sup>. In this study, the sensory assessment of final products, smoked sardines in oil with carrots, garlic, pickles, black pepper and red pepper was conducted using the sensory attribute especially the hot taste using the methodology described by Gatchalian<sup>[20]</sup> with a

**Table 2.** Mean Scores on the Results Sensory Evaluation of the using the multiple comparison test and the known reference (R) Sardines that does not undergo smoking.

Attitudes	T2-smoked in 30 minutes		T3- Smoked in 45 minutes		T4- Smoked in 60 minutes	
	WM	AD	WM	AD	WM	AD
Appearance	3.3	Slightly better than R	2.4	Much better than R	2.8	Slightly better than R
Odor	4	No difference	2.2	Slightly better than R	4.2	No difference
Taste	3.9	No difference	1.2	Extremely better than R	4.2	No difference
texture	3.3	Slightly better than R	1.9	Extremely better than R	2	Much better than R
<b>Total</b>	14.5		7.7		13.2	
Mean	3.6	Slightly better than R	1.9	Extremely better than R	3.3	Slightly better than R

panel of trained panellist (Table 2). The hot taste (pungency) is the mainly required taste by consumers in this kind of product. The member of the jury giving their evaluation points on the criteria (hot taste) of the final product. Statistically we compare the products by Analysis of Variance (ANOVA) test for analyzing randomized complete block designs.

### Descriptive characteristics of bottled smoked sardines

Table 3 shows characteristics of bottled products in varied processing. The come-up- time for the product to reach 121°C was 5-10 minutes. After attaining 121°C the product was subjected to steam-air mixture (10Psi + 5Psi) until the product temperature reach to 118°C in 15 minutes.

The result of the color implies that the longer the processing time the darker the color of the product. Hence, the time of processing affects the color of the Bottled Smoked sardines in Coconut Sauce. Results of the descriptive characteristics of bottled Smoked sardines are presented shown in Table 3.

The results of sensory evaluation on spiciness, garlic and chilli flavor were rated just about right. While the product processed in 90 minutes the color was rated dark cream it indicated that the higher the temperature the color of the product change. Moreover, the firmness of bones processed in sixty (60) was rated moderately firm while the product seventy-five (75) and ninety (90) minutes were rated About Right. Generally, the products were rated Just About Right processed in 60 and 90 minutes while the processed in 75 minutes was rated just right.

It was noted that the processing time does not changed the saltiness, Spiciness, Garlic Flavor and Chili Flavor of the product.

On the firmness of bones of the smoked sardines shows

that in all levels of processing time it was described by the panelists that the flesh is tender or Just about right this means that although the products were subjected to various processing time the bones remain tender, therefore the flesh has a good texture.

### Significant difference on the sensory attributes of bottled smoked sardines in oil

The result of the sensory evaluation was subjected to F – test and it was computed using five percent (5%) level of significance. The results of the F – test of the sensory attributes of the bottled Smoked sardines are shown in Table 4.

**Table 4.** Results of Analysis of Variance (ANOVA) on the Different Sensory Attributes of Bottled Smoked sardines.

Attributes	F	P-value	Decision
Saltines	6.11	1	Not Significant
Spiciness	1.947588	0.148582	Not Significant
Garlic Flavor	3.075345	0.051057	Not Significant
Chili Flavor	2.71	1	Not Significant
smoky odor	2.71	1	Not Significant
Color	2.079245	0.057124	Not Significant
Firmness of bones	2.163585	0.170911	Not Significant

As reflected in Table 4, the p-value of all Attributes are greater than the ( $p < 0.05$ ) level of significance therefore the null hypothesis is accepted. Hence, the smoked sardines processed at different time has no significant difference. This result implied that smoked sardines can be processed at 60, 75, and 90 minutes are acceptable to the consumers. However, it is also recommended that product should be subjected to shelf life analysis because storage time can affects the keeping quality of the produce. Although based from the microbiological analysis products are commercially sterile.

**Table 3.** Summary Descriptive Characteristics of smoked sardines Process at 250°F at Varied Processing Time.

Characteristics	Processing Time					
	60 Minutes		75 Minutes		90 Minutes	
Saltines	2.4	Just Right	2	Just Right	2.4	Just Right
Spiciness	2.8	Just About Right	2.4	Just About Right	2.9	Just About Right
Garlic Flavor	2.8	Just About Right	2.4	Just About Right	2.9	Just About Right
Chili Flavor	2.5	Just About Right	2.5	Just About Right	2.5	Just About Right
smoky odor	2.4	Just Right	2	Just Right	2.4	Just Right
Color	2.8	Just About Right	2.4	Just Right	3.5	Dark Cream
Firmness of bones	3.6	Moderately Firm	2.2	Just Right	1.6	Just Right
<b>Total</b>	<b>19.3</b>		<b>15.9</b>		<b>18.2</b>	
Mean	3.2	Just About Right	2.7	Just Right	3	Just About Right

## CONCLUSIONS AND RECOMMENDATIONS

### Conclusions

Smoking the sardine fish before canning improves the quality of the products particularly its palatability. Addition of ingredients also improves the flavor of the products. The selection of raw materials is one of the most important factors for producing safe and quality bottled smoked sardines and other ingredients were important to produce a quality product. Considering this fact, the authors wanted to produce this new product bottled smoked sardines in oil with carrots, pickles Red and black pepper, garlic. Thus, the critical control point (CCP) are identified according to the Codex Alimentarius during processing. According to the results, the test for commercial sterility the products were processed in accordance with the standard. This result confirms that the tested products are stable and that the CCPs are mastered.

Each sample processed in varied length of processing time had different descriptive characteristics. However, the product can be processed at different processing time such as, 60, 75 and 90 minutes but it needs shelf life analysis at Food Laboratory.

### Recommendations

Based from the findings and conclusions, the following recommendations were advanced.

1. The Bottled Smoked sardine recipe may be improved and may be developed with different variations.
2. The shelf – life of Bottled Smoked sardines may be determined in the future investigation.
3. Further laboratory analysis may be conducted specially on the shelf life and nutritional content Bottled Smoked sardines.
4. The university shall help the researcher in promoting the product for livelihood project of the fisherfolks.

### ACKNOWLEDGMENT

The authors gratefully acknowledge the Partido State University, to Dr. Raul G. Bradicena, Luisa M. Lanciso and Patricia M. Candelaria for their technical and moral support. Furthermore researchers would like express their gratitude to Department of Science and Technology (DOST), Industrial Technology Development Institute, Standards and Testing Division, Manila for testing samples for commercial sterility, to Partido state University, and Bicol Consortium, Industry, Energy and Emerging Technology, Research and Development (BCIEERD) professors for invaluable ideas, recommendations that further improved the research study and

to the Food Laboratory employee of Central Bicol State University of Agriculture (CBSU) for the cooperation and patience of conducting the sensory evaluation of the finish product.

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