

Effect of Formalin on the Sensory and Some Biochemical Attributes of Fish

Prof. Rony L. Villaflorres, PhD

Department of Physical Sciences, College of Science
University of Eastern Philippines
6400 Catarman, Northern Samar,
Philippines

Abstract

*Unscrupulous practice of some fish vendors uses formalin (40% solution of formaldehyde, CH₂O) as preservative for fish especially when there are no available cool storage facilities and ice to preserve fish and fish products. Formalin being considered as highly toxic for human consumption could result to serious health hazard. Currently, there is no available tool in the local markets to detect formalin adulterated fishes and fish products that would safeguard consumers against the hazard of consuming fish treated with formalin. In order to develop strategies to detect formalin treated fish, this study was conducted to determine the fish quality and appearance based on sensory evaluation and some biochemical indicators. A controlled experiment was conducted using *Chanoschanos* Linn treated with 0%, 10%, 20% and 30% formalin and stored in ice. Sensory evaluation based on eye appearance, and odor smell of fish for 3 consecutive days showed no significant differences between treated and non-treated fishes. The pH and the trim ethylamine content if fish are not affected once the fish is preserved with formalin. Overall, the results showed that sensory evaluation based on fish eyes appearance and odor, as well as the pH and the trim ethylamine contents of fish cannot discriminate fish products treated with or without formalin. Further study should be conducted to develop alternative and sensitive method of detecting formalin in fish and fish products that could be used by authorities in monitoring the prevalence of formalin treated fish in the market.*

Introduction

Fish is the most popular viands for most Filipinos. It is easy to prepare as a menu, and affordable to buy. Freshness is the preference considered by the buyers. Vendors do some means to preserve the freshness of the fish and common way is to preserve it by refrigerator or by the use of ice. But, despite the fact that formalin is dangerous for human intake, there are some fish vendors who used formalin as fish preservative. Especially when there is a forecasted disaster, the fish farm owners are prone to harvest and preserve them by using chemical. In this study, the sensory attributes of the fish treated with the different diluted solutions of formalin were compared to that of not treated and the commercially available fish.

Sensory changes are those perceived with senses (appearance, odor). In this study, the instrument used for the sensory attributes of fish was a survey questionnaire composed of three parts; the eyes and gills appearance of the fish, and the odor and smell of the fish.

The fresh fish have bright, clear, bulging eyes and reddish-pink gills, are free from unpleasant odor, and exhibit a fine elastic flesh that springs back when pressed. There should be no discoloration and no odor. A strong odor indicates poor quality.

Another characterization method applied in this study was the Thin Layer Chromatography. The standard trimethylamine was tested in this method. The retention factor of standard served as guide on other retention factors of the different fish samples with trim ethylamine. If the retention factor of trimethylamine is less, the effect of the formalin on the sensory and biochemical attributes is high. Spectrophotometric analysis on trim ethylamine on different fish samples was adopted on this study. This is to analyze the concentration of trim ethylamine present on the different fish samples within a period of time. If the concentration of the trim ethylamine is less as the period of time gets longer, the concentration increase. If it is suppressed by the formalin concentration, the trim ethylamine is lesser. Through this characterization, the effect of formalin on sensory and biochemical attributes of *Chanos Chanos* was quantified.

Methodology

This study was conducted at the Bio-Physical (Chemistry Laboratory) College of Science, University of Eastern Philippines, Catarman, Northern Samar. College of Science is the one of the ten colleges of the university. The University of Eastern Philippines, Catarman, Northern Samar. This study used descriptive-correlational-experimental designs. This method was utilized to describe the sensory attributes of the fish. It correlated the effect of formalin solutions to the sensory and biochemical attributes of fish. It is experimental because the subject (fish) was experimentally treated with formalin solutions and scientifically observed as regards its sensory and biochemical attributes. Specifically, it employed the evaluation survey approach in gathering the data for the sensory attributes. The instrument used for sensory attributes of fish was a survey questionnaire composed of three parts. Part 1 is about the eyes appearance, Part 2 is about the gills appearance and the Part 3 is about the odor and smell. The instrument used for biochemical attributes were pH meter, vernier caliper, spectronic 20, triple-beam balance, and whatman filter paper 42 for TLC. The samples of fish were availed from the owner of the fishpond at Victoria, Northern Samar. Purposively, *chanoschanos* was used as the sample in this study; and treated with 0%, 10%, 20%, and 30% formalin solutions. The control variable samples were not treated with these diluted formalin solutions. One control variable was availed from the wet public market of Catarman. All fish samples were refrigerated. This was done for three days, and the experiments were done after every twenty-four hours. To legitimize the conduct of this study, permission was secured from the Director for Laboratories, College of Science, and the Director for Agriculture, Provincial Office, Northern Samar. Both written and personal communication to the respective concerned individuals were done. In the three-day conduct of this study, all observations were recorded.

Results and Discussion

This study found out that the sensory attributes on eyes, gills, odor smell, and the pH of fish treated with different formalin concentrations and that of not treated with formalin were the same at constant temperature for 72 hours observation with 12-hour time interval. The freshness of the fish looks the same that can deceive the fish buyers. Table 1. Summary of Results on the Test of Difference among the Different Treatments in terms of 0%, 10%F, 20%F and 30%F on the pH as a Biochemical Attributes of Fish

Biochemical Mean	F-values Interpretation			
	Computed	Critical		
0%F	8.70	0.025	3.47	NS
10%F	8.37			
20%F	8.82			
30%	9.13			

As to the test of differences of the presence of trimethylamine biochemical attributes was found no significant difference, (shown in Table 2). It implies that the trimethylamine content in the fish treated with formalin and that not treated were the same.

Table 2. Comparison of the presence of TMA for a period of 3 days

Period	t-values			
	Mean	Interpretation		
Computed	Tabular			
D1 vs D2	0.022 vs 0.038	1.705	2.306	Not Significant
D1 vs D3	0.22 vs 0.060	1.660	2.306	Not Significant
D2 vs D3	0.038 vs 0.060	1.469	2.306	Not Significant

Table 2a. Spectrophotometric Method on Trim ethylamine on Fish for a Period of three days at 3 Different Wavelengths

Day 1	Wavelength	Absorbance	Transmittance
Treatments			
0%F	450 nm	0.03	95
10%F	450 nm	0.02	96
20%F	450 nm	0.01	98
30%F	450 nm	0.01	98
Day 2			
0%F	480 nm	0.05	90
10%F	480 nm	0.03	95
20%F	480 nm	0.03	95
30%F	480 nm	0.02	96
Day 3			
0%F	510	0.08	83
10%F	510	0.04	92
20%F	510	0.05	90
30%F	510	0.03	95

Conclusions

Based on the results of the study, there is no significant difference among treatments on the eyes, gills and odor or smell of the fish within a period of three days. Therefore, the sensory attributes of fish whether treated or not treated of formalin solutions are closely similar. It implies that the effect of formalin on sensory attributes of treated *ChanosChanos Linn* and that not treated was the same; there is no significant difference among the treatments on the pH values and the retention factor of trim ethylamine as tested through thin layer chromatography. Therefore, the pH and the trim ethylamine content of fish are not affected once the fish is preserved with formalin. It implies that formalin affected on the pH of *ChanosChanos Linn* to remain constant at the same storage temperature; and the trim ethylamine in fish treated with formalin was subdued.

Recommendations

It is further recommended to develop alternative and sensitive method of detecting formalin in fish and fish products that could be used by authorities in monitoring the prevalence of formalin treated fish in the market.

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