



# Evaluation of Optimum Temperature and Soaking Time for Reduction of Nitrite Levels in Cirebon Typical Salted Fish

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**Abstract.** Salted fish is one of Indonesia most common side dish. Processing salted fish into ready-to-eat usually done by immersing salted fish in the water. Else of reducing the saltiness and soaking can also reduce harmful compounds like nitrite, which can disrupt the blood's oxygen-binding process. Nitrite can build up methemoglobin compounds which disrupt oxygen supply. The study aims to determine which temperature and length of time to soak salted fish effectively reduce nitrite levels. This experimental laboratory study uses a Pre-Posttest Control Group Design. The samples chosen were jambal roti, peda and gubaran salted fish. Five grams of the sample were immersed in a temperature of 40°C, 50°C, 60°C, 70°C with immersion time of 10, 15, 20, 25 minutes respectively with a completely randomized design (CRD). The immersion was repeated three times, and the average nitrite levels in the water were compared between temperature, immersion time, and type of fish. Statistically, the most effective temperature to reduce nitrite is 70°C with a soaking time of 20 minutes. The fish's size influences the effectiveness, wherein gubaran salted fish is a thin sheet so that it has more surface area. In conclusion, the most effective soaking time is 20 minutes at 70°C

**Key Word:** Nitrite, Salted Fish, immersion;

## 1. Introduction

Salted fish or Indonesian known as "Ikan asin" is the most common side dish in Indonesia. Salted fish is a food that is easily found in Indonesia because Indonesia is an archipelago country. There are many varieties, types, shapes and sizes of salted fish, and almost every coastal area in Indonesia has salted fish with its own characteristics [1]. Cirebon has the largest fish catching area in the West Java region [2]. The Cirebon area is one of nineteen districts in West Java Province as one of the industrial places for preservation by giving salt to fish [1],[2]. In Cirebon, famous for its three salted fish types, namely Jambal Roti, Peda and Gubaran Salted Fish [2]. Salted fish is preserved by reducing water content by providing salt to be consumed for a long time without any spoilage [3]. Because of salted fish's frequent consumption, the nitrite content in salted fish may enter the body [4],[5]. Side effects caused due to excessive sodium nitrite consumption are cancer, damage to various tissues, and even the human body's organs. The main side effect of excessive sodium nitrite consumption is damage to various organs resulting from

hypoxia [4]. Nitrite is a dangerous compound to human health because it can react with haemoglobin to form methemoglobinemia, blocking oxygen in the body[4]. The bond between nitrite and haemoglobin will also induce ROS formation (Reactive Oxygen Species), which will cause oxidative stress. Hypoxia and oxidative stress that occur can induce apoptosis. Another side effect that can be caused is cancer. Nitric oxide (NO) can bind to myoglobin in salted fish which then undergoes a nitrosation process to form nitrosmyoglobin. Nitrosmyoglobin is a derivative of nitrosamines, which are compounds that are carcinogenic in the human body [6].

Processing salted fish into ready-to-eat usually done by immersing salted fish in the water [7]. Else of reducing the saltiness, soaking can also reduce harmful compounds like nitrite. Even though many homemakers have done this, there are no detailed studies on reducing nitrite levels in salted fish with immersion. so it is necessary to do a study on the effectiveness of temperature and long soaking time to reduce nitrite levels in salted fish

## 2. Method

The study was an experimental laboratory study with Pre-Posttest Control Group Design using salted fish as the subject. The samples were Peda, Jambal roti, and Gubaran Salted Fish. The temperature used was 40, 50, 60, 70 degrees Celsius with a soaking time of 5, 10, 15, 20, and 25 minutes. The design used was a completely randomized design (CRD). The number of repetitions to be carried out was three times for each type of fish. Nitrite levels in the used immersion water indicate the amount of nitrite reduced from salted fish. The measurement of nitrite levels was carried out using a colourimetric method with references to SNI 06-6989.9-2004. The data obtained were analyzed statistically using the normality test with a confidence level of 95%. The data then analyzed using numerical comparative hypothesis test of more than two groups continued with Post Hoc analysis of the comparative numerical test. This study has passed the ethical review of the KEPK FK UGJ.

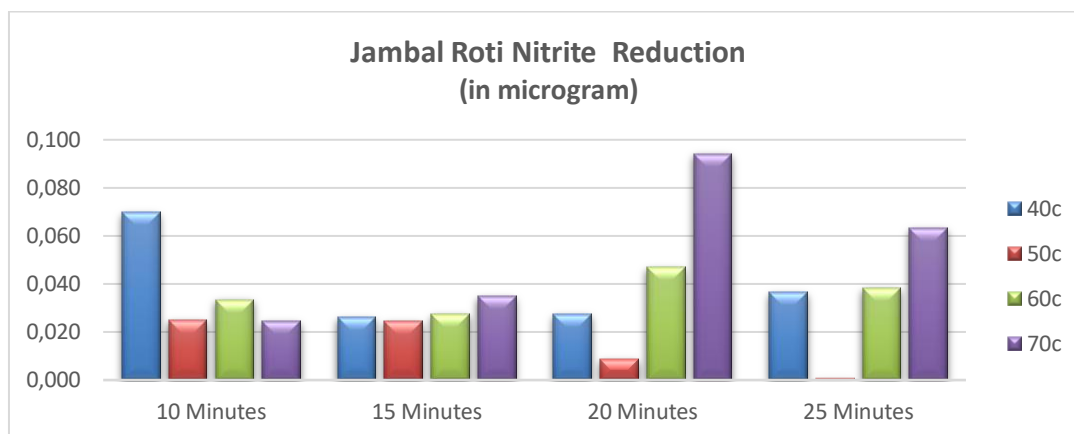
### 3. Results and Discussion

Salted fish Jambal roti is one type of salted fish well known in Indonesia, especially Java. Jambal roti is a salt fermented product made from sea catfish (*Arius thalassinus* Ruppel) [5]. The term jambal roti is used because of the characteristic texture of the meat that crumbles easily after frying like toast with a distinctive aroma. Salted peda fish is a salt fermentation product of mackerel or mackerel (*Rastrelliger neglectus*) [3]. Salted peda fish which has a high glutamate content produces a savoury taste that Indonesian people enjoy doing. This fish is usually sold as whole fish. Meanwhile, salted fish is a product of salted fish fermented by several types of fish, the main characteristic of which is the fish that will be salted, split vertically and then opened so that the drying

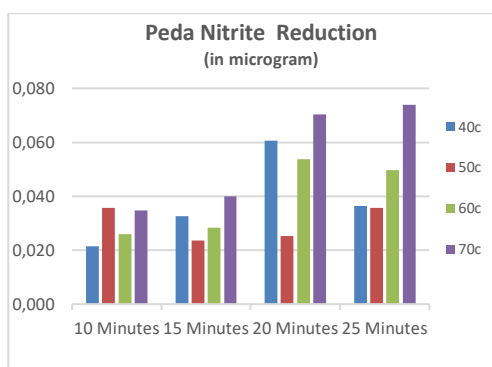
process is much faster[8]. Before doing nitrite testing on salted fish, the maximum absorption wavelength was determined using UV-Vis spectrophotometry at a wavelength between 480-580 nm [9]. It obtained a maximum wavelength of 540 nm at a concentration of 1.4 ppm as the highest concentration in nitrite's standard series solution. They were giving a good peak and by the provisions of SNI 06-6989.9-2004. The resulting wavelength obtained according to the literature, is 543 nm. The description of the results of the pretest data analysis is presented in figure 1. below.

In general, there is an increasing trend of nitrite reduction from each immersion temperature. The process of immersing and heating the salted fish will directly contact the heating and immersion media. The longer the soaking and heating, the water content will come into contact with the salted fish's surface, which indicates the emergence of air bubbles that evaporate due to the heating process. This is because sodium nitrite has a very high solubility in water so that when the water moves gradually from the innermost part of the material towards the outer part, the nitrite will also be carried away until part of it is released and there is a shift to the immersion medium[9]. This process of transferring nitrite causes reduction of nitrite in salted fish.

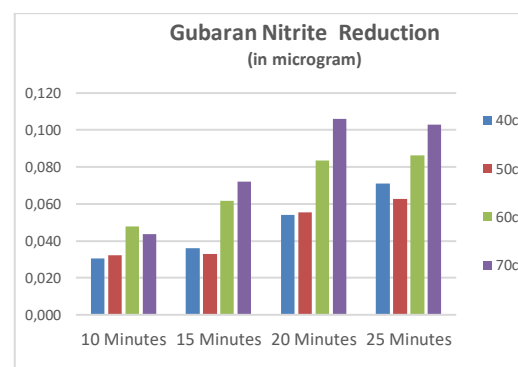
Statistically, the data obtained is not normally distributed, so the test used is non-parametric. The Kruskal Wallis test results show that the reduction of nitrite may begin to occur at temperatures above 50<sup>0</sup> Celsius, this is concluded from the difference in the level of nitrite reduction of jambal roti at 40<sup>0</sup> Celsius and 50<sup>0</sup> Celsius, Peda at 50<sup>0</sup> Celsius and dissolved at 40<sup>0</sup> Celsius. Furthermore, it was found that the best temperature to reduce nitrite in salted fish was 70<sup>0</sup> C.



**Figure 1.** Nitrite reduction in jambal roti salted fish over time.



**Figure 2.** Nitrite reduction in Peda salted fish over time.



**Figure 3.** Nitrite reduction in gubaran salted fish over time.

An increase in temperature can cause the expansion of fish tissue so that nitrites trapped in the fish's body can be released into the water [10]. In addition to temperature, the fish's condition also affects the speed at which the fish releases nitrites into the water. Salted fish, jambal roti and peda are quite large, and in fact, it is usually only sold in pieces. As a comparison, 5 grams of jambal roti and peda fish are a small part of the fish's body, while the Gubaran salted fish is small and light enough that 5 grams of fish can consist of 1 salted fish. Gubaran fish are also split vertically so that they have a fairly flat body and a better surface area than jambal roti and peda. From the length of soaking time, it is known that the trend of nitrite reduction tends to increase over time, and the increase is slowed down at 20 minutes. This trend is seen in both salted and salted fish. The statistical rate of nitrite reduction in the immersion time of 25 minutes in pamphlets and

burial was not different from the soaking time of 20 minutes. There is no definite mechanism as to why there is a reduction in nitrite reduction in soaking time of 25 minutes. One of the possible ones is the saturation point, but this is only a conjecture and needs further testing [9],[10],[11].

The weakness of the study was that the nitrite test was only carried out on the water used for soaking salted fish so that it cannot describe the total nitrite amount in salted fish, besides that, the soaking media is water which can evaporate if given heating, so that it can affect the nitrite concentration in the immersion water.

#### 4. Conclusion

From the results And discussion obtained, it can be concluded that soaking salted fish in warm water can help reduce nitrite levels in salted fish, and nitrite levels are reduced the greatest at 700C for 20 minutes.

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