



## ARTICLE REVIEW: EFFECTIVENESS OF USE PACKAGING ON PINDANG FISH

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### Keywords

Type of packaging, quality, shelf life, pindang fish.

### ABSTRACT

Fish is a source of animal protein whose presence is quite vital in supporting the fulfillment of essential nutrients to meet the needs of body functions. Fish pindang is one of Lampung's specialties served with yellow sauce. This typical Lampung Pindang has a unique and different taste, the taste is very savory, fragrant and delicious, it is a natural combination, because the majority of the ingredients in the recipe are made from natural spices, which is made with the addition of tamarind and turmeric but with a short shelf life. Fish pindang will be more durable if packaged in plastic packaging that has been vacuumed. The types of packaging materials that can be used are Polypropylene (PP), Polyethylene (PE) and Aluminum Polypropylene (AlPP). These types of packaging materials certainly have different characteristics and can affect the quality and shelf life of fish. Therefore, it is necessary to know the effectiveness of the use of packaging on pindang fish. The review method is by initiation from various primary sources, namely related articles published in various journals in the last 10 years. Parameters observed were chemical quality (pH and water content), physical (L and <sup>0</sup>Hue values), microbiology (total microbial and total mold) and shelf life (visual fungus, gas and color change). Observations were made on days 0, 7, and 14. Based on the results of the study, it was shown that the interaction of packaging technique and type of packaging affected the pH of storage on the 7th day. The packaging technique treatment affected the pH and L values on the 7th and 14th days of storage, while the water content and <sup>0</sup>Hue were significantly different only on

the 7th day of storage. The type of packaging only affects the pH of the yellow spiced pindang fish on the 7th and 14th days of storage. The combination of vacuum packaging with PP is recommended as the best treatment because it is better able to maintain pH, water content, and produces the best color.

## Introduction

Pindang fish is the result of fish processing with a combination of salting and boiling, most of which are made from skipjack tuna. In East Lombok Regency, skipjack tuna production reached 33.7% in a period of 2 years from 2008 to 2010 of the total capture fisheries obtained, skipjack tuna in addition to relatively high production also has a high nutritional content [1]. The nutritional content of skipjack tuna is 103 kcal energy, 22 g protein, 1.01 g fat, 1.3 g ash, 29 mg calcium, and 1.25 mg iron. The yellow spiced pindang fish produced usually has a relatively low shelf life of less than 24 hours. Traditionally processed pindang fish is very easy to grow with fungi and bacteria, especially the micrococcus group [2]. Proper packaging is another way to extend the shelf life of food products. Packaging can protect and prevent food spoilage by blocking the entry of oxygen and air containing many contaminants. The types of packaging materials that can be used are Polypropylene (PP), Polyethylene (PE) and Aluminum Polypropylene (AlPP). These types of packaging materials certainly have different characteristics and can affect the quality and shelf life of fish. Therefore, it is necessary to know the effectiveness of the use of packaging on pindang fish. One of the packaging techniques that can be applied is the vacuum packaging technique. Vacuum packaging is packaging by removing gas and moisture from the packaged product. Vacuum packaging is usually combined with other types of plastic packaging because it is strong, flexible, easy to shape, and difficult to penetrate water and air. Types of packaging that have a high density with low water vapor and gas permeability are Polypropylene (PP), Polyethylene (PE) plastics and Aluminum Polypropylene (Al-PP) combination packaging. Type of PP, Polypropylene in packaging that is commonly used daily, while packaging with plastic in the form of Polyethylene (PE) and Polypropylene (PP) can reduce water content, maintain protein content, lower pH value, suppresses total bacterial colonies and reduces the percentage of cooking loss of beef [3]. The type of packaging combined with both vacuum and non-vacuum packaging techniques affects the quality of food products. Vacuum packaging is proven to extend the shelf life of food products. Yellow spiced pindang fish stored at room temperature in packaging without a vacuum can only last for 2 days. The shelf life of the yellow spiced pindang fish product requires studies that can better maintain the quality and extend the product's shelf life [4]. In this review, we will discuss the effect of packaging techniques and types of packaging on the quality and shelf life of yellow spiced pindang fish.

## **Review Method**

Citation from various primary sources, namely related articles published in various journals in the last 10 years.

## **Result and Discussion**

### **Degree of Acidity or pH**

One of the important aspects that determine the quality and shelf life of foodstuffs. The pH value of yellow spiced pindang fish during storage was observed based on the results of the further test of significantly honest difference (BNJ) showing that the interaction of packaging technique and type of packaging treatment on the pH of yellow spiced pindang fish was not significantly different at 0 and 14 days of storage, but different evident on the 7th day of storage. The effect of treatment on the pH of yellow spiced pindang fish has not been found on day 0 storage. And the combination of vacuum packaging techniques with Polypropylene (PP) is better able to maintain product pH. Quality deterioration can be minimized by controlling the pH of the packaged meat and maintaining its ideal storage temperature accurately [5]. Vacuum conditions can further inhibit the growth of spoilage microbes and prevent fat oxidation in packaged materials. The conditions in the airtight packaging and the good permeability properties of (PP) packaging were able to suppress microbial growth, it was in accordance with the total number of microbes of yellow spiced pindang fish on the 7th day of observation which was the lowest from other treatments. The decrease in pH of yellow spiced pindang fish packaged with PP tended to be more manageable than (PE) and (Al-PP). (PP) packaging has the characteristics of being stronger, low penetrating power, good resistance to grease and stable at high temperatures [6]. (Al-PP) packaging type is thinner than (PP) which makes it easier for water vapor and gas to penetrate and affects its permeability to be greater. (PP) plastic has a lower permeability to O<sub>2</sub> than (PE) plastic, so the respiration process in (PP) plastic is slower than (PE) plastic. The decrease in pH of yellow spiced pindang fish packaged with (PP) tends to be more manageable than (PE) and (Al-PP) [7]. Increased water content has an effect on increasing Aw so that it supports microbial growth [8]. The decrease in pH of yellow spiced pindang fish packaged with PP tended to be more manageable than (PE) and (Al-PP). The permeability of (PP) to water vapor is better than (PE), while the type of packaging Al-PP is thinner when compared to PP which makes it easier for water vapor and gas to penetrate and affects the permeability to be greater.

### **Water Content**

The water content in foodstuffs also determines the level of acceptance and durability of the food itself. The water content of yellow spiced pindang fish during storage for 14 days was presented in observations with the results of a further test of significantly honest difference (BNJ), showing that the interaction of packaging technique treatment and type of packaging on the level of the water of pindang yellow spiced fish was not significantly

different on the 0, 7, and 14 days of storage. The packaging technique and the type of packaging were not significantly different on the water content of the product on the 0th day of storage. The packaging technique treatment gave a significantly different effect on the water content of the product on the 7th day of observation. Products packaged with the vacuum technique have a lower water content than those packaged with the non-vacuum technique. Vacuum packaging is more effective in reducing the rate of increase in water content during storage due to the vacuum treatment that all water vapor and air contained in the packaging have been sucked out of the package first. Vacuum packaging is in an airtight and airtight condition and is very dense so that it inhibits the penetration of water into the material from the environment [9]. Vacuum packaging is water resistant which acts as a barrier against moisture content. Vacuum packaging can inhibit the growth of aerobic microbes that can damage the tissue structure of the material so that the process of decomposing bound water into free water on the material can be prevented. Microorganisms can cause the breakdown of the protein structure in food, causing the release of water bound to muscle tissue. The treatment of packaging technique and type of packaging on the 14th day each gave no significant effect on the water content of the yellow spiced pindang fish, because the vacuum packaging was filled with air due to the permeability of the type of packaging used, causing an increase in the number of microbes. which causes an increase in microbial metabolism which will increase the amount of free water in the yellow spiced pindang fish. The total number of yellow spice pindang microbes on the 14th day of storage has exceeded the limit of total microbial contamination according to SNI 27.17.1:2009 concerning the quality of pindang fish, namely in all treatments it has exceeded  $1.0 \times 10^5$  CFU/g. The increase in the number of microbes is also influenced by the transfer of water vapor from the environment into the packaging through the pores of the packaging.

### **L Value**

The L value shows the brightness level where the number 0 is black while the number 100 is white. The brightness level of yellow spiced pindang fish during 14 days of storage was presented based on the results of the further test of significantly honest difference (BNJ) indicating that the interaction of the packaging technique and type of packaging treatment on the L value of the product was not significantly different at the 0, 7, and 14 days of storage. The treatment of packaging techniques and types of packaging were not significantly different from the brightness level of yellow spiced pindang fish on day 0 storage. The packaging technique treatment had an effect on the L value of yellow spiced pindang fish on days 7 and 14, while the type of packaging had no effect. Vacuum packaging can prevent microbial growth due to the unavailability of air in the packaging [10]. Vacuum conditions in addition to preventing microbes from growing, can also prevent oxidation. Fat oxidation can produce malonaldehyde components that can interact with amino acids that cause color changes, especially in the dark-fleshed fish group. Dark-fleshed fish are fish that are classified as having dark or red colored flesh, including skipjack tuna

which is classified as having a red flesh color. Red or dark meat contains myoglobin and hemoglobin which are pro-oxidants and rich in fat so that during the storage process, red meat in tuna will change color to brown (myoglobin becomes metmyoglobin [11]). Fat oxidation can produce malonaldehyde components that can interact with amino acids that cause color changes, especially in the dark-fleshed fish group. Dark-fleshed fish are fish that are classified as having dark or red colored flesh, including skipjack tuna which is classified as having a red flesh color.

### **°Hue**

°Hue indicates the color range of the product analyzed using the Colorimeter. °Hue is obtained from a combination of red, yellow, green, blue, and violet [12]. °Hue of yellow spiced pindang fish during storage for 14 days based on observations showed that the interaction of packaging technique treatment and type of packaging on the L value of yellow spiced pindang fish was not significantly different at 0, 7, and 14 days of storage. Turmeric contains curcumin which can provide the yellow color of the material. The vacuum packaging technique treatment can prevent the degradation of the pigment or color of the yellow spiced pindang fish. Vacuum conditions can inhibit the growth of microbes that can produce enzymes that degrade the color of a material on the 14th day,

### **Total Microbes**

The total number of microbes in food products is one indicator of food safety. The effect of packaging techniques and types of packaging on the total microbes of yellow spiced pindang fish can be seen in the observations showing that the lowest total number of microbes in yellow spiced pindang fish is on the 0th day of observation. The raw materials used contain high nutrients, high moisture content, and packaging properties and characteristics. The number of microorganisms in processed food is influenced by water content, water activity, pH, temperature, and length of time [13]. (PP) packaging is the type of packaging that is most suitable for use with vacuum packaging techniques. The permeability properties of (PP) to water vapor are better than that of (PE) and (PP) which have water and vapor resistance properties. Microbial growth can be suppressed because the availability of oxygen is very minimal in vacuum packaging. Generally, bacteria that grow on foods that have high nutrition are *Bacillus cereus*, *Salmonella*, *Staphylococcus aureus*, and also *Vibrio parahaemolyticus* [14]. High microbial growth is due to the availability of oxygen, free water and sufficient air to support optimal microbial growth. The total microbes from the non-vacuum combination treatment with (PE) were significantly higher than the vacuum treatment at each storage period. Total mold one of the causes of the decline in product quality is due to the presence of molds, molds have filaments or threads that form a mass and can spread quickly on the surface. The use of turmeric and tamarind can prevent and inhibit the growth of fungi/mold [15]. In addition, the absence of fungus is due to the processing of the yellow spiced pindang fish by heating to a temperature above 90°C. The growth temperature of the fungus is 20-40°C. High temperature treatment at the time of heating can prevent the

growth of mold / mold. Vacuum packaging treatment can further prevent mold growth due to the unavailability of oxygen and lower water content in the packaging [16].

### **Storability**

Analysis of the storage quality of yellow pindang fish based on observations showed that several parameters including visual fungus growth, gas formation, and color changes. Based on several studies, it was shown that there was no fungal growth visually in yellow spiced pindang fish with all treatments for 14 days of storage. It is suspected that this is due to the process of processing yellow spiced pindang fish by heating and temperatures above 90°C which are higher than the mushroom growth temperature, which is 20-40°C [17]. The use of turmeric and tamarind is also able to suppress the growth of product molds. The chemical content of turmeric rhizome includes curcumin, essential oils, resins, desmethoxycurcumin, oleoresin, and bidesmethoxycurcumin which provide antibacterial and antifungal effects, while tamarind contains organic acids, namely tartaric acid, carboxylic acid, palmitic acid, oleic acid, citric acid and quinic acid [18]. Product packaging in a bloated condition can also indicate the food is no longer safe for consumption, this is due to the activity of several harmful microbes that produce gas. The formation of gas only occurs in yellow spiced pindang fish that is packaged in a vacuum, this is due to the growth of microorganisms in the packaging that can produce gas such as CO<sub>2</sub> so that the packaging becomes bloated and indicates the type of microorganism that grows, namely anaerobic or facultative anaerobic microbes. These bacteria grow in unavailable conditions or with only a small amount of oxygen. Types of gas-producing anaerobic microbes include *Bacillus coagulans*, *B. stearothermophilus*, *C. botulinum* [19]. The shelf life of vacuum-packed products is longer because the absence of oxygen can inhibit the growth of destructive microorganisms and chemical reactions. Discoloration can be further prevented in vacuum packaged products (VPP, VPE). Color changes in packaged products are caused by air and microorganisms. Oxygen is a factor that can support the growth of microorganisms and the oxidation of fats contained in yellow spiced pindang fish so that it can cause changes in the color of yellow spiced pindang fish.

### **Conclusion**

The combination treatment of vacuum packaging techniques with polypropylene packaging is recommended as the best treatment. This type of polypropylene packaging has water and vapor-resistant properties, while under vacuum conditions it will inhibit the circulation of air and water vapor so that it can inhibit the growth of microorganisms which causes the pressure cooker to become soft and soft. Polypropylene packaging has the characteristics of being stronger, low penetrating power, good resistance to grease and stable at high temperatures. Analysis of the storability quality of pindang fish includes several parameters including visual fungus growth, gas formation, and color changes. Based on the analysis carried out, there was no visual fungus growth in pindang

fish with all treatments for 14 days of storage. The combination treatment of vacuum packaging techniques with polypropylene packaging is recommended as the best treatment because it produces pindang fish with the best value with undetectable total mold and meets the Indonesian National Standard (SNI) for pindang fish until the 7th day of storage.

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