

# Review Article: Use of Vacuum Packaging In Smoked Fish Products

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## ABSTRACT

Smoked fish is a fishery product that has good economic prospects in Indonesia, so smoked fish products must have good quality. One of the obstacles to smoked fish products is the ease of quality loss and short shelf life. The decrease in quality in smoked fish is caused by the decomposition of components by microbes, enzymes and fat oxidation during storage. One way to deal with this is to use vacuum packaging. Vacuum packaging is a vacuum packaging system by removing oxygen from the shelf life process. Vacuum packaging provides good benefits or effects on smoked fish products, including on storage length, organoleptic value, and TVB-N value on smoked fish products.

## KeyWords

Organoleptics, Quality reduction, Smoked fish, Storage length, TVB-N Value, Vacuum packaging.

## INTRODUCTION

Smoked fish is one of the fishery products that are much loved by the people of Indonesia. Smoked fish business is one of the post-harvest fisheries businesses that also provide benefits to the national economy. Based on KKP statistics (2012), the volume of smoked fish production in Indonesia reached 108,066 tons. The quality of smoked fish during storage is affected by packaging and storage conditions. In general, smoked fish are marketed without packaging so that the shelf life of the product becomes very short (Margoro et al 2000). Poorly packaged smoked fish are very easy to contaminate by pathogenic bacteria that can harm the health of consumers. The decrease in quality in smoked fish is caused by the decomposition of meat components by microbes, enzymes and fat oxidation during storage which can result in sensory changes (taste, texture, smell, and color). Therefore, a way is needed to prevent microbial and oxygen contamination during storage (Hadiwiyoto 1993)

One way to overcome this is to use vacuum packaging. Vacuum packaging is one of the useful methods of packaging products to extend shelf life, protect products, and be safe for products. Vacuum packaging can extend the shelf life of products 3-5 times longer than without vacuum (Jay 1996). Vacuum packaging can also inhibit contamination from pathogenic bacteria during storage and provide oxygen-free conditions by removing the air inside the packaging. The presence of oxygen in the packaging can cause a decrease in product quality because oxygen triggers the growth of microorganisms and chemical reactions (Astawan et al 2015). This review journal aims to find out the effect of the use of vacuum packaging on smoked fish products.

## Vacuum Packaging

Vacuum packaging is a vacuum packaging system by removing oxygen from the shelf life process, thus extending shelf life. This vacuum packaging process is done by inserting the product into plastic packaging followed by air control using a vacuum packing machine (Vacum Packager), then closed and disabler. With the absence of air in the storage process, oxidation damage can be eliminated so that the freshness of the product will last 3-5 times longer than products stored with nonvakum (Jay 1996). Whereas, nonvakum packaging is ordinary packaging, the disadvantage of this shelf life method is that there is a possibility of less than perfect sealing, there is still a gap so that air or water vapor can enter, because the heat sealer is operated manually (Rahmadana 2013).

Vacuum packaging has long been used to improve performance in product packaging systems. Advantages of using vacuum packaging include packaging becomes neater and product durability becomes longer. Research on the microbial ecology of food has been conducted and conveyed that the microbial ecology of food depends on the environment, food type, packaging process, and storage temperature (Ozpolat et al. 2014). The same is also conveyed by Kenneth (2007), that vacuum packaging can reduce the amount of damage by extending the shelf life of food.

## Smoked Fish

Fumigation is one of the methods used to preserve food products that contain high protein, such as fish (Suroso et al 2018; Paputungan et al 2015). However, this goal shifted to produce products with distinctive flavors (Prasetyo et al 2015). Smoked fish is a traditional fish processing product to preserve, give color, and add a distinctive taste to fishery processed products (Wibawa and Priyatno 2015). Smoked fish become one of the processed fishery products that are much in demand by the community. Smoked fish result from the merging of salting and fumigation methods aimed at reducing the moisture content in fish so that bacteria are not given the opportunity to live and multiply. This can make the fish have the ability not to rot for a long time. In the future, smoked fish will become a promising business commodity and have good prospects, especially for expo commodities.

A typical area of smoked fish marine products is the North Semarang area. Some fish that can be processed into smoked fish are Manyung fish, Sembilang fish, and Stingray fish. Smoked fish from these fish has a distinctive and delicious taste. Smoked fish can be processed again into sambal and can be cooked with other ingredients, such as eggplant, tempeh, and coconut milk.

## Storage Length

The benefits of using vacuum packaging in smoked fish products one of them is to extend the shelf life of smoked fish products. With vacuum packaging, the air in the storage process is eliminated so that damage due to oxidation and exposure to microorganisms can be minimized and eliminated. This can affect the shelf life of smoked fish products become longer and the quality of smoked fish products can be maintained.

According to privatewati research (2018) which examined the length of storage in smoked fish, smoked stingrays, and smoked cobs with vacuum and non-vacuum packaging showed that smoked fish with non-vacuum packaging has a shelf life of one day, while with vacuum packaging has a shelf life of 3 days at room temperature storage. Smoked stingrays with non-vacuum packaging have a shelf life of one day, while with vacuum packaging has a shelf life of 5 days. Smoked cobs with non vacuum packaging have a shelf life of a day, while with vacuum packaging has a shelf life of 4 days. This suggests that vacuum packaging can extend shelf life or storage length on smoked fish products. According to Renate research (2009), vacuum packaging can reduce the amount of oxygen in the packaging, prevent contamination of microorganisms, and extend the shelf life of the product. In addition, vacuum packaging also provides better visual effects. Nasution et al.'s research on vacuum packaging on smoked fish stored at cold

temperatures also showed the same thing. The results of the study are that vacuum-packed smoked fish have a longer storage period of 49 days, while smoke-packed fish that are packaged non-vacuum have a long time of storage for 42 days.

According to Jay (1996) vacuum packaging can extend the shelf life of products longer than without vacuum. According to research Astawan et al. (2015) states that the shelf life of vacuum packaged products is longer because the absence of oxygen can inhibit the growth of destructive microorganisms and chemical reactions. Long storage is very influential on organoleptics in smoked fish products because during storage there are physical and chemical changes caused by the activity of enzymes and microorganisms (Kaiang et al 2016)

## **Organoleptics**

The use of vacuum packaging in smoked fish products can have a good effect on organoleptic products. The presence of microorganisms and oxygen can affect the taste and aroma in smoked fish products. Angela et al (2015) states that changes in aroma and poor taste in smoked fish products are caused by environmental factors that support microbial growth during storage such as water content, temperature, oxygen resulting in the growth of microbes. However, with the use of vacuum packaging on smoked fish products can maintain the organoleptic quality of the product. This is because vacuum packaging can prevent the growth of microorganisms and the presence of oxygen in the packaging.

## **Appearance**

With the use of vacuum packaging, the decrease in the value of organoleptic appearances can be slowed. This is because by vacuum packed can suppress the presence of bacteria in smoked fish products. In the vacuum packaging study of white snapper smoke during storage conducted by Stefani et al (2020) experienced a decrease in the value of appearance, both using vacuum and non-vacuum packaging. According to Winarno (2002), the decrease in organoleptic value of this sighting can be due to bacterial activity. Nevertheless, the use of vacuum packaging in white snapper smoke can slow the decline in appearance compared to non-vacuum packaging. The organoleptic value of vacuum-packaged appearances has a higher value than non-vacuum. The organoleptic value of vacuum appearance is 4.47 - 6.73, while non-vacuum 3.67 - 6.60. The same was also shown in Angela et al (2015) research, that vacuum-packed cakalang smoked fish have a higher average appearance value of 5.8 - 7.5 than those that are not vacuum packed. Meanwhile, those that are not vacuum packed have an average value of 4.3 - 6.3. This suggests that with the use of vacuum packaging on smoked fish products, it can slow the decline in the value of organoleptic appearances.

## **Smell**

Based on research conducted by Stefani et al (2020) on the use of various packaging in processed white snapper smoke shows that during storage, organoleptic value in terms of aroma decreased. However, organoleptic test results in terms of the aroma of white snapper smoke with vacuum packaging during storage have a higher value of 5.13 - 6.47 compared to non-vacuum packaging which is 3.53 - 6.33. Then, research conducted by Angela et al (2015) on the use of vacuum and non-vacuum packaging in cakalang smoked fish during 21 days of storage showed that the organoleptic value of scent with vacuum and non-vacuum packaging decreased. This decrease is caused by the appearance of mold in the product so that it causes a rancid odor. However, the average organoleptic value of vacuum-packed cakalang smoked fish aroma is 5.8 - 8.9, while cakalang smoked fish packed with non-vacuum 4.3 - 7.5. This suggests that vacuum packaging may slow the decline in the organoleptic value of aroma in smoked fish products.

## **Taste**

The use of vacuum packaging can slow the decline in the organoleptic value of flavors in smoked fish products. Vacuum

packaging cannot stop the decline in the organoleptic value of taste, but it can only slow the decline in the value of organoleptic flavors. According to Winarno (2002) long storage tends to increase water content so that the taste in food becomes unpleasant and not accepted by consumers, but with the use of vacuum packaging can suppress the presence of bacteria and the entry of air from the outside so that it can maintain or slow down the decline in quality. This is evidenced by research conducted by Angela et al (2015) which showed that vacuum-packed cakalang smoked fish have a higher average organoleptic taste value than non-vacuum which is 6.9 - 8.2. Meanwhile, the average value of organoleptic non-vacuum taste is 6.3 – 7.7. Then, in research conducted by Stefani et al (2020) showed that in storage for 24 hours, which has a better taste quality value is white snapper smoked fish with vacuum packaging of 4.73 - 6.60 compared to non vacuum packaging 3.53 - 6.47.

### **Texture**

The texture value can be affected by the moisture content of the product. According to Purnomo (1995), high water content causes the texture in foodstuffs to become soft and the longer storage also causes the texture of the meat to get softer. However, the use of vacuum packaging can inhibit the decrease in the value of organoleptic texture in smoked fish products. This is evidenced in research conducted by Stefani et al (2020), on 24-hour storage that has a good texture quality is white snapper smoked fish products with vacuum packaging of 5.00 - 6.47, while non-vacuum packaging 3.67 - 6.33. The texture value can be affected by the moisture content of the product. According to Purnomo (1995), high water content causes the texture in foodstuffs to become soft and the longer storage also causes the texture of the meat to get softer. However, the use of vacuum packaging can inhibit the decrease in the value of organoleptic texture in smoked fish products. This is evidenced in research conducted by Stefani et al (2020), on 24-hour storage that has a good texture quality is white snapper smoked fish products with vacuum packaging of 5.00 - 6.47, while non-vacuum packaging 3.67 - 6.33. In Angela et al research (2015) also showed the average organoleptic value of cakalang smoked fish texture with vacuum packaging 5.1 – 7.9 and non-vacuum 4.9 – 7.7. Based on the research it is known that vacuum packaging can inhibit the decrease in the value of organoleptic texture in smoked fish products.

### **Total Volatile Base Nitrogen (TVB-N)**

Deterioration in the quality of fish can also be caused by the influence of enzymatics and bacteria. Both of these influences will break down the constituent components of fish body tissues resulting in physical changes such as fish meat becoming soft and chemical changes that produce volatile and foul-smelling compounds. Volatile compounds give the impression that fish have become rotten, so these compounds are used as a sign of deterioration in the quality of smoked fish. The levels of these evaporating compounds can be determined in a laboratory called tvb-N levels determination. TVB-N levels vary between the types of fish with each other or with the same type of fish. The state and amount of TVB-N levels depends on the quality of the freshness of the fish. The lower the quality of the fish, the higher the LEVEL of TVB-N.

In a study conducted by Nasution et al (2018) on vacuum and non vacuum packaging on smoked fish, showed that vacuum-packed smoked fish have a lower TVB-N value than those packaged nonvakum. This shows that vacuum packaging is more effective at inhibiting the activity of spoiling bacteria compared to nonvakum packaged ones. Then, in a study conducted by Angela et al (2015) on vacuum packaging on cakalang smoked fish showed that on storage day to 0 the average value of TVB-N is 21.84 mg N / 100 grams and for non-vacuum 23.52 mg N / 100 grams. Then, on the 7th day, the average value of a vacuum-packed TVB-N is 29.4 mg N / 100 grams while non-vacuum is 43.25 mg N / 100 grams. Then, on the 21st storage day, the average value of TVB-N in smoked fish cakalang is 27.72 mg N / 100 grams, while non vacuum 45.36 mg N / 100 grams. Based on the data shows that the value of TVB-N in vacuum and non vacuum packaged products has increased the value of TVB-N. However, non-vacuum packaging products have a

higher increase in value than vacuum-packaged products. This proves that vacuum packaging can inhibit the increase in the value of TVB-N in smoked fish products.

The increase in TVB-N levels is due to the influence of bacteria as evidenced by an increase in the number of bacteria as parameters of fish decay. According to Jinadasa (2014), the increasing value of TVB-N can cause changes in smell and taste in packaged products. The high value of TVB-N is also associated with increased activity of microorganisms and autolysis reactions in fish muscle tissue causing texture damage and decreased water holding capacity (Zhang et al. 2015).

Vacuum packaging can inhibit the oxidation process because there is no oxygen in the packaging so that it can inhibit the increase in the value of TVB-N. The effectiveness of the use of vacuum packaging against TVB-N levels is also supported by research conducted by Purnamayati et al (2018), the research shows that the longer the storage time, the value of TVB-N is increasing. However, the value of TVB-N in vacuum-packaged products is lower compared to non-vacuum packaging. The same results were also shown in a study conducted by Ozpolat et al. (2014) that the TVB-N value of processed fish products increased during storage, but the value of vacuum-packaged TVB-N was lower than that of non-vacuum-packed ones. This is because the availability of oxygen in non-vacuum packaging is greater than vacuum packaging.

## Conclusion

The use of vacuum packaging has a good influence on smoked fish products. This is because, the presence of oxygen in the packaging that triggers the growth of microorganisms and chemical reactions minimized or eliminated. The effects of the use of vacuum packaging on smoked fish products include the length of storage of smoked fish products to be longer, organoleptic values can be inhibited by the decline, and the value of TVB-N in smoked fish products with vacuum packaging is lower than without vacuum.

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