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REVIEW ARTICLE: POLYPROPYLENE PLASTIC PACKAGING AGAINST THE SHELF LIFE OF FISH CRACKERS

Fitri Anggraeni[1)] and Junianto[2)]

[1] *Student, Faculty of Fisheries and Marine Science, Padjadjaran University, Indonesia. Corresponding Author: fitri.anggraeni1411@gmail.com*
[2]*Lecture, Faculty of Fisheries and Marine Science, Padjadjaran University, Indonesia.*

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fish crackers, packaging, processed fish, polypropylene plastic, shelf life, thickness, water content

ABSTRACT

Fish crackers are a type of flour-based processed food with the addition of fish or shrimp as the main ingredient. One of the flaws of fish crackers is that they easily absorb moisture from the air around them, making them less crunchy during storage. As a result, the most critical component in maintaining the quality and shelf life of fish crackers is packaging. Packaging can help protect food from contamination and contamination, as well as physical disturbances like friction, collision, and vibration. Polypropylene is a plastic with high tensile strength, is leak-proof, gas and odor-resistant, and is unaffected by humidity fluctuations, making it ideal for snack and dry product packaging. The goal of this study is to find out what factors influence the shelf life or storage time of fish crackers packaged in polypropylene plastic. The findings revealed that many parameters such as the RH in the storage room and the thickness of the polypropylene plastic used influenced the shelf life of fish crackers. The shorter the shelf life, the higher the RH and also the thinner the plastic, and vice versa.

I. INTRODUCTION

Crackers from different parts of Indonesia usually have diverse features and flavors, which are influenced by the ingredients used, such as fish and shrimp, to provide a distinct taste and aroma. Furthermore, the addition of fish or shrimp improves and strengthens the taste of the processed crackers while also increasing the protein content. Crackers are a popular snack in the community, composed primarily of flour and frequently served as a side dish to staple dishes such as rice [1].

Extending the shelf life of processed fisheries products is possible with proper packaging. By limiting the entry of oxygen and air containing many pollutants, packaging can sustain and prevent food degradation [2]. Packaging can also protect products against damage and pollution, as well as physical disturbances including friction, collision, and vibration [3].

According to [4], shelf life is a storage condition for food goods that refers to the amount of time it takes for a specific level of quality degradation to occur. Food products will lose quality, food value, weight, value for money, trust, and growth power if they are stored. [5]. One of the most common issues encountered in the industry when producing and marketing products is shelf life. The accuracy with which the type of packaging is chosen has a significant impact on the product's longevity till it reaches the consumer. Varied forms of packaging will elicit different reactions from consumers. As a result, it is vital to employ a method for calculating shelf life that is the quickest, easiest, and most accurate, as well as one that is consistent with the features of the food product concerned [6]. The expiry date of a product is highly tied to the type of material it is packaged in [7].

According to [8], the most influential factor in decreasing the quality of food products is the change in water content in the product. Changes in the water content of the material in the packaging are influenced by the permeability of the packaging. The addition of water content to the material is also influenced by the humidity of the air in the storage room. The purpose of this review is to determine the factors that affect the shelf life or duration of storage of fish crackers packaged with polypropylene plastic, so as to provide information to consumers about the shelf life of these fish crackers.

II. POLYPROPYLENE PACKAGING AGAINST THE SHELF LIFE OF FISH CRACKERS

2.1 Polypropylene Plastic Packaging

Polypropylene (PP) is a thermoplastic polymer produced by the chemical industry that is used in a variety of products such as plastic bags, cups, buckets, and bottles [9]. Polypropylene has a high melting point of 190-200 degrees Celsius and a crystallization point of 130-135 degrees Celsius. Chemical resistance (chemical resistance) is strong in polypropylene, whereas impact strength is low[10]. Polyethylene has many advantages, including its ease of heating, flexibility, low moisture and water permeability, ability to be frozen (-50o C), transparency to opaqueness, and ability to be laminated with other materials. Polyethylene's flaw is that it has a high oxygen permeability and is not grease resistant. [11]

Polypropylene (PP) is one type of plastic linear hydrocarbon polymer (CnH2n) which has a tensile strength of high, leakproof, limiting (medium) to water vapor , gases and odors and is not affected by changes in humidity [12] making it suitable for use as a packaging for snacks and dry products. The packaging used has an area of 26 cm x 18 (cm) x 2 surface area, which is 936 cm2 or equivalent to 0.0936 m2. The larger the packaging area used can extend the shelf life by slowing the rate of water vapor.

2.2 Moisture content

The nature of the food to be packaged, the ambient conditions in which it is stored, and the nature of the packaging material must all be considered when designing food packaging. Water content has a significant impact on the quality of crackers that consumers would accept, so packaging with a low permeability to water vapor must be chosen to avoid crackers from losing their crispness. Packaging has the ability to enhance shelf life and retain material quality for longer periods of time [13]. PP packaging has a low permeability to water vapor and O2 and can limit material-to-O2 contact [14]. The oxygen permeability constant of PP packaging is 3500 to 4500g/m2/day. This will provide an opportunity for oxygen to penetrate the product [15].

The raw value and textural profile are closely related to the moisture content of the dried product. The total amount of water content of an ingredient can occur because the quantity of free water included in the food material is greater; the higher the total amount of water content of an ingredient can occur because the amount of free water contained in the food material is higher. The texture of the profile data is made up of numerous criteria, including hardness, crispness (fracturability), power cohesive, adhesive nature, elasticity (springiness), stickiness (gumminess), power chewable, and resilience (resilience). The value of hardness and crispness, on the other hand, are the most important factors for baked crackers. An environment that has a high RH causes the crackers to absorb water more quickly from the environment as a reaction to reach equilibrium conditions which will cause the crackers to become sluggish.

2.3 Shelf

Life The shelf life of crackers is estimated by determining the critical moisture content and equilibrium moisture content. In a study conducted [16] using the accelerated method of critical moisture content approach at the RH of product storage of 65% or the daily humidity value. The results of this study indicate that the shelf life of African catfish crackers packaged in transparent PP plastic can last up to 231 days. This is because the water vapor permeability of transparent PP plastic is 0.0114 g/ m2. day. mmHg. According to [17], bottled water vapor permeability is the ability of water vapor to penetrate a package at certain temperature and RH conditions, so that the smaller the bottled water permeability, the lower the water vapor penetration power. The lower the value of the water vapor permeability of the packaging, the lower the rate of water vapor diffusion so that it can maintain crispness and prolong the shelf life of the product. While the prediction results of the shelf life of kemplang (with the microwave oven method) in storage at a temperature of 27 C (assuming the critical point of fish cracker moisture content is 10%) which was studied by [18] showed that kemplang processed with a microwave oven in PP packaging, has value of k, which is 0.0138/day. The initial moisture content for kemplang processed with a microwave oven is 6.36%. The estimated shelf life of kemplang processed in a microwave oven in PP packaging is 32 days. Then for fried kemplang packaged in PP, it has a k value of 0.0198/day. The critical value of water content for the storage of fried kemplang is 7%, while the initial water content is 3.75%. The estimated shelf life of fried kemplang in PP packaging is 31 days.

From the results of the study [19] which examined the shelf life of kemplang crackers at environmental RH with different packaging thicknesses, during the study the ambient temperature was recorded at ±30°C with environmental RH (±63%) and RH in storage jars (±53%). The permeable surface area of the packaging is about 6,305 mm2, the thickness (t) of the plastic sheet is 0.3 mm, 0.5 mm and 0.7 mm. During storage, the moisture content of kemplang crackers in PP plastic packaging increased, both at the RH of the environment and the RH of storage jars. The results obtained for the shelf life of kemplang crackers using PP plastic with a thickness of 0.3 mm are predicted to last for 12 days, PP plastic with a thickness of 0.5 mm is predicted to last up to 14 days and PP plastic with a thickness of 0.7 mm is predicted to last for 33 days. While the shelf life of kemplang crackers in RH storage jars with a thickness of 0.3 mm PP plastic packaging is predicted to last for 185 days and 0.5 mm and 0.7 mm PP plastic packaging thickness is predicted to last > 365 days. These results indicate that the shelf life of kemplang crackers is strongly influenced by the RH conditions in the storage room and the thickness of the plastic used because at high RH, the water vapor pressure gradient between the storage environment air and the kemplang crackers is greater so that the driving force for the absorption of water vapor from the environmental air to the kemplang crackers is greater. in crackers even bigger. The higher the RH and the thinner the plastic, the shorter the shelf life, and vice versa. This explains that the higher the rate of adding water to the ingredients, the faster the kemplang crackers become sluggish or can be said to be not crunchy. Thin plastic packaging also has a higher water vapor permeability, so the rate of penetration of water vapor into the packaging is greater and the rate of change in water content in kemplang is faster. According to [20], the low permeability value of the packaging has the ability to prevent the entry of large water vapor. Packaging with low water permeability will make it more difficult for water vapor to enter [21].

It's different with the results of research [22] regarding the shelf life of the product fish crackers SME "two brothers" it was found that fish crackers were packaged using pp plastic with a thickness of 0.03 mm the shelf life was 21.83 days and packaged fish crackers using pp plastic with a thickness of 0.08 mm can last up to 141.21 days or the equivalent of 4 months and 21 days. Fish crackers packaged with 0.03 mm PP plastic have the smallest shelf life value, this is because this packaging has the largest permeability value so that water vapor from the environment will easily enter the packaging and will be absorbed by the fish crackers. so that it makes fish crackers experience a decrease in quality in the form of being not crunchy. According to [23] polypropylene plastic has good resistance to grease and low water vapor permeability. However, the packaging used has a smaller thickness compared to 0.08 mm PP plastic so that the process of transferring water vapor into the packaging takes place more quickly, resulting in a faster decrease in the quality of fish crackers.

Conclusion

Packaging can extend shelf life and maintain material quality longer. PP packaging can reduce the contact between the material and O2 and has a low permeability to water vapor and O2. Polyethylene packaging has very beneficial properties, namely, it is easy to heat, flexible, low moisture and water permeability, can be used in frozen storage, has high tensile strength, is leak resistant, gas and odor and is not affected by changes in humidity.

The shelf life of crackers is influenced by various factors such as RH conditions in the storage room and the thickness of the plastic. At high RH, the water vapor pressure gradient between the storage environment air and the crackers is greater so that the driving force for the absorption of water vapor from the environmental air into the crackers is also greater. The higher the RH and the thinner the plastic, the shorter the shelf life, and vice versa. Thin plastic packaging also has a higher water vapor permeability, so the rate of penetration of water vapor into the packaging is greater and the rate of change in water content in kemplang is faster. The low permeability value in the packaging has the ability to prevent the entry of large water vapor. Packages with low water permeability will make it more difficult for water vapor to enter.

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