



RESEARCH PAPER

OPEN ACCESS

Influence of freezing and pasteurization of the physical condition of the plastik (PE, PP and HDPE) as selar fish packaging (*Selaroides leptolepis*) in sendang biru, malang, east java. Indonesia

Titik Dwi Sulistiyati and Eddy Suprayitno

Faculty of Fisheries and Marine Science, Brauwijaya University, Malang, East Java, Indonesia

Article published on December 14, 2014

Key words: Packaging, PE (PolyEthylene), PP (Poly Propylene), HDPE (High Density Polyethylen).

Abstract

Selar fish abundance in the coastal region of the Sendang Biru Malang needed a good production packaging for marketing purposes and the protection of the product from any damages up to the consumer. Various packaging can extend its durable, one type of packaging materials that are inexpensive and easily found that plastic. Plastic is made from oil and natural gas as a source, and in the process was replaced by synthetic materials so they can be retrieved plastic properties as desired. The plastic used for freezing and pasteurization selar fish which is a type of plastic, PE, PP and HDPE. The purpose of this research is to know the comparison of various kinds of plastic packaging materials as well as determine the types of plastic packaging is good against freezing or pasteurization process fish. The results showed that plastic PE (PolyEthylene) is a plastic that is well used to the freezing due to low temperature resistant. While plastic HDPE (High Density Polyethylen) used for pasteurization and resistant to high temperatures.

*Corresponding Author: Eddy Suprayitno ✉ eddysuprayitno58@yahoo.com

Introduction

Selar fish (*Selaroides leptolepis*) is a type of small fish plagis (surface fish) that lived in sea in a particular area. Many fish caught in coastal waters as well as living in a group up to a depth of 80 m and is one of the fish that are of interest to the community. A lot of demand and the price is high enough will encourage an increase in arrests on this fish (Hidayat, 2005). Selar fish abundance is also found in coastal areas of Sendang Biru Malang needed a processing such as freezing and pasteurization for extending the save. In addition to that required to protect product packaging material until it came to the marketing.

Packaging is a place or container used to package a product. In general the functions of packaging in the food product during distribution to hosts from the manufacturer to the consumer, protect and preserve the product, as the identity of the product, improve efficiency, protect bad influences from the outside, protect the bad influence of product in it, expanding the use and marketing of products, adding to the attractiveness of the prospective buyer, means of information and advertising, as well as giving comfort to the consumer (Sembiring, 2009).

According to Suprayitno (2009), the type of packaging materials commonly used among other things such as metal cans, plastic containers, tubes, flexible packaging, bottle and jar glasses.

Packaging materials are generally divided into two kinds, namely packaging food products and non-food product packaging. Packaging food products generally requires more than the security assurance of the non food product packaging. According to Nurminah (2014), a type of plastic packaging, including the packaging of food products, among others, PE (Poly Ethylene) serves as a layer or layers of adhesive seal, PP (Poly Propylene) serve as other packaging materials and upholstery seal layer, or as a stand-alone package. While HDPE (High Density Polyethylen) has a stronger material, hard, opaque and more resistant to high temperatures.

Freezing fish means preparing the fish to be stored in low temperature which is much below the low point of the fish. Freezing aims to preserve the natural properties of fish. Freezing changed almost the entire content of the water in the fish into ice. In practice it is very difficult to freeze the liquid inside the body fluid because most fish that have a very low freezing point between -55°C and -65°C . In General, freezing up to -12°C or 30°C is supposed to have enough (Masyamsir, 2001).

Pasteurization is a process of heating food for the purpose of killing harmful organisms such as bacteria, viruses, protozoa, molds and yeasts. Pasteurization aims to achieve a "reduction of the log" in a number of organisms, reduce their number so that it could no longer cause disease (provided the product has been pasteurized refrigerated and used prior to the expiry date). Pasteurization temperatures vary with product type tergantung which is about $60-105^{\circ}\text{C}$ (Nurcholis, 2013).

This research is used to know the comparison of various kinds of plastic packaging materials as well as determine the types of plastic packaging is good against freezing or pasteurization process.

Materials and method

Place and Time

This research was conducted in the laboratory of Marine Station Sendang Biru Malang, East Java, from August 2014 to September 2014.

Materials

Plastic PE, PP and HDPE into the main ingredients are described as selar fish packaging material for freezing and pasteurization is then seen changes physical properties that occur.

Working Procedures

The research method used is descriptive method, which focus attention to solving actual problems as they are at the time of research descriptive research is

implemented, determine and report on the current situation (Soendari, 2013).

On the process of freezing, selar fish already in fillets are put into plastic, PE, PP and HDPE which is already on the seal. Then put in the freezer for 24 hours as well as observed from a plastic condition, the condition of the fish, pH, temperature and TMA.

On the process of pasteurization, selar fish that had been washed clean and fillet are included in each plastic, PE, PP and HDPE. Then vacuum to remove oxygen, so anaerobic microbes cannot live in it. Later

in the meeting to seal and no air is coming back. The plastic that contains the fish in pasteurization at a temperature of 65°C for 30 minutes as well as observed from a plastic condition, the condition of the fish, pH, temperature and TMA. Measurement of pH using pH meters, temperature measurement with a thermometer as well as measurements of the TMA using vials of conway.

Results and discussion

As seen from the data can be analyzed that the type of plastic that is resistant to low temperatures is plastic PE.

• *Characteristics of plastic packaging materials for freezing Selar fish*

Parameters	Types of Plastic		
	PE	PP	HDPE
a) Plastic condition	a) plastic still good	a) plastic is a little torn	a) plastic became hard
b) Fish condition	b) 100% fish frozen	b) 65% fish frozen	b) 70% fish frozen
c) Fish pH	c) 6.55	c) 6.47	c) 6.86
d) Fish Temperature (°C)	d) 16.7	d) 19.2	d) 17.5
e) TMA (mgN/100 g)	e) 0.16	e) 0.22	e) 0.34

Plastic PE including types of low density, there is a little hole in the chain between the molecules that cause it has a number of long chains that are little more than a distance of high density, thus having high density nature of the material that is stronger, harder and more durable. Hydrogen bonding between molecules also plays a role in determining the melting point of plastic, in addition to the fish fillets are packed in suitable forms of plastic PE (Muwarni, 2011). Plastic PE has a thickness of 0.001 to 0.01 inches, which are widely used as food packaging, easy to make pouches with a good density so that both are used for low temperature (Nurminah, 2014). pH chart fish with different plastic packaging material due to the freezing are presented in Fig. 1.

pH Freezing of Plastic

From the data Fig. 1, it can be seen that type of plastik PE, PP and HDPE was able to maintain a pH of the fresh fish between 6.47-6.58.

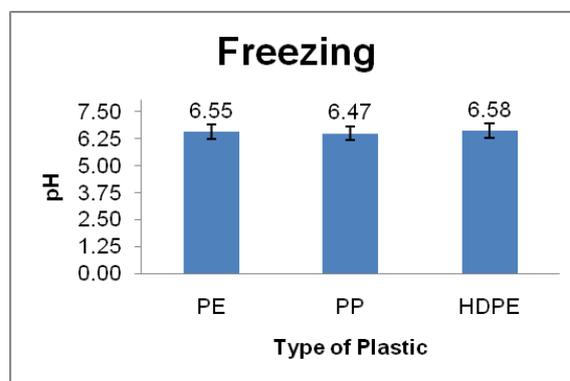


Fig. 1. pH chart fish with different plastic packaging material due to the freezing.

The pH value is one of the indicators used to determine the level of the freshness of the fish. On the process of decaying fish fish meat pH changes very big role because of the effect on the process of autolysis and bacterial assaults (Munandar, 2009). Fish temperature chart with different plastic packaging material due to the freezing are presented Fig. 2.

Temperature Freezing of Plastic

From Fig. 2, the types of plastic are good for freezing is PE plastic because it can lower the temperature of the fish up to 16.7°C, if compared with the plastic type PP or HDPE. This PP plastic properties, among others, namely flexible so easy to set up and has a high range power, impermeable to water, water vapor and gas, can be used for frozen storage temperature-50°C (Miltz, 1992).

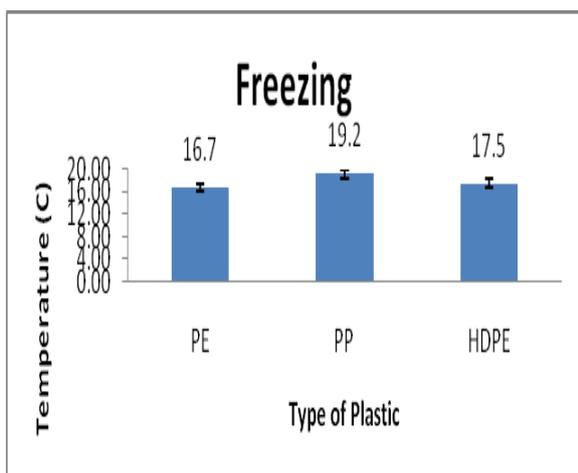


Fig. 2. Fish temperature chart with different plastic packaging material due to the freezing.

The lower the temperature of the fish is then able to extend power durable fish. Advantages of preservation with freezing is the original properties of fish did not experience changes in texture, taste and smell (Adawyah, 2000). Chart of the TMA fish with different plastic packaging material due to the freezing are presented in Fig. 3.

TMA Freezing of Plastic

From Fig. 3, the TMA (Trimethylamine) content of the fish is packed with plastic PE is 0.16 mgN/100 g fish meat has the lowest number of TMA.

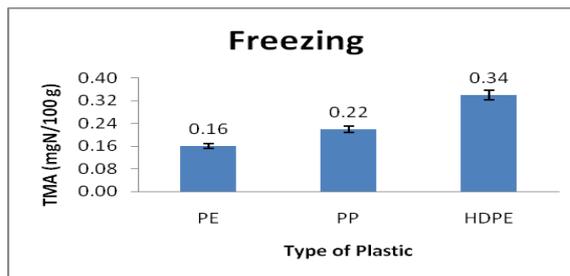


Fig. 3. Chart of the TMA fish with different plastic packaging material due to the freezing.

The lowest content of the TMA shows that the freshness of the fish can still awake and types of plastic PE right used for freezing. The higher the levels of TMA the fish quality is increasingly ugly, because the levels of TMA related bacterial pembusuk in fish flesh. As a quality standard of freshness of fish then made the default value TMA as national standards, where the value of the fishery should not be of TMA at 22 mgN/100 g fish meat (Murjiharto, 2005). Pictures of fish before freezing are presented in Fig. 4. While freezing fish after images are presented in Fig. 5.



Fig. 4. Fish before freezing.



Fig. 5. Fish after freezing.

• Characteristics of plastic packaging materials for pasteurization Selar fish

Parameters	Type of Plastic		
	PE	PP	HDPE
a) Plastic condition	a) Plastic become shrink	a) Plastic become hard	a) Plastic still good
b) Fish condition	b) 50% soft fish meat	b) 45% soft fish meat	b) 65% soft fish meat
c) Fish pH	c) 6.89	c) 7.01	c) 6.65
d) Fish Temperature (°C)	d) 35.43	d) 35.40	d) 35
e) TMA (mgN/100 g)	e) 1.76	e) 1.92	e) 1.34

As seen from the above data can be analyzed that the type of plastic that is resistant to high temperatures as HDPE plastic is plastic still good condition after pasteurization. These results are supported by Destyanto (2007) statement that the HDPE plastic are included in the category of thermoplastic, because it has the bond between a linear molecule so that it can change form. The properties of the HDPE plastic in General is resistant to chemical substances (such as oil), has a resistance to high temperatures. Special properties of HDPE is density 0.965- 0.952 g/cm³ tensile strength, 3200-4500 Psi compression strength, 2700-3600 Psi, water absorption 0.01%, melting point 130-137°C. pH chart drawing fish with different plastic packaging material due to pasteurization is presented in Fig. 6.

pH Pasteurization of plastic

From Fig. 6, shows the pH of fish after pasteurization is done with different packaging still worth consumed because it includes fresh fish that is pH of 6,65-7.01.

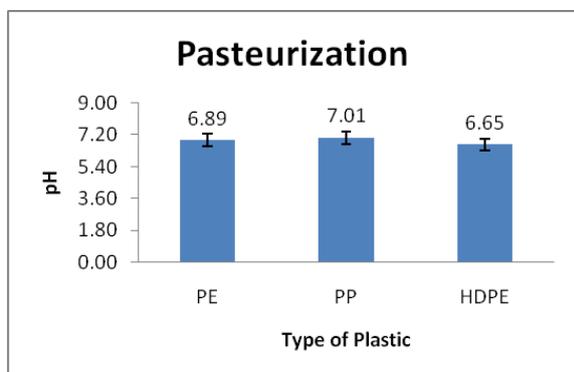


Fig. 6. pH chart fish with different plastic packaging material due to pasteurization.

pH is one of the parameters to determine the decline of fish by way of measuring the number of H⁺ ions. This method is used for pH in fresh fish and petrol. The concentration of H⁺ in the example interpretation pH < 7.6 shows the quality of fresh, pH 7.6-7.9 shows can be eaten but not number one quality and pH > 7.9 shows the value of the foul (Sasmito, 2009). Fish temperature chart with different plastic packaging material due to pasteurization are presented in Fig. 7.

Temperature Pasteurization of plastic

From the fig. 7 temperature conditions the fish with HDPE packaging after pasteurization do have the highest value that is equal to 35°C

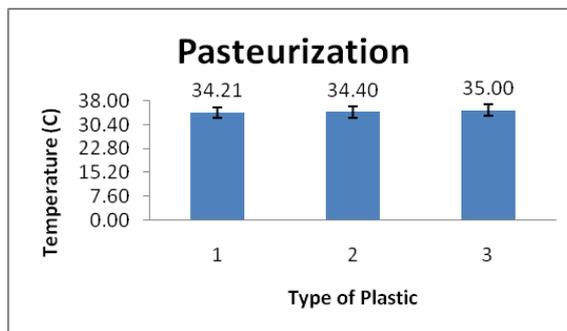


Fig. 7. Fish temperature chart with different plastic packaging material due to pasteurization.

Types of plastic HDPE material properties have a stronger, harder until opaque, semi flexible, resistant to chemicals and liquids are more resistant to high temperatures but it is recommended to use disposable (Firman, 2012). Treatment gives a warming aims to kill most microorganisms and cause other microorganisms into three active, usually the process is referred to as pasteurization (Nurhikmat, 2008). Chart of the TMA fish with different plastic packaging material due to the freezing are presented in Fig. 8.

TMA Pasteurization of Plastic

From Fig. 8, it can be seen that the amount of the lowest fish after TMA pasteurization is a fish that is packed with plastic HDPE, which means the quality of the fish is still good.

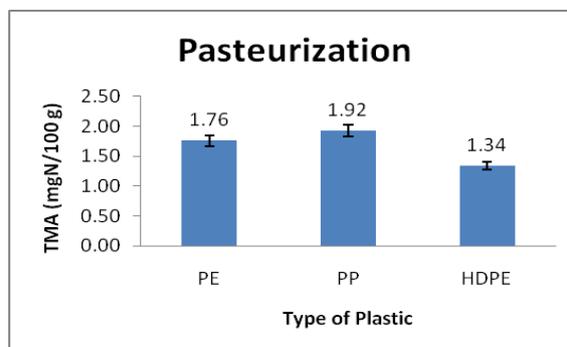


Fig. 8. Chart of the TMA fish with different plastic packaging material due to the freezing.

The maximum limit for the number of bacteria on a product is 5×10^5 . To determine the quality of a good fish, limit the range of TMA is not more than 30-40% of mgN/100 g fish meat. For fresh fish. Frozen products are value TMA must not be more than 30mgN/100 g of his (Suprayitno, 2009).

HDPE (high density polyethylene) ethylene polymerization with created through the addition of various metal and polymer polyethylene produced composed of nearly linear polymer polymer largely. Linear form yields a strong material nature, meetings and the structure is easily arranged. HDPE plastic is hard and has a high melting point making it resistant to high temperatures (Sinaga, 2012). Pictures of fish before pasteurization are presented in Fig. 9. While pasteurization fish after images are presented in Fig. 10.



Fig. 9. Fish before pasteurization.



Fig. 10. Fish after pasteurization.

Conclusion

Based on the results obtained that the packaging is an attempt to protect products from damage and makes these products can have an identity. All kinds of packaging materials which are easily available and the price is relatively cheap one is plastic. Plastic PE, PP and HDPE which is used for freezing and pasteurization has different properties. Plastic PE is a good plastic used for freezing fish selar as resistant to low temperatures. While HDPE plastic used for

pasteurization selar fish because it is resistant to high temperatures.

References

- Adawyah R.** 2000. Fish Processing and Preservation. Bumi Aksara. Jakarta
- Destyanto F.** 2007. Experimental Study The Influence Of Temperature Sintering Againsts The Character Of Physical and Mechanical Composite Plastics (HDPE-PET) Former Rubber Tire. Mechanical Faculty University Of Sebelas Maret. Surakarta.
- Firman.** 2012. The Influence Of Kind Plastic in Rambutan Fruit (*Nephelium lappaceum*, Linn) Storage. Agricultural Faculty University Of Hassanudin. Makassar.
- Hidayat.** 2005. Making Hydrolysates Protein Yellow Selar (*Caranx leptolepis*) With Papain Enzyme. Fisheries And Marine Science Faculty. Bogor Agricultural Institute. Bogor.
- Masyamsir.** 2001. Handling Fishery Product. Department Of Education, Bandung
- Munandar.** 2009. Quality Changes of Tilapia Fish (*O. niloticus*) by Killing Techniques and Gutting During Low Storage Temperature. Bogor Agricultural University. Bogor.
- Murdjiharto TJ.** 2005. Fish Protein Nutritional Biochemistry. Brawijaya University. Malang
- Muwarni.** 2011. Danger Behind Of Plastic Packaging. www.Ebookpangan.Com
- Nurcholis M.** 2013. Blansing, Pasteurisasi dan Sterilisasi. University Of Brawijaya. Malang.
- Nurhikmat.** 2008. The Influence Of Variation treatment in Organoleptic dan Value Of Catfish.

Ficheries dan Marine Science Faculty. University Of Brawijaya

Nurminah M. 2014. The Various Research Plastic Packaging And Paper as its Effect on Material Packed. University Of North Sumatera

Sasmito B. 2009. The Basis Of Preserving Food stuffs. University Of Brawijaya. Malang.

Sembiring. 2009. The Influence Of Kind Quality Packaging Fresh Red Chili During Cold Storage . University Of North Sumatera. Medan.

Sinaga P. 2012. Plastic Material. Quality Control Of Instrumen Laboratory With PT. Sugitek Indo Tama.

Soendari T. 2013. Descriptive Metode. PPT Research Methods.

Suprayitno E. 2009. Packaging Technique. Fisheries And Marine Science Faculty. University Of Brawijaya. Malang.