# CHAPTER I
# INTRODUCTION

## 1.1 Background

Fish is a high-protein meal that has been consumed by humans since the dawn of time. Fish is well known for being a versatile side dish that is inexpensive and high in nutritional value. However, fish can be easily damaged and spoiled if not consumed immediately within 6-7 hours after getting caught, otherwise the fish will begin to rot owing to bacteria. Therefore, fish preservation is necessary to prevent and extend the shelf life of fish, especially during the season where fish come in abundance.

Mackerel (*Rastrelliger sp*) is a popular type of marine fish available in Indonesia. The community uses mackerel extensively, both for direct consumption and as raw material for processed products, and it is one of Indonesia's most essential basic needs. Fishspoils faster than other meals. Because all decay processes require water, and water makes up 80% of a fish's body, it is an ideal environment for spoilage bacteria and other microorganisms to thrive. Microorganisms activity, enzymatic reactions, and chemical reactions are the major causes of spoiling. The process of food spoilage can be avoided by either consuming it as soon as possible or preserving it.

Formalin is commonly used as a preservative to extend the shelf life of fish and prevent it from rotting quickly. The use of formalin, however, is not recommended because it contains formaldehyde which is toxic to humans and can cause death. Another method to preserve fish is to use ice to slow down the decomposition process. When the ice melts, it should be replaced immediately. Considering the difficulty in acquiring safe chemicals, it is better to use natural chemicals derived from plants such as guava (*Psidium guajava L.*).

Guava plant (*Psidium guajava L.*) is a plant that has antifungal, antimicrobial and antioxidant properties. Guava leaf extract is a natural preservative that contains tannins, essential oils, flavonoids, and saponins. These components can prevent the presence of pathogenic bacteria in food which are known as food spoilage.

Based on the content and potential of the guava plant, it is expected that it can be used as a natural fish preservative. Furthermore, guava leaves are very easy to find, making them easy to use. Therefore, this study is highly interested in conducting research on The Potential of Guava Leaf Extract (*Psidium guajava L.*) Application as a Natural Preservative for Mackerel (*Rastrelliger sp.*).

**1.2 Research Questions**

Based on the above background, the formulation of the problem in this study is how the potential of guava leaf extract as a natural preservative for mackerel with the parameters of the physical properties of the sample.

**1.3 Research Objective**

This study aims to determine the potential of guava leaf extract as a natural preservative for mackerel with parameters of the physical properties of the sample.

**1.4 Research Benefits**

The benefits of this research are (a) To increase scientific knowledge for researchers about the potential of guava leaf extract as a natural preservative for mackerel with parameters of the physical properties of the sample, (b) To provide input for the process of developing further similar research, (c) To provide information about the potential of leaf extract guava as a natural

preservative for mackerel, so that it can provide consideration in the use of dangerous preservatives that are toxic to humans and can even cause death, i.e., the use of formalin.

# CHAPTER II

# LITERATURE REVIEW

## 2.1 Food Preservative

According to the Regulation of the Minister of Health No. 722/Menkes/Per/IX/1988, what is meant by preservatives are food additives that are useful for preventing or inhibiting the process of fermentation, acidification or other forms of damage or materials that can provide protection for foodstuffs from spoilage caused by microorganisms (Cahyadi, 2008).

The use of appropriate food preservatives in accordance with the regulations will result in products with the expected quality. However, an improper and excessive usage will result in the product no longer to be safe for consumption. This is due to the compounds classified in it are mostly synthetic chemical compounds which when used in excessive amounts or not in compliance with the regulations can be fatal to health (Alsuhendra and Ridawati, 2013).

The use of chemicals as additives in food is currently often found in food and beverages. One of the additives in food is a chemical preservative that functions to slow down food spoilage, whether caused by spoilage microbes, bacteria, yeast, or fungi by inhibiting, preventing, stopping the process of decay and fermentation of foodstuffs (Winanrno and Jeni, 1983 in Husni, 2003). et al, 2007). One type of preservative that is often used is formalin.

## 2.2 Formalin

Formalin is a hazardous material that can threaten the health of human body. The body can be exposed to formalin through the digestive tract (ingestion), skin contact or inhalation. Exposure to formalin can cause health problems, both acute symptoms (short term) and chronic

symptoms (long term). Death can be caused by ingesting as little as 30 milimeters of formalin, or roughly 2 tablespoons (Antoni, 2010). So far, people in general know formalin as a substance used in the process of preserving corpses. Formalin is also used as a pesticide and disinfectant componentAlthough most people, especially producers, aware that using this chemical as a preservative is harmful, its use is increasing rather than decreasing since the price is relatively cheap compared to the legal preservatives (Hastuti, 2010). Despite its extraordinary durability, formalin is prohibited from being used in food. In Indonesia, several laws that prohibit the use of formalin as a food preservative are Ministerial Regulation No. 722/1998, Minister of Health Regulation No. 1168/Menkes/PER/1999, Law No. 7/1996 on food and Law No. 8/1999 on consumer protection. This regulation is enacted due to the danger of the residue left behind which is carcinogenic to the human body (Sitiopan, 2012).

**2.3 Guava Plant**

Guava is found across Southeast Asia, from Indonesia through South Asia, India, and Sri Lanka. The number and variety of these plants is enormous; it is estimated that there are presently around 150 species worldwide (Ashari, 2006). Guava is a plant that is widely used by the community as food and can be used for treatment. The part of the plant that is often used as medicine is the leaf (Ministry of Health, 1989).

In Indonesia, guava plants have several regional (local) names, for example glima breueh (Aceh), glimeu beru (Gayo), Galiman (Batak karo), guava Klutuk (Java), dambu (Gorontalo), kujawase (South Seram), gawaya (Ternate), lutu hate (Ambon), pertukal or guava milk (Sumatra). Foreign names Fan Shi Liu gan, Jamphal, guajave or guajava (Dalimartha, 2001).

The classification of guava plants (Psidium guajava L) according to Hapsoh and Hasanah (2010) is as follows:

Kingdom: Plantae

Division: Spermatophyta

Class: Dicotyledonae

Order: Myrtales

Family: Myrtaceae

Genus: Psidium

Species: *Psidium guajava L.*

### 2.3.1 Guava Morphology

Guava plants are shrubs or small trees with a height of 3-10 meters. This plant has a taproot and a stiff woody stem that is difficult to break. The stem grows upright and has branches and twigs. The trunk and branches have a grayish-brown bark and the bark peels off easily. Guava branches are covered in buds and each bud develops into branches that produce fruit (Cahyono, 2010).

The leaves on the guava plant have a single leaf structure and emit an aroma when crushed. The position of the leaf's crosses with the location of the leaves facing each other and the spines of the leaves are pinnate. Guava leaves come in a variety of shapes, including, oval, oblong, and inverted egg round. The oval leaf shape is the most common leaf form. Differences in leaf shape can be influenced by genetic factors and environmental factors (Tsukaya, 2005). Guava leaves have an asymmetrical leaf base, with blunt leaf tips and flat leaf edges. The texture of guava leaves resembles paper with a pale leaf surface (glaucous) and the presence of fine, short, and pubeodor hairs. Guava leaves are generally green depending on the variety (Parimin, 2005).

The guava flower type is a true flower. The flowers grow at the tips of young twigs, star-shaped, radially symmetrical flower type, and white. The flower consists of 4 petals, 5 white crown leaves, and 200 stamens. The seeds are round, small, and yellowish white in color. Has seeds in two pieces with hard seed properties and a smooth surface (Cahyono, 2010).

Depending on the variety, guava fruit can be round, somewhat oval, or oval. The size also varies, depending on the variety. Similarly, the color of the fruit's flesh varies according on the variety, with some being red, and others being white. The fruit has a thin skin and a smooth to rough surface, the ripe fruit has soft flesh, while the unripe flesh is rather hard and crunchy. The fruit tastes sweet, less sweet, and bland, depending on the variety and the cultivation technique (Cahyono, 2010).

### 2.3.2 Guava Leaf Bioactive Compound Components

Guava leaves are antimicrobial since they contain a decent amount of phenolic compounds including tannins and flavonoids. Secondary metabolites found in guava leaves include of tannins, polyphenols, flavonoids, essential oils, monoterpenoids, sisculterpenes, alkaloids, quinones and saponins, as well as vitamins B1, B2, B3, B6 and C (Hermawan, 2012).

Guava leaves contain triterpenoid compounds (Begum et al, 2002). To determine the presence of triterpenoid compounds in guava plants, it can be done by adding Lieberman-Burchard reagent consisting of concentrated sulfuric acid and anhydrous acetic acid. The positive result of this test is that the extracts of the plants tested (in guava are leaves and fruit) showed a change in color, namely red, pink, or purple. In guava plants, the results obtained in leaves and fruit that there are triterpenoid compounds in small amounts (Widyawati, 2006).

Extraction of guava leaves through quercetin extraction with n-hexane solvent followed by methanol solvent showed that the quercetin compound was proven positive in guava leaves

(Ariani, et al, 2008). High levels of quercetin in guava leaves can be used for the treatment of capillaries (Yuliaani et al, 2003). Guava leaf extract also contains hexadecanoic acid or palmitic acid and diisooktil beenzendicarboxylic acid (Hapsari, 20011).

In qualitative analysis, guava leaves contain a large group of tannins and steroids, a few flavonoids, saponins, and phenol hydroquinone, but no alkaloids and triterpenoids (Indriani, 2006). Guava leaf extracts prepared with ethanol and water revealed the presence of phenolic compounds and antioxidant activity(Rivai et al, 2010).

**2.3.3 Benefits of Guava Leaves**

Guava leaves can be useful (efficacious), among others, for the treatment of diarrhea, canker sores, diabetes, hemorrhoids, bloating in children and many other benefits. One way to cure diarrhea, dysentery, and loose stools is to boil a few leaves (5-10 leaves) or roots in enough water (1-2 cups) for 15 minutes, then drink the water. For healing skin diseases such as ringworm and sunburn, boiled in water, and while still warm splash onto the body or for bathing. While swollen gum disease and inflammation of the mouth, the boiled water is to rinse (Cahyono, 2010).

In addition, guava fruit is also useful for the treatment (therapy) of various diseases, such as improving digestion, lowering cholesterol, antioxidants, relieving fatigue and lethargy, dengue fever, and canker sores. In addition to the fruit, other plant parts such as leaves, root bark, and roots, and the young fruit also have medicinal properties to cure dysentery, diarrhea, ringworm, sunburn, vaginal discharge, diarrhea, mouth inflammation, swollen gums, and other diseases (Cahyono, 2010).

According to the Directorate General of BPPHP of the Ministry of Agriculture in 2002, the nutritional content of guava per 100 grams is in table 1 below:

Table 1. The content of guava leaves per 100 grams

| Guava leaf content | Total |
|---|---|
| Energy | 49,00 cal |
| Protein | 0,90 gr |
| Fat | 0,30 gr |
| Carbohydrate | 12,20 gr |
| Calcium | 14,00 mg |
| Phosphor | 28,00 mg |
| Iron | 1,10 mg |
| Vitamin A | 25 SI |
| Vitamin B1 | 0,05 mg |
| Vitamin B2 | 0,04 mg |
| Vitamin C | 87,00 mg |
| Niacin | 1,10 mg |
| Fiber | 5,60 gr |
| Water | 86 gr |

Source: Directorate General of BPPHP Ministry of Agriculture 2002

### 2.3.4 Guava Leaf Pharmacological Activities

a. Anti-cancer

Guava leaf extract showed cytotoxic activity in OV2008 and Kasumi-1, making it suspected to have anti-cancer potential (Levy & Carley, 2012). In this study said, testing on ethanol extract of guava leaves showed that it significantly induces cytotoxicity and increases the sub-G1 phase of HT-29 cells (inhibition of 35.5%).

b. Antidiabetic

Guava leaf boiled water is reported to reduce blood glucose levels. In this study, it was found that there is a significant difference in fasting blood glucose levels in the intervention

group before and after being given guava leaf boiled water therapy in patients with type II diabetes mellitus (Maharani et al, 2013).

c. Anti Plasmodic Guava leaf extract is reported to have potential as an antimalarial agent (Barzinji et al, 2014).

d. Anti-ulcer

In this study, guava leaf methanol extract was tested with 3 different tests, namely aspirin (ASP), pyloric ligase (PL), and ethanol induced in ulcers of test animals in the form of male Witsar rats. The results obtained from the administration of guava leaf extract at doses of 100 mg/kg and 200 mg/kg significantly inhibit gastric ulcers caused by aspirin, pyloric ligase, and ethanol. The potency of guava leaf extract is equivalent to the standard anti-ulcer drug, namely omeprazole (Raja & Sundar, 2012).

e. Burn wound healing

The test was carried out on female mice whose backs were shaved off and induced by heat induction at 800C for 5 seconds. The test animals were divided into 5 groups, namely positive control (using bioplacenton drug), 3 groups smeared with guava leaf extract with negative control. The results of this test are guava leaf extract is efficacious to heal burns (Oktriani et al, 2012).

**2.4 Morphology of Mackerel Fish**

Mackerel is the name of a group of fish belonging to the Rastrelliger clan, Scrombridae tribe. This type of fish has a fairly small body, but is still related to mackerel, tuna, mandidihang, and mackerel. Mackerel has a flat body shape with a chestlarger than the rest of the body and is covered by small and rigid scales. The body  is turquoise on the back with dark dots or black spots above the ribs while the underside of the body is silvery white. The dorsal fin is clearly

separated into two fins, each consisting of 10 to 11 hard fingers and 12 to 13 weak fingers (Hidayat, 2014).

Systematically, mackerel is included in the following classification (Nontji, 2005):

Kingdom: Animalia

Filum: Chordota

Class: Pisces

Order: Percomorphi

Family: Scombridae

Genus: Rastrelliger

Species: *Rastrelliger s.*

The anal fin has 12 weak rays. Behind the second dorsal and anal fins are 5 to 6 additional fins called finlets. The ventral (ventral) fin consists of 1 hard and 5 weak rays. The caudal fin is deep forked, and the pectoral fin is wide and tapered (Hidayat, 2014).

The eyes have fatty membranes, small teeth on the jawbone. Fine gill filter 29-34, At the bottom of the first gill arc the gill filter is long and looks like feathers when the mouth is opened (Burhanuddin et al 1984 in Astuti 2007).

The body is streamlined, with thegut length is usually 1.4 to 1.8 times the length of the FL. Its body has a black stripe along the back and black spots on the body near the pectoral fins. The dorsal fin is yellow with a black tip. The caudal and pectrol fins are yellowish. The most distribution is in the Indian Ocean and parts of the East Pacific (Hidayat, 2014).

**2.5 The Quality of Fresh Mackerel**

What is meant by fresh mackerel is fish that still has the same characteristics as live fish, both in odor, taste, and texture. Fresh fish are fish that have just been caught and undergo a

process of preservation and further processing, fish that have not undergone physical or chemical changes or that still have the same characteristics when caught (Warsito, Rindiani and Nurdyansyah, 2015).

Table 2. Differences between fresh mackerel and rotten mackerel

| Section | Fresh Mackerel | Rotten Mackerel |
|---|---|---|
| Eye | Brilliant, clear cornea, black pupils, convex eyes. | Dim, sunken corneas, gray pupils, covered with mucus. |
| Gill | Color red to dark red, brilliant, odorless. | Pale or dark in color, gray or slimy in color, foul odor or dirty. |
| Mucus | There is natural slime covering the fish which odors typical of fish species, the appearance of the slime is brilliant, like live fish slime, clear. | Turns yellowish with an unpleasant odor or the mucus has disappeared, milky white or thick mucus. |
| Skin | Brilliant, not yet fading, contrasting original colors. | Slightly faded, if the impression of the eye is not good then the skin is cracked and dry. |
| Odor | Fresh mackerel has no aroma other than the typical odor of fish. | The fishy odor (fish specific odor) is reduced and there is something like an ammonia odor. |
| Texture | The cut is bright and elastic, when pressed there are no finger marks. | Soft, the texture changes, when pressed there are marks, |
| Abdominal Cavity | Clean and free from pungent | the meat has lost its elasticity. |

| | | |
|---|---|---|
| | odors, the texture of the stomach wall is compact, elastic without any discoloration with a characteristic fresh odor. | Soft, the texture changes, when pressed there are marks, the meat has lost its elasticity. |
| Blood | Blood along the spine is fresh, red, of normal consistency. | Blood along the spine is dark in color, often accompanied by an odor |

Source: Suhartini and Hidayat (2005).

**2.6 Mackerel Damage**

Fish that is stored for too long will cause degradation of the components of the preparation of fish meat which causes the release of water bonds. Fish meat will lose its water holding capacity so that the water content in the fish body will decrease. The new bound water is present together with the protein. The new bound water can be frozen below 0 C. Microbial activity requires certain water activities (Soewedo, 1983).

In general, fish color damage occurs due to pigment compounds present in fish such as hemoglobin and myoglobin which are caused by the oxidation process. The brown or gray color is caused by myoglobin turning into metmyoglobin and methemoglobin. Myoglobin dye can give blood its red color (Soewedo, 1983).

Fish meat contains very little connective tissue (tendon), so it is highly digested by autolysis enzymes (enzymes found in fish) and the process of spoilage in fish meat is faster than the spoilage of livestock or other animal products. The results of this digestion cause the fish meat to become soft so that it is a very suitable medium for the growth of microorganisms. Usually, in the body of a fish that has undergone a process of decay, changes occur, such as the

emergence of a foul odor, the meat becomes stiff, the eyes fade, and the presence of mucus on the gills and the body on the outside (Moeljanto, 1982).

In fish meat, the decrease in fish protein content is in line with the decrease in fish fat content because of fat and protein degradation which results in a rancid odor and unpleasant taste. Rancidity occurs due to the activity of bacteria in fish flesh. Damage to fat and protein oxidation can cause changes in taste (Tranggono and Sutardi, 1990).

## 2.7 Preservation of Mackerel

Processing and preservation are an important part of the fishery industry chain. Without these two processes, the increase in fish production that has been achieved so far will be in vain, because not all fishery products can be utilized by consumers in good condition. Processing and preservation aim to maintain the quality and freshness of fish as long as possible by inhibiting or completely stopping the causes of quality deterioration (decay) and causes of fish damage (e.g. enzyme activity, microorganisms, or oxygen oxidation), so that fresh fish reaches consumers (Sunarman, 2000).

The main objectives of the fish preservation and processing process are (Anonymous, 2008):

1. Prevent the process of fish spoilage, especially when production is abundant.
2. Increase marketing reach.
3. Implement diversification of processing fishery products.
4. Increase the income of fishermen or fish farmers.

### 2.7.1 How to Preserve Mackerel

The process of preserving fish can be done in several ways, namely:

**a. Preservation of mackerel with low temperature**

Preservation of fish at low temperatures can be done by cooling and freezing. Basically, the process of cooling and freezing fish has the same principle, namely reducing or stopping the activity of microorganisms that cause fish spoilage. The difference between the two processes lies only in the final temperature used. The final temperature used in the cooling process is 0 C, while in the freezing process the final temperature can reach -42 C. Chilled or frozen fish has a long shelf life, meaning that the fish will remain fresh if it is stored in a low temperature place (Sunarto, 2003).

In the process of cooling fish using cooling media, heat transfer occurs from the fish's body to the cooling medium so that the fish's body temperature will decrease. The body temperature of the fish will be the same as the temperature in the cooling medium. If the temperature of the cooling medium used is lower, the body temperature of the fish will be lower and the water content will be lower (Afrianto and Liviawaty, 1989).

**b. Preserving Mackerel Fish with Salting**

Salting is an ancient form of preservation that is still widely used today. In the manufacture of fish, fish are preserved by a combination of salting and drying. At high concentrations, salt can prevent damage to fish by enzymes in fish meat and spoilage by microorganisms. Salt has a high osmotic pressure, so it will draw water from fish meat and fluids from microbial cells. As a result, microbes will undergo plasmolysis and die. The addition of salt causes the fish protein to denature so that the fish meat shrinks, and the water is released. Drying will reduce the water content in fish meat so that microbes cannot grow properly, and spoilage can be prevented. In general, drying is done traditionally by drying (Warsito, Rindiani and Nurdyansyah, 2015).

**c. Preservation of mackerel by smoking (*pemindangan*)**

Basically, fish preservation by smoking is a combination of salting, drying and smoking activities. The main purpose of smoking is to kill bacteria and increase the shelf life of fish. In the process of smoking fish, the most important element is the smoke produced from burning wood. The smoke that comes from burning wood consists of steam and very small solid particles. These two elements have the same chemical composition but in different ratios. The chemical elements contained in smoke are water, aldehydes, acetic acid, ketones, alcohol, formic acid, phenol, and carbon dioxide which act as colorants and preservatives. (Buckle, et al., 1987). d. Preservation of puffer fish with smoking. The process of boiling is boiling fish in salt water. The factors that affect the quality of smoked fish are the freshness of the fish, salt and environmental conditions (cleanliness of tools and materials, the process of making smoked fish and storage of the results of smoking). Many transfer methods have been carried out, including (Nuraini, 2008).

a. Boiling with saturated salt solution for 10 minutes.

b. Adding spices (garlic and turmeric).

c. Boiling with 100% salt water

But from the results of smoking (*pemindangan*) as above, it will rot easily because of the high-water content.

**e. Preservation of mackerel with fermentation**

The process of preserving fish by fermentation involves the role of microorganisms. Generally, by using lactic acid bacteria because lactic acid bacteria can produce organic acids in the form of lactic acid and acetic acid. Acetaldehyde compounds (improves flavor) as well as a kind of antimicrobial compounds to inhibit the growth of destructive bacteria. Factors that affect

fermentation include acid, use of pure culture, temperature, oxygen, and lactic acid bacteria (Murniati and Sunarman, 2000).

# CHAPTER III

# RESEARCH METHOD

## 3.1 Research Time and Place

This research was conducted from March to April 2019 at the Chemistry Laboratory, Medan Area University.

## 3.2 Tools and Materials

The tools used in this research are beaker glass, Erlenmeyer glass, tweezers, knife, basin, gloves, analytical balance, stirring rod, blender, bowl (place for soaking fish), sieve, funnel, label paper, and documentation tools. The materials used in this study are guava leaves, mackerel, distilled water.

## 3.3 Research Method

This research employs a descriptive qualitative and quantitative methods. The treatment consisted of two factors, namely guava leaf extract (K) and storage time (P), each of which consists of the following average rates:

Guava leaf extract factor (K):

K0: Without guava leaf extract with a concentration of 0%

K1: Given guava leaf extract with a concentration of 20% (100 ml guava leaf extract + 400 ml distilled water)

K2: Given guava leaf extract with a concentration of 40% (200 ml betel leaf extract + 300 ml distilled water). K3: Given guava leaf extract with a concentration of 60% (300 ml betel leaf extract + 200 ml distilled water).

K4: Given guava leaf extract with a concentration of 80% (400 ml betel leaf extract + 100 ml distilled water)

Storage time factor (P):

P1: Long storage time (1 day)

P2: Long storage time (2 days)

P3: Long storage time (3 days)

P4: Long shelf life (4 days)

P5: Long shelf life (5 days)

### 3.4 Research Procedure

This research was carried out in 4 stages, i.e., the provision of guava leaf extract, the provision of mackerel, the mackerel preservation process using guava leaf extract, and after soaking the guava leaf extract an analysis of the physical quality of mackerel fish consisting of texture, aroma, color, body surface mucus and gills.

#### 3.4.1 Provision of Guava Leaf Extract

Samples of guava leaves were taken from the yard belonging to residents in the Medan area, Medan Perjuangan District. The samples were cut into small pieces, then washed thoroughly. After that, the guava leaves were soaked in distilled water for 24 hours. After soaking for 24 hours then blended. The results of the blender were filtered using a sieve. The dregs are discarded, and the filter results are taken in the form of a liquid extract. The liquid extract is diluted according to a predetermined concentration.

#### 3.4.2 Preparation of Mackerel

Mackerel samples were taken from the fir tax on Jalan Cemara, Pulo Brayan Darat II, East Medan, Medan City. The fish samples have an average size of 63 grams/head. The mackerel sample was put into Styrofoam and added with ice cubes to prevent the spoilage process.

### 3.4.3 The Process of Preserving Mackerel Using Guava Leaf Extract

Twenty containers of Tupperware are prepared (containers for preserving fish), then samples of mackerel were put into Tupperware, each Tupperware containing 1 mackerel. In each Tupperware, guava leaf extract was added with different concentrations (concentration variations consisted of 0%, 20%, 40%, 60%, and 80%). After that, the Tupperware was closed and the changes that occurred were observed based on the predetermined time variation.

### 3.4.4 Quality Analysis of Soaked Mackerel Fish

The quality of mackerel fish soaked with guava leaf extract was analyzed through the physical properties of the quality of mackerel including eyes, gills, aroma, texture, and body surface mucus.

### 3.5 Procedure for Observing Physical Properties of Samples

**Physical Properties of mackerel samples from soaking with guava leaf extract**

Observations of the physical properties of the samples were carried out on mackerel fish that were soaked with guava leaf extract. Observation of the physical properties of mackerel consistes of texture, aroma, color, body surface mucus, and gills. The observation procedure uses a score sheet that has been prepared in advance. The assessment was carried out on day 1, day 2, day 3, day 4, and day 5. In a whole state the fish samples were presented and then assessed based on quality criteria and specifications in the form of a score sheet. The results of the assessment were tabulated and continued with a quality assessment. The criteria for observing the physical properties of the sample quality can be seen in table 3.

**Determination of The Best Treatment**

To acquire the results, the data from the assessment of the physical properties of the sample were analyzed. Subsequently, the test of the physical properties hypothesis of the assessment sample for all treatments is conducted, and then select the best alternative from all treatments based on the results of physical properties observation using the effectiveness index method. This test utilizes a weighting procedure from the quality parameters determined.

**Treatment Scheme**

| | | | | |
|---|---|---|---|---|
| K0P1 | K0P2 | K0P3 | K0P4 | K0P5 |
| K20P1 | K20P2 | K20P3 | K20P4 | K20P5 |
| K40P1 | K40P2 | K40P3 | K40P4 | K40P5 |
| K60P1 | K60P2 | K60P3 | K60P4 | K60P5 |
| K80P1 | K80P2 | K80P3 | K80P4 | K80P5 |

**Information:**

K = Extract concentration

K0 = 0% concentration (Without guava leaf extract)

K20 = Extract concentration 20%

K40 = Extract concentration 40%

K60 = Extract concentration 60%

K80 = Extract concentration 80%

P = Storage Time

P1 = Storage time 1 day

P2 = Storage time 2 days

P3 = Storage time 3 days

P4 = Storage time 4 days

P5 = Storage time 5 days

Table 3. Criteria for Physical Characteristics of Fish Quality

| Parameter | Quality Criteria and Specifics | Score |
|---|---|---|
| Eye | Bright, protruding eyeballs, clear cornea. | 9 |
| | Slightly bright, flat eyeball, pupil slightly grayish, slightly cloudy cornea. | 6 |
| | Slightly sunken, pupil grayish, cornea a bit cloudy. | 3 |
| | Very sunken, yellow cornea. | 1 |
| Gill | Brilliant red color, without mucus. | 9 |
| | The red color is a bit dull, without mucus. | 6 |
| | Slightly dull red in color, thick mucus. | 3 |
| | Red brown, there is a little white, thick mucus | 1 |
| Odor | Odors very fresh, specific by type. | 9 |
| | Neutral. | 6 |
| | The odor of ammonia, the odor of acid is clear. | 3 |
| | Strong ammonia odor, obvious rotten odor. | 1 |
| Texture | Dense, elastic when pressed with fingers, hard tear the flesh from the spine. | 9 |
| | Slightly soft, slightly elastic when pressed with fingers, it's hard to tear the flesh from the bone behind. | 6 |
| | Soft, finger marks visible when pressed but quickly lost, easy to tear the flesh from spine. | 3 |
| | Very soft, finger marks do not disappear when pressed, it's easy to tear the meat from the spine. | 1 |
| Body surface mucus | The mucus layer is clear, transparent, shiny bright. | 9 |
| | The mucus layer is starting to get a bit cloudy, the color white is a bit dull, less transparent | 6 |
| | Thick lumpy mucus, cloudy white. | 3 |
| | Thick, lumpy mucus, yellow brownish. | 1 |

# CHAPTER V

# CONCLUSIONS AND SUGGESTIONS

## 5.1 Conclusion

Guava leaf extract (Psidium guajava L) has potential as a natural preservative for mackerel (*Rastrelliger sp*). Based on this research, guava leaf extract was effective as a natural preservative for mackerel (*Rastrelliger sp*) at a concentration of 60% and a concentration of 80% for up to 3 days. Those who did not use the extract were damaged on 2 days of storage. In storage 5 which was treated with extract or not all fish were damaged and unfit for consumption.

## 5.1 Suggestions

In connection with the results obtained in this study, it is hoped that further research will be carried out using different types of fish, so a comparison between one type of fish and another can be seen. Subsequently, it is also necessary to carry out organoleptic tests to see the level of preference for fish that have been preserved. Furthermore, a test to examine the protein levels after the fish is preserved may need to be conducted.

PROOFREADING

| | | | |
|---|---|---|---|
| 1. | Food that contains a lot of protein | : | High-protein meal |
| 2. | Widely known | : | Well known |
| 3. | Accessible | : | Versatile |
| 4. | Affordable in price | : | Inexpensive |
| 5. | Or else | : | Otherwise |
| 6. | Start | : | Begin |
| 7. | Needs to be done | : | Is necessary |
| 8. | Overcome | : | Avoided |
| 9. | Quickly | : | Soon |
| 10. | A perfect medium | : | An ideal environment |
| 11. | Way | : | Method |
| 12. | In addition | : | Furthermore |
| 13. | Apply | : | Use |
| 14. | Very interested | : | Highly interested |
| 15. | Research titled | : | Research on |
| 16. | Will produce products | : | Will result in products |
| 17. | In acordance with | : | In compliance with |
| 18. | Formalin exposure | : | Exposure to formalin |
| 19. | Widespread to | : | Found across |
| 20. | Types | : | Variety |
| 21. | Now | : | Presently |
| 22. | In the world | : | worldwide |
| 23. | Has a hard woody stem | : | A stiff woody stem |
| 24. | Overgrown with buds | : | Covered in buds |
| 25. | Each bud grows into branches | : | Each bud develops into brances |
| 26. | Give off an aroma | : | Emit an aroma |
| 27. | Squeezed | : | Crushed |
| 28. | Prefect flower | : | True flower |
| 29. | The flesh of the fruit | : | The fruit’s flesh |
| 30. | Likewise, | : | Similarly, |
| 31. | Showed | : | Revealed |
| 32. | Is splashed on | : | Splash on |
| 33. | There was a significant difference | : | There is a significant difference |
| 34. | Not easily separated | : | rigid |
| 35. | The body color is turquoise | : | The body is tuquoise |
| 36. | Body color has | : | Its body has |
| 37. | Foul odoring | : | Foul odor |
| 38. | Processing and preservation is an important | : | Processing and preservation are an important |
| 39. | *Pemindangan* | : | Smoking (*pemindangan*) |
| 40. | Are able to | : | Can |
| 41. | Glass erlenmeyer | : | Erlenmeyer glass |

| | | | |
|---|---|---|---|
| 42. | Uses | : | Employs |
| 43. | Consisted of | : | Consist of |
| 44. | Bowl | : | Containers |
| 45. | This test uses | : | This test utilizes |