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The Effect of Basil Leaves (*Ocimum sanctum* L.*)* as Natural Preservative for Mackerel (*Rastrellinger sp*.)

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Abstract

Basil is a plant that can be used as a traditional medicine. One part of the basil plant used as an alternative medicine is the leaves. Basil leaves contain active compounds, including flavonoids, saponins, tanins, and essensial oils. These active compounds is able to prevent the presence of pathogenic bacteria that can accelerate food spoilage, so that basil leaves can be used as an alternative natural preservative. The objective of the study was to determine the ability of basil leaves as a natural preservative for mackerel. The research was carried out in vitro, by observing the physical, chemical, and microbiological characteristicts of mackerel which were treated 8 hours of soaking basil leaf extract. Variations in the concentration of basil leaves used were 0, 25, 50, 75 and 100%. The results showed that the physical quality of the 8-hour storage samples showed changes in the physical quality of the fish, as seen from the color, eyes, gills, mucus, aroma and texture. The microbioloical quality of fish was analyzed by the total plate number method. The total number of bacteria decreased as the concentration of basil leaf extract increased.

Keywords: *basil leaves, mackerel, natural preservative*

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INTRODUCTION

Basil leaves (*Ocimum sanctum* L.) is a plant commonly used by Indonesian people as a traditional medicine which has various benefits, namely to treat constipation, headaches, diarrhea, and as an aroma enhancer in food. Basil leaves contain active compounds, namely flavonoids, saponins, tannins, and essential oils which have the potential as antimicrobials. The content of these active compounds is able to prevent the presence of pathogenic bacteria that accelerate food spoilage. Basil has antimicrobial activity that can inhibit the growth of bacteria (Deviyanti et al., 2015).

Basil leaves are known to contain antioxidants such as eugenol, flavonoids, and ursalic acid which function as free radical scavengers (Mustika, 2014). Flavonoid compounds in these plants play a role in preventing free radicals and will reduce the

potential for cell death. It is related to the prevention of cell aging (Pandey & Madhuri, 2010).

Food ingredients that are easily damaged include meat and fish since it has a high protein content and water content. Fish quickly spoil and rot if not handled properly. This damage causes an increase in the growth of contaminating microorganisms (Huda et al., 2020). Chemicals are often applied to reduce the growth rate of contaminating microorganisms in fish. This process has bad effects for health and can lead to accumulation of toxins in the body. It underlies the use of natural preservatives obtained from plants. Natural preservatives are known to have many benefits, namely as food additives and food preservatives (Naufalin & Yanto, 2012).

Mackerel (*Rastrelliger* sp.) is a fish lives in the sea, has a body shape like a plate covered with fine scales. The chest is larger than other body parts (Nurdyansyah et al., 2015). Freshness of fish is an important thing that needs attention due to it relates to the quality of fish. The fresher the fish eaten, the better the quality. Proper handling of fish will help maintain the freshness of the fish, so the selling price of fish in the market will be high (Tamuu et al., 2014).

Damage to mackerel can be seen from changes in the color and texture of the fish's body. The color change occurs due to the oxidation process of pigments such as hemoglobin and myoglobin in the fish's body. The most visible discoloration is usually on the gills. Changes in fish body texture due to the breakdown of protein in fish meat. In addition, fish that have experienced a decrease in quality will also emit a pungent odor. To prevent decay, it is necessary to preserve mackerel using natural compounds from plants. One of them is basil leaves.The objective of this study was to determine the ability of basil leaves as a natural preservative for mackerel.

METHOD

The method used was experimental laboratories. The data used were primary data from observations of the physical and microbiological characteristics of mackerel for 8 hours after treatment. Mackerel samples were obtained from the Traditional Market (Pajak Ikan) on Jalan Pahlawan, Tg. Morawa.Number of mackerel used as many as 30 fish with an average weight of about ± 63 grams of fish. Samples of basil leaves were obtained from the residents' gardens at Jl. Tengku Bergalit Hamlet I, Bandar Labuhan Village, Kec. Tg. Basil leaves were washed thoroughly using running water and dried for 1 day. The dried basil leaves were then mashed to obtain the dried simplisia form. Next, the concentration of the basil leaf solution was made, namely 0, 25, 50, 75, and 100%.

The process of preserving mackerel with a solution of basil leaves was carried out by soaking the fish in a container for 8 hours at a temperature of 25^{o}C – 30^{o}C. Immersion treatment was carried out for all concentration variations. Furthermore, observations of physical characteristics such as texture, color and aroma of fish were carried out.

Microbiological quality testing of fish samples was carried out using the total plate number method. Weigh 25 grams of the soaked fish sample at each concentration, ground it and put it in the Erlenmeyer. Added sterile distilled water until the volume reaches 250 ml. The suspension was homogenized with a vortex. Multilevel dilutions were made up

to 10-4. Sample inoculation into the test medium was carried out using the pour plate method. Prepare sterile NA media in a test tube with a temperature of ± 60^0C. Inoculated as much as 1 ml of suspension (10-4 dilution), then homogenized with a vortex. Furthermore, the media containing the suspension in the tube was inoculated into a sterile Petri dish. The test plates were incubated at 25^0C – 30^0C. Total bacterial colonies were counted using a colony counter.

RESULTS AND DISCUSSION

Result

Basil leaf extract has the potential as a natural preservative in mackerel. The parameters in the observation of basil leaf extract as a fish preservative were the physical characteristics of the fish which included the texture of the meat, the color of the surface of the fish's body, the aroma, the color of the eyes, the gills, and the mucus on the surface of the fish's body. Observations of the physical characteristics of mackerel in the 8-hour immersion treatment can be seen in table 1.

Table 1. The effect of the concentration of basil leaves on the physical characteristics of mackerel based on SNI 2729 standards after 8 hours of storage

Parameters of physical characteristics	Extract Concentration (%)				
	0	**25**	**50**	**75**	**100**
Texture	3	3	6	6	6
Color	3	6	6	9	9
Aroma	6	6	9	9	9
Eye	6	6	6	6	6
Gill	1	3	3	6	6
Body Surface Mucus	6	9	9	9	9

Data in table 1 shows the physical quality of mackerel has changed in all treatments. In the control of texture and color parameters, fish showed low values, included in the bad category and fish gills were classified as very bad. Increasing the concentration of basil leaf extract showed an improvement in the quality of fish samples. The higher the concentration of the extract, the higher the organoleptic value.

(a) (b)

Figure 3. Mackerel gills in 8 hours immersion treatment (a) control; (b) 100%

Total bacterial colonies in mackerel were calculated using the total plate number (ALT) method. According to the Indonesian National Standard, the threshold value for bacterial contamination in fish was 5×105 CFU/gram (Martoyo et al., 2014). There were

differences in the number of bacteria in the mackerel samples after treatment at each concentration variation.

Table 2. The amount of bacterial contamination in mackerel after 24 hours of incubation on NA media

Concentration (%)	Total Bacteria (CFU/ml)
0	55.0×101
25	48.0×101
50	46.3×101
75	39.3×101
100	19.7×101

Based on the data in table 2, it is known that basil leaf concentration variations of 25, 50, 75 and 100% are able to reduce the number of bacterial populations compared to the control treatment. The highest number of bacteria at a concentration of 0% (control) with the number of bacteria 55.0 × 101. While the least number of bacteria at a concentration of 100% with the number of bacteria 19.7×101 CFU/ml. The more basil leaf extract, the lower the bacterial population.

Discussion

Basil leaves contain phenolic, eugenol and aromatic compounds. These aromatic compounds make basil leaves have a fresh, distinctive aroma (Singh et al., 2012). Apart from these secondary metabolites, calcium, phosphorus, magnesium, beta-carotene and vitamin C are also found in basil leaves (Bhattacharjya et al., 2020).

In traditional medicine, basil leaves are used to treat fever, cough, joint pain, canker sores, skin diseases, ear inflammation, colds and to help overcome menstrual problems such as irregular menstruation and stomach cramps (Siagian et al., 2015; Wahid et al., 2020). Basil leaves are also used as a spice in the kitchen, because it has a distinctive fresh aroma (Nurcahyanti et al., 2011). Apart from that, basil leaves can also be used as an ingredient for making hand sanitizers (Larasati & Apriliana, 2016).

Basil has an antagonistic ability that can inhibit the growth of contaminating microorganisms including bacteria. (Deviyanti et al., 2015; Rohmani & Kuncoro, 2019). The content of flavonoids, saponins and tannins has the potential as a natural preservative, so it can maintain freshness in fish and maintain fish quality. The use of basil leaf extract in mackerel samples keeps the mackerel texture good and adds a fresh aroma to the fish. Flavonoid compounds have the ability to inhibit nucleic acid synthesis and reduce the function of the cytoplasmic membrane. It can also inhibit cell energy metabolism (Kumalasari & Andiarna, 2020).

Sumiati & Marjanah (2020) states that Belimbing wuluh fruit and basil leaves have potential as antibacterial. Therefore these two plants can be used as an alternative natural preservative. Basil leaf extract with a concentration of 50% is known to be effective as a natural preservative for mackerel (Rastrellinger sp.).

Fish is said to be fresh if it still has characteristics that are almost the same as live fish. Among other things, it does not experience changes in color and texture and does

not have a strong odor. Fish that are treated with natural preservatives after being caught and handled properly will also have the same freshness as live fish (Nurdyansyah et al., 2015). Several factors that trigger fish damage include water content and high protein levels in the fish's body. About 70% of the fish body is composed of water and as much as 20% is protein. High water and fish content will accelerate the growth of bacteria in mackerel, with a water content of 73.91% and a protein content of 22.10% (Desniar et al., 2011). Basil leaf extract is known to be able to inhibit the growth of Bacillus cereus bacteria and pathogenic bacteria Enterococcus faecalis (Anggraini, 2018; Fanani Hakim et al., 2020). Both of these bacteria are food contaminating bacteria.

Based on SNI No 2729 of 2013, good fish quality can be seen from the physical characteristics of the fish. These characteristics include the brightness of the eye color, the denseness of the color of the gills (dark red or reddish brown), the thin layer of mucus on the body surface and the body of the fish looks bright and shiny. In addition, the easiest to observe is the smell of fresh fish, not smelling bad and the texture of fish meat is chewy (not mushy).

Fish texture is one of the important physical factors to see the quality of fish. Soaking the extract for 8 hours showed a change in the texture of the fish. At a concentration of 0.25%, the texture of the fish was soft, the finger marks did not want to disappear when pressed, the fish scales are released on the surface of the body. Whereas at concentrations of 50, 75, 100% the texture of the fish was still in good condition because the texture of the fish looked a bit soft and a little elastic when pressed with a finger and it was difficult to tear the fish flesh from the spine.

Fish body color is an important parameter to observe to determine fish quality. The results showed that the body color of the fish was pale white in the treatment of 25, 50, 75 and 100% basil leaf extract, the surface color of the mackerel body looked bright white and greenish. Changes in the aroma of fish samples were influenced by the distinctive aroma of basil leaf extract samples. Basil leaves are known to contain aromatic compounds and essential oils which have a distinctive aroma.

In each treatment, the eye characteristics of the fish samples still looked good and were in accordance with the established SNI standards. The eye is one of the important factors in determining the physical quality of fish. Changes in freshness could be seen in the brightness of the fish's eyes.

The gills are a part of the fish's body that easily changes color and quality, because fish gills are the center of oxygen-taking blood. Dead fish cause blood circulation to stop. The gills are the part of the fish's body that is most clearly experiencing changes in fresh, bright red fish gills.

The results showed that at extract concentrations of 0, 25 and 50% the gills changed color. The organoleptic value of gills in the treatment of 0% extract concentration showed the lowest value of 1. The fish gills looked gray, with thick brown mucus that had rotted. In the treatment of extract concentrations of 25 and 50%, the organoleptic values were 3. The gills were gray, with white mucus covered on the surface. In the treatment of extract concentrations of 75 and 100%, the fish gills were pink and still looked fresh. Gills are an important factor in determining the quality of fish. Gills are fish organs that rapidly change due to the oxidation process and bacterial contamination from several other fish organs.

Body surface mucus is a physical characteristic that also determines the quality of the fish. From the results of the study it was known that all fish samples given basil leaf extract showed parameters of the surface mucus of the fish body in accordance with SNI.

The inhibition of bacterial growth by basil leaf extract is due to the presence of natural bioactive compounds that are antiseptic and actibacterial such as phenolic compounds, eugenol and essential oils. (Larasati & Apriliana, 2016; Zahra & Iskandar, 2017). Based on study of Florence et al., (2012), which stated that there was a decrease in the number of microorganisms in fish along with an increase in the concentration of the active ingredients given.

CONCLUSION

The conclusion in this study is basil leaf extract can be used as a natural preservative for mackerel. The higher the concentration of basil leaf extract, the more it affected the quality of mackerel. Basil leaf extract concentrations of 75% and 100% showed better physical and microbiological quality of mackerel compared to other concentration variations.

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