



## Effect of the best concentration of lime (*Citrus aurantifolia*) and vinegar (*Acetum*) on the shelf life of mackerel (*Atule mate*)

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### Abstract

Mackerel is a source of animal protein that is very important in fulfilling human nutritional needs. However, one of the major challenges in the fishing industry is extending the shelf life of mackerel. The purpose of this study was to determine the effect of the shelf life of mackerel with the addition of lime and vinegar. The research method used was a completely randomized design (CRD) with factors namely concentration of 10%, 20%, 30% and control. The results showed that the addition of lime and vinegar Panelists tended to prefer mackerel with the addition of vinegar compared to the addition of lime for aroma, texture and appearance (color) parameters. In general, the addition of vinegar 30% concentration was most preferred by the panelists.

**Keywords:** Lime, Completely randomized design (CRD), panelists

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### Introduction

Indonesia is a maritime country that has the potential of marine resources is very large and abundant both in terms of quantity and diversity. Based on the spread of fishing grounds. The *maximum sustainable yield* (MSY) that can be utilized is estimated at 6.4 million tons per year in marine waters in Indonesian territory (Dahuri 2004). Fish is one of the food sources that are needed by humans because they contain lots of protein. With a high enough protein and water content, fish is a very perishable commodity (Adawyah 2007) <sup>[1]</sup>. One commodity that is easy to rot and difficult to maintain from the aspect of freshness is fish (Afrianto and Liviawaty 1989) <sup>[2]</sup>. One of them is the selar fish.

Selar fish (*Atule mate*) is one source of animal protein that is very important in meeting human nutritional needs. However, one of the big challenges is to extend the shelf life of the selar fish before it is consumed by humans. Shelf life is the time required by a fishery product, under storage conditions, to arrive at a certain level or level of quality degradation.

Short shelf life can result in decreased fish quality, which has an impact on economic losses, as well as health risks due to consuming selar fish that is not fresh (Huda *et al.* 1998) <sup>[5]</sup>. Efforts to maintain the shelf life of selar, namely by using natural preservatives containing citric acid. Lime juice is quite effective to maintain freshness and reduce fishy odor in fish meat due to the content of citric acid and ascorbic acid. Both of these acids can react with TMA and will form ammonium bimetal (Poernomo *et al.* 2004) <sup>[6]</sup>. In vinegar solution, there are compounds that can inhibit the growth of various microbes. Vinegar solution is able to break down polysaccharides into glucose and acetic acid, acetic acid is used to inhibit the growth of bacteria and microbes found on fish skin. Most of these antimicrobial effects are caused by the formation of lactic acid and acetic acid and the resulting decrease in pH, but its nature is limited to inhibiting bacterial growth, not to the stage of killing these putrefactive microbes (Sutrisno 2009) <sup>[8]</sup>.

### Research Objectives

The purpose of this study was to determine the effect of the use of natural preservatives (lime juice and vinegar) on the quality of quality degradation in selar fish meat (*Atule mate*) and find out the most optimal levels of natural preservatives to maintain the quality of selar fish meat (*Atule mate*).

## Research Methods

The method used in the study was an experimental method consisting of 4 treatments, using Complete Randomized Design (RAL). RAL is considered a simpler design than other experimental designs. In a complete randomized design, treatment is given completely randomly to experimental units or vice versa. This pattern is known as complete randomization or randomization without restrictions. Usually a complete randomized design is used for experiments that have a uniform or homogeneous experimental medium or environment (Mattjik, 2002). This study used a complete randomized design with 4 factors, namely 10%, 20%, 30% concentration and control. The material used is a natural preservative test material, namely lime (*Citrus aurantifolia*) and vinegar (*Acetum*).

## Results and Discussion

### Organoleptic Test

Organoleptic is a test of food ingredients based on likes and desires for a product. Organoleptic tests also called sensory tests or sensory tests are a way of testing using human senses as the main tool for measuring the receptivity of products. The senses used in organoleptic tests are the sense of sight/eye, sense of smell/nose, sense of taste/tongue, sense of touch/hand. The ability of this sensory apparatus will be the impression that will later become an assessment of the product tested according to the sensors or stimuli received by the senses. The ability of the senses to assess includes the ability to detect, recognize, distinguish, compare, and the ability to judge likes or dislikes (Saleh 2004) [7].

**Table 1:** Average Value of Freshness Level (Organoleptic) Selar Fish with the Addition of Lime as a Preservative

No	Specifications	Organoleptic mean values Selar Fish (Lime)				Average
		0%	10%	20%	30%	
1	Color	2,5	4	3	5	3,6
2	Texture	1	3,5	2	4,5	2,8
3	Aroma	1	2,5	4	4,5	3
	<b>Average</b>	1,5	3,3	3	4,6	

**Table 2:** The Average Value of Freshness (Organoleptic) Level of Selar Fish with the Addition of Vinegar as a Preservative

No	Specifications	Organoleptic mean values Selar Fish (Vinegar)				Average
		0%	10%	20%	30%	
1	Color	2,5	6	5,5	6,5	5
2	Texture	1	4	4,5	6	4,8
3	Aroma	1	2	4,5	5	3,16
	<b>Average</b>	1,5	4	4,8	5,8	

### Color

Determining the quality of a food in general depends on several factors, one of which is color. Visually, color largely determines consumer acceptance of a product. Color is the first appearance that greatly influences consumers to choose a product (Maryati *et al.*, 2021).

Based on the results of organoleptic observations in the table, it can be seen that the overall average value of treatment of the color of selar fish with the addition of natural preserved ingredients lime and vinegar is 3.6 and 5 respectively which shows that the color of selar fish with the addition of natural preserved vinegar is better than lime. The average results of color organoleptic tests with the addition of natural preserved

vinegar from each treatment in Table 2. Treatment A (0%) has a value of 1, Treatment B (10%) has a value of 2, Treatment C (20%) has a value of 4.5, Treatment D (30%) has a value of 4.5. From these results, it can be seen that the color of the selar fish with the addition of natural preservation of vinegar in treatment D (30%) with a value of 6.5 is better, because according to the assessment, the color of the selar fish is quite bright and looks still a bit fresh.

### Texture

Texture is a sensation of pressure that can be observed with the mouth. Texture can be assessed in several ways, namely: when bitten, chewed or when touched using fingers. Various types of food texture sensing, can include elasticity, dryness, juiciness, hard, smooth, rough and oily (Mukminah *et al.*, 2019) [9].

Based on the results of organoleptic observations in the Table, it can be seen that the overall average value of treatment of the texture of selar fish with the addition of natural preserved ingredients lime and vinegar is 2.8 and 4.8 respectively which shows that the texture of selar fish with the addition of natural preserved vinegar is better than lime. The average results of organoleptic texture tests with the addition of natural preserved vinegar from each treatment in Table 2. Treatment A (0%) has a value of 1, Treatment B (10%) has a value of 4, Treatment C (20%) has a value of 4.5, Treatment D (30%) has a value of 6. From these results, it can be seen that the texture of selar fish with the addition of natural preservation of vinegar in treatment D (30%) with a value of 6 is better, because according to the assessment, the texture of selar fish is quite bright and looks still a bit fresh.

### Aroma

Aroma is one of the supporting factors for taste that determines the quality of a product. Aroma is also one of the indicators to determine the degree of acceptance of a product by consumers. Aroma testing in a new product is considered important because it quickly provides assessment results on the product. The emergence of this aroma or odor is because the odor substance is volatile or volatile (Asikin and Kusumaningrum, 2016) [3, 4].

Based on the results of organoleptic observations in the Table, it can be seen that the overall average value of treatment of the aroma of selar fish with the addition of natural preserved ingredients lime and vinegar is 3 and 3.13 respectively which shows that the aroma of selar fish with the addition of natural preservation vinegar is better than lime. The average results of organoleptic aroma tests with the addition of natural preserved vinegar from each treatment in Table 2. Treatment A Vinegar (0%) has a value of 1, Treatment B Vinegar (10%) has a value of 2, Treatment C Vinegar (20%) has a value of 4.5, Treatment D Vinegar (30%) has a value of 5. From these results, it can be seen that the aroma of selar fish with the addition of natural preservation of vinegar in treatment D (30%) with a value of 5 is better, because according to the assessment, the aroma released from selar fish still smells typical of fish but has begun to decrease (neutral).

## Conclusion and Advice

### Conclusion

Based on the analysis of data and observations presented, it can be concluded that the determination of the quality of a food depends on several factors, one of which is color. The

addition of natural preserved vinegar at a rate of 30% gives the best color to the fish. The highest organoleptic value in treatment D showed that the color of selar fish with the addition of vinegar was rated best. Color greatly determines consumer acceptance of a product, because it is the first appearance that influences consumers to choose a product. In addition to color, texture and aroma are also important factors in determining the quality of a food product. The addition of natural preserved vinegar at a rate of 30% gives the best texture to the fish. Treatment D has the highest organoleptic value, indicating the most preferred texture of selar fish. The addition of natural preserved vinegar at a rate of 30% gives the best aroma to the fish. Treatment D had the highest organoleptic value, indicating that the aroma of selar fish with the addition of vinegar was rated best. The results of organoleptic observations show that the addition of natural preserved vinegar gives a better color, texture, and aroma than lime in selar.

### Suggestion

Based on the results of research, color, aroma, and texture are important factors in determining the quality of a food and influencing consumer acceptance of the product. In this study, the addition of natural preserved ingredients of vinegar to selar fish gave better results in terms of color, texture, and aroma compared to the addition of natural preserved ingredients of lime. Therefore, it is recommended to use natural preserved vinegar ingredients in selar fish to improve the quality and consumer acceptance of the product. In addition, it is advisable to consider the use of vinegar's natural preserved ingredients in food products to improve their quality, and it is also important to pay attention to other factors such as taste and physical appearance in improving the quality and consumer acceptance of food products.

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