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INTERVENTION EFFECT OF LIQUID SMOKE OF PYROLYSIS RESULT OF COCONUT SHELL ON PROFILE OF pH FILLET OF *LATES CALCARIFER*

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Abstract

Non-fresh fish will have pH value (base) of meat greater than the fresh one.This is due to biochemical and microbial reactions taking place in post-mortem fish meat, thus producing base compounds such as ammonia, trimethylamine, and other volatile compounds.The present study is to disclose Intervention Effect of Liquid Smoke of Pyrolysis Result of Coconut Shell on the Profile of pH Fillet of *Lates Calcarifer*.

Concentration and optimum immersing duration of liquid smoke are determined by making optimum curve. By using concentration data and optimum immersing duration of liquid smoke, fillet *Lates Calcarifer* is immersed and drained for 2 hours at 40°C and then kept in freezer at 4°C until the sample will be analyzed every 2 days.

The result indicates that concentration and optimum immersing duration are 5% and 10 minutes, respectively and pH Fillet of *Lates Calcarifer* until the 10th keeping day does not bring about significant impact on the time.

Keywords: Liquid smoke, *Lates Calcarifer,* pH*,* concentration, soaking time

Introduction

Fish meat is source of protein for a large number of people, but extremely breakable foodstuffs if compared with other animal meats. In tropical region, for example, with high temperature, fish usually begins to spoil after being captured (Berkel *et al*., 2004). Such condition is called as chemical and biological transformation since main components of fish are broken in enzymatic manner, a condition in which after the fish dies oxygen supply in its tissue is discontinued as the result of disruption in blood circulation system, malfunction of mitochondria system, and periodic shortage of adenosine triphosphate through various ATPase activities. Following the running out of creatine phosphate, anaerobic glycolysis keeps on growing some ATPs with final product of accumulated lactic acid. The initial loss of freshness results from autolytic enzyme of endogen in muscle and followed by spoilage due to microbial activity, particularly the rapid growth of specific spoilage organism (SSO). Interaction between microbe and reaction of physiochemical metabolism accelerate degradation of fish quality such as amine formation, lipid oxidation, protein degradation, which contributes to bad odor, and texture being softened (Hernandez *et al.,* 2009).

Value of acidity degree (pH) is one of indicators in measuring the degree of fish freshness. In fish spoilage process, change in pH of fish meat autolysis process and bacterial attack (Fardiaz, 1992). To Erikson and Misimi (2008) anaerobic reaction occurring after fish mortality will benefit ATP and glycogen as sources of energy, making the amount of ATP keep on decreasing resulting in that pH of fish body decreases and muscular tissue is unable to ensure its flexibility (ductility).

pH is commonly used to measure fish deterioration and it is pH of muscular tissue to measure (Howgate, 2009). To Bhobe and Pai (1986), the increase in pH (*Metapeneusdohsnai*) during keeping period at lower temperature takes place due to amine formation through bacteria which reduces TMAO to become TMA, decomposition of tissue protein and deamination process. Kyrana and Lougovois (2002) discloses that the increased pH in fish meat takes place due to long period of keeping which is also correlated with rapid spoilage condition of fish.

The alive fish has 7.5 of meat pH. However, after mortality, glycogen is broken through glycolysis into pyruvic acid and then lactic acid, thus making the fish meat be more acidic. pH below 7.7 is considered to have good quality, preferably in range of 7.7 and 7.9 which is acceptable by consumers and pH above 7.9 be spoilage (Zamir *et. al*., 1998). To Bremner (2002) pH of fish meat when it is alive is 7.0 and after its death, it declines to be about 6.6 – 5.5 but depending on fish species.

To delay spoilage process, some attempts have been performed including keeping fresh fish by using ice, giving formalin or liquid smoke. The reason is that microbial growth may be delayed by reducing a_w and pH thereof, because low condition of pH in fish meat causes decomposition by bacteria to run slow. Liquid smoke of coconut shell as reported by Zuraida *et. al*. (2011) contains phenolic compounds such as phenol, 2-methoxylphenol (guaiacol), 3,4-dimethoxylphenols, and 2-methoxy-4-methylphenol. Dihydroxy benzoic acid, methoxybenzoic acid and 150 hydroxyl benzoic acid serves as acid components. To Bower *et al*.,(2009) phenol is one of components of smoke which acts as antioxidant, while other components are organic acid, alcohol, carbonyl, hydrocarbon, and nitrogen compound such as nitro-oxide. Phenolate is usually used in food industry as antioxidant and antibacterial (Esekhiagbe *et al.,* 2009).

A lot of researches on liquid smoke usage as preservative for fish have been carried out, but their outputs are just different.The present research is to study Intervention Effect of Liquid Smoke of Pyrolysis Result of Coconut Shell on the Profile of pH Fillet of *Lates Calcarifer*.

2.Procedure

2.1.Instruments / Materials:

pH meter analyzer 255 (Corning Scientific Co., Corning, NY), buffer pH 4, buffer pH 7, fillet *Lates calcarifer*, liquid smoke grade-2, blender, glassware, akuades.

2.2.Working Stage:

The concentration of liquid smoke is defined by making concentration variation, 0%; 5%; 10%; 15%; 20%; 25% and 30%, respectively.The data obtained is developed into optimum curve as to obtain optimum concentration data of liquid smoke.

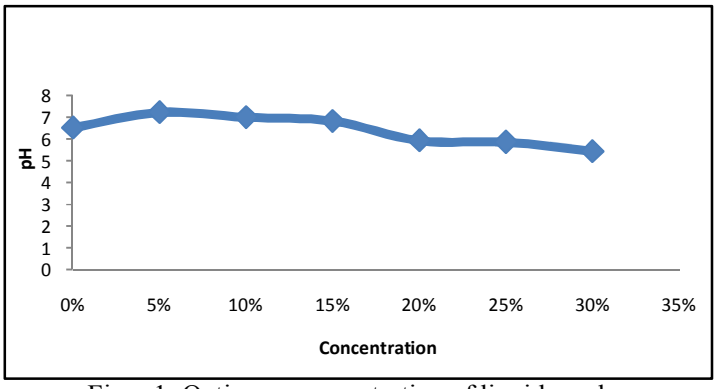
Immersion duration of liquid smoke is designated by making variation of immersion duration of 0 minute; 5 minutes; 10 minutes; 15 minutes; 20 minutes; 25 minutes and 30 minutes, respectively.The data obtained is developed into optimum curve as to data on optimum immersion duration of liquid smoke.

The degree of pH value is determined by using concentration data and optimum immersion duration of liquid smoke; fillet *LatesCalcifier* is immersed with liquid smoke and drained for 2 hours at 40°C and then put into Styrofoam, kept in freezer at 4°C until the sample will be analyzed every days.

3. Results and Discussion

3.1. Concentration and optimum immersion duration of liquid smoke.

The data of measurement result of pH of fillet *Lates Calcarifer* toward concentration variation of liquid smoke shows that the optimum concentration of liquid smoke at 5% of concentration has influenced pH of fillet *Lates Calcarifer*. Based on concentration variation of liquid smoke provided to Fillet *Lates Calcarifer*, 5% of concentration is optimum concentration of liquid smoke which can maintain the increase value of pH in fillet *LatesCalcarifer*.



Figur 1. Optimum concentration of liquid smoke

This is due to the fact that organic acid component on liquid smoke which provides acid contribution to Fillet *Lates Calcarifer* at 5% of concentration has been able to influence pH of fillet *Lates Calcarifer*. Similar to one reported by Tranggono, *et. al.,* (1996) smoke of coconut shell contains 7 main components: Phenol, 3-metyl-.2cyclopentadion, 2-methoxyphenol, 2-methoxy-4-methylphenol, 4-ethyl-2-methoxyphenol, 2.6-dimethoxy phenol and 2.5-dimethoxy benzyl alcohol.

Acids sourced from liquid smoke may influence aroma, pH and storage life of food. The combination between functional component of phenol and content of organic acid works synergistically in preventing and controlling microbial growth, and high content of acid may obstruct microbial growth because microbe can only grow at low content of acid (Pszczola,1995).

The duration of optimum immersion of liquid smoke in 10 minutes can withstand pH value of fillet *Lates Calcarifer* to 5.546, and increase again. With the increase time of immersion, there is a tendency in which pH value of Fillet *Lates Calcarifer* to decline again, because the longer it is immersed in acidic liquid smoke, the more acidic the fillet will be.

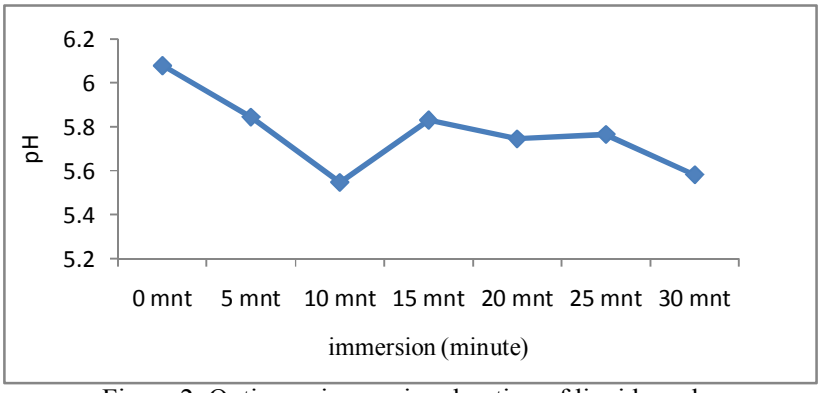


Figure 2. Optimum immersion duration of liquid smoke

3.2. Profile of pH of Sea Fish *Lates Calcarifer*

Value of acidity degree (pH) is one of indicators in measuring the degree of fish freshness. The data of analysis result of pH value of fillet *Lates Calcarifer* without allocation of liquid smoke in the 0th, 2nd, 4th, 6th, 8th, and 10th day is 6.39; 6.31; 6.09; 6.24; 7.09 and 8.13, respectively. And the pH value of fillet *Lates Calcarifer* with allocation of liquid smoke in the

0th, 2nd, 4th, 6th, 8th, and 10th day is 6.3992, 6.3162,6.4624, 6.0835, 6.3052, and 8.1215, respectively. The data indicates that the pH value in the beginning of storage decreases in the 6th day for fillet without liquid smoke, and thereafter, it increases again. Similarly, in fillet with liquid smoke, the pH value increases after the 8th day.

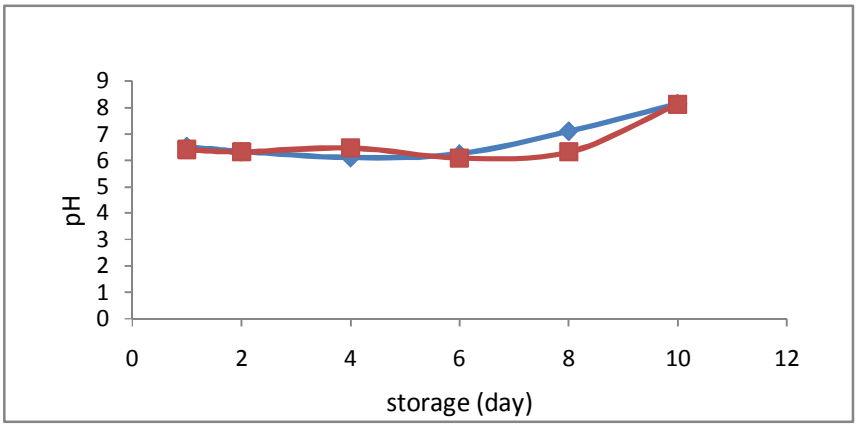


Figure 3. Profile of pH of Sea Fish *Lates Calcarifer*

In this study, the starting value of pH in fillet *Lates Calcarifer* is in range of pH value as found by (Periago *et. al*., 2005; Orban *et. al*., 2003) that is at pH 6.44 and 6.27, respectively. Ersoy *et. al.,*(2008) find starting pH value in fish meat is 6.23.

The increase in pH value in the 6th day for fillet without liquid smoke takes place two days earlier than that with liquid smoke, that is, in the 8th day. This is caused by not only considerable amount of accumulated lactic acid, but also effect of components contained in liquid smoke. To Nurjanah *et. al.,* (2007), the increase in pH value is caused by autolytic process in fish meat which brings about the occurrence of decomposition by enzyme into more simplified compounds. The enzymatic decomposition into simple compounds starts when pH value declines. The declined pH value will activate cathepsin enzim. The enzyme is capable of decomposing protein into more simplified compounds, thereby increasing pH value. The pH value in fish meat will continue to increase near to neutral value after rigor mortis phase ends. In line with the increased time of storage, there will be increase in pH value in initial post-rigor phase and it continues to increase in the last post-rigor phase (Nurjanah *et. al.,* 2007).

Eskin (1990) states that after the fish is dead, there will be biochemical transformation in body tissue which is marked by declination of pH resulting from accumulation of lactic acid, which is formed through glycogen decomposition process in fish meat, which is glycogen transformation into lactic acid in glycolysis process. To Erikson and Misimi (2008), anaerobic reaction taking place after the death of fish will benefit ATP and glycogen which has been formed during the life of fish as source of energy, resulting in that the amount of ATP keeps on decreasing. Accordingly, pH of fish body decreases and muscular tissue is unable to ensure its flexibility (ductility).

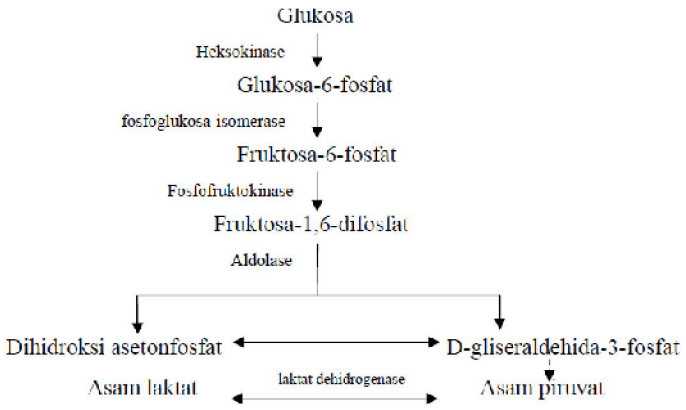


Figure 4. glycolysis process in fish meat

High content of glycogen may retard glycolysis process in fish meat, thus delaying the arrival of rigor mortis process. During rigor mortis process, the pH value in fish meat will suffer declination from 6.9-7.2, which is initial pH, to 6.2-6.6. High and low initial pH in fish will mainly depend on the amount of glycogen and strength of buffer in fish meat.The strength of buffer in fish meat is caused by protein, lactic acid, phosphoric acid, TMAO and volatile bases. The pH value in fish meat will keep on increasing closing to neutral value after the end rigor mortis phase (Farber, 1965).

Pacheco-Aguilar *et. al*., (2000) states that pH is one of determinant factors for life sustainability of microorganism growth during storage, processing, and distribution of fish. In the beginning of storage, the sample pH value will decrease to the lowest after the condition of rigor mortis, then it will increase until it has alkali property in the end of storage. The increase pH may be caused by accumulation of alkali compound such as ammonia and trimethylamine originated from microbial action during spoilage of fish muscles (Ruiz-Capillas and Moral, 2005; Özyurt, *et. al.,* 2009).

4. Conclusion

The grade-2 at 5% of concentration and 10 minutes of immersion duration may provide increase delay in pH of fillet *Lates Calcarifer* for 2 days if compared with that without liquid smoke. However, this does not give significant impact on the time.

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