



Effect of Sodium Chloride Concentration on *Aeromonas hydrophila*, Proximate and Organoleptic Analyses in Catfish (*Clarias* sp.) Flesh

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Abstract

Intensive aquaculture on catfish (*Clarias* sp.) has been getting problem due to pathogenic bacteria such as *Aeromonas hydrophila*. Fish infected by *A. hydrophila* would bear various symptoms, including hemorrhagic on the skin, gills, ulcers, and pale skin color. To tackle this situation, salt (sodium chloride) treatment with different concentrations can be used, which acts as both bactericidal and bacteriostatic agents. This study aimed to determine the effect of different salt concentration (*viz.* 0%, 5%, 10% and 15%) added in the treated samples by evaluating the availability of pathogenic bacteria using total plate count (TPC) and total *A. hydrophila*, along with proximate and organoleptic assessment. An experimental method was used in this research with a completely randomized design (CRD). The results showed that the TPC value in all sample treatments was higher (around 5×10^5) than that recommended by Indonesia National Standard (SNI). On the other hand, the sample added 10% and 15% salts exhibited a significant effect on the decrease of *A. hydrophila* through a selective medium Rimler-Shotts agar. For proximate analysis, the treated samples contained in the ranges of 67.33-80.03% (WB), 0.91-13.58% (WB), 35.06-69.92% (DW) and 4.41-1451% (DW) of moisture, ash, crude protein, and fat, respectively. In addition, a sensory test of catfish flesh samples showed that all parameter tests, including mucus, odor, and texture met the referred standard. Taken together, this study may contribute to developing an approach in treating pathogenic bacteria during rearing and also post-harvesting catfish; however, further research is required to obtain a better outcome in dealing with food safety issues.

INTRODUCTION

Catfish is a commercially important freshwater fish species in Southeast Asia countries, include Indonesia. According to Pihanto (2017), it is a good source of

beneficial nutrients for the human body due to the dominant protein content (around 17.7%). Other valuable components such as lipid and ash were

also found at 4.8% and 1.2% based on a wet basis (WB), respectively. DJPB (2019) reported that national catfish production reached 1.1 million tonnes (MT) in 2017, which increased by approximately 131% in 2016 and roughly estimated around 1.4 MT in 2020. This increase because of the national policy on intensive farming through the biofloc aquaculture system initiated by the government. Typically, this rearing system uses a high stocking density of up to 1000 fish per m² (Hermawan *et al.*, 2014). Moreover, Wibowo (2013) stated that a high-density treatment can produce catfish with a size of 100 g during period of rearing (about 2 months). There are many advantages in employing this method, as follows: 1) it does not require large rearing areas, 2) the availability of live feed derived from beneficial flocculants accumulated in bottom of fishpond, and 3) improve the water quality due to the role of microorganisms, especially nitrifying bacteria (Ma'ruf, 2016). However, if the water quality is not maintained carefully during the rearing period, it may trigger the presence of pathogenic bacteria, resulting in fish infection (Kurniawan and Dewi, 2018).

Aeromonas hydrophila, a Gram-negative bacterium, rod-shaped, no spores, facultatively anaerobic, has been widely known as a pathogenic bacterium causing the infection of various fish during the rearing period (Austin and Austin, 2016). In many cases, *A. hydrophila* causes *Motile Aeromonas Septicaemia* (MAS) disease, which can infect freshwater fish with a mortality rate of 100% (Sya'bani *et al.*, 2015). Bertha *et al.* (2016) revealed that the mortality rate of catfish can reach 100% within a week. Furthermore, fish attacked by *A. hydrophila* shows various clinical symptoms like its stomach tends to be whiter, hemorrhagic in the body becomes wider and some swelling signs appear in the internal organs, including liver, spleen, and intestinal guts (Mangunwardoyo *et al.*, 2010). More importantly, the infection of *A. hydrophila* on fish would easily transmit and infect

through injured body surfaces or gills, further spread into the whole fish's body, and finally found in the blood vessels and other important fish organs. (Mahasri *et al.*, 2012).

Several previous studies demonstrated that various managements have been employed to control MAS during rearing time, including vaccination, natural extract addition, and prebiotic supplementation (Mulia and Purbomartono, 2007; Wahjuningrum *et al.*, 2010; Sukenda *et al.*, 2016). According to a study by Wahjuningrum *et al.* (2010), the mixture of *Phyllanthus niruri* and *Allium sativum* extracts could inhibit *A. hydrophila*; similar to the previous finding, the addition of probiotics during the rearing period could also prevent the infection of *A. hydrophila* (Sukenda *et al.*, 2016). Almost all studies on fish infected *A. hydrophila* has been carried out during the farming process. In contrast, research on the post-harvest handling of catfish infected with *A. hydrophila* have been much less explored. Also, the post-harvest treatments of fishery products so far focused on maintaining freshness and shelf life by applying low temperatures, high temperatures, and salting procedures due to highly perishable products. However, there is limited information focus on the post-harvest handling of fish infected with *A. hydrophila*, considering numerous fresh fish, particularly catfish, found in in the local market (data not published) showed symptoms recently identified as *A. hydrophila* infection, such as septicemia in the fins, skin, and gills.

To solve this problem, an attempt proposed to reduce and minimize the availability of pathogenic bacteria in the catfish flesh is salt treatment. Salt can act as an antibacterial component because it possesses bacteriostatic and bactericidal effects (Assadad and Utomo, 2011). The addition of sodium chloride (NaCl) into fish meat would cause denaturation of protein in fish due to the differences in salt concentrations outside and inside of fish meat. The denaturation process caused by salt addition would changes in the meat,

resulting in changes in fish meat attributes. In addition to this, salt would cause an autolysis reaction by absorption of liquid found in fish meat, thus water used for the bacteria metabolism is reduced or even completely lost. Therefore, this study aimed to determine the effect of different salt concentration (*viz.* 0%, 5%, 10% and 15%) added in the treated samples by evaluating the availability of pathogenic bacteria using total plate count (TPC) and total *A. hydrophila*, along with carrying out proximate dan organoleptic assessment.

METHODOLOGY

Place and Time

The research was conducted in December 2018-March 2019 at Brawijaya University, Malang, East Java, Indonesia.

Research Materials

The catfish (*Clarias* sp.) was obtained from the catfish farming group in Singosari, Malang. *A. hydrophila* was purchased from the culture collection of the Microbiology Laboratory of the Faculty of Medicine, Universitas Brawijaya. Salt (Garam Daun) with 98% NaCl content was used for treatment in the catfish's flesh. Growth and bacterial identification media used in this study, including Tryptone Soya Broth (TSB) (Oxoid, UK), Tryptone Soya Agar (TSA) (Oxoid, UK), Nutrient Agar (NA) (Oxoid, UK), Rimler-Shotts (RS) (Oxoid, UK), and Lactose Broth (LB) (Oxoid, UK). The feed used for rearing during the *A. hydrophila* infection in catfish under the brand LP (Matahari Sakti, Surabaya). Meanwhile, supporting equipment at this research was an incubator (Mammert, Germany), a binocular light microscope (Olympus, Japan), and a UV-Vis spectrophotometer (Heraeus, UK).

Research Design

This study used an experimental method with a simple Completely Randomized Design (CRD), and all treatments were made of triplicates. The

independent variables in this study were catfish with and without infection of *A. hydrophila*, along with adding different salt concentrations (0%, 5%, 10%, and 15%, w/w). The parameters that were observed included the Total Plate Count (TPC) test, total *A. hydrophila* count, proximate analysis, salt concentration, and organoleptic test.

Work Procedure

Infection of *A. hydrophila* in Catfish

The infection was used by immersion method. Catfish is placed in an aquarium container with a density of 10 fish/50 L. Infection was carried out through *A. hydrophila* that have been cultured in TSB media for 48 hours at 37°C, the prepared solution was then taken as much as 10 mL with a density of 2.42×10^{11} and directly put into a tested tank and further rearing for 7 days in a controlled condition. After that, the reared catfish were feed commercial fish feed with an appropriate nutritional formulation. The feeding was provided three times a day for 7 days. During the treatment process, the water quality was routinely monitored with determining a pH in the range of 6.5-8.0 and temperature at 27-30°C (Amalia *et al.*, 2013; Aniputri *et al.*, 2014; Apriyani, 2017; Wardani *et al.*, 2017).

Salt Treatment on Catfish

After the 7th day of rearing, the catfish were individually harvested. Catfish infected with *A. hydrophila* experienced morphological changes in clinical symptoms in the form of infected catfish stomach experiencing swelling, pale skin and wounds (ulcers), whereas this did not occur in catfish without infection. After harvesting, catfish are then filed for meat and separated from the skin (skin-off). The catfish meat is then crushed to expand the contact surface between the salt and the meat, weighed and added with salt with a concentration of 0%, 5%, 10% and 15% using the dry salting method (Akbaradiansyah *et al.*, 2018). The sample was done by dividing the meat into

6 samples consisting of one sample as a negative control with a log TPC value of 9.93 CFU/ml on NA media (meat that was not infected with *A. hydrophila* and was not treated with salt) and one positive control with a value TPC log 26.43 CFU/ml on NA media (meat infected with *A. hydrophila* and not given salt treatment). Meanwhile, the other four samples were meat infected with *A. hydrophila* and added with salt.

Total Plate Count (TPC) and Total *A. hydrophila*

TPC calculations can be done using the pour plate method with a slight modification to the use of physiological salts instead of using Butterfield's phosphate buffered (SNI, 2015). The refined sample is then weighed as much as 1 g then put into a test tube containing 9 mL of sterile 0.9% saline solution, then homogenized and marked as 10^{-1} . The next step is the gradual dilution to 10 dilutions. Planting is done by pouring 1 ml of sample into sterile Petri dishes in Duplo followed by pouring 10-15 ml of sterile Nutrient Agar (NA) media then incubated at a temperature of 30-35 °C for 24 hours. The total *A. hydrophila* test was carried out following the TPC stage, but the medium used was *A. hydrophila* selective media, namely Rhimmler-shots (RS) agar. After the incubation period is completed, observations are made. The bacterial colonies on the NA medium were round in shape and white, while the colonies of *A. hydrophila* on the RS medium were round and yellow in color. The colony count of bacterial colonies uses a colony counter and the calculation is carried out using the Total Plate Count formula:

$$N = \frac{\sum C}{[(1 \times N1) + (0.1 \times N2)] \times D}$$

Where:

N = ..number of product colony (colony/ml)

$\sum C$ = ..the number of colonies on all counted plates

N1 = the number of plates at the first dilution

N2 = the number of plates at the second dilution

D = the first calculated dilution

Proximate Analysis

Proximate analysis composed of crude protein, fat, ash, and moisture contents according to method standardized by SNI (2015). The proximate analysis was conducted at the Laboratory of Food Quality and Safety, Faculty of Agricultural Technology, Brawijaya University. The moisture content was carried out by gravimetric method and then calculated using a formula:

$$\text{Water content} = \frac{B-C}{B-A} \times 100\%$$

Where:

A = the weight of the empty plate (g)

B = plate weight + initial sample (g)

C = plate weight + dried sample (g)

Ash content was determined by using the following equation:

$$\text{Ash content} = \frac{B-C}{\text{sample weight}} \times 100\%$$

Where:

A = .the weight of the empty plate (g)

B = the weight of plate filled with ash (g)

In addition, crude protein content of samples was determined by Kjeldahl method and the percentage was calculated using the formula:

$$PC = \frac{(VA-VB) \times N \text{ HCl} \times 14.007 \times 6.25}{W \times 100} \times 100\%$$

Where:

PC = protein content

VA = HCl for sample titration (ml)

VB = HCl for blank titration (ml)

N HCl = normality standard for HCl

14.007 = nitrogen atomic weight

6.25 = protein conversion factor for fish

W = sample weight

For fat content, all treated samples were determined by Soxhlet method with the equation presented below:

$$\text{Fat content} = \frac{(C-A)}{B} \times 100\%$$

Where:

A = weight of the empty flask (g)

B = weight of sample (g)

C = weight of flask and extracted fat (g)

Organoleptic Test in Catfish Flesh Samples

An organoleptic test was carried out at the Laboratory of the Fish Parasites and

Diseases, Faculty of Fisheries and Marine Science, Brawijaya University. Around 15 untrained panelists prepared to evaluate sensory tests consisting of various parameters, such as mucus, texture, odor, and meat. Organoleptic value of fish freshness using a scoresheet 1-9 based on SNI 2006.

Data Analysis

The collected data were analyzed using analysis of variance (ANOVA), followed by Duncan test. For the organoleptic test, the Friedmann test was precisely used to evaluate the catfish samples.

RESULTS AND DISCUSSION

A. hydrophila Growth in Catfish

TPC value is used to determine the number of aerobic and anaerobic microorganisms in fishery products (SNI, 2015). In this study, the TPC value was calculated based on the total bacteria found in the catfish samples which were both infected and non-infected *A. hydrophila* and to compare the effect of salt concentrations on the TPC value and the *A. hydrophila* collected. All data are depicted in Figure 1.

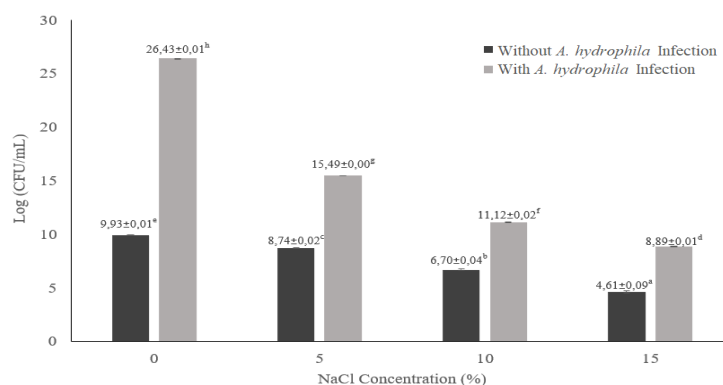


Figure 1. TPC value found in the catfish flesh with adding different salt concentrations using NA media.

TPC analysis on the catfish flesh samples infected and non-infected *A. hydrophila* with adding different NaCl concentrations (0%-15%) showed significant differences ($p < 0.05$). The TPC value decreased along with the increase in salt concentration in each treatment. The lowest TPC value was observed in log 4.61 CFU/mL of catfish meat sample without infection of *A. hydrophila* infection and addition of 15% salt concentration, while the highest TPC value was found in log 26.43 CFU/mL in the catfish sample infected *A. hydrophila* with 0% salt concentration (as a control). The number of bacteria in the catfish without *A. hydrophila* infection decreased with increasing salt concentration. It might be due to the ability of sodium chloride in inhibiting pathogens and putrefactive bacteria. Chloride ion (Cl⁻) in salt is toxic for most microorganisms, resulting in

bacterial cell cytoplasm disruption, thus causing death (Salosa, 2013). On the other hand, the samples treated by *A. hydrophila* were correlated with an increase in the number of bacteria when compared to the samples without *A. hydrophila* addition, as shown by the increase in the number of bacteria grown on the non-selective media (NA) (Parija, 2012). Meanwhile, along with the increase in salt concentration, the number of bacteria decreased due to the function of salt as bacteriostatic and bactericidal agents, as aforementioned.

The treatment of salt added in the flesh samples also affected water activity (a_w) content. The decrease in the a_w value of the treated samples caused some bacteria would be killed before reaching the death phase. Nevertheless, salt added in the food products is not directly killed all bacteria because among them

characterized as halophilic bacteria, which can grow and survive in the media added by salt component (Karim *et al.* 2014). This evidence was found in this study, even though the TPC value showed a significant decrease in the treatment 15% salt concentration, some bacteria was still

detected on the NA media, which is possible detected as a halophilic group.

RS media is a selective medium for determining the total *A. hydrophila* count in catfish meat samples. The total *A. hydrophila* count using RS media can be seen in Figure 2.

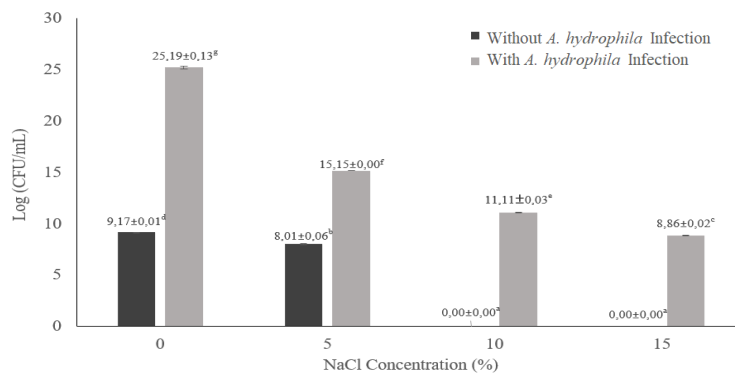


Figure 2. TPC value found in the catfish flesh with adding different salt concentrations using RS media.

The total *A. hydrophila* count was conducted using selective media (RS) and found the samples infected and non-infected *A. hydrophila* with both adding different salt concentrations were significantly different outcomes ($p < 0.05$). The TPC value decreased along with the increase in salt concentration in each treatment, both infected and non-infected treatments. The lowest TPC value were log 0.00 CFU/mL in the catfish meat samples without *A. hydrophila* infection with the addition of salt concentrations (10% and 15%), while the highest TPC value was log 25.19 CFU/mL in catfish meat sample with *A. hydrophila* infection, along with the addition of salt concentration (0%). After infection, the number of *A. hydrophila* increased, this is due to the infection of *A. hydrophila* with a density of 10^8 ; according to Plante *et al.* (1989), *A. hydrophila* has a doubling time ranging from 55-85 minutes.

At 0% and 5% salt concentrations, the number of bacteria in RS media is still high. It might be due to *A. hydrophila* can survive in the low salt concentration. Sari *et al.* (2011) stated that *A. hydrophila* can grow at a salt concentration of 0-4% while at a concentration of more than 5%, it suffers and tends to die. Meanwhile, in the treatment of catfish samples infected with *A. hydrophila*, there are still detected a number of bacterial colonies even though salt material was added. In this case, *A. hydrophila* might be able to adapt in the high salt concentration through modifying its cell membrane by synthesizing osmoprotectors such as betaine and proline, thus allows bacteria to tolerate osmotic stress (Dahdouh *et al.*, 2016).

Salt Content in Catfish Flesh

The salt composition in catfish meat samples with and without infection of *A. hydrophila* are shown in Figure 3.

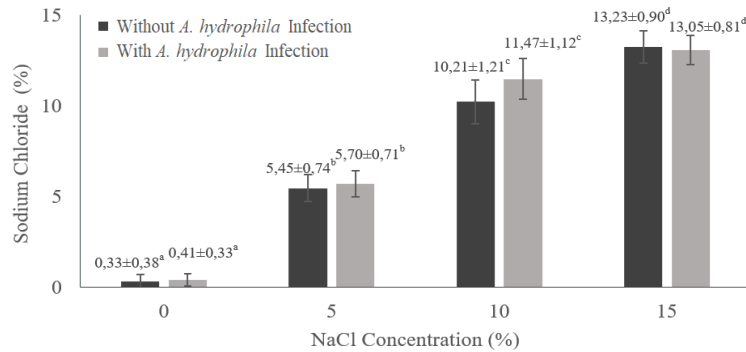


Figure 3. Salt composition (%) in the catfish flesh.

The salt content in the samples with and without *A. hydrophila* infection was significant differences ($p < 0.05$). The highest salt content was found in catfish samples with the addition of 15% salt concentration; conversely, the lowest salt content in catfish meat samples with the addition of 0% salt concentration (control). Interestingly, the samples without salt addition were also detected, this might be due to the presence of minerals content such as Na, K and Ca in the catfish flesh (Ersoy and Özeren, 2009). In addition, the salt content in the samples added 15% salt concentration without infected by a pathogen contained 13.05%, whereas in the samples infected by *A. hydrophila* with 15% addition showed 13.23% of salt content detected. According to Rahmawati *et al.* (2018), stated when the amount of salt concentrations penetrated optimally into the fish meat in terms of saturated condition, the salt components would be not penetrated the fish sample.

Salting results in the salt penetration into the fish's body by removing fluids from the fish's body due to differences in concentration (osmosis process) and this

process will stop if the salt levels outside and inside the meat are balanced (Nilawati, 2014). Reduced moisture content will affect the occurrence of chemical changes in foodstuffs, thereby affecting the microbial content of foodstuffs (Thariq *et al.*, 2014). The importance of salt content analysis in foodstuffs to provide valuable information, considering that high salt levels (>20%) can cause hypertension with elevating blood pressure (Salosa, 2013).

Proximate Composition in Catfish Flesh

Proximate analysis of catfish meat with and without infection of *A. hydrophila* treated with different salt concentrations presented in crude protein, fat, ash, and moisture contents. The purpose of this evaluation was to determine the effect of the treatments on the nutritional components of catfish meat samples.

Moisture content on the treated flesh samples is presented in Figure 4.

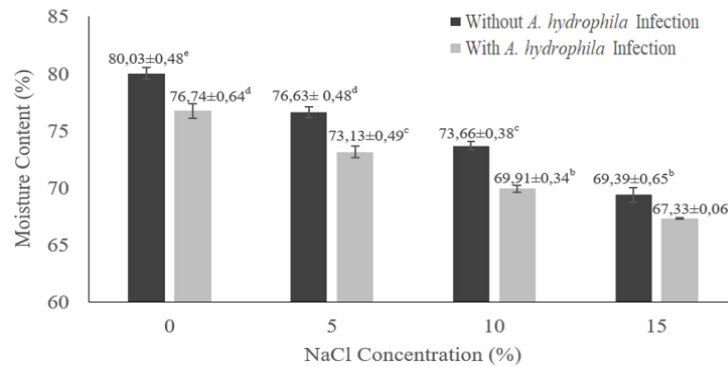


Figure 4. Moisture content (%) in catfish flesh samples.

The moisture content between treatments in this study was significantly different ($p < 0.05$) with the highest content (80.03%) in the muscle sample without infection of *A. hydrophila* and salt addition, while the lowest moisture content (67.33%) observed in the infected sample with 15% salt addition. It means that the higher the salt concentration added in the treated samples, the lower the moisture content obtained. Puspita and Agustini (2019) stated that salt is a hygroscopic component and would cause a significant difference in osmotic pressure, resulting in moisture content within fish meat pulled out. In addition,

the moisture content in catfish meat without infection is higher than in infected muscle samples, this is due to several *A. hydrophila* colonies grew well in fish meat samples. With the increase in bacteria contained in foodstuffs, the value of the moisture content would further decrease. Water contained in fish flesh tissue can be reduced by several factors, including the presence of salt in fish muscle, which penetrate water content in the presence of salt ions (Salosa, 2013; Paparang, 2013).

Ash content of catfish meat samples with and without infection of *A. hydrophila* and both added different salt concentrations are illustrated in Figure 5.

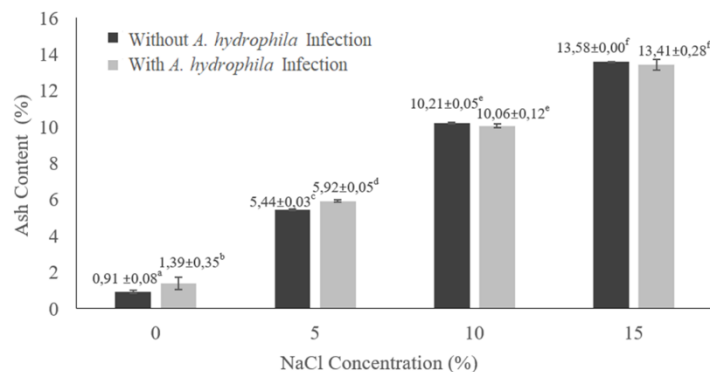


Figure 5. Ash content (%) in thr treated catfish meat samples.

The value of ash component in the fish flesh samples treated with and without *A. hydrophila* infection along with adding different salt concentrations showed significant effects ($p < 0.05$). The highest ash content (13.58%) was obtained in the 15% salt addition, while the lowest ash composition (0.91%) was found in the control, which was without any additions of *A. hydrophila* and salt

concentration. Ash component in food materials is closely associated with some mineral elements. Ash composition contained in salt material is formed through burning at high temperature. It can be stated that the higher salt content in food products, the higher ash content (Cherlin *et al.*, 2017).

Crude protein composition of the flesh taken from catfish treated with and

without the addition of a pathogenic bacterium and also treated with different

salt concentrations. Their protein contents in fish samples can be seen in Figure 6.

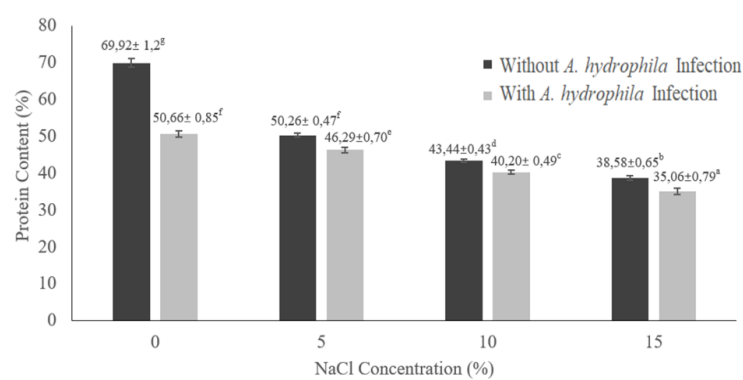


Figure 6. Crude protein content (%) in the treated catfish meat samples.

ANOVA analysis showed that the protein content (based on dry basis) of all treatments was a significant difference ($p < 0.05$). The highest protein content found in the treatment without salt and *A. hydrophila* infection with a value of 69.92% and the lowest was in the infection treatment at 15% salt content with a protein value of 35.06%. Salt in food application would cause the solubility of protein component decreased, another way it causes separation protein

into the sediment (salting out). The greater the salt added, the lower the protein content (Winarno 2004; Wahyudi and Maharani, 2017). The decrease in protein levels caused by the dry salting process can result in shrinkage of myofibers and denaturation or aggregation of proteins (Jiang *et al.*, 2019).

Figure 7 shows the crude lipid content (%) in both treated and non-treated catfish meat samples.

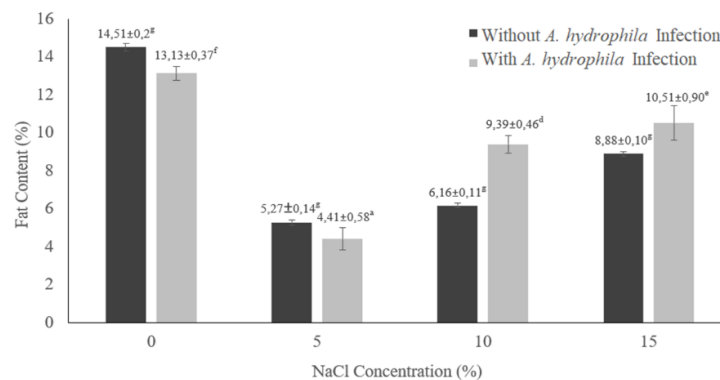


Figure 7. Crude lipid content (%) in the treated catfish meat samples.

Fat composition in the treated and non-treated fish showed significant differences ($p < 0.05$). The highest fat content in the treatment without infection and without a salt addition was about 14.51%, whereas the lowest (4.4%) in the treatment of *A. hydrophila* infection with a salt addition of 5%. The increase of fat content in ingredients is caused by the salt which can absorb water from the meat samples. By decreasing the water content

in food, it will increase the levels of fat, protein, and minerals. In contrast, the decrease of fat content in the samples might be due to the degradation of fat by some microorganisms (Susanti *et al.*, 2012).

Meanwhile, the increase of salt concentration could affect on fat content in the muscle samples increased. As stated by Thariq *et al.* (2014), the increase of fat content was caused by decreased

proteolytic enzymes and suppression of lipolytic enzymes derived from microorganisms and meat along with the increase in salt concentration. The suppression of lipolytic enzymes would suppress fat degradation. According to Hadiwiyoto (1993), the deterioration of the food quality in terms of the fat oxidation process due to the effects of autolysis and/or due to microbial activity. However, several types of microorganisms do not affect the fat in food. This is due to the different types of extracellular enzymes produced by these microorganisms.

Organoleptic Attribute on Catfish Flesh

Infection of pathogenic bacteria on fish during rearing time would make disruption in the fish's body that is normally found throughout fish's body, such as eyes, gills, fins, and skin. Also, fish infected by bacteria would result in undesirable flavors or off-flavors and produce more mucus with sticky slime and an unpleasant, fishy odor, as well as gill color, tend to be greyish-brown and smell bad (Husni and Putra, 2018). Moreover, for flesh attribute, some evidence showed the fish infected and contaminated by some bacteria would break nutritional component down and result in off-flavors, non-elasticity, and undesirable taste (Siagian, 2002). Therefore, the value of the organoleptic test from catfish flesh samples is presented in Figure 8.

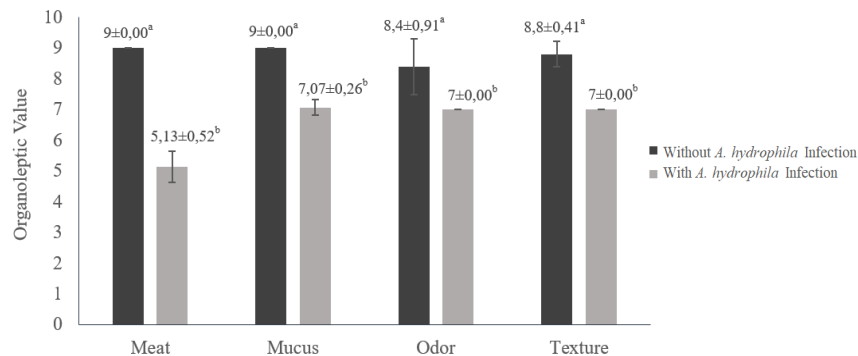


Figure 8. Organoleptic value from catfish flesh samples.

An organoleptic score was carried out by assessing the freshness value of rearing catfish on day 7 compared to the control treatment (without any infections and NaCl additions) based on the attribute of appearance, mucus, odor, and texture. The results analyzed using the Friedman Test showed significant differences ($p < 0.05$) in all parameters. This study shows that there are differences in terms of organoleptic tests from catfish flesh with and without *A. hydrophila* infection, as well as salt treatments. However, the score of mucus, odor and texture parameters obtained in this research was more than 7.0, meaning its score met the SNI 2006 for freshness evaluation, while the appearance of fish meat exhibited around 5.13, meaning that it might be due to the different ability of response in

evaluating fresh fish samples compared to the fish infected with *A. hydrophila*.

As aforementioned, fish infected by bacteria, especially in the muscle part would tend to fast deterioration compared to the healthy fish. This is because most pathogenic bacteria found in fish used nutrients component of fish muscle as a great source for growth media. As a result, structural changes observed in meat tend to be soft and watery known at the bacterial density of 10^{10} (Siagian, 2002). Apart from meat, observations on fish mucus were carried out to determine freshness properties (Sibirian *et al.*, 2012). Salikin *et al.* (2014) stated that carp fish (*Cyprinus carpio*) infected by *Aeromonas caviae* resulting in morphological changes signed by excessive mucus discharge. Bacterial

infection causes deteriorate fish's muscle, resulting in breaking down organic components with giving off unpleasant odors (Casaburi *et al.*, 2015). In addition to this, fish with an undesirable flavor generated from metabolic residues, including diamine, cadaverine, putrescin used for deterioration indicators of meat. Moreover, fish's muscles deteriorated by pathogenic bacteria would change in taste, tenderness, juiciness, aroma, and texture attributes (Siagian, 2002).

CONCLUSION

Taken together, the addition of salt component in the catfish's flesh samples treated with and without *A. hydrophila* infection could reduce total bacteria count through non-selected media (NA) and selected media (RS). For chemical composition, the value of crude protein, fat, ash, and moisture showed that all treatments were significantly different ($p < 0.05$), with a higher salt concentration added in the catfish meat samples, the moisture and crude protein contents decreased, while ash content in all treatments increased, and lipid content fluctuated. Meanwhile, the organoleptic attribute of treated samples showed a score of more than 7 observed in mucus, odor, and texture parameters, based on SNI standard for freshness evaluation. However, in the meat samples, the appearance test assessed around 5.13, meaning that its score below the national standard of freshness. It might be due to the different ability of response in evaluating fresh fish samples compared to the fish infected with *A. hydrophila*. This study may contribute to developing an approach in treating pathogenic bacteria during rearing and also post-harvesting catfish; however, further research is required to obtain a better outcome in dealing with food safety issues.

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