

**THE 5<sup>th</sup> INTERNATIONAL CONFERENCE ON HEALTH POLYTECHNICS OF  
SURABAYA (ICOHPS)**

**(Choose one of the following conferences)**

**3<sup>rd</sup> International Conference of Electronics, Biomedical Engineering, and Health  
Informatics (ICEBEHI)**

**2<sup>nd</sup> International Conference of Nursing and Public Health Science (ICoNPHS)  
2<sup>nd</sup> International Conference of Midwifery (ICoMid)**

**2<sup>nd</sup> International Conference of Medical Laboratory Technology (ICoMLT)**

**2<sup>nd</sup> International Conference of Environmental Health (ICoEH)**

**1st International Conference of Nutrition (ICoN)**

**2<sup>nd</sup> International Conference of Dental and Oral Health (ICoDOH)**

**The Effect of Pineapple Peel and Crown Leaves of Pineapple (*Ananas  
comosus*) on Decreasing Formalin Levels in Salted Anchovy**

**Nana Arisyi Amajida<sup>1</sup>, Nastiti Kartikorini<sup>2</sup>, Baterun Kunsah<sup>3</sup>, Siti Mardiyah<sup>4</sup>  
Diah Ariana<sup>5</sup>**

***Medical Laboratory, Faculty of Health Sciences, University of Muhammadiyah  
Surabaya.***

***Corresponding author: kunsah11@um-surabaya.ac.id***

**ABSTRACT**

Fish is a food that is widely consumed by the community because it is easily obtained and the price is affordable, including as a source of animal protein. Salted anchovy is processed salted fish from fresh anchovies that are preserved by a salting process, because of their small size, anchovy is very easy to rot. There are several salted fish producers that use harmful additives such as formalin. Formalin has the potential to harm the health of the body. *Saponin* compounds in pineapple peel and citric acid compounds in pineapple leaf crowns can reduce formalin levels. This study aimed to determine whether there was an effect of giving the skin and crown of pineapple (*Ananas comosus*) leaf juice to reduce formalin levels in anchovies. This type of research was experimental. The number of samples used in this study were 25 samples with 5 repetitions. The treatments in this study were 5%, 10%, 15%, and 20%. The optimum result was obtained at the lowest average value with an immersion concentration of 20%, which was 482.35 mg/L. From the results of the study, it was found that the average level of formalin after receiving treatment decreased. The results of the normality test were normally distributed, the ANOVA test showed that there was an effect of giving skin juice and pineapple leaf crown to decrease formalin levels in anchovies. The results of reducing the level of formalin 0% with the most optimum decrease of 20% was 22.88%.

**Keywords: Reduced formalin content, salted anchovy, pineapple peel and crown of pineapple leaves.**

## BACKGROUND

Many people on the coast depend on their life as fishermen. The survival of a fisherman depends on the fishing process, fish processing process, and marketing management (Suarnadwipa et al, 2018). Fish is a food that is widely consumed by the community because it is easy to obtain and the price is affordable, including as a source of animal protein (Tasya, 2019). Fish is a food that is easily decomposed (damaged). The reason is that fish meat has a very high water content, neutral pH, soft texture, and high nutritional content so that it becomes a good medium for bacterial growth. Making salted fish is one of the simplest fish preservation at low cost (Anggraini, 2020). By salting the spoilage in fish can be inhibited so that it can be stored for a long time. Salt as a preservative can inhibit the growth of bacteria and enzyme activities that cause spoilage in fish (Tarigan, 2019). The nutritional content is quite good, namely 100g of salted fish contains 198 kcal of energy, 42% protein, and 1.50% fat, calcium and phosphorus (Anggraini, 2020). Anchovies are a source of calcium to prevent bone loss (Behavior et al., 2017). The nutritional content of fresh anchovy per 100 g is 74 kcal energy, 10.3 g protein, g fat, 4.1 g carbohydrate, 972 mg calcium, 253 phosphorus, 3.9 mg iron, 554 mg sodium, potassium. 126.1 g, copper 302.2 mg, zinc 0.2, vitamin A (RE) 28 mcg, vitamin B1 0.24 mg, vitamin B2 0.1 mg and niacin 1.9 mg (Fanny et al., 2019 ).

Research conducted by (Rahmawati et al., 2016) shows that the formalin content of salted fish in Pucang Market, Gubeng District, Surabaya City, the results showed that the highest percentage of formalin content was anchovy 69%, salted fish jambal roti 50%, salted fish field anchovies 31%.

Formalin anchovy can be identified by the characteristics of its flesh which is chewy, whole, whiter, and clean compared to salted fish that is not formalized, which is slightly brown in color (Madonsa et al., 2019). Potential acute health effects that can be caused by formalin are irritation. While the chronic health potential caused by formalin can cause cancer and changes in cell function (Ernawati et al., 2017). If you consume too much food or drink that contains high doses of formalin, it can also cause convulsions (convulsions), haematuria (peeing blood), and vomiting blood which can lead to death (Sugiarti and Aminah, 2019). Reducing formalin residues in food is very important considering the dangers caused by formaldehyde. There are several ways that can be done to reduce residues in formalin foods. According to (Zamhariroh and Hanum, 2018) the key meeting plant also contains saponins so that it can reduce formalin levels. The use of Intersection Keys gave effective results and had a positive effect in reducing formalin levels. In the study (Sarwindah and Wardoyo, 2019), by adding a solution of miana leaves to the level of formalin residue in tofu.

Miana leaves contain saponins that can bind formalin so that the levels of formalin in tofu can be reduced. Research on reducing formalin levels using other natural ingredients has also been carried out by (Burhan, Rini and Nurhaeni, 2019) lime contains citric acid which can be used to reduce formalin levels in anchovy salted fish. salty anchovy with the highest value of derivation reached 79.71%. Based on previous studies show that various natural ingredients are effective in reducing formalin levels.

One of the natural ingredients that have not been maximally utilized is waste from pineapple in the form of skin and leaf crowns. Pineapple skin contains chemical compounds such as bromelain, tannins, saponins, and flavonoids (Lenny et al., 2021). While pineapple leaf crown fiber contains chemical compounds such as cellulose, lignin,

pectin, fat and wax, ash and other substances such as protein and other organic acids (Ulfah, 2020). The content of other organic acids such as: citric acid, malic acid and oxalic acid with the most dominant type of acid namely citric acid (78% of total acid) (Pradana, 2018). Saponins can bind and precipitate formalin, so that it can reduce formalin levels in salted fish (Sarwindah and Wardoyo, 2019). The content of citric acid in the crown of pineapple leaves as a provider of H<sup>+</sup> ions has catalyzed the process of releasing formalin bonds (Burhan et al., 2021). Combining the two waste skins and leaf crowns on pineapples in order to reduce formalin levels in anchovies to the maximum.

## RESEARCH METHODS

The type of research used was experimental. In this study the population used was anchovies purchased in the Kenjeran Coastal Coastal Area, Surabaya. Samples were the type of anchovy salted fish. The number of samples used in the study were 25 samples. The location of the research was conducted at the Health Chemistry Laboratory, University of Muhammadiyah Surabaya. The time for writing and researching Scientific Papers (KTI) takes place from December 2021 to July 2022, while the examination time was carried out in June 2022. In this study, there were two independent variables, namely, giving pineapple peel and leaf crown (*Ananas comosus*) and without giving pineapple peel and leaf crown extract (*Ananas comosus*). The dependent variable in this study was formalin levels. In this study, there were several control variables, namely, using formalin incubation time of 60 minutes, incubation time of pineapple peel and leaf crown for 1 hour, temperature, fish container, weight of salted fish as much as 10 grams, volume of skin juice and pineapple leaf crown according to each concentration, the volume of formalin is 200ml, the concentration of formalin was 10%, the concentration of peel juice and pineapple leaf crown were 0%, 5%, 10%, 15%, 20%. The method used in this research was UV-Vis spectrophotometry based on light absorption. The tools used in this research were: analytical balance, knife, scissors, measuring cup, blender, filter, spoon, fish container, test tube, volume pipette, measuring pipette, test tube rack, beaker glass, distillation flask, spectrophotometer, measuring flask, stirring rod, cuvette, erlenmeyer, mortar and pestle, funnel, label paper. The materials and reagents used in the study were: aquadest, pineapple peel and crown leaf extract, anchovy salted fish, formaldehyde standard solution, 10% formalin solution, 10% phosphoric acid, Hantzsch reagent.

### Inception procedure

#### a. Preparation of 10% formalin solution

Preparation of 10% formalin solution by pipetting 37% formalin as much as 10 mL was put into a 100 ml volumetric flask, then added using distilled water up to 100 ml (up to the meniscus limit).

#### b. Preparation of Hantzsch larutan solution

Preparation of Hantzsch solution by weighing 15 grams of ammonium acetate dissolved in 100 ml of distilled water. Then 0.3 ml of glacial acetic acid and 0.2 ml of acetyl acetone were added and then added with distilled water to 100 ml (Harahap, 2019).

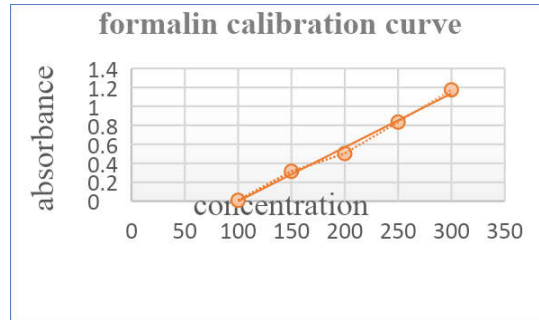
#### c. Preparation of 6 mg/ml formaldehyde mother standard solution

formalin (containing 37% formaldehyde in water) was pipetted as much as 1.1 ml (solution form), put into a 200 ml volumetric flask, then added using aquadest to the limit of the meniscus.

- d. Preparation of standard solution of formaldehyde concentration 100-300 ppm  
From the standard 6 mg/ml formaldehyde parent solution, a concentration of 100 ppm was made by measuring 1.7 ml of the mother liquor added using distilled water to 100 ml, then a concentration of 150 ppm was made by measuring 2.5 ml of the mother liquor added with distilled water to 100 ml, then the concentration was made. 200 ppm by measuring 3.3 ml of the mother liquor was added to 100 ml of distilled water, then a concentration of 250 ppm was made by measuring 4.2 ml of the mother liquor added to 100 ml of distilled water, then a concentration of 300 ppm was made by measuring 5 ml of the mother liquor added with distilled water to 100 ml (Solution B).
- e. Preparation of 10% phosphoric acid solution  
Phosphoric acid (85%) was measured as much as 11.8 ml and then added to a 100 ml volumetric flask with distilled water to the limit of the meniscus.
- f. Blank Solution  
Put 10 ml of distilled water and 5 ml of Hantzsch reagent into a closed test tube and then heat it in a water heater at 40°C for 30 minutes. After cooling, transfer it to a 25 ml volumetric flask quantitatively and adjust the volume using aquadest, shake until homogeneous (Solution C) (Harahap, 2019).
- g. The procedure for making pineapple peel and crown leaves  
For the first peel the peel and crown of the pineapple leaves Wash the skin and crown of the pineapple leaves and then dry until the washing water is gone next cut the pineapple skin and crown into small pieces and then weigh 5 grams, 10 grams, 15 grams and 20 grams of pineapple skin. Weigh 5 grams, 10 grams, 15 grams and 20 grams of pineapple leaf crown and then the skin and crown of the pineapple leaves are mashed with a blender. After puree with a blender, squeeze and strain the peel and crown of pineapple leaves according to their respective concentrations next, added with 100 ml of distilled water to obtain concentrations of 5%, 10%, 15%, and 20%. Procedure for giving skin and crown of pineapple leaves to anchovies. Anchovy is given 10% formalin for 60 minutes. Then the anchovy is dried under the hot sun for 2 days until it is completely dry. Weighed 10g of formalin anchovy salted fish for each concentration. The skin and crown of pineapple leaves were given using various concentrations, namely 5%, 10%, 15% and 20%. Soaking for 1 hour.
- h. Preparation of test solution  
A total of 10 grams of anchovy that had been treated were then crushed and put into a distillation flask. Add 100 ml of distilled water and 10 ml of 10% phosphoric acid. Then steam distillation is carried out using a steam distillation device, the distillation is accommodated in an erlenmeyer. Pipette 1 ml of distillate and put into a closed test tube. Added distilled water until the volume is 10 ml and 5 ml of Hantzsch reagent and then heated in a water bath at 40°C for 30 minutes. After cooling, it was transferred to a 25 ml volumetric flask quantitatively and adjusted the volume using aquadest. Shake until homogeneous and then transferred into a test tube (Solution A).

i. How to determine

Solutions A, B and C were each made up of an absorption spectrum at the maximum wavelength (approximately at 420 nm in length) using UV-Vis spectrophotometry (Harahap, 2019). The data obtained by means of a spectrophotometer will display the results based on the analysis of the calibration curve with the calibration regression equation as follows:



Picture 3.1 Formalin calibration curve graph

Calculation of formalin levels with sample absorbance values is plotted on a calibration curve or the equation of a calibration curve line so that the formalin content is obtained.

$$y = 0.0057x - 0.571 \quad R^2 = 0.9913$$

Information :

y = Declare absorbance

x = Concentration

b = Regression coefficient

(stating slope = slope)

a = regression constant (represents the intercept)

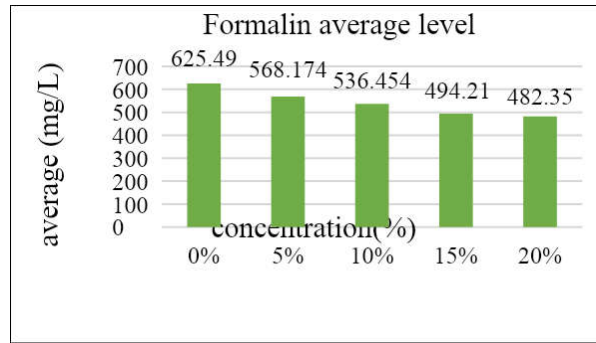
## RESULTS AND DISCUSSION

After being given the treatment with various concentrations of extract of the peel and crown of pineapple leaves with UV-Vis spectrophotometry can be seen in table 4.1

**Table 4. 1 Results of Reducing Formalin Levels After Soaking**

repetition	Formalin levels by soaking the peel and crown of pineapple leaves for 1 hour with a concentration (mg/L)				
	0%	5%	10%	15%	20%
1	626,49	626,49	550,70	555,61	520,17
2	626,49	626,49	569,47	450,35	497,37
3	626,49	561,05	524,91	532,63	498,77
4	626,49	569,47	525,96	474,74	446,49
5	626,49	457,37	511,23	457,72	448,95
amount	3.127,45	2.840,87	2.682,27	2.471,05	2.411,75
average	625,49	568,174	536,454	494,21	482,35
Standard deviation	0	69.158	23.306	47.118	32.890

From the results of statistical calculations using the SPSS method, the level of formalin in anchovies without skin and pineapple leaves was 625.49 mg/L. The average level of formalin in anchovies with the application of skin juice and 5% pineapple leaf crown is 568,174 mg/L. The average level of formalin in anchovies with 10% pineapple peel and crown extract was 536,454 mg/L. The average level of formalin in anchovies with the application of skin juice and pineapple leaf crown 15% is 494.21 mg/L. Then it decreased to the lowest average value with an immersion concentration of 20%, which was 482.35 mg/L. Based on the results of the examination of formalin levels in anchovies by soaking the skin and crown of pineapple leaves, it is known that there are differences in each concentration. The decrease before and after administration of pineapple peel and crown was the highest with a concentration of 20%. From the data obtained from the average formalin content of anchovy above, the diagram data obtained from the average level of formalin as follows:



**Figure 4. 1 Bar Chart Graph of Average Formalin Levels in Anchovy Based on Skin Juice and Pineapple Leaf Crown**

The results of reducing formalin levels at a concentration of 0% with the most optimum decrease in formalin levels of 20% were 22.88%. After getting the results of the examination of formalin levels in anchovies, it was continued with a normality test using the one-sample Kolmogorov-Smirnov Test, and The result was normal. Furthermore, the Anova test was carried out to determine the effect of giving the peel and crown of pineapple leaves to the decrease in formalin levels in anchovies using the Anova test, and The results of the ANOVA test on the formalin content of anchovy showed that there was an effect of the peel and crown of pineapple leaves on the decrease in formalin levels in anchovy as indicated by the calculated F value of 9.921 with a significant level of  $P <$  which was smaller than 0.05. Then the data was continued with the Tukey HSD test using the SPSS 28 (Statistical Program Social Science), and the results of the Tukey test showed that the level of formalin in the treatment of 0% (without administration) and 5% there was no significant difference. In the 0% treatment (without giving) there was no significant difference with the 10% and 15% treatment. In the 5% treatment there was no significant difference with the 10% and 15% treatment. However, in the treatment of 0% (without treatment) and 20% there was a significant difference, explaining that the most effective administration was at 20% formalin levels.

Based on the results of laboratory tests using a UV-VIS spectrophotometer with a wavelength of ( $\lambda$ ) 420 nm, the average formalin content for the average level of formalin in anchovies with the application of skin juice and 5% pineapple leaf crown is 568,174 mg/L. The average level of formalin in anchovies with 10% pineapple peel and crown extract was 536,454 mg/L. The average level of formalin in anchovies with the application of skin juice and pineapple leaf crown 15% is 494.21 mg/L. Then it decreased to the lowest average value with an immersion concentration of 20%, which was 482.35 mg/L. Based on the research data, there is an effect of giving the peel and crown of pineapple leaves to the reduction of formalin levels in anchovies. Significant at a concentration of 20% the effect of giving peel and crown of pineapple leaves, the higher the concentration the lower the formalin levels in anchovy. However, it should be noted that the higher the concentration will affect the taste of anchovy. According to (Sarwindah and Wardoyo, 2019) the formalin content in tofu decreased after soaking using a solution of miana leaves. This is because the miana leaves contain saponins that can bind formalin levels. And the content of saponins has two polar and nonpolar groups that have the ability to form water and formalin emulsions, so that saponins act as emulsifiers. Saponins will dissolve in water and form micelles, the head is round which can bind with water and formalin (polar) while the tail is non-polar. Formalin is soluble in water. Surfactants are compounds known to be emulsion stabilizers. Surfactant molecules that have dissolved in water, form monomers and are concentrated on the water surface, while the hydrophobic hydrocarbon tails will

move away from the water surface. Micellization occurs due to hydrophobic interactions, this interaction will result in aggregation while the hydrophilic head will remain in direct contact with water. According to (Burhan et al., 2021) lime can reduce formalin levels in anchovies because it contains citric acid as an acid compound that acts as a provider of H<sup>+</sup> ions which has catalyzed the process of releasing formalin bonds. Acid compounds in solution can function as catalysts, in addition to reactants. The reason for using pineapple peel is because it contains saponins and pineapple leaf crown contains citric acid, therefore utilizing both waste from pineapple fruit that is underutilized. The most significant decrease in formalin levels was with a concentration of 20%. Because the higher the content of saponins and citric acid can reduce the level of formalin is the best. In this study, researchers found that the peel and crown of pineapple (*Ananas comosus*) leaves can reduce formalin levels in anchovies. So that they can utilize and do immersion using natural ingredients containing saponins and citric acid to reduce formalin levels. Can take advantage of waste peel and crown of pineapple leaves. As well as being beneficial for the surrounding community, other researchers can take advantage of other natural materials.

## CONCLUSION

1. There was an effect of giving the peel and crown of pineapple (*Ananas comosus*) leaf juice to the reduction of formalin levels in anchovy.
2. The most optimum effectiveness of giving pineapple peel and crown to reduce formalin levels in anchovy with a concentration of 20% with an average yield of 482.35 mg/L. The results of reducing formalin levels at a concentration of 0% with the most optimum decrease in formalin levels of 20% were 22.88%.

## RECOMMENDATION

1. For institutions.  
With this research, it is hoped that it can be used as a reference or reference and can add insight that the peel and crown of pineapple leaves can reduce formalin levels.
2. For the next researcher:
  - a. For further research, it can be done about reducing formalin levels by using pineapple peel and crown leaf extract with a lower concentration of less than 20% with other complexing solutions such as Schiff's reagent.
  - b. Using a soaking time of under 60 minutes if using pineapple.
  - c. The concentration of the standard solution is increased to a susceptible concentration of 200-600 ppm.
3. For the community  
For information, the peel and crown of pineapple leaves can be used as an alternative to reduce formalin levels in anchovies.

## REFERENCES

Anggraini Bela Dwi (2020) 'Penurunan Kadar Formalin Pada Ikan Asin Menggunakan Air Cucian Beras', *Politeknik Kesehatan Kemenkes Medan Jurusan Teknologi Laboratorium Medis*, pp. 1–4.

Behavior, C. et al. (2017) 'Analisis Perilaku Konsumen Dalam Pembelian Teri Krispi Di Kabupaten Pamekasan Madura', *Agromix*, 8(2), pp. 75–81. Available at: <https://doi.org/10.35891/agx.v8i2.782>.



- Burhan, A.H., Rini, Y.P. and Nurhaeni, F. (2019) 'Pengaruh perendaman Air Jeruk Nipis Terhadap Kadar Formalin Dalam Ikan Asin Teri Nasi', *Media Ilmu Kesehatan*, 7(3), pp. 191–197. Available at: <https://doi.org/10.30989/mik.v7i3.295>.
- Ernawati, A., Pangestuti, D.R. and Widajanti, L. (2017) 'Efektivitas Perendaman Air Hangat Dan Air Garam Terhadap Penurunan Kadar Formalin Ikan Asin Di Tingkat Pedagang Pasar Kota Semarang', *Jurnal Kesehatan Masyarakat*, pp. 614–616.
- Fanny, L. *et al.* (2019) 'Diperkaya Tepung Tempe Dan Tepung Ikan Teri ( *Stolephorus sp* )', 26.
- Harahap, E. p (2019) 'Penentuan Kadar Formaldehid Pada Ikan Dengan Metode Spektrofotometri Uv-Visible Di Badan Pengawas Obat Dan Makanan Medan', *Departement Kimia Fakultas Matematika Dan Ilmu Pengetahuan Alam Universitas Sumatera Utara*, pp. 12–17.
- Lenny, Iskandar, B. and Silalahi, A.A. (2021) 'Formulasi dan Pengujian Stabilitas Sediaan Mikroemulsi Ekstrak Etanol Kulit Nanas (*Ananas comosus L* ) Dalam Bakteri *Staphylococcus epidermidis*', *Majalah Farmasi dan Farmakologi*, 25(3), pp. 103–108. Available at: <https://doi.org/10.20956/mff.v25i3.17911>.
- Madonsa, R. *et al.* (2019) 'Identifikasi Formalin Pada Ikan Teri Kering Yang Beredar Di Pasar Tradisional Girian Dan Winenet Di Kota Bitung', *Jurnal Biofarmasetikal Tropis*, pp. 75–77.
- Pradana, A.R. (2018) 'Aplikasi CaCl<sub>2</sub> Dalam Upaya Peningkatan Kualitas Mahkota Dan Buah Tanaman Nanas (*Ananas comosus (L.) Merrill*) Klon GP-3', *Skripsi, Universitas Brawijaya Fakultas Pertanian Malang*, p. 5.
- Rahmawati, R., Juliana, C. and Sari, M. (2016) 'Kandungan Formalin Pada Ikan Asin Di Pasar Pucang, Kecamatan Gubeng, Kota Surabaya', *Gizi Poltekkes Kemenkes Surabaya*, pp. 140–143
- Sarwindah and Wardoyo, F.A. (2019) 'Penurunan Kadar Formalin pada Tahu Putih dengan Larutan Daun Miana (*Coleus benth*) Berdasarkan Variasi Waktu Perendaman', *Prosiding Seminar Nasional Unimus*, pp. 83–87. Available at: <https://prosiding.unimus.ac.id/index.php/mahasiswa/article/view/444>.
- Suarnadwipa, N., Adnyana, I.W.B. and Wicaksana, H. (2018) 'Pemberdayaan Masyarakat Nelayan Melalui Pelatihan Pengawetan Ikan Menggunakan Mesin Pendingin', *Buletin Udayana Mengabdi*, 17(2), p. 106. Available at: <https://doi.org/10.24843/bum.2018.v17.i02.p18>.
- Tarigan Novita (2019) 'Analisa Kadar Formalin Pada Ikan Asin Yang Diperjual Belikan Dipusat Pasar Medan Dengan Variasi Waktu Perendaman', *Politeknik Kesehatan Kemenkes RI Medan Jurusan Analis Kesehatan Medan Jurusan Analis Kesehatan*, pp. 1–4.
- Tasya, A.S.D. (2019) 'Efektivitas Perendaman Air Panas Dan Metode Penggorengan Terhadap Penurunan Kadar Formalin Pada Ikan Asin Kepala Batu Di Kota Medan', *Program Studi S1 Kesehatan Masyarakat Universitas Sumatra Utara*, pp. 1–5.
- Ulfah, D. (2020) 'Pengaruh Penambahan Additive Cmc Daun Nanas Terhadap Filtration Loss Dan Rheology Lumpur Universitas Islam Riau'.

Zamhariroh and Ratmana Hanum, G. (2018) 'Efektivitas Temu Kunci (*Boesenbergia rotunda*) Terhadap Penurunan Kadar Formalin Pada Ikan Tuna (*Thunnus sp.*)', *Journal of Medical Laboratory Science/ Technology*, 1(2), pp. 68–76. Available at: <http://creativecommons.org/licenses/by/4.0/>. Havard, times new roman 11 spasi 1,0 with after 12