Vol. 11, No.2: 58–66
December 2022
EISSN: 2541-1969
ISSN: 2338-0950
https://bestjournal.untad.ac.id/index.php/ejurnalfmipa

Natural Science
Journal of Science and Technology

Original article

Antimicrobial Potential of Catfish (*Clarias batrachus*) and Snakehead Fish (*Chana striata*) Mucus on Bacterial Coliform Growth and its Application as the Organic Face Mask and Lipstick

Wenny P.L. Tarigan[1]*, Christine U. Tarigan[2], Cherline Halim[3], Jennifer Valerie[3], Vionita Itanza[4], Russell Oeintz[5]

[1]Department of Science Education, Universitas Negeri Yogyakarta, 55281, Indonesia
[2]Department of Cosmetology, Universitas Negeri Yogyakarta, 55281, Indonesia
[3]Department of Accountancy, Pelita Harapan University, 20112, Indonesia
[4]Department of Management, Mikroskil University, 20112, Indonesia
[5]Department of Mechanical Engineering, Sampoerna Uiversity, 20112, Indonesia

Keywords:
Clarias batrachus, *Chana striata*, cocoa, lipstick, organic, mask

Article history:
Received 26 November 2022
Received in revision form 06 January 2023
Accepted 10 January 2023
Published 20 January 2023

Abstract

Mucus from snakehead fish (*Chana striata*) and catfish (*Clarias batrachus*) has the potential to be employed in organic cosmetics and wound healing. The aim of this study is to create antimicrobials from *Clarias batrachus* and *Chana striata* mucus that may inhibit the growth of coliform bacteria. It also seeks to establish the minimum inhibitory concentration of *Clarias batrachus* and *Chana striata* mucus extracts against the growth of *Escherichia coli* when cocoa extract is added as an internal ingredient for making face masks and organic lipstick. The content of anthocyanin in cocoa beans used as a natural colouring agent that can replace synthetic dyes. The pooled fish mucus was extracted with succeeding centrifugation and filtration. The acidic mucus extracts were tested for antimicrobial-inhibitory effects and minimum inhibitory concentration (MIC) by agar-overlay diffusion and plate dilution method, respectively. The results showed that all fish mucus extracts exhibited antimicrobial effects against tested pathogens with catfish exhibiting the highest inhibitory effects against the bacteria sample as compared to the broad-spectrum antibiotic control. Interestingly, their mucus revealed inhibitory effects against bacteria at the lowest concentration (1:4 dilution). The present findings revealed the potential antimicrobial use of freshwater fish mucus against medically-important pathogens.

INTRODUCTION

Catfish (*Clarias batrachus*) known as freshwater fish have complex mechanisms of immunity. Although dwelling in a contaminated aquatic habitat with pathogenic bacteria, these animals hardly ever get an infection because the skin mucus's general immunity. In the form of antimicrobial peptides, they have the capacity to act as an antiseptic for catfish slime or mucus protein-containing substances (AMPs). Due to their strong bactericidal properties, these substances could be employed in the treatment of wounds. Where the protein substances capable of eradicate harmful germs are.

Snakehead fish (*Chana striata*) known as freshwater fish that are rich in albumin, a type of protein essential for the human body. Albumin is essential in human body, especially in the process of healing the wounds. Shortage of albumin in the human body (hypo albumin) causes nutrients cannot be distributed properly throughout the body.

*Coresponding Author: wenny.tarigan@gmail.com
DOI: https://dx.doi.org/10.22487/25411969.2022.v11.i2.16171

How to Cite: Tarigan *et al*. "Antimicrobial Potential of Catfish (*Clarias batrachus*) and Snakehead Fish (*Chana striata*) Mucus on Bacterial Coliform Growth as Materials for Making Organic Face Mask and Lipstick"
Natural Science: Journal of Science and Technology. Vol. 11, No. 2: 58–66, December 2022.

Snakehead fish is known to have kind of a higher nutritional content. Snakehead fish protein content of 25.5% is higher than the protein content of 20.0% cat fish, 16% carp, 20.0% snapper. In addition, albumin is also very good for health in the formation of new cell tissue, accelerate the recovery of the damaged body tissue and maintain the balance of fluids in the blood vessels.

The mucus extract of snakehead fish can help to moisturize the skin. Lack of moisture and protein is the cause of dry, dull, and rough skin. In order to enhance the state of dry and dull skin and make it more smooth, bright, and moisturized, snakehead fish, which is high in protein and moisture content, softens and moisturizes the skin. Some beauty products that can be developed using slime extract the snakehead is face masks, lipsticks, lip balm, soap and facial foam.

Flawless, clean, smooth healthy and free from skin infection due to contamination by coliform bacteria which cause skin disease is everyone's hope. Healthy skin has a consistency criteria such as facial chewy, elastic/flexible, soft, radiant skin colour, no breakouts and normal skin type. However, in fact a lot of people have problems in their the skin. All people are looking for the safest solution for their bodies amid the rapid misuse composed of hazardous chemicals in the drug or cosmetics used for beauty treatments. One of the natural ingredients that are good for skin health is the extract of snakehead fish.

The natural materials/traditional can be used in beauty treatments. While there are no chemicals that are hazardous, especially to the skin, the advantages of using natural materials and traditional medicine are also modest. Cosmetic has become a primary need for most people, especially women (Lirio, 2018). Cosmetic preparation that is very common to use are face masks and lipsticks. Lipstick included as the decorative cosmetic preparations, whose use solely attached to the body makeup. In general, the use of decorative cosmetics aims to hide the flaws on the skin that can lead to a good psychological effect, namely the emergence of self-confidence. Requirements for decorative cosmetics are an attractive color, fragrance, not sticky, and does not undermine or damage the health of the skin (Tranggono and Latifah, 2007).

In general lipstick contains chemicals that are harmful to health. One of the harmful chemicals commonly found in lipstick formulations are preservatives. Paraben is one kind of harmful chemical preservatives that can cause premature aging, irritation, allergy and cancer when used continuously at a dose in cosmetic formulations that exceed the limit (Epstein, 2006). The interests of consumers on the function of decorative cosmetics makes consumers often overlook important compositions in cosmetic formulations. This condition encourages the use of certain herbal ingredients as an alternative to chemical preservatives. One of the organic materials that could potentially inhibit microorganism growth and toxin production is catfish mucus.

These circumstances encourage product development efforts, especially food additives that are natural dyes. Most natural dyes derived from extracts of plants, animals or microorganisms (Nurtamin, 2016). Brown bean plant extracts can be used as natural dyes. In addition to its ability to exfoliate dead skin cells, cocoa also contains antioxidants that can delay the premature aging of skin cells. Brown fat, cocoa powder, and other common components are used in the currently being developed cosmetic goods, including chocolate-brown face masks, scrubs, and soaps. Chocolate mask can serve to make the face smooth and fresh. Based on this, the researchers are interested in making formulations of organic face masks and lipsticks that can provide minimal effect or even no side effect made from extracts of catfish mucus, snakehead fish mucus, powdered chocolate so it can be used intensively, safe, and satisfying the needs of consumers. Face masks and lipsticks will be made with a combination of organic natural ingredients, which are not harmful to the body.

MATERIALS AND METHODS

Fish and Mucus Collection

Clarias batrachus and *Chana striata* were collected by the fishermen from river. The fish were stocked into the 1,2 x 1,0 x 1,2 m capacity glass aquaria and acclimatized to laboratory conditions in a tap water. They were placed in different glass aquaria with the same size and capacity. They were maintained for one week. During this period the fish were fed with commercial feed once a day at ad libitum. Every day 50% of the water was changed. After one week of acclimatization the fish were used for mucus collection. Only healthy fish were used for mucus collection, dead fish or fish with skin lesions were removed from the tanks.

Fishes were starved for one day prior to mucus collection. Before collection of mucus, fish were kept out of water and filled with 0.9 ml NaCl as much as 5 ml. The fish was shaken forward and back after the fish was removed and then the mucus was taken back in specimen tray for 1 hour. After one hour mucus secreted on the epidermal surface of the body of fish was collected as sample. Mucus was carefully scraped from the dorsal body surface using a sterile spatula. Mucus was not collected in the ventral side to avoid intestinal contamination. The collected fish mucus was stored at 40 °C for further use. Fish's mucus was diluted using distilled water to produce slime concentrations of 20% (1 ml extract + 4 ml distilled water), 40% (2 ml extract + 3 ml distilled water). *C. striata* mucus flour solution was centrifuged at a speed of 1000 rpm for 1 minute

to obtain a supernatant. The supernatant was stored in a refrigerator at 4ºC and was ready for use in antimicrobial research (Balasubramanian *et al*. 2012). The materials needed for making cosmetic products could be seen in Table 1.

Antimicrobial Assays

In-vitro antimicrobial evaluation of fish mucus of *C. batrachus* were carried against chicken faecal bacteria. *Escherichia coli* strains were obtained from the experimental sample from the previous researcher.

The spectrum of antimicrobial activity was studied as human pathogens. Ciprofloxacin used against pathogenic bacteria as control. In-vitro antibacterial assays were carried out by Disc Diffusion Agar Method (Agusmansyah, 2017). Whatman No.1 filter paper disc with 4 mm diameter were used. 0.1 ml of culture of bacteria was poured on agar plate surfaces. For antibacterial assays, bacterial strains were grown in Nutrient Agar (NA) Carolina medium for 24 hrs at 37 ± 0.1 °C. The concentration of bacterial suspensions was adjusted to 108 Cfu/ml in Muller Hinton agar. Paper disc were impregnated on the agar to load 10 µl of each sample. The impregnated disc was placed on the medium suitably spaced apart and the plates were incubated at 50 °C for 20 minutes to permit good diffusion and then transferred to an incubator at 37 ± 0.1 °C for 24 hrs. The results were recorded by measuring the zones of growth inhibition surrounding the disc. All data on antimicrobial activity are the average of triplicate analysis. In order to determine the antimicrobial effect of the fish mucus and ciprofloxacin (10µg/ml/disc) were measured after incubation for 24 hrs at 37 ± 0.1°C.

Table 1. Materials of Cosmetic Products

Composition	Function
Rice flour	Fastener
Chocolate powder	Perfumes, natural dye
Milk powder	Stiffening agents
Catfish slime extract	Nutrition agent, natural preservative
Snakehead slime extract	Nutrition agent, natural preservative
Beeswax	Natural emulsifier
Petroleum jelly	Moisturizing agent
Castor oil	Stiffening agent
Cocoa butter	Emollient
Jojoba oil	Emollient
Cocoa powder	Perfumes, natural dye
Red food coloring (powder)	Natural dye

Sterilization Equipment

Sterilizization of the research tools and materials, except catfish (*Clarias batrachus*) mucus, snakehead fish (*Chana striata*) and bacterial suspensions, might affect the results of the study. The tool is sterilized by boiling it in boiling water for 20 minutes, after which it is placed back in the oven and coated with paper at 121 ° C for 15-20 minutes. The liquid agar media was put into the oven to be sterilized before being planted with bacteria.

Preparation of Bacteria Suspension

The newly produced feces sample was weighed as much as 10 grams, then dissolved with 100 ml of distilled water in the beaker glass. Chicken feces solution was not homogeneous, so researchers used a centrifugation to separate the supernatant from platelet particles. Every 1 ml of the supernatant was used as a suspension of fecal coliform bacteria which was then tested using safranin solution, catalase test, citrate test and cell shape observation to determine the class of bacteria produced. Based on the results of staining that has been done, bacterial samples in fecal have similarities with Escherichia genus bacteria, then most likely the suspension of these bacteria was *Escherichia coli*.

Preparation of Organic Cosmetic Products

Organic face mask preparation formulations used in this study are as follows:

Table 2. Organic face mask formulation.

Composition	Concen-tration (%)	Function
Rice flour	7	Candle
Chocolate powder	68	Perfumes, natural dye
Milk powder	15	Stiffening agent
Catfish slime extract	X	*Nutrition agent*, natural preservative
Slime extract snakehead	Y	*Nutrition agent*, preservative

Information:

Formula (%): Preparation lipstick with mucus extracts concentration of catfish and snakehead which shows the most optimal result-based test antibacterial inhibition zone.

X: Catfish slime extract the best inhibitory activity

Y: Snakehead mucus extract with the best inhibitory activity

The procedure for making organic face masks was:

a. The preparation phase ingredients: rice flour, cocoa powder, milk powder, extracts of catfish slime, slime extract the snakehead.

b. Comparison of mask material: 7%, 68%, 15%.
c. Preparation tools: knife, scales, bowls, trays, tea spoon, strain the tool, pestle, blender.
d. Material washed clean
e. Materials weighed accurately.
f. Oven-dried material periodically in less than 3 days
g. Materials that have been dried and then crushed, screened to obtain powder mask
h. Next stage was sensory testing. Sensory testing was used to determine how much the degree of fit organic mask created results.
i. Sensory testing conducted on high school students and teachers as panelists at 2-week period, 1x week trial period.
j. Respondents were asked to give feedback about their personal preferences or otherwise (dislike).

The lipstick formulations (Imada, 2016) used in this study were as follows:

Table 3. Dosage formulations lipstick.

Composition	Concentration (%)	Function
Beeswax	30	Candle
Petroleum jelly	10	Candle
Castor oil	25	*Stiffening agents*
Cocoa butter	10	Emollient
Jojoba oil	5	Emollient
Cocoa powder	7	Perfumes, natural dyes
Food coloring (powder)	3	Natural dyes
Catfish slime extract	x	*Nutrition agent*, natural preservative
Snakehead slime extract	y	*Nutrition agent*

The procedure for making organic lipstick was:

a. Beeswax, castor oil, cocoa butter, white petroleum jelly, and jojoba oil, cocoa powder, extracts of catfish slime and mucus extract the snakehead in the form of flour were weighed. Catfish slime extract, snakehead and jojoba oil and cocoa powder were dissolved in ½ castor oil, and stirred until homogeneous (Mass 1).
b. Beeswax, white petroleum jelly, cocoa butter and ½ castor oil was placed in the heat-resistant container and then heated on a hot plate at a temperature of 80-85 °C and stirred at constant speed until all ingredients melt and homogenized. Stirring was done constantly so as not to form air bubbles (Mass 2).
c. Mass 1 was mixed slowly to a mass of 2 with heating that is not too high (60-65° C) to prevent clotting in the dye, then stirred until the mass 1 uniformly dispersed in the mass 2.
d. After a homogeneous mixture, which is still liquid lipstick mass was poured into a lipstick container stock. Lipstick then allowed to harden.
e. Evaluation of lipstick preparations include measurement of yeast fungi numbers, homogeneity, rub test, melting point test, hardness test preparation and test the stability of lipstick organic lipstick that includes observation of the changes in the shape, color and odor of the preparation (ISO 16- 4769, 1998).

RESULTS AND DISCUSSION

Bacteria Isolation

Lactose-fermenting bacteria (example: *Escherichia coli*, *Klebsiella* sp.) would produce red or pink colonies, because they ferment lactose. The presence of bacteria on endo media indicated that lactose could be fermented by the bacteria. The antibacterial activity is indicated by the inhibition zone around the filter paper that has been soaked with catfish mucus extract and snakehead for 15 minutes (Table 4). The results of planting bacterial samples from native chicken feces (*Gallus varius* L.) on Nutrient Agar (NA) as shown in Figure 1.

Figure 1. *Escherichia coli* in agar media

Cosmetic Products

Organic Face Masks

Face masks used in this study using all the natural ingredients. Based on the opinion of five panelists on organic, face mask products made from catfish, snakehead, chocolate powder and milk do not cause skin inflammation on the panelists' faces. After application of an organic mask, the panelist's facial skin feels soft and looks brighter. This is caused by increased facial skin moisture so that the lines and wrinkles on the skin are not visible. The aroma of organic masks is favored by panelists because the chocolate aroma produced provides a relaxing effect when used. The resulting mask texture is smooth enough so that it does not cause skin irritation when applied to the face with the pH of the organic mask

solution in the range of 6.2 (close to neutral) as shown in Figure 2.

Table 4. The results of inhibition zone diameter of catfish and snakehead fish mucus extracts on the growth of *E.coli*.

No.	Extracts Concentration	Inhibition Zone (cm)	Inhibitory Criteria
1	40% Catfish mucus	1,16	Non-Effective
2	40% Snakehead fish mucus	1,84	Effective
3	60% Catfish mucus	1,83	Effective
4	60% Snakehead fish mucus	2,26	Effective
5	Positive Control (*Penicillin*)	3,5	Effective
6	Negative Control (NaCl 0.9%)	-	Non-Effective

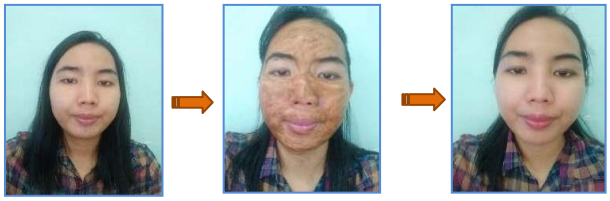

Figure 2. The results of using organic masks on panellist's face.

Organic Lipstick from Combination of Catfish and Snakehead fish mucus, and Cocoa Seeds

The basic components used in making lipstick bases are oil, fat, and wax (Cowan, 1999). Beeswax is an important wax in making lipstick bases. Beeswax can make lipstick hard, but too much use of beeswax will make the lipstick blunt. The use of beeswax on a lipstick basis ranges from 5-20% (Belitz, 2009). In addition, beeswax has good binding properties, which helps to produce a homogeneous mass. Beeswax has good oil retention properties which acts as a binder to bind together different components in the formulation and improve the structure of lipstick (Fitri, 2012). Melting point of beeswax ranges between 62-65° C. While cocoa butter shows significant cracks at temperatures below 20°C. A very sharp melting point is at 35° C with fusion at temperatures around 30-32°C. Then, mixing the lipstick base begins by melting the material with the highest melting point so that the stability of the material with the lower melting point is still maintained. After the solid material has melted, white petroleum jelly is added.

In this study, lipstick preparations with a combination of catfish and snakehead mucus extract were made in one formulation with the best extract concentration. Based on the results obtained from the antibacterial test of each extract by the diffusion method, it is known that the catfish slime extract and snakehead mucus extract with a concentration of 40% gives the best effect in inhibiting the growth of *E. coli* bacteria so that the results are used as a reference for the manufacture of lipstick preparations in this research.

Table 5. Lipstick physical quality inspection

Test	Week I	Week II	Unit
Homogeneity	+	+	°C gram
Melting Point	59	59	
Resistance	97.44	97.44	
Stability:			
Smell	3	3	
Taste	Chocolate	Chocolate	
Topical Power	4	4	

The results of the obtained organic lipstick can be seen in Figure 3. Evaluation of the quality of lipstick preparations includes homogeneity, strength, stability and topical checks as summarized in Table 5.

Homogenecity of Lipstick

Homogeneity test lipstick is important to know whether when applied lipstick will give an even color. The resulting lipstick has good homogeneity during storage. Mucus extracts of catfish, snakehead, and cocoa powder are distributed evenly on a lipstick basis with the help of castor oil, because their viscosity can prevent the deposition of pigments at the time of manufacture (Adliani, 2012).

Homogeneity testing of lipstick showed an even result in the preparation of a combination of lipstick extract concentration of catfish and snakehead by 40%. The resulting color is evenly dispersed when applied to transparent glass and no coarse grains appear which means that the lipstick preparation is homogeneous.

Lipstick Melting Point

The melting point of the average lipstick preparation combination of slime extract of catfish, snakehead and chocolate powder in this study was at a temperature of 58° C. Examination of the melting point of the preparation is done through covenants, with lipstick preparation control without the addition of extracts. The results of the examination of the melting point of this lipstick preparation indicate that the melting point of the lipstick preparation decreases with the addition of the coloring composition.

The strength of the lipstick was tested, and the findings reveal a relationship between the weight and time at which the lipstick broke. It has been demonstrated that the quantities of coloring and preventative substances added to the mix of the fundamental ingredients of lipstick have an impact on how strong the lipstick is. Lipstick formulations with shorter time intervals tend to have softer textures, whereas those with longer time intervals tend to have harder textures. Lipstick strength test showed that the breaking point of the preparation was at 96.44-97.44 grams. These results indicate that the hardness of a lipstick depends on the composition of the lipstick base formulation and the combination of other ingredients added to the lipstick base formulation, which also determines the physical quality in the lipstick product.

Lipstick Stability

The smell of lipstick is influenced by a mixture of wax and fat used in the formulation. The odor of lipstick also comes from the cocoa powder added to the lipstick formulation, which is useful for covering up damage to oil or fat arises due to the formation of volatile fatty acids resulting from hydrolysis of oil or fat and a brown coloring agent. The aroma of chocolate will cover the vapors of fatty acids formed by oil/fat hydrolysis (Kusuma and Wulandari, 2003). The composition of lipstick has different flavors. With the addition of a little sugar and flour, chocolate powder extract tastes bitter. The lipstick formula tastes a touch sweet after being transformed into a lipstick preparation. Organoleptic test was performed once a week for 2 weeks. The results is in accordance with the requirements of a good lipstick that lipstick must not have an unpleasant taste.

Topical Test

The pleasant feel to use lipstick is the benchmark for consumers to choose lipstick. Consumers tend to choose lipstick that sticks to the lips. The results of physical quality inspection of lipstick preparations showed that the power of organic lipstick preparations was sufficiently attached to the skin for 2 weeks of storage, with an inspection interval of once a week. The power of applying or sticking power of lipstick on the skin is influenced by the concentration of wax used. The addition of beeswax concentrations of more than 35% will make the texture of lipstick preparations harder so it will not stick to the skin (Perdana Kusuma & Wulandari, 2003). During 2 weeks of storage the color of the lipstick preparations produced by basting did not show any significant changes. The color change that occurs in the lipstick preparation during storage reflects that the emulsion in the lipstick is starting to be unstable.

Lipstick Resistance

The results of the examination of the strength of the lipstick show the relationship between the time interval and the weight at which the lipstick was broken. The composition of the basic ingredients of lipstick with the addition of concentrations of coloring and preventive substances has been proven to have an effect on lipstick formulations so as to determine the strength of the lipstick. Shorter time intervals indicate that lipstick formulations have a softer texture, whereas longer time intervals indicate that lipstick formulations have a harder texture. Lipstick strength test showed that the breaking point of the preparation was at 96.44 - 97.44 grams. These results indicate that the hardness of a lipstick depends on the composition of the lipstick base formulation and the combination of other ingredients added to the lipstick base formulation, which also determines the physical quality in the lipstick product.

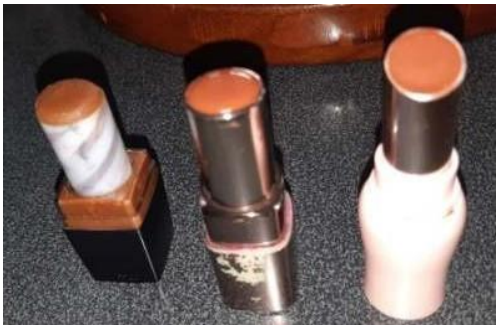

Figure 4. Organic lipstick products

DISCUSSION

Based on the inhibition zone category according to Davis and Stout (1971), it is known that the catfish and snakehead mucus extracts at a concentration of 40% and 60% provide sufficient inhibition against the bacterium. Although both fish have the same antibiotic potential, the inhibition zone created by catfish is larger than that of snakehead fish when compared between the two fish mucus samples. This is due to catfish do not have scales as a protective body so that the body of catfish produces more mucus than snakehead fish. Positive control is included in the category of high inhibition while negative control does not show inhibition against test bacteria.

According to Patil (2015) and Zakaria (2015), the diameter of the inhibition zone depends on the speed of diffusion of antibacterial compounds on agar media. The speed of diffusion can be influenced by the ratio of the amount of solvent and solute. In

certain circumstances, antibacterial can work optimally at low concentrations. At low concentrations, the amount of solvent is greater than the solute. Pure water as a solvent can accelerate the process of diffusion on agar media.

If the concentration is high, then the molecular density of the antibacterial compound is high so that it diffuses longer in the medium than in a low concentration. Therefore, extract concentration of 40%, 60% was not significantly different.

Ciprofloxacin as a positive control was significantly different from the treatment of fish mucus extract and had the greatest inhibitory zone value. Ciprofloxacin has an inhibition zone diameter of 35 mm so it is categorized as having a strong inhibitory power. Ciprofloxacin has bacteriostatic properties because it interferes with the process of bacterial protein synthesis.

Negative control is not included in statistical calculations because it does not have a resistor zone value. From the results of the study, 0.9% NaCl solution as a negative control forms a clear zone around the filter paper. However, this cannot be said to be an inhibitory zone because distilled water does not have antibacterial properties against *E. coli*. The visible clear zone is caused by uneven distribution techniques so that bacterial colonies are not evenly spread on the media.

The results obtained support the results of research conducted by Subramanian that catfish mucus can inhibit the growth of *E. coli* bacteria and can be used as a wound healing agent. In research conducted by Chabuck *et al*. (2013), catfish and snakehead mucus extracts have a high enough power to inhibit the growth of *E. coli* bacteria. This is indicated by the diameter of the inhibition zone formed by 30 mm.

According to Lirio (2019) catfish and snakehead mucus contain flavonoids and tannins. Flavonoids inhibit bacterial growth by damaging the plasma membrane. Flavonoids bind to proteins in the plasma membrane so that the cell membrane surface tension decreases and cell membrane permeability increases. As a result, molecular or ionic leaks occurs, causing cell damage or death. Tannins have the ability of "astringent action" which is able to prescribe protein so that it affects bacterial peptidoglycan. Tannin is a polar compound. *E.coli* gram-negative bacteria have polar cell walls so tannins that are also polar can penetrate to the bacterial cell walls.

The cell wall provides tensile strength and protection against mechanical and osmotic stress. If the cell wall is damaged then it will disrupt the activities in the cell so that the cell will also be damaged and eventually die. Hence, tannins work to harm the *E. coli* bacteria's cell wall. Tannins also interfere with the cytoplasm and plasma membrane's ability to function, inhibit the performance of enzymes, and eliminate the substrate needed for bacterial growth.

In contrast to catfish, snakehead fish have mucoprotein in their bodily mucus at significantly higher concentrations. Catfish therefore produce a narrower inhibition zone than snakehead fish. Both the mucus from catfish and snakeheads has the capacity to act as an antibacterial. A defense mechanism against microbial invasion and other environmental dangers is mucoprotein. The glycoprotein found in snakehead and catfish mucin exhibits antibacterial activity, bactericidal potential, and wound healing properties.

Mucin is a glycoprotein compound. Glycoproteins are chemical compounds that are structurally complex consisting of proteins and carbohydrates with their oligosaccharide chains that are covalently attached to proteins in co-translational or posttranslational modification. Carbohydrates are an important part of a healthy and balanced diet that provides the energy needed to drive most cell biochemical processes in which wound healing must not be abandoned. Antimicrobial activity in mucus shows its role against gram- positive bacteria (*B. subtilis* and *S. aureus*) and gram-negative bacteria (*E coli*, *S. typhi* and *K. pneumoniae*) because mucin extract inhibits the growth of both gram-positive and gram-negative bacteria. This result is corroborated by other reports published about catfish mucin. The report also shows that carbohydrates and proteins have a strong antibacterial effect.

Based on the results of the analysis conducted there was no presence of mold or fungus either in the lipstick or the lipstick preparation that was created. According to SNI 16-4769 (1998) the preparation of face masks and organic lipsticks in this study is feasible to use because it meets the SNI standards for cosmetic mold numbers that is negative. Organic mask test panelists feel comfortable and do not cause irritation when wearing masks so that the skin becomes smoother and firmer after using this natural face masks. The panelists can significantly reduce wrinkles on their facial skin by using this natural mask. The parts of the face that are thought to have the most wrinkle alterations are the forehead, nose, chin, and cheek regions. The amount of active chemicals that are absorbed into the skin will improve its moisture value. The more often you wear a face mask, the more active absorbed ingredients will increase the skin’s moisture value.

CONCLUSION

Both catfish (*Chana striata*) and catfish mucus extract (*Clarias batrachus*) showed antibacterial activity against the growth of faecal coliform bacteria *E. coli*, although mucus catfish had a stronger antimicrobial effect than catfish slime based on the formation of an inhibitory zone. The concentration of cork and catfish slime extract of 40% have been able to demonstrate the ability of antimicrobials with a mean inhibition zone on the mucous cork at 2.26 cm and 1.84 on catfish slime with a concentration of 60%. Claricin, hepcidin, and proteases are found in mucus catfish and act as a first line of defense against germs and fungus. Albumin (6.224 grams per 100 grams) and protein (25.2%) are found in catfish, and they support blood osmotic pressure regulation to improve cells' ability to inhibit bacteria growth. Compared to catfish mucus with an 18.7% protein concentration, catfish mucus has a 25.2% greater ability to suppress bacteria growth.

The preparation formula lipstick with a combination of extracts the cork and mucous slime concentration of catfish by 40% is the proper formulation to manufacture organic lipstick preparations with good quality. Quality organic face masks and lipsticks are made from a combination of mucus extract the cork, catfish slime, chocolate powder is physically in accordance with the requirements of SNI 16-4769 and microbial contamination has been qualified as there was no mold in the preparation of masks and lipsticks.

ACKNOWLEDGEMENTS

The author would like to thank two anonymous reviewer for this invaluable suggestion for improving this manuscript. Especially the Delima Husada Gresik Health Academy which has facilitated this research to completion.

REFERENCES

Nazliniwaty, N.A., Purba, D. 2012. Formulasi Lipstik Menggunakan Zat Warna dari Ekstrak Bunga Kecombrang (Etlingera elatior (Jack) R.M. Sm.). *Journal of Pharmaceutics and Pharmacology*. 1(2), 87–94.

Agusmansyah, S. 2017. Uji efektifitas pengaruh ekstrak etanol daun tua sirsak pertumbuhan bakteri Salmonella thypi dan Staphylococcus aureus. [Thesis]. Lampung, Indonesia: Universitas Lampung.

Anisah, Nor. 2015. Studi Eksperimen Pembuatan Masker dengan Komposisi Bunga Pukul Empat, Kencur dan Binahong untuk Kulit Jerawat. [Thesis]. Lampung, Indonesia: Universitas Negeri Lampung.

Balasubramanian, S., Baby, R.P., Arul, P.A., Prakash, M., Senthilraja, P., Gunasekaran, G. 2012. Antimicrobial properties of skin mucus from four freshwater cultivable fishes (Catla catla, Hypophthalmichthys molitrix, Labeo rohita and Ctenopharyngodon idella). *Journal of AJMR*. 6(24), 5110–5120.

Belitz, H.D., Grosch, W. 2009. Food chemistry. Second Edition. Springer Berlin: Berlin.

Chabuck, Z.A.B, Al-Charrakh, A.H., Hindi, N.K.K., Hindi S.SK. 2013. Antimicrobial Effect of Aqueous Banana Extract. *Research Gate: Pharmaceutical Sciences*. 27, 73–75.

Cowan MM.1999.Plant products as antimicrobial agents. *Journal of Clinical Microbiology Reviews*.12(4): 564–582.

Davis, W.W., dan Stout, T.R., 1971. Disc Plate Method of Microbiological Antibiotic Assay. *Applied Microbiology*. 22(1), 659–665.

Deelder, C.L.1984. Synopsis of biological data on the eel Anguilla anguilla (Linaeus, 1758). FAO Fisheries Synopsis No. 80. Revision 1. Food and Agriculture Organization of The United Nations. Rome.

Fitri, N. 2012. Antimicrobial peptides sebagai obat alternatif pada resistensi antibiotik. *Jurnal Kefarmasian Indonesia*. 2(2), 62–67.

Hakim, A.A, Kamal, M.M., Butet, N.A., Afandi, R. 2015. Komposisi spesies ikan sidat (Anguilla spp.) di delapan sungai yang bermuara ke Teluk Palabuhan Ratu, Sukabumi, Indonesia. *Jurnal Ilmu dan Teknologi Kelautan Tropis*. 7(2), 573–586.

Hasibuan, S.A. 2017. Perbandingan daya hambat ekstrak daun jarak pagar (Jatropha curcas Linn) terhadap pertumbuhan bakteri Staphylococcus aureus dan Escherichia coli secara in vitro. Skripsi. Lampung: Universitas Lampung.

Imada, Anasya. 2016. Mutu Sediaan Lipstik dari Kombinasi Ekstrak Biji Anggur (Vitis vinifera) dan Ekstrak Angkak (Monascus purpureus). Skripsi. Yogyakarta: Universitas Atma Jaya.

Lirio, G.A.C, de Leon, J.A.A., Villafuerte, A.G. 2019. Antimicrobial Activity of Epidermal Mucus from Top Aquaculture Fish Species against Medically-Important Pathogens. *Walailak J Sci & Tech*. 16(5), 329–340.

Mahayasih. 2014. Uji aktivitas protein larut air umbi porang (Amorphophallus muelleri Blume) terhadap Escherichia coli dan Staphylococcus aureus. *Jurnal Pustaka Kesehatan*. 2(2), 185–191.

Notoatmodjo, S. 2012. Metodologi penelitian kesehatan. Jakarta: Rineka Cipta.

Nurtamin, T., Nurman, R.Y., Hafizah, I. 2016. Antibacterial activity of eel (Anguilla spp.) Mucus against Salmonella typhi. *The Indonesian Biomedical Journal*. 8(3), 179–182.

Oroh SB. Kandou FEF. Pelealu J.Pandiangan D. 2015.Uji daya hambat ekstrak metanol Selaginella delicatula dan Diplazium dilatatum terhadap bakteri Staphylococcus

aureus dan Escherichia coli. *Jurnal Ilmiah Sains*. 15(1): 52–58.

Patil, R.N., Kadam, J.S.,Ingole, J.R., Sathe, T.V., Jadhav, A.D. 2015. Antibacterial activity of fish mucus from Clarias batrachus (Linn.) against selected microbes. *Journal of Biolife*. 3(4):788–91.

Perdanakusuma, O., Wulandari, Z. 2003. Optimasi Proses Pembuatan Lipstik dengan Penambahan Berbagai Konsentrasi Malam Lebah. *J. Tek. Ind. Pert*. 14(3), 95–100

Subramanian, S., Ross, N.W., Kinnon, S.L.M. 2008. Comparison of antimicrobial activity in the epidermal mucus extracts of fish. *Comp. Biochem. Physiol. Part B.* 150, 85–92.

Tranggono, R.I., Latifah, F. 2007. Buku Pegangan Ilmu Pengetahuan Kosmetik. Jakarta: Gramedia Pustaka.

Zakaria, N.K.C. 2015. Pengaruh Ekstrak Ikan Gabus (Channa striata) terhadap Penyembuhan Luka Pasca Operasi Bedah Laparatomi Kucing (Felis domestica). *Jurnal Pustaka Kesehatan*, 3(2), 195–198.