
Literature Study of Formulating and Testing Physical Properties of Hand Sanitizer Preparations of Various Plant Extracts

Susi Yanti¹, Cory Linda Putri^{2*}

¹ Bachelor of Pharmacy Study Program, Health Study Program, Aufa Royhan University In Padangsidempuan City

² Bachelor of Pharmacy Study Program, Health Study Program, Aufa Royhan University In Padangsidempuan City

Corresponding Author: cory.hrp20@gmail.com

ARTICLE INFO

Received: 29 Nov 2021

Accepted: 13 Jan 2022

Volume: 2

Issue: 1

Doi: 10.56338/jphp.v2i1.3730

KEYWORDS

Gel; Hand Sanitizer;
Formulation; Physical
Properties Test

ABSTRACT

Hand sanitizers are widely used for practical reasons when there is no water. Hand sanitizer is easy to carry and can be used quickly without the use of water. According to the US FDA (Food and Drug Administration) the advantages of hand sanitizers are that they are able to kill germs in a relatively fast time. The use of antiseptic gels that contain alcohol can cause irritation so it is not safe to be used again, it is necessary to use antiseptics made from nature or containing natural ingredients that are safe when applied to the surface of the hands repeatedly. The purpose of this literature study is to determine the formulation of hand sanitizer gel and test the physical properties of various plant extracts based on a literature study. The method used in this research is a study of literature from 6 journals, both national journals indexed by sinta 1-4 and international journals indexed by Scopus related to the title of the proposed research, namely the study of the formulation literature and testing the physical properties of hand sanitizer gel preparations from oil Nutmeg Essentials, Noni leaf extract, Trembesi leaf extract, Bay leaf extract, Cucumber extract, Papaya leaf extract. In the study of making hand sanitizers from various extracts, it can be concluded that the hand sanitizer gel that was formulated met all the requirements for evaluating the physical properties of the gel which included organoleptic, homogeneity, and pH tests, while for dispersion and adhesion there were those that did not meet the standards.

INTRODUCTION

Health is an aspect that is very important for life, one way to maintain a healthy body is by maintaining hand hygiene. According to the Indonesian Ministry of Health (2011), a disease that often arises due to lack of hand hygiene is diarrhea. A clean and healthy life is the desire of every human being. All activities carried out by humans in this world depend on cleanliness and health. In maintaining the health condition of the body, one way to maintain hand hygiene is very important. Hands are often contaminated directly with microbes in daily activities, so hands can be an intermediary for the entry of microbes into the body. One of the easiest and most common ways to keep your hands clean is to wash your hands with soap. Hand hygiene is one of the important principles in the implementation of prevention, control and reduction of health problems caused by bacterial infections (1).

According to the World Health Organization (WHO) and the Chairperson of the Indonesian Infection Control Nurses Association, hands are one of the ways in which germs enter the body. Keeping hands clean is one of the first defenses to maintain health. Data from the World Health Organization (WHO) shows that hands contain 39,000-460,000 CFU/cm² of bacteria that have a high potential to cause infectious diseases and contribute to 3.5% of total deaths in Indonesia. The most appropriate prevention of the spread of bacteria, viruses and fungi is by washing hands with soap and running water (2). The practice of washing hands with soap and water is one of the hand hygiene programs to reduce the risk of infection. In everyday life, the habit and maintaining adherence to the practice of washing hands with soap is very difficult to overcome, especially for people who have solid

activities. Based on these problems, many alternatives to hand washing using antiseptic hand sanitizers have been developed, known as hand sanitizers (3).

Hand sanitizer is a gel with various ingredients that quickly kill microorganisms on the skin of the hands. Hand sanitizers are widely used for practical reasons when there is no water. Hand sanitizer is easy to carry and can be used quickly without the use of water. According to the US FDA (Food and Drug Administration) the advantages of hand sanitizers are that they are able to kill germs in a relatively fast time (Permatasari, 2014) Hand sanitizer preparations containing antiseptics are now commonly used by people who care about health, as a way out to maintain health and hand hygiene that is practical and easy to carry (4). Hand antiseptic aims to remove dirt and flora on the hands (5).

The use of hand antiseptics (hand sanitizer) in the form of gel preparations has become a lifestyle among the middle and upper class people. Gel is a semi-solid preparation (soft mass) consisting of a suspension made of small inorganic particles or large organic molecules, penetrated in a liquid, has thixotropic properties, that is, it becomes a liquid when shaken and solidifies again when allowed to cool (6).

Hand sanitizer preparations are easy to get in the market, hand sanitizer gels on the market contain a lot of alcohol compounds as antiseptics to be able to kill bacteria. How to use it is easy, namely by dripping on the palm of the hand, then flattening it on the entire surface of the hand without the need to rinse with water, the use of antiseptic gel containing alcohol can cause irritation so it is not safe to be used repeatedly (7). Therefore, we need antiseptics made from nature or containing natural ingredients that are safe. When applied to the surface of the hand repeatedly. The trend back to nature makes people return to using natural materials as a way to maintain their health. Public awareness of the use of natural materials is better than synthetic materials is increasing. One proof of this growing trend is the large number of topical products made from active plants for health care (7).

Based on the description above, researchers are interested in conducting a literature study on formulations and testing the physical properties of hand sanitizer gel preparations from from oil Nutmeg Essentials, Noni leaf extract, Trembesi leaf extract, Bay leaf extract, Cucumber extract, Papaya leaf extract.

METHODOLOGY

Research design

The research to be carried out is a qualitative research type, namely research with a description method that begins with collecting, analyzing and interpreting data and facts, data obtained from the literature.

Object of research

NO	Research Title	Researcher
1	Preparation of Gel Hand Sanitizer Nutmeg Essential Oil (<i>Myristica fragrans</i> Houtt.) : Physical Stability Test and Antibacterial Activity Test Against <i>Staphylococcus aureus</i>	Nurlina Octavia (2016)
2	Noni Leaf Ethanol Extract Preparation Gel Hand Sanitizer Formulation (<i>Morinda citrifolia</i> L.)	Yohana Sinambela (2018)
3	Hand Sanitizer Trembesi Leaf Extract (<i>Albizia saman</i> (Jacq.) Merr) Grape Aroma As Antiseptic	Nur Aini Ayu Meiliawati, at all (2018)
4	Formulation and Test of Physical Properties of Hand Sanitizer Gel From Bay Leaf Extract (<i>Syzygium polyanthum</i>)	Yusrinie Wasiaturrahmah and Raudhatul Jannah (2018)
5	Formulation and Stability Test of Gel Hand Sanitizer Ethanol Extract Cucumber (<i>Cucumis Sativus</i> L.) Extract	Hanik Endah Paramita, at all (2021)
6	Effect of Variations in HPMC Concentration on Physical Properties of Gel Hand Sanitizer Papaya Leaf Extract (<i>Carica papaya</i> L.)	Mikhania Christiningtyas Eryani, at all (2021)

Work procedures

Searching for literature by searching publications using the Google Scholar database based on the PICOT (Problem - Intervention/Exposure - Comparison - Outcome - Time) search technique. The implementation of the PICOT technique uses the keywords (Hand Sanitizer Preparation Formulation) or (Extract Hand Sanitizer Preparation Formulation). After Googling, 6 appropriate journals were obtained. Then the results of each study were compared, Organoleptic Test, Homogeneity Test, pH Test, Spreadability and Adhesion Test.

RESULTS AND DISCUSSION

Organoleptic Test

Tabel 1. Organoleptic Test

Initials	Formulation	RESULTS		
		Form	Smell	Color
F1	Essential Oil Gel noni leaf extract	Semi Solid	Typical Pala	yellowish
F2	noni leaf extract	Semi Solid	Distinctive scent perfume	Dark chocolate
F3	extract trembesi leaf	Semi Solid	The distinctive aroma of trembesi leaf extract with the aroma of grapes	Dark green black
F4	bay leaf extract	Semi Solid	The Typical Smell of Salam Leaves	Greenish Brown
F5	Cucumber Extract	Semi Solid	Special extract	Dark green
F6	leaf pawpaw extract	Semi Solid	Bau pepaya menyengat	Hijau tua

The results of the organoleptic test include shape, color and smell, each researcher can see in Table 1. All researchers make hand sanitizer in gel form but have different viscosities, while the color of the gel is influenced from the extracts used by researchers, such as exact leaves from the leaves. generally green to brown in color. While the smell is also in accordance with the typical smell of the extracts used, except for F2 and F3 which add perfume.

Homogeneity Test

Table 2. The results of the homogeneity test of hand sanitizer gel

Initials	Formulation	Homogeneity
F1	Essential Oil Gel	Homogeneous
F2	Noni leaf extract	Homogeneous
F3	Extract trembesi leaf	Homogeneous
F4	Bay leaf extract	Homogeneous
F5	Cucumber Extract	Homogeneous
F6	Leaf pawpaw extract	Homogeneous

Homogeneity test to determine that the active substance is evenly distributed in the preparation and there are no lumps of particles. The results of the homogeneity test from 6 research journals showed uniform data, namely homogeneous, there were no coarse grains in the gel preparation, fulfilling the requirements.

pH Test

Table 3. pH test results for hand sanitizer gel

Inisial	Formulation	pH
F1	Essential Oil Gel	6
F2	Noni leaf extract	5,7
F3	Extract trembesi leaf	5
F4	Bay leaf extract	6-7
F5	Cucumber Extract	4,4 – 5,6
F6	Leaf pawpaw extract	5,4 – 5,8

The pH test of the preparation is carried out to see the safety of the preparation when used on the skin, namely by equating the pH of the preparation with the pH of the skin. The pH of human skin ranges from 4.5 to 6.5 (8). The pH test results illustrate that hand sanitizer gel preparations are safe to use because they are still in accordance with the pH of human skin.

Spreadability Test

Table 4. Results of the Spreadability Test for hand sanitizer gel

Inisial	Formulation	Spreadability
F1	Essential Oil Gel	4,3 cm
F2	Noni leaf extract	-
F3	Extract trembesi leaf	-
F4	Bay leaf extract	5,5 cm
F5	Cucumber Extract	7,7 cm
F6	Leaf pawpaw extract	5,4 cm

The dispersion test of the preparation aims to determine how well the gel preparation spreads on the skin surface, because it can affect drug absorption and the speed of release of the active substance at the site of its use. A preparation is good and preferably when it spreads easily on the skin and is comfortable to use. According to Husnani's 2015 research, preparations that have a lower viscosity (more dilute) produce a larger dispersion diameter because they are easier to flow. According to research by Ningsih et al in 2019, it was stated that the results of the spreadability test of a preparation must also refer to the SNI No. Standard. 06-2588 applicable, good dispersion has a value of 50-70 mm, this value is considered a comfortable and stable semisolid state. Based on the values in the table above, it can be concluded that the dispersive power of the research results meets the standards, except that F2 and F3 do not test the dispersion.

Adhesion Test

Table 5. Results of the stickiness test for hand sanitizer gel distribution

Inisial	Formulasi	Adhesion Test
F1	Essential Oil Gel	0,672
F2	Noni leaf extract	-
F3	Extract trembesi leaf	-

F4	Bay leaf extract	16,3
F5	Cucumber Extract	1,13
F6	Leaf pawpaw extract	-

The adhesion test is used to determine the ability of the gel to adhere to the skin. The longer it takes for the gel to stick, the greater its adhesion to the skin. Based on Table 5 above, only F1 and F5 meet the requirements. The requirement for the adhesive power of the gel preparation is that the preparation should have an adhesive power of not less than 4 seconds (9). Meanwhile, F2, F3, and F4 did not test the adhesion.

CONCLUSION

In the study of making hand sanitizers from various extracts, it can be concluded that the hand sanitizer gel that was formulated met all the requirements for evaluating the physical properties of the gel which included organoleptic, homogeneity, and pH tests, while for dispersion and adhesion there were those that did not meet the standards.

REFERENCES

- Ahmad T, Wani IA, Manzoor N, Ahmed J, Asiri AM. Biosynthesis, structural characterization and antimicrobial activity of gold and silver nanoparticles. *Colloids Surfaces B Biointerfaces*. 2013;107:227–34.
- Walidah I, Supriyanta B, Sujono S. The Killing Power of Hand Sanitizer with 59% Alcohol in Packages After Repeated Use against Total Plate Number (ALT). *J Teknol Lab*. 2014;3(1):7–12.
- Srikartika P, Suharti N, Anas E. Inhibitory Ability of Active Ingredients of Several Trademarks of Hand Sanitizer against the Growth of *Staphylococcus aureus*. *J Kesehat Andalas*. 2016;5(3).
- Athiroh N, Permatasari N, Sargowo D, Widodo MA. Antioxidative and blood pressure-lowering effects of *Scurrula atropurpurea* on deoxycorticosterone acetate–salt hypertensive rats. *Biomarkers genomic Med*. 2014;6(1):32–6.
- Nabel M, Schrey SD, Poorter H, Koller R, Jablonowski ND. Effects of digestate fertilization on *Sida hermaphrodita*: Boosting biomass yields on marginal soils by increasing soil fertility. *Biomass and Bioenergy*. 2017;107:207–13.
- ANDRIANI D. Prescribing Profile for Concocted Capsules at One Pharmacy Surabaya. UNIVERSITAS AIRLANGGA; 2015.
- Wasiaturrahmah Y, Jannah R. Formulation and Test of Physical Properties of Hand Sanitizer Gel from Bay Leaf Extract (*Syzygium polyanthum*). *Borneo J Pharmascientech*. 2018;2(2).
- Ali A, Javaid A, Shoaib A, Khan IH. Effect of soil amendment with *Chenopodium album* dry biomass and two *Trichoderma* species on growth of chickpea var. Noor 2009 in *Sclerotium rolfsii* contaminated soil. *Egypt J Biol Pest Control*. 2020;30(1):1–9.
- Docherty KM, Borton HM, Espinosa N, Gebhardt M, Gil-Loaiza J, Gutknecht JLM, et al. Key edaphic properties largely explain temporal and geographic variation in soil microbial communities across four biomes. *PLoS One*. 2015;10(11):e0135352.