Phytochemical Screening And Formulation Of Hand Sanitizer Gel Preparations From Temu Hitam Rhizome Extract (*Curcuma Aeruginosa* Roxb)

Rika Puspita Sari[1*], Zola Efa Harnis[2], Nina Irmayanti Harahap[3]

[1,2,3] Department of Pharmacy, Faculty of Pharmacy, Institut Kesehatan Deli Husada Deli Tua
*Corresponding Author:
Email: rikapuspitatambunan@gmail.com

Abstract
*Temu Hitam (*Curcuma aeruginosa *Roxb) is one of the most widely grown plants in Indonesia at an altitude of 400–750 m asl and contains many secondary metabolites, including flavonoids, alkaloids, saponins, tannins, and curcuminoids, which in the test had antibacterial activity and growth inhibitors. worm larvae in the gastrointestinal tract and the effect of increasing the body's immunity The purpose of this study was to identify the content of secondary metabolites contained in the rhizome of black turmeric, which would then be formulated into gel hand sanitizer preparations. Secondary metabolite testing was conducted on alkaloids, flavonoids, saponins, tannins, steroids/triterpenoids, and glycosides. Three different hand sanitizer gel formulations were created using different extract concentrations, 5%, 10%, and 15%. Evaluation tests were then run on the preparations, including stability, organoleptic, homogeneity, pH, and dispersion tests. Alkaloids, flavonoids, tannins, saponins, and steroids were found in the temu hitam rhizome, according to the results of secondary metabolite testing. The dosage form was semi-solid, had a light brown to blackish brown hue, a distinct spice scent, was homogeneously prepared, and had a pH of 7.0, according to the examination of the formulation results 4,1 ± 0,17; 4,4 ± 0,19; 4,9 ± 0,08; 4,9 ± 0,09, viscosity 2378 ± 209,9; 3340 ± 220,7; 4509 ± 285,6; 4881 ± 276,7; and spreadability test 5; 6,2; 5,4; 4,9 cm . The conclusion of this study is that the results of the phytochemical screening of simplicia and the ethanolic extract of the Temu Hitam rhizome showed positive results, containing secondary metabolites of alkaloids, flavonoids, tannins, saponins, glycosides, and steroids/triterpenoids that can be formulated into hand sanitizer gel preparations that meet the requirements for preparation evaluation.*

Keywords: *Temu hitam rhizome, gel, handsanitizer and gel evaluation.*

I. INTRODUCTION

The increasing number of cases of COVID-19 (Corona Virus Disease) since 2019 has made this problem a global health problem. There are about 3.8 million cases reported of the occurrence of this disease, which affects more than 200 countries and continues to increase cases as more and more patients become infected with this virus. COVID-19 is an infectious disease caused by the SARS-CoV-2 virus that attacks the respiratory system. Recent studies reveal that transmission of SARS-CoV-2 is possible in aerosol and fomite form, and the virus can remain viable and infectious in aerosols for hours and on surfaces for days, depending on the inoculum warehouse [1], [2]. Prevention of COVID-19 starts with oneself by being able to maintain personal health, change a healthy lifestyle, eat nutritious food, be diligent in exercising, and get enough rest. A simple thing that can be done is to maintain hand hygiene [3]. Hands are one of the transmission media for various diseases [4]. This is because the hands are the part of the body that do the most activity and are the most touched by objects when doing activities that can make viruses, bacteria, or fungi stick to the hands. The thing that can be done to maintain hand hygiene is to diligently wash hands in running water using hand soap, and the easiest thing to do is to use a hand sanitizer with antiseptic content that is able to kill germs on the hands.

The use of hand sanitizer is a preparation that is currently chosen by many people to keep hands hygienic because it is easy to carry everywhere, and how to use it is also not difficult. Just spraying or pouring the preparation into the palm of the hand and rubbing until all the preparation is evenly distributed to the surface of the hand [5], [6].Gel preparations are used by the public because they have good aesthetic value, are transparent, are easy to spread evenly when applied to the skin without pressure, give a cold sensation, do not cause scars on the skin, and are easy to use [7]. Hand sanitizer gel is a hand sanitizer that

contains an active ingredient of 60% alcohol with active ingredients that can use active ingredients derived from nature that have antibacterial activity [8].One of the plants that is efficacious as an antibacterial is the extract of the Temu Hitam rhizome. Temu hitam rhizome (Curcuma aeruginosa Roxb) is one of the rhizome plants that is often used as medicine or herbal medicine. It grows in teak forests or in fields at an altitude of 400–750 m above sea level and is widely sold in traditional markets. This black ginger rhizome contains metabolites, namely flavonoids, alkaloids, saponins, tannins, and curcuminoids, which are antibacterial against Escherichia coli [9]. The benefits of Temu Hitam Rhizome (Curcuma aeruginosa Roxb) can kill larvae and worms in the digestive tract. Tannins and other active compounds are anthelmintics, which can kill or break the life cycle of adult worms, larvae, or worm eggs [10] Based on the above, the researchers are interested in formulating the Temu Hitam Extractas a hand sanitizer preparation because of its high metabolite content as an inhibitor of bacterial growth.

II. METHODS

Methods

The method used for the formulation of this Temu Hitam Extracthand sanitizer preparation is an experimental method. The sample used was the black ginger rhizome, which was taken from several traditional markets in Medan City purposively, without comparing the sample's growing places.

Apparatus

The apparatus used in this study were glassware (beaker glass, measuring cup, stirring rod, Erlenmeyer, watch glass, funnel), a rotary evaporator, an analytical balance, a blender, a hot plate, a water bath, a test tube, a tube rack, a dropper pipette, a pH meter, a handscoon, a mask, a mortar, and a stampler.

Materials

Ethanol extract of Temu Hitam rhizome, Ethanol 96%, Glycerin, Methylparaben, Triethanolamine (TEA), Hydrochloric Acid Reagent (HCL), Ammonia, Chloroform, Magnesium, Carbomer, Propylene Glycol, Methylparaben, Propyl Paraben, Aquadest, Sulfuric Acid (H2SO4), Reagent Mayer, Dragendroof, Bouchardat, $FeCl_3$ 10%.

Preparation of Ethanol Extract of Temu Hitam Rhizome

A total of 1000 grams of black turmeric simplicia was soaked in 96% ethanol in a ratio of 1 part simplicia dissolved in 10 parts solvent for 5 days using 75 parts of the 96% ethanol solvent. Then filtered, remaceration was carried out using 25 parts of 96% ethanol solvent for 2 days, then filtered, concentrated with a rotary evaporator at 40^{o}C [11], [12].

Phytochemical Screening

Phytochemical screening was carried out on simplicia and ethanol extracts of Temu Hitam rhizome, including the examination of alkaloids, glycosides, saponins, flavonoids, tannins, steroids, and triterpenoids [13].

Alkaloid Identification

The simplicia powder was added with 2N HCl and distilled water, heated over a water bath, filtered, and the filtrate was taken three times, each time put in a test tube, and each added to the test tube with Mayer, Dragendroff, and Bouchardat reagents. Alkaloids are said to be positive if there is a precipitate in two of the three reagents [14].

Saponin Identification

The simplicia powder is put in a test tube, hot water is added, shaken vigorously for 10 seconds, and then a good foam is formed for not less than 10 minutes as high as 1-10 cm and does not disappear with the addition of 2N HCl [15].

Tannin Identification

The simplicia powder was macerated with distilled water for 15 minutes, then filtered. The filtrate was diluted until it was colorless, and 2 drops of a 10% FeCl3 solution were taken. It was said to be positive for tannin if there were blue and green colors in the filtrate [16].

Flavonoid Identification

The simplicia powder was macerated with distilled water for 15 minutes, then filtered. The filtrate was diluted until it was colorless, and 2 drops of a 10% FeCl3 solution were taken. It was said to be positive for tannin if there were blue and green colors in the filtrate [17].

Steroid/triterpenoid Identification

Simplicia powder was macerated with N-Hexane solution and filtered. The filtrate was evaporated, and the remainder was added with Liebermann-Burchad reagent through the cup wall. It is said to be positive for triterpenoids or steroids if a red color is formed, which changes to a blue-green color [18], [19].

Glicoside Identification

The simplicia powder was dissolved in ethanol solvent, evaporated in anhydrous acetic acid, and then slowly added a little concentrated H2SO4 through the wall of the test tube. It is said to be positive for glycosides if a blue or green color is formed in the filtrate [20].

Formulation of Hand Sanitizer Gel Preparation of Temu Hitam Extract

The formulation of the Temu Hitam rhizome hand sanitizer gel preparation can be seen in Table 1 below.

Table 1. Handsanitizer Gel Formulation of Temu Hitam Extract

Bahan	Formula			
	F1	F2	F3	F4
Temu Hitam Extract	-	5	10	15
Carbomer 940	0,5	0,5	0,5	0,5
Propilenglikol	15	15	15	15
TEA	1	1	1	1
Metyl paraben	0,2	0,2	0,2	0,2
Propyl Paraben	0,1	0,1	0,1	0,1
Aquades ad	100	100	100	100

Where:

F1: Formulation without the content of Temu Hitam rhizome extract

F2: Formula with 5% temu hitam rhizome extract

F3: Formula with 10% temu hitam rhizome extract

F4: Formula with 15% temu hitam rhizome extract

Formula was made in three formulations with varying concentrations of Carbomer 940 rhizome extract sprinkled on a mortar, added with hot water, and stirred rapidly in a mortar to avoid agglomerates until a gel mass was formed, then neutralized with the addition of TEA as a base [21]. Methyl paraben and propyl paraben were each dissolved in distilled water. Propylene glycol was added to the mortar and stirred until homogeneous. Furthermore, the extract of temu hitam rhizome was dissolved in distilled water and stirred until dissolved. The soluble temu hitam rhizome extract is put into a mortar and ground homogeneously until a gel is formed [22], [23].

Evaluation of Gel Handsanitizer Extract of Temu Hitam Rhizome Extract

The preparation of the Gel Handsanitizer Extract of Temu Hitam Rhizome that has been formulated was tested for preparation evaluation.

Organoleptic Test

Organoleptic testing is a test carried out to see the shape, color, and smell of the preparation visually [21]

Viscosity Test

A Brookfield viscometer was used to determine the viscosity. The viscosity of the hand sanitizing gel will be determined by measuring 100 mL of the hand sanitizing gel preparation, the ethanol extract of the black ginger rhizome, then changing the spindle and the speed employed and running a viscometer [22].

Homogenity Test

By spreading the sample on a slide, bonding it with a slide or other clear material, and checking to see if the preparation base was smooth and the surface even, the homogeneity test was conducted. There cannot be any visible coarse granules, and the preparation must display a homogenous pattern [7].

pH Test

The pH test was carried out using a pH meter by dipping the tool into the hand sanitizer preparation from the ethanol extract of the temu hitam rhizome [8].

Spreadability Test

The gel preparation was placed on a glass plate and then overwritten with another glass plate for 1 minute, then the diameter of the preparation formed was measured using a caliper [21]

III. RESULT AND DISCUSSION

Extraction Results of Temu Hitam Simplicia Rhizome Powder

Based on the results of the extract of the temu hitam rhizome using a 96% ethanol solution, 5000 mL of extract was produced, then concentrated using a rotary evaporator, then concentrated on a water bath to obtain a thick extract of 72 g.

3.1 Phytochemical Screening of Simplicia Powder and Ethanol Extract of Temu Hitam Rhizome

The results of phytochemical screening of simplicia powder and ethanol extract of temu hitam rhizome were positive for containing secondary metabolites of alkaloids, flavonoids, tannins, saponins and steroids. The results of the phytochemical screening test can be seen in table 2 below.

Table 2. Secondary metabolite compounds found in simplicia and ethanol extract of temu hitam rhizome

Secondary Metabolites	Simplisia	Ekstrak
Alkaloid	+	+
Flavanoid	+	+
Glikosida	+	+
Saponin	+	+
Tannin	+	+
Steroid / Triterpenoid	+	+

Note: (+) Positive Result

The production of white deposits in Meyer's reagent and reddish brown deposits in Wagner's and Dragendorff's reagents served as indicators that the analysis of secondary metabolites produced positive alkaloids [13]. The alkaloids were deemed positive if two or three of the reagents produced findings that were positive. Positive results from an experiment utilizing $FeCl_3$ on simplicia and an ethanol extract of temu hitam rhizomes included color alterations to intense green, red, purple, and black hues [24]. This shows that tannin components were present in both the simplicia and the ethanol extract of the Temu Hitam rhizome.

The simplicia and ethanol extracts of the black walnut demonstrated stable foam formation when saponins were examined by shaking with hot water and adding 2N HCl [25].Both were determined to contain flavonoids after a flavonoid test revealed positive results and a noticeable shift in color, specifically a reddish-black hue [26]. When the Lieberman-Bouchard reagent was used, the reaction produced a red-purple color (signifying a positive triterpenoid), as opposed to when it did not [27]. Both had successful outcomes with triterpenoids and steroids. All secondary metabolites found in plants each have specific roles to play and advantages to offer, making them all excellent candidates for use in herbal and natural remedies with minimal side effects.

3.2 Preparation of Hand Sanitizer Preparation Black Intersection Extract

The preparation of hand sanitizer ethanol extract of Temu Hitam rhizome was made in 3 concentrations with different amounts of extract added and 1 formula without the addition of extract as a negative control. The formula for hand sanitizer preparation is: F1 (0%); F2 (5%); F3 (10%); and F4 (15%), each prepared with a weight of 100 mL. The resulting preparation is in the form of a gel due to the addition of carbomer 940 as a gelling agent, the addition of TEA as a pH stabilizer, the addition of glycerin as an emollient or softener, maintaining moisture on the skin, and using methyl paraben and propyl paraben as preservatives in the preparation so that the preparation can be stored longer [28], [29].

3.3 Evaluation of Hand Sanitizer Preparation of Intersection Black Extract

Organoleptis

Organoleptic testing was carried out to see how the smell, taste and dosage form differed based on differences in concentration. The results of organoleptic testing of hand sanitizer gel preparations can be seen in Table 3 below.

Tabel 3. Organoleptic testing for hand sanitizer preparations of Temu Hitam extract

Formula	Organoleptic Testing		
	Shape	Color	Smell
F1 (Negative Control)	Semi Solid	Translucent	Odorless
F2 (5%)	Semi Solid	Light Brown	Spice Smell
F3 (10%)	Semi Solid	Dark Brown	Spice Smell
F4 (15%)	Semi Solid	Dark Brown	Spice Smell

From the table above, it can be seen that there is an effect of differences in the concentration of the added extract on the color and odor produced in the preparation. The higher the concentration of the added extract, the more concentrated the color of the gel preparation produced [30]. The resulting sample has a herbal and spicy smell due to the addition of temu hitam rhizome extract, and the higher the concentration added, the more concentrated the odor produced [31].

Viscosity

The results of the viscosity test of the temu hitam rhizome ethanol extract gel can be seen in Table 4 below and the decrease in the viscosity of the preparation during storage can be seen in Figure 1. Measurements were carried out for 28 days and were measured every week.

Table 4. Testing the viscosity of the Temu Hitam Extract hand sanitizer preparation

Formula	Viscosity Test				Average viscosity
	Week 1	Week 2	Week 3	Week 4	
F1 (Negative Control)	2589	2476	2350	2100	2378 ± 209,9
F2 (5%)	3587	3455	3220	3100	3340 ± 220,7
F3 (10%)	4869	4567	4412	4189	4509 ± 285,6
F4 (15%)	5151	4989	4887	4500	4881 ± 276,7

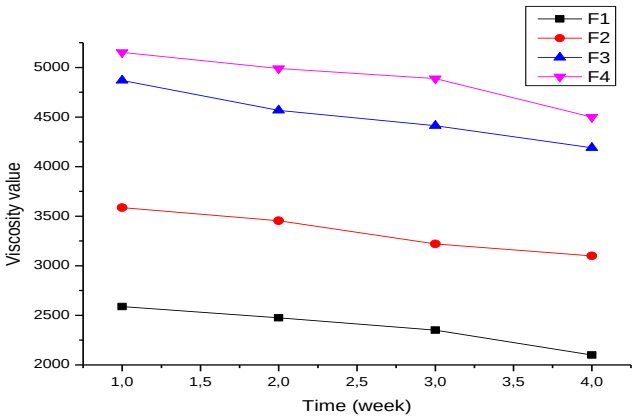

Fig 1. Viscosity testing every week of measurement

Table 4 shows the results of testing the gel viscosity of the temu hitam rhizome ethanol extract preparation where the formulations F1, F2, F3, and F4 meet the gel viscosity requirements. The viscosity value of a good gel preparation, according to SNI, is 5000–10,000 cps [8]. Viscosity results are influenced by the administration of the extract. The more extract added, the thicker the preparation or the higher the viscosity value. The administration of carbopol in the preparation also provides a viscosity response for the preparation because carbopol provides an ionization process in the gel preparation to form hydrogen bonds in the carboxyl group so that there is an increase in the viscosity of the gel preparation [32].

Homogenity

The results of the homogeneity test of the ethanol extract of the Temu Hitam rhizome extract from each formula can be seen in Table 5 below

Table 5. Testing the homogeneity of the Temu Hitam Extract hand sanitizer preparation

Formula	Homogeneity
F1 (Negative Control)	Homogeneous
F2 (5%)	Homogeneous
F3 (10%)	Homogeneous
F4 (15%)	Homogeneous

Homogeneity testing was carried out to see the homogeneity of the gel that had been made. Tests carried out by means of a gel smeared on a glass object The gel is said to be homogeneous if there is no visible coarse grain on the glass layer [33].

pH

The results of pH testing of each formula can be seen in Table 6 below and the results of pH measurements were carried out for 4 weeks, and the results of measurements for 4 weeks can be seen in Figure 2 below.

Table 6. Testing the pH of the Temu Hitam extract hand sanitizer preparation

Formula	pH Testing				Average pH
	Week 1	Week 2	Week 3	Week 4	
F1 (Negative Control)	4,0	4,1	4,2	4,4	4,1 ± 0,17
F2 (5%)	4,2	4,4	4,6	4,6	4,4 ± 0,19
F3 (10%)	4,8	4,9	4,9	5,0	4,9 ± 0,08
F4 (15%)	4,8	4,9	5,0	5,0	4,9 ± 0,09

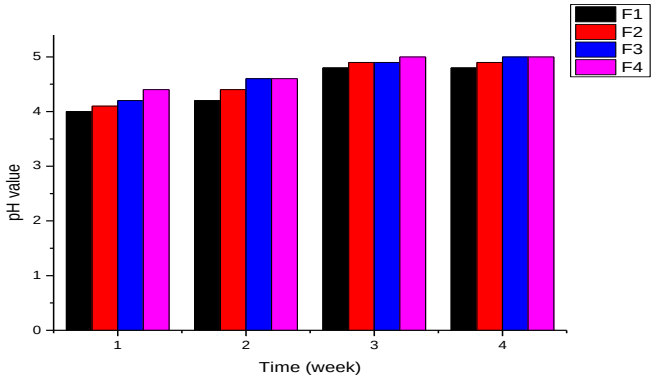

Fig 2. Graph of the pH of the preparation for 4 weeks of storage

The pH test was carried out to find out whether the hand sanitizer gel preparation made from the ethanol extract of the rhizome of black turmeric was safe to use or not. The pH of the preparation greatly affects whether the formulation that is formulated is able to irritate the user or not. The results of the formulations showed that the pH of each formula was in the range of 4-5 [34]. Based on SNI No. 06-2588, it is written that a good pH value for preparations used on the skin is in the range of 4.5–6.5. The condition of the preparation that is too acidic will cause the skin to become irritated, red, and itchy, while the preparation that is too alkaline will cause the user's skin to become scaly [35].

Spreadability

The results of testing the dispersive power of the ethanol extract of the temu Hitam rhizome extract from each formula can be seen in Table 7 below.

Tabel 7. Testing the spreadability of the Temu Hitam Extracthand sanitizer preparation

Formula	Daya Sebar Sediaan (cm)
F1 (Negative Control)	5
F2 (5%)	6,2
F3 (10%)	5,4
F4 (15%)	4,9

The spreadability test was carried out to determine the ability of the gel to spread when used on the skin. The dispersion test is strongly influenced by the viscosity of the preparation. The lower the viscosity,

the wider the spreadability of the preparation. From the test, it can be seen that the results of the measurement of the dispersion power of the ethanol extract of the temu Hitam rhizome extract were said to be still within the permitted size. Based on the SNI value, the permissible dispersion measurement value for gel preparations is between 5-7 cm [36].

IV. RESULT

The results of the phytochemical screening of simplicia and the ethanolic extract of the temu hitam rhizome showed positive results containing secondary metabolites of alkaloids, flavonoids, tannins, saponins, glycosides, steroids/triterpenoids which can be formulated into hand sanitizer gel preparations that meet the requirements for the evaluation of the preparation.

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