PAPER • OPEN ACCESS

Utilization of moringa oleifera leaves for making hand sanitizers to prevent the spread of COVID-19 virus

To cite this article: F Arifan et al 2021 IOP Conf. Ser.: Earth Environ. Sci. 623 012015

View the article online for updates and enhancements.

IOP Conf. Series: Earth and Environmental Science 623 (2021) 012015 doi:10.1088/1755-1315/623/1/012015

Utilization of moringa oleifera leaves for making hand sanitizers to prevent the spread of COVID-19 virus

F Arifan^{1*}, R W Broto¹, E F Sapatra¹, A Pujiastuti¹

¹ Department of Industrial Technology, Universitas Diponegoro, Semarang, Indonesia

fahmiarifan@live.undip.ac.id

Abstract. Nowadays, the presence of Covid-19 in Indonesia is so terrible. But in truth, this virus can be prevented by maintaining personal hygiene. One of the simplest ways to maintain personal hygiene is to wash your hands and use hand sanitizers as a practical measure if there is no time to wash hands or limited water in certain places. Moringa leaves contain natural antiseptic ingredients, such as polyphenols. Antiseptic material can be processed into natural hand sanitizers. The results of various tests such as organoleptic, viscosity, scattering, and antibacterial test, shown that the percolation extraction method could produce an extract of hand sanitizers. It can be processed into hand sanitizers which comply with hand sanitizer quality standards. Moringa leaf extract hand sanitizer has many antibacterial components, namely saponins, triterpenoids, and tannins. The best result shows 24 minutes of the percolator, with heating temperature 40°C and stirring time 45 minutes. The results obtained a viscosity of 2120 Cps, 4,79 cm of scattering test, and the average diameter of inhibition zones of 23,33 mm and fulfill the required standard.

1. Introduction

Coronavirus (Covid-19) is a giant enveloped RNA virus. Coronavirus is a virus that generally attacks humans and animals consciously or unconsciously. In humans, the coronavirus usually attacks the respiratory tract and causes upper respiratory tract infections ranging from mild respiratory infections to moderate respiratory diseases [1]. Coronavirus can be prevented by strengthening our body's immune system and maintaining personal hygiene [2]. One way is to wash your hands frequently to keep them away from bacteria and viruses. But if you don't have time to wash your hands, you can use a hand sanitizer that is easier to carry around [3].

Moringa plant is one of the many plants that grow in Indonesia Moringa plants have many benefits ranging from leaves, flowers, stems, fruits, and seeds [4]. Every part of it has been put to fair use by the community. One element that is widely used is the leaves. Moringa leaves are efficacious as antidiabetic, nourish hair, treat rheumatism, treat herpes, treat internal medicine (stomach ulcers, intestinal injuries, and kidney stones), and treat cancer. Moringa leaves have medicinal properties that need further study, especially their antioxidants' ability because they contain polyphenols, flavonoids, and ascorbic acid. Antioxidants are substances that can inhibit the chain reaction of atoms or atomic groups of a radical compound [5].

Content from this work may be used under the terms of the Creative Commons Attribution 3.0 licence. Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI. Published under licence by IOP Publishing Ltd 1

IOP Conf. Series: Earth and Environmental Science 623 (2021) 012015 doi:10.1088/1755-1315/623/1/012015

Antioxidants can inhibit the chain reaction of atoms or atomic groups from an intense composition. The equation of the free extreme inhibition reaction by antioxidants can be seen in figure 1 below.



Figure 1. Antioxidant free radical inhibition reaction.

Other benefits of Moringa leaves can improve the nutritional status of malnourished children. Research conducted shows that Moringa leaves can overcome malnutrition in various countries by adding it to children's daily food [6]. Moringa leaves are not much treated as functional food [7]. Therefore, there needs to be innovation in processing Moringa leaves into an acceptable product and beneficial to the community. In this research, Moringa leaves will be processed into non-food products, namely hand sanitizers, useful for Coronavirus prevention.

Extracts are concentrated preparations of plants or animals obtained by releasing active substances from each medicinal ingredient, using a suitable menstruum, vaporizing all or almost all of the solvent, and the remaining sediment or powder is regulated to set standards [8]. The primary methods of drug extraction are maceration and percolation. Usually, the extraction method is chosen based on several factors such as the nature of the drug's raw material and its adaptability to each type of extraction method, and its importance in obtaining a perfect or near-perfect extract from the drug. Thus, percolation is an escape by flowing the search fluid through a simplicia powder that has been moistened [9].

2. Methodology

2.1 Equipment

The primary tool used in this research is a percolator. The percolator circuit in figure 2 consists of a funnel equipped with inlet-outlet tubing. Other tools needed are a basin, mixer, stove, thermometer. While the tools that will be used for making hand sanitizers are heating vessels and mixers. Then a tool for testing the physical properties of the hand sanitizer using Ostwald viscosimeter and round-scale glass.

Figure 2. Percolator extractor for extraction of Moringa leaves.

IOP Conf. Series: Earth and Environmental Science 623 (2021) 012015 doi:10.1088/1755-1315/623/1/012015

2.2 Materials and variables

Fixed variables are Implisia powder (100 grams), aqua dest (1750 ml), carbopol (5 grams), TEA (5 grams), PG (100 ml), PEG (150 ml), glycerol (50 ml), alcohol (2 liters), moringa leaf extract (1,5 liter), and Staphylococcus aureus bacteria. While, independent variables are time in percolator (12 hour, 24 hour, and 48 hour), Heating Temperature (40 °C, 50 °C, and 60 °C), and stirring time (15 minutes, 30 minutes, and 45 minutes).

2.3 Experimental stage

2.3.1 Moringa leaf extraction procedure with the percolation method. First of all, we need to round the moringa leaves until they are powder. And then prepared percolator, and soaked with 100 grams of Simplicia powder (moringa leaves) with 2,5-5 parts. Next, put in a closed vessel for at least 3 hours. The mass will move little by little into the percolator while being carefully pressed each time. The pouring liquid is sufficiently poured until the liquid starts to drip, and on the top of simplicia, there is still a layer of the liquid. Then, closed percolator and left for 24 and 48 hours until the juice is dripping at 1 mL per minute. We added enough to find the liquid until there is always a layer of liquid on the simplicia. Then squeezed, mixed with liquid juice into the percolate, adding liquid until the desired volume is obtained. Then transferred into a vessel, closed, left for several hours in a cool place, protected from light. After the precipitate is formed, it is filtered and then evaporated percolates on a water bath until thick Moringa leaf extract.

2.3.2 Making hand sanitizer from Moringa leaf extract.



Figure 3. Scheme for making hand sanitizer from Moringa leaf extract.

IOP Publishing

3. Results and discussion

3.1 Organoleptic test

Organoleptic tests are carried out using the human senses, including shape, color, and aroma. Based on observational data, the nature of the gel preparation is thick semi-solid with a bright green color that matches Moringa leaf extract; the smell obtained is the distinctive aroma of Moringa leaf.

3.2 Scattering test

The scatter power test is carried out on 27 existing samples with the same treatment that is taken. An example is weighing 1 gram, then measuring the distribution diameter, and then placing another round glass and ballast with a total mass of 125 grams for 1 minute. The aim is to determine the amount of force required by the gel to spread to human skin or determine the ability to extend the gel preparation when applied to the skin.

Sample	Duration of	Heating Temperature (°C)	Stirring time (minutes)	Scattering Test (cm) Treatment	
	Percolation (minutes)				
				Before	After
1	12	40	15	4,5	4,74
2	12	40	30	4,5	4,74
3	12	40	45	4,51	4,78
4	12	50	15	4,5	4,78
5	12	50	30	4,5	4,78
6	12	50	45	4,5	4,78
7	12	60	15	4,515	4,78
8	12	60	30	4,5	4,78
9	12	60	45	4,52	4,8
10	24	40	15	4,5	4,78
11	24	40	30	4,52	4,8
12	24	40	45	4,51	4,79
13	24	50	15	4,5	4,78
14	24	50	30	4,51	4,79
15	24	50	45	4,51	4,79
16	24	60	15	4,515	4,78
17	24	60	30	4,52	4,8
18	24	60	45	4,52	4,8
19	48	40	15	4,52	4,8
20	48	40	30	4,5	4,78
21	48	40	45	4,5	4,78
22	48	50	15	4,5	4,78
23	48	50	30	4,51	4.79
24	48	50	45	4,51	4,79
25	48	60	15	4,51	4,79
26	48	60	30	4,51	4,78
27	48	60	45	4,51	4,79

 Table 1. Results of the scattering test.

IOP Conf. Series: Earth and Environmental Science 623 (2021) 012015 doi:10.1088/1755-1315/623/1/012015

According to Syaiful (2016), the proper semi-solid preparation for topical use is 3 cm-5 cm [10]. The tests that have been carried out obtained data still within the range of the scatter power parameters so that all preparations can be said to be stable.



(Sample)

Figure 4. Results of the antibacterial test.

The test results also showed that the activity of Moringa leaf extract on the growth of Staphylococcus aureus bacteria showed different values, so there was a difference in the effect of the test bacteria's treatment. From table 4 it appears that 27 samples have antibacterial power ranging from moderate to loud. The largest average diameter was obtained in the condition of percolation time at minute 24, with a temperature of 50 °C and with a long stirring time of 45 minutes that is equal to 23,33 mm. In comparison, the smallest average diameter is in the percolation time in the 12nd minute, with a temperature of 40 °C and a long stirring time of 15 minutes, which is equal to 13,33 mm. The activity of Moringa leaf extract on the growth of Staphylococcus aureus bacteria showed a significant value from the optimum conditions. So it can also be seen that the section with the highest yield is obtained in these conditions. If the temperature and extraction time that is too long and exceeds the optimum limit will cause the loss of compounds that cannot stand the heat due to oxidation [12].

In the graph, it can be seen that Moringa leaf extract is shown to have antibacterial activity against Staphylococcus aureus. It can be seen from the formation of inhibition zones. As has been done in previous studies said that chemical compounds contained such as secondary metabolites such as flavonoids, alkaloids, phenols, which can also inhibit bacterial activity [13]. Saponin compounds, including glycoside groups found in various types of plants that function to store carbohydrates and as a protector from pests, with a mechanism to reduce the surface tension of the bacterial cell wall, resulting in increased permeability of cell leakage and cause intracellular compounds will come out [14].

Flavonoids function as antioxidants that can maintain body cell oxidation. Flavonoids are also phenol compounds which have a conjugated aromatic system [15]. Conjugated aromatic structures are easily damaged at high temperatures. Also, some groups of flavonoids have glycoside bonds with sugar molecules. Glycoside bonds will break easily or break at high temperatures. Flavonoids damage the permeability of bacterial cell walls, microsomes, and lysosomes due to their interactions with bacterial DNA. Alkaloids are the largest group of secondary plant substances that have the ability to an antibacterial. The mechanism is

by disturbing the constituent components of peptidoglycan in bacterial cells so that the cell wall layer is not formed intact and causes these cells' death.

4. Conclusion

From various tests, namely organoleptic, viscosity, and dispersal power, the percolation extraction method can produce hand sanitizer extracts. It can be processed into hand sanitizers following with hand sanitizer quality standards. And Moringa leaf extract hand sanitizer is handy in killing bacteria and other microbes because it has antibacterial components, namely flavonoids, saponins, triterpenoids, and relatively high tannins. The optimal conditions obtained are percolator time 24 minutes, heating temperature 40 °C, and stirring time 45 minutes. From these results obtained an average diameter of inhibition zones of 23,33 mm. So the hand sanitizer from Moringa Oleifera extract can be used to prevent the spread of the Covid-19 virus.

References

- Jombart T, Cori A and Nouvellet P 2020 Estimation of Transmissibility in the Early Stages of a [1] Disease Outbreak (Available from: https://CRAN.R-project.org/package=earlyR)
- Li Q, Guan X H, Wu P, Wang X Y, Zhou L, Tong Y Q, et al. 2020 N Engl J Med [2]
- Kurniawan D W and Wijayanto B A 2012 Asian Journal of pharmaceutical and Biological research [3] (24)
- [4] Isnan W and M N 2017 Balai Litbang Lingkungan Hidup Dan Kehutanan Makassar 14(1) 63-75
- [5] Srikanth V S, Mangala S and Subrahmanyam G 2014 Int. J. Sci. Study 2(1) 32-35
- Thurber M D and Fahey J W 2009 J. Nutr. Ecol. 48(3) 212-225 [6]
- Kasolo J N 2010 Academic Journals 4(9) 753-757 [7]
- [8] Kulip J, Lam N F, Manshoor N, Julius A, Said I M, Gisil J and Tukin W F 2010 J. Trop. Biol. 6 21-33
- Molyneux P 2004 J.Sci. Technol 26(2) 211-219 [9]
- [10] Syaiful S D 2016 Rev Bras Ergon 2 9-10
- Ferdiaz S 1993 Food Microbiology Analysis (Jakarta: Raja Grafindo-Persada) [11]
- Ibrahim A M, Yunita and Feronika H S 2015 J. Food Ag-Ind. 3 (2) 530-541 [12]
- Pandey A, Pandey R D, Tripathi P, Gupta P P, Haider J, Bhatt S and Singh A V 2012 Moringa oleifera [13] Lam. 1(1) pp 1-8
- [14] Robinson T 1995 High Organic Plant Content, VI mold (translation) (Bandung: ITB Publisher) p 367
- [15] Harborne J B 1996 Phytochemical Methods to Guide Modern Ways to Analyze Plants translated by Kosasih Padmawinata and Imam Sudiro (Bandung: ITB) Ed II p 4-7: 69-76