ETHOS
JURNAL PENELITIAN DAN PENGABDIAN KEPADA MASYARAKAT
Editorial Office : ETHOS, Jurnal Penelitian dan Pengabdian Kepada Masyarakat
Jalan Taman Sari No. 20, Bandung, Jawa Barat, 40116, Indonesia.
Phone : (022) 4203368, 4205546 ext. 6737
Email : ethos@unisba.ac.id
Website : https://ejournal.unisba.ac.id/index.php/ethos/index
ISSN : 1693-699X EISSN : 2502-065X

Education on the Production of Fig Leaves Extract Hand Sanitizer in Cilayung Village, Jatinangor

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Article

Article History
Received : 2023/08/05
Reviewed : 2023/12/12
Accepted : 2024/01/24
Published : 2024/01/30

DOI:
doi.org/10.29313/ethos.v12i1.2582

Volume : 12
No. : 1
Month : January
Year : 2024
Pages : 25-30

Abstract

During the COVID-19 pandemic, people are advised to always wash their hands using soap and running water or hand sanitizer. Concerns about dangerous chemicals in hand sanitizers encouraged us to carry out community service in villages close to our campus, namely Cilayung Village, Jatinangor, West Java. In this activity, we used the fig plant, which was proven to have antibacterial activity. This community service aims to use fig leaf extract as an active ingredient in hand sanitizer. The method used is simple technology on a household scale: boiling fig leaves to obtain an extract, which is then formulated into a hand sanitizer. Before the activity, we optimized the formula of hand sanitizer from fig leaves. During community service, we provide education on fig leaves which have antibacterial activity, accompanied by making your own (do-it-yourself) hand sanitizer that can be used every day. The result, which is assessed through an interactive quiz, shows that education can increase participants' knowledge regarding the use of fig leaves, and they can process fig leaves into hand sanitizer. The conclusion is that people know the benefits of fig leaves and how to process them into hand sanitizer.

Keywords: antibacterial; hand sanitizer; simple technology; do-it-yourself.

Introduction

The fig (Ficus carica L.) plant is a member of the Moraceae family that originates from the Middle East and West Asia but is now cultivated throughout the world. Fig products are used as food and medicine to treat various diseases (Barolo *et al*., 2014). Metabolites that have been found in fig plants include phenolic compounds, phytosterols, organic acids, anthocyanins, triterpenoids, coumarins, and volatile compounds (Oliveira *et al*., 2009). Various parts of this plant have been proven to have antioxidant (Caliskan and Polat, 2011; Solomon *et al*., 2006), anticancer (Rubnov *et al*., 2001), hepatoprotective (Gond and Khadabadi, 2008), hypoglycemia (Perez *et al*., 1998), hypolipidemia (Asadi *et al*., 2006), antibacterial (Jeong *et al*., 2009), antipyretic (Patil *et al*., 2010), nematocide (Liu *et al*., 2011), and anthelmintic (De Amorin *et al*., 1999).

The fig products generally come from the fruit. This is because fruit contains the highest levels of polyphenols, flavonoids, and anthocyanins compared to other parts (Caliskan and Polat, 2011). In this research and community service, fig leaves are used to increase the economic value of fig leaves and reduce organic waste. Fig leaves are generally just left to dry and become organic waste. Community assistance is needed to manage organic waste and utilize it for preparations that can be used daily. This organic waste management supports urban farming, as it can optimize the potential that exists in society into productive activities (Amaranti *et al*., 2016).

During the COVID-19 pandemic, people are advised to always wash their hands using soap and running water or hand sanitizer. This is because the hands are the part of the body that most often comes into direct contact with foreign objects, so it is important to avoid touching the nose, mouth, or eyes if they are not clean (Wijayanto, 2020). Hand sanitizers with an ethanol content of 60% or higher are recommended to kill harmful bacteria, including coronavirus, which is the cause of COVID-19 (Shree *et al*., 2020). Ethanol in the hand sanitizer formula functions to break down the lipid, which is the main component of the cell walls of microorganisms. Ethanol reacts by denaturing proteins by dehydrating and dissolving lipids, so that cell membranes are damaged and enzymes are inactivated by ethanol (Sauerbrei, 2020). Concerns about dangerous chemicals, including ethanol in hand sanitizers, encouraged us to carry out community service in villages close to our campus, namely Cilayung Village, Jatinangor District, West Java. Since the location chosen is near campus, the benefits of the research conducted can be directly applied by the community around the campus. In this activity, the fig leaves were proven to contain alkaloids, flavonoids, tannins, phenolic compounds, saponins, steroids, and terpenoids (Saptarini *et al*., 2022a). These compounds greatly contribute to the various pharmacological activities of the fig leaves, including antibacterial activity. This community service aimed to use fig leaf extract as an active ingredient for hand sanitizer. The method in this activity is simple technology on a household scale, that is, boiling fig leaves to obtain the extract using the kitchen equipment you have, then formulating it into hand sanitizer.

Methods

The community service activities were conducted based on the modification of the method carried out by Baedowi *et al*. (2022). The steps of community service activities can be seen in Figure 1. The activity began with a location survey in the village around the campus, namely Jatinangor District, with the target participants being members of Family Welfare Development (Pembinaan Kesejahteraan Keluarga, PKK). Meanwhile, other community service members optimized the hand sanitizer formula in the laboratory and continued with making a video of household-scale hand sanitizer production. The video contains a simple extraction method at home, the tools, and materials needed to make hand sanitizer, as well as the steps for producing water-based hand sanitizer, so it is environmentally friendly and safe to use. The best hand sanitizer formula is made by cutting fig leaves into smaller pieces to maximize the extraction of secondary metabolites. Next, a simple extraction was carried out by boiling 100 g of fig leaves with 500 ml of water at a low temperature of 40–50 °C for 30 minutes. The boiled fig leaves are filtered to separate the residues and extract. The extract was allowed to cool at room temperature. In the final step, mix it with lime juice and boiled water to reach 1000 ml.

The activity continued with activities at the community service location, including a pre-test in the form of an interactive quiz to assess knowledge about the benefits of fig leaves as a hand sanitizer and how to make hand sanitizer at home. After the pre-test, education was carried out on hand sanitizer production to provide the knowledge needed for hand sanitizer production. The activity continued with the practice of producing hand sanitizers using selected formulas so that all participants could understand the production process of making hand sanitizers, from preparing tools and materials to packaging them in spray bottles. The final step was a discussion to ensure that all participants understood and could produce hand sanitizer independently at home. The activity closed with a post-test to reassess knowledge about the benefits of fig leaves as a hand sanitizer and how to make hand sanitizer at home.

 DOI: https://doi.org/10.29313/ethos.v12i1.2582

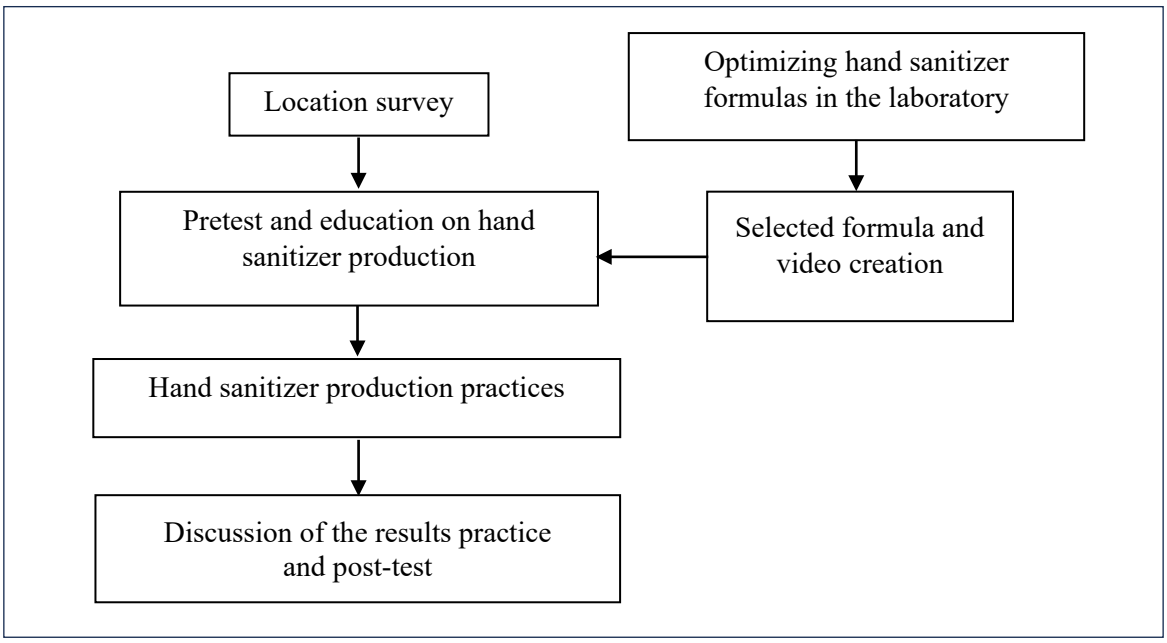

Figure 1. Community Service Implementation Method

Results and Discussion

Fig leaves were collected from Ciwidey District, West Java Province, which has an altitude of 1148 m above sea level. The lowest temperature and relative humidity are 10 °C and 20%, respectively, while the highest is 30 °C and 70%, respectively (www.worldweatheronline). The conditions in Ciwidey District are suitable for fig cultivation, causing figs to grow well. Figs are cultivated in mostly Mediterranean-type climates (Flaishman *et al*., 2008) on marginal lands under rain-fed conditions with improved cultural practices. Now, its cultivation is enhanced by irrigation (Melgarejo *et al*., 2007), along with agro-technologies to increase fruit quality and yield (Erez *et al*., 2003).

The community service activities on our campus are held together with research. The results of previous research proved that fig leaves have antibacterial activity (Saptarini *et al*., 2022b). This activity is used to make hand sanitizer. However, fig cultivation is still limited to the Jatinangor District, West Java. This is overcome by using alternative plants that have antibacterial activity, such as betel leaves, basil leaves, aloe vera, etc., which are easier to find in home gardens. It is hoped that the education provided can increase public knowledge regarding the use of plants that have antibacterial activity to be processed into natural hand sanitizers.

The COVID-19 pandemic has not ended in Indonesia, but it has begun to enter a new habit, which is called the new normal. People are allowed to carry out activities outside the house by applying the 5M health protocol. This protocol includes washing hands with soap and running water or hand sanitizer, wearing a mask, maintaining distance, staying away from crowds, and reducing mobility (https://covid19.kemkes.go.id). The community service activities were carried out among PKK members who represented neighborhood and community harmony in Cilayung Village, Jatinangor. This was done to limit the number of people gathering in the Cilayung Village multi-purpose room. With this community service activity, it is hoped that the implementing team can (i) introduce home garden plants that have antibacterial activity, (ii) increase public awareness, willingness, and knowledge regarding the use of home garden plants as antibacterials, (iii) introduce simple technology for processing garden plants with antibacterial activity, (iv) open insight into the use of home garden plants as hand sanitizers, and (v) assist in making hand sanitizers from fig leaves to stop the transmission of COVID-19. Hand sanitizer was chosen to be made for this community service activity since it can be used to break the chain of the spread of COVID-19 during the pandemic. This is because hand sanitizers containing fig leaf extract or plants with antibacterial activity can destroy the coronavirus.

The community service activity is the implementation of research on the antibacterial activity of fig leaf extract. The result of the experiment at the Pharmaceutical Analysis Laboratory, Faculty of Pharmacy, Universitas Padjadjaran, shows that fig leaf extract is proven to have antibacterial activity, thus supporting the use of fig leaves as a hand sanitizer. Next, students involved in community service carried out experiments in the laboratory to test the water-boiled fig leaves for antibacterial activity. The students then optimized the water-based hand sanitizer formula so that the ratio between the weight of fig leaves and the water used for boiling was obtained. This is because commercial hand sanitizers are generally 70% alcohol-based. Optimization is needed to get a good hand sanitizer formula. After obtaining the optimal formula, a video was made of making your own (do-it-yourself, DIY) hand sanitizer that can be used every day. The purpose of making this video is to help explain it to PKK members who mobilize the PKK during counseling. Furthermore, videos can also be shown via in focus or shared via social media. The video is made with a duration of no more than 5 minutes, so it is not boring and is informative because it is provided with a script that makes it easy to follow when practicing DIY.

Before being given material on the production of hand sanitizer, an interactive quiz was conducted to assess public knowledge regarding the use of fig leaves as a hand sanitizer and how to make hand sanitizer from water-boiled fig leaves. However, none of the participants were able to answer the questions correctly. So, when the material was given, the participants responded very enthusiastically by listening to the material given. This was observed in the discussions held during the delivery of the material. During the discussion, people's understanding of the material provided can be observed. The material given opens up insight into home garden plants that have antibacterial activity, such as betel leaves, soursop leaves, noni leaves, basil leaves, lemongrass leaves, and many more. After providing the material, an interactive quiz was held again with the same questions to reassess knowledge about the benefits of fig leaves as a hand sanitizer and how to make hand sanitizer at home. The participants can answer the questions correctly and enthusiastically. The post-test score shows an increase of 30–40% compared to the pre-test score. Changes in behavior before and after service community activities can be seen in Table 1.

Table 1
Changes in the Participants' Behavior Before and After Service Community Activities

Indicator	Before activities	After activities
Knowledge	Do not know about the use of fig leaves for hand sanitizer	Know about the use of fig leaves for hand sanitizer
Skills	Do not know how to make hand sanitizer	Know how to make hand sanitizer

The ingredients to produce hand sanitizer are fig leaf extract, lime juice, and boiled water. The fig leaves are boiled at low temperatures around 40–50 °C for 30 minutes so that the secondary metabolites in the fig leaves are completely extracted and are not damaged by heat. The participants were given information not to boil fig leaves or other plants used as active ingredients in hand sanitizers at high temperatures because if the boiling process is carried out for too long or at too high temperatures, the active compounds will be damaged and the fig leaf boiled water obtained will be useless. Before adding other ingredients, participants were reminded to let the boiled water reach room temperature. After cooling, lime juice is added as an antioxidant so that the color of the extract does not turn brown due to oxidation. Apart from that, lime juice provides a refreshing fragrance, making it more comfortable when using hand sanitizer. Next, the hand sanitizer is put into a spray bottle, so it is practical to carry and easy to use (Figure 2). Since this hand sanitizer is made from plant ingredients and without alcohol, it is safe to use for every day purposes because the alcohol in hand sanitizer can cause dry skin (Sauerbrei, 2020).

DOI: https://doi.org/10.29313/ethos.v12i1.2582

Figure 2. Results of the Fig Leaf Hand Sanitizer

The participants were guided in the production of hand sanitizer independently. The process of producing hand sanitizer is simple, and the materials used are easy to obtain, causing the counseling and mentoring process to run smoothly without any obstacles. During the production process, participants also actively discussed developments in COVID-19, vaccinations, and new habits that must be implemented during the COVID-19 pandemic. During the discussion, the potential of home garden plants growing in Cilayung Village that could be used as active ingredients for hand sanitizers was also discussed. The service community activity ended with a discussion on the commercialization of hand sanitizers made from natural ingredients. The discussion discussed selecting plants that have antibacterial activity, extracting active compounds from plants, and calculating production costs and promotion.

Conclusion

These service community activities open participants' insight into the use and processing of home garden plants into hand sanitizers that can be commercialized. The participants can make hand sanitizer from water-boiled fig leaves and the results of the interactive quiz show that the participants already know the benefits of fig leaves as a hand sanitizer and how to make hand sanitizer at home.

Acknowledgment

The authors would like to thank the financial support from Unpad Internal Grant number 2201/ UN6.3.1/PM.00/2022.

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