

Community Service Based on A Training Method for Making Liquid Hand Sanitizers to Prevent The Spread of COVID-19 in Tegalsari Kulon Progo

Erna Astuti^{1,*}, Nining Sugihartini², Zainab³, Putri Rachma Novitasari²

¹ Department of Chemical Engineering, Faculty of Industrial Technology, Universitas Ahmad Dahlan, Yogyakarta, Indonesia.

² Pharmaceutical Technology Laboratory, Faculty of Pharmacy, Universitas Ahmad Dahlan, Yogyakarta, Indonesia.

³ Phytochemistry Laboratory, Faculty of Pharmacy, Universitas Ahmad Dahlan, Yogyakarta, Indonesia.

*Corresponding Author: erna.astuti@che.uad.ac.id

ARTICLE INFO

Article history

Received : March 10, 2023

Revised : April 17, 2023

Accepted : May 2, 2023

Keywords

Alcohol;
Hand sanitizer;
Pandemic;
Training;
WHO standard.

ABSTRACT

Background: During this Covid-19 pandemic, the use of hand sanitizer needs to be encouraged to maintain hand hygiene. During endemic and new normal times, the use of hand sanitizer is highly recommended. The hand sanitizers circulating in the market are still predominantly made from alcohol. Hand sanitizer in liquid or spray form is more effective than gel hand sanitizer.

Contribution: The purpose of this community service is to improve knowledge in making liquid hand sanitizers for the people of Tegalsari Hamlet. With this training, the community can provide hand sanitizer independently.

Method: The steps of training were to share videos of making hand sanitizers, organize discussion sessions via Google Meeting, send materials for making hand sanitizers to participants, and did training. The method of making hand sanitizer follows WHO standards. The training participants were 28 teenagers from Tegalsari.

Results: From the evaluation, it is known that there is an increase in the ability to make hand sanitizer by 50.74% and an increase in community skills.

Conclusion: The training participants succeeded in making hand sanitizer. This activity got a very good response from training participants. Participants are very enthusiastic and stated that this activity is very useful for them. It was proven that the participants were capable to produce hand sanitizers independently.

This is an open-access article under the [CC-BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) license.
Copyright © 2023 Erna Astuti, Nining Sugihartini, Zainab, Putri Rachma Novitasari.



INTRODUCTION

During the COVID-19 pandemic, people were encouraged to maintain hand hygiene, especially outside the home or at certain times. One way to keep the hands clean is to use hand sanitizer instead of soap. During endemic or new normal times, the use of hand sanitizers is still recommended. WHO recommends alcohol-based hand sanitizers such as ethanol, isopropanol, and hydrogen peroxide to prevent COVID-19 and as part of a healthy lifestyle [1]. Hand sanitizers circulating in the market are still predominantly made from alcohol. Most alcohol-based hand sanitizers are effective at inactivating enveloped viruses, including COVID-19 [2]. Alcohol has the advantage of killing germs quickly when applied to the skin [3]. Alcohol-based hand sanitizers are more effective in inhibiting the bacteria *P. aeruginosa*, *E. coli*, *S. aureus*, and *C. albicans* [4]. In its manufacture, the formulation of 70% alcohol and 0.05% triclosan is the most optimal. This is evidenced by its inhibitory effect on the growth of *S. aureus* bacteria, which reached 72.45% for 30 seconds [5]. One ingredient for cleaning hands besides soap that can inhibit the growth of bacteria and even kill them is hand sanitizer [6]. Hand sanitizers are grouped in gel and liquid forms. Diana [7] stated that hand sanitizers in liquid or spray form are more effective than hand sanitizer gels in reducing the number of germs on hands.

The inhibitory effect of bacterial growth on alcohol is due to the presence of an active substance that acts as an antiseptic. To reduce the use of alcohol-based hand sanitizers, especially with high concentrations, alternative natural ingredients are highly recommended. Apart from being abundant and safe to use, natural ingredients also contain active antibacterial substances that can be used as hand sanitizers. Compounds that are classified as antibacterial compounds in plants include terpenoids, flavonoids, saponins, alkaloids, tannins, and phenols [8-10]. Another benefit of flavonoids is as an anti-inflammatory and antibiotic [11]. Several antibacterial compounds exist in betel leaves [12-14], basil leaves and kaffir lime peel extract [15], avocado seeds [5], onions white [16], and lemongrass [17]. The inhibition power of natural hand sanitizers, *Streptococcus sp.*, and *Staphylococcus sp.*, is equivalent to the inhibition of commercial hand sanitizers [18]. Betel leaf extract can inhibit the growth of *Bacillus sp.*, *E. Faecalis bacteria*; *S. aureus*, *S. agalactiae*, *A. hyrophila*, *E. coli*, *K. pneumonia*, *P. aeruginosa*, and *V. alginolyticus* when extracted with methanol [19]. Whereas basil leaves and essential oils from avocado stems and seeds can inhibit the growth of *S. aureus* and *E. coli* when extracted with ethanol [19, 20].

Tegalsari is one of the target hamlets of Universitas Ahmad Dahlan, where community service is carried out. Residents of Tegalsari, Kulon Progo have abundant potential for family medicinal plants. Residents realize this potential, so they try to utilize family medicinal plants to maintain and improve health. Parts of medicinal plants that are widely planted for use include rhizomes (turmeric by 54.3%), leaves (betel nut by 48.6%), stems (cinnamon by 31.40%), roots (reeds by 40.0 %), herbs (gotu kola by 37.10%), fruit (lime by 40.0%) and flowers (cloves by 57.10%) [21]. Betel leaf has potential as a natural hand sanitizer. Therefore the people of Tegalsari Hamlet have the potential to make natural hand sanitizers from betel leaves. Literature survey state that betel leaf has a higher bacterial inhibition power than other natural ingredients such as avocado seeds, lemongrass, and garlic [22]. Another advantage of betel leaf is the leaves are easy to get, abundant, and cheap. To develop potential of the Hamlet, community service was carried out in the Tegalsari Kulonprogo to provide training in making hand sanitizers. As a first step, hand sanitizer is made using alcohol as raw material. In the next stage, it is hoped that a hand sanitizer from betel leaves can be made. Hand sanitizer is made in liquid or spray form. Training on making hand sanitizers with alcohol-based ingredients

was carried out offline [23,24,25], while Ambarwati et al. [26] used video tutorials to disseminate hand sanitizer making. Training on making hand sanitizers is planned to be carried out using the hybrid method. Counseling on making hand sanitizers was carried out by making video tutorials followed by discussions with online meetings. After that, the practice of making hand sanitizers was carried out offline

METHOD

Materials

The materials used were alcohol of 96%, hydrogen peroxide of 3%, glycerine of 98%, and distilled water. The manufacture of hand sanitizers follows WHO standards [27].



Caption:

1. Glycerine of 98%
2. Ethanol of 96%
3. Essential oil
4. Hydrogen peroxide of 3%

Figure 1. Materials for making hand sanitizer

Procedure

Training on making hand sanitizers was held in Tegalsari Kulonprogo on November 5 and 7 2021. The training participants were 28 teenagers from Tegalsari Kulonprogo. Two students from the Universitas Ahmad Dahlan helped in making a video for making hand sanitizers. The steps of service activities are shown in Figure 2.

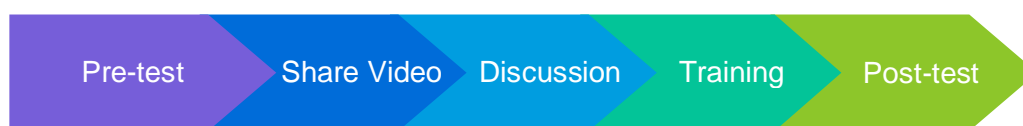


Figure 2. Method of community service

The community service activities began with distributing the Google form pre-test to make hand sanitizers to all training participants, sharing video links for making hand sanitizers, and sending materials to partners. Then partners make hand sanitizers in small groups based on the guidelines in the video. After making the hand sanitizer, the training participants were asked to fill out a post-test to find out the increase in their understanding of making biodiesel. All communication with participants is done via the WhatsApp group.

RESULTS AND DISCUSSION

Training on making hand sanitizer was held in October 2021 in Tegalsari Kulon Progo with 28 teenagers as participants. This activity is a community service, a collaboration between Universitas Ahmad Dahlan and Tegalsari hamlet administrators. The ongoing Covid-19 pandemic has caused the training to make hand sanitizers unable to be carried out in person in full. Therefore the implementation of community service is carried out in a hybrid manner, a combination of online and offline. The series of activities included pre-test activities, video submissions for making hand sanitizers, explanations for making hand sanitizers, conducting training, and post-testing activities. The training participants were teenagers from Tegalsari Kulonprogo.

Training participants are given a pre-test to determine their level of understanding. The pre-test material is delivered using a Google form, while the link for working on the Google form is disseminated via the WhatsAps group, as shown in Figure 3.

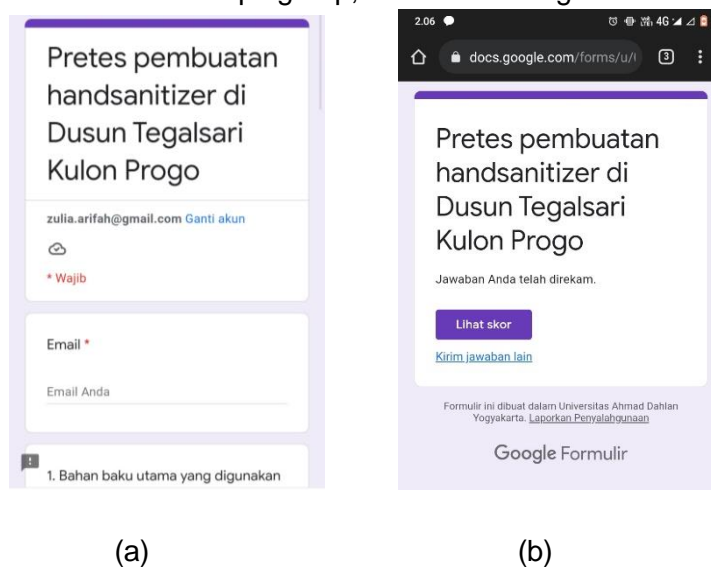


Figure 3. (a) pre-test link for making hand sanitizer (b) pre-test response.

To support community service activities, materials for making hand sanitizers were prepared. Furthermore, the participants were given a guide in the form of a video on making hand sanitizers, given an explanation with Google Meeting, then they practiced directly making hand sanitizers in small groups. Figure 4 shows the handout for making hand sanitizer and the video that was made.

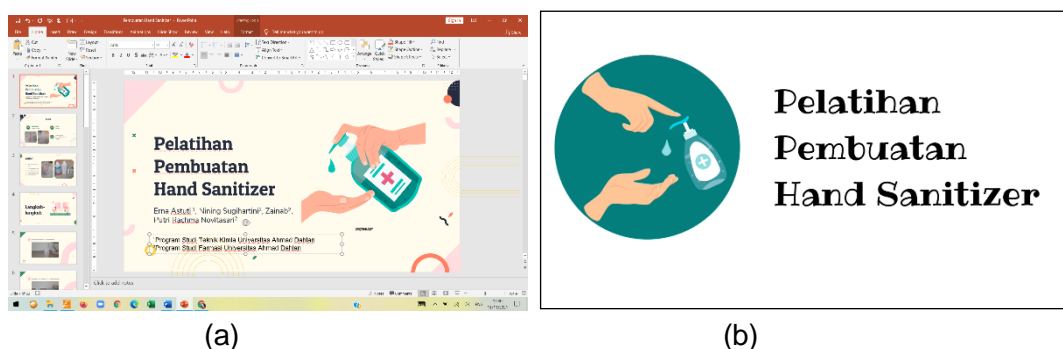


Figure 4. (a) handout for making hand sanitizer (b) video for making hand sanitizer.

Most of the participants (94.1%) stated the delivery of training materials on making hand sanitizers through video tutorial media is delivered clearly [26].

The training on making hand sanitizers was held at the Tegalrejo Hamlet hall and was attended by training participants complying with health protocols. During the training, the participants were divided into several groups. Each group consists of 4 participants. Kurniawan et al. [24] conducted the same training with 4-5 participants per group. Participants make hand sanitizers based on the instructions presented in the video (see Figure 5).



(a)

(b)

Figure 5. (a) practice of making hand sanitizer for all participants (b) practice of making hand sanitizer for each group.

The training of making hand sanitizers was carried out during a pandemic so that activities were carried out according to health protocols. All participants have to wear a mask. Physical distancing between participants was observed. There were no difficulties faced by the participants. The training went smoothly. Each group managed to make hand sanitizer. To measure the increase in the knowledge and skills of the trainees in making hand sanitizers, a post-test was carried out after the trainees had attended the training, the display of the Google Form for the post-test can be seen in Figure 6.

The image shows a screenshot of a Google Form on a mobile device. The title of the form is "Post tes pembuatan handsanitizer di Dusun Tegalsari Kulon Progo". Below the title, there is a login prompt: "Login ke Google untuk menyimpan progres. Pelajari lebih lanjut" with a red asterisk and the word "Wajib" below it. There is an "Email *" field with a sub-label "Email Anda". Below that is a question: "1. Bahan baku utama yang digunakan pada pembuatan handsanitizer adalah: *" with a "10 poin" value. The question has four radio button options: "air", "alkohol", "gliserin", and "H2O2".

Figure 6. Post-test for making hand sanitizer

An evaluation of community empowerment was carried out by comparing the results of the pre-test and post-test, the results are presented in Table 1.

Table 1. Calculation of the increase in participants' understanding.

Question number	Average Value		
	Before training	After training	% increase in understanding
1	82.35	100.00	17.65
2	52.94	75.00	22.06
3	29.41	91.67	62.25
4	17.65	91.67	74.02
5	76.47	100.00	23.53
6	23.53	100.00	76.47
7	35.29	83.33	48.04
8	29.41	100.00	70.59
9	41.18	83.33	42.16
10	29.41	100.00	70.59

Table 1 shows the average level of understanding of participants about making hand sanitizer before training of 44.44%. After the participants received an explanation and practiced making hand sanitizers, the average level of understanding increased to 92.50%. There is an increase in understanding of 48.06%. From Table 1, a graph of the understanding value relationship for each question was made.

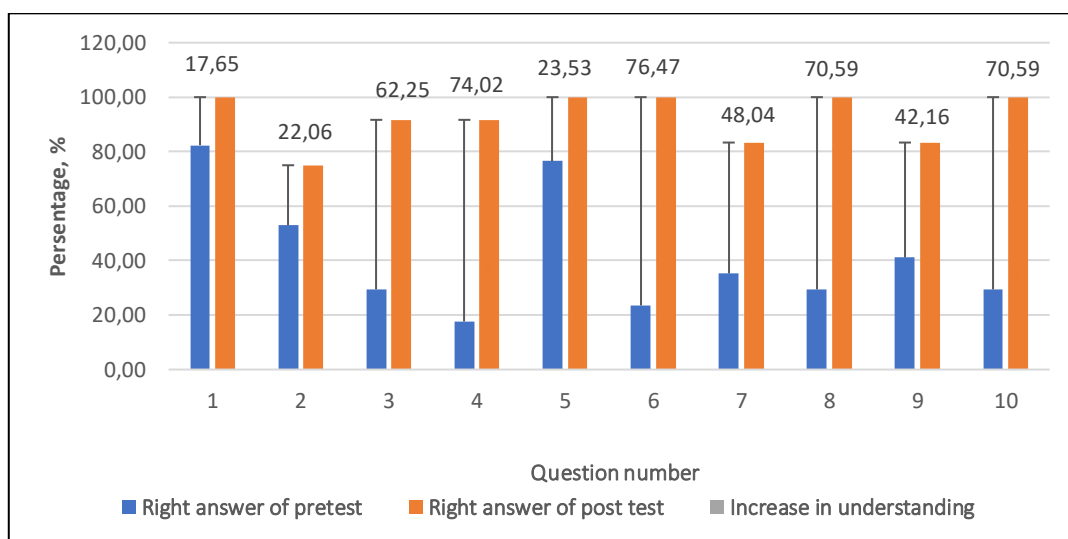


Figure 7. The impact of increasing participants' understanding of hand sanitizer training.

The evaluation results showed that there was an increase in the participants' knowledge about making hand sanitizer by 50.74%, calculated from the average increase in each point. Thus the community service activity program in the form of soap-making training was successfully carried out. Participants proved to be independently successful in practicing making in groups. The skills of the participants increased. It is hoped that in the future participants will be able to independently meet the needs for hand sanitizers for themselves and the surrounding environment.

CONCLUSION

Hand sanitizer training has been carried out in Tegalsari Kulonprogo. The training participants succeeded in making hand sanitizer. This activity got a very good response from training participants. Participants are very enthusiastic and stated that this activity is very useful for them. From the measurements, there was an increase in participants' knowledge about making hand sanitizer by 50.74%. The participants' skills in making hand sanitizers increased, and it was proven that the participants succeeded in making hand sanitizers independently. After the training, it is hoped that the Tegalsari Hamlet community will be able to provide hand sanitizers independently and get used to using hand sanitizers as part of a healthy lifestyle.

Acknowledgment

All authors are grateful to LPPM UAD for providing funds for this community service activity and to the entire Tegalsari Kulonprogo community for supporting this activity.

REFERENCES

- [1] A. Mahmood, M.E., S. Pervez, H.A. Alghamdi, A.B. Tabinda, A.Yasar, K. Brindhadevi, and A. Pugazhendhi, "COVID-19 and frequent use of hand sanitizers; human health and environmental hazards by exposure pathways," *Science of the Total Environment*, vol. 742(140561), pp. 1-7, 2020.
- [2] A.P. Golin, D. Choi, and A. Ghahary, "Hand sanitizers: A review of ingredients, mechanisms of action, modes of delivery, and efficacy against coronaviruses," *American Journal of Infection Control*, vol. 48, pp. 1062–1067, 2020.
- [3] H.A.L. Filipe, S.M. Fiuza, C.A. Henriques, and F.E. Antunes, "Antiviral and antibacterial activity of hand sanitizer and surface disinfectant formulations," *International Journal of Pharmaceutics*, vol. 609, 121139, pp. 1-13, 2021.
- [4] S.A.H. Vuai, M.G. Sahini, K.S Sule, A.S. Ripanda, and H.M. Mwanga, "A comparative in-vitro study on antimicrobial efficacy of on-market alcohol-based hand washing sanitizers towards combating microbes and its application in combating Covid-19 global outbreak," *Heliyon*, vol. 8, e11689 , pp. 1-6, 2022.
- [5] A. Asngad and D.W. Subiako, "Potensi Ekstrak Biji Alpukat Sebagai Hand sanitizer Alami : Literatur Review," *Jurnal Bioeksperimen*, vol. 6, no. 1, pp. 106-115, 2020.
- [6] [R. Retnosari, Sutrisno, and K. Handoyo, , "Aktivitas Antibakteri Metabolit Skunder dari Ekstrak Metanol Biji Alpukat (*Persea americana* Mill.)," *Jurnal Cis-Trans: Jurnal Kimia dan Terapannya*, vol. 1, no. 1, hlm 16-21, 2017.
- [7] A. Diana , "Pengaruh Desiminasi Dokter Kecil Tentang Penggunaan Hand sanitizer Gel dan Spray Terhadap Penurunan Angka Kuman Tangan Siswa SDN Demakijo Gamping Sleman", *Skripsi, Poltekes Kemenkes Yogyakarta*, 2012.
- [8] S.B. Acharya, S. Ghosh, G. Yadav, K. Sharma, S. Ghosh, and Joshi, " Formulation and Antibacterial Efficiency of Water-based Herbal Hand Sanitizer Gel," *BioRxiv*, vol. 1, no. 1, pp. 1-16, 2018.
- [9] A.C.C. Egebuonu, I.C. Opera, C. Onyeabe, and N.O. Uchenna, "Proximate, Functional, Antinutrient, and Antimicrobial Properties od Avocado pear (*Persea americana*) seed," *Journal of Nutritional Health and Food Engineering*, vol. 8, no. 2, pp. 1-5, 2018.
- [10] H.A. Alghamdi, "A need to combat COVID-19; herbal disinfection techniques, formulations and preparations of human health friendly hand sanitizers," *Saudi Journal of Biological Sciences*, vol. 28, pp. 3943–3947, 2021.
- [11] Feliana, S. Mursiti, and Harjono, "Isolasi dan Elusidasi Senyawa Flavonoid dari Biji

- Alpukat (*Persea americana* Mill.),” Indonesian Journal of Chemical Science, vol. 7, no. 2, pp. 153-159, 2018.
- [12] S. Ahmed, S. Zaman, R. Ahmed, Md.N. Uddin, A. Acedo Jr., Md.L. Bari, “Effectiveness of non-chlorine sanitizers in improving the safety and quality of fresh betel leaf,” LWT - Food Science and Technology, vol.78, pp. 77-81, 2017.
- [13] D.S. Fathoni, I. Fadhillah, M. Mujtahid Kaavessina, “Efektivitas Ekstrak Daun Sirih Sebagai Bahan Aktif Antibakteri Dalam Gel Hand Sanitizer Non-Alkohol, Equilibrium, vol. 3, no.1, pp. 9-14, 2019.
- [14] A.D.T. Phan, G.Netzel, P. Chhim, M.E. Netzel, and Y. Sultanbawa, “Phytochemical Characteristics and Antimicrobial Activity of Australian Grown Garlic (*Allium Satavum* L.) Cultivars”, Foods, Vol 8, pp. 1-16, 2019.
- [15] I.K. Dewi and B. Yuniarto, “Uji Efektivitas Sediaan Hand Sanitizer Kombinasi Ekstrak Daun Kemangi (*Ocimum Sanctum* L) Dan Ekstrak Kulit Jeruk Purut (*Citrus hystrix*), “Kebidanan Dan Kesehatan Tradisional, Vol. 1, No. 2, pp. 130-135, 2016.
- [16] A.D.T. Phan, G.Netzel, P. Chhim, M.E. Netzel, and Y. Sultanbawa, “Phytochemical Characteristics and Antimicrobial Activity of Australian Grown Garlic (*Allium Satavum* L.) Cultivars,” Foods, vol. 8, no. 9, pp. 1-16, 2019.
- [17] P.S. Andila and I.K. Toya, “Formulasi Hand sanitizer Dengan Bahan Aktif S Irih (*Piper Betle* L.), Lidah Buaya (*Aloe Vera* (L.) Burm. F.) dan Minyak Atsiri Sereh Wangi (*Cymbopogon Winterianus* Jowitt) untuk Mencegah Covid-19,” Buletin Udayana Mengabdikan, vol. 19 no. 3, pp. 375-381, 2020.
- [18] N. Josoh, F.Z.A. Zulklifi, E.N.M. Mahabob, H. Zulkipli, dan P.S. Rosman, “ Synergism of Virgin Coconut Oil and Mulberry Leaves Extract as Agent in Free Alcohol Hand Sanitizer”, 2nd Kelantan International Learning and Innovation exhibition, 19-20 August 2019.
- [19] D.A. Larasati and E. Apriliana, “Efek Potensial Daun Kemangi (*Ocimum basilicum* L) Sebagai Pemanfaatan Hand Sanitizer”, Majority, vol. 5, pp. 124-129, 2016.
- [20] O.T. Osuntokun, M.O. Akinola, O.M. Aladejana, and A.O. Ogunlade, “Efficacy of Essential Oils form *Persea americana* Steam Bark and Seed Extracts,” Journal of Applied Microbiology and Biochemistry, vol. 2, no. 2, pp. 1-6, 2017.
- [21] Zainab, N. Sugihartini, E. Astuti, P.R. Novitasari, Profil jenis tumbuhan obat dan penyakit yang diderita warga Dusun Tegalsari, Kulon Progo, Yogyakarta, Prosiding Seminar Nasional Hasil Pengabdian kepada Masyarakat Universitas Ahmad Dahlan, pp. 1627-1633, October 2021.
- [22] D.F. Pranoto, O.F. Famly, C. Akbar, and E. Astuti, “Potential of Antibacterial Activity in Natural Ingredients (Betel Leaves, Basil Leaves, Avocado Seeds, Lemongrass, Garlic) As Natural Hand Sanitizers: Journal Review,” Chemica, vol. 8, no. 2, pp. 101-109, 2021.
- [23] R.N. Atmadani, “Pelatihan Pembuatan Hand Sanitizer yang Lembut di Kulit dalam Pencegahan Covid-19 di Kalangan Siswa SMA (Training on Making Soft Hand Sanitizer for Skin in The Prevention of Covid-19 among High School Students),” PengabdianMu: Jurnal Ilmiah Pengabdian kepada Masyarakat, vol. 6, Issue 6, pp. 567–571, 2021.
- [24] I.D. Kurniawan, Y. Suryani, A.R. Hafsari, M.A. Salim , T. Cahyanto , A. Adawiyah , Musa’adah, and S. Tridesianti, “Pelatihan Pembuatan Hand Sanitizer Kepada Masyarakat Desa Tangguh di Desa Sukawening, Kecamatan Ciwidey, Bandung,” Jurnal Surya Masyarakat, vol. 4, no. 1, , pp. 69-79, 2021.
- [25] N. Fatimah, F. Handayani, R. Sundu, and A.K. Ansyori, “Pelatihan Pembuatan Hand Sanitizer Dan Penyuluhan Phbs Pada Warga Rt. 12 Kelurahan Gunung Lingai Kota Samarinda,” Jurnal Abdi Masyarakat, vol. 1, no. 1, 2022.
- [26] N.S.S. Ambarwati, M.O. Armandari, N. Hidayah, C.M. Putri, and S. Marlina, “Pelatihan Pembuatan Hand Sanitizer Melalui Media Video Tutorial Dalam Mensosialisasikan Pola

- Hidup Bersih Di Lingkungan Kelurahan Jakasampurna Bekasi Barat Dalam Upaya Menyikapi Pandemi COVID-19,” *Sarwahita : Jurnal Pengabdian Kepada Masyarakat*, vol. 18, no. 2, pp. 121-127, 2021.
- [27] World Health Organization, “Guide to Local Production: WHO-recommended Handrub Formulations,” April 2010.

This page is intentionally left blank

SPEKTA (Journal of Community Service: Technology and Applications)