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Community Training in Jatimas Semarang Through Ethnobotany-Based Conservation and Utilization of Lerak (*Sapindus rarak* DC.)

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Abstract: *Lerak (Sapindus rarak DC) has many benefits, including washing soap, vegetable pesticides, toothpaste foaming agent, gel soap base, and antibacterial agent. Along with the many uses, it must be balanced with conservation activities to maintain the preservation of lerak resources. This service program aims to determine the usefulness of lerak (Sapindus rarak DC) and the Ethnobotany-based lerak conservation efforts in the community of Jatimas, Mijen, Semarang. This community service was carried out in January-February 2021 in Jatimas, Mijen, Semarang. This service program uses the Participatory Action Research (PAR) method. The results showed that the community could use the lerak plant as herbal soap, jewelry washer, and insecticide. Through this community service program, the community has carried out generative conservation of the lerak with seeds.*

Introduction

Indonesia is an archipelagic country with approximately 17,000 small islands and five large islands[1]. This geographical condition makes Indonesia one of the countries with high biodiversity (mega biodiversity). One of the biodiversity that Indonesia has is the diversity of flora. There are about 20,000 species of flora owned by Indonesia, and 40% of them are endemic to Indonesia[2].

[1] Mersmann, F., Wehnert, T., Andreeva, T., Fekete, H., Luna, L., & Streitferdt, V. K. Implementation of nationally determined contributions: *Indonesia country report* (2017).
[2] Kusmana, C., & Hikmat, A. Keanekaragaman hayati flora di Indonesia. *Journal of Natural Resources*

The diversity of flora in Indonesia is widely used to meet the Indonesian people's food, clothing, and housing needs. In addition, large plants (trees) can function as flood and landslide prevention agents[3]. Planting trees has the function of (1) resisting the destructive power of falling rainwater and the flow of water over the soil surface, (2) conducting transpiration, and (3) adding organic matter to the soil. In addition, trees also play a role in minimizing the strength of rainwater dispersion and increasing water infiltration into the soil[4]. Several trees that can prevent flooding include *Albizi falcate*, *Erythrna* sp, *Eucalypthus saligna*, *Bambusa bambos*, *Acacia mangium,* and *Sapindus* spp[5].

Indonesia is geographically located at the intersection of three main plates: This makes Indonesia vulnerable to natural disasters such as earthquakes, volcanic eruptions, and tsunamis. In addition to natural disasters, Indonesia has the potential to emerge from unnatural disasters due to several activities that can damage the environment. One of the disasters that often occurs in Indonesia is the flood disaster. Almost all provinces in Indonesia have been hit by floods, one of which is the city of Semarang. The government and community institutions of Semarang City have made many efforts to prevent flood disasters, one of which is tree planting. Apart from functioning as a flood prevention agent, planting trees in Semarang is also a conservation effort.

Data from the Central Statistics Agency (2021) shows that the city of Semarang has a lot of plant diversity used as plantation crops, horticulture, forestry, and food crops[6]. According to BPS data from Semarang City (2020), some of the plants that fill plantations include coconut, cloves, coffee, cashew, kapok, ginger, cardamom, and siwalan[7]. Meanwhile, forestry plants that have been planted and conserved are acacia, bamboo, teak, mahogany, sengon, jabon, waru, white teak, and suren. Based on BPS data, the lerak has not been found as a forestry plant that can be utilized.

Lerak is traditionally used as a detergent which is quite effective in the batik industry[8]. Lerak (*Sapindus rarak* DC) is a native plant of Southeast Asia that is widely spread throughout Asia. Lerak belongs to the *Sapindaceae* family and includes soapberry plants. Lerak can grow to about 42 meters with a natural forest habitat at an altitude of 200-1600 meters. Lerak has compound leaves with 7-9 pairs and reaches 50 cm in length. Lerak leaves have a smooth texture, white zygomorphic flowers, and round fruit with about 2x1.8 cm[9].

Several studies mention the benefits of lerak fruit, including a natural soap substitute for detergent, a foaming agent for toothpaste, and an essential ingredient for

and Environmental Management 5, no. 2 (2015): 187-187.

[3] Saroinsong, F. B., & Kalangi, J. I. Pengelolaan Pekarangan Untuk Pencegahan Banjir Di Kelurahan Matani 3. *Edupreneur: Jurnal Pengabdian kepada Masyarakat bidang Kewirausahaan,* 1, no. 2 (2018).

[4] Arsyad, S. *Konservasi Tanah dan Air.* (Bogor: IPB Press, 2006).

[5] Singh, R., & Sharma, B. *Biotechnological Advances, Phytochemical Analysis and Ethnomedical Implications of Sapindus Species.* Springer Nature (2019).

[6] "*Keanekaragaman hayati Jawa Tengah,"* BPS Jateng, akses April 2021, https://jateng.bps.go.id/.

[7] BPS Kota Semarang. *Statistik Daerah Kecamatan Mijen 2020.* Semarang: BPS Kota Semarang 2020.

[8] Laela, E., Isnaini, I., Rufaida, E. Y., & Sayogo, R. Efektivitas Sabun Alami terhadap Warna Batik. *Dinamika Kerajinan dan Batik* 35, no. 2 (2018): 119-124.

[9] Singh, R., & Sharma, B. *Biotechnological Advances, Phytochemical Analysis and Ethnomedical Implications of Sapindus Species.* Springer Nature (2019).

gel soap[10][11][12][13][14]. In addition, lerak can also be used as a vegetable pesticide, as an agent to reduce methane gas emissions in ruminants, and function as an antibacterial agent[15][16][17][18][19].

The benefits of the lerak are quite a lot. However, data released by the Central Java Environment and Forestry Service (2019) shows that the lerak is a protected plant and is under threat, so it needs to be balanced with efforts to preserve the lerak lerak remains sustainable. One of the efforts to preserve the lerak is by conservation. Conservation is all activities related to the maintenance and utilization of natural resources, the lerak. Conservation aims to realize the preservation of biological natural resources and the balance of the ecosystem. In addition, conservation also utilizes natural resources in a harmonious and balanced manner[20].

Techniques used in plant conservation vary widely, including cuttings, shoots, tissue culture, and seeds. One of the techniques used to conserve lerak is a generative propagation technique through seeds. Generative propagation through seeds is a simple and easy technique, but not many people have applied this technique.

Mijen is a sub-district located in the southwest of the city of Semarang, Central Java. To the west and south, Mijen District is bordered by Kendal City, the east by Gunungpati District, and the north by Ngaliyan District. Socially, the Mijen community works as industrial workers (166,644 people), farm laborers (15,744 people), farmers (10,722 people), and the smallest is residents who work in the transportation sector (781

[10] Purwayudha, I. G. P. S. Buah Lerak (Sapindus rarak) Sebagai Foaming Agent Dalam Pasta Gigi (Sapindus rarak As Foaming Agent In Tooth Paste) (*Doctoral dissertation,* UNIVERSITAS AIRLANGGA 2010).

[11] Budiman, I. Pembuatan Tablet Detergen Effervescent Dari Lerak (*Sapindus rarak*) Sebagai Solusi Alternatif Permasalahan Limbah Domestik. *Students e-Journal* 1, no. 1 (2012): 39.

[12] Diniah, Z. Produksi Cairan Deterjen Tradisional Ramah Lingkungan Dari Biji Larek Dalam Upaya Menjaga Ekosistem Sungai. *PKM-P* 3, no. 1 (2019): 56-61.

[13] Muttafaq, M. F., Prasetyo, M. A., & Radianto, D. O. Perbandingan buah lerak (*Sapindus rarak* De Candole) dengan daun waru (*Hibiscius tiliaceus*) dalam mempertahankan warna pada kain batik. *In Prosiding Seminar Nasional Pendidikan Biologi V 2019*. 2020.

[14] Wijayanti, F., Sari, M., Suprayitno, R., & Aminin, D. The Gel Soap with Raw Materials of Lerak Fruit (*Sapindus rarak* DC). *Stannum: Jurnal Sains dan Terapan Kimia* 2, no. 1 (2020): 1-6.

[15] Mediana, G., & Prijono, D. Pengaruh Pemanasan Dan Penyimpanan Terhadap Aktivitas Insektisida Ekstrak Lerak (*Sapindus rarak*) Pada Larva *Crocidolomia pavonana* (F.)(LEPIDOPTERA: CRAMBIDAE). *Agrovigor: Jurnal Agroekoteknologi* 7, no. 2 (2014): 90-98.

[16] Hidayah, N. Pemanfaatan Senyawa Metabolit Sekunder Tanaman (Tanin dan saponin) dalam Mengurangi Emisi Metan Ternak Ruminansia. *Jurnal Sains Peternakan Indonesia* 11, no. 2 (2016): 89-98.

[17] Mayasari, S.L., &Anif, H.S "Pemanfaatan Getah Biduri (*Calotropis gigantean*) dan Buah Lerak (*Sapindus rarak*) seabagai Pestisida Nabati Pembasmi Keong Mas (*Pomaceae canaliculata* L.)" (Universitas Muhammadiyah, Surakarta, 2016), Doctoral dissertation.

[18] Puspitosari, D., Rochman, N., & Tobing, O.L. Daya Insektisidal Minyak Nilam (Pogostemon Cablin Benth) dan Ekstrak Lerak (*Sapindus rarak* DC.) pada Hama Gudang *Sitophiluz zeamais* (Motsch.). *Jurnal Agronida* 1, no. 1 (2018).

[19] Sinurat, A.P., Wina, E., Rakhmani, S.I., Wardhani, T., Hartati, T., & Purwadari, T. Bioactive substances of some herbs and their effectiveness as antioxidant, antibacterial and antifungal. *Jurnal Ilmu Ternak dan Veteriner* 23, no. 1 (2018): 18-27.

[20] Rachman, M. Konservasi nilai dan warisan budaya. *Indonesian Journal of Conservation* 1, no. 1 (2012).

people). Almost all of the land use in Mijen sub-district is still used for villages, except for the Mijen sub-district, which is close to urban areas[21].

The lerak conservation activity is one of the Community Service program activities by students of UIN Walisongo Semarang. The target of this community service is the Jatimas community, Mijen District, and in collaboration with the Padepokan mBuritan Farmer Community. Empirically, the knowledge of the Mijen community in the use of the lerak plant has not been well documented, so we try to report it. Based on the initial survey, lerak has not been widely cultivated by the people of Semarang, especially the people of Mijen. Whereas based on literature studies, lerak has many potentials to be used in everyday life by the community[22][23].

The community service that we do with the Padepokan mBuritan Farmer Community aims to invite the Mijen community to go back to nature with various efforts, one of which is plant conservation. Increasing public knowledge is essential because the community is an active actor in biological conservation.[24] In addition, protection itself has a function to maintain protected areas and enrich plant species in agroforestry patterns so that forests can be sustainable and communities become prosperous.[25] Therefore, we hope that our community service activities can increase people's knowledge to protect the environment through plant conservation.

Method

This service program will be held in January - February 2021 in Jatimas, Mijen, Semarang. The method used is Participatory Action Research (PAR). The definition of PAR is a type of partnership with the community in a participatory process of collaboration that includes research, education, and action activities, which are explicitly oriented to social transformation.[26] In this case, the community service team partners with the Jatimas community and the Padepokan mBuritan Farmer Community.

The stages of implementing this service program begin with a site survey. The implementation of this location survey aims to get an accurate picture of the situation and condition of the target service. The next stage is to conduct coordination meetings related to community service programs with community leaders. During the program

[21] BPS Kota Semarang. *Statistik Daerah Kecamatan Mijen 2020.* Semarang: BPS Kota Semarang 2020.

[22] Muttafaq, M. F., Prasetyo, M. A., & Radianto, D. O. Perbandingan buah lerak (*Sapindus rarak* De Candole) dengan daun waru (*Hibiscius tiliaceus*) dalam mempertahankan warna pada kain batik. *In Prosiding Seminar Nasional Pendidikan Biologi V 2019* (2020).

[23] Wijayanti, F., Sari, M., Suprayitno, R., & Aminin, D. The Gel Soap with Raw Materials of Lerak Fruit (*Sapindus rarak* DC). *Stannum: Jurnal Sains dan Terapan Kimia* 2, no. 1 (2020): 1-6.

[24] Puspitasari, A. A., Suharso, P., & Hartanto, W. Perubahan Kondisi Ekonomi Masyarakat Dengan Adanya Konservasi Sumber Daya Alam Pada Taman Nasional Meru Betiri Desa Sarongan Kecamatan Pesanggaran Kabupaten Banyuwangi. *JURNAL PENDIDIKAN EKONOMI: Jurnal Ilmiah Ilmu Pendidikan, Ilmu Ekonomi dan Ilmu Sosial* 14, no. 2 (2020): 299-303.

[25] Harianto, S. P., Qurniati, R., & Duryat, D. Konservasi Tanaman Pala (*Myristica fragrans*) untuk Memperkaya Jenis Tanaman Pada Pola Agroforestri. Lampung: UNILA Repository (2017).

[26] Ansori, M., Afandi, A., Fitriyah, R. D., Safriyani, R., Farisia, H. Pendekatan-Pendekatan dalam University-Community Engagement. Surabaya: UIN Sunan Ampel Press. (2021).

implementation process, the service team directly approached the community to find out the use of the lerak plant. It provided training on lerak plant conservation efforts through generative propagation with the Padepokan mBuritan farming community. The next stage is work evaluation to determine the level of success, shortcomings, and obstacles that occur during the implementation of the service program. This evaluation can be a benchmark for improving the performance of the service team. The scheme of the work steps of the community service program in the Jatimas Mijen housing estate in Semarang can be seen in Figure 1.

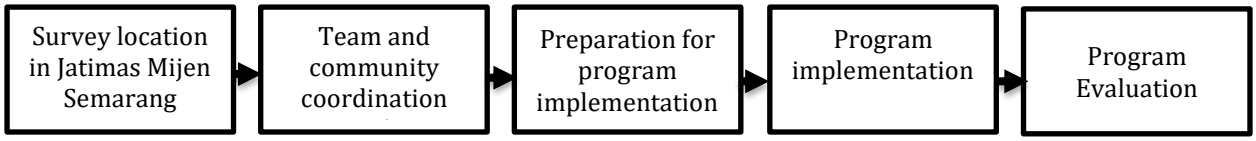
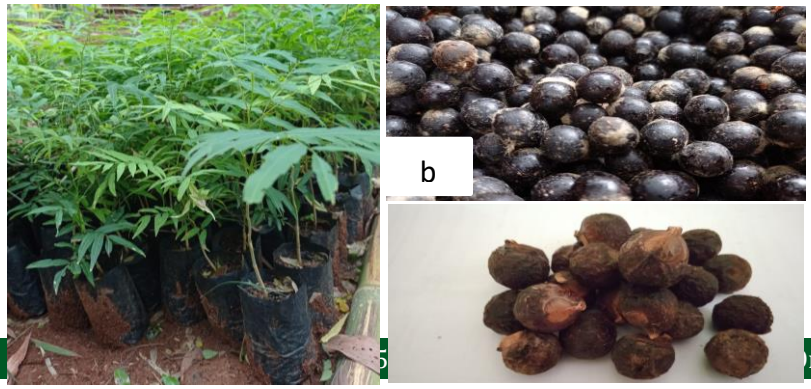


Figure 1. Schematic of community service work steps

This service program applies the PAR method steps that actively involve relevant parties in reviewing the problem to change for the better, namely the Jatimas community and the Padepokan mBuritan Farmer Community. Primary data collection techniques were obtained through observation, semi-structured interviews, and ongoing, active, and participatory discussions (Focus Group Discussion). Meanwhile, secondary data was obtained by studying literature, previous research, and all information related to this research. The data analysis technique in this study used descriptive analysis, presented in narration and pictures.

Result

The community service carried out is in the form of training on the conservation of the lerak plant (*Sapindus rarak* DC). Service activities are carried out with a series of activities: observing program locations, implementing programs, and evaluating activities. The service is carried out in collaboration with the Padepokan mBuritan Farmer Community. Padepokan mBuritan is a community in Jatimas, Mijen, Semarang that cares about the environment. Some of the programs that have been carried out include independent nurseries, planting mangroves, and planting toga plants. Based on the observations made, the lerak plant is cultivated by a farming community named Padepokan mBuritan. This farming community focuses on growing plants for conservation. There are 23 types of cultivated plants, one of which is lerak (*Sapindus rarak* DC). The cultivation of this lerak plant has been carried out since the beginning of the Covid-19 pandemic. The appearance of the lerak plant nursery is presented in the following picture:



a c

Figure 2. *(a) Lerak nursery, (b) Lerak seeds (c) Lerak fruits. (Source: Research document, 2021)*

Lerak is not widely known and cultivated by the people of Jatimas, Mijen, Semarang. Its existence is only in the nursery owned by the Padepokan mBuritan farming community. Initially, lerak seeds in the Padepokan mBuritan nursery were obtained from Sumowono, Semarang Regency. Since being cultivated in early March 2020, the Padepokan mBuritan farming community has planted lerak in the Wonosobo, Dieng and Limbangan, Kendal areas. However, lerak planting has not been carried out in the area around the nursery location, so one of the goals of this service is to conserve lerak around the residences of the people of Jatimas, Mijen, Semarang. After doing community service with the Padepokan mBuritan community, the expected social change is that the community is aware of the importance of conservation, especially the lerak plant. There are several stages in lerak conservation efforts which can be seen in the image below.

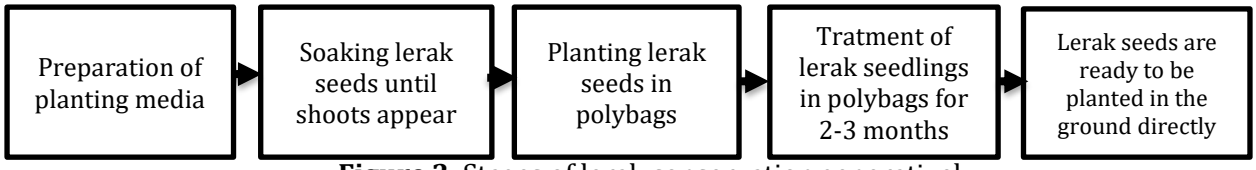


Figure 3. Stages of lerak conservation generatively

Lerak plant propagation can be done generatively using seeds. The bunch contains an array of 8 to 12 lerak fruits, round in shape with a size of 2 cm, has a dark green color and black seeds. The generative propagation of lerak must use seeds that are pretty old and healthy. The seeds to be sown were previously stored in a shady place, periodically moistened, and then seeded until they became seeds. Lerak plant seeds resulting from generative propagation can be moved to a broader area of cultivation when the plant is 3 months old.[27]

The conservation of the lerak plant in Jatimas, Mijen, Semarang is carried out by the Padepokan mBuritan farming community and several Jatimas communities. Not too many people participate in lerak plant conservation activities due to the Covid-19 pandemic, which is to avoid large crowds. In the following, documentation is presented in Figure 4 when the community carried out conserving the lerak.

[27] Udarno, L. Lerak (*Sapindus rarak*) Tanaman Industri Penggantu Sabun. Bogor : Badan Penelitian dan Pengembangan Perkebunan. *Warta Penelitian dan Pengembangan Tanaman Industri* 15, no. 2 (2009).

Figure 4. *(a) Making planting media, (b) Lerak planting. (Source: Research document, 2021)*

In addition, the community service team also conducted an ethnobotanical study of the lerak plant (*Sapindus rarak* DC) in Jatimas, Mijen, Semarang to document local community knowledge. Ethnobotany is a discipline that studies the relationship between humans and plants. Ethnobotany comes from two words, namely 'ethno' (study of ethnicity or society) and 'botany' (study of plants).[28] The discipline of ethnobotany revolves around the use of plants by specific communities or ethnicities, which can improve human life.[29] Documentation of community knowledge is done by conducting observations and interviews. Interviews were conducted with key informants and members of the Padepokan mBuritan farming community.

Based on the results of interviews and direct observations with the people of Jatimas who are members of the Padepokan mBuritan farming community, it turns out that not many people know, let alone use the lerak plant. Therefore, the ethnobotanical study was carried out only with the lerak farming community, namely Padepokan mBuritan. The observations and interviews show that the lerak plant is commonly used by the people of Jatimas as herbal soap, washing material for batik cloth and jewelry, and natural insecticides. The following documentation shows the results of making lerak herbal soap and spraying lerak fruit insecticides, illustrated in Figure 5 below.

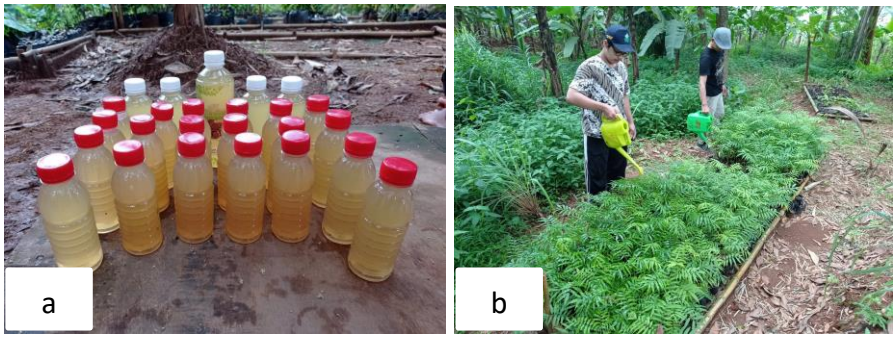


Figure 5. *(a) Lerak herbal soap product, (b) Watering plants using insecticide lerak.*

In addition, lerak wood can also be used as a building material. The stems are straight, round, and have a hard texture suitable for building materials (Singh & Sharma, 2019). However, the community has not been able to use it because there are no lerak plants that have grown up. Based on this, the community service team invited the Jatimas community to carry out generative conservation.

[28] Cotton, C. *Ethnobotany: Principles and Aplications*, (New York (US): John Wiley & Sons Inc, 1996).

[29] Kandowangko, Novri.Y, Margaretha Solang, Jusna Ahmad. *Kajian Etnobotani Tanaman Obat Oleh Masyarakat Kabupaten Bonebolango Provinsi Gorontalo.* Laporan Penelitian. Gorontalo: Jurusan Biologi, Fakultas Matematika dan IPA, Universitas Negeri Gorontalo (2011).

Discussion

Observation of the Program Location

Observation activities were carried out to determine the condition of the service location. Jatimas Mijen Housing Semarang was chosen as the location for the service because it has the potential for lerak plants to be conserved. The Jatimas housing estate, adjacent to the Jatibarang reservoir, also has a reasonably large land area usually managed by the local community by planting several plants, such as bananas, chilies, cassava, etc. guava and papaya. However, there is also land that has not been used as a nursery, one of which is the lerak plant.

Efforts to plant perennials such as lerak plants also need to be carried out around Jatimas housing. This is because more land management is for growing consumption crops only. Seeing the condition of the soil in the form of terraces, landslides can occur during the rainy season. So that planting lerak will be very useful, namely to minimize the occurrence of landslides.

Program Implementation:

Ethnobotany of Lerak (Sapindus rarak DC)

Ethnobotany is an interdisciplinary study of how people from certain cultures and regions use native plants, focusing on how humans use, manage, and perceive plants, such as food, medicine, divination, cosmetics, and coloring, textiles construction, clothing. Rituals and in social life. The status of ethnobotany as a science does not experience problems. Still, the level of the object of research is very vulnerable due to the rapid rate of erosion of natural resources, mainly flora and traditional knowledge about how to use plants from certain ethnic groups. So efforts to document local community knowledge about a particular plant need to be done. Documentation can be in the form of photos, written documents, magazines, documentaries, and herbariums.

Ethnobotanical studies were conducted directly on farming communities that cultivate lerak. The ethnobiological approach is used to focus on local community knowledge about the lerak plant and its management (utilization).[30] The data collection technique used the direct observation method on how the Padepokan mBuritan farming community processed and utilized the lerak plant. Then, semi-structured interviews were also conducted to dig deeper into information regarding the community's use of the lerak plant. Interviews were conducted with key informants and members of the Padepokan mBuritan farming community. The respondents of the ethnobotany research were male with ages ranging from 30-40 years.

Based on the results of interviews and direct observations with the people of Jatimas who are members of the Padepokan mBuritan farming community, it turns out that not many people know, let alone use the lerak plant. Therefore, the ethnobotanical

[30] Purwanto, Y., & Munawaroh, E. Etnobotani jenis-jenis Pandanaceae sebagai bahan pangan di Indonesia. Berkala Penelitian Hayati A, 5, (2010):97-108

study was carried out only with the lerak farming community, namely Padepokan mBuritan. The results of the ethnobotany study show that the lerak plant is used by the people of Jatimas as herbal soap, washing material for batik cloth and jewelry, and natural insecticides.

Lerak Herbal Soap (Sapindus rarak DC)

One of the lerak (Sapindus rarak DC) uses by the Padepokan mBuritan farming community is to make herbal soap. The plant organ used to make herbal soap is part of the lerak fruit. Herbal soap from lerak fruit is commonly used for washing hair, batik cloth, jewelry. Rural people use lerak herbal soap to wash their hair to avoid dandruff and dry hair. Lerak fruit can be used as a recommendation for natural soap ingredients for cleaning batik cloth.[31] Soap from lerak fruit has been proven to maintain color and make batik cloth cleaner and brighter.[32]

Making lerak herbal soap is relatively easy and only requires a few ingredients and the tools used are also simple. 400 grams of ripe lerak fruit is separated from the seeds, then soaked in 10 liters of clean water for 24 hours. After washing, the lerak fruit is kneaded until it foams and boiled for about 20-30 minutes. Then the boiled lerak fruit is left to cool, then packaged in bottles, and the lerak herbal soap is ready to be used. The stages of making 10 liter lerak herbal soap are presented in Figure 6 below.

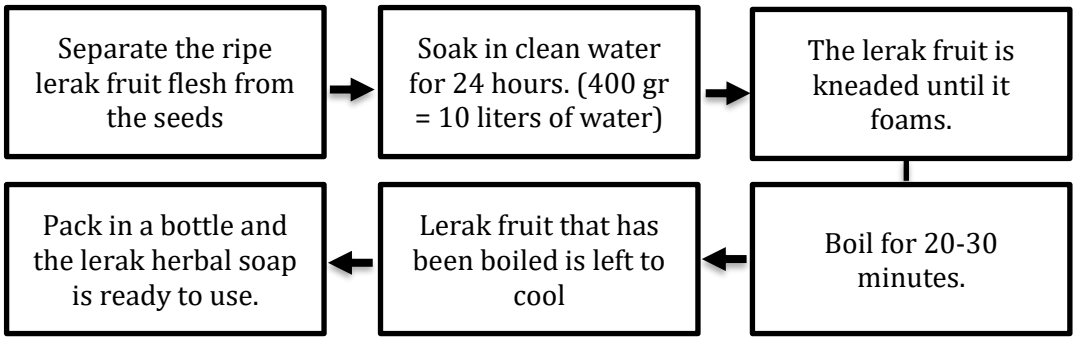


Figure 6. The procedure for making lerak herbal soap

Lerak fruits extracted using 96% ethanol solvent contains several compounds, including alkaloids, saponins, tannins, quinones, phenols, and terpenoids.[33] The test using thin-layer chromatography showed saponin activity which was indicated by the presence of purple spots. The content of saponin compounds in the ethanolic extract of lerak fruit is relatively high, with a foam index value of 20,000, fish index 8,000, and homolytic index of 2,500. This saponin compound will produce foam and can be used as a natural detergent. Lerak fruit herbal soap is not only beneficial for washing clothes and hair, but it is also used to restore the brightness of dirty ornaments from jewelry such as gold, silver, and other precious metals.[34]

[31] Muttafaq, M. F., Prasetyo, M. A., & Radianto, D. O. Perbandingan buah lerak (Sapindus rarak De Candole) dengan daun waru (*Hibiscius tiliaceus*) dalam mempertahankan warna pada kain batik. *In Prosiding Seminar Nasional Pendidikan Biologi V 2019*. UMM (2020).

[32] Kirtikar, K. R., & Basu, B. D. *Indian medicinal plants*. Allahabad: BLM Publication (1991).

[33] Fajriaty, I., Hariyanto, I. H., & Haryanto, Y. Anti-fertility effect of ethanol extract of lerak (Sapindus rarak DC) fruits in female Sprague Dawley Rats. *Nusantara Bioscience* 9, no. 1 (2017): 102-106.

[34] Singh, N., Kaur, A., & Yadav, K. A reliable in vitro protocol for rapid mass propagation of Sapindus mukorossi Gaertn. *Nature & Science* 8 (2010): 41–47.

Natural Insecticide Lerak (Sapindus rarak DC)

The Padepokan mBuritan farming community also uses lerak fruit as a natural insecticide. Saponin content is a toxic active compound that has the potential as an insecticide. Insecticides are poisonous substances commonly used in killing and controlling pests. Using lerak fruit as an insecticide is by dissolving 10 grams of powder from the dried lerak fruit and seeds in 90% 100 ml ethanol[35]. Parts of the lerak plant that can be used as an insecticide are the fruit and leaves. The pulp of the fruit can also use the leftovers from making lerak herbal soap. The lerak fruit and leaves are cut into small pieces, then add water and probiotics. This probiotic serves as a starter in the fermentation process. Then all the ingredients are stirred until evenly distributed and left for about three months. The stages of making lerak natural insecticide can be seen in the chart presented in Figure 7. When applied as an insecticide, 30 ml of fermentation is diluted first using one liter of water. After that, the insecticide made from natural lerak plants is splashed on the plants.

Figure 7. The procedure for making lerak's natural insecticide

Mediana's (2014) research on the effect of lerak extract on larvae of *Crocidolomia pavonana*, commonly found as a pest in Brassicaceae plants that can kill and inhibit the survival of these larvae[36]. The lerak extract that is effective for use as an insecticide has been heated at a temperature of 40^0C and only has a shelf life of 7 days. The increase in temperature makes the insecticide more effective because the temperature rise will increase the compound's solubility in the solvent. At the same time, the storage period is faster due to the possibility of microbes breaking down the lerak extract. Extracts from lerak fruit, apart from being an insecticide, can also be used as a repellent or to repel insects[37]. The repellent power of lerak fruit extract is the most effective, with a

[35] Novizan. *Membuat dan Memanfaatkan Pestisida Ramah Lingkungan.* (Tangerang PT Argo Media Pustaka 2002).

[36] Mediana, G., & Prijono, D. Pengaruh Pemanasan Dan Penyimpanan Terhadap Aktivitas Insektisida Ekstrak Lerak (*Sapindus rarak*) Pada Larva *Crocidolomia pavonana* (F.)(LEPIDOPTERA: CRAMBIDAE). *Agrovigor: Jurnal Agroekoteknologi* 7, no. 2 (2014): 90-98.

[37] Suryaningsih, Siti., Rochman, N., & Setyono. Daya Repellent Ektrak Buah Lerak (*Sapindus rarak* DC.) dan Ekstrak Daun Kirinyuh (*Chromolaena odorata* L.) Terhadap Hama Gudang *Callosobruchus maculatus* F. *Jurnal Agronida* 3, no.1 (2017): 36-45.

concentration of 4.5% at 77.9%. The research was tested on the pest *Callosobruchus maculates*, which often causes crop damage to green beans.

Lerak Conservation (*Sapindus rarak* DC)

Conservation can be interpreted as an effort that aims to preserve the environment. Environmental conservation carried out can be planting perennials, grasses and making terraces and buildings to prevent erosion. The purpose of conservation efforts or reforestation of the area is to support the sustainability of environmental ecosystems.[38] Conservation activities can also be used as one of the preventive measures taken to overcome environmental problems such as natural disasters.[39]

Lerak plant conservation begins with making planting media. The planting medium used to plant lerak seeds is a mixture of roasted husks, humus soil, and soil. Planting media used to plant seeds generally is easy to obtain, cheap, loose, and fertile. In addition, the main factors for plant growth must also be available in growing media, such as water, air, and nutrients. The utilization of roasted husks from rice husk waste as a planting medium is believed to increase the availability of nutrients, increase the ability of the soil to hold water and improve soil structure. It can also improve drainage and water aeration.[40]

The use of burnt husks and humus soil can function as adsorbents to reduce metal levels. Burnt husks and humus soil have properties that can exchange ions, reducing levels of toxic and hazardous waste metals, one of which is chromium metal (Cr).[41] Humus soil produced from the weathering process of organic matter is a source of negative charge on the soil to help retain nutrients and water.[42]

Lerak plant seeds take about 2-3 months to be planted in the ground directly. Assistance for caring for lerak plant seeds needs to be carried out on an ongoing basis. Training on making lerak herbal soap and lerak insecticide also need to be done for the wider community. In addition, a more in-depth research study is necessary to determine the effectiveness of herbal soap products and lerak fruit insecticides made by the Padepokan mBuritan farming community.

Activity Evaluation

[38] Setyowati, D. L. Upaya Konservasi Lingkungan pada Kawasan Industri Candi Kota Semarang. Indonesian Journal of Conservation 3, no.1 (2014).

[39] Adikusuma, F. A, "Implementasi Gerakan Konservasi Alam Dalam Meningkatkan Civic Responsibility: Studi Kasus di Kabupaten Kuningan, Jawa Barat" (Universitas Pendidikan Indonesia, 2019), Doctoral dissertation.

[40] Sofyan, S.E., Riniarti, M., & Duryat. Pemanfaatan Limbah Teh, Sekam Padi, dan Arang Sekam Sebagai Media Tumbuh Bibit Trembesi (Samanea saman). *Jurnal Sylva Lestari* 2, no.2 (2014): 61-70.

[41] Riapanitra, A & Andreas, R. Pemanfaatan Arang Batok Kelapa dan Tanah Humus Baturraden untuk Menurunkan Kadar Logam Krom (Cr). *Molekul* 5, no.2 (2010): 66-74.

[42] Kumalasari, S.W., Syamsiyah, J., & Sumarno. Studi Beberapa Sifat Fisika dan Kimia Tanah pada Berbagai Komposisi Tegakan Tanaman di Sub Das Solo Hulu. *Jurnal Ilmiah Ilmu Tanah dan Agroklimatologi* 8, no. 2 (2011): 119-124.

The generative conservation of the lerak plant by the Jatimas Mijen community raises awareness to conserve biodiversity. This can be seen from the enthusiasm of the people who take part in lerak plant conservation activities. In addition, the formation of the Padepokan mBuritan Farmer Community in Jatimas Mijen also shows the community's concern for carrying out conservation movements. After the lerak conservation training activity, the service team evaluated the activities. The results of the evaluation of lerak conservation training activities indicate that there are several obstacles in the implementation of the activities.

The main obstacle in developing lerak plants in Semarang City is the lack of attention from parties involved in agricultural activities, including those who hold policies in carrying out conservation, namely the government. Contributing thoughts and taking policy steps need to be done in the development of lerak plants. If this effort is not carried out, it is certain that the existence of lerak plants in our country will be increasingly rare and may even become extinct in the future.

Conclusion

Based on the results of community service-based research that has been carried out, it can be concluded that there are two essential points. The first point, through a community service program in the form of generative lerak conservation training, the community in Jatimas can understand that the lerak plant is a plant that is already rare and needs to be conserved. Second point, The ethnobotanical study shows that the Jatimas people who are members of the Padepokan mBuritan farming community after the service program is implemented, the community can use the lerak as a herbal soaps, washing materials for batik cloth and jewelry, as well as natural insecticides.

After closing the training program and community assistance related to lerak plant conservation, it is hoped that the community will be able to follow up the program independently by always taking care of the lerak plant seeds so that the quality of the lerak plant will be better. Local knowledge about the use of lerak plants in herbal soaps and natural insecticides must be preserved by the next generation in Jatimas Mijen.

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