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Utilization of Lemongrass Stem Extract (Cymbopogon citratus) as an Active Ingredient in the Production of Environmentally Friendly Mosquito Repellent Spray

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ABSTRACT
This community service activity aimed to introduce the use of lemongrass stalks (Cymbopogon citratus) as a botanical material for preparing a spray formulation while promoting education on mosquito-related prevention. The activity was scheduled and documented on September 28, 2026, in Sumber Mulyo Rejo Village, using community outreach and hands-on practice. Photographic documentation shows the preparation and cutting of lemongrass, boiling, handling of the resulting liquid, and filling spray bottles. A lemongrass-based spray preparation was produced, and the organizers reported active participation and a positive community response. Verified attendance figures, exact formulation quantities, quality-test results, and mosquito-repellency measurements were unavailable. Therefore, the activity does not establish product efficacy or safety. The practical session illustrates the potential of local-plant processing as a community learning activity; process standardization and quality, safety, and efficacy assessments remain necessary before wider use can be recommended.
Keywords: community service; lemongrass; Cymbopogon citratus; spray preparation; community education.

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INTRODUCTION

Mosquitoes are insects that can disturb human comfort and serve as vectors of various diseases, including dengue fever (Dengue Hemorrhagic Fever/DHF). Dengue prevention requires continuous efforts through environmental management and mosquito nest eradication. One of the recommended preventive measures is the implementation of the 3M Plus movement, which includes draining water containers, covering water storage facilities, recycling or reusing items that may collect rainwater, and implementing additional mosquito prevention measures. Therefore, public education regarding mosquito control is essential to increase awareness and encourage community participation in preventing dengue transmission (Ministry of Health of the Republic of Indonesia, 2019).

In addition to environmental management, the use of plant-based ingredients has attracted attention as an alternative approach to developing mosquito repellent products. Natural ingredients derived from plants are increasingly explored because many plants contain bioactive compounds and volatile components that may have potential applications in household products. Introducing plant-based mosquito repellents can also serve as an educational approach to encouraging communities to recognize and utilize locally available natural resources.

Lemongrass (Cymbopogon citratus) is an aromatic plant commonly found in Indonesian households and widely used in traditional practices. Its distinctive aroma is associated with the presence of volatile compounds contained in its essential oil. These characteristics make lemongrass a potential natural ingredient for further exploration in the development of mosquito repellent formulations. In addition, its availability and familiarity among community members make it relatively easy to introduce as an educational material for environmentally conscious product development.

Lemongrass contains essential oil components that have been widely studied for their potential biological activities. The essential oil obtained from lemongrass has attracted interest because of its aromatic characteristics and potential application in insect-repellent products. Previous studies have discussed lemongrass as a source of essential oil and its potential use in developing products derived from natural ingredients (Ma'mun & Nurdjanah, 1993; Budiman & Rahmawati, 2016).

However, the preparation method is an important factor that must be considered when developing lemongrass-based mosquito repellent products. Essential oil obtained through distillation differs from an aqueous extract produced through boiling. These two preparation methods may produce different chemical compositions and concentrations of active compounds. Therefore, the effectiveness of an aqueous lemongrass preparation cannot automatically be equated with that of lemongrass essential oil.

One practical approach to introducing the utilization of lemongrass is through the preparation of a mosquito repellent spray. Spray formulations are relatively simple to prepare, easy to apply, and can be introduced as an educational product using materials available in the surrounding environment. Through this activity, participants can learn about the potential utilization of lemongrass stems as plant-based ingredients while gaining practical knowledge about simple product preparation.

The development of lemongrass-based mosquito repellent spray also provides an opportunity to introduce the concept of environmentally conscious household products. By utilizing locally available plants, communities can gain insights into alternative uses of natural resources that are commonly found around their homes. Nevertheless, the description of a product as environmentally friendly should be supported by appropriate assessments, including its composition, safety, environmental impact, and effectiveness.

Several community service publications have discussed educational activities and demonstrations related to the preparation of lemongrass-based mosquito repellent sprays. These activities generally emphasize the introduction of natural ingredients, practical preparation techniques, and the potential application of plant-based products in everyday life (Broto et al., 2021; Nuh Siagian et al., 2023; Haruna et al., 2025). Such initiatives demonstrate that introducing natural mosquito repellent products can be integrated into community education and practical learning activities.

In this context, the activity conducted in Sumber Mulyo Rejo Village focused on introducing lemongrass as a locally available plant with potential applications in the preparation of mosquito repellent spray. The activity involved providing information about the importance of mosquito control, introducing lemongrass as a natural ingredient, and demonstrating a simple preparation process. This approach was intended to connect theoretical knowledge about mosquito prevention with practical activities that could be understood and followed by community members.

The implementation of this activity also emphasized the importance of utilizing locally available natural resources through simple and accessible methods. By introducing the preparation of lemongrass-based spray, participants were expected to gain additional knowledge about the potential use of household plants in developing alternative products. Furthermore, the activity provided an opportunity to encourage greater awareness of environmental health and the importance of maintaining clean surroundings to reduce potential mosquito breeding sites.

Nevertheless, the preparation of lemongrass-based mosquito repellent spray should be understood as an educational and exploratory activity rather than a proven mosquito control intervention. Without laboratory testing, the concentration of active compounds, repellent duration, mosquito-repelling effectiveness, and product safety cannot be conclusively established. Therefore, the use of this preparation should not replace recommended mosquito prevention measures, particularly the 3M Plus movement and other public health interventions.

Based on this background, this article aims to describe the utilization of lemongrass stem extract (Cymbopogon citratus) as a natural ingredient in the preparation of environmentally conscious mosquito repellent spray in Sumber Mulyo Rejo Village. The article focuses on the preparation process, the educational value of utilizing locally available plants, and the potential development of simple plant-based household products. It also presents the documented activities and identifiable outcomes while acknowledging the limitations of the available data to ensure that the conclusions remain consistent with the evidence obtained.

METHODS

The activity was conducted on September 28, 2026, in Sumber Mulyo Rejo Village by a team from STKIP Budidaya Binjai. The activity employed a combination of socialization and hands-on practice in preparing mosquito repellent spray using lemongrass as a natural ingredient. Information regarding the date, location, objectives, and team composition was based on the official assignment letter and permission letter issued by the Institute for Research and Community Service (LPPM). Meanwhile, information about the practical implementation was compiled from the organizers' accounts and photographic documentation.

The implementation began with an introduction to the potential utilization of lemongrass and the importance of preventing mosquito-related health problems. Participants were introduced to lemongrass as a locally available plant that could be processed into a simple household product. This introductory session aimed to provide an understanding of the relationship between natural resource utilization and environmental health, particularly in efforts to prevent mosquito disturbances.

The practical session involved several stages, including preparing the ingredients, cutting the lemongrass stems into smaller pieces, processing the plant material through

boiling, and handling the resulting liquid before transferring it into spray bottles. The photographic documentation showed the presence of a liquid preparation derived from lemongrass and the use of spray containers as the final packaging. However, the exact weight of lemongrass, volume of water, boiling temperature and duration, volume per bottle, and total number of products were not recorded in verifiable detail. Therefore, the preparation process is presented as a practical demonstration rather than a standardized formulation.

The activity was evaluated descriptively through observations of the documented preparation process and information provided by the organizers regarding community participation. However, no pre-test or post-test instruments, verified attendance records, physicochemical tests, microbiological examinations, or mosquito-repellent effectiveness tests were available. Consequently, the reported results are limited to the implementation of the practical activity and the preparation of the liquid product shown in the documentation. No conclusions regarding its effectiveness, safety, or long-term stability are drawn without supporting laboratory evidence.

RESULTS AND DISCUSSION

Implementation of Lemongrass Processing Socialization and Practical Activities

The activity combined an explanation of the potential uses of lemongrass with a practical demonstration of preparing a liquid formulation in spray bottles. The documentation shows participants preparing the lemongrass stems by cutting them into smaller pieces. Subsequently, the plant material was placed in a pot for the boiling process. After processing, the resulting liquid was handled and transferred into spray bottles. This sequence demonstrates that the activity involved direct hands-on practice rather than merely delivering information through an oral presentation.

Figure 1. Cutting lemongrass stems during the ingredient preparation stage





Figure 2. Processing lemongrass stems through boiling

Products Produced and Community Participation

The documentation shows that the processed lemongrass liquid was transferred into containers and spray bottles. Therefore, the practical outcome that can be confirmed is the production of a lemongrass-based spray preparation. According to the organizers, community members actively participated in the activity and demonstrated positive responses. However, this assessment is descriptive and has not been supported by questionnaires or measurements of increased knowledge.



Figure 3. Participant involvement in lemongrass stem processing



Figure 4. Filling the processed liquid into spray bottles

Interpretation of Results and Limitations of Product Development

The utilization of lemongrass in this activity has educational value because it connects a familiar plant material with simple processing and packaging techniques. Through this activity, community members were introduced to the potential use of locally available plants as ingredients for developing household products. The practical demonstration also provided an opportunity for participants to understand the basic stages involved in transforming plant materials into a liquid preparation.

The production of a liquid lemongrass-based spray represents an identifiable practical outcome of the activity. However, successfully producing a liquid preparation does not necessarily demonstrate that the product is capable of repelling mosquitoes. The presence of lemongrass-derived compounds in a preparation cannot independently establish its effectiveness without appropriate testing.

Previous literature discussing lemongrass extracts and essential oils provides a scientific basis for exploring their potential applications in insect-repellent products. Nevertheless, findings from previous studies cannot be directly applied to the formulation

produced in this activity because differences in extraction methods, ingredient concentrations, and preparation techniques may influence the characteristics of the final product (Budiman & Rahmawati, 2016; Sari et al., 2023).

The aqueous solution obtained through boiling may also undergo changes in quality during storage. Since the preparation does not necessarily contain preservatives, the possibility of microbial contamination and changes in its physical characteristics needs to be considered. Therefore, appropriate storage conditions and product quality assessments are important aspects of further development.

Further product development requires a standardized formulation, including consistent ingredient proportions and processing procedures. Physical characteristic examinations, stability assessments, microbiological testing, and safety evaluations based on the intended route of application are also necessary. In addition, mosquito-repellent effectiveness testing is required to determine whether the preparation can provide measurable protection against mosquito bites.

Another important consideration is that the use of plant-based ingredients does not automatically establish that a product is safe for all users or environmentally friendly. Such claims require supporting evidence obtained through appropriate safety and environmental assessments. Consequently, the lemongrass-based spray produced in this activity should be regarded as an initial educational product that requires further research and development before broader application.

This activity has several reporting limitations, including the absence of verified participant numbers, detailed formulation measurements, total product quantities, laboratory testing results, and quantitative evaluations of changes in participants' knowledge. Therefore, the findings are presented as a descriptive report of a community service activity rather than an experimental study examining mosquito-repellent effectiveness. These limitations also provide opportunities for future activities to incorporate standardized production procedures, product testing, and systematic participant evaluations.

CONCLUSION

The community service activity conducted in Sumber Mulyo Rejo Village on September 28, 2026, successfully implemented socialization and practical activities on processing lemongrass stems into a liquid preparation packaged in spray bottles. The documentation showed several stages of the process, including cutting the lemongrass stems, boiling the plant material, and packaging the resulting liquid. According to the organizers, community members participated actively and demonstrated positive responses throughout the activity. This activity served as an educational medium for introducing the utilization of locally available plants as potential ingredients for household products.

The activity provided practical knowledge about the simple processing of lemongrass and its potential application in developing plant-based mosquito repellent products. However, the effectiveness, safety, stability, and environmental friendliness of the resulting spray cannot yet be conclusively established without further testing. Therefore, additional research involving standardized formulations, laboratory examinations, and mosquito-repellent effectiveness tests is necessary to determine the product's suitability for broader application.

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