

COMMUNITY EMPOWERMENT POST-DISASTER AT KHOIROTUL USROH ISLAMIC BOARDING SCHOOL THROUGH SKIN DISEASE EDUCATION AND PRODUCTION OF TRANSPARENT SOAP AND RED GALANGAL (*Alpinia purpurata*) OINTMENT

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Abstract

Floods occurring near river basins severely impact environmental sanitation and dermatological health in affected communities. Humid, overcrowded post-disaster conditions increase the incidence of skin diseases caused by fungal and bacterial infections. This community service program aimed to empower students (santri) and teachers at the Khoirotul Usroh Islamic Boarding School in Langkat Regency through skin disease prevention education and training in the production of transparent soap and topical ointment using active extracts of red galangal (*Alpinia purpurata*) rhizomes. The training involved 106 participants divided into two hands-on workgroups: female students (n=48), who focused on transparent soap formulation, and male students (n=58), who focused on topical ointment formulation (20-gram pots). Program evaluation included pre- and post-tests to measure knowledge acquisition, along with organoleptic quality testing of the produced preparations. Results showed an increase in average knowledge scores in both groups: the female student group recorded an average increase of 8.75 percentage points (from 74.38% to 83.13%), while the male student group recorded a 4.22 percentage point increase (from 79.66% to 83.88%); no formal inferential statistical test was conducted to confirm significance. The transparent soap began to solidify within 1 hour and fully hardened within 24 hours, yielding a clear appearance, stable foam, and pleasant fragrance. The topical ointment (20 g/pot) displayed a smooth, homogeneous texture, a cooling sensation upon application, and a distinctive herbal aroma. The school management demonstrated strong commitment to the sustainable, independent production and use of these herbal products.

Keywords: *Alpinia purpurata*, Community Service, Health Education, Post-Disaster, Transparent Soap, Topical Ointment.

INTRODUCTION

Flood disasters in North Sumatra significantly impact public health and environmental conditions. High-density residential areas and religious educational institutions, such as Islamic boarding schools (pesantren) situated near river basins, frequently face compromised clean water access and disrupted sanitation infrastructure. The damp, unsanitary, and congested post-disaster environment accelerates the emergence and transmission of environmentally mediated skin conditions, including irritant contact dermatitis, scabies, fungal infections (pityriasis versicolor, tinea), and secondary bacterial infections (Roy & Kurien, 2022; Huang et al., 2016; World Health Organization, 2018). Khoirotul Usroh Islamic Boarding School, located in Stabat District, Langkat Regency, represents a flood-affected community requiring post-disaster health recovery interventions. In crowded boarding dormitories, shared bathing facilities and limited personal hygiene practices exacerbate skin disease transmission among students (Nasution & Asyary, 2022; Sundawa et al., 2021). Relying solely on curative clinical treatments is insufficient due to restricted healthcare access following disasters. Consequently, community-based promotive and preventive approaches are vital. Indonesia possesses rich megabiodiversity, including medicinal plants such as red galangal (*Alpinia purpurata*). Empirical and scientific literature indicates that red galangal contains bioactive compounds—including eugenol, cineole, flavonoids, phenols, and terpenoids—with antibacterial and antifungal properties (Sujono et al., 2019; Khilma et al., 2020; Ulhaq et al., 2023). Flavonoids in red galangal rhizomes are reported to act by shrinking fungal cell walls or membranes, disrupting cell permeability and inducing cell lysis (Juariah, 2023). This extract shows

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promise for processing into personal hygiene preparations, such as transparent soap, and topical care preparations, such as ointment. This community engagement program transferred science and technology by integrating post-flood skin health education with hands-on training for producing transparent soap and topical ointment containing *Alpinia purpurata* extract. This initiative directly supports the Sustainable Development Goals (SDGs), specifically Goal 3 (Good Health and Well-being), Goal 4 (Quality Education), and Goal 15 (Life on Land).

METHODOLOGY

The activity was conducted at the Khoirotul Usroh Islamic Boarding School, Langkat Regency, North Sumatra. The target population comprised students (santri) and teaching staff. The implementation proceeded through four structured phases.

1. Preparation and Material Procurement: Included field observations, partner permits, and educational booklet development. Prior to implementation, permission for participation and for photographic/video documentation of students was obtained from the boarding school's leadership on behalf of the santri. Standardized *Alpinia purpurata* rhizome extract was sourced from PT Berkah Alam Nusantara, accompanied by the supplier's product specification sheet; specific standardization parameters (e.g., total flavonoid or phenolic content, extraction method) were not detailed in the materials available for this manuscript and should be reported in future publications to support reproducibility. Supporting materials—including transparent soap bases, surfactants, ointment bases (vaseline album/paraffin), hot plates, digital scales, mortars and pestles, and 20-gram plastic ointment pots—were provided by the team.

2. Health Education: Delivered interactive lectures on post-flood skin conditions, risk factors, personal hygiene maintenance, and the therapeutic bioactivity of red galangal extract.

3. Hands-on Training and Formulation: Participants were divided into two workgroups: a Transparent Soap Workgroup, comprising 48 female students who practiced melting soap bases under controlled temperatures, incorporating the extract, mixing to homogeneity, pouring into molds, and packaging; and a Topical Ointment Workgroup, comprising 58 male students who practiced weighing ointment bases, gradually triturating the extract using mortars and pestles, and filling the finished preparation into 20-gram containers.

4. Evaluation and Physical Testing: Knowledge enhancement was evaluated using pre-test and post-test questionnaires. Physical organoleptic evaluations (clarity, foam stability, setting time, texture, scent, and cutaneous sensation) were conducted once on the student-made products immediately following production; no shelf-life or stability testing over time was performed.

RESULTS AND DISCUSSION

Training Execution and Product Formulation

The training activities proceeded smoothly with active participant engagement. The educational session provided essential literacy regarding post-flood dermatological risks and personal hygiene practices, as illustrated in Figure 1.



(a)



(b)

Figure 1. Health education session on post-disaster skin disease prevention for students at Khoirotul Usroh Islamic Boarding School: (a) interactive lecture session; (b) group discussion with male students.

Workgroup segmentation effectively facilitated technology transfer and independent practice, allowing participants to directly apply theoretical concepts (Figure 2):

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Transparent Soap Formulation (Female Students): The 48 female students successfully melted the soap base under controlled thermal conditions, incorporated the standardized extract, and poured the mixture into molds without excessive air bubble entrapment. Initial setting occurred within approximately 1 hour, with complete hardening achieved after 24 hours at room temperature.

Topical Ointment Formulation (Male Students): The 58 male students carried out base-extract homogenization via trituration using mortars and pestles. Participants hygienically filled the finished ointment into 20-gram capacity plastic pots.



(a)



(b)

Figure 2. Hands-on formulation training: (a) Female students preparing transparent soap; (b) Male students tritulating red galangal ointment using mortar and pestle.

Knowledge Acquisition Evaluation

Comparative pre-test and post-test evaluation results are summarized in Table 1.

Table 1. Participant Knowledge Scores Pre- and Post-Education

Participant Group	Target Formulation	Mean Pre-Test Score (%)	Mean Post-Test Score (%)	Increase (percentage points)
Female Students (n = 48)	Transparent Soap	74.38	83.13	8.75
Male Students (n = 58)	Topical Ointment (20 g)	79.66	83.88	4.22

As shown in Table 1, both groups showed an increase in average knowledge scores after the education session. The female student group's mean score rose from 74.38% to 83.13%, an increase of 8.75 percentage points (a relative increase of approximately 11.8%). The male student group's mean score rose from 79.66% to 83.88%, an increase of 4.22 percentage points (a relative increase of approximately 5.3%). These results suggest that the health education materials and technical formulation demonstrations were understood by participants; however, no paired-sample statistical test (e.g., paired t-test or Wilcoxon signed-rank test) was performed on the pre-/post-test data, so the improvement cannot be described as statistically significant, and this should be addressed in future evaluations of the program.

Organoleptic and Physical Quality Assessment

Organoleptic evaluations of the finished preparations are presented in Table 2. The final products were packaged in designated containers, with physical characteristics considered desirable and aesthetically acceptable by the evaluation team (Figure 3).



(a)

(b)

Figure 3. Final packaged products: (a) Clear red galangal transparent soap; (b) Red galangal topical ointment in 20-gram pots.

Table 2. Organoleptic Characteristics of Red Galangal Soap and Ointment

Product Type	Evaluated Parameter	Organoleptic Observation
Transparent Soap	Clarity / Color	Clear / Transparent
	Curing Time	~1 hour (initial set) / 24 hours (fully hardened)
	Foam Stability	Abundant and stable
	Fragrance	Fresh / pleasant
Topical Ointment	Texture & Homogeneity	Smooth and homogeneous (non-gritty)
	Cutaneous Sensation	Cool, soothing feel upon application
	Fragrance	Distinctive herbal red galangal scent

The transparent soap produced a clear appearance with stable foaming properties, suitable for cleansing post-flood skin contaminants. The 20-gram topical ointment demonstrated uniform spreadability and homogeneity. Its cooling sensation is a property commonly reported for topical preparations containing essential-oil-bearing rhizome extracts and may contribute to comfort during application, consistent with the reported antifungal and antibacterial bioactivity of *Alpinia purpurata* rhizome extract described in previous laboratory studies (Sujono et al., 2019; Ulhaq et al., 2023). These organoleptic results are broadly consistent with other community-based transparent soap formulation programs using plant extracts, such as the Moringa-leaf-based antibacterial transparent soap reported by Ria et al. (2025), which similarly reported clear appearance and stable foam as indicators of acceptable product quality. It should be noted that the organoleptic assessment in this program was conducted once, shortly after production, and did not include microbiological testing (e.g., antibacterial or antifungal zone-of-inhibition assays) or shelf-life/stability testing; such testing would strengthen future evaluations of the products' claimed therapeutic properties.

Partner Skills and Program Sustainability

Throughout the program, students displayed high enthusiasm and successfully followed formulation protocols. Participants operated laboratory and production equipment—such as digital scales, hot plates, and mortars/pestles—independently under technical guidance. This success cultivated strong commitment from the boarding school leadership to maintain ongoing production of both products. Beyond supporting internal health needs, the school plans to scale production through the Boarding School Community Enterprise (BUMP) as a sustainable herbal enterprise.

Limitations

This program has several limitations that should be considered when interpreting the results and should be addressed in future implementations: (1) knowledge gains were evaluated only through descriptive comparison of pre- and post-test means, without inferential statistical testing; (2) the standardization parameters of the *Alpinia purpurata* extract used were not fully documented in the materials available for this manuscript; (3) organoleptic and physical quality assessment of the soap and ointment was conducted once, without microbiological efficacy testing or stability testing over time; and (4) the evaluation did not include a follow-up assessment of participants' knowledge retention or actual hygiene behavior change after the training.

CONCLUSION

The community service initiative at Khoirotul Usroh Boarding School increased participants' knowledge and practical skills regarding post-disaster skin care management. Training delivered to 106 participants increased average knowledge scores across both workgroups (an 8.75 percentage-point gain in the soap group and a 4.22 percentage-point gain in the ointment group). The transparent soap achieved desirable physical quality (1-hour initial set, 24-hour full cure, high clarity, stable foam), while the 20-gram topical ointment displayed a smooth, homogeneous texture with a cooling herbal effect. Partner institutions expressed strong enthusiasm and commitment toward sustainable independent production. Future iterations of this program would benefit from inferential statistical analysis of knowledge outcomes, documented extract standardization, and microbiological or stability testing of the finished products.

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