Training on The Use of Telang Flowers as Food Coloring for Women Who Sell Traditional Foods in Kotagede

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Abstract
This community engagement project aimed to empower ten traditional food vendors in Kotagede, Yogyakarta, by training them to utilize telang (Clitoria ternatea) flowers as natural food coloring. Employing a participatory approach, the training covered health risks of synthetic dyes, the benefits and cultivation of telang flowerplants, natural dye extraction techniques, and basic product branding. Data were collected through pre- and post-tests, observation, and semi-structured interviews. Results showed a significant increase in participants' knowledge and practical skills, with post-test scores rising across all indicators. Most participants successfully applied the extract in traditional dishes and reported improved consumer interest due to the natural and visually appealing color. Some began cultivating the plants and branding their products with natural labels. Despite minor challenges regarding shelf life and packaging, the training effectively promoted innovation, health awareness, and entrepreneurship among women food vendors. This program highlights the potential of locally sourced natural ingredients in supporting sustainable, health-conscious food businesses.

Keywords: *Telang flower, natural food coloring, community empowerment, traditional food, women's entrepreneurship, Kotagede*

INTRODUCTION

The use of food coloring is a common practice in traditional and modern food production, serving not only to enhance visual appeal but also to indicate flavor, freshness, or uniqueness. In Indonesia, especially in areas with rich culinary traditions such as Kotagede, Yogyakarta, food coloring is often applied to traditional foods such as "klepon," "jenang," and "cendol." However, many local food vendors still rely heavily on synthetic dyes, which have been linked to various health risks, including allergic reactions, hyperactivity in children, and potential carcinogenicity (Yusof et al., 2020; Pratiwi et al., 2021).

Natural dyes, on the other hand, offer a safer, more sustainable alternative. Among the most promising sources of natural food dyes is the telang flowerflower (*Clitoria ternatea*), which contains anthocyanins—water-soluble pigments responsible for its vibrant blue to purple coloration depending on pH levels (Khoo et al., 2017). This plant grows well in tropical climates and is abundant in rural and semi-urban regions of Indonesia, including Yogyakarta. Several studies have highlighted the butterfly pea's strong antioxidant properties and potential for use in health-promoting foods and beverages (Lee et al., 2019; Nurdiani et al., 2022). Clitoria ternatea is not only visually appealing but also has medicinal properties and nutritional value. Research by Rahman et al. (2020) shows that extracts from telang flowerflowers exhibit antibacterial, anti-inflammatory, and antidiabetic effects. These qualities make it highly suitable for functional food development, aligning

with growing consumer demand for healthy and natural products. In Malaysia and Thailand, for instance, the use of telang flowerin drinks and desserts has become a cultural and commercial success, encouraging similar innovation in neighboring countries.

Despite its potential, awareness and application of telang flowerflower extract as a natural food colorant among traditional food sellers in Indonesia remain limited. A study by Kartini et al. (2021) noted that only 15% of micro-food entrepreneurs in Central Java had ever used natural coloring in their products, citing reasons such as lack of knowledge, limited access to raw materials, and concerns over preservation. This knowledge gap presents an opportunity for targeted community education programs, especially those focused on empowering women in culinary microbusinesses.

The empowerment of women through entrepreneurship and skill development is a key strategy for improving household income and food security. According to the United Nations (UN Women, 2022), programs that support women in food processing and marketing have direct positive effects on community resilience and economic development. In Kotagede—a region not only known for its culinary heritage but also for its strong community-based economy—such initiatives can serve as a catalyst for innovation and sustainable livelihoods. Community-based training programs have been shown to be effective in transferring knowledge and skills, particularly when combined with participatory methods and practical applications (Gunawan et al., 2023). In the context of food innovation, hands-on training in processing, packaging, and branding is essential to ensure adoption and sustainability. Studies by Setyowati & Nugroho (2022) underscore the need for continuous mentoring and locally adapted content to maximize the impact of entrepreneurship training for women.

There is also a growing interest in environmentally friendly food production methods, especially as consumers become more health-conscious and aware of the ecological impacts of synthetic chemicals. Natural dyes like those from telang flowerflowers are biodegradable and non-toxic, aligning with the principles of green food processing and sustainable development (Nguyen & Tran, 2020). Promoting their use in local food industries supports both environmental goals and cultural preservation. Furthermore, telang flowerflower's ability to change color based on pH makes it a versatile ingredient that can be creatively applied to a wide range of food products. This pH-sensitive property allows for dynamic food presentations and can serve as a natural indicator of freshness or acidity (Tan et al., 2021). Traditional foods, when enhanced with this feature, gain a modern appeal without compromising authenticity, which is essential in competitive culinary markets.

The implementation of natural dye training programs can also contribute to product differentiation. As consumer expectations evolve, small-scale food vendors must adopt unique selling propositions to remain competitive. The use of telang flowercoloring can serve this function, adding a storytelling element and a visual advantage to traditional food products (Andriani & Hasanah, 2020). With proper packaging and marketing, these naturally colored products can access broader markets, including tourism and health-conscious consumers. Previous community engagement programs in the food sector have demonstrated that even low-cost interventions can significantly increase income, consumer interest, and product quality (Lestari et al., 2021). With minimal investment, women can transform commonly available plants into high-value culinary innovations. In the case of Kotagede, where traditional culinary skills are strong but market innovation is limited, training in natural dye application could have far-reaching benefits.

Therefore, this program aims to conduct a targeted training workshop for ten women food vendors in Kotagede on the cultivation, extraction, and application of telang flowerflower extract as a food coloring. The objectives are to enhance participants' knowledge of natural food dyes, promote sustainable practices, and enable product innovation that respects local tradition while meeting modern market demands. The expected outcome is increased skill competency, improved product value, and strengthened economic resilience for female food entrepreneurs.

METHODOLOGY

This community engagement activity employed a qualitative participatory action approach, focusing on empowering traditional food-selling women in Kotagede through skill-based training on the use of telang flower (*Clitoria ternatea*) flowers as natural food coloring. The method was

designed to involve community members actively, from planning to implementation and evaluation, following the principles of community-based participatory research (CBPR), which emphasizes co-learning and mutual benefit (Minkler & Wallerstein, 2011; Gunawan et al., 2023).

The target participants were 10 women who actively run small-scale traditional food businesses within the Kotagede area. The selection criteria included: (1) being actively involved in food preparation and sales for at least one year, (2) a willingness to participate fully in the training sessions, and (3) openness to adopting new food preparation techniques. This purposive sampling approach is commonly used in community service activities to ensure the relevance and applicability of training content (Creswell, 2014).

Prior to the training, a needs assessment was conducted using informal interviews and observation to understand the participants' current practices, challenges related to food coloring, and their awareness of natural alternatives. This initial stage was crucial in designing a relevant and context-specific module (Zakaria et al., 2020). The findings indicated that most participants still relied on synthetic food dyes and were unaware of the health risks or the availability of safe natural alternatives like telang flowerflowers. The training was held over two consecutive days and included four core sessions, delivered through interactive presentations, practical demonstrations, group discussions, and hands-on practice. On the first day, Session 1 focused on theoretical knowledge about natural colorants, especially the telang flowerflower, including its health benefits, ecological sustainability, and culinary potential. This session also addressed issues of food safety and consumer health trends based on recent studies (Khoo et al., 2017; Yusof et al., 2020).

Session 2 introduced the participants to basic cultivation techniques of *Clitoria ternatea*, including how to plant, care for, harvest, and store the flowers. As this plant can be grown easily in urban home gardens or pots, this component was designed to support long-term sustainability. Participants were encouraged to establish small gardens as future dye sources. This aligns with the urban agriculture and food sovereignty movement advocated by Nugraha et al. (2021). On the second day, Session 3 covered extraction techniques using traditional tools such as blenders, filters, and basic pH modifiers (lime or vinegar). The process included making concentrated liquid extracts and powdered forms through drying and grinding. Emphasis was placed on hygiene, dosage, and storage practices to ensure consistency and safety (Rahman et al., 2020).

Session 4 emphasized branding and marketing. Participants were guided in packaging design, labeling, storytelling (e.g., "natural color, healthier life"), and basic cost-benefit analysis. Simple marketing strategies using social media, local markets, and word-of-mouth promotion were also introduced. This session was based on recommendations from studies highlighting the importance of visual branding and value-added storytelling in traditional food entrepreneurship (Setyowati & Nugroho, 2022; Andriani & Hasanah, 2020). To evaluate the effectiveness of the training, a mixed-method evaluation was employed. A pre-test and post-test, each consisting of 15 questions related to the materials taught, were given to assess cognitive learning. The scores were analyzed using descriptive statistics to compare knowledge improvement before and after the training. In addition, participants completed feedback forms and participated in semi-structured group interviews to explore their perceptions, challenges, and willingness to apply what they had learned.

The analysis of qualitative data from interviews followed thematic coding as described by Braun and Clarke (2006), focusing on emerging themes such as motivation, perceived benefits, barriers to implementation, and innovation potential. Participant responses were triangulated with facilitator field notes to increase credibility. All procedures adhered to ethical guidelines for community-based educational programs. Informed consent was obtained verbally at the start of the program. Participants were informed about the purpose of the training, how the data would be used, and were ensured anonymity and confidentiality. The project received support and approval from the community leaders of Kotagede, ensuring local cultural appropriateness and buy-in (Gunawan et al., 2023).

In summary, this methodology combined knowledge transfer, practical skill-building, and community-based empowerment in a format that was interactive, context-sensitive, and aligned with both academic and local objectives. The participatory and hands-on nature of the training was intended not only to build awareness but also to inspire innovation among traditional food vendors, ensuring sustainable application of natural food dyes within their small businesses.

RESULTS

Participant Demographics and Background

A total of 10 female participants were involved in the training program. All participants were traditional food vendors from the Kotagede area, Yogyakarta. The age range of participants was 31 to 54 years, with the majority (60%) aged between 35–45 years. Most had completed secondary school education and had been in the food-selling business for over five years. Based on the preliminary survey, 90% of participants were still using synthetic food dyes, while none had previously used telang flowerflower extract in their food products.



Figure 1. Cake making practice

Knowledge Pre-Test and Post-Test Analysis

To measure learning outcomes, a pre-test and post-test with 15 multiple-choice questions were administered before and after the training. Topics included health impacts of synthetic dyes, benefits of telang flowerflower, extraction techniques, and marketing strategies.

Indicator	Pre-Test Mean Score	Post-Test Mean Score	Score Increase
Knowledge of synthetic dye risks	5.8 / 10	8.9 / 10	+3.1
Knowledge of telang flowerflower	4.6 / 10	9.2 / 10	+4.6
Extraction techniques	3.2 / 10	8.5 / 10	+5.3
Application in food products	4.9 / 10	8.7 / 10	+3.8
Branding and storytelling	2.5 / 10	7.6 / 10	+5.1

The analysis showed a statistically significant increase in knowledge across all indicators. The largest improvement was observed in technical skills related to extraction methods (+5.3), followed by branding and storytelling (+5.1). This supports previous findings by Lestari et al. (2021) that participatory training significantly enhances microentrepreneurs' applied knowledge.

Practical Skills Assessment

During hands-on sessions, participants successfully extracted natural dye from dried and fresh *Clitoria ternatea* flowers using both cold and hot infusion techniques. Nine out of ten participants demonstrated the ability to identify the appropriate flower-to-water ratio, apply pH modifiers (lime juice or vinegar) to adjust color tone (from blue to purple) and store the extract in hygienic containers for reuse. Participants also incorporated the extract into existing food products such as *putu ayu*, *klepon*, and *serabi*. Visual observation and participant feedback showed that **100%**

of participants preferred the natural color appearance over artificial colors, 80% noted a subtle floral aroma that complemented sweet traditional foods and **60%** expressed intent to shift to full-time use of telang flowerextract due to its uniqueness and health appeal. These findings align with Rahman et al. (2020), who found that natural dye integration in traditional foods not only improves nutritional value but also enhances visual marketing appeal.



Figure 2. snacks from the training that use bayang flower coloring

Qualitative Feedback and Thematic Analysis

Feedback was collected through semi-structured group discussions and individual interviews. Thematic coding revealed five dominant themes Health Awareness**:** Participants expressed increased concern over synthetic dye use, particularly for children *"Saya baru tahu kalau pewarna sintetis bisa berbahaya. Mulai sekarang saya ingin pakai pewarna alami,"* (Participant 3); Empowerment and Confidence: Most participants reported feeling empowered to innovate and experiment with their products *"Sekarang saya jadi lebih percaya diri menjual makanan saya karena lebih sehat dan unik,"* (Participant 7); Market Differentiation**:** Several participants noted that the color-changing property of the telang flowerdye (blue to purple) attracted customer attention *"Anak-anak suka warna berubahnya, jadi lebih laku,"* (Participant 1); Challenges and Limitations: Some concerns were raised regarding the short shelf-life of liquid extract and the need for more advanced packaging tools *"Kalau bisa ajarkan juga bagaimana cara mengawetkan atau membuat bubuknya,"* (Participant 9); Follow-Up Needs: All participants requested continued mentorship and collaboration with universities or cooperatives to market their natural-dye products beyond Kotagede.

This echoes the findings of Setyowati & Nugroho (2022), who emphasized the importance of follow-up support in community empowerment programs to ensure long-term impact.

Observation of Behavioral Change

Within two weeks post-training (follow-up monitoring), it was observed that 7 out of 10 participants had fully implemented telang flowerflower extract in at least one product; 3 participants had started cultivating telang flowerplants at home; 4 participants began branding their products with a natural-food label ("warna alami, sehat alami").

These behavioral changes suggest strong short-term adoption and intention to sustain practices introduced during training. Nguyen & Tran (2020) note that when natural resources are locally available and culturally accepted, adoption rates tend to be higher in community-based interventions.

DISCUSSION

The training proved effective in enhancing participants' knowledge, skills, and attitudes regarding the use of telang flowerflowers as natural food coloring. The significant increase in post-test scores confirms the success of the knowledge transfer, while practical sessions fostered hands-on experience that contributed to behavioral change. The shift toward natural food coloring reflects

a growing trend in health-oriented consumption. As Yusof et al. (2020) noted, consumers are increasingly rejecting artificial additives in favor of safer, natural alternatives. The telang flowerflower not only fulfills this demand but also offers economic potential as a locally sourced input for product innovation. However, some limitations remain. The short shelf life of the liquid extract and limited preservation knowledge may hinder wider adoption. Future programs should include modules on dehydration techniques for making telang flowerextract powder, business modeling, and micro-packaging methods to support commercialization. In line with UN Women (2022), empowering women in food-based microenterprises enhances family income and community resilience. This training contributes to that objective by equipping women with knowledge, practical skills, and new perspectives on innovation and sustainable food practices.

CONCLUSION

The training on the utilization of *Clitoria ternatea* (telang flowers) flowers as natural food coloring for traditional food vendors in Kotagede has yielded significant outcomes in terms of knowledge enhancement, skill development, and behavioral change. Participants showed a remarkable increase in their understanding of the risks associated with synthetic dyes and the benefits of natural alternatives. Moreover, they demonstrated practical competency in extracting and applying telang flowerflower dye in traditional food products. The training empowered women vendors to innovate their food businesses by introducing healthier and more attractive alternatives that resonate with current consumer trends. The majority of participants indicated a strong intention to adopt telang flowerextract in their production practices, with several already cultivating the plants and implementing branding strategies. Nevertheless, challenges such as storage stability and limited technical equipment for preservation must be addressed in follow-up programs. Future initiatives should focus on powder extract production, sustainable packaging, and wider market access strategies. This community engagement project proves that participatory, context-sensitive training can empower local women economically and promote health-oriented practices. It underscores the role of natural resources in supporting micro-entrepreneurship and sustainable food production within culturally rich communities like Kotagede.

SUGGESTION

It is recommended to continue this program by providing further training on variations of telang flowerflower-based products, including the development of new recipes and natural preservation techniques to extend the shelf life of the products.

THANK-YOU NOTE

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