
Research Article

Formulation of Aromatherapy Candles from Agarwood (Aquilaria malaccensis) Leaf Extract as a Product Innovation and an Entrepreneurship Opportunity

Nolensah Sinaga¹, Agus Susanti^{2,*}

¹ Akademi Kesejahteraan Sosial Ibu Kartini Semarang; e-mail : susanti@aksibukartini.ac.id

² Akademi Kesejahteraan Sosial Ibu Kartini Semarang; e-mail : susanti@aksibukartini.ac.id

* Corresponding Author : susanti@aksibukartini.ac.id : Agus Susanti

Abstract: Aromatherapy is the use of essential oils derived from natural materials to improve physical and psychological well-being. One of the most popular aromatherapy products is the aromatherapy candle, which provides relaxation while creating a comfortable atmosphere. This study aimed to develop aromatherapy candles based on agarwood (*Aquilaria malaccensis*) leaf extract, evaluate product quality, analyze public acceptance, and identify their potential as an entrepreneurial opportunity. This study employed an experimental method with a descriptive approach. The research stages included the extraction of agarwood leaves through a distillation process, the formulation of aromatherapy candles, product validation by three experts using sensory evaluation, and a public acceptance test involving 40 respondents using a Likert-scale questionnaire. The results showed that the third experiment produced the best extract characteristics, including a golden-yellow color, a stronger distinctive agarwood aroma, and an oily texture. The public acceptance test indicated that the average scores for color, texture, ease of use, and aroma were 3.16, 2.90, 3.42, and 3.02, respectively, which were categorized as good to very good. These findings demonstrate that agarwood leaf extract has the potential to be used as an alternative ingredient in the production of aromatherapy candles, in addition to receiving a high level of public acceptance, the product possesses economic value and can be developed as an innovative product and entrepreneurial opportunity in the beauty, spa, wellness, and creative industries.

Keywords: Agarwood Leaf Extract; Aromatherapy Candles; Entrepreneurial Opportunity; Product Quality; Public Acceptance.

1. Introduction

In recent years, the wellness and self-care industries have experienced rapid growth due to increasing public awareness of physical and mental health. Aromatherapy products have become increasingly popular because they are believed to promote relaxation, reduce stress, and create a comfortable atmosphere in daily activities [1]. The growing demand for natural-based products has also encouraged the development of various aromatherapy innovations utilizing local herbal resources. This trend creates opportunities for the development of aromatherapy products that not only provide health benefits but also possess economic value and market competitiveness.

The utilization of natural ingredients in the development of beauty, health, and aromatherapy products has attracted considerable attention because they are considered safer, environmentally friendly, and more sustainable than synthetic materials [2]. Numerous studies have shown that plants containing essential oils and bioactive compounds have the potential to be developed into value-added products that offer functional benefits to consumers while generating promising economic returns. Furthermore, the use of natural ingredients in the aromatherapy and wellness industries is consistent with the growing consumer preference for herbal-based, natural health, and green products that support the sustainable utilization of local resources. Therefore, innovation in natural-based products represents a relevant strategy for advancing the creative, health, and entrepreneurial sectors [3].

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One plant with considerable potential for aromatherapy development is agarwood (*Aquilaria malaccensis*) leaves. Agarwood leaves contain various secondary metabolites identified through LC-QTOF-MS analysis, including bioactive compounds with potential pharmacological activities. Previous studies have reported that agarwood leaf extract exhibits antioxidant activity and lipoxygenase inhibitory properties, indicating its potential application in the development of natural-based products for the health and pharmaceutical industries. In addition, agarwood leaf extract has demonstrated significant antioxidant activity through free-radical scavenging assays. The bioactive compounds present in agarwood leaves play an important role in protecting against oxidative damage, making them a promising raw material for cosmetic, health, and aromatherapy products based on natural ingredients [4], [5].

The high economic value of agarwood has encouraged the utilization of agarwood leaves as a more sustainable alternative raw material. Aromatherapy candles formulated with agarwood leaf extract possess promising economic value and market potential, making them suitable for development as entrepreneurial products in the beauty, spa, and wellness industries.

One innovative product that can be developed from agarwood leaves is an aromatherapy candle. Aromatherapy candles are preparations made by incorporating essential oils derived from natural materials, such as citronella and sweet orange leaves, into a wax base. These products function not only as room fragrances but also provide aromatherapeutic benefits when burned [6]. In addition, plant-based aromatherapy products have significant potential for entrepreneurial development because they are easy to produce, beneficial to consumers, and aligned with the growing demand for environmentally friendly natural products [7].

Although numerous studies have investigated the benefits of aromatherapy and the development of aromatherapy candles using various natural ingredients, most of them have focused on essential oils derived from commonly used plants such as citronella, lavender, patchouli, and citrus. The utilization of agarwood leaf extract as the primary ingredient in aromatherapy candles remains relatively unexplored. Furthermore, studies integrating product development, quality evaluation, consumer acceptance, and entrepreneurial opportunity analysis within a single framework are still limited.

Therefore, this study aims to develop aromatherapy candles based on agarwood leaf extract, evaluate product quality through expert validation, analyze public acceptance, and assess their potential as an entrepreneurial opportunity. The contributions of this study are as follows: (1) introducing agarwood leaf extract as an alternative ingredient for aromatherapy candle production; (2) evaluating product quality and feasibility through expert validation; (3) analyzing public acceptance of the developed product; and (4) identifying the potential of agarwood leaf extract-based aromatherapy candles as an innovative product and entrepreneurial opportunity in the health, beauty, spa, and creative industries.

Accordingly, the novelty of this study lies in the development of aromatherapy candles based on agarwood leaf extract that are evaluated not only in terms of product quality and consumer acceptance but also from the perspective of entrepreneurial opportunities as an innovative product derived from local natural resources.

2. Preliminaries or Related Work or Literature Review

2.1 Aromatherapy

Aromatherapy is a complementary therapy method that utilizes essential oils derived from natural ingredients to improve physical and psychological health. Essential oils are known to possess various biological activities, such as anti-stress and anti-anxiety effects, as well as improving sleep quality and emotional well-being [8]; [9]. Recent research developments indicate that aromatherapy plays a significant role in reducing anxiety and enhancing relaxation, as demonstrated in various experimental studies and recent meta-analyses. Therefore, aromatherapy is increasingly applied in various products such as perfumes, soaps, and aromatherapy candles.

2.2 Aromatherapy Candles

Aromatherapy candles are one of the most widely used aromatherapy products because they function as room fresheners as well as a medium for relaxation. According to [10], aromatherapy candles not only serve as a source of lighting but also as a complementary therapy that can help reduce anxiety levels and enhance relaxation through their effects on the brain's limbic system. In line with this, [11] states that aromatherapy candles are widely

avored products due to their ability to create a comfortable and relaxing atmosphere through the combination of lighting effects and emitted aromas. Therefore, aromatherapy candles not only have functional value as air fresheners but also provide benefits for users' mental and emotional health.

Previous studies have developed aromatherapy candles using various natural ingredients and essential oils. [12] states that aromatherapy candles are one form of inhalation aromatherapy that produces scents with therapeutic effects, such as providing relaxation, functioning as room fresheners, and having potential as alternative therapy media. In addition, the production of aromatherapy candles can also enhance creativity and open entrepreneurial opportunities through the utilization of easily obtainable natural materials. [13] explains that aromatherapy candles are a form of inhalation aromatherapy that provides relaxation effects and serves as a complementary therapy in improving comfort and psychological well-being through stimulation of the olfactory system. Besides their therapeutic benefits, aromatherapy candles also have economic value and potential to be developed as creative products based on natural materials that can become business opportunities.

Another study conducted by [14] states that aromatherapy candles are a form of inhalation aromatherapy that provides relaxation effects and functions as complementary therapy in improving psychological well-being, while also having potential as economically valuable products and business opportunities.

2.3 Agarwood Leaves

[15] shows that agarwood leaves (*Aquilaria malaccensis*) contain various secondary metabolite compounds such as flavonoids, alkaloids, saponins, and tannins that function as natural antioxidants. The phenolic and flavonoid compounds in agarwood leaves make them potentially useful in the fields of health, cosmetics, and aromatherapy due to their biological activities such as antioxidant and antibacterial effects. This is supported by research [16], which states that agarwood leaf extract has been proven to exhibit antibacterial activity against various microorganisms, making it a promising raw material for innovative natural-based products.

2.4 Entrepreneurial Opportunities

Entrepreneurial opportunity refers to an individual's ability to recognize and develop ideas or products that have economic value. According to [17], entrepreneurship education in higher education plays a role in shaping students' interest and ability to identify business opportunities in their surrounding environment. Through entrepreneurship education, students acquire knowledge and skills that can be used to identify and utilize existing business opportunities.

In line with this, [18] states that entrepreneurial opportunities can increase through entrepreneurship education, which is able to develop knowledge, skills, and attitudes in recognizing and utilizing business opportunities. This indicates that business opportunities are not only derived from the environment but also from an individual's ability to identify and develop business ideas.

Furthermore, [19] explains that fostering an entrepreneurial mindset among students is an important factor in creating new business opportunities because it encourages creative, innovative, and opportunity-oriented thinking. A strong entrepreneurial mindset helps individuals face business challenges and create added value from a product or service.

In addition, [20] in their study revealed that increased creativity, innovation, and income expectations play an important role in encouraging entrepreneurial interest. These factors can open opportunities for the creation of new businesses based on creative and innovative products that have economic value and market competitiveness.

Based on the above description, entrepreneurial opportunities are influenced not only by entrepreneurship education but also by entrepreneurial mindset, creativity, innovation, and an individual's ability to recognize and develop business opportunities. Therefore, the development of aromatherapy candles based on agarwood leaf extract has the potential to become an innovative product that can be developed as a business opportunity for communities and small business actors.

2.5 Research Gap and Novelty of the Study

Previous studies have extensively discussed the benefits of aromatherapy and the development of aromatherapy candles using various natural ingredients such as lemongrass,

patchouli, lavender, and citrus. On the other hand, several studies have also examined the bioactive compounds of agarwood leaves and their potential in health and cosmetic applications. However, studies developing aromatherapy candles based on agarwood leaf extract are still very limited. In addition, there are not many studies that integrate product innovation, consumer acceptance, and entrepreneurial opportunities in a single study. Therefore, the novelty of this research lies in the utilization of agarwood leaf extract as the main ingredient in aromatherapy candle production, which is evaluated in terms of product quality, consumer acceptance, and its potential as a business opportunity.

3. Proposed Method

3.1 Research Design

This study is an experimental research with a descriptive qualitative approach. The research was conducted at the Cosmetology Laboratory of Akademi Kesejahteraan Sosial Ibu Kartini Semarang. The acceptance test involved 40 respondents, consisting of 30 students from the Cosmetology Study Program and 10 members of the general public. The research instrument used a questionnaire with a 4-point Likert scale, namely 1 = dislike, 2 = slightly like, 3 = like, and 4 = strongly like.

3.2 Tools and Materials

The tools and materials used for the preparation of agarwood leaf extract are presented in Table 1 as follows:

Table 1. Preparation of Tools and Materials for Agarwood Leaf Extract Production

No	Tools & Materials	Description
1	Mini gas stove	Tool
2	Measuring glass	Tool
3	Aluminum bowl	Tool
4	Sponge	Tool
5	Plastic jar	Tool
6	Assembled distillation apparatus	Tool
7	Water	Material
8	Ice cubes	Material
9	Dried agarwood leaves	Material

Source: Author

3.3 Research Procedure

The research procedure is presented in Figure 1 as follows:

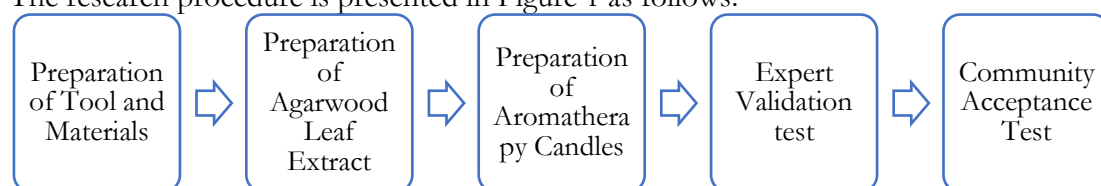


Figure 1. Research Procedure

Source: Author

3.4 Data Collection Techniques

Data were collected through observation, expert validation, documentation, and community acceptance testing of aromatherapy candle products based on agarwood leaf extract. The collected data included product quality, respondent feedback, and the product's potential as an entrepreneurial opportunity.

3.5 Data Analysis Techniques

The data were analyzed using a descriptive qualitative method supported by quantitative data in the form of validator and respondent assessment scores. The results of the analysis were used to describe product quality, the level of community

acceptance, and the product's potential as an entrepreneurial opportunity. used Method

4. Results and Discussion

4.1 Results of Agarwood Leaf Extract and Aromatherapy Candle Production

The production of agarwood leaf extract was conducted through three experiments with different treatments. The variations in treatment aimed to obtain an extract with optimal aroma and texture characteristics as the main ingredient for aromatherapy candles. The results of the three experiments are presented in Table 2.

Table 2. Characteristics of Agarwood Leaf Extract

Experiment	Result Characteristics
I	Liquid, clear, moderately strong aroma
II	Oily liquid, yellowish-white, stronger aroma
III	Oily, golden yellow, strongest aroma

Source: Author

Based on Table 2, Experiment III produced the best-quality extract, indicated by a golden yellow color, oily texture, and a stronger characteristic agarwood aroma compared to the previous experiments. This result shows that modifications in the distillation process influence the quality of the produced extract. These findings are consistent with the study by Mohamed A. Eissa, which states that agarwood leaves contain bioactive compounds that have potential for development in aromatherapy products.

The best extract was then used in the production of aromatherapy candles. The resulting product had a solid form, attractive color, and a distinctive agarwood aroma that remained stable after the molding process. This indicates that agarwood leaf extract can be well formulated into a candle base and produce a stable product.

4.2 Expert Validation Results

Product validation was carried out by three validators by assessing aspects of color, texture, ease of use, and aroma. The validation results showed that Experiment III received the highest evaluation compared to the other experiments. These results indicate that product quality is influenced by the characteristics of the agarwood leaf extract used. A stronger aroma and better texture were the main factors supporting the product's feasibility as an aromatherapy candle.

4.3 Community Acceptance Test Results

The acceptance test was conducted with 40 respondents consisting of students from the Cosmetology Study Program and members of the general public. The average assessment results are presented in Table 3.

Table 3. Community Acceptance Test Results

Assessment Aspect	Average Score
Color	3,16
Texture	2,90
Ease of use	3,43
Aroma	3,03

Source: Author

Based on the acceptance test results, the ease of use aspect obtained the highest score of 3.43, while texture received the lowest score of 2.90. Nevertheless, all aspects were categorized from good to very good, indicating that the product was well accepted by the community.

The high rating for ease of use indicates that the product is practical for consumers. Meanwhile, the distinctive agarwood aroma adds value as an aromatherapy product that functions to create a relaxing atmosphere. These findings support the studies by Abdullah et al. (2024) and Peres & Januario (2023), which state that aromatherapy candles can provide relaxation effects and improve user comfort.

4.4 Product Potential as an Entrepreneurial Opportunity

Aromatherapy candles based on agarwood leaf extract have the potential to be developed as a business product because they utilize natural raw materials with economic value and align with the trend of wellness products based on natural ingredients. The high level of community acceptance indicates that the product has the opportunity to be accepted by consumers and marketed more widely.

In addition to its function as an aromatherapy medium, this product supports the sustainable utilization of local resources because it uses agarwood leaves, which are more readily available compared to agarwood wood. This research is in line with the study by Agus Susanti (2025), which states that creativity and product innovation can create new business opportunities with economic value. Therefore, aromatherapy candles based on agarwood leaf extract have the potential to be developed as innovative products in the fields of beauty, spa, wellness, and the creative industry.

5. Comparison

Comparison with Previous Studies is Presented in Table 4 as Follows:

Table 4. Comparison of the Study with Previous Research

Researcher	Research Object	Research Focus	Main Results
Helsin et al. (2021)	Lemongrass and citrus aromatherapy candles	Aromatherapy candle formulation	Produced aromatherapy candles with air freshener and mosquito repellent functions
Yuandrian et al. (2025)	Essential oil aromatherapy candles	Study of aromatherapy benefits	Demonstrated the benefits of aromatherapy candles for relaxation
Melina Wati (2025)	Soka flower aromatherapy oil	Entrepreneurial opportunity	Product has potential to be developed into a business
This study	Agarwood leaf extract aromatherapy candles	Product development, validation, community acceptance, and entrepreneurial opportunity	Produced aromatherapy candles based on agarwood leaf extract that are accepted by the community and have potential as a business product

Source: Author

6. Conclusions

This study successfully developed aromatherapy candles based on agarwood leaf extract as an innovative product utilizing local natural resources. The results showed that the third experiment produced the best agarwood leaf extract characteristics, namely golden yellow color, oily texture, and a stronger aroma compared to the other experiments.

Expert validation results indicated that the product is suitable for use as an aromatherapy candle. In addition, the acceptance test involving 40 respondents showed that the product received good to very good ratings in terms of color, texture, ease of use, and aroma. The ease of use aspect obtained the highest score, while the texture aspect received the lowest score, although it was still in the good category.

The findings indicate that agarwood leaf extract has the potential to be used as an alternative material in the production of aromatherapy candles. The resulting product not only serves as a relaxation medium but also has economic value that can be developed into a business opportunity in the fields of beauty, spa, wellness, and the creative industry.

This study still has limitations in terms of the number of respondents and the absence of laboratory testing on chemical content and product aroma durability. Therefore, future research is recommended to conduct more in-depth laboratory analysis, expand the number

of respondents, and develop formulation variations to improve product quality and competitiveness.

Author Contributions: Nolen Sah Sinaga and Agus Susanti contributed to the development of the research concept, research design, implementation of the study, data collection, data analysis, and manuscript preparation. Nolen Sah Sinaga was responsible for conducting the experiments and field data collection. Agus Susanti was responsible for validation, research supervision, manuscript review, and editing. Both authors have read and approved the final version of the published manuscript.

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Conflicts of Interest: The authors declare that there is no conflict of interest in this study. The research was conducted independently without any influence from any party in the research design, data collection, data analysis, manuscript preparation, or the decision to publish the research findings

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