

Formulation and Physical Evaluation of Lavender (*Lavandula angustifolia*) Essential Oil Aromatherapy Candles

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ABSTRAK

Lavender merupakan salah satu tanaman yang bunganya banyak digunakan dalam pembuatan aromaterapi. Komponen utama minyak lavender adalah linalil asetat dan linalool yang dapat memberikan efek relaksasi. Aromaterapi merupakan sediaan yang mengandung bahan beraroma tertentu untuk memberikan rasa tenang dan relaksasi. Penelitian ini bertujuan untuk memformulasikan dan mengevaluasi secara fisik lilin aromaterapi yang mengandung minyak atsiri lavender (*Lavandula angustifolia*). Penelitian dilakukan secara eksperimental di laboratorium dengan minyak atsiri lavender sebagai zat aktif serta variasi beeswax dan asam stearat. Formula I mengandung soy wax 50%, beeswax 50%, dan asam stearat 25%, sedangkan Formula II mengandung soy wax 50%, beeswax 60%, dan asam stearat 30%. Hasil penelitian menunjukkan bahwa kedua formula memenuhi kriteria evaluasi organoleptik, waktu bakar, titik leleh, dan uji hedonik. Dengan demikian, minyak atsiri lavender dapat diformulasikan ke dalam sediaan lilin aromaterapi.

Keywords: Aromaterapi; Lavender (*Lavandula angustifolia*); Minyak atsiri; Soywax; Beeswax

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ABSTRACT

Lavender flowers are widely used in aromatherapy because their principal constituents, linalyl acetate and linalool, are associated with relaxing effects. Aromatherapy preparations contain volatile aromatic substances intended to promote calmness and relaxation. This study aimed to formulate and physically evaluate aromatherapy candles containing lavender (*Lavandula angustifolia*) essential oil. An experimental laboratory design was employed, with lavender essential oil as the active ingredient and variations in beeswax and stearic acid concentrations. Formula I contained 50% soy wax, 50% beeswax, and 25% stearic acid, whereas Formula II contained 50% soy wax, 60% beeswax, and 30% stearic acid. The formulations were evaluated for organoleptic characteristics, burning performance, melting point, and hedonic acceptance. Both formulations met the specified physical-evaluation criteria, demonstrating that lavender essential oil can be successfully incorporated into aromatherapy candle formulations.

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Keywords: Aromatherapy; Lavender (*Lavandula angustifolia*); Essential oil; Soywax; Beeswax

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1. Introduction

Lavender is one of the plants known to contain substantial amounts of essential oil. Its flowers are widely used in aromatherapy, and the principal constituents of lavender oil are linalyl acetate and linalool, which are associated with relaxing effects [1]. Lavender aromatherapy may promote calmness, emotional balance, comfort, openness, and confidence. It has also been used to reduce feelings of pressure, stress, pain, emotional imbalance, hysteria, frustration, and panic. In Indonesia, lavender fragrance is currently incorporated into herbal teas, bath soaps, cosmetic products, and aromatherapy oils. Lavender oil has been reported to have relatively low toxicity and a lower tendency to cause allergic reactions than some other essential oils [2].

Aromatherapy is a therapeutic approach that utilizes essential oils extracted from plants containing volatile compounds. Through their aroma, these oils are intended to support healing, improve well-being, enhance emotional comfort, and restore bodily balance [3].

Aromatherapy can be administered using essential-oil diffusers that generate heated vapor or by means of aromatherapy candles. Aromatherapy candles provide a comparatively affordable alternative to diffusers. They usually contain plant-derived essential oils whose volatile constituents are released during burning and subsequently inhaled. The aroma generated by the candle may provide therapeutic and relaxing effects. Aromatherapy candles are increasingly used by the public because they are believed to help address insomnia, physical tension, muscular pain, low mood, and stress [4].

Based on this rationale, the present study was conducted to formulate and physically evaluate aromatherapy candles containing lavender (*Lavandula angustifolia*) essential oil.

2. Methods

This study used an experimental laboratory design to prepare aromatherapy candles containing lavender (*Lavandula angustifolia*) essential oil.

Equipment

The equipment used in this study included glass stirring rods, a wick-centering device, beakers, graduated cylinders, soft and rough cloths, a heating bath, candle wicks, an analytical balance, a thermometer, and glass candle containers.

Materials

The materials used in this study were alcohol, stearic acid, beeswax, lavender essential oil, candle colorant, and soy wax.

Preparation of Lavender (*Lavandula angustifolia*) Aromatherapy Candles

Two aromatherapy candle formulations were prepared using different concentrations of the candle-base components. Formula I contained 50% soy wax, 50% beeswax, and 25% stearic acid, whereas Formula II contained 50% soy wax, 60% beeswax, and 30% stearic acid. All ingredients were weighed according to the predetermined concentrations. Soy wax was placed in a beaker and melted over a water bath with continuous stirring until completely liquefied (Mass I). Beeswax was separately placed in another beaker and melted under the same conditions (Mass II). Both molten bases were then set aside. Stearic acid was placed in a graduated cylinder and melted over the water bath with stirring until completely liquefied (Mass III) [5].

Mass I was reheated and combined with Masses II and III. After the mixture became completely homogeneous, lavender essential oil was added and mixed thoroughly. Candle colorant was subsequently incorporated and mixed until uniform.

A wick was positioned at the center of each glass candle container, after which the molten preparation was poured into the container and allowed to solidify completely [6].

Evaluation of Lavender (*Lavandula angustifolia*) Aromatherapy Candles

1. Organoleptic Evaluation

The organoleptic evaluation was performed to assess the visible physical characteristics of the preparation, including shape, color, and odor, over a two-week observation period [7].

2. Burning Test

A higher essential-oil content may shorten the burning duration of an aromatherapy candle. In addition to active-ingredient concentration, burning time is influenced by wick size and wick position. A larger wick or a wick located closer to the edge of the candle may accelerate candle consumption [8].

3. Melting-Point Test

The melting-point test was conducted to determine the temperature at which the candle melted. The candle melting-point standard according to SNI 0386-1989-A/SII 0348-1980 is 50-58 °C, whereas Pancarani (2020) reported an aromatherapy-candle melting-point range of 53.25-55.84 °C [9].

4. Hedonic Test

Sensory evaluation was conducted using a hedonic test based on preference for the candle aroma before burning, aroma after burning, color, and overall acceptance. Fifteen respondents aged 20-25 years participated. Direct olfactory evaluation was used to determine the respondents' degree of preference for the sensory quality of the aromatherapy candles [10].

3. Results and Discussion

Evaluation Results of Lavender (*Lavandula angustifolia*) Aromatherapy Candles

Table 1. Formulation of Lavender (*Lavandula angustifolia*) Aromatherapy Candles

Material	F1	F2	Function
Lavender essential oil	10%	10%	Active ingredient
Soy wax	50%	50%	Base
Beeswax	50%	60%	Base
Stearic acid	25%	30%	Improves flame durability and consistency
Candle colorant	q.s.	q.s.	Colorant

Table 1 presents the formulations of lavender aromatherapy candles prepared using different concentrations of soy wax, beeswax, and stearic acid. After the two formulations were prepared, they were evaluated for organoleptic characteristics, burning performance, melting point, and hedonic acceptance.

1. Organoleptic Evaluation Results

The organoleptic evaluation was conducted to assess the visible physical characteristics of the preparations, including shape, color, and odor, over a two-week observation period. The results for Formulas I and II are presented in Table 2.

Table 2. Organoleptic Evaluation of Lavender (*Lavandula angustifolia*) Essential-Oil Candles

No.	Organoleptic characteristic	F1	F2
1	No cracks	✓	✓
2	Not easily broken	✓	✓
3	Wick positioned at the center	✓	✓
4	Characteristic lavender odor	✓	✓

The organoleptic observations showed that both candles had a uniform color, retained an intact form without cracks or breakage, emitted the characteristic odor of lavender essential oil, and had centrally positioned wicks. These characteristics are consistent with the SNI candle-quality requirements, which describe an acceptable candle as having a uniform color, no cracks or breakage, and a centrally positioned wick.

2. Burning-Test Results

The aromatherapy candles exhibited burning durations ranging from approximately 5 to 7 hours. According to Turnip (2003), burning time is the period during which a candle remains alight until it is completely consumed. It is calculated as the difference between the initial ignition time and the time at which the wick is fully burned. Burning time is related to melting point: a higher melting point generally results in a longer burning duration. The results are presented in Table 3.

Table 3. Burning-Test Results for Lavender (*Lavandula angustifolia*) Essential-Oil Candles

Candle formulation	Flame color	Time until completely burned
F1	Bright purple	5 h 18 min
F2	Bright purple	7 h 5 min

The results indicate that the candles burned for 5 h 18 min to 7 h 5 min. Formula II had a longer burning duration than Formula I. Formula I contained beeswax and stearic acid at 50% and 25%, respectively, whereas Formula II contained beeswax and stearic acid at 60% and 30%, respectively. The higher stearic-acid concentration in Formula II may have contributed to a longer and more consistent flame duration.

Raharja (2006) reported that increasing the stearic-acid concentration produces a harder candle with a denser and more crystalline structure, thereby extending burning time.

According to SNI (2011), a higher stearic-acid content may prolong candle burning. This observation is consistent with the function of stearic acid in improving flame consistency and durability.

3. Melting-Point Results

The melting point is the temperature at which the solid and liquid phases of a substance coexist in equilibrium at a specified pressure. For this test, the candle was placed in an evaporating dish and heated in a water bath. The temperature at which the candle melted was observed and recorded.

Table 4. Melting-Point Results for Lavender (*Lavandula angustifolia*) Essential-Oil Candles

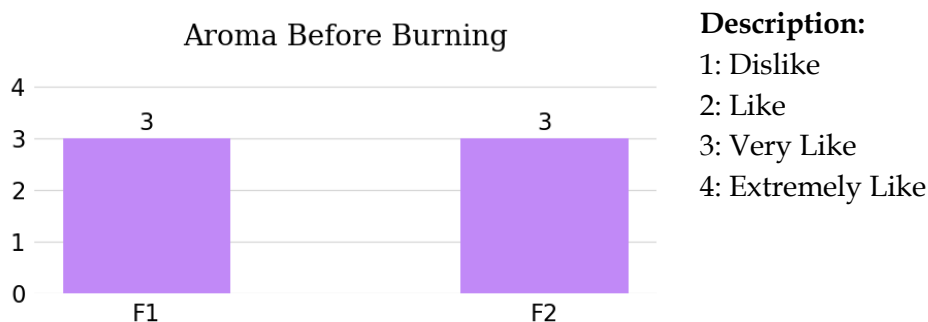
Candle formulation	Melting point (°C)
F1	50-53
F2	51-54

Formula I exhibited a melting-point range of 50-53 °C, whereas Formula II exhibited a range of 51-54 °C. The different beeswax and stearic-acid concentrations used in the two formulations likely contributed to the observed difference in melting point.

The SNI (2011) melting-point standard is 50-58 °C, while Pancarani (2020) reported an aromatherapy-candle standard of 51-55 °C. The values obtained for both formulations were within these ranges. Formula II had the higher melting point, whereas Formula I had the lower melting point.

4. Hedonic-Test Results

The sensory evaluation of the aromatherapy candles was conducted using a hedonic test. The evaluated parameters included preference for the aroma before burning, aroma after burning, color, and overall acceptance. Fifteen respondents aged 20-25 years participated. Direct olfactory assessment was used to determine preference for the sensory quality of the candles (Badan Standardisasi Nasional, 2006). The results are presented below. Can Be seen in Figure 1.

**Figure 1.** Hedonic-Test Results for Lavender (*Lavandula angustifolia*) Essential-Oil Candles (Before Burning)

Based on the pre-burning aroma preference results, the panelists' preference for the lavender aromatherapy candles was reported as score 4 (extremely like). Both Formula I and Formula II received the same preference level because they contained the same concentration of lavender essential oil (10%). Can Be seen in Figure 2.

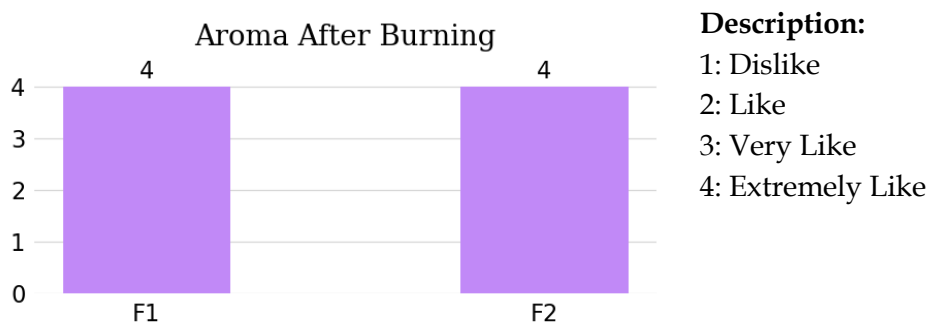


Figure 2. Hedonic-Test Results for Lavender (*Lavandula angustifolia*) Essential-Oil Candles (After Burning)

The post-burning aroma preference results showed a score of 4 (extremely like) for the lavender aromatherapy candles. Most panelists rated both Formula I and Formula II as extremely liked because the lavender aroma was perceived as refreshing and relaxing. Can Be seen in Figure 3.

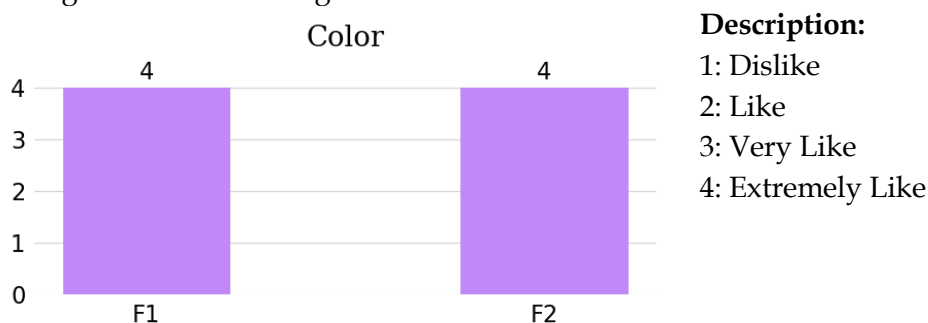


Figure 3. Hedonic-Test Results for Lavender (*Lavandula angustifolia*) Essential-Oil Candles (Color)

For color preference, the panelists assigned a score of 4 (extremely like), consistent with the lavender essential oil used and the purple color of the candles.

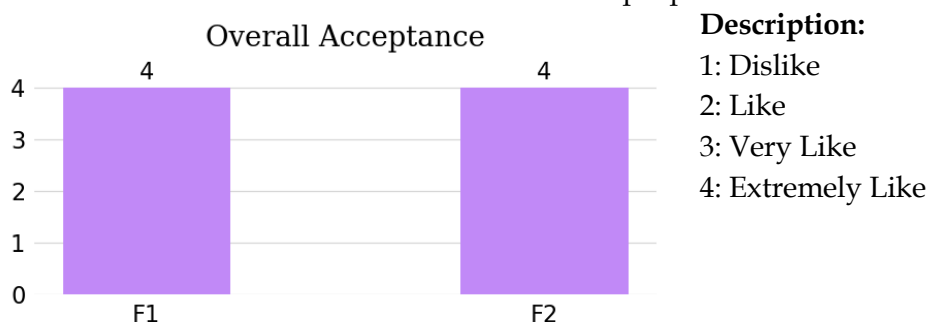


Figure 4. Hedonic-Test Results for Lavender (*Lavandula angustifolia*) Essential-Oil Candles (Overall Acceptance)

The overall-acceptance results showed that both Formula I and Formula II received a score of 4 (extremely like). The panelists positively evaluated the packaging, external appearance, shape, and overall presentation of both candle formulations. Can Be seen in Figure 4.

4. Conclusion

Based on the study results, lavender (*Lavandula angustifolia*) essential oil can be formulated into aromatherapy candles with a characteristic aromatic odor and acceptable physical appearance. The candles are intended to promote relaxation during rest, an effect commonly associated with the principal lavender constituents linalyl acetate and linalool. Across the evaluation parameters, both formulations exhibited acceptable physical characteristics and positive hedonic responses. These findings indicate that lavender essential oil is suitable for incorporation into aromatherapy candle preparations.

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