



## The Influence of Palm Oil Addition in Aromatherapy Candle Formulation on Physical Property Tests

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### ABSTRACT

Currently, aromatherapy candles have become one of the choices for people to start a healthy lifestyle. The therapeutic effects produced from the inhalation process are considered safe. The aim of this research is to obtain a high-quality aromatherapy candle formulation with the addition of palm oil. Candles with the addition of palm oil do not produce smoke when burned. This is what makes the resulting aromatherapy candles better. The tests conducted in this study are organoleptic tests and burn time tests. Palm oil can be formulated in synthesized in aromatherapy candle preparations and is physically stable. The addition of oil to the candle can make the candle's color lighter. The addition of palm oil makes the burn time longer compared to formulations without palm oil. The wax preparation with the longest burn time is formula 4, which has a dominant stearic acid base and the addition of palm oil. Organoleptically, the best wax is the one with formula 6, which is a wax with a mixture of stearic acid base, paraffin, and palm oil. The color produced is homogeneous and the texture of the wax is smooth

## **INTRODUCTION**

The popularity of aromatherapy candles is increasing along with the trend of healthy lifestyles and the growing public awareness of the importance of natural stress management. Some studies show that certain aromas have a direct impact on the brain's limbic system, the part that regulates emotions, behavior, and memory. For example, the aroma of lavender has been proven to have a sedative effect that can help reduce insomnia symptoms, improve sleep quality, and lower anxiety levels (Vora et al., 2024). Aromatherapy is a treatment that involves the regular use of purified (concentrated) base plant oils. Flowers, roots, spices, natural products, seeds, or bark and other fragrant plant mixtures to maintain and enhance physical, physiological, and deep well-being. Non-concentrated oils from all parts of the plant differ from natural recipes but are mostly separated by steam distillation (Melviani et al., 2021). Aromatherapy candles are candles that are modified by using additional aromatherapy oils aimed at providing a relaxing or calming aroma (Wardani et al., 2021).

## **LITERATURE REVIEW**

Beside its therapeutic benefits, the formulation of aromatherapy candles is also an important concern. The selection of wax base materials such as stearic acid, paraffin, and palm oil affects the quality of the resulting wax. Stearic acid contains saturated and unsaturated fatty acids. Its largest component is palmitic acid, which will solidify at room temperature. In candle making, stearic acid will make the candle hard and appear crystalline, capable of producing a dense candle structure (Sari & Haryanti, 2024). Paraffin is made from petroleum, which, if used continuously, can produce pollutants that have a negative impact on health and the environment. (Oktarina et al., 2021). Palm oil consists of two parts: stearin, which is the solid fraction making up 30%, and olein, which is the liquid fraction making up 70% (Aisyah et al., 2020). Candles with a palm oil base are a type of candle that does not produce black smoke when burned, thus they do not emit an unpleasant odor (Susanto et al., 2023). The purpose of this research is to determine the differences in formulation and physical properties testing of aromatherapy candles.

## **METHODOLOGY**

The research conducted is experimental research, specifically research carried out in the Pharmaceutical Laboratory of Bina Bangsa University.

### **Tools and Materials**

The tools used in this research include an analytical balance (Acis), water bath, thermometer, porcelain beaker, melting point apparatus, stirrer (Pyrex), dropper, measuring cup (Pyrex), beaker glass (Pyrex), capillary tube, jar packaging, and wick. The materials used in this research are stearic acid, paraffin, palm oil, lavender oil, and oil dye.

### **Research Procedure**

#### **1. Preparation of Materials**

Stearic acid, paraffin, and beeswax were purchased from an E-Commerce platform. Meanwhile, palm oil and lavender oil were bought at the Tekun Jaya chemical store in Yogyakarta.

## 2. Aromatherapy Candle Formula

The formulation of Aromatherapy Candles can be seen in Table 1

Table 1. Aromatherapy Candle Formula

Material	Formula (gram)					
	F1	F2	F3	F4	F5	F6
Stearic acid	20	-	10	20	-	10
Paraffin	-	20	10	-	20	10
Palm oil	-	-	-	4	4	4
Lavender oil	1	1	1	1	1	1
Oil dye	Just enough ( $\pm 0,1$ gr)					

### 1. Making Aromatherapy Candles

Aromatherapy candles are made by melting stearic acid, paraffin, and palm oil, which have been weighed according to the formula, in a porcelain dish placed on a water bath. The preparation is stirred until melted, add candle dye and stir until mixed, then pour into the aromatherapy candle container. After the temperature drops to 60°C, lavender oil is added, stirred until evenly mixed, and the candle is fitted with a wick. After it has set/hardened, the candle is removed from the mold.

### 2. Test The Physical Properties of Aromatherapy Candles

The physical properties test of aromatherapy candles includes organoleptic tests and burn time tests. The organoleptic test is conducted by observing the color, shape, and smell of the preparation. The burn time test on the candle is conducted to determine the difference between the initial burn time and the time when the candle is completely burned out (Lusiana et al., 2023).

## RESULT AND DISCUSSION

### Organoleptic Test of Aromatherapy Candles

The organoleptic test is a test conducted using the five senses to measure the physical appearance of aromatherapy candles. Based on SNI, the condition of a good candle is having a homogeneous color, being free from defects, cracks, and breaks (Lusiana et al., 2023). In this study, the aromatherapy candles were given color from oil-based dyes to make them look more attractive and to help distinguish between one formula and another. The physical form of the produced candles can be seen in the following image 1:



Figure 1. Physical Form of The Candle

Formulas 1, 2, and 3 are formulas without the addition of palm oil. Meanwhile, formulas 4, 5, and 6 have palm oil added. All formulas produce wax that is solid, flawless, unbroken, and crack-free. Waxes with a stearic acid base will produce wax with a dense and crystalline structure (Isma et al., 2023). This is evident in formulas 1 and 4. Meanwhile, waxes with a paraffin base will produce dense wax (Rahardja et al., 2019), which is consistent with the wax produced in formulas 2 and 5. For formulas 3 and 6, with a stearic acid and paraffin base, the wax produced is dense, soft, and does not appear to have crystalline granules.

The color of the wax produced in Formulas 1, 2, 4, and 5 is not homogeneous, which could be caused by several factors, namely the difference in melting points of the wax and the dye or the difference in solubility of both, and the wax texture not being smooth. The dye not being able to penetrate all the wax particles with a stearate and paraffin base is also one of the reasons for the non-homogeneous color of the wax. Formula 3 and 6 produce solid wax with a homogeneous color. For formulas 4, 5, and 6, the wax produced has a lighter color due to the addition of palm oil. Palm oil has a light yellow base color, which affects the color of the wax, making it lighter compared to formulas without the addition of palm oil.

#### **Burn Time Test**

The burning time of a candle is the duration that indicates the candle's endurance until it is completely burned or melted. The burning time is calculated from the start of the burning until the candle is completely consumed (Rusli & Rerung, 2018). According to the III edition of the Pharmacopeia, stearic acid has a melting point of 54°C (Yuliana et al., 2023). Meanwhile, paraffin has a melting point of 46.7°C (Rahardja et al., 2019). The results of the burn time test can be seen in the following figure and table 4:



Figure 2. Aromatherapy Candle When it Starts to Be Lit



Figure 3. Aromatherapy Candle When it Starts to Melt

Table 2. Results of the Burning Time Test

Formula	Burn time (minutes)
1	34
2	31
3	18
4	37
5	33
6	21

The results of the burn time test showed that formula 3, with a base of stearic acid and paraffin, had the fastest burn time of 18 minutes, while formula 4 had the longest burn time of 37 minutes. The wax preparation with the addition of palm oil has a longer burning time compared to the wax preparation without the addition of palm oil. This is because vegetable oils burn in three stages: the first stage is unsaturated fatty acids, the second is saturated fatty acids, and the last is glycerol. In this case, the first to burn is paraffin, followed by stearic acid, and then palm oil which contains crude glycerol (Arbianzah, 2019).

The longest burn time test results are the formulas containing the most dominant stearic acid, specifically in formula 1 and formula 4. Stearic acid has a higher boiling point compared to paraffin, which makes the formulas with stearic acid have a longer burn time. The properties of stearic acid that make the candle hard and dense cause the heat from the candle burning to have difficulty penetrating the candle structure, resulting in a longer burn time (Aisyah et al., 2020).

## **CONCLUSION AND RECOMMENDATION**

Palm oil can be formulated into aromatherapy wax preparations and is physically stable. The addition of oil to the candle can make the candle's color lighter. The addition of palm oil makes the burn time longer compared to formulations without palm oil. The candle formulation with the longest burn time is formula 4, which has a dominant stearic acid base and the addition of palm oil. Organoleptically, the best wax is the one with formula 6, which has a homogeneous color and a smooth texture.

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