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PHYSICAL PROPERTIES AND PREFERENCE LEVELS TESTING OF PERFUME FORMULATION FROM MEDANG PIRAWAS LEAF'S ESSENTIAL OIL (*LITSEA ELLIPTICA* BLUME)

Indri Astuti Handayani[1], Guritno Syahputra[1], Eriawan Rismana[1], Yanthy Susanti[1]

[1] Sekolah Tinggi Ilmu Kesehatan IKIFA, Program Studi Sarjana Farmasi, Indonesia

*E-mail: guritnosyahputra@gmail.com

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ABSTRACT

The use of perfume is a necessity in daily life for many individuals. Perfume compositions rely on essential oils, categorized into top, middle, and base notes, which differ based on the volatility and specific gravity of the oils used. The essential oil of medang pirawas leaves (*Litsea elliptica* Blume), rich in terpineol (23.36%), is known for its distinct aroma and is used in perfumes. This study aimed to evaluate the physical properties and preference levels of perfume formulations made with *Litsea elliptica* essential oil. The oil was extracted via steam distillation and analyzed using GC-MS. A base formula (F0) combined Litsea elliptica and lavender essential oils, with variations incorporating sweet orange (F1), lemon (F2), lime (F3), and bergamot (F4) essential oils. Physical tests included specific gravity (0.7–1.2), stain tests on tissue, HVS, and filter paper, and aroma longevity (>240 minutes). Preference tests were conducted with 30 respondents. All formulations met specific gravity standards and showed no staining. F4 was the only formulation that satisfied aroma longevity requirements, while F1 was the most preferred. Statistical analysis using SPSS 26 revealed data normality for specific gravity and aroma longevity. Paired Sample T-Tests showed significant effects of citrus essential oils on specific gravity ($p = 0.01$) but not on aroma longevity ($p = 0.638$). In conclusion, the formulations met physical property standards beside aroma longevity which only F4 excelled at and F1 being the most favored by respondents. The addition of citrus essential oils had a significant impact on the specific gravity, but not for the aroma longevity.

Keywords: *perfume, essential oil*, *Litsea elliptica Blume*

INTRODUCTION

The perfume industry has undergone significant acceleration over the past 20 years, with Indonesia's perfume market alone estimated to generate an annual revenue of USD 25–30 million.(1) Perfume has become an essential item for a segment of the population, widely used by individuals of all age groups, including adults, teenagers, and even children.(1) Its use has integrated seamlessly into daily life, fostering a positive ambiance and enhancing comfort during various activities.(2)

Perfumes are categorized into two types: natural and synthetic. Natural perfumes are formulated from essential oils, which influence individuals physically and psychologically. In contrast, synthetic perfumes are limited to providing a pleasant aroma without any additional effects. Essential oils extracted from aromatic plants can elicit psychological responses, offering unique benefits.(2)

Fragrance products are available in various forms, such as *eau de cologne*, *eau de toilette*, *eau de parfum*, and perfume. Perfume specifically refers to fragrances with a concentration of aromatic compounds ranging from 15% to 30%.(3) These perfumes are composed of three types of "notes" based on their evaporation rates: top notes, middle notes, and base notes. Each note serves a distinct purpose, and their combination results in a well-balanced fragrance with a unique and pleasing character.(4) Differences in the properties of these notes are influenced by the volatility index and the specific gravity of the essential oils used. The higher the volatility index and the lower the specific gravity, the more easily an essential oil evaporates.(5)

The increasing prevalence of perfume use in society has raised health concerns, particularly regarding allergic reactions. Perfumes, as cosmetic products, are potential causes of dermatitis due to allergens.(6) Therefore, using natural ingredients with unique fragrances and minimal allergenic potential, such as essential oils, is essential for creating safer perfume formulations.

Essential oils are naturally derived plant products with various beneficial biological properties. One notable source of essential oils is *Litsea elliptica Blume*, commonly known

as medang pirawas leaves. This tropical plant, prevalent in Southeast Asia, particularly East Kalimantan, is widely used in traditional herbal medicine.(7)

Research has shown that the essential oil from medang pirawas leaves has a scent reminiscent of pine wood, with connotations of coniferous plants and a subtle citrus-like aroma, making it suitable for use in perfumes.(8) Additionally, the oil contains terpineol, a compound with a distinctive fragrance commonly used in perfume compositions.(5)

Besides *Litsea elliptica Blume*, other essential oils frequently used in perfumes include oils from *Citrus* species and lavender (*Lavandula angustifolia*). Essential oils from *Citrus* species, characterized by their refreshing and invigorating aroma with its high volatility, are ideal for use as top notes.(9) Common species include *Citrus sinensis* (sweet orange), *Citrus aurantifolia* (lime), *Citrus limon* (lemon), and *Citrus bergamia* (bergamot). Lavender essential oil, on the other hand, has moderate volatility, making it more suitable as a middle note in perfume formulations.(5). This research aimed to evaluate the physical properties and preference levels of perfume formulations made with *Litsea elliptica* essential oil.

MATERIAL & METHODS

This research method is qualitative experimental which aimed to evaluate the physical properties and preference levels of perfume formulations made with *Litsea elliptica* essential oil. The samples used in this study were *Litsea elliptica* Blume leaves, which were harvested in East Kalimantan.(10) The leaves then air-dryed in room temperature.(10) The dried leaves of *Litsea elliptica* Blume were identified in Herbal Materia Medika Batu Malang Laboratory. The leaves then steam distilled in BKSDA East Kalimantan to extract essential oils,(10) which were subsequently analyzed using Gas Chromatography-Mass Spectrometry (GC-MS) in Diponegoro University Laboratory to determine their chemical composition. The essential oil was then used as the primary ingredient in formulating a perfume along with lavender oil and citrus sp oil. This research was conducted at the Phytochemistry Laboratory of the IKIFA Jakarta Health Sciences College, from February to August 2024. A series of evaluations were conducted, including organoleptic assessment to analyze sensory attributes, specific gravity measurement to determine physical

properties, a staining test to assess its stain-free capability. Additionally, the longevity of the perfume's scent was tested, along with a preferences test to gauge consumer acceptability. Statistical analysis using SPSS version 26 was applied to the specific gravity and longevity data to identify significant correlations and validate the findings.

RESULT & DISCUSSION

GC-MS Analysis of *Litsea elliptica* Blume Essential Oil

Gas Chromatography-Mass Spectrometry (GC-MS) analysis was conducted to determine the chemical composition of the extracted essential oil. The GC-MS analysis revealed the presence of various compounds within the essential oil. Among these compounds, five major fractions were identified Terpineol, Dihidro- (23,26%), 2-Norbornil-2-propanol (16,20%), 2-Undekanol (10,79%), 1,10-Dekanediol (7,59%), 7-Okten-2-ol, 2,6-dimetil- (5,82%). These compounds contribute to the distinctive aroma and potential therapeutic properties of the essential oil. Terpineol, a compound frequently encountered in essential oils, possesses distinctive organoleptic properties characterized by a floral, lilac-like aroma with a fresh and dense character.(11) The terpineol identified in this study exhibited a volatility index of 48.(5) The relatively low volatility index of this terpineol compound renders it suitable for utilization as a base note in perfume formulations.

Perfume Formulation Based on *Litsea elliptica* Blume Essential Oil

The perfume formulation adheres to a pyramid fragrance structure, composed of three distinct layers: top notes, middle notes, and base notes.

Table 1. Perfume Formulation

Ingredients (mL)	F0	F1	F2	F3	F4
Sweet Orange Oil	-	0,8	-	-	-
Lemon Oil	-	-	0,8	-	-
Lime Oil	-	-	-	0,8	-
Bergamot Oil	-	-	-	-	0,8
Lavender Oil	0,9	0,9	0,9	0,9	0,9
Litsea Elliptica Oil	0,7	0,7	0,7	0,7	0,7
Fixative	0,5	0,5	0,5	0,5	0,5
Etanol + DPG (1:1)	*Ad* 10 mL				

Table 2. Volatility Index and Specific Gravity of Essential Oils

Ingredients	*Volatility Index*	*Specific Gravity*
Sweet Orange Oil	970	0,844
Lemon Oil	950	0,8587
Lime Oil	800	0,859
Bergamot Oil	450	0,879
Lavender Oil	160	0,858
Litsea Elliptica Oil (Terpineol)	48	0.82

The top notes provide an immediate, refreshing, and invigorating experience by incorporating limonene in citrus sp essential oil as top notes with its high volatility index and low specific gravity which were Sweet Orange Oil (F1), Lemon Oil (F2), Lime Oil (F3) and Bergamot Oil (F4).(5,12)

As for the base formula (F0), the formula incorporated Lavender Oil as middle notes with lower volatility index, adding a soothing and floral character to the perfume and Litsea Oil which contain Terpineol with the lowest volatility indext as base notes, offering a woody and fougere aroma. (5,10,11)

To enhance the longevity and stability of the fragrance, the additional of fixatives used and as solvent, a combination of ethanol and dipropylene glycol (DPG) used with 1:1 ratio.(13)

Organoleptic Evaluation

The organoleptic evaluation focused on two key aspects: color and aroma. For the color evaluation, we observed the appearance of each formulation, noting any variations in hue and clarity. For the aroma evaluation, we assessed the overall scent profile, including the intensity, pleasantness, and any specific notes or nuances.

Table 3. Result of Organoleptic Evaluation

Formula	Aroma	Color
F0	Sweet, non-irritating odor.	Clear
F1	Sweet, non-irritating odor, with a hint of sweet orange odor	Clear Yellowish
F2	Sweet, non-irritating odor, with a hint of lemon odor	Clear
F3	Sweet, non-irritating odor, with a hint of lime odor	Clear Yellowish
F4	Sweet, non-irritating odor, with a hint of bergamot odor	Clear Yellowish

Specific Gravity Evaluation

Specific gravity is a measure of the density of a substance relative to water. For perfume formulations, a specific gravity within a certain range (0,7 – 1,2) is desirable to ensure optimal performance and stability. The specific gravity of all five formulations falls within the acceptable range of 0.7 to 1.2. This indicates that the formulations meet the required standards for specific gravity.(3).

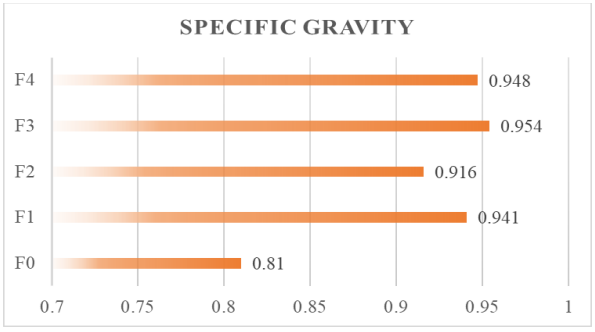

Figure 1. Result of Specific Gravity Evaluation

Staining Test

Each formulation is applied to three different types of surfaces: tissue paper, filter paper, and HVS paper. The samples were left to dry for a specific period, and then we observed any staining or discoloration. All five formulations showed no signs of staining on any of the surfaces tested. This indicates that the formulations are non-staining and safe for use on various materials.(2).

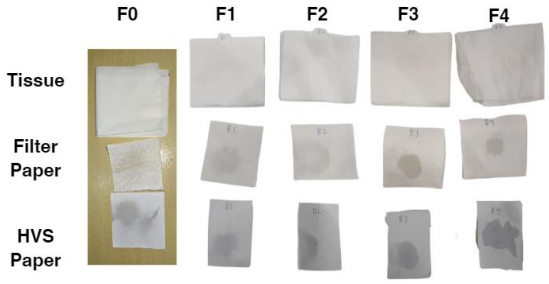

Figure 2. Result of Staining Test

Longevity Test

Longevity refers to the duration of a fragrance's scent on the skin. This test measured the longevity of each formulation by recording the time it took for the scent to fade. Formula F4 exhibited the highest longevity, surpassing the minimum requirement of 240 minutes.(14) This superior performance can be attributed to the presence of Bergamot Oil, which has a lower volatility index and higher specific gravity compared to other citrus essential oils. These properties contribute to a longer-lasting fragrance experience.(3,5)

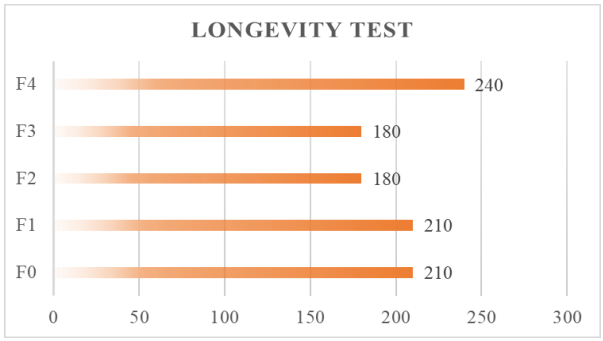

Figure 3. Result of Longevity Test

Preferences Test

A panel of 30 respondents was asked to evaluate each formulation based on their overall preference. Formulation F1 emerged as the clear favorite, receiving the highest number of votes. This indicates that Formulation F1 was perceived as the most appealing in terms of its fragrance profile, intensity, and overall sensory experience.

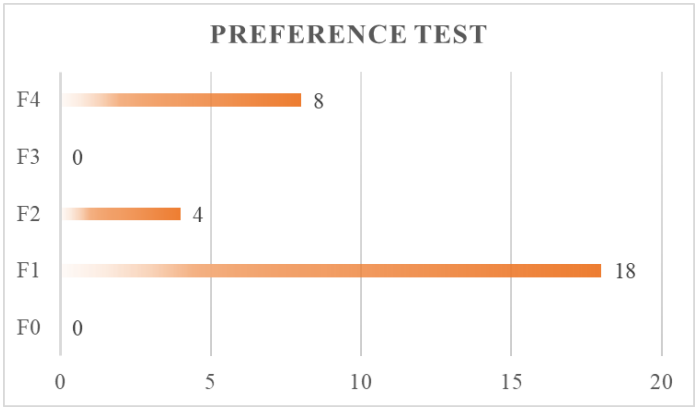

Figure 3. Result of Preferences Test

Normality Test

Normality testing determined if the data follows a normal distribution, which is an assumption for many statistical tests. This reseach include two normality tests: the Kolmogorov-Smirnov test and the Shapiro-Wilk test. For the specific gravity and aroma longevity data, both tests yielded significance values greater than 0.05. This indicates that the data for these variables follows a normal distribution. The analysis then continued using parametric statistical test.

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	BJ_B0	Statistic	df	Sig.	Statistic	df	Sig.
BJ_B_New	.81	.280	4	.	.889	4	.380

a. Lilliefors Significance Correction

Figure 5. Normality Test of Specific Gravity

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	WAKTU_B0	Statistic	df	Sig.	Statistic	df	Sig.
WAKTU_B	210	.283	4	.	.863	4	.272

a. Lilliefors Significance Correction

Figure 6. Normality Test of Longevity

Paired Sample T Test

A paired sample t-test is used to compare the means of two related samples. This test compared the specific gravity and aroma longevity of the original formulation (F0) with the formulations containing added citrus essential oils (F1, F2, F3, and F4).

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	BJ_B0 - BJ_B_New	-.129750	.016701	.008350	-.156325	-.103175	-15.538	3	.001

Figure 7. Paired Sample T Test of Specific Gravity

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	WAKTU_B0 - WAKTU_B	7.500	28.723	14.361	-38.204	53.204	.522	3	.638

Figure 8. Paired Sample T Test of Longevity

The results of the paired sample t-test for specific gravity revealed a significant difference ($p = 0.01$) between the original formulation and the formulations with added citrus essential oils. This suggests that the addition of citrus essential oils had a significant impact on the specific gravity of the formulations.

However, the paired sample t-test for aroma longevity showed no significant difference ($p = 0.638$) between the original formulation and the formulations with added citrus essential oils. This indicates that the addition of citrus essential oils did not significantly affect the aroma longevity of the formulations.

CONCLUSION

In conclusion, all of our perfume formulations met the required standards for specific gravity and were found to be non-staining, indicating their suitability for practical applications. While all formulations performed well in terms of specific gravity and staining, only Formulation F4 met the minimum requirement for aroma longevity. Formulation F1 being the most favored by respondents. The addition of citrus essential oils

had a significant impact on the specific gravity of the formulations, but did not significantly affect the aroma longevity of the formulations.

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