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MAKING EAU DE PARFUM FROM VANILLA AND PATCHOULI ESSENTIAL OILS BASED ON FRANGIPANI FLOWER ESSENTIAL OIL (PLUMERIA SP.)

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ABSTRACT

This study aims to make Eau de Parfum based on frangipani (Plumeria sp.) essential oil by adding vanilla and patchouli essential oils as middle and base aromas. The frangipani essential oil was extracted using the soxhletation method using n-hexane as a solvent. The volume of frangipani essential oil used varied, namely 2.4 ml, 2.6 ml, 2.8 ml, 3 ml, and 3.2 ml, while the volume of vanilla essential oil varied, namely 1.2 ml, 1 ml, 0.8 ml, 0.6 ml, and 0.4 ml. The perfume formula was evaluated through specific gravity, aroma persistence, yield, composition (GC-MS), and organoleptic (homogeneity, clarity, and aroma) tests. The results showed that a volume of 3 ml of frangipani essential oil and 0.6 ml of vanilla essential oil produced the aroma most preferred by panelists, with an average specific gravity value of 0.82–0.83 g/ml, and an aroma that lasted up to 5 hours. GC-MS tests showed the presence of active compounds such as dimethyl phthalate, geranyl benzoate, and nerolidol which play a role in the stability and durability of the perfume aroma.

Keywords: aroma, frangipani flower, Eau de Parfum, GC-MS, organoleptic

1. INTRODUCTION

1.1 Background

Essential oils are liquid extracts obtained from aromatic plants. Various industries currently require essential oils for a variety of human products, including pharmaceuticals, perfumes, cosmetics, beverages, and food (Siswantito et al., 2023). Essential oils are liquids derived from the extraction of aromatic plants or plant parts, typically containing volatile terpenoids. These oils have a distinctive odor from each plant due to the differences in their constituent compounds. Essential oils have numerous pharmacological activities, such as antioxidant and antibacterial properties. Essential oils come in various varieties, such as patchouli oil and fennel oil, which are used as raw materials for perfume production (Chairunnisa et al., 2023).

Perfume or fragrance oil is a mixture of essential oils and aroma compounds, fixatives, and solvents used to provide a pleasant scent to the human body, objects, or rooms. Perfume is a mixture of fragrant substances dissolved in a suitable solvent.

The amount and type of solvent mixed with the fragrance oil determine whether a perfume is considered a perfume extract, Eau de parfum, Eau de toilette, or Eau de Cologne (Meidina et al., 2015). The use of perfume has become a necessity in most people's activities. Perfume is used by various groups, from adults and teenagers to children. The use of perfume can create a positive atmosphere and make activities more comfortable. The perfume used can enhance a person's image, influence mood, and influence the wearer's personality. Various impressions can be created from the use of perfume, so many people choose perfume because they like its scent (Setiyaningsih, 2014).

The perfume-making process uses solvents to reduce the concentration of fragrance ingredients in the ingredients, dissolve the fragrance ingredients, and increase the volume of the perfume (Ilmu & Indonesia, 2019). Ethanol is generally used as a solvent because it can be the most effective solvent for essential oils that have hydrophobic components. The term "ethanol" in the perfume world is no

longer used, now replaced by "absolute," which is a type of ethanol and has a better level of homogeneity. Absolute has the properties of binding perfume aromas because it contains fixative substances and also has the view that the perfume aroma can last longer compared to using other solvents (Andreansyah, 2024).

2. RESEARCH METHODS

Research methodology

2.1 Research Place

This research was conducted at the Process Unit Laboratory, Basic Chemistry Laboratory, Lhokseumawe State Polytechnic.

2.2 Tools and Materials

2.2.1 Tools used

The equipment used includes glass beakers, measuring cups, measuring pipettes, glass bottles, gloves, micro pipettes, pycnometers, glass funnels, containers or basins, HVS tissue paper, filter paper, smelling strips, and questionnaires used in organoleptic analysis.

2.2.2 Materials used

The materials used in this study were frangipani flowers (Plumeria sp), vanilla essential oil, patchouli essential oil, 96% ethanol, and n-hexane.

2.3 Experimental Treatment Design

2.3.1 Fixed Variables

- Frangipani flowers : 1200 gr
- n-hexane : 6 liters
- Patchouli essential oil : 0.6 ml
- 96% ethanol : 15.8 ml
- Cycles : 20

2.3.2 Independent Variables

Frangipani essential oil: 2.4; 2.6; 2.8; 3 and 3.2 ml

Vanilla essential oil : 1.2; 1; 0.8; 0.6 and 0.4 ml

2.3.3 Dependent Variable

1. Specific Density Test
2. Organoleptic Test (homogeneity, clarity, aroma)
3. fragrance durability test
4. Yield Test
5 Composition Test (GC-MS)

2.4 Experimental and Testing Procedures

2.4.1 Making frangipani flower extract

1. Drying Frangipani flowers must be dried until they are completely free of moisture, as moisture can reduce extraction efficiency.
2. Fill the frangipani flower extraction tube (depending on the capacity of the device).
3. Place the solvent (according to the capacity of the flask) in a round-bottom flask.
4. Assemble the Soxhlet apparatus properly, ensuring all connections are secure to prevent leaks.
5. Turn on the heater and set the temperature to the boiling point of the solvent used.
6. The solvent will evaporate, rise to the condenser, and condense back into the extraction tube.
7. The solvent liquid drips through the flower material, dissolving the active compounds, and returns to the flask after passing through the siphon.
8. Allow the process to repeat (until the solvent returning to the flask is clear).
9. Once extraction is complete, turn off the heater and allow the apparatus to cool.

2.4.1 Making Eau De Parfum

1. Prepare the essential oils of frangipani, vanilla, patchouli, and alcohol.
2. Mix the aromas top notes frangipani essential oil, middle notes vanilla essential oil, base notes patchouli essential oil, Solvent 96% ethanol.

3. Mix the oils according to the desired
4. Store the mixture in a tightly sealed glass bottle in a cool place
5. After maturation, filter the mixture using filter paper or muslin cloth to remove residues
6. Ensure the bottle is tightly sealed to prevent evaporation
7. Transfer the perfume to a sterile perfume bottle using a funnel.

3. RESULTS AND DISCUSSION

3.1 Research Results

Table 3.1 Data from Analysis and Testing of Eau de Parfum

Vanilla Essential Oil (ml)	Frangipani Essential Oil (ml)	Specific Gravity Test (g/ml)	fragrance durability test (hours)
1,2	2,4	0,83	5 jam
	2,6	0,83	5 jam
	2,8	0,82	5 jam
	3	0,82	5 jam
	3,2	0,83	5 jam
1	2,4	0,82	5 jam
	2,6	0,83	5 jam
	2,8	0,83	5 jam
	3	0,83	5 jam
	3,2	0,82	5 jam
0,8	2,4	0,83	5 jam
	2,6	0,82	5 jam
	2,8	0,82	5 jam
	3	0,81	5 jam
	3,2	0,82	5 jam
0,6	2,4	0,83	5 jam
	2,6	0,83	5 jam
	2,8	0,82	5 jam
	3	0,82	5 jam
	3,2	0,82	5 jam
0,4	2,4	0,83	5 jam
	2,6	0,83	5 jam
	2,8	0,83	5 jam
	3	0,83	5 jam
	3,2	0,83	5 jam

3.2 Discussion

A combination of frangipani essential oil and vanilla essential oil to create a perfume with a floral aroma derived from frangipani and a warm sweetness derived from vanilla. Based on observations, the resulting perfume has a physical form of a clear liquid, with a homogeneous appearance and no signs of sedimentation or phase separation. The combination of jasmine essential oil and vanilla essential oil creates a perfume with a floral aroma derived from jasmine and a warm, sweet aroma derived from vanilla. The resulting aroma is soft yet long-lasting, consistent with the characteristics of an Eau de Parfum, which contains a moderate to high concentration of essential oils. Its unique aroma gives an elegant and refreshing impression when applied to the skin.

3.2.1 Specific gravity

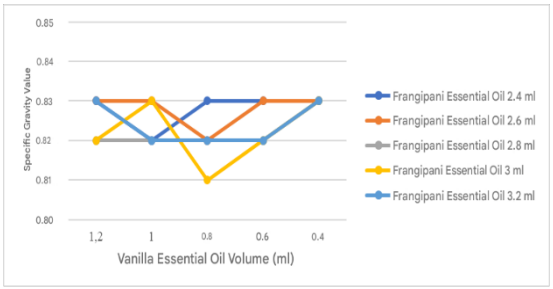


Figure 3.1 Graph showing the effect of variations in frangipani essential oil extract and vanilla essential oil on specific gravity values

The test results showed that all samples tested had specific gravity values ranging from 0.82 to 0.83 g/m, which still met the quality standards based on SNI. This indicates that the perfume mixture was made in accordance with the physical quality requirements for specific gravity.

The results show that variations in the volume of frangipani essential oil (3.2 ml to 2.4 ml) did not cause significant changes in specific gravity, with the majority of samples tending to have stable specific gravity values (around 0.83). However, small variations were seen to be more influenced by the amount of vanilla essential oil added.

When mixing perfume with 1.0 mL and 0.6 mL of vanilla essential oil, the specific gravity values tended to be slightly higher, reaching 0.83. This indicates that the composition of essential oils and solvents used was appropriate and produced a stable and homogeneous perfume solution. Conversely, in mixtures

with 0.8 mL and 0.4 mL of vanilla essential oil, the specific gravity values tend to be lower, approaching 0.82, indicating an excess of solvent, while values that are too high may indicate the use of overly concentrated or unbalanced aromatic ingredients.

3.2.2. Fragrance durability

Table 3.2 Fragrance durability Test Results on Perfume Samples

Observation	sample				
5 hours	S1	S2	S3	S4	S5
5 hours	S6	S7	S8	S9	S10
5 hours	S11	S12	S13	S14	S15
5 hours	S16	S17	S18	S19	S20
5 hours	S21	S22	S23	S24	S25

Based on the fragrance durability test in Table 3.2, the results show that all samples from S1 to S25 have the same fragrance durability, lasting for 5 hours or more. This indicates that all perfume samples tested have relatively good and consistent fragrance durability.

3.2.3. Yield

Yield testing aims to determine the amount of extract obtained from raw materials after undergoing the extraction process. In this study, yield testing aims to measure the efficiency of the essential oil extraction process from frangipani flowers (Plumeria sp.) using the Soxhlet method with n-hexane as the solvent. The yield obtained will serve as an indicator of the success of the extraction process and will be used as a basis for calculating the final product, such as perfume or other formulations.

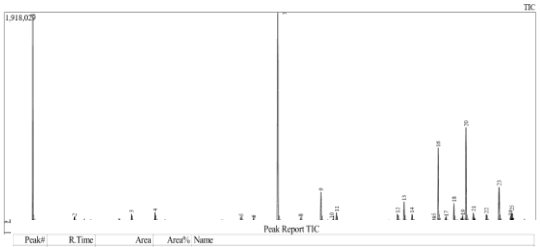
In this study, the dry raw material mass used was 1200 grams (1.2 kg) of frangipani flowers, and the mass of essential oil obtained after the extraction and solvent separation process was 75 ml.

$$\text{yield (\%)} = \frac{\text{essential oil mass}}{\text{raw material mass}} \text{ x } 100\%$$

$$\text{yield (\%)} = \frac{67,5}{1200} \text{ x } 100\% = 5,6\%$$

The yield of 5.6% is within the normal range for essential oil extracts from flowers, considering that flowers generally contain small amounts of essential oil compared to other parts of the plant such as leaves or bark. This value shows that the Soxhlet method is quite effective for extracting essential oil from frangipani flowers.

3.2.4 Composition (GC-MS)



Peak#	R.Time	Area	Area%	Name
1	5.257	3327247	17.04	Styrene
2	8.547	124067	0.64	Decane
3	13.054	212501	1.09	Octanoic acid, methyl ester (CAS) Methyl octanoate
4	14.916	308095	1.58	Octanoic Acid
5	21.686	147904	0.76	Decanoic acid (CAS) Capric acid
6	22.679	88162	0.45	Hexadecane
7	24.611	5502978	28.18	Dimethyl phthalate
8	26.410	126136	0.65	Phenol, 2,4-bis(1,1-dimethylethyl)- (CAS) 2,4-Di-tert-butylphenol
9	28.016	867568	4.44	Nerolidol
10	28.974	103873	0.53	1-Heptadecene
11	29.243	339438	1.74	1,2-Benzenedicarboxylic acid, diisodecyl ester
12	34.057	320146	1.64	CRESYL OCTANOATE
13	34.583	594244	3.04	Benzyl benzoate
14	35.209	181818	0.93	1-Octadecene (CAS) .alpha.-Octadecene
15	36.898	142363	0.73	Hexamethyl-pyranoindane
16	37.280	1850882	9.48	Benzoic acid, 2-hydroxy-, phenylmethyl ester (CAS) Benzyl salicylate
17	37.863	122231	0.63	Octadecane
18	38.521	471737	2.42	Hexadecanoic acid, methyl ester
19	39.182	117405	0.60	Decanoic acid, phenylmethyl ester
20	39.476	2510040	12.85	Geranyl benzoate
21	40.050	228531	1.17	1-Tricosene
22	41.079	236681	1.21	1,6,10,14-Hexadecatetraen-3-ol, 3,7,11,15-tetramethyl-, (E,E)-
23	42.077	1170567	5.99	1-BROMO-3,7-DIMETHYL-OCTA-2,6-DIENE
24	42.995	180842	0.93	9,12-Octadecadienoic acid (Z,Z)-, methyl ester (CAS) Methyl linoleate
25	43.076	251331	1.29	Heneicosane
		19526787	100.00	

Figure 3.2 Gas Chromatography–Mass Spectrometry (GC-MS) Test Results

The results of Gas Chromatography–Mass Spectrometry (GC-MS) testing on essential oils aim to accurately and thoroughly identify and determine the chemical compounds contained in essential oils.

Based on the GC-MS analysis of frangipani essential oil, several chemical compounds were identified that play a significant role in the characteristics of perfume, both as fragrances and as fixatives. These components contribute to the distinctive aroma, fragrance longevity, and stability of the perfume. Some of the dominant compounds that play a significant role in perfume production include Dimethyl phthalate (28.18%), Geranyl benzoate (12.85%), Benzyl salicylate (9.48%), Nerolidol (4.44%), and Benzyl benzoate (3.04%). These compounds possess properties that

support both aromatic function and longevity.

3.2.5 Organoleptic

The organoleptic test conducted was a preference x test or hedonic test. This hedonic test is an acceptance test that involves evaluating a person's likes or dislikes of a product. Organoleptic testing in this study used the hedonic method. This was done by visually observing the finished perfume, including its homogeneity, clarity, and aroma. The availability of eau de parfum in 25 perfumes was tested by 25 panelists.

There were five assessment parameters used by the panelists when evaluating the resulting perfumes. To determine the most preferred product, we added up the panelists' scores: very dislike (1), dislike (2), neutral (3), like (4), and very like (5). The sensory score was obtained by adding the five highest scores and dividing by the number of panelists and the number of samples.

3.2.5.1 Organoleptik on homogeneity

Homogeneity testing of perfumes is a test to assess the uniformity of the mixture of all perfume components, such as essential oils, ethanol, and other solvents. The assessment was carried out by 25 panelists on a scale of 1 to 5, where a score of 5 indicates a very good level of homogeneity.

The test results show that most perfume samples have a very high level of homogeneity. Thirteen out of 25 samples received a perfect average score of 5.0. This indicates that the mixing process for these samples was optimal, resulting in a stable and evenly distributed aroma throughout the product.

Several other samples received average scores between 4.5 and 4.8, which still fall within the good category. Only one sample, S25, received the lowest average score of 4.1. This score indicates that the aroma produced is still inconsistent and there may be an imbalance in the mixing of ingredients or aroma distribution.

3.2.5.2 Organoleptik on clarity

Clarity tests were conducted to evaluate the visual appearance of the perfumes, particularly to ensure that there was no cloudiness, sediment, or particles visible to the eye. The assessment was carried out by 25 panelists using a scale of 1–5, with 5 indicating perfect clarity.

The results showed that the majority of perfume samples had excellent clarity. Thirteen of the 25 samples received a perfect average score (5.0), indicating that the filtration or mixing process was performed optimally. High clarity reflects the stability of the compatibility of the ingredients used.

Some of the other samples received average scores between 4.6 and 4.8, which are still considered good and acceptable. Samples with the lowest average score of 4.6 (such as S3, S7, S11, S15, S22) indicate slight differences in panelists' perceptions of clarity, which may be due to minor influences from viscosity, material color, or imperfect mixing.

3.2.5.3 Organoleptic on aroma

The aroma test aims to evaluate the quality of the fragrance produced by each perfume sample, including intensity, balance, and overall aroma suitability. The assessment was carried out by 25 panelists using a scale of 1–5, where 5 indicates a highly desirable aroma.

Based on the assessment results, most perfume samples showed high average scores. There were 7 samples (S10, S14, S16, S17, S18, S19, and S20) that received average scores between 4.7 and 4.8, indicating that the aromas produced by these samples were highly preferred by the panelists. This indicates that the aromatic ingredients in these samples are well-balanced and capable of producing a strong, harmonious, and pleasant aroma character.

Several other samples, such as S3, S7, S11, S15, and S23, received an average score of 4.6, which is also considered good. Meanwhile, the lowest scores were found in samples S1 and S5, with an average of 3.5, indicating that the aroma of these samples was less appealing to the panelists. This could be due to an imbalance in the composition of aromatic compounds, weak fragrance intensity, or a lack of aromatic complexity.

In general, it can be concluded that the majority of perfume samples exhibit good to very good aromatic performance. Differences in panelist evaluations also highlight the influence of subjectivity and individual preferences toward specific aromatic characteristics. Therefore, it is important to adjust the formulation.

4. CONCLUSION

4.1 Conclusion

Based on the results obtained in this study, the following conclusions were drawn:

1. The volume of frangipani essential oil significantly impacted the characteristics of the perfume's top notes. The greater the volume of frangipani essential oil used, the stronger the floral scent produced. However, too high a volume can overpower the aroma of the middle and base notes. A 3 ml volume was the most optimal sample because it produced a soft, non-overpowering floral scent, which was most preferred by the panelists. Thus, frangipani essential oil plays a significant role in shaping the initial impression of the perfume.
2. The addition of vanilla essential oil affects the character and balance of the middle note. The addition of vanilla essential oil provides a sweet and warm aroma that enriches the perfume composition. A volume of 0.6 ml of vanilla essential oil provides the most balanced effect, as it blends well with the scent of frangipani and does not overpower the base note of patchouli. The use of vanilla in the right amount can enhance the appeal of the perfume.

4.2 Suggestions

For further research, it is recommended to create other types of essential oils as middle or base notes to determine the effect of ingredient combinations on the balance and character of the perfume's aroma.

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