

LAVENDER AROMATHERAPY WAX (*Lavandula angustifolia*) FORMULATION WITH OIL PURIFICATION BASE USED COOKING OIL AS A REPELLENT

Siti Nurul H. Adam¹), Srimuliani Arbie²), Sucia Pratiwi Tampoy³)

^{1,2,3}) Universitas Bina Mandiri Gorontalo

E-mail: sitinuruladam1102@gmail.com, srimulianiarbie94@gmail.com, suciatampoy@gmail.com

ABSTRACT

Malaria is still a health problem in Indonesia, including in Gorontalo Province with 1,581 cases recorded. Prevention efforts are carried out through the development of natural *repellent* that is safe and environmentally friendly using lavender. This study aims to determine the evaluation and formulation activity of lavender aromatherapy wax (*Lavandula angustifolia*) with the purification base of used cooking oil as a *repellent* against *Anopheles vagus* mosquitoes. The method in this study uses an experimental method with four formulas, namely F0 (0%), F1 (15%), F2 (20%), and F3 (25%) lavender essential oil. Evaluation included organoleptic tests, burn time, melting point, hedonic tests, and *repellent* activity against *Anopheles vagus* mosquitoes. The data were statistically analyzed using *the One Way ANOVA* test. The results showed that the entire aromatherapy candle formula is solid, evenly purple, smoothly textured, with an optimal burn time and a melting point of 50–58°C. The hedonic test showed that F1 and F2 were the most preferred by the panelists, while F3 was too stinging and F0 was less attractive. All formulas with lavender extract have *Repellent activity* against the *Anopheles vagus* mosquito. Statistical tests revealed significant differences in the burn time and melting point between the formulations, as indicated by a one-way ANOVA significance value of 0.025 ($p < 0.05$). Consequently, it is concluded that used cooking oil-based lavender aromatherapy candles serve as an effective repellent, with the highest aroma acceptance found at concentrations of 15% to 25%.

Kata kunci: Aromatherapy Candles, Lavender, Used Cooking Oil, Repellent, *Anopheles Vagus*

INTRODUCTION

Malaria is one of the infectious diseases that is still a public health problem in Indonesia, including in Gorontalo Province, with 1,581 cases recorded in 2024 [1]. This disease can lead to severe complications such as anemia, kidney failure, and even death. One of the efforts to prevent its transmission is the use of mosquito repellent (*Repellent*) to avoid the bite of *the Anopheles* mosquito as a vector of the disease.

Commonly used synthetic repellents, such as *N,N-diethyl-3-methylbenzamide* (DEET), have been shown to be effective but have the potential to cause side effects such as skin irritation and nervous system disorders if used long-term [2]. Therefore, it is necessary to develop a *repellent* made from natural materials that is safer and more environmentally friendly. One of the natural ingredients that has great potential as a

Submit: Nov 12th, 2025

Accepted: Nov 29th, 2025

Published: Dec 24th, 2025

repellent is lavender essential oil (*Lavandula angustifolia*), which contains the active compounds linalool and linalyl acetate. This compound is known to be able to disrupt the olfactory system of mosquitoes and provide a soothing aroma [3].

The application of lavender essential oil in the form of aromatherapy wax provides the advantage of being able to spread the scent slowly and evenly without direct contact with the skin. Aromatherapy candles are also more practical and do not cause an irritating effect. When the candle burns, the heat causes the essential oils to evaporate so that volatile compounds such as linalool disperse into the air and disrupt the orientation of the mosquito towards the human host [4].

As the basic ingredient for making candles, the use of natural oils that are cheap and easy to obtain is a promising alternative. Used cooking oil, which is household waste from repeated frying products, can be reused after going through the purification process. Purification using bagasse has been proven to be effective in reducing the level of free fatty acids and improving the color and clarity of the oil [5]. The use of used cooking oil as a candle base is not only environmentally friendly, but also supports the principle of circular economy because it converts waste into products with useful value.

Based on this description, this study aims to formulate aromatherapy candles made from lavender essential oil (*Lavandula angustifolia*) with the purification basis of used cooking oil as a *repellent* against *Anopheles vagus* mosquitoes, as well as

evaluate the physical characteristics of the wax and the mosquito repellent activity produced.

RESEARCH METHODS

This study uses a type of quantitative research with a descriptive approach and true experimental design. This research was conducted from June to July 2025 with the research location being conducted at the Natural Materials Laboratory, Gorontalo State University. Sampel yang akan digunakan dalam penelitian ini adalah minyak esensial lavender.

1. Tools and Materials

The tools used in this study are stirring rods, porcelain cups, measuring cups (Pirex), beacker glass (Pirex), digital scales (Sojikyoo), thermometers, stopwatches, Hote plates, glass cups, knives, sifters and mosquito test cages. The materials used in this study are used cooking oil, stearic acid, lavender essential oil, citric acid, candle dye, gauze wire, and bagasse.

2. Formula

The basic formulation chosen for the manufacture of aromatherapy candles in this study with the following combinations:

Table 1 Modification of Aromatherapy Candle Formulation

Material	Concentration (%)				Function
	F0	F1	F2	F3	
Lavender Essential Oil	0	15	20	25	Active Substances
Citric Acid	1	1	1	1	Antioxidant
Candle Dye	1	1	1	1	Dye
Used Cooking Oil	3 : 5	3 : 5	3 : 5	3 : 5	Basis
Refining Results: Stearic Acid					

Sumber: [6] dan [7]

RESEARCH RESULTS

1. Physical Evaluation of Aromatherapy Candles

a. Organoleptic

Organoleptic testing is used to examine the physical shape of a product that includes the color, shape, smell, and texture of the product directly with the eyes. The results of the organoleptic test of the 4 formulas can be seen in **Table 2** below.

Table 2 Results of Organoleptic Evaluation Test

Formula	Replication	Shape	Color	Aroma	Tekstur
F0	1	Dense	Purple	Has No Scent	Soft
	2	Dense	Purple	Has No Scent	Soft
	3	Dense	Purple	Has No Scent	Soft
F1	1	Dense	Purple	Aromatic	Soft
	2	Dense	Purple	Aromatic	Soft
	3	Dense	Purple	Aromatic	Soft
F2	1	Dense	Purple	Aromatic	Soft
	2	Dense	Purple	Aromatic	Soft
	3	Dense	Purple	Aromatic	Soft
F3	1	Dense	Purple	Aromatic	Soft
	2	Dense	Purple	Aromatic	Soft
	3	Dense	Purple	Aromatic	Soft

(Source: Processed data, 2025)

b. Baking Time

The burning time test aims to determine the time of durability of the candle needed until the fire is extinguished. The results of the burn time test of the 4 formulas can be seen in **Table 3** below.

Table 3 Results of Candle Burning Time Evaluation Test

Formula	Rerata ± SD	Baking Time		
		Vulnerable to Standards	ANOVA Test	Information
F0	3 hours 52 minutes ± 54 minutes 47 seconds	The longer the candle burns, the better the quality of the candle	0,025 (p>0,05)	Meet
F1	3 hours 59 minutes ± 53 minutes 49 seconds			
F2	1 hour 43 minutes ± 17 minutes 50 seconds			
F3	50 minutes 29 seconds ± 18 minutes 51 seconds			

(Source: Processed data, 2025)

c. Melting Point

The melting point test aims to find out at what temperature the wax can melt by using the melting point. The melting point test results of the 4 formulas can be seen in **Table 4** below.

Table 4 Melting Point Evaluation Test Results

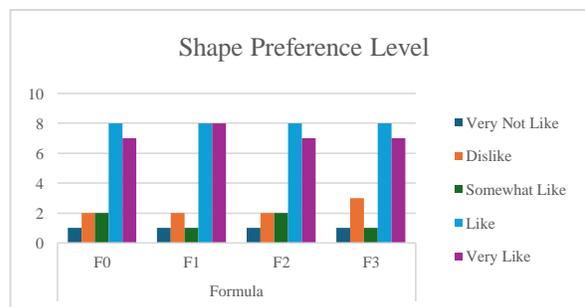
Formula	Rerata ± SD	Melting Point		
		Vulnerable to Standards	ANOVA Test	Information
F0	56,333± 0,9387	50°C - 58°C	0,013 (p>0,05)	Meet
F1	52,900± 0,9849			
F2	51,433± 0,6936			
F3	53,033± 0,3844			

(Source: Processed data, 2025)

2. Hedonic Test

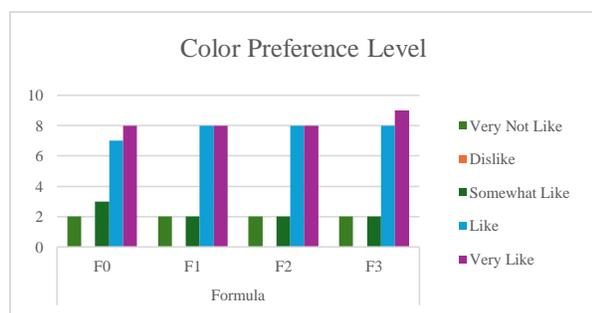
The purpose of the level test was to find out the level of preference of the panelists for the shape, color, and aroma of the lavender aromatherapy candle before the burning process by giving a questionnaire to 20 panelists.

Figure 1 Diagram of Hedonic Test Results of Form Preference Level



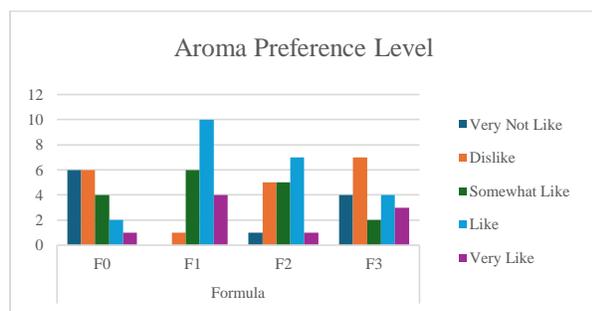
(Source: Processed data, 2025)

Figure 2 Diagram of Hedonic Test Results of Color Preference Level



(Source: Processed data, 2025)

Figure 3 Diagram of Hedonic Test Results of Aroma Preference Level



(Source: Processed data, 2025)

3. Repellent Activity

The purpose of the Repellent activity test is to find out how much protection the aromatherapy candle preparation has against the *Anopheles vagus mosquito*. The results of the activity test of the 4 formulas can be seen in **Table 5** below.

Table 5 Results of Repellent Activity Evaluation Test

Formula	Rerata
F0	0%
F1	8,3%
F2	23,3%
F3	33,3%

(Source: Processed data, 2025)

DISCUSSION OF RESEARCH RESULTS

The aromatherapy candle formulation is made by combining processed used cooking oil and stearic acid as the main base ingredients. This combination was chosen because stearic acid plays a role in increasing the stiffness and durability of the wax, while purified used cooking oil can provide a more durable and environmentally friendly combustion result. This study aims to evaluate and test the effectiveness of lavender aromatherapy wax (*Lavandula angustifolia*) which uses used cooking oil as a base material, as an ingredient to repel *Anopheles vagus mosquitoes*.

The formula used consists of 4 types, namely F0 (without lavender essential oil), F1 (15%), F2 (20%), and F3 (25%). The aromatherapy candle is made with a weight of 40 grams and is added citric acid 1%, candle dye 1%, and candle base ingredients derived from processed used cooking oil and steric acid with a ratio of 3:5 using the melting method. The characteristic test of aromatherapy wax was carried out with several physical properties tests, namely organoleptic tests, melting point tests, burning time tests, and hedonic tests involving 20 panelists. The purpose of this

physical properties test is to ensure that the wax produced meets the standards of physical parameters such as color, shape, aroma, melting point, and good baking time in accordance with SNI 0386-1989-A/SII 0348-1980.

Meanwhile, the *aromatherapy wax repellent* test uses the protective power method with 4 test cages measuring 40 x 40 cm, each containing 20 mosquitoes. The test aims to see how effective aromatherapy candles are in protecting against mosquito bites. The use of used cooking oil as a base material makes wax a good alternative because it is beneficial for the environment and the economy. To purify used cooking oil, adsorbents from bagasse are used. This adsorbent works by absorbing impurities, free fatty acids, and water which causes the oil to become clearer and improves the quality of the oil so that it can be reused [5].

The effectiveness of bagasse in this process stems from its primary components—cellulose, hemicellulose, and lignin—which act as natural adsorbents. The hydroxyl groups (-OH) within the cellulose and hemicellulose structures bind to free fatty acids (FFA) via hydrogen bonding, effectively reducing acidity levels in the used cooking oil. Simultaneously, lignin functions as a robust adsorbent for volatile oxidation products and pigments responsible for discoloration. Crucially, the adsorption mechanism must objectively eliminate the "rancid" odor inherent in used cooking oil before the lavender essential oil is introduced. Experimental observations indicate that the physical and chemical adsorption by bagasse significantly reduces the concentration of

secondary oxidation products, such as aldehydes and ketones, which are the primary sources of unpleasant odors. Ensuring the removal of these background odors is vital, as any residual rancidity would chemically interfere with and diminish the therapeutic efficacy of the lavender aromatherapy. This pre-treatment renders bagasse an effective, eco-friendly alternative for purifying used oil into a neutral base material suitable for high-quality wax production [8].

In the process of processing used cooking oil, 500 ml of used cooking oil and 50 grams of bagasse are used with a heating temperature of 100°C using a hotplate for 80 minutes, resulting in a clear product that does not emit a strong odor, making it suitable for use as a wax base [9]. The mixture of used cooking oil with stearic acid in a ratio of 3:5 plays a role in forming a solid wax structure and is able to support the addition of active substances [6].

The results of the organoleptic test show that all wax formulas made meet quality standards according to SNI 0386-1989-A/SII 0348-0980. The candle has a solid shape that does not break, an even purple color, a soft texture, and the wick is located in the center. This is influenced by the ingredients used in the manufacture of aromatherapy candles. Organoleptic tests are performed to visually see the physical appearance of the product, such as color, shape, aroma, and texture. The distinctive scent of lavender essential oil is only felt in formulas F1 to F3, while formula F0 has no scent. The higher the concentration of lavender essential oil, the stronger the scent produced, especially in the F3 formula which

has the most pronounced scent. This suggests that lavender essential oil can mix well in aromatherapy candles. These results are in line with previous research [10] which states that the essential oils in aromatherapy candles play a role in improving sensory quality, especially in terms of scent. The distinctive scent of lavender is caused by the volatile compounds linalol and linalyl acetate when the candle is burned [11]. The results of the organoleptic test can be seen in **Table 2**

The burn time test aims to find out how long the candle can burn until it runs out. The test results showed that formulas with a low concentration of essential oils (F1) had a longer flame than formulas with a higher concentration of essential oils. The average F1 ignition time is 3 hours and 59 minutes, almost the same as F0 which is 3 hours and 52 minutes. Meanwhile, F2 only burned for 1 hour and 43 minutes and F3 decreased drastically to 50 minutes 29 seconds. These results are in accordance with research conducted by [12], which states that the higher the concentration of lavender essential oil, the faster the wax burns out. This happens because essential oils have volatile properties, thus accelerating the process of burning aromatherapy candles. Research [6] also report the same thing, namely the addition of aromatic ingredients in high concentrations can shorten the duration of the candle flame due to its volatility properties. In addition to the essential oil properties that affect the burning time of the candle, the size and location of the wax wick also affect the duration of the burning. The larger the size of the wick or the

further to the edge of the wick, the candle will run out faster, as noted in the study [13].

Meanwhile [14] It also states that the longer the burning time shows the longer the candle burns, and the longer the burning time, the better the quality of the candle. Thus, F0 and F1 can be categorized as having the most optimal combustion power. The results of the combustion time test can be seen in **Table 3**

Based on the results of the burning time test in **Table 3** of Formulas F0, F1, F2, and F3, statistical analysis was carried out to ensure that there was a significant difference between the average physical evaluation of the preparation of lavender aromatherapy wax (*Lavandula angustifolia*) and the purification base of used cooking oil as a *Repellent*. Prior to the *One Way ANOVA test*, Shapiro-Wilk data normality tests were performed, the results showed a significance value of F0 0.907 ($p>0.05$), F1 0.912 ($p>0.05$), F2 0.498 ($p>0.05$), and F3 0.910 ($p>0.05$), indicating normal distributed data. The homogeneity test of the Levene Test produced a significance value of 0.367 ($p>0.05$), meaning that the data were homogeneous. Normal and homogeneous data were then tested by *One Way ANOVA*, the result was a significance value of 0.025 ($p<0.05$), meaning that there was a significant difference between the formulas F0, F1, F2, and F3. This shows that the variation in the concentration of lavender essential oil does not have a significant effect on the burning time of lavender aromatherapy candles.

The melting point test is performed to find the specific temperature at which the wax can melt, using the melting point method. The test results showed that all

formulas were still within the limits of the SNI 0386-1989-A/SII 0348-1980 standard, which is between 50°C to 58°C. F0 formula has the highest melting point, which is 56.3°C, while formulas that use essential oils have a lower melting point. The formula F1 reaches 52.9°C, F2 is 51.4°C, and F3 is 53.0°C. This suggests that the addition of lavender essential oil makes the melting point of the wax drop. This phenomenon is due to the presence of volatile compounds such as linalool and linalyl acetate that fuse in the structure of the wax, thereby weakening the bonds between molecules and making it easier for the wax to melt at lower temperatures [15]. These results are also supported by research [4] which states that waxes with essential oils added tend to have a lower melting point than waxes with no volatile ingredients added.

The melting point also affects the candle burn time. The relationship between the melting point and the burning time of aromatherapy candles is the opposite. Candles that have a high melting point require more heat to melt, while candles with a low melting point melt more easily. In this study, formulas that had a higher essential oil content had a lower melting point, so the burn time was also shorter. This shows the relationship between the physical properties of the wax and the time of burning [16]. However, in F3 (25%) the melting point is slightly higher than in F1 (15%), i.e. F3 has a melting point of 53.0°C. Supposedly, the melting point of F3 is lower because the essential oil content is more. However, the difference is very small and still within the limits of measurement variation, so

statistically it cannot be considered different. The biggest difference is only in F0, while F1, F2, and F3 still have not much different values. A small difference in F3 can be affected by several factors, such as the size and position of the sample inside the capillary pipette. Too many or too dense samples in the capillaries can cause uneven heating, resulting in a higher visible melting point. Meanwhile, too few samples make the melting point look lower [17]. The results of the melting point test can be seen in **Table 4**

Statistical analysis was performed to determine whether there was a significant difference in the average physical evaluation of lavender aromatherapy wax preparations (*Lavandula angustifolia*) that used used cooking oil purification base as a *Repellent*. The melting point test results of the formulas F0, F1, F2, and F3 are shown in table 4.4. Prior to the *One Way ANOVA test*, the data normality test was carried out using the Shapiro-Wilk method. The significance values of F0 of 0.414 ($p>0.05$), F1 0.510 ($p>0.05$), F2 0.908 ($p>0.05$), and F3 0.144 ($p>0.05$) indicate that the data have a normal distribution. Furthermore, the homogeneity test was carried out using the Levene method, and the significance value of 0.402 ($p>0.05$) showed that the data was homogeneous. After that, it was followed by *the One Way ANOVA test*, and a significance value of 0.013 ($p>0.05$) was obtained, which showed that there was no significant difference between the formulas F0, F1, F2, and F3. This suggests that variations in the concentration of lavender essential oil do not significantly affect the melting point of lavender aromatherapy candles.

The hedonic test was carried out to find out the extent to which respondents liked the shape, color, and aroma of the candle. This test involved 20 panelists who had no special experience. They were asked to rate each of these aspects using a questionnaire with a 5-point scale, namely: Very Not Like (1), Dislike (2), Somewhat Like (3), Like (4), and Very Like (5). Once all the answers are collected, the number of people who voted for each category is counted.

The data is processed by converting the number of panelists to a percentage of the total respondents, so that it is easier to understand (the questionnaire sheet can be seen in Appendix 10). The results of the hedonic test showed that the panelists preferred the shape and color of all wax formulas. F1 and F2 formulas received the highest responses (Likes) and (Very Likes). In terms of scent, Formula F1 and F2 were preferred over F3, as respondents considered the scents in F3 to be too strong or pungent. F0 gets the lowest scent score because it does not contain lavender essential oil. This shows that a moderate concentration of essential oils (around 15-20%) is more optimal in creating a comfortable and desirable scent. This is also in accordance with the research conducted [7] which mentions that a moderate concentration of lavender essential oil is preferred because it has a relaxing effect, while high concentrations can cause discomfort due to too strong an aroma.

The addition of lavender essential oil with different concentration levels has a big impact on the ability of aromatherapy candles to repel mosquitoes. This test aims to measure how effective the wax is in

providing protection against *the Anopheles vagus mosquito*. The test was carried out by lighting aromatherapy candles in a cage containing 20 mosquitoes. For 15 minutes, the number of dead mosquitoes was recorded. In the group that did not use essential oils (F0), the number of dead mosquitoes was used as a reference. The results were analyzed using the protection power formula. Tests show that all formulas containing lavender essential oils (F1, F2, and F3) have increased repellency as the oil concentration increases. This result is in accordance with the principle that *the power of the Repellent* tends to increase if the concentration of the active ingredient is higher [17]. The mechanism of repellency against mosquitoes is caused by linalool compounds that work by interfering with mosquitoes' olfactory receptors, so that mosquitoes have difficulty detecting human body odor [3]. The F3 formula, which is with a concentration of 25%, gives the highest repellent effect, with the highest protection power seeing mosquitoes die when burning candles, which is (33.3%), compared to F2 (23.3%), and F1 (8.3%). F0 does not show *any Repellent effect* at all because it does not contain essential oils. The effect *of this repellent* comes from the linalool compound contained in lavender essential oil, which interferes with the working system of mosquitoes. This is in accordance with the research conducted by [18] Where the volatile compounds contained in lavender essential oil, commonly known as linalol compounds, in addition to its aroma that mosquitoes do not like, can also irritate mosquitoes.

Overall, the results of this study show that the best formula is not only the one that has the highest repellent, but also the formula that is able to balance physical quality, aroma comfort, and *repellent activity*. Based on these parameters, F1 Formula with a concentration of 15% lavender essential oil can be considered the most optimal. This formula has a melting point (52.9°C), a fairly long burning time (3 hours 59 minutes), is preferred by the panelists in terms of aroma, and has *a significant Repellent activity* (8.3%). Thus, F1 is considered superior to other formulas because it is able to combine good sensory qualities.

The results showed that although the F1 formulation (15%) produced the best overall characteristics, there were still some physical aspects that could be improved through the reformulation process. Reformulation can be done by adjusting the ratio between the refinedized used cooking oil and stearic acid so that the color of the wax is more uniform and its stability increases. In addition, the addition of natural color-stabilizing ingredients or increased homogenization processes during mixing can also minimize color differences in each replication. This reformulation effort is expected to be able to produce aromatherapy candles with better physical quality, more consistent burning time, and a stable aroma during combustion.

CONCLUSION

Based on the results of the research that has been conducted, it can be concluded that:

1. Lavender aromatherapy candle (*Lavandula angustifolia*) with a used

cooking oil purification base has activity as *a repellent* against *Anopheles vagus* mosquitoes.

2. The best formula was obtained at a concentration of 15% lavender essential oil (F1) with good physical characteristics, a panelist-preferred scent, the most optimal burning time, and effective protective power. Thus, the combination of refined-derived used cooking oil and stearic acid can be recommended as an alternative base for environmentally friendly in the manufacture of natural aromatherapy candles.

BIBLIOGRAPHY

- [1] Ministry of Health of the Republic of Indonesia, "Malaria Cases in Indonesia," Ministry of Health of the Republic of Indonesia. Accessed: Mar. 18, 2025. [Online]. Available: <https://Malaria.Kemkes.Go.Id/Case>
- [2] N. S. Daud, Y. Moses Sapu, and S. A. Idris, "Effectiveness of Repellent Stick Preparation of TWalang Fruit Extract (Meistera Chinensis) Against Aedes Sp Mosquitoes," *Journal of Indonesian Pharmaceutical Personnel*, Vol. 6, No. 3, pp. 92–102, Jan. 2024, doi: 10.36387/jifi.V6i3.1644.
- [3] A. Sanei-Dehkordi, A. Abdollahi, Z. Montaseri, M. Safari, M. Rostami Chaijan, And M. Osanloo, "Lavender And Geranium Essential Oil-Loaded Nanogels With Promising Repellent And Antibacterial Effects," *Psyche: Journal Of Entomology*, Vol. 2023, 2023, Doi: 10.1155/2023/9911066.

- [4] A. Buang, A. Nurilmi Adriana, and U. Pncasakti Makassar, "Aromatherapy Candle Formulation of Combination of Patchouli Leaf Essential Oil (Pogostemon Cablin Benth) and Lime Leaf Essential Oil (Citrus Aurantifolia Swingle) as an Anti-Mosquito Aedes Aegypti," *Fito Medicine: Journal Pharmacy And Sciences*, 2022, [Online]. Available: [Http://Journal.Unpacti.Ac.Id/Index.Php/Fito](http://Journal.Unpacti.Ac.Id/Index.Php/Fito)
- [5] M. A. Ferdian, R. G. Perdana, and P. P. Rahardjo, "Purification of Used Cooking Oil by Adsorbtion Method Using Bagasse," *Journal of Halal Agroindustry*, Vol. 8, No. 2, pp. 147–154, Oct. 2022, doi: 10.30997/Jah.V8i2.4713.
- [6] C. Anggraini and T. R. Kurniasih, "Effect of Combination of Used Cooking Oil and Stearic Acid on Arabica Coffee (Coffea Arabica) Aromatherapy Candle Preparation," *Indonesian Journal of Pharmacy & Science*, Vol. 7, No. 2, pp. 67–73, Dec. 2024, doi: 10.52216/Jfsi.Vol7no2p67-73.
- [7] D. A. Sari, Y. Ambari, A. W. Ningsih, and D. Rahmawati, "Physical Stability Test of Mosquito Repellent Lotion Combination of Lavender Oil (Lavandula angustifolia) and Rosemary Oil (Rormarinus officinalis)," *Scientific Journal of Ibn Sina (Jiis): Pharmaceutical and Health Sciences*, Vol. 8, No. 3, pp. 98–107, Jan. 2024, doi: 10.36387/jiis.V8i3.1680.
- [8] E. W. I. Hajar, A. F. W. Purba, P. Handayani, and Mardiah, "The Refining Process of Used Cooking Oil Using Bagasse for the Manufacture of Solid Soap," *Journal of Process Integration*, Vol. 6, p. 57, Dec. 2016.
- [9] J. Agroindustry Engineering and Management, R. Hakim, L. Putu Wrsiati, and I. Wayan Arnata, "Characteristics of Used Cooking Oil Resulting from the Refining Process with Bagasse at Various Variations in Temperature and Stirring Time," 2021.
- [10] Salsabila Aina, Agni Hutahaen Titi, and Basith Abdul, "Formulation and Activity Test of Aromatherapy Candles from Tablebellum Essential Oil (Cymbopogon citratus) as an Insect Repellent," 2023.
- [11] R. Prusinowska And K. B. Śmigielski, "Composition, Biological Properties And Therapeutic Effects Of Lavender (Lavandula Angustifolia L). A Review," *Herba Polonica*, Vol. 60, No. 2, Pp. 56–66, Oct. 2014, Doi: 10.2478/Hepo-2014-0010.
- [12] I. J. Asiyah, D. Purwaningsih, D. Wulandari, F. Farmasi, U. Setia, And B. Surakarta, "Pemanfaatan Beberapa Tanaman Herbal Sebagai Zat Aktif Dalam Beberapa Sediaan Pengharum Ruang Sebagai Pengusir Nyamuk Utilization Of Some Herbal Plants As Active Materials In Some Space Including Provisions As Mosquito Repellent," Jul. 2021.
- [13] Riani, Setia Budi, And Dede Mahdiyah, "Formulasi Dan Evaluasi Sediaan Lilin Aromaterapi Dari Minyak Jintan Hitam (Niggella Sativa) Dan Minyak Lavender (Lavandulla) Untuk Menghilangkan Stres," *Journal Of Social Science Research*, Vol. 3, No. 5, Pp. 9237–9248, 2023.

- [14] A. K. Sidiq And P. T. Bunda, "Formulasi Dan Uji Sifat Lilin Aromaterapi Kombinasi Minyak Atsiri Daun Kemangi (*Ocinum Sanctum L*) Dan Sereh (*Cympogogon Atratus*)," *Journal Of Pharmacy Tiara Bunda*, Vol. 1, Pp. 32–37, 2022. Prescription Medicines." *Journal Of Health, Technology And Science (Jhts)* 6.1 (2025): 40-51.
- [15] P. Mishra, J. Kumar, A. E. Prabahar, A. Verma, And A. K. Verma, "Linalool Based Herbal Mosquito Repellant," *Int J Mosq Res*, Vol. 10, No. 3, Pp. 15–23, May 2023, Doi: 10.22271/23487941.2023.V10.I3a.674
- [16] S. Sulhatun, S. Sarah, M. Masrullita, N. Sylvia, and Z. Ginting, "Effect of Comparative Pecan Oil and Lavender Flower Oil on the Aromatherapy Wax Properties of Pecan Oil-Based Aromatherapy Wax Formulation with the Addition of Lavender Flower Oil," *Unimal Journal of Chemical Technology*, Vol. 12, No. 1, pp. 12–22, Jul. 2023, doi: 10.29103/Jtku.V12i1.11610.
- [17] T. Mandala Sari and P. Syalsa Nesya Firza, "Formulation and Activity Test of Aromatherapy Wax Aromatherapy Wax of Kaffir Leaf Essential Oil (*Citrus Hystrix*) Against *Culex Sp.* Mosquitoes," 2024.
- [18] I. J. Asiyah, D. Purwaningsih, D. Wulandari, F. Pharma, U. Setia, and B. Surakarta, "Utilization of Some Herbal Plants As Active Materials In Some Space Including Provisions As Mosquito Repellent," 2021.
- [19] Thaib, Sheila, And Tri Setiawati Maulana. "Analysis Of The Role Of Pharmacists In Education On Herbal Medicines Used In Conjunction With