



Original Article

Formulation of Aromatherapy Massage Oil from Lavender (*Lavandula Angustifolia*), Chamomile (*Matricaria Recutita*), and Petitgrain (*Citrus Aurantium*) for Stress Relief

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ABSTRACT

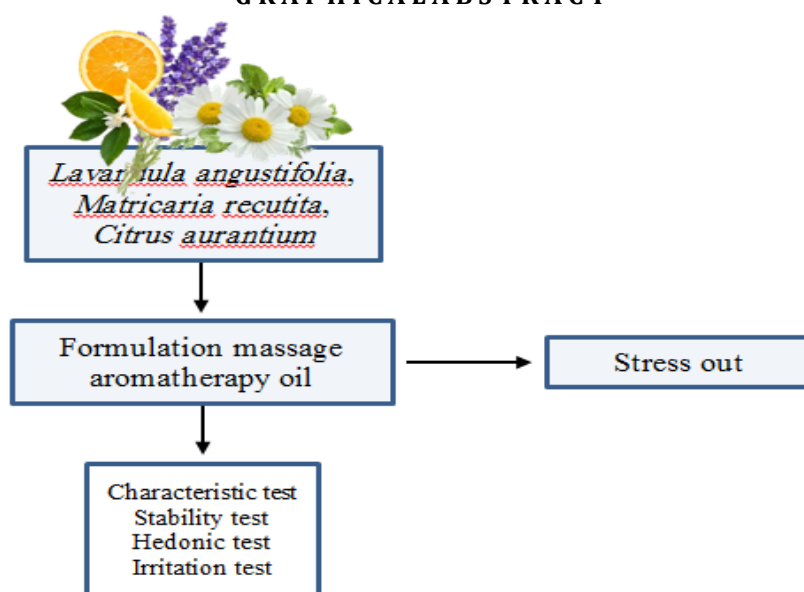
Stress is non-specific response of the body to the demands placed on it, which have an impact on anxiety, depression, and muscle pain. The use of synthetic drugs causes side effects such as irritation of the digestive tract and drowsiness. Therefore, it is necessary to use alternative therapies, one of which is the use of natural ingredients in the form of aromatherapy massage oil. This study aimed to formulate aromatherapy massage oil from the essential oils of lavender, chamomile, and petitgrain. The formulas were then put through organoleptic, pH, and viscosity tests to see how they looked and how stable they were. The stability test was carried out at room temperature on days 0, 1, 3, 5, 7, 14, 21, and 28. A hedonic test evaluated people's preferences for the formulas. The Kligman method irritation test served as a means of evaluating the formulas' safety. The results of the characteristic test showed that all of the tested parameters were met by the formulas. The results of the stability test showed that the formulas were organoleptically stable and had a pH with a significant value of > 0.05 . The viscosities were stable for the formulas F1, F2, F4, and F6. Meanwhile, the formulas F3 and F5 experienced significant changes, but were still included in the acceptable range for topical massage oil. The results of the irritation test showed that the formulas were safe to use and did not irritate the skin. Based on the results of the tests, aromatherapy massage oil containing lavender, chamomile, and petitgrain essential oils has excellent organoleptic, pH, and viscosity stability. It is aesthetically pleasing, passes the hedonic test, and is safe for the public. These results support the use of aromatherapy massage oil as a complementary treatment for stress.

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GRAPHICAL ABSTRACT



Introduction

Stress is a non-specific physical and psychological body response to a burden imposed on an individual [1]. The physical body responses to stress include palpitations, shortness of breath, and cold sweats [2]. Severe stress can lead to malignancy by suppressing the immune system. In fact, stress can decrease the activity of cytotoxic T lymphocytes and natural killer cells, and also lead to the growth of malignant cells, genetic instability, and tumor expansion. Studies have shown that the plasma concentration of norepinephrine, which increases after induction stress, has an inverse relationship with the immune function of phagocytes and lymphocytes [3]. Based on data from the World Health Organization (WHO), it is explained that approximately 450 million people in the world experience stress. Meanwhile, data on the Indonesian population experiencing stress is as high as 10% [4]. Anxiety and depression are emotions related to stress [5]. Based on data from the WHO, it reveals that depression and anxiety occupy the position of having the highest prevalence of common mental disorders in the world [4]. Aromatherapy is an ancient healing process that uses pure aromatic plant essences.

This alternative treatment is made from volatile plant materials, first known as essential oils. Essential oils, or essential oil extracts, are aromatherapy plant extracts used after previous processing [6], and the use of essential oils is safer than synthetic drugs [7]. In this study, lavender (*Lavandula angustifolia*), chamomile (*Matricaria recutita*), and petitgrain (*Citrus aurantium*) essential oils were mixed together to make aromatherapy massage oils. The use of a mixture of essential oils together can have a better synergistic effect than using a single one [7]. The results of formulation of aromatherapy massage oil need to be evaluated to see which formulas comply with the requirements. Evaluations carried out included testing the safety aspect based on irritation tests, hedonic tests, and characteristic and stability tests, which included colour, odor, and form, and were tested on days 0, 1, 3, 5, 7, 14, 21, and 28.

Materials and Methods

Materials

Virgin coconut oil (VCO), lavender essential oil, chamomile essential oil, and petitgrain essential oil were obtained from PT Darjeeling Sembrani Aroma, Bandung, Indonesia.

Methods

This research has passed the ethical proper test at the Health Research Ethics Committee State Polytechnic of Health Malang no. 732/KEPK-POLKESMA/2022.

Formulation of aromatherapy massage oil

The formulation of massage aromatherapy oil was based on empirical use [8], and is presented in [Table 1](#).

Characteristics test

A characteristic test involves observing the organoleptic properties, pH, and viscosity. Organoleptic testing is carried out by observing the color, shape, and aroma of the formulas [9], using five senses. Observation of the pH of the preparation was done using a pH meter. The pH test was carried out by calibrating the pH meter electrode at three points: pH 4, pH 7, and pH 10. The electrodes were rinsed with Aquadest, and then wiped with a tissue. Next, the electrode is dipped into a pH 4 solution until the pH value is read. Thereafter, the same steps were performed for pH 7 and pH 10. After calibration using a 3-point pH meter, it is ready to be used to measure the pH value of the formulas. The viscosity testing was done using an Ostwald viscometer, and then calculated using this formula:

$$\frac{\eta_1}{\eta_2} = \frac{\rho_1 \cdot t_1}{\rho_2 \cdot t_2}$$

Stability test

The stability test was done by observing organoleptics, pH, and viscosity on days 0, 1, 3, 5, 7, 14, 21, and 28. The results of the stability test data were analyzed using the Statistical Package for the Social Sciences (SPSS) software.

Hedonic test

The hedonic test is a way to judge how aromatherapy massage oil looks based on its

smell, color, texture, and how comfortable it is to use. This test was carried out on 30 respondents by distributing questionnaires and sample formulas. Assessment of formulas is described by a scale value consisting of a scale of 1-7 to indicate the preference degree for aromatherapy massage oil formulas that have been made [10].

Irritation test

The irritation testing procedure was carried out by taking 0.1 mL of the formulas and applying it to the respondent's skin, and then covering it with a patch [7]. If there are no signs of irritation, such as itching and redness, after 5 hours of skin testing, the preparation can be categorized as safe [11]. Based on the International Contact Dermatitis Research Group (ICDRG), the irritation level can be assessed using a scale of 0-3: Scale 1 for a weak positive reaction (non-vesicular), erythema, infiltration, maybe papules; scale 2 for a strong positive reaction (vesicular), erythema, infiltration, papules, and edema/vesicles; and scale 3 for a very strong positive reaction, ulcerative, or bulla; and a scale of 0 for negative reactions [12].

Results and Discussion

After formulation and evaluation of aromatherapy massage oil, the following results were obtained:

Characteristics test

Organoleptic observation with color parameters showed a greenish-blue result, as displayed in [Figure 1](#). This is due to the use of chamomile essential oil, which contains chamazulene, which can give rise to a greenish-blue color in the formula that has been made. In the aroma parameter, a distinctive smell is obtained according to the concentration of essential oils in the formulas [13]. This is in accordance with the properties of essential oils, which are their distinctive smell according to the producing plant [14].



Figure 1: The formulas appearance

Table 1: The formulas of aromatherapy massage oil

No.	Formula	VCO (mL)	Lavender oil (mL)	Chamomile oil (mL)	Petitgrain oil (mL)	Total (mL)
1	F1	20	0.6	0.2	0.2	21
2	F2	20	0.2	0.2	0.6	21
3	F3	20	0.3	0.1	0.1	20.5
4	F4	20	0.1	0.1	0.3	20.5
5	F5	20	0.1	0.1	-	20.2
6	F6	20	-	0.1	0.1	20.2

Table 2: Characteristic test of the formulas

Sample	Organoleptic			pH	Viscosity
	Color	Odor	Form		
F1	Greenish blue	Typical dominant strong lavender	Homogeneous liquid	5.56 ± 0.31	3.36 ± 0.07
F2	Greenish blue	Typical dominant strong orange	Homogeneous liquid	5.36 ± 0.50	3.21 ± 0.00
F3	Greenish blue	Typical dominant lavender	Homogeneous liquid	5.54 ± 0.23	3.55 ± 0.09
F4	Greenish blue	Typical strong orange	Homogeneous liquid	5.58 ± 0.13	3.57 ± 0.08
F5	Greenish blue	Typical lavender chamomile	Homogeneous liquid	5.66 ± 0.44	3.81 ± 0.01
F6	Greenish blue	Typical chamomile petitgrain	Homogeneous liquid	5.31 ± 0.06	3.78 ± 0.05

All the formulas were clear and in the form of homogeneous liquids due to the good solubility of the essential oils and the carrier oil, virgin coconut oil (VCO). The good solubility was caused by the same polarity of the oils [15]. In the pH test that has been carried out, as listed in Table 2, all formulas have a pH value in accordance with the requirements, which is 4.5-6.5. This shows that the formulas were safe to use on the skin because it is not too acidic that can irritate the skin, and not too alkaline, which can cause dry and scaly skin [9]. The pH value also has a standard deviation that is smaller than the average value. This indicates that there is little variation or no significant gap between the

maximum and the minimum values [16]. An average value that is greater than the standard deviation value indicates that the average value can be used as a representative of the entire research dataset [17]. The results of the viscosity tests that have been carried out are indicated in Table 2, which shows that all formulas meet the requirements for a good oil viscosity value. The requirements for the viscosity value of oil in linimentum formulas are 2.3-6.0 cP [18]. The viscosity value also has a standard deviation that is smaller than the average value. The higher the viscosity of the food preparation, the thicker and more difficult it is to flow [19]. The smaller the

compound particles, the lower the viscosity value [20].

Stability test

Organoleptic testing was done by looking at the color, smell, and shape of the formulas after they had been kept at room temperature for 4 weeks. The formulas were observed on days 0, 1, 3, 5, 7, 14, 21, and 28. Observations were made by five respondents with attention to color, smell, and shape. In organoleptic observation, no differences were found at the 8 test day points, and the formulas remained stable. Observation of the pH test shows that the pH value is in accordance with the required range, namely 4.5-6.5. The results of the pH values are provided in Table 3. Observations on the pH stability test that have been analyzed using repeated measurements ANOVA obtained a significance value of <0.05, which means that there is no significant difference or the aromatherapy massage oil is stable. The requirements for the viscosity value of oil in linimentum preparations are 2.3-6.0 Cp [18]. The results of the viscosity tests are shown in Table 4, which shows that all formulas meet the requirements for a good oil viscosity value [16]. The viscosity value also has a standard deviation that is smaller than the average value. This shows that there is little variation or no significant gap between the maximum and the minimum values. In the data analysis that has been carried out, the formulas F1, F2, F4, and F6 obtained a significance value of 0.05, which means that there was a change in the pH value during the 28 days of storage that was not significantly different. Formulas F3 and F5 obtained a significance value of 0.05. Therefore, it can be concluded that changes in viscosity values during 28 days of storage were significantly different, but still met the range of good viscosity requirements.

Hedonic test

The data obtained from 30 respondents was analyzed using SPSS. An analysis of Variance (ANOVA) is used to see the average difference between groups [21]. Based on the analysis using ANOVA, the most preferred formula was

obtained, namely F6, with an average value of 5.22, as summarized in Table 5. The most preferred sequence of formulas is F6, F4, F3, F5, F1, and F2. In the results of the advanced analysis of Tukey's Honestly Significant Difference data, a significance value of 0.169 was obtained. The results of this significance indicate that the average difference between one formula and another is not significantly different.

Irritation test

The formula is mentioned to be irritating and unsafe if it is found that 10% of the respondents (one respondent) show a weak reaction [7]. In the tests that have been carried out, all respondents did not experience signs of irritation at a weak, strong, or extreme level. Therefore, it was concluded that all the preparations that had been tested were safe and did not irritate the skin with a negative reaction in the test, as depicted in Figure 2.

The Use of Aromatherapy Massage oil as a Relaxation Media

The use two or more essential oils together for relaxation is better than using just one. This is because essential oils work well together and make each other's relaxing effects stronger. According to research done by Won and Choi (2017), lavender aromatherapy significantly reduced stress compared to before it was given. This is because lavender essential oil contains limonene, which can stop the sympathetic and parasympathetic nerves from working and relieve symptoms of nervous tension and anxiety [22]. Adiwibawa [23] found that lavender aromatherapy can help reduce stress because the aromatic molecules of lavender essential oil can affect the hypothalamus, the autonomic nervous system, and the endocrine system. When inhaled, these molecules create a relaxing response by calming, balancing, and stimulating, which can lower the levels of the stress hormones cortisone and cortisol in the body. The main parts of lavender are linalool and linalyl acetate, which can help reduce anxiety and act as a sedative, anticonvulsant, and antidepressant [24]. For health reasons, chamomile is used to treat

anxiety disorders [24]. Using both chamomile and lavender in aromatherapy at the same time can help with depression and anxiety [25]. On the other hand, Julianto (2014) demonstrated that citrus aromatherapy has a significant effect

on people who are about to have major surgery at Palembang Muhammadiyah Hospital, with a p-value of 0.001 and a significance level of 95% [26].

Table 3: The pH test of the formulas

Sample	pH ± SD								P-value
	Day-0	Day-1	Day-3	Day-5	Day-7	Day-14	Day-21	Day-28	
F1	5.48 ± 0.25	5.37 ± 0.08	5.96 ± 0.43	5.39 ± 0.25	5.26 ± 0.20	5.54 ± 0.29	5.48 ± 0.25	5.09 ± 0.40	0.190
F2	5.34 ± 0.31	5.42 ± 0.43	5.00 ± 0.31	5.60 ± 0.33	5.07 ± 0.33	5.20 ± 0.23	5.34 ± 0.31	4.54 ± 0.23	0.182
F3	5.56 ± 0.27	5.36 ± 0.41	5.40 ± 0.46	5.95 ± 0.37	5.50 ± 0.32	5.41 ± 0.37	5.56 ± 0.27	5.05 ± 0.32	0.335
F4	5.53 ± 0.46	5.60 ± 0.30	5.71 ± 0.11	6.10 ± 0.35	5.57 ± 0.42	5.40 ± 0.53	5.53 ± 0.46	5.15 ± 0.30	0.317
F5	6.02 ± 0.13	5.75 ± 0.44	5.57 ± 0.46	6.39 ± 0.10	5.78 ± 0.27	5.82 ± 0.35	6.02 ± 0.13	5.63 ± 0.08	0.263
F6	5.46 ± 0.20	5.28 ± 0.10	5.46 ± 0.41	5.07 ± 0.17	5.59 ± 0.35	5.36 ± 0.20	5.46 ± 0.20	5.32 ± 0.26	0.229

Table 4: Viscosity test of the formulas

Sample	Viscosity (cP) ± SD								P-value
	Day-0	Day-1	Day-3	Day-5	Day-7	Day-14	Day-21	Day-28	
F1	3.09 ± 0.07	3.28 ± 0.09	3.11 ± 0.06	3.14 ± 0.09	3.28 ± 0.04	3.11 ± 0.06	3.24 ± 0.02	3.15 ± 0.12	0.184
F2	3.06 ± 0.02	3.21 ± 0.14	3.09 ± 0.07	3.17 ± 0.06	3.26 ± 0.13	3.11 ± 0.03	3.14 ± 0.03	3.19 ± 0.03	0.217
F3	3.35 ± 0.10	3.51 ± 0.04	3.36 ± 0.08	3.43 ± 0.04	3.52 ± 0.08	3.30 ± 0.06	3.45 ± 0.07	3.34 ± 0.08	0.037*
F4	3.39 ± 0.03	3.53 ± 0.12	3.38 ± 0.11	3.38 ± 0.10	3.46 ± 0.09	3.35 ± 0.11	3.43 ± 0.10	3.35 ± 0.05	0.162
F5	3.97 ± 0.12	3.75 ± 0.05	3.63 ± 0.03	3.61 ± 0.10	3.75 ± 0.11	3.58 ± 0.07	3.75 ± 0.12	3.58 ± 0.03	0.030*
F6	3.99 ± 0.03	3.83 ± 0.09	3.76 ± 0.07	3.72 ± 0.10	3.74 ± 0.01	3.57 ± 0.09	3.68 ± 0.01	3.74 ± 0.09	0.086

Table 5: Hedonic Test results

Hedonic test		
Tukey HSD ^a		
Sampel	N	Subset for alpha = 0.05
		1
F2	30	4.5333
F1	30	4.7417
F5	30	4.8333
F3	30	4.9417
F4	30	5.0083
F6	30	5.2250
Sig.	30	0.105



Figure 2: Irritation test Kligman's method

Conclusion

Tests show that aromatherapy massage oil containing lavender, chamomile, and petitgrain essential oils has excellent organoleptic, pH, and viscosity stability. It is aesthetically pleasing, passes the hedonic test, and is safe for the public. These results support the use of aromatherapy massage oil as a complementary treatment for stress.

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Authors' Contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

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