Jurnal Pijar MIPA
https://jurnalfkip.unram.ac.id/index.php/JPM

ISSN 1907-1744 (Print)
ISSN 2460-1500 (Online)

# Formulation and Physical Stability Aromatherapy Medicated Oil of Red Ginger (*Zingiber officinale var rubrum*)

I Kadek Bagus Ari Pramana, Made Asmarani Dira, Ida Ayu Manik Damayanti*, Ni Wayan Sukma Antari

Bachelor of Clinic and Community Pharmacy Program, Faculty of Health, Institute of Technology and Health Bali, Bali, Indonesia
*E-mail: idaayumanikk@gmail.com

Received: May 28, 2024. Accepted: July 28, 2024. Published: July 29, 2024

**Abstract:** Aromatherapy products for health relax the body, refresh the mind, and act as a placebo in treating diseases. The more modern aromatherapy medicated oil innovation has high competitiveness in its distinctive aroma and packaging without reducing pharmacological effectiveness. One source of essential oil is red ginger (Zingiber officinale var rubrum), which has pharmacological effects such as antioxidant, anti-inflammatory, analgesic, and anti-carcinogenic. This research aims to prepare, formulate, perform a physical evaluation, and conduct hedonic testing of red ginger aromatherapy medicated oil. This research is experimental research with a posttest group design research design. The physical evaluation results, including organoleptic tests on color, showed that preparations F0 to F3 were precise, yellow +, yellow ++, and yellow +++, respectively. The aroma shows preparations F0 to F3, respectively, the smell of menthol to the typical aroma of red ginger (strong), and the texture F0 to F3 shows a liquid texture. The homogeneity test showed that preparations F0 to F3 were homogeneous. The pH test showed that the pH value of the preparation ranged between pH 5.5 and 6.2 for preparations F0 to F3. This study concluded that the red ginger aromatherapy medicated oil formulation with a concentration of 2%, 4%, and 6% has good physical quality.

**Keywords:** Aromatherapy Medicated Oil; Physical Stability; Red Ginger.

## Introduction

Indonesia has the potential to be a source of aromatherapy. Around 12 other essential oil-producing plants are still in the industrial-scale development stage, and around 40 types of plants can be created [1]. These plants have aromatic variations because they contain essential oils, namely essential oils. Essential oils are volatile oils and are a mixture of compounds in liquid form obtained from plant parts, roots, bark, stems, leaves, fruit, seeds, and flowers [2]. The need for essential oils is increasing along with the development of modern industries such as perfume, cosmetics, food, aromatherapy, and pharmaceutical industries [3]. One of the aromatic plants that produces essential oil is ginger (*Zingiber officinale*). The roll-on aromatherapy preparation formulation uses the ginger plant (*Zingiber officinale*) with a concentration of 2% [4].

Ginger (*Zingiber officinale*) is a rhizome plant that is very popular as a spice and medicinal ingredient. Ginger is efficacious for treating digestive disorders at risk of colon cancer and constipation, curing flu, relieving nausea in pregnant women, reducing pain during the menstrual cycle, reducing the risk of colorectal cancer attacks, and helping improve heart health [5]. Apart from being used as a medicinal ingredient, ginger (*Zingiber officinale*) is used as an external medicinal herb (both) to treat rheumatism (tuju) and as a drink to treat impotence (wandu) [6]. One type of ginger plant that is good for various treatments is red ginger (*Zingiber officinale var rubrum*). Utilization of red ginger and medang stems (*Cinnamomum iners Reinw. Ex Blume*) are used as aromatherapy candles [7]. Aromatherapy is a method of treatment that uses odors that generally come from plants and smell fragrant and delicious. It is called essential oils. Essential oils are soft, aromatic liquids and evaporate quickly at room temperature. Red ginger is used as an aromatherapy mask sticker by utilizing the essential oil content in red ginger as the main component, effectively preventing COVID-19 [8]. A variety of plants that can be used as a source of essential oil is red ginger. Red ginger has distinctive properties: a fragrant aroma and spicy taste formed by Gingerol and shogaol compound components [9]. The chemical compounds in red ginger, namely Gingerol, shogaol, and zingerone, have pharmacological effects such as antioxidant, anti-inflammatory, analgesic, and anti-carcinogenic. The bioactive compounds of red ginger rhizomes include β-carotene, terpenoids, ascorbic acid, alkaloids, and polyphenols (flavonoids, glycosides, flavonoids, and routine). The chemical compound content of red ginger contains flavonoids, alkaloids, saponins, terpenoids, tannins, and Gingerol. The compounds obtained were Gingerol, shogaol, and paradol [10]. Red ginger, an essential ingredient for topical medicine, is still not widely used, so research was carried out to determine the formulation of red ginger aromatherapy medicated oil preparations using physical stability tests.

## Research Methods

### Red Ginger Essential Oil Extraction

**How to Cite:**
Pramana, I. K. B. A., Dira, M. A., Damayanti, I. A. M., & Antari, N. W. S. (2024). Formulation and Physical Stability Aromatherapy Medicated Oil of Red Ginger (Zingiber officinale var rubrum). *Jurnal Pijar Mipa*, *19*(4), 688–692. https://doi.org/10.29303/jpm.v19i4.6934

The process of distilling ginger plants using the steam distillation method is carried out for 6 hours. Essential oils using the steam distillation method are more optimal when done for 6 hours [11] and waited until red ginger (Zingiber officinale var rubrum) essential oil is obtained. The ginger plant essential oil obtained was then separated using a separating funnel with $Na^2SO^4$ added [12].

**Red Ginger Aromatherapy Medicated Oil Formulation**

The formulation of red ginger aromatherapy medicated oil is done by first preparing the tools and materials. Next, each ingredient is weighed to make 10 ml of each formula. Menthol and champignon are crushed in a mortar until they melt. Then, transfer it into a beaker and add *gandapura* oil, *Oleum foeniculi*, and red ginger oil according to the formula made; finally, add oleum cocos (VCO) and 10 ml.

**Physical Stability Test**

The physical stability test is carried out using several tests, namely the organoleptic test, which is carried out by visually observing the preparation's physical appearance, including color, aroma, and texture. Next, a homogeneity test is carried out by observing whether there are coarse grains or not using the glass attached. The test was repeated three times for each preparation [13]. After that, a pH test was carried out using a pH meter and repeated three times. The next test, namely the spreading power test, is carried out by pouring enough aromatherapy preparation into the middle of the glass, then covering it with another glass and adding a load of 25 grams, 100 grams, 250 grams for 1 minute, then measuring the diameter of the spreading area using a ruler [14]. Stability tests are carried out using organoleptic, homogeneity, pH, and spreadability tests every week for 28 days of product storage at 25º C [15].

**Data analysis**

Statistical analysis was carried out for the normality test ($p>0.05$) and in the homogeneity test ($p>0.05$), followed by One-way ANOVA to determine whether there were significant differences or not and if there were substantial differences, then continued with the Duncan test. Post hoc test to see differences between groups.

## Results and Discussion

The results of the distillation of red ginger essential oil with a sample weight of 3000 grams using the steam distillation method were carried out for 6 hours to obtain 15 ml of essential oil with a yield of 0.5%. In this study, red ginger essential oil showed no transparent stains on the filter paper because the crucial oil evaporated at room temperature, proving that the oil obtained was necessary. The formulation of aromatherapy medicated oil, which uses the active ingredient red ginger (*Zingiber officinale var rubrum*), is made in a volume of 10 ml.

**Table 1.** Formula of Red Ginger Aromatherapy Medicated Oil (*Zingiber officinale var rubrum*)

| Ingredients | Function | Formula % | | | |
|---|---|---|---|---|---|
| | | F0 | F1 | F2 | F3 |
| Red ginger essential oil *(Zingiber officinale var rubrum)* | Active substance | 0% | 2% | 4% | 6% |
| Camphor | Antiirritant | 15% | 15% | 15% | 15% |
| Menthol | Antiirritant | 65% | 65% | 65% | 65% |
| Gandapura Oils | Antiseptic | 5% | 5% | 5% | 5% |
| *Oleum foeniculi* | Anti-bacteria | 5% | 5% | 5% | 5% |

Based on the research that has been carried out, the results of the physical stability test for red ginger aromatherapy medicated oil are obtained as follows:

**Table 2.** Organoleptic Test Results of Red Ginger Aromatherapy Medicated Oil (*Zingiber officinale var rubrum*) on Color

| Formula | Color | | | |
|---|---|---|---|---|
| | Weeks I | Weeks II | Weeks III | Weeks IV |
| F0 | Clear | Clear | Clear | Clear |
| F1 | Yellow + | Yellow + | Yellow + | Yellow + |
| F2 | Yellow ++ | Yellow ++ | Yellow ++ | Yellow ++ |
| F3 | Yellow +++ | Yellow +++ | Yellow +++ | Yellow +++ |

**Table 3.** Organoleptic Test Results of Red Ginger Aromatherapy Medicated Oil (*Zingiber officinale var rubrum*) on Aroma

| Formula | Aroma | | | |
|---|---|---|---|---|
| | Weeks I | Weeks II | Weeks III | Weeks IV |
| F0 | Menthol | Menthol | Menthol | Menthol |
| F1 | Typical red ginger (Weak) | Typical red ginger (Weak) | Typical red ginger (Weak) | Typical red ginger (Weak) |
| F2 | Typical red ginger (Moderate) | Typical red ginger (Moderate) | Typical red ginger (Moderate) | Typical red ginger (Moderate) |
| F3 | Typical red ginger (Strong) | Typical red ginger (Strong) | Typical red ginger (Strong) | Typical red ginger (Strong) |

**Table 4.** Organoleptic Test Results of Red Ginger Aromatherapy Medicated Oil (*Zingiber officinale var rubrum*) on Texture

| Formula | Texture | | | |
|---|---|---|---|---|
| | Weeks I | Weeks II | Weeks III | Weeks IV |
| F0 | Liquid | Liquid | Liquid | Liquid |
| F1 | Liquid | Liquid | Liquid | Liquid |
| F2 | Liquid | Liquid | Liquid | Liquid |
| F3 | Liquid | Liquid | Liquid | Liquid |

The organolepticity of a preparation is related to product presentation because it reflects the quality of the product, which is assessed using the human senses [16]. Based on the organoleptic test results of red ginger aromatherapy medicated oil in Table 2, it is known that red ginger aromatherapy medicated oil F1, F2, and F3 have different colors. Aromatherapy medicated oil with red ginger essential oil with a concentration of 2% has a clear yellow + color, a concentration of 4% clear yellow ++, and a concentration of 6% clear yellow +++. The color difference in aromatherapy medicated oil F1, F2, and F3 is due to adding red ginger essential oil with increasing concentration. The greater the concentration of red ginger essential oil added, the higher the color produced, and the resulting color is by SNI 06-1312 -1998 [17]. In F0, it is only apparent because red ginger essential oil is not added. When seen directly, a product's color is vital in attracting the sense of sight. If a product's color does not appeal, it will be a lousy assessment for consumers [18]. The color change is influenced by the addition of red ginger essential oil and different variations in concentration, where the addition of essential oil affects the increase in concentration used, resulting in a color change [19].

In Table 3, it is known that FI has a typical aroma of red ginger (weak), F2 is typical of red ginger (medium), and F3 is typical of red ginger (strong). This is due to adding red ginger with different concentrations in each formula; the greater the concentration. Suppose you add red ginger essential oil; the distinctive red ginger aroma is produced. In F0, it only smells like menthol, gandapura, and Oleum foeniculi because red ginger essential oil is not added. The aroma can be observed with the sense of smell on the part of taste. Each ingredient has a different aroma and can change because the process and processing method will determine the resulting aroma that will be smelled [20]. Aroma is an essential part of a product because the aroma stimulus can be received directly by the human nose quickly to produce a product sensation, allowing humans to perceive whether the product is safe [21]. In Table 4, it can be seen that all aromatherapy medicated oil formulas have a liquid texture.

Based on the homogeneity test that has been carried out, all formulas show homogeneity, meaning that all aromatherapy medicated oil formulas do not contain any visible particles or coarse grains when the homogeneity test is carried out. The active substances and main ingredients used can be mixed well or are homogeneous, meaning that all aromatherapy preparations do not contain visible particles or coarse grains [22].

**Table 5**. pH Test Results Red Ginger Aromatherapy Medicated Oil (*Zingiber officinale var rubrum*)

| Formula | Weeks | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| F0 | 5.6 | 5.6 | 5.6 | 5.7 |
| F1 | 5.7 | 5.8 | 5.7 | 5.8 |
| F2 | 5.8 | 5.9 | 5.8 | 5.8 |
| F3 | 6 | 6.1 | 6.1 | 6.1 |

Based on the pH test results, it was found that the pH value of the preparation ranged from 5.6-6.1 for formulas F0, F1, F2, and F3, which means that red ginger aromatherapy medicated oil meets the requirements for good pH measurements. The recommended pH test results for a topical preparation are 4.5-6.5 [23]. Conditions that are too acidic will cause the skin to become irritated, while conditions that are too alkaline can cause the skin to become scaly [24].

**Table 6.** Analysis One Way ANOVA of pH Test

| Formula | p | Means |
|---|---|---|
| F0 | 0.552 | Not significant differences |
| F1 | 0.441 | Not significant differences |
| F2 | 0.552 | Not significant differences |
| F3 | 0.552 | Not significant differences |

The statistical analysis results using SPSS show that in the normality test, all formulas have a value of $p>0.05$, where the data is usually distributed, followed by a homogeneity test, which also shows a value of $p>0.05$, which shows that the data is homogeneous. Based on the assumption that regular and homogeneous data are met, parametric testing determines whether significant differences exist between each formula. One Way ANOVA analysis where the p value $<0.05$ indicates substantial differences in the data groups. The study was continued with a post hoc test, namely the Duncan test, to determine which groups had significant differences. The post hoc test results show that each formula has a p-value> 0.05, which means it is not significantly different. This indicates that aromatherapy medicated oil has good stability in pH test parameters at 25º C for 28 days.

**Table 7.** Spread Test of Red Ginger Aromatherapy Medicated Oil (*Zingiber officinale var rubrum*)

| Formula | Weight (gr) | | |
|---|---|---|---|
| | 50 | 100 | 250 |
| F0 | 3.5 | 4.5 | 5 |
| F1 | 3.8 | 4.6 | 5.4 |
| F2 | 4.6 | 5.3 | 6.2 |
| F3 | 5 | 5.6 | 6.1 |

**Table 8.** Analysis One Way ANOVA of Spread Test

| Formula | p | Means |
|---|---|---|
| F0 | 0.987 | Not significant differences |
| F1 | 0.872 | Not significant differences |
| F2 | 0.812 | Not significant differences |
| F3 | 0.553 | Not significant differences |

The spreadability test is carried out by pouring enough aromatherapy preparation into the middle of the glass, then covering it with another glass and adding a load of 25 grams, 100 grams, 250 grams for 1 minute, then measuring the diameter of the spreading area using a ruler. Based on Table 8, this study's average spread power test results showed that the average spread power was 5-6.1 cm. The requirement for good spreadability is around 5-7 cm, so all aromatherapy oil formulations meet the spreadability test requirements [25]. The results of statistical analysis on the dispersion power test show that the data is usually distributed with a value of $p>0.05$, followed by a homogeneity test showing that the data is homogeneous at $p>0.05$. Based on the assumption that regular and homogeneous data are met, parametric testing is used to determine whether there is a significant difference between each formula, namely One Way ANOVA analysis where

the p value <0.05 indicates a significant difference. The analysis results showed p>0.05, which shows that aromatherapy medicated oil has good stability in the spreadability parameters.

## Conclusion

The physical evaluation results, including organoleptic tests on color, showed that preparations F0 to F3 were precise, yellow +, yellow ++, and yellow +++, respectively. The aroma shows preparations F0 to F3, respectively, the smell of menthol to the typical aroma of red ginger (strong), and the texture F0 to F3 shows a liquid texture. The homogeneity test showed that preparations F0 to F3 were homogeneous. The pH test showed that the pH value of the preparation ranged between pH 5.5 and 6.2 for preparations F0 to F3. This study concluded that the red ginger aromatherapy medicated oil formulation with a concentration of 2%, 4%, and 6% has good physical quality.

## References


[1] Kementrian Perdagangan Republik Indonesia. (2011). *Handbook Of Commodity Profile "Indonesian Essential Oils: The Scents Of Natural Life." Trade Policy Analysis And Development Agency, Ministry Of Trade Of The Republic Of Indonesia*, 1st, 1–47. Indonesian Essential O.

[2] Marwati, M., Taebe, B., Tandilolo, A., & Nur, S. (2021). Pengaruh Tempat Tumbuh Dan Profil Kandungan Kimia Minyak Atsiri Dari Rimpang Jahe Merah (Zingiber Officinalle Linn. Var Rubrum). Jurnal Sains Dan Kesehatan, 3(2), 248–254.

[3] Azalia, A., Suroso, E., Hidayati, S., & Joen, D. A. Z. (2020). Model penyulingan minyak atsiri jahe merah berbasis produksi bersih. *JTUR*, *2*(2), 238-249.

[4] Iskandar, A. F., Nurjanah, S., Rosalinda, S., & Nuranjani, F. (2023). Penyulingan minyak atsiri jahe merah (Zingiber officinale var. Rubrum) menggunakan metode hidrodistilasi dengan variasi waktu penyulingan. *TEKNOTAN*, *17*(1), 53-60.

[5] Meirista, I., Hadriyati, A., Aptiarmi, H., & Jannah, M. (2022). Pemanfaatan rimpang jahe merah dalam usaha pengobatan dan pemeliharaan kesehatan. *Martabe: Jurnal Pengabdian Masyarakat*, *5*(3), 912-917.

[6] Antok, N. A., & Novi, I. (2022). Literature Review Manfaat Jahe (Ginger) untuk Kesehatan terkait Masalah Nyeri dan Mual Muntah. *Gorontalo Journal of Public Health*, *5*(2), 100-113.

[7] Paramawidhita, R. Y. (2023). Formulasi Lilin Aromaterapi Dari Minyak Atsiri Kombinasi Jahe Merah (Zingiber Officinale Var. Rubrum) Dan Batang Medang (Cinnamomum Iners Reinw. Ex Blume) Sebagai Antiemetik. *Lumbung Farmasi: Jurnal Ilmu Kefarmasian*, *4*(1), 48-54.

[8] Julianti, T. R., Pertiwi, N. I., & Anggia, R. (2023). Formulasi Stiker Masker Aromaterapi Rimpang Jahe Merah (Zingiber officinale var. Rubrum) Dengan Minyak Nilam (Pogostemon cablin Benth) SEBAGAI Pencegah Sars CoV-2. *Jurnal Ilmiah Farmako Bahari*, *14*(1), 32-43.

[9] Srikandi, S., Humaeroh, M., & Sutamihardja, R. T. M. (2020). Kandungan gingerol dan shogaol dari ekstrak jahe merah (Zingiber officinale Roscoe) dengan metode maserasi bertingkat. *al Kimiya: Jurnal Ilmu Kimia dan Terapan*, *7*(2), 75-81.

[10] Wahidah, S. W., Fadhilah, K. N., Nahhar, H., Afifah, S. N., & Gunarti, N. S. (2021). Uji Skrining Fitokimia dari Amilum Familia Zingiberaceae. *Jurnal Buana Farma*, *1*(2), 5-8.

[11] Mierza, V., Ravelliani, A., Al Bara, B., Marisah, M., & Sa'diyyah, N. (2023). Isolasi Senyawa Limonen pada Minyak Atsiri Menggunakan Metode Uji Hidrodestilasi, Destilasi Uap dan Destilasi Air-Uap. *Jurnal Farmasetis*, *12*(1), 15-20.

[12] Putri, I. A., Fatimura, M., Husnah, H., & Bakrie, M. (2021). Pembuatan minyak atsiri kemangi (Ocimum basilicum L.) dengan menggunakan metode distilasi uap langsung. *Jurnal Redoks*, *6*(2), 149-156.

[13] Yanuarto, T., & Aulia, P. (2023). Pembuatan Dan Uji Mutu Roll On Aromaterapi Minyak Atsiri Lengkuas (Alpania malaccensis). *Parapemikir: Jurnal Ilmiah Farmasi*, *12*(2), 227-231.

[14] Fatmawati, A., Zuliyati, I. C., & Mulyaningsih, S. (2022). Formulasi dan Evaluasi Sediaan Roll On Aromaterapi Blended Peppermint, Lavender dan Lemon sebagai Antiemetika. *INPHARNMED Journal (Indonesian Pharmacy and Natural Medicine Journal)*, *5*(2), 8-16.

[15] Shintawati, S., & Zulfahmi, Z. (2020). Identifikasi Minyak Citronella Dengan Gcms Dan Aplikasinya Sebagai Minyak Angin Aromaterapi [Identification of Citronella Oil With GCMS and Its Application In Aromatherapy Medicated Oil Formulation]. *Jurnal Teknologi & Industri Hasil Pertanian*, *25*(2), 62-70.

[16] Ismawati, I., Destryana, R. A., & Huzaimah, N. (2020). Mutu Organoleptik Dan Daya Terima Panelis Terhadap Crackers Kasembukan (Paederi foetida Linn.) Sebagai Pangan Fungsional. *Agrointek: Jurnal Teknologi Industri Pertanian*, *14*(1), 67-74.

[17] Iskandar, A. F., Nurjanah, S., Rosalinda, S., & Nuranjani, F. (2023). Penyulingan minyak atsiri jahe merah (Zingiber officinale var. Rubrum) menggunakan metode hidrodistilasi dengan variasi waktu penyulingan. *TEKNOTAN*, *17*(1), 53-60.

[18] Mukti, A. B., Widayanti, A. D., & Prasastono, N. (2021). Pengaruh Penggunaan Sari Buah Strawberry Terhadap Penampilan, Tekstur, Aroma, Warna Dan Rasa Sebagai Pengganti Air Mineral Dalam Pembuatan Churros. *Jurnal Pariwisata Indonesia*, *17*(1), 1-10.

[19] Nafisah, L. (2020). Konsentrasi jahe merah (Zingiber officinale rosc) terhadap karakteristik fisikokimia dan

organoleptik daging sayat ayam kampung (Gallus domesticus). *Jurnal Teknologi Pangan dan Hasil Pertanian*, *15*(1), 11-16.

[20] Nurhayati, A. P. D., Ersandy, A. R. D., Sa'adah, N. N., Setiawan, E., Ashuri, N. M., Indiani, A. M., ... & Wayan, N. (2022). Diversifikasi produk herbal serbuk instan jahe merah dalam upaya peningkatan produktivitas masyarakat Desa Oro-Oro Ombo, Kota Batu. *Sewagati*, *6*(4), 397-404.

[21] Egahny, E. S., & Aufa, N. (2023). Galeri Atsiri Indonesia. *Jurnal Tugas Akhir Mahasiswa Lanting*, *12*(2), 192-201.

[22] Astuti, R. D., & Millenia, D. P. (2021). Formulasi Dan Evaluasi Balsam Aromaterapi Ekstrak Daun Jeruk Purut (Citrus Hystrix Dc) Dengan Variasi Cera Alba Sebagai Stabilizing Agent. *Jurnal Kesehatan Farmasi*, 43-49.

[23] Brown, M. B., Williams, A. C. (2019). The Art and Science of Dermal Formulation Development. United States: CRC Press.

[24] Kharisma, D. N. I., & Safitri, C. I. N. H. (2020). Formulasi dan uji mutu fisik sediaan gel ekstrak bekatul (oryza sativa L.). Prosiding SNPBS (Seminar Nasional Pendidikan Biologi dan Saintek) Ke-5.

Tandikura, J. S., Sipahelut, S. G., & Augustyn, G. H. (2022). Potensi Minyak Jahe Merah Dan Minyak Jeruk Manis Sebagai Bahan Aktif Alami Dalam Pembuatan Handsanitizer. *Ekologia: Jurnal Ilmiah Ilmu Dasar dan Lingkungan Hidup*, *22*(2), 65-74.