

## Bukti Correspondensi Artikel

Judul. : KASTURI ORANGE PEEL (CITRUS MICROCARPA BUNGE) ESSENTIAL OIL- CHEMICAL PROFILE, FORMULATION AS ROLL-ON AROMATHERAPY AND ITS EVALUATION

Penulis Corresponding : Yahdian Rasyadi\*

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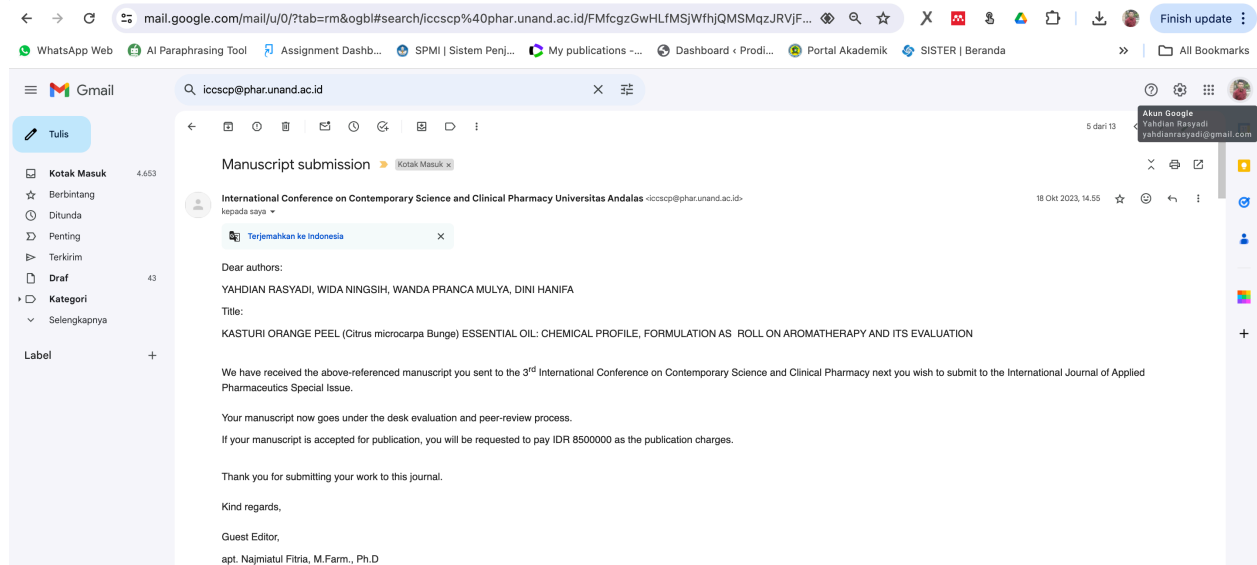
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KASTURI ORANGE PEEL (*Citrus microcarpa* Bunge) ESSENTIAL OIL: CHEMICAL PROFILE, FORMULATION AS ROLL ON AROMATHERAPY AND ITS EVALUATION

**Objective:** Kasturi orange (*Citrus microcarpa* Bunge) is widely cultivated and consumed in Indonesia. The fruit's flesh is a good source of vitamin C. Essential oil of *kasturi* orange peel is one of the ingredients used as a raw material for aromatherapy roll-on preparations. Roll-on aromatherapy is currently widely used by various age groups. This research aims to determine the content of *kasturi* oil, its formulation as a roll-on aromatherapy preparation, and its physical evaluation.

**Methods:** The essential oil of *kasturi* orange peel was extracted using the distillation method, and then the physicochemical properties were examined. The chemical content of the oil was analyzed using GC-MS. The roll-on aromatherapy preparation formulas were made by varying concentrations of *kasturi* oil, F0 (0%), F1 (4%), F2 (6%), and F3 (10%). Additional substances used were menthol, camphor, patchouli oil, and virgin coconut oil. Patchouli oil was used in this preparation to make the aroma last longer. Evaluation of roll-on aromatherapy preparations includes organoleptic tests, pH tests, specific gravity, viscosity, clarity, and stability.

**Results:** From the extraction results, the percentage yield of essential *kasturi* oil was 0.55% v/w, with a density of 0.850 g/mL and a refractive index of 1.469. From the chromatogram results, there were 18 compounds in *kasturi* oil; the largest component was D-limonene (32.59%). Physical evaluation results of all roll-on aromatherapy formulas had met the requirements.

**Conclusion:** From the chromatogram results, there were 18 compounds in *kasturi* oil, with the largest component were D-limonene (32.59%). Formula F3 had the best aroma intensity, approximately for 5 hours, with a slightly strong aroma, and physical evaluation results of all roll-on aromatherapy formulas had met the requirements.

**Keywords:** Roll on, aromatherapy, *kasturi* oil, *Citrus microcarpa* Bunge, *kasturi* orange peel.

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carcinogenic, or nephrotoxic in humans. Kasturi orange peel oil extracted with N-hexane and dichloromethane will produce aromatic compounds [4].

Aromatherapy is a form of alternative medicine that utilizes plant volatiles, also known as essential oils, which aim to improve mood, health, and cognitive function. Apart from that, aromatherapy is made from various plant extracts, such as flowers, leaves, wood, plant roots, bark, and other parts of plants, with different manufacturing methods according to their respective uses and functions [5]. Various essential oils have been researched and found to be effective as a mild sedative that calms the central nervous system, which helps overcome insomnia, especially those caused by stress, anxiety, tension, and depression [6].

One of the components used in making aromatherapy preparations is a fixative such as Patchouli Oil (*Pogostemon cablin* Benth). Patchouli oil contains several compounds, including **boenesein**, benzaldehyde, patchouli alcohol, patchoulien, and **arispogilene**. The patchouli alcohol content in patchouli oil can be used as a fixative agent (binding agent), which is useful for the pharmaceutical industry in manufacturing medicines, cosmetic products, and others. If the patchouli alcohol content is higher, the higher quality of the patchouli oil is produced [7]. Based on research conducted by Humaira et al. (2022), the best concentration of patchouli oil as a fixative in the preparation of air freshener gel is with a concentration of 3% and a concentration of coffee oil with a concentration of 5% [8]. Siahaan et al. (2014) also used patchouli oil as a base note, where the mixture of lemongrass and ylang-ylang oil can reduce stress levels in healthy women. In this research, the essential oil of **kasturi** orange peel was formulated into a roll-on preparation by adding patchouli oil as a fixative [9]. The preparation was then evaluated for its physical properties, including organoleptic, pH, viscosity, specific gravity, stability, and aroma intensity test [10].

**MATERIALS AND METHODS**

**Materials**

Kasturi oranges were obtained from the **Tunggul Hijau** area, Padang City, Indonesia. The materials used in this study were camphor, menthol, patchouli oil, and virgin coconut oil.

**Extraction Of Essential Oil Kasturi Orange Peel**

The extraction process for essential oil of **kasturi** orange peel was carried out using water-steam distillation. The material used in this research was fresh **kasturi** orange (*Citrus microcarpa* Bunge). Kasturi orange was cleaned, and the peel was removed. **Kasturi orange peel was weighed** using an analytical balance (Kern®). Steam distillation was done to separate essential oils from **kasturi** orange peel. A distillation kettle was filled with water until the water surface was not far below the filter. Kasturi orange peel samples were put into a kettle with a certain weight. The boiler was closed tightly and connected to a condenser, adapter, and reservoir. The distillation kettle was heated until all the essential oil had been distilled. The essential oil in the distillate was separated from the water in a separating funnel (Duran®) [11].

**Measurement of Kasturi Oil Yield**

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We sincerely appreciate the valuable feedback provided by you and the reviewers. We have carefully addressed each comment and suggestion, making necessary revisions to enhance the clarity, validity, and overall quality of the manuscript.

In the revised version, you will find the tracked changes highlighting the modifications made, along with a detailed response to each comment in the attached document. We believe that these changes address the concerns raised and improve the overall strength of the manuscript.

We remain committed to upholding the high standards of IJAP, and we hope that the revised manuscript meets the approval of you and the reviewers. We appreciate the time and effort invested in the review process and would be grateful for any further guidance you may provide. Thank you once again for the opportunity to contribute to IJAP. We look forward to hearing from you and the reviewers soon.

Best regards,

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Best regards,

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## KASTURI ORANGE PEEL (*CITRUS MICROCARPA BUNGE*) ESSENTIAL OIL: CHEMICAL PROFILE, FORMULATION AS ROLL-ON AROMATHERAPY AND ITS EVALUATION

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Original Article

### KASTURI ORANGE PEEL (*CITRUS MICROCARPA BUNGE*) ESSENTIAL OIL: CHEMICAL PROFILE, FORMULATION AS ROLL-ON AROMATHERAPY AND ITS EVALUATION

YAHDIAN RASYADI<sup>1</sup>, WIDA NINGSIH<sup>2</sup>, WANDA FRANCA MULYA<sup>3</sup>, DINI HANIFA<sup>4</sup>

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#### ABSTRACT

**Objective:** Kasturi orange (*Citrus microcarpa Bunge*) is widely cultivated and consumed in Indonesia. The fruit's flesh is a good source of vitamin C. Essential oil of kasturi orange peel is one of the ingredients used as a raw material for aromatherapy roll-on preparations. Roll-on aromatherapy is currently widely used by various age groups. This research aims to determine the content of kasturi oil, its formulation as a roll-on aromatherapy preparation, and its physical evaluation.

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**Conclusion:** From the chromatogram results, there were 18 compounds in kasturi oil, with the largest component were D-limonene (32.59%). Formula F3 had the best aroma intensity, approximately for 5 h, with a slightly strong aroma, and physical evaluation results of all roll-on aromatherapy formulas had met the requirements.

**Keywords:** Roll on, Aromatherapy, Kasturi oil, *Citrus microcarpa bunge*, Kasturi orange peel

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#### INTRODUCTION

Essential oils, commonly called volatile oils, are substances that evaporate easily and have a distinctive aroma. They are insoluble in water and contain organic compounds and natural extracts from plant species from leaves, flowers, wood, seeds, and even plants. At least 150 types of essential oils are traded on the world market, and 40 varieties are produced in Indonesia. Even though many kinds of essential oils are produced in Indonesia, only a few have been developed [1]. Essential oils have many uses, depending on the type

from various plant extracts, such as flowers, leaves, wood, plant roots, bark, and other parts of plants, with different manufacturing methods according to their respective uses and functions [2]. Various essential oils have been researched and found to be effective in a mild sedative that calms the central nervous system, which helps overcome insomnia, especially those caused by stress, anxiety, tension, and depression [3].

One of the components used in making aromatherapy preparations is a fixative such as Patchouli Oil (*Pogostemon cablin* Benth). Patchouli