

# Shampoo Formulation With The Addition Of Lemon Oil As An Anti-Dandruff Shampoo

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## Abstrac

Hair, primarily composed of keratin, plays a vital role in individual appearance. Dandruff, a common hair issue, affects 50% of adults globally, with prevalence higher in men. Factors contributing to dandruff include increased sebum production, environmental elements, stress, and fungal growth on the scalp. This literature review explores the potential of lemon essential oil in anti-dandruff shampoo formulations. Lemon's rich vitamin C content and antibacterial properties make it a promising candidate. Two studies are examined, indicating lemon essential oil's effectiveness against *Pityrosporum ovale* and *Malassezia* sp., causative agents of dandruff. Formulations with 17.5% lemon essential oil demonstrate the highest inhibitory power. Another study highlights the significance of an HPMC base of 6% in inhibiting *Malassezia* sp. Lemon essential oil emerges as a valuable component in the development of effective anti-dandruff shampoos.

Keywords : dandruff, lemon essential oil, shampoo.

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## I. INTRODUCTION

Hair is a filament that emerges from the skin layer and is formed by the most dominant substance, namely keratin. However, nowadays, various problems with hair are commonly encountered. One of them is dandruff (1). Hair plays a crucial role for every individual as it can influence one's appearance (2). Dandruff, or Pityriasis capitis, is a disorder of the scalp characterized by excessive scales on the scalp, usually white or gray, present in the hair. It is often accompanied by itching and may show little or no signs of mild inflammation (3). Dandruff can occur in eyebrows and the scalp, but it commonly occurs on the scalp (4).

Dandruff occurs in 50% of the adult population worldwide and is more prevalent in men than women (5). Several factors can contribute to dandruff, such as increased sebum production in sebaceous

glands, individual vulnerability, environmental factors (temperature and humidity), stress, and excessive fungal growth on the scalp leading to flaky scalp (6). Decreased immune system factors can trigger fungal growth, causing issues like dandruff (7). Indonesia, being a tropical country with high humidity, provides favorable conditions for the growth of fungi, especially on the skin<sup>8</sup>. Some substances that can be used to address dry dandruff include limonene, linanin acetate, asani citrate, citric acid, sulfur, phosphorus, and vitamin C (8).

Lemon is rich in vitamin C and antioxidant content, benefiting the human body (10). Additionally, vitamin C is found in the peel of lemon, making lemon peel useful for extracting essential oil. Lemon peel essential oil has the potential to serve as an antifungal and antimicrobial agent to reduce dandruff on the scalp (11). Lemon is used as an antibacterial agent due to its active compounds such as flavonoids, citric acid, terpenoids, and tannins, which inhibit antibacterial growth (12).

Shampoo is the most common hair care product used by people with the main ingredient being a surfactant/detergent(13). Shampoo is a cosmetic preparation used to cleanse hair and the scalp, removing dirt such as oil, dust, dead cells, and more, without causing irritation to the skin (14). Shampoos come in various scents, and many formulations use essential oils as a key ingredient. Even citrus peel, like lemon peel, can be utilized to create a beneficial product such as an anti-dandruff shampoo (15). Lemon essential oil has the ability to refresh the mind by creating a positive frame of mind and eliminating negative emotions (16). Essential oil derived from lemon can be used as an ingredient in shampoo with the right formulation. Based on this background, a literature review was carried out to evaluate and identify research aimed at supporting the development of further research on anti-dandruff shampoo with the addition of lemon essential oil.

## **II. METHODOLOGY**

This research is a literature review, specifically a Systematic Literature Review. The term is commonly used to refer to a research methodology or specific study and development conducted to gather and evaluate related research on a specific topic focus (17). The focus topic for this study is "Shampoo, dandruff, lemon essential oil, anti-dandruff shampoo," based on a previous researcher's work that is scientifically justifiable. The journal examines two published research papers related to Lemon shampoo and its effects on dandruff issues in hair (18).

### III. RESULT AND DISCUSSION

In the production of shampoo with the addition of lemon essential oil, various formulas are used, incorporating ingredients such as lemon essential oil, sodium lauryl sulfate, propyl paraben, methyl paraben, propylene glycol, fragrance (lemon oil), and Trypticase Soy Agar (TSA) medium from Oxoid England. The primary purpose of creating this shampoo is to investigate the effectiveness of lemon essential oil in reducing dandruff on the hair.

In one study that discusses about the use of lemon essential oil to address dandruff issues. Lemon essential oil is employed to combat the fungus *Pityrosporum ovale*, which causes dandruff. The study involves three formulations of lemon essential oil shampoo gel, which will undergo further testing to evaluate the effectiveness of the gel in reducing dandruff. The formulations utilize the same ingredients with lemon essential oil ratios of 12.5%, 15%, and 17.5%.

The research revealed that the antifungal activity test of lemon essential oil shampoo against *Pityrosporum ovale* yielded the best minimum inhibitory concentration (MIC) at 17.5%, demonstrating the most effective inhibitory power with an average inhibition diameter of 27.73. This indicates that lemon essential oil is effective in inhibiting the fungus *Pityrosporum ovale*, which is the causative agent of dandruff (19).

In another study that discusses about formulation of an anti-dandruff shampoo gel using lemon essential oil (*Citrus limon* Burm.) against the fungus *Malassezia* sp., which is the causative agent of dandruff. The research involved comparing the content ratios of Carbomer and HPMC (Hydroxypropyl Methylcellulose). There are 6 formulation with the same concentration of lemon essential oil, which is 0.5%. these formulation have different ratios of HPMC and Carbomer: 3 formulations with HPMC content of 6%, 7%, and 8%, and 3 formulations Carbomer content of 2.5%, 3%, and 3.5%.

The study concluded that the most effective formula in the lemon essential oil shampoo gel (*Citrus Limon* Burm.) contains an HPMC base of 6%. This formula demonstrated activity in inhibiting the fungus *Malassezia* sp., the causative agent of dandruff, with an inhibition zone of 29.4 mm. It is evident that lemon essential oil has the potential as an antifungal agent against *Malassezia* sp., with a Minimum Inhibitory Concentration (MIC) of 0.5% (20).

### IV. CONCLUTIONS AND NEWNESS

From both of these studies, it can be concluded that the addition of lemon essential oil in shampoo gel formulations is capable of inhibiting the growth of fungi that cause dandruff. Additionally, the

incorporation of other ingredients can also assist shampoo gel formulations in inhibiting the causes of dandruff. In the first study, a lemon essential oil content of 17.5% inhibited fungal growth with an average coverage diameter of 27.73 mm. Then in the second study, adding HPMC to one of the shampoo preparations with a lemon essential oil content of 0.5% was able to inhibit fungal growth with an average coverage diameter of 29.4 mm.

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**TABLES AND FIGURES**Table 1 Data from the anti-fungal activity test results of lemon oil anti-dandruff shampoo gel against the fungus *Pityrosporum ovale*

No	Preparation	Diameter Inhibits Fungal Growth (mm)
1	Blanko	13,73 ± 0,47
2	F1	25,36 ± 0,32
3	F2	26,62 ± 0,35
4	F3	27,73 ± 0,55

Source : Wijayanti et.al (2019)

## Information :

F1 = Formula With Essential Oil Concentration 12,5%

F2 = Formula With Essential Oil Concentration 15%

F3 = Formula With Essential Oil Concentration 17,5%

Table 2 Observation Results of Activity Tests of Lemon Essential Oil Gel Shampoo Preparations

Storage Time	Formula 6 (mm)	Comparison (mm)	Formula Without Lemon (mm)
Day 3	28,2	44,4	5,5
Day 4	29,0	45,0	6,6
Day 5	29,4	45,6	7,0
Day 6	29,4	45,7	7,0

Source : Budiman et.al (2015)