

Original Article

A Review on Benefits of Peppermint and Eucalyptus Essential Oil

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Abstract

The effects of peppermint oil and eucalyptus oil preparations on neurophysiological, psychological and experimental algometric parameters were investigated in 32 healthy subjects in a double-blind, placebo-controlled, randomized cross-over design. Four different test preparations were applied to large areas of the forehead and temples using a small sponge and their effect was evaluated by comparing baseline and treatment measure. The combination of peppermint oil, eucalyptus oil and ethanol increased cognitive performance and had a muscle-relaxing and mentally relaxing effect, but had little influence on pain sensitivity. A significant analgesic effect with a reduction in sensitivity to headache was produced by a combination of peppermint oil and ethanol. The essential plant oil preparations often used in empiric medicine can thus be shown by laboratory tests to exert significant effects on mechanisms associated with pathophysiology of headache.

Keywords: antioxidant, anti-inflammatory, Natural remedies, antibacterial

Introduction

Essential oils have been used for centuries in traditional medicine for their therapeutic benefits. ^[1,2] In recent years, essential oil inhalers have gained popularity for their convenience, efficacy, and ability to provide direct therapeutic effects. Inhalation offers a fast, effective way to experience the health benefits of essential oils, particularly for respiratory and cognitive issues. Among these oils, peppermint (*Mentha piperita*) and eucalyptus (*Eucalyptus globulus*) stand out for their respiratory support and mental clarity properties. ^[3,4]

Peppermint and eucalyptus oils have been used for centuries to treat a variety of ailments, including respiratory congestion, headaches, and mental fatigue. Their efficacy is linked to the chemical composition of each oil, which contains bioactive compounds like menthol and eucalyptol. The purpose of this review is to evaluate the scientific evidence behind the use of peppermint and eucalyptus essential oil inhalers, focusing on their chemical constituents, benefits for respiratory health, cognitive effects, and safety. ^[5]

Historical and Cultural Usage

Historically, peppermint has been used in ancient Egyptian, Greek, and Roman cultures for its medicinal properties, primarily as a digestive aid and to treat headaches. Eucalyptus, native to Australia, was traditionally used by Indigenous Australians to treat wounds and respiratory issues. The medicinal use of these oils has transcended cultures and continues to be prevalent today.

Essential oils are now a significant part of the global health and wellness market, which is projected to reach \$14.6 billion by 2027. Inhalers, in particular, are gaining traction due to their ability to deliver essential oils directly to the respiratory system, providing quick relief from congestion and mental fatigue. [6,7]

Peppermint

• Chemical Constituents:

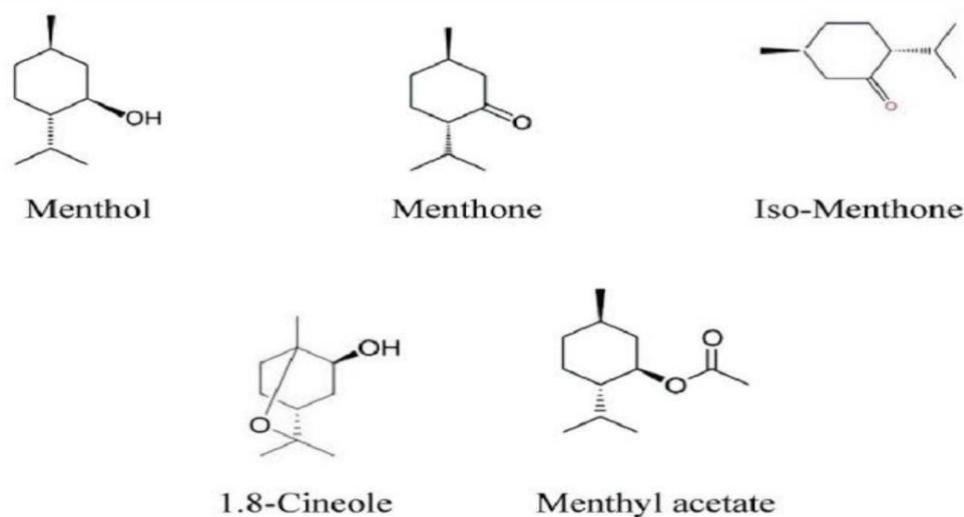
Peppermint oil consists of several key bioactive compounds:

Menthol (35-45%)

Menthone (10-30%) These compounds are responsible for peppermint's distinctive cooling sensation and its therapeutic benefits. Menthol is particularly worthy for its ability to activate cold-sensitive receptors in the skin, resulting in a cooling effect. Menthone, a ketone, and Limonene, a monoterpene, contribute to peppermint's anti-inflammatory and digestive benefits. [8]

1,8-Cineole (Eucalyptol)

Limonene



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Figure 1: Structure of major chemical composition of peppermint oil. [9]

Molecular structure of menthol:

Menthol is a cyclic monoterpene alcohol. Its molecular structure allows it to interact with transient receptor potential (TRP) channels, especially TRPM8, which is involved in sensing cold temperatures. This interaction explains its cooling sensation and why it provides relief from headaches and congestion. [10]

• Respiratory Benefits:

Peppermint oil's most well-known use is for respiratory relief. When inhaled, menthol acts as a natural decongestant, helping to clear the nasal passages and thin mucus. A study published in the Journal of Ethnopharmacology demonstrated that menthol inhalation significantly improved airflow in individuals suffering from nasal congestion and sinusitis. [11]

Additionally, peppermint oil's anti-inflammatory properties help reduce swelling in the sinuses, making breathing easier. These benefits make peppermint oil an ideal ingredient in inhalers used for respiratory conditions such as bronchitis, sinusitis, and the common cold. [12]

• Cognitive and Mental Benefits:

Peppermint oil is also known for its ability to enhance cognitive function. A study in the International Journal of Neuroscience found that peppermint oil can improve alertness, memory, and overall mental clarity. The oil's aroma stimulates the hippocampus, the part of the brain responsible for memory and

learning. Inhalation of peppermint oil has been shown to reduce mental fatigue and improve concentration during tasks that require sustained focus. ^[13,14]

In aromatherapy, peppermint oil is commonly used in inhalers to boost mental performance and relieve stress. Its invigorating scent can help alleviate symptoms of depression and anxiety, providing an overall mood enhancing effect ^[15]

Eucalyptus

- **Eucalyptus chemical constituents:**

Eucalyptol (1,8-Cineole) (70-85%)

Pinene

Limonene

Terpineol

The high concentration of eucalyptol is the key factor behind eucalyptus oil's therapeutic properties, particularly its expectorant and anti-inflammatory effects. α -Pinene and Limonene contribute to antimicrobial activities, which can help prevent infections in the respiratory tract. ^[16]

Molecular Structure of Eucalyptol:

Eucalyptol is a monoterpene oxide, known for its ability to break down mucus and clear the airways. Its molecular structure allows it to penetrate deeply into the respiratory system, where it exerts expectorant effects. ^[17,18]

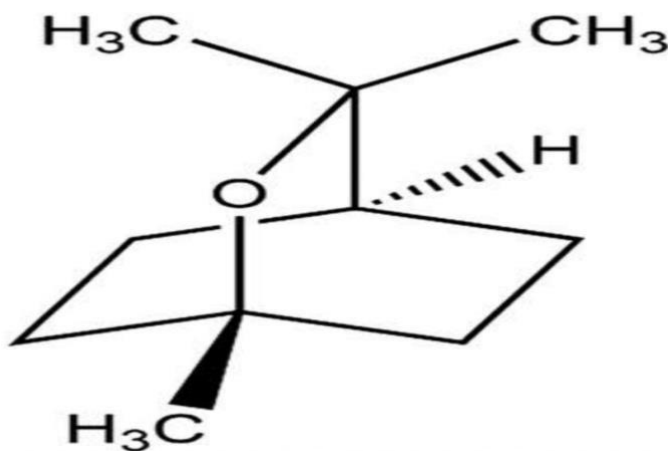


Figure 2: Structure of chemical composition of eucalyptol ^[19]

- **Respiratory Support:**

Eucalyptus oil has long been used to alleviate symptoms of respiratory conditions such as asthma, bronchitis, and the common cold. ^[20] Eucalyptol acts as an expectorant, helping to loosen and expel mucus from the lungs and bronchial tubes. A study in the American Journal of Respiratory and Critical Care Medicine showed that eucalyptol significantly reduced inflammation and improved airflow in patients with chronic obstructive pulmonary disease (COPD). ^[21]

Additionally, the anti-inflammatory effects of eucalyptus oil help reduce swelling in the nasal passages, making it easier to breathe. This makes eucalyptus oil a popular choice in inhalers designed to relieve respiratory congestion. ^[22]

- **Antimicrobial Properties:**

Eucalyptus oil's antimicrobial properties are another reason for its widespread use in respiratory care. Studies have shown that eucalyptus oil can inhibit the growth of bacteria, viruses, and fungi, helping

to prevent infections in the respiratory tract.^[23] It is especially effective against pathogens such as *Staphylococcus aureus* and *Escherichia coli*, which are known to cause respiratory infections.^[24] Inhalation of eucalyptus oil can provide a dual benefit: clearing the airways and preventing infections.^[25]

- **Synergistic Effects of Peppermint and Eucalyptus Oils**

- **Combined Benefits:**

When combined, peppermint and eucalyptus oils create a synergistic effect that enhances the therapeutic benefits of both oils. Menthol and Eucalyptol work together to provide a more potent decongestant effect, which is especially beneficial for clearing nasal passages and easing breathing during colds and sinus infections.^[26,27]

A study published in the *Journal of Respiratory Medicine* highlighted the effectiveness of this combination in treating patients with chronic sinusitis. The combination was found to reduce symptoms such as nasal congestion, headache, and throat irritation more effectively than either oil used alone.^[28,29]

- **Mechanism of Action:**

The mechanism by which these oils act is largely through their interaction with the olfactory system.^[30,31] Inhalation of essential oils stimulates the olfactory receptors, which send signals to the brain's limbic system, an area associated with memory, emotions, and behavior. This interaction helps explain why inhalation of peppermint and eucalyptus oils can lead to improved cognitive function and mood, as well as relief from respiratory symptoms.^[32,33]

Expanded Usage and Methods of Application

- **Inhalation Methods**

Direct Inhalation: This method involves inhaling the essential oils directly from an inhaler or diffuser. It provides fast relief from congestion and mental fatigue, as the oils are rapidly absorbed through the respiratory system.^[34,35]

Steam Inhalation: Adding a few drops of peppermint or eucalyptus oil to hot water and inhaling the steam can enhance the oils' effects, especially for deep respiratory issues like bronchitis.^[36]

Diffusion: Diffusers can spread the essential oils into the air, allowing for longer, gentler inhalation. This method is particularly useful for continuous mental alertness and air purification.^[37,38]

- **Topical Application:**

While not as direct as inhalation, topical application of diluted peppermint and eucalyptus oils can provide localized relief for muscle pain or tension, and their aromas still offer cognitive and benefits^[39,40]

Safety and Usage Guidelines:

Peppermint and eucalyptus oils are generally safe for most people when used as directed. However, certain populations, such as pregnant women, children, and those with sensitive skin, should take precautions.^[41,42] Both oils should be diluted before topical application to avoid skin irritation. It is recommended to consult a healthcare provider before using these oils, particularly for individuals with respiratory conditions such as asthma.^[43,44,45]

- **Dosage Recommendations:** For inhalers, 1-2 drops of essential oil can be added to the inhaler wick.^[46] When using steam inhalation, 3-5 drops in hot water are sufficient.^[47,48]
- **Side Effects:** Peppermint oil may cause allergic reactions or breathing difficulties in sensitive individuals.^[49] Eucalyptus oil should not be ingested, as it can cause serious health and complications.^[50]

- **Conclusion:**

Peppermint and eucalyptus essential oil inhalers offer a practical and effective solution for managing respiratory problems, improving mental clarity, and promoting overall wellness. The synergistic effect of these oils enhances their therapeutic properties, making them a popular choice for natural remedies. While evidence supports their benefits, further research is needed to explore their long-term efficacy and potential applications in other areas of health.

References

1. McKay, D. L & Blumberg, J.B, A review of the bioactivity and potential health benefits of peppermint tea (*Mentha piperita* L.). *Phytotherapy Research* **2006**.20(8)619-633
2. Kamatou, G. P, Vermaak, I., & Viljoen, A. M. Menthol: A simple monoterpene with remarkable biological properties. *Photochemistry* **2013**.96, 15-25
3. Santos, P. L., et al. The antimicrobial activity of *Mentha piperita* and *Mentha spicata* essential oils in oral pathogens. *Acta Odontologica Latino Americana* **2019**. 32(2).101-106
4. Cermak, S.C, & Baug S, Composition and properties of peppermint essential oil (*Mentha piperita*). *Journal of Agricultural and Food Chemistry* **2020**. 68(16)
5. Juergens, U. R. et al, Anti-inflammatory effects of eucalyptol (1,8-cineole) in bronchial asthma: A double-blind placebocontrolled trial. *Respiratory Medicine*, **2003**. 97(3),250-256.
6. Sadlon, A.E & Lamson, D. W Immune-modifying and antimicrobial effects of eucalyptus oil and simple inhalation devices. *Alternative Medicine Review* **2010**. 15(1),33-47.
7. Cameron, M., & Gagnier, J.J, Use of peppermint oil in treatment of irritable bowel syndrome: A comprehensive review *Journal of Clinical Gastroenterology* **2013**.47(9),741-748
8. Ben-Arye, E, et AL, Complementary medicine in the treatment of cancer: New approaches and perspectives. *EvidenceBased Complementary and Alternative Medicine*, **2011**. (1),13-17
9. Edris, A. E. Pharmaceutical and therapeutic potentials of essential oils and their individual volatile constituents: A review *Phytotherapy Research*, **2007**.21(4),308-323.
10. Horváth, G., & Ács, Essential oils in antimicrobial treatment. *Journal of Clinical Microbiology* **2015**. 59(9),841-846
11. Review of clinical data on eucalyptus oil and its effectiveness in respiratory therapy. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7163989/>
12. Clinical study on menthol's efficacy in respiratory health. <https://www.sciencedirect.com/science/article/abs/pii/S003193841830372X> -
13. Ali, B., et al. Essential oils used in aromatherapy: A systemic review. *Asian Pacific Journal of Tropical Biomedicine* **2015**. 5(8),601-611.
14. Shen, Y. C., et al. Eucalyptus essential oil as a source of 1,8-cineole for respiratory care. *Phytomedicine* **2013**. 20(1),52-57
15. Moss, M., & Oliver, L. Plasma 1,8-cineole correlates with cognitive performance following exposure to eucalyptus oil in a dose-dependent manner. *Journal of Clinical Neuroscience* **2012**.19(7),930-934.
16. Buchbauer, G., Jirovetz, L., Jäger, W., Plank, C., & Dietrich, H. Fragrance compounds and essential oils with sedative effects upon inhalation. *Journal of Pharmaceutical Sciences* **1993**.82(6),660-664.
17. Lis-Balchin, M., & Hart, S. Studies on the mode of action of the essential oil of lavender (*Lavandula angustifolia* P. Miller). *Phytotherapy Research*, **1999**. 13(6)540-542
18. de Groot, A. C., & Schmidt, E Essential Oils, Part IV: Contact Allergy. *Dermatitis*, **2016**.27(4),170-175.
19. Perry, N., & Perry, E. Aromatherapy in the management of psychiatric disorders. *Clinical Research in Aromatherapy* **2006**.6(7),1-4
20. Howes, M. J., Perry, N. S., & Houghton, P. J. Plants with traditional uses and activities, relevant to the management of Alzheimer's disease and other cognitive disorders. *Phytotherapy Research* **2003**. 17(1)1-18

21. Price, S., & Price, L. Aromatherapy for health professionals. Elsevier Health Sciences **2012.1**(2),56-58.
22. Lawless, J. The Encyclopedia of Essential Oils: The Complete Guide to the Use of Aromatic Oils in Aromatherapy, Herbalism, Health & Well Being. HarperThorsons **2013.** (9)134-135.
23. Tisserand, R., & Young, R. Essential Oil Safety-E-Book: A Guide for Health Care Professionals. Elsevier Health Science **2013.**
24. Maddocks-Jennings, W., & Wilkinson, J. M. Aromatherapy practice in nursing: Literature review. Journal of Advanced Nursing **2004.48**(1) ,93-103.
25. Komori, T., Fujiwara, R., Tanida, M., Nomura, J., & Yokoyama, M. M. Effects of citrus fragrance on immune function and depressive states. Neuroimmunomodulation **1995.** 2(3),174-180
26. Haze, S., Sakai, K., & Gozu, Y. Effects of fragrance inhalation on sympathetic activity in normal adults. Japanese Journal of Pharmacology **2002.** 90(3),247-253.
27. Levenstein, S., Prantera, C., Varvo, V., et al. Stress and exacerbation in ulcerative colitis: A prospective study of patients enrolled in remission. The American Journal of Gastroenterology **1996.91**(3),452-459.
28. Setzer, W. N. Essential oils and anxiolytic aromatherapy. Natural Product Communications **2009.4**(9), 1305-1316.
29. Ali, N. A. A., Sharopov, F. S., Alhaj, M., Hill, G. M., Porzel, A., & Wessjohann, L. A. Chemical composition and biological activities of essential oil from *Pulicaria undulata* from Yemen. Natural Product Communications **2015.10**(1),147-150.
30. Miyazawa, M., Shindo, M., Shimada, T., & Tomita, T. Oxidation of (+)-menthol by cytochrome P450 in rat liver microsomes. Bioscience, Biotechnology, and Biochemistry **1998.62**(6),1057-1061.
31. Alaoui-Jamali, M. A., & Daoud, S. Effects of limonene on tumor promotion and carcinogenesis. Journal of Nutritional Science and Vitaminology **1990.36**(5),431-435.
32. Woolf, A., & Shaw, J. (2007). Essential oils and poisoning: The essential facts. Toxicon **2007.** 50(8), 987-991.
33. Lis-Balchin, M. Essential oils and ‘aromatherapy’: their modern role in healing. The Journal of the Royal Society for the Promotion of Health **1997.** 117(5), 324-329.
34. Falk, H., & Baldauf, R. Linalool and its metabolites as antimicrobial and antifungal agents. Flavour and Fragrance Journal **2011.26**(2), 74-87.
35. Ali, B., Al-Wabel, N. A., Shams, S., Ahamad, A., Khan, S. A., & Anwar, F Essential oils used in aromatherapy: A systemic review. Asian Pacific Journal of Tropical Biomedicine **2015.5**(8), 601-611.
36. Syed, T. A., & Qureshi, Z. A. Treatment of common warts with peppermint oil. Journal of Clinical Microbiology **1999.37**(6), 1954-1999.
37. Kim, H. J., Chen, F., Wang, X., & Chung, H. Y. Evaluation of antioxidant activity of vetiver (*Vetiveria zizanioides*) oil and identification of its antioxidant constituents. Journal of Agricultural and Food Chemistry **2005.53**(3) 769-774.
38. Şahin, F., & Güllüce, M. Antibacterial activities of menthol and menthone against pathogens. World Journal of Microbiology and Biotechnology **2004.20**(2), 183-187.
39. Gobbo-Neto, L., & Lopes, N. P. Medicinal plants: Factors influencing secondary metabolite production. Brazilian Journal of Pharmacognosy **2007.** 17(4)603-612.
40. Santos, Robert L. “Section Three: Problems, Cares, Economics, and Species”. The Eucalyptus California State University. Archived from the original on **2006-09-10**
41. Treanor, Tom, “The Home Front,” Los Angeles in **1942.**
42. Mrs. M. Grieve. “A Modern Herbal: Eucalyptus”. Retrieved **2005.**
43. Sunset Western Garden Book (6th ed.). Sunset Publishing Corporation. **1995.** pp. 606–7.
44. Eucalypt forest”. Commonwealth of Australia. Retrieved 29 January **2017.**
45. Frampton, Alex The Complete Illustrated Book of Herbs. The Reader’s Digest Association. OCLC 748502326. Archived on 6 April **2017.**

46. Nair, B “Final report on the safety assessment of Mentha pipermint (Peppermint) Oil, Mentha piperita (Peppermint) Leaf Extract, Mentha piperita (Peppermint) Leaf, and Mentha piperita (Peppermint) Leaf Water”. International Journal of Toxicology **2001**. 20 Supple 3 (4): 61–73.
47. mentha and pipermint Mountainvalleygrowers.com. Archived from the original on **2013**.
48. Linnaeus, C. Species Plantarum **1753**. 2:576-577.
49. Wong, Warren The Changes that Occur in Peppermint Oil During Aging, Including the Relationship Between Changes in Chemical Composition and Flavor Characteristics. Ph.D.
50. Tate s peppermint oil: a treatment for postoperative nausea. J Adv nurs **1997**.26:543-9