

## Phytochemical Profile and Antimicrobial Potential of Peppermint Essential Oil: A Focus on Its Photoprotective and Optical Properties

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### Abstract

The rich phytochemical composition of peppermint essential oil, comprising compounds of diverse chemical nature, determines its potential for the development of complementary products for the management of moderate inflammatory and infectious conditions. The present study aims to analyze the chemical profile, optical characteristics, and antimicrobial properties of peppermint essential oil. Gas chromatographic analysis identified 38 volatile constituents, with menthol (44%), menthone (22 %), limonene (2.41%), and piperitone (8.15 %) as the major components. The evaluation of antimicrobial and antifungal activities revealed that the oil exhibited higher sensitivity against Gram positive bacteria, while the strongest inhibitory effect was observed against the fungus *Penicillium chrysogenum*.

Assessment of the photoprotective properties by UV spectroscopic analysis demonstrated a low sun protection effect, with SPF values ranging between 0.05 and 1.5, indicating a weak photoprotective potential. The critical wavelength, determined from cumulative absorbance curves, was found to be above 370 nm, suggesting partial UVA coverage. Additionally, optical methods were applied to evaluate the solubility of the oil in a Creps buffer, and the results were compared with its solubility in ethanol. The obtained data confirm that peppermint essential oil possesses a complex chemical and biological potential, suitable for incorporation into natural antimicrobial and dermatological formulations.

### Keywords

Peppermint essential oil, SPF, antimicrobial and antifungal activities.

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