



Effect of the essential oils from *Piper* sp. and blue led lights in the enhancement of the antibiotic activity of drugs against mdr bacterial strains

Ana C.A. Silva ^a, Jefferson S. Diodato ^b, José W. Castro ^b, Edinaldo F.F. Matias ^{a, b}, Luiz E. Silva ^c, Wanderlei do Amaral ^c, Beatriz Helena L.N.S. Maia ^c, Aurea P. Ferriani ^c, Amanda K. Souza ^b, Lucindo J. Quintans-Júnior ^d, Henrique D.M. Coutinho ^a  

Show more 

 Outline |  Share  Cite

<https://doi.org/10.1016/j.jphotobiol.2019.111604>

[Get rights and content](#)

Highlights

- The blue LED light interferes with the action of essential oils in a synergistic manner.
- The blue LED light interferes with the action of the antibiotics in a synergistic manner.
- The photoactivation of EO is a promising methodology against bacterial infections.

Abstract

The indiscriminate use of antibiotics has made bacterial resistance an important public health problem, since many antibiotics have become ineffective. Phototherapy can be considered an alternative to reduce the abusive use of antimicrobials, thus impacting microbial resistance. The objective of this study was to determine the chemical profile and to evaluate the effect of blue LED lights on the antibacterial activity of essential oils from *Piper* species, as well as their aminoglycoside antibiotic activity modulation using the

microdilution method to determine the Minimum Inhibitory Concentration (MIC). The antibiotic activity modulating effect of these oils was also determined using the broth microdilution method with 96-well plates which were exposed to LED light for 20 min. Chemical components were characterized by gas chromatography coupled to mass spectrometry, revealing β -copaen-4- α -ol, germacrene A and germacrene B as major essential oil constituents for *Piper arboreum* (OEPar), *Piper aduncum* (OEPad) and *Piper gaudichaudianum* (OEPg), respectively. OEPar obtained a MIC of 512 $\mu\text{g/mL}$ against *Staphylococcus aureus* and a MIC $\geq 1024 \mu\text{g/mL}$ against *Escherichia coli*. OEPad and OEPg showed MIC values $\geq 1024 \mu\text{g/mL}$ against the utilized strains. The essential oils modulated the effect of the antibiotics amikacin and gentamicin, with this effect being potentiated when exposed to blue LED. The blue LED light in the absence of the essential oil also showed an ability to modulate aminoglycoside antibiotic activity in this study, presenting mostly synergistic effects. In conclusion, the results obtained in this study demonstrate that photodynamic therapy using blue LED light interferes with the antibacterial action of *P. arboreum*, *P. aduncum* and *P. gaudichaudianum* essential oils and aminoglycoside antibiotic activity.

[< Previous](#)

[Next >](#)

Keywords

Antibacterial activity; Modulation; Photodynamic therapy; Blue LED light

[Recommended articles](#)

Cited by (5)

[Green phytoextracts as natural photosensitizers in LED-based photodynamic disinfection of multidrug-resistant bacteria in wastewater effluent](#)

2022, Chemosphere

[Show abstract](#) 

[Chemical characterization and antimicrobial potential of the essential oil obtained from the leaves of *Piper xylosteoides* \(Kunth\) Steud](#)

2022, South African Journal of Botany

[Show abstract](#) 

Antibiotic Combination Therapy: A Strategy to Overcome Bacterial Resistance to Aminoglycoside Antibiotics

2022, Frontiers in Pharmacology

Brazilian essential oils as source for the discovery of new anti-COVID-19 drug: a review guided by *in silico* study

2021, Phytochemistry Reviews

Larvicidal Activity of Essential Oils From Piper Species Against Strains of *Aedes aegypti* (Diptera: Culicidae) Resistant to Pyrethroids

2021, Frontiers in Plant Science

[View full text](#)

© 2019 Elsevier B.V. All rights reserved.



Copyright © 2022 Elsevier B.V. or its licensors or contributors.
ScienceDirect® is a registered trademark of Elsevier B.V.

 RELX™