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# SYNERGISTIC ANTIMICROBIAL EFFECTS OF COFFEE GREEN EXTRACT AND OIL IN MICROEMULSIONS ENHANCED BY PHOTODYNAMIC THERAPY: A STRATEGY AGAINST ANTIBIOTIC RESISTANCE

**Paulinne Moreira Lima**[1*], Catarina Silva Guimarães[1], Caroline Vieira Gonçalves[1], Caio Cesar Pereira[1], Laryana Borges Garcia[1], Isabela Dias dos Santos[1], Jayne Ferreira da Silva Oliveira[1], Micaela Sousa Coutinho Silva[1], Mateus Freire Leite[2], André Luís Morais Ruela[3], Gabriel Azevedo de Brito Damasceno[1], Denise Brentan da Silva[4], Robson Amaro Augusto da Silva[1], Juliano Geraldo Amaral[1]

paulinneml@ufba.br

*1- Universidade Federal da Bahia, CAT- IMS, Rua Hormindo Barros, 58, Candeias, Vitória da Conquista, 45029094, Bahia, Brazil. 2- Universidade Federal de Alfenas, Rua Gabriel Monteiro da Silva, Alfenas, Centro, 37130001, Minas Gerais, Brazil. 3- Universidade Federal de Ouro Preto, Morro do Cruzeiro, Bauxita, Ouro Preto, 35400000, Minas Gerais, Brazil 4 - Universidade Federal de Mato Grosso do Sul, Av. Costa e Silva, Universitário, 79002970, Campo Grande, Mato Grosso do Sul, Brazil.*

Coffee, one of the main tropical crops, has Brazil as its leading global producer. Rich in chlorogenic acids, it exhibits antimicrobial activity and serves as a natural alternative against antibiotic resistance, a major public health issue. Another promising strategy is antimicrobial photodynamic therapy (aPDT), which uses photosensitizers, light, and oxygen to eliminate microorganisms. The green coffee oil was characterized using gas chromatography, and the green coffee extract using high-performance liquid chromatography, both coupled with mass spectrometry. Microemulsions were prepared by the spontaneous emulsification method, containing green coffee oil and extract, stabilized by surfactants. The antimicrobial potential of the developed microemulsion system and the green coffee extract was evaluated *in vitro* by PDT using high-intensity blue LED light against methicillin-resistant *Staphylococcus aureus* (ATCC 43300). The dispersed systems obtained presented droplet sizes of approximately 25 to 60 nm, PDI of 0.088 to 0.290, and zeta potential of approximately -12 to -25 mV, at different temperatures and stability tests. Furthermore, they exhibited Newtonian flow behavior with a viscosity of approximately 30 cP. In addition, they were effective in treating microorganisms at lower doses than previously reported in the literature, with a potentiated effect when combined with photodynamic therapy, acting at a minimum green coffee extract concentration of 250 $\mu g.ml^{-1}$ and, when photoactivated, acting at 125 $\mu g.ml^{-1}$, in addition to also showing activity without the incorporated extract. The developed microemulsions show potential as antimicrobial agents in the pharmaceutical industry, with antibacterial action enhanced by photodynamic effects. The study highlights the use of plant compounds, promoting the bioeconomy and benefiting family farming, due to the economic value of coffee in Brazil.

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