BACTERIOSTATIC ACTIVITY OF ESSENTIAL OILS FROM *Xylopia ochrantha* and *Pilocarpus spicatus*

Scaffo, J.C. [1,2*]; Machado, F.P.[2]; Aguiar-Alves, F.[1] Rocha, L.[2]
[1]*Federal Fluminense University, Rua Dr. Mario Vianna, 523, Niterói, RJ, Brasil*
(Laboratório de epidemiologia molecular e biotecnologia)
[2] *Federal Fluminense University, Rua Dr. Mario Vianna, 523, Niterói, RJ, Brasil*
(Laboratório de Tecnologia de Produtos Naturais)
**juliascaffo@id.uff.br*

Introduction

The adaptation of microorganisms over the years has led to increased microbial resistance and new challenges. The world's leading health organizations, such as the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) in the United States, warn of the emergence of bacterial strains resistant to various classes of antimicrobials and report the difficulties in treating these infections [1,2]. As a result, products of plant origin such as essential oils have emerged as sources of alternative candidates for the study of new antibacterial compounds due to the wide variety of bioactive secondary metabolites in their composition [3]. The aim of this study was to evaluate the antimicrobial potential of the essential oils of *Xylopia ochrantha* and *Pilocarpus spicatus* against bacterial strains of clinical interest.

Material and Methods

In this analysis, the activities of the essential oils of *Pilocarpus spicatus* and *Xylopia ochrantha* leaves were evaluated against the strains of *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Escherichia coli*, *Enterobacter cloacae*, *Pseudomonas aeruginosa* and *Klebsiella pneumoniae* using the serial microdilution technique, assessing the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC). The essential oils were analyzed using GCMS-QP5000 (SHIMADZU), a gas chromatograph equipped with an electron impact ionization mass detector (70 eV) to identify the chemical substances, and GC-2014 (SHIMADZU) with a flame ionization detector for quantification.

Results and Discussion

The results showed bacteriostatic activities of the essential oils with inhibitions in the concentration range between 1 mg/mL and 2 mg/mL for all the microorganisms analyzed. In the oil of *Pilocarpus spicatus*, it was possible to identify the majority substances Alpha-pinene (4.52%), Sabinene (22.64%), Limonene (15.11%), Germacrene D (7.45%). The oil of *Xylopia ochrantha* resulted in major substances such as Alpha-pinene (6.43%), Beta-pinene (11.26%), Germacrene D (13.16%), Bicyclogermacrene (13.74%). The inhibition of bacterial activity can be related to the major components of the essential oils, one of which is present in both is Germacrene D. It has broad-spectrum activity against Gram-positive and Gram-negative bacteria, and its function can be attributed to the hydrophobicity of the components, leading to an increase in membrane permeability and the leakage of cellular constituents and ions [4].

Conclusion

In this way, it was possible to observe a bacteriostatic activity at 1 mg/mL of both oils against *Pseudomonas aeruginosa* while for *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Escherichia coli*, *Enterobacter cloacae* and *Klebsiella pneumoniae* the inhibition of microbial growth was at 2 mg/mL. Thus, the future prospects of the work involve the development of nanoemulsions with these oils, in order to enable and evaluate a possible potentiation of the MIC values of the nanostructured essential oils.

Acknowledgments
The authors would like to express appreciation for the support of the sponsors CAPES (Finance Code 001), FAPERJ (E-26/210.068/2021 and E-26/210.915/2021).

Bibliographic References
[1] CDC. Antibiotic resistance threats in the United States, 2019, Atlanta, GA: U.S. Department of Health and Human Services. Center for Disease control and Prevention, [s. l.], p. 3,103-104, 2019.
[2] DE FREITAS, Luiz Carlos. WHO (2017) Global priority list of antibiotic-resistant bacteria to guide research, discovery, and development of new antibiotics. Cadernos de Pesquisa, [s. l.], v. 43, n. 148, p. 348–365, 2013.
[3] TARIQ, Saika et al. A comprehensive review of the antibacterial, antifungal and antiviral potential of essential oils and their chemical constituents against drugresistant microbial pathogens. Microbial Pathogenesis, [s. l.], v. 134, n. June, p. 103580, 2019.
[4]OLAJUYIGBE O, ASHAFA A. Chemical Composition and Antibacterial Activity of Essential Oil of Cosmos bipinnatus Cav. Leaves from South Africa. Iran J Pharm Res. 2014 Fall;13(4):1417-23.