
SBPMat
B-MRS
SOCIEDADE BRASILEIRA
DE PESQUISA EM MATERIAIS
SALVADOR
XXIII B-MRS Meeting 2025
September 28th to October 2nd
BRICS
Brasil 2025

Ocimum Gratissimum essential oil characterization and application to potential 3D printing bone scaffolds

Maria Eduarda De Almeida Astolfo[1,2], Sara Kierulff Balabram[1,2], Stanislau Bogusz Jr[3,2], Bianca Chieregato Maniglia[4]

[1]Universidade de São Paulo (*IQSC*) , [2]São Carlos Institute of Chemistry, [3]Universidade de São Paulo, [4]Institute of Chemistry, University of São Paulo (*Físico Química - IQSC*)

e-mail: maria.e.astolfo@usp.br

Bone tissue is a complex connective tissue that performs crucial structural and functional roles in the human body, including supporting locomotion, protecting internal organs, and storing essential elements for hematopoiesis and homeostasis [1]. Its regeneration relies on the dynamic balance between osteoblasts, osteoclasts, and osteocytes [2]. Trauma and diseases can compromise its integrity, while traditional techniques, such as scaffolds, present significant limitations [3]. In this context, this study explores using essential oil (EO) from clove basil (*Ocimum gratissimum*) incorporated into starch-based hydrogels for 3D printing, aiming to develop innovative, highly personalized, and potential functional bone scaffolds. The EO was characterized in terms of composition through gas chromatography (GC), and among the identified compounds, trans-ocimene and eugenol were the major ones, representing 16% and 54% of the total chromatogram, respectively. The total phenolic content was determined using Folin-Ciocalteu method, yielding 520 mgEAG/gEO, while antioxidant activity was measured using FRAP assay, with 1,110 mgTR/gEO, and ABTS assay, with 2,109 mgTR/gEO. The EO was incorporated into potato starch hydrogels formulations for 3D printing of bone scaffolds at three concentrations: 0.3, 0.5, and 0.7 µL/g. These formulations were characterized in terms of their mechanical, morphological, functional, and active properties. The gradual addition of essential oil has led to alterations in the structural integrity of the hydrogels and, consequently, of the bone scaffolds, in addition to contributing to the enhancement of their antioxidant properties with therapeutic effects. Therefore, throughout this work, relevant results regarding the application of essential oil in starch-based hydrogel formulations for 3D printing of bone scaffolds will be achieved, with potential improvements in processability and functionality still under characterization.

Acknowledgements
FAPESP

References

AMIRYAGHOUBI , N.; FATHI, M.; BARAR, J.; OMIDI, Y. Reactive and Functional Polymers, 177, p. 105313, 2022.

KONDI, S.; GOWDA, S.R Surgery (Oxford), 41, n. 10, p. 625-631, 2023

CHRISTY, P.N.; BASHA, S.K.; KUMARI, V.S.; NASHIR, AK.H. et al. Journal of Drug Delivery

Science and Technology, 55, p. 101452, 2020.