Session AES-P-402 - AES02 Sunday Food Systems & Food Fermentations Microbiology

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Potential of Lignin-Based Carbon Dots for Controlling Food Pathogens

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Authors

M. Nitschke[1], R. Meyer[2], L. Mattoso[3], C. Marangon[3];
[1]University of São Paulo, São Carlos, Brazil, [2]Aarhus University, Aarhus, Denmark, [3]Embrapa Instrumentation, São Carlos, Brazil

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Abstract

In recent years, lignin has attained significant attention as an alternative material to replace fossil-based resources due to its intrinsic antibacterial and antioxidant properties, coupled with biodegradability and biocompatibility. However, lignin-biobased applications in commercial materials present some challenges regarding its supply with consistent quality from one batch to another, its economically viable production and isolation, and reduced heterogeneity. In this sense, lignin carbon dots (LCDs) are endowed with excellent advantages when compared to their precursor materials. Some potential features include good aqueous solubility, low toxicity, biocompatibility, ease of synthesis, fluorescence stability, eco-friendliness, and abundance of functional groups on their surface for ligand conjugation. Herein, an eco-friendly hydrothermal technique was employed to synthesize high fluorescent, lignin-derived carbon dots. The synthesized lignin-CDs were characterized by UV-Vis, Fluorescence spectrophotometry, and Transmission electron microscopy (TEM) with posterior evaluation of their antibacterial activity. The minimum inhibitory concentration (MIC) was determined using the microbroth dilution technique and the minimum bactericidal concentration (MBC) was also evaluated. The synthesized LCDs exhibited antimicrobial action toward the food pathogens ***Listeria monocytogenes***, ***Staphylococcus aureus***, and ***Salmonella enterica*** Enteritidis. MIC values of 1000 µg mL^{-1} for ***S. aureus*** and 2000 µg mL^{-1} against ***L. monocytogenes*** and ***S.*** Enteritidis, were found. Although LCDs inhibited all bacteria, they were not able to kill the cells at the concentrations tested, showing bacteriostatic activity. Therefore, lignin-based carbon dots can be employed as an eco-friendly alternative to meet the increasing demands for multifunctional coatings in the fight against foodborne diseases.