MCoBi19-002

Potential of phytelephas macrocarpa seeds in the manufacture of biomaterials for bone regeneration

Correia, H.C.(1); Gemini-piperni, S.(1); Da Silva, Y.F.(1); Simao, R.A.(1);
(1) UFRJ;

The investigation of Phytelephas macrocarpa seeds, notable for their abundant composition of homomannan, represents a promising milestone in the development of innovative and eco-efficient biomaterials for bone bioengineering. This biopolymer, which endows vegetable ivory with characteristics such as exceptional mechanical resistance and remarkable water insolubility, along with its ability to emit luminescence through the Clustering-Triggered Emission (CTE) mechanism, reveals untapped potentials for biomedical applications, especially in the area of bone regeneration [1,2]. In this context, the present study focuses on exploring the seeds of Phytelephas macrocarpa, a scarcely explored source with notable properties such as high vascularization and porosity, suggesting its potential for various applications, including bone bioengineering. Moreover, the seed exhibits natural fluorescence and presents a visual similarity to the açaí seed, highlighting the vast spectrum of Brazilian biodiversity. The choice of this raw material is based not only on Brazil's natural wealth but also on the potential of its natural components to promote cell adhesion and proliferation, essential for the success of bone implants. Preliminary results indicated that the surface derived from the seeds displays fluorescence under excitation at multiple wavelengths, most notably at 488nm and 546nm, posing a challenge for the selection of dyes for cell marking due to potential overlap with fluorescent signals from the cells. However, the distinction between the surface emission and specific cell marking was possible, suggesting a promising interaction between the cells and the material. The adhesion and spreading of cells observed after 24 hours of incubation, along with the formation of bridges between the markings, point to the biocompatibility of the surface and the potential presence of components from Phytelephas macrocarpa that favor cell-material interaction. The presence of blue emissions, possibly related to plant components with fluorescence at 305 nm, and the distinction between these emissions and the nuclear markings of the cells indicate a promising path to deepen the understanding of these interactions and their biological specificity. The next steps of the study will include detailed characterization of the surfaces using advanced techniques such as scanning electron microscopy (SEM), fluorescence spectroscopy, X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), atomic force microscopy (AFM), Raman spectroscopy, thermogravimetric analysis (TGA), and voltammetry. Furthermore, additional biological assays will be conducted to evaluate cytotoxicity, cell differentiation, and the ability of cells to produce both organic and inorganic extracellular matrix.