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PHYSICAL CHARACTERIZATION OF INCLUSION COMPLEXES OF HYDROALCOHOLIC EXTRACT OF AÇAÍ SEED WITH β-CYCLODEXTRIN

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ABSTRACT

Introduction: The açaí seed, derived from the *Euterpe oleracea* palm, is often discarded, contributing to waste accumulation. However, its reuse can minimize environmental impacts and add value to its production chain. Rich in bioactive compounds such as phenols and flavonoids, the seed exhibits antioxidant and anti-inflammatory properties, making it promising for nutraceutical and pharmaceutical applications. Nonetheless, the low solubility and bioavailability of these compounds limit their effectiveness. The formulation of inclusion complexes (IC) with β-cyclodextrin (β-CD) is an effective strategy to improve these characteristics, providing greater stability and controlled release of bioactive compounds. The physical characterization of these complexes is essential for optimizing their applications, and techniques such as Fourier-transform infrared spectroscopy (FTIR) and scanning electron microscopy (SEM) are fundamental for analyzing molecular interactions and particle morphology, ensuring the preservation of compound properties. **Objective:** Based on the above, this study aims to promote the physical characterization of inclusion complexes with β-cyclodextrin and hydroalcoholic extract of açaí seed. **Methodology:** Açaí seeds, collected in the state of Maranhão, were initially dried and ground using a knife mill to obtain powder. Subsequently, the hydroalcoholic extract was obtained by maceration with 60% ethanol, which was concentrated by rotary evaporation. The extract was incorporated into IC with β-cyclodextrin (β-CD) by malaxation in proportions of 1:1, 1:2, and 2:1. The 60% açaí seed extract and the ICs were analyzed by FTIR. The analysis was conducted in attenuated total reflectance (ATR) mode in the range of 4000 to 400 cm^{-1}, with 64 scans. The results were expressed as a percentage of transmittance. Scanning Electron Microscopy (SEM) was used to characterize the morphology of the inclusion complex particles. The analyses were conducted with a Tescan Vega equipment, operated at 5 kV, with magnifications ranging from 100 to 800 times. Scales of 20 µm, 50 µm, and 100 µm were used. **Results and Discussion:** In the FTIR analysis, the formation of the inclusion complexes (IC) is evidenced by the presence of absorption bands from both the açaí seed extract and β-cyclodextrin (β-CD). The stretching of the O-H bond was observed between 3504.66 and 3201.83 cm^{-1} in the IC, while β-CD presented this bond at 3224 cm^{-1}. The asymmetric stretching of the C-O-C bond of the ring and the glycosidic bond appears at 1157 cm^{-1} in both. Asymmetric stretching of the C-H bond is observed between 2949.16 and 2852.72 cm^{-1} in the extract and at 2854.65 cm^{-1} in the IC, with a decrease in band intensity indicating interactions between the extract and β-CD. The three formulations of inclusion complexes exhibited similar morphological characteristics, with amorphous surfaces, undefined contours, and a rough texture displaying bumps, depressions, and fissures. These irregularities are attributed to the malaxation process, which involves intense agitation and shear forces. The micrographs revealed morphological changes indicating the formation of the inclusion complex, validating the interaction between β-cyclodextrin and the açaí seed extract, and suggesting the effectiveness of the encapsulation process. **Conclusion:** FTIR analysis demonstrated that the formulation of the IC preserved the molecular structure of the compounds derived from the açaí seed and presented characteristic bands of the molecular mixture's composition. FTIR and SEM analyses confirmed that the extract was effectively integrated into the carrier, evidencing the effectiveness of the encapsulation method.