

ABSTRACT

The current investigation was aimed at the utilization of *Pongamia pinnata* L. seeds as a gold mine for procuring medicinally important products with diverse pharmacological properties. It also deals with the development of novel methods for the isolation and characterization of compounds from the seed oil. Structural elucidation was carried out via HRMS, FTIR, XRD, NMR, Raman spectroscopy and thermogravimetric studies. Density functional theory (DFT) has also been used to calculate vibrational spectra of isolated compounds (Karanjin and Glabrin) with sufficiently high accuracy. The photophysical property of Karanjin in different microenvironments was also studied as a function of the solvatochromic parameters. The physicochemical parameters of the compound were determined by *in silico* drug-likeness property, and molecular docking against bacteria revealed their potential as highly functionalized and medicinally useful compounds. The potency of seed crude extracts and purified compounds were assessed against pathogenic indicators. The antibacterial action was evaluated by multiparametric flow cytometry, supported by Raman scattering, cell leakage analysis and FESEM imaging that revealed complex patterns of probable cell wall leakage and cell disruption. Current work gave additional scientific support to the mode of antibacterial action of Karanjin and Glabrin as depicted using fluorescent probes indicating its utility as a potential pharmacophore.