

ZELENE INOVACIJE ZA ZDRAVIJU I ODRŽIVIJU BUDUĆNOST KROZ PROJEKAT VIVENDI

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Tri četvrtine lekova koji se koriste u borbi protiv kancera potiču iz prirodnih izvora. Međutim, njihova ekstrakcija iz biomase zahteva upotrebu isparljivih i toksičnih organskih rastvarača, što predstavlja značajan rizik po zdravlje ljudi i životnu sredinu. Pored toga, bioaktivna jedinjenja (BAC) često imaju nisku bioraspoloživost, slabu rastvorljivost u vodi i nestabilnost. Projekat VIVENDI (*Green Innovation: Unlocking the Bioactive Potential of Biomass for Enhanced Pharmaceuticals and Foods through Eco-Friendly Sustainable Technologies*), koji se realizuje u okviru poziva Dijaspore2023, razvija integrisanu, ekološki prihvatljivu strategiju ekstrakcije i formulacije. Ova strategija zamenjuje konvencionalne rastvarače održivim alternativama i povećava stabilnost BAC jedinjenja primenom micelarne enkapsulacije.

Po prvi put se primenjuje novi proces tečno-čvrsto membranske ekstrakcije, koji koristi membranski mikromikser za simultanu izolaciju (ekstrakciju) i micelizaciju ciljnih bioaktivnih jedinjenja. Ispituju se dva model sistema: (i) jednostepena ekstrakcija bioaktivnih jedinjenja iz otpada maline korišćenjem bio-baziranih jonskih tečnosti i prirodnih dubokih eutektičkih rastvarača; i (ii) ekstrakcija partenolida iz *Tanacetum parthenium* L. pomoću vodenog bifaznog sistema formiranog biokompatibilnim biopolimerima tipa Pluronic i bio-baziranim jonskim tečnostima.

Stečena znanja tokom realizacije ovog projekta omogućiće valorizaciju biomase i biljnih ostataka nakon prerade, smanjenje industrijskog otpada i razvoj nove, isplative zelene tehnologije za izolaciju i očuvanje bioaktivnih jedinjenja, uz oslanjanje na multidisciplinarnu ekspertizu članova VIVENDI konzorcijuma.

Zahvalnica

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GREEN INNOVATIONS FOR HEALTHIER AND MORE SUSTAINABLE SOLUTIONS WITHIN THE VIVENDI PROJECT

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Three-quarters of cancer-fighting agents in medical use are derived from natural sources. However, their extraction from biomass requires significant quantities of volatile and toxic organic solvents, posing substantial risks to human health and the environment. Additionally, these bioactive compounds (BACs) often exhibit low bioavailability after administration, insolubility in water, and instability.

Addressing these challenges, the Vivendi project (*Green Innovation: Unlocking the Bioactive Potential of Biomass for Enhanced Pharmaceuticals and Foods through Eco-Friendly Sustainable Technologies*), under the call Dijaspóra2023, addresses these challenges by developing an integrated, eco-friendly extraction and formulation strategy that replaces conventional solvents with sustainable alternatives and enhances BAC stability through micellar encapsulation.

A novel liquid–solid membrane extraction process, employing a membrane micromixer, has been applied for the first time to simultaneously isolate and micellize target compounds. Two model systems are investigated: (i) one-step extraction of BAC from raspberry using bio-based ionic liquids and natural deep eutectic solvents, and (ii) extraction of parthenolide from feverfew using an aqueous biphasic system formed with biocompatible Pluronic-type biopolymers and bio-based ionic liquids. To further improve stability, BACs are microencapsulated using different encapsulation techniques (spray and freeze-drying, and Lego-Inspired Microfluidic encapsulation), using different biopolymers, and thoroughly characterized with advanced analytical techniques.

The knowledge generated within the VIVENDI project will enable the valorization of biomass and herbal residues, reduce industrial waste, and establish a novel, cost-effective green technology for BAC isolation and preservation, leveraging the multidisciplinary expertise of the VIVENDI consortium members.

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