

Exploiting the multifunctional properties of polyphenols: from wastes to high-value products

PHENOCYCLES is addressing the environmental concern derived from agro-industrial wastes proposing their exploitation for obtaining important bioactive molecules (polyphenolic compounds: PP), to be utilized for different purposes, with a typical circular economy approach. PHENOCYCLES aims to explore innovative uses of PP and validate methods for their extraction with a green chemistry approach. PP extracted from agro-industrial wastes (grape, apple, berry pomaces) and herbs with therapeutic value will be purified/fractionated with pilot-scale nano/ultrafiltration membranes to recover different PP fractions, to be employed in four distinct sectors:

- human health: synthesis of substances for photodynamic therapy (PDT) and drug delivery (DD), development of innovative phytocarrier systems, formulation of PP loaded micro/nano-scale systems, development of new food supplements (nutraceuticals), and hypoallergenic cosmetics.
- plant production: PP-based nanomaterials for plant protection against soil-borne pests, to increase plant resistance to stresses, impacting plant-organisms' trophic interactions.
- environment protection: use of PP as a sensitizer or intermediate in the synthesis of materials for water disinfection and advanced oxidation processes (AOPs).
- material sciences: synthesis of metal-based oxide nanostructures useful for photocatalytic applications.

PHENOCYCLES consortium consists in 10 institutions (Universities or Research Centres) belonging to 7 countries, both European (Italy, Poland, Romania, Spain) and non-European (Argentina, Colombia, Uzbekistan). All the partners are involved in the research activities on polyphenols and in the exchange of participants, with the aim to increase their personal skills and the scientific level of each institution.

PHENOCYCLES is financed through EU Marie Skłodowska-Curie Actions (MSCA): MSCA Staff Exchanges 2022 (HORIZON-MSCA-2022- SE-01) Project: 10.3030/101131420 (01 March 2024 – June 2028)

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