CichOpt

OPTIMAL USE AND VALORIZATION OF BIOMASS STREAMS FROM *CICHORIUM*

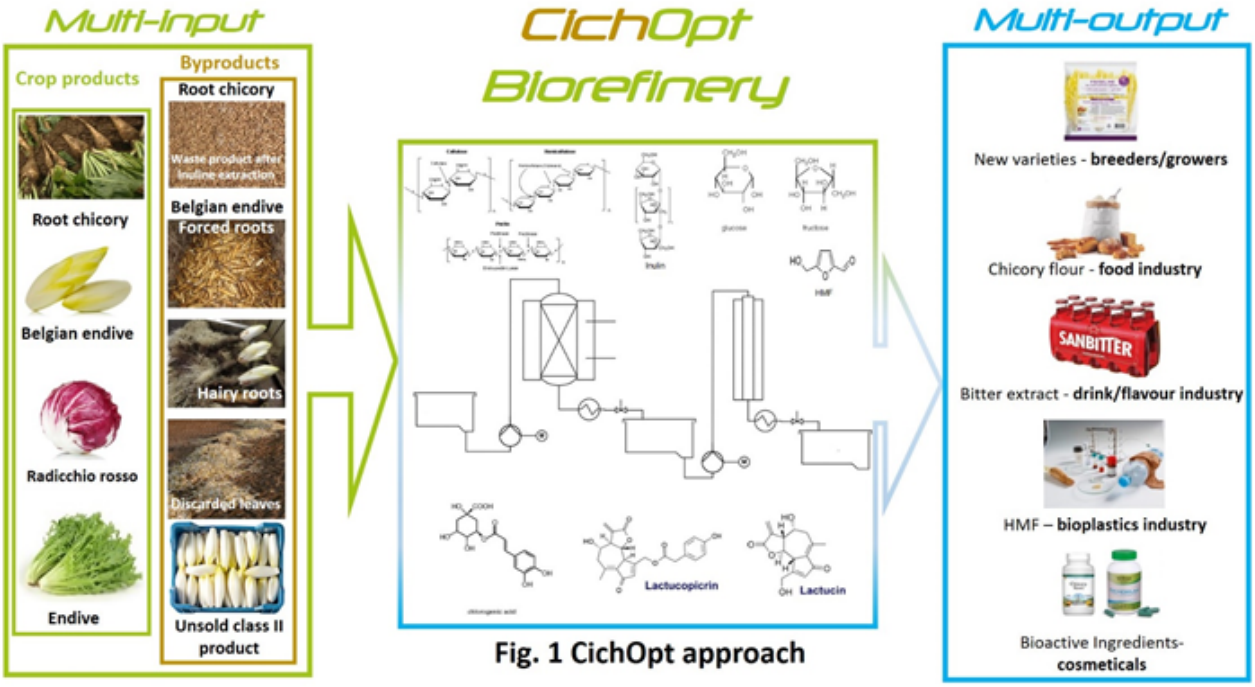

Fig. 1 CichOpt approach

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FACCE SURPLUS
SUSTAINABLE AND RESILIENT AGRICULTURE FOR FOOD AND NON-FOOD SYSTEMS

CichOpt

BACKGROUND

The project focuses on different crops in the *Cichorium* genus which are of major economic importance in Europe: industrial chicory grown for inulin extraction, and Belgian endive, Radicchio Rosso and Endive grown as leaf vegetables. The biomass from these crops is especially interesting as a feedstock for the bio-economy because they are rich in dietary fibers (DF) and free sugars (food applications, green chemistry, biobased materials), and the bioactive sesquiterpene lactones (SL) and polyphenols (PP) (relevant for food, beverages, cosmetic applications). In addition, significant volumes of by-products & waste fractions from these *crops* remains currently largely underutilized.

OBJECTIVE

The overall aim of the CichOpt project is to develop innovative biorefinery processing schemes to turn different underutilized *Cichorium* biomass streams (multi-input) into fractions with high added value which can be used in a wide range of applications, ranging from food & drink applications over cosmetics to biomaterials (multi-output), striving for a zero-waste approach. A close interaction with all market relevant actors and stakeholders, throughout the project, should lead to successful business cases and sustainable new value chains.

METHODOLOGY

Systematic and detailed molecular analysis of the target compounds using state-of-the art omic-technologies in different varieties and tissues of selected *Cichorium* crops forms the scientific basis for selected valorization routes. Monitoring of the presence of these interesting compounds in the existing by-products and waste fractions which are generated throughout the current value chain of these crops (on the field, at the farm, during industrial processing, during storage, at the vegetable auctions) provides insights into potential volumes and value. Using the data from the molecular analysis, a long-term strategy for high value *Cichorium* materials will be developed. Plant breeding targets will be defined for robust *Cichorium* germplasm, with the aim to develop *Cichorium* varieties with tailored content of high value compounds and/or which are diversified in taste characteristics. Selection of the most promising starting materials for biorefinery process development will be performed. A cascade biorefinery scheme with a multitude of selected bio-based applications in mind will be developed.

RESULTS

The bioprospection of over 500 samples from more then 4 different *Cichorium* species and many different cultivars provided valuable insights into the macronutrient and bioactive compound composition, which is the basis for breeding and selection programs leading to new varieties. Processing of harvested biomass and by-products, at both lab and pilot-scale, led to fractions that can be used as ingredients for the food and beverage industry. A simple process led to a liquid fraction enriched with sugars and bioactive components (polyphenols and bitter substances) on the one hand, and a dietary fiber concentrate that can be used as a functional ingredient in bakery products, meat substitutes and other food products on the other hand. Significant antimicrobial activity of enzyme-treated material was demonstrated towards typical human skin pathogenic microbes, relevant for cosmetical applications. The production of hydroxymethylfurfural, a green chemistry building block, starting from underutilized *Cichorium* biomass was demonstrated in a small demo plant.