From agrifood waste towards novel bio-based materials

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The organic fraction of urban waste is mainly composed of edible and non-edible discards from cereals and vegetables. Along with a strong effort to decrease food waste, the valorisation of non-edible biomass (peel, seeds, petals) is essential to decrease the problems connected to disposal while generating new value. In the logic of biorefinery, the initial biomass should be entirely valorised in an array of products.
In this work, we aimed at applying this principle to a previously established production of novel leather-like material obtained from fruit peels, which generates a liquid waste that is currently not valorised, by introducing enzymatic hydrolysis and microbial fermentations.
The first part of the study consisted in comparing the properties of the final leather-like material obtained by alternative processing of the biomass. The process involved i) mechanical pre-treatment of the fruit peel; ii) enzymatic *versus* chemical hydrolysis; iii) blending of the solid fraction with plasticizers to obtain the desired film; iv) characterization of the mechanical properties of the different final leather-like material. We proved that by changing the enzymatic cocktail or the conditions of the hydrolysis it is possible to vary the composition of the biomass and so to create bio-based materials with tuneable mechanical properties.
In the second part of the study we characterized the liquid fractions obtained from the chemical versus enzymatic hydrolysis and we tested them as growth media for yeast cell factories. The preliminary results showed that these liquid fractions can be used to grow model yeasts, with the possibility to produce high-value products such as carotenoids and organic acids.
The work showed that it is possible to generate a process integrating the production of novel bio-based materials from agrifood waste with the production of biotechnological compounds through the valorisation of the liquid discards from the process by using yeast cell factories.

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