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## FROM WASTE TO RESOURCE: BIOWAFER PROJECT

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### Abstract

Even though the problem of resource depletion of our planet is getting increasingly worse, most of the input of agro-food industry is discarded, causing expensive management and disposal issues. According to the Circular Economy principles, these problems can be faced by giving more value to wastage, turning it into inputs to innovative supply chains: the biorefineries. The BIOWAFER project addresses those issues investigating how agri-food by-products consistently produced in Emilia-Romagna Region (Italy) can be assigned to consecutive biorefinery processes integrated in order to obtain high-added value molecules for cosmetics and pharmaceuticals. Among all food chains considered, tomato, wine and cheese industries were chosen for waste valorisation. In order to overcome the seasonal waste production, a detailed analysis of storage and stabilization of the by-products was performed. *Streptococcus zooepidemicus* was chosen to obtain hyaluronic acid through waste fermentation process. The biorefinery was integrated with waste bioconversion by *Hermetia illucens* larvae followed by sustainable chemical extraction processes of potential antioxidants, lipids and peptides. Finally, the residues of all the above-mentioned phases will be used for pyro-gasification, to obtain biochar and syngas for agronomic and energy purposes respectively, allowing the closure of the supply chains in a circular way. Many other circular approaches are presented in literature, but, in our knowledge, no one use fermentation coupled with larvae rearing for waste reduction and conversion. Despite some challenges in scaling-up the proposed biorefinery, the project aims to overcome a linear production system by making the supply chains increasingly circular.

**Key words:** agri-food chain, biochar, biorefinery, circular economy, *Hermetia illucens*

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