Bioprocesses development based on low-cost feedstocks by fermentation technology for added-value compounds production

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Bio-based industries are focused on the use of renewable biological resources for the production of bio-based products and biofuels. Under this scope, bioprocesses development based in low-cost substrates has been the major goal of the team. The main objective is to give a competitive solution for the biotechnological industry to re-use sub-products or wastes as feedstock, improving the sustainability of biotechnological processes, through the use of greener and more competitive technologies. Thus, is of most importance to demonstrate that these technologies enable the production of new chemical building blocks and new products from feedstocks that replace the need for fossil based inputs.

In this context, the team has been focused on the study of the potential of different low-cost and renewable material to develop and optimize fermentation processes. Submerged fermentation technology has been applied for several applications using the yeast *Yarrowia lipolytica* such as: crude glycerol from the biodiesel industry to produce organic acids (ex. citric acid), the renewable substrate castor oil for aroma production and oily wastes for microbial lipids and lipase production. This yeast species has been considered as cellular model for dimorphism studies. Its ability to change from oval typical yeast shape to a pseudo hyphae morphotype has been studied by the team and correlated with operational factors in bioreactors [1]. This morphological characteristic of *Y. lipolytica* makes it one of the few yeast species able to grow under solid-state fermentation. With this knowledge, new opportunities will be explored by the team under the scope of the recent financed project Waste4Lip, such as the transformation of wastes into feedstock for biorefineries by solid-state fermentation with *Y. lipolytica*.

Solid-state fermentation (SSF) has many advantages in comparison to traditional submerged fermentation, such as: higher products titers, better yields, easier recovery of products, smaller reactor volumes and low energy requirements. Over the last years, this technology has been applied by the team to up-grade solid wastes from olive oil and wine industries by SSF with *Aspergillus* spp, producing added-value compounds like enzymes and phenolic compounds, and at the same time, obtaining a fermented solid with improved nutritional value to be used as animal feed. Strategies of wastes mixtures and pre-treatments have been developed as well as scale-up of the process to prove its feasibility [2].

References

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[2] Leite, P, Salgado, JM, Venâncio, A, Domínguez, JM, Belo, I (2016). Ultrasounds pretreatment of olive pomace to improve xylanase and cellulase production by solid-state fermentation. Bioresource Technol. 214: 737–746.