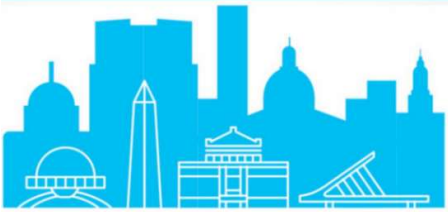

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Optimization of revalorization process from wine industry residual biomass.

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The large quantities of residual biomass generated by agro-industries represent important resources for new value chains with strong industrial potential. The circular vision of bioeconomy promotes the revalorization of these wastes by obtaining biofuels and bioproducts with high added value. Despite the significant evolution observed in the last decades, and an increasing volume of related patents, circular bioeconomy research is not yet significantly mirrored by the market, showing that its full potential is still far from being reached. Grapes are one of the most widely grown fruits throughout the world. A significant amount of solid waste is generated mainly composed of grape pomace, which can represent more than 20% of the biomass harvested and processed. Grape pomace is a low-value by-product that contains a significant quantity of useful components that could be employed as food ingredients, chemicals, and biofuels. The successful recovery of these compounds would not only reduce the generated pollutants, but would also contribute to the sustainable development and economic competitiveness of the wine industry. In this context, the objective of this work is to analyze the recovery process of bio-active compounds from by-products of the wine industry and to optimize two variables of interest a) total extraction yield and b) the required fresh solvent flow, from the definition of different objective functions through mathematical modelling. The effect of the quantity of raw material to process, its moisture content and the extraction temperature on the mentioned variables was studied. The implemented non-linear program (NLP) was not oriented to explore optimal structural alternatives (process synthesis), but to optimize the different operating variables against different optimization scenarios, fulfilling the proposed restrictions. The proposed process configuration is based on a standard structure for this type of extractive plants. It consists of a tunnel dryer, a crusher, extractors, intermediate storage tanks, a film evaporator, a heat exchanger and pumps. The optimization model was solved for different alternatives in order to explain the effect of a range of operating conditions and volume of each leaching tank to achieve at least given percentage of anthocyanin extraction with a minimum solvent requirement. The solutions of the analyzed alternatives adequately represent the trade-offs between the total extraction yield and required solvent. As a result, an increase in solvent consumption with the increase in extraction yield is observed. The energy consumed in the evaporator is proportional to the quantity and quality of the product, as well as to the quantity of recovered solvent, which reduces the consumption of fresh solvent for a given feed value. These results are promising, and set the base for future studies such as the design and selection of operation mode, exploring different configuration alternatives.