Enzymatic hydrolysis of *Camelina sativa* meal for carotenoids production by the yeast *Rhodosporidium toruloides*

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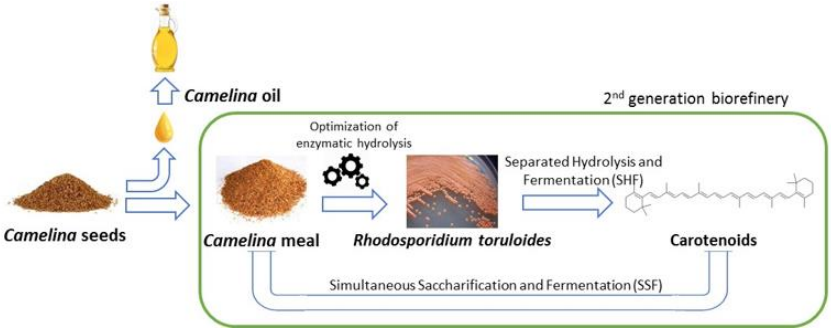
Abstract:



As the circular economy advocates a near total waste reduction, the industry has shown an increased interest toward the exploitation of various residual biomasses. The origin and availability of biomass used as feedstock strongly affect the sustainability of biorefineries, where it is converted into energy and chemicals. Here, we explored the valorization of *Camelina* meal, the leftover residue from *Camelina sativa* oil extraction, beyond its use as animal feed.
Camelina meal hydrolysates were used as nutrient and energy sources for the fermentation of the carotenoid-producing yeast *Rhodosporidium toruloides* in shake flasks. Total acid hydrolysis revealed that carbohydrates accounted for a maximum of 31 ± 1.0% of *Camelina* meal. However, because acid hydrolysis is not optimal for subsequent microbial fermentation, an enzymatic hydrolysis protocol was assessed, yielding a maximum sugar recovery of 53.3%. Separate hydrolysis and fermentation (SHF), simultaneous saccharification and fermentation (SSF), and SSF preceded by presaccharification of *Camelina* meal hydrolysate produced 5 ± 0.7, 16 ± 1.9, and 13 ± 2.6 mg/L of carotenoids, respectively. Importantly, the presence of water-insoluble solids, which normally inhibit microbial growth, correlated with a higher titer of carotenoids, suggesting that the latter could act as scavengers.
The process under development provides an example of how different final products, such as pure carotenoids and carotenoid-enriched *Camelina* meal, can potentially increase the initial value of the source material. The obtained data will help assess the feasibility of using *Camelina* meal to generate high value-added products.