CABBI
CENTER FOR ADVANCED BIOENERGY AND BIOPRODUCTS INNOVATION

Scale-up of Microbial Lipid and Bioethanol Production from Oilcane

Background/Objective

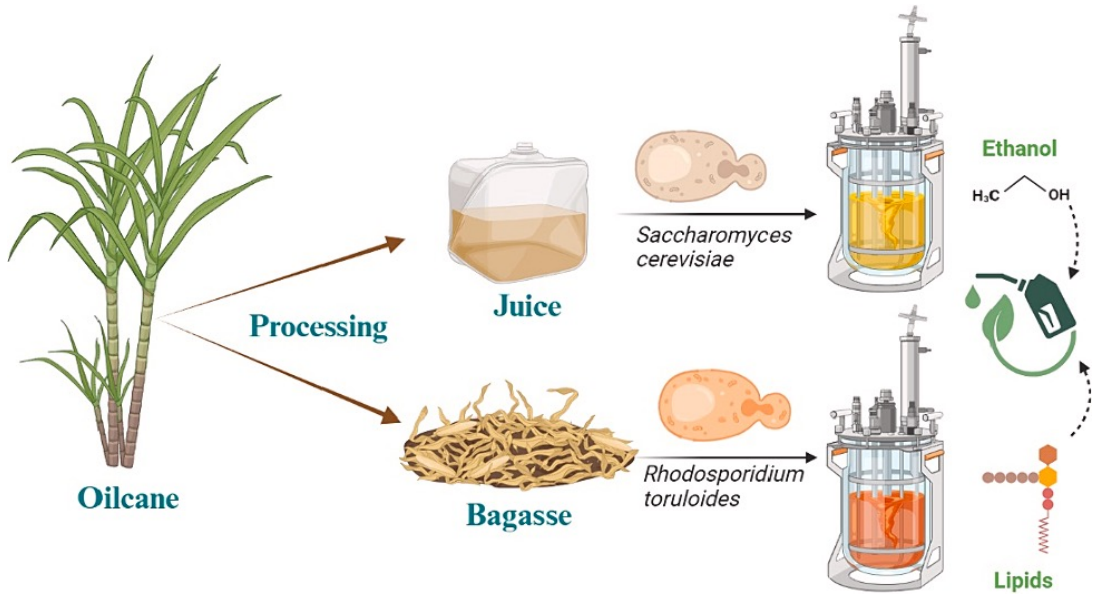
Microbial oils are a biomass-derived substitute for liquid fuels and vegetable oils that can be derived from oilcane, an engineered sugarcane with superior feedstock characteristics for biodiesel production. We tested the production potential of oilcane stems by processing them into juice and hydrothermally pretreated lignocellulosic hydrolysate, which were valorized to ethanol and microbial oil using *Saccharomyces cerevisiae* and engineered *Rhodosporidium toruloides* yeast strains, respectively.

Approach

We extracted juice from oilcane 1566 stems and prepared hydrolysate from the hydrothermally pretreated bagasse. Microbial lipids were produced from hydrolysate using a strain of *R. toruloides* engineered for enhanced intracellular lipid accumulation in flasks and a 75 L fermenter. Ethanol was produced from juice using *S. cerevisiae* in 250 mL and 3 L bench-scale bioreactors. The fatty acid profile was analyzed using lipids extracted from the cell pellet using supercritical CO_2 via gas chromatography with flame ionization detection.

Results

106 g/L of ethanol and 8.8 g/L of lipids were produced. *R. toruloides* consumed all major carbon sources in the hydrolysate and produced lipids with a similar fatty acid composition to palm oil. The fatty acid profile of *R. toruloides* was not altered by the media conditions.



Graphical abstract of oilcane processing.

Significance/Impacts

This demonstrated the feasibility of integrated bioconversion of oilcane feedstocks to lipids at a pilot scale.

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