Integration of Plant and Microbial Oil Processing at Oilcane Biorefineries for More Sustainable Biofuel Production

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Background/Objective

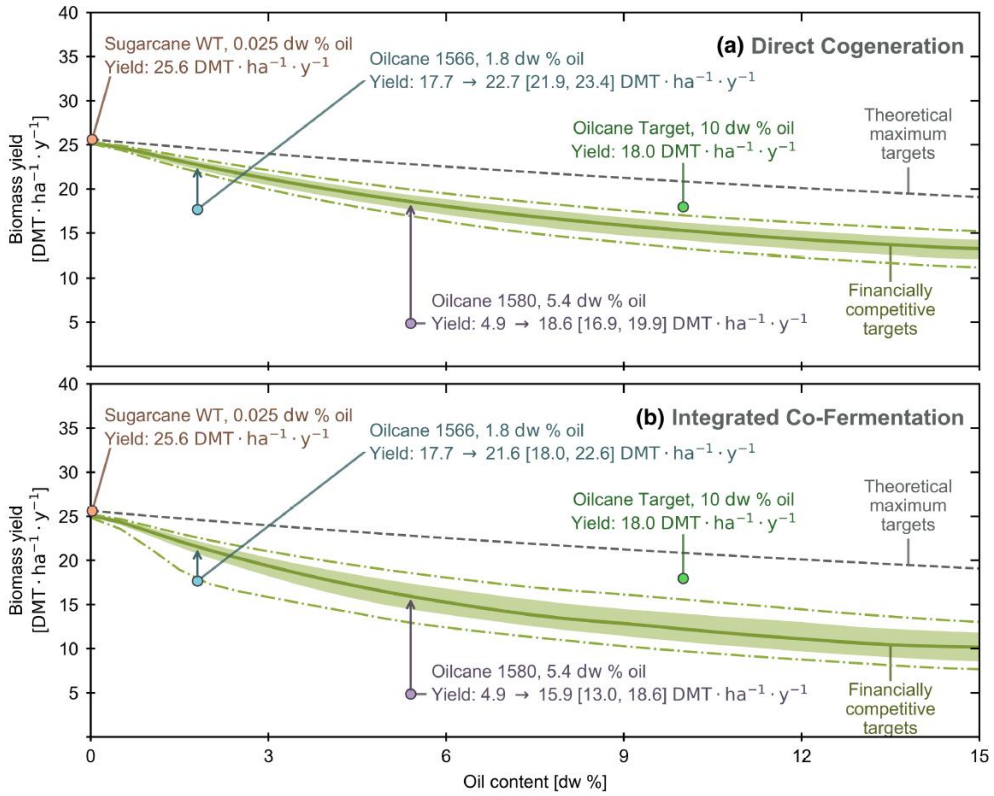
- Engineered oil-accumulating sugarcane (oilcane) and microbial oil have the potential to increase renewable oil production and help meet the expected demand for bioderived oleochemicals and fuels.
- To assess potential synergies of processing both plant and microbial oils, this study characterized the economic and environmental implications of integrating microbial oil production at oilcane and sugarcane biorefineries.

Approach

Researchers characterized the environmental and economic implications of integrating microbial oil production at oilcane and sugarcane biorefineries and then calculated feedstock yield improvements that would be required for oilcane to gain financial parity with sugarcane.

Results

Current oilcane prototypes resulted in higher costs and carbon intensities (CI) than microbial oil from sugarcane. However, with oil content increased to 10 dw%, oilcane with up to 30% lower yield than sugarcane could still be more profitable in all simulated scenarios. Compared to soybean-derived biodiesel, oilcane-derived biodiesel would have 3.0-3.9 times higher yield per unit land area and 57-63% reduction in CI. Improving oilcane biomass yield to be equivalent to sugarcane would result in an increase from 20% to 87% of evaluated scenarios having a minimum biodiesel selling price within or below market price range.



Target and observed biomass yield vs. oil content processed via two modeled microbial biorefinery configurations. Green solid = target yield for market competitiveness.

Significance/Impacts

This study suggests a path forward for improving environmental and economic sustainability of oilcane biorefineries. It characterizes how further development of oil-accumulating C4 feedstocks and microbial oil technologies would enable the wider production of oleochemicals and oil-based biofuels.

Cortés Peña et al. 2024. "Integration of Plant and Microbial Oil Processing at Oilcane Biorefineries for More Sustainable Biofuel Production." *Global Change Biology Bioenergy*. DOI: 10.1111/gcbb.13183.