

Coprocessing Corn Germ Meal for Oil Recovery and Ethanol Production: A Process Model for Lipid-Producing Energy Crops

Background/Objective

Biodiesel production can be expanded using genetically modified crops to accumulate oils in their vegetative tissue, but processing the new crops for both lipid recovery and ethanol production from cell wall saccharides is challenging and expensive. Our previous study used corn germ meal as a model substrate to test liquid hot water (LHW) pretreatment as a recovery method. Here we expand on that by recovering lipids after simultaneous saccharification and co-fermentation (SSCF) of LHW pretreated biomass using corn germ meal as a model for oil-bearing energy crops.

Approach

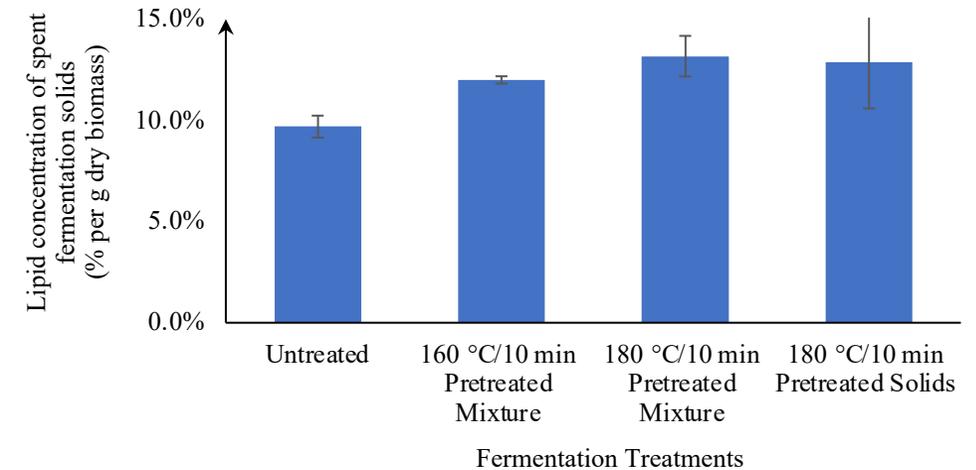
- Pretreated germ meal by LHW (160° and 180° C for 10 min) followed by simultaneous saccharification and co-fermentation (SSCF).
- After fermentation, lipids were extracted from both the spent fermentation whole broth and fermentation solids for composition analysis and fatty acid profiling.

Results

Lipid contents in fermentation solids of pretreated germ meal increased 3.7 to 5.7-fold compared to untreated germ meal (Figure). The maximal lipid yield achieved after fermentation was 36.0 mg lipid per g raw biomass. The maximal relative amount of triacylglycerol (TAG) was 50.9% of extracted oil.

Significance/Impacts

This work provides insights on fate of oil during hydrolysis and fermentation, and thus envisions the coprocessing of lipid-producing energy crops for both oil recovery and ethanol production.



Lipid concentrations of spent fermentation solids (% per g dry biomass).