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Authors: Reizl Jane A. Chato, Cape Caryl R. Cuevas, Justine Shaira N. Tangpuz, Luis K. Cabatingan, Alchris W. Go, Yi-Hsu Ju

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Dilute acid hydrolysis as a method of producing sugar-rich hydrolysates and lipid-dense cake residues from copra cake

Reizl Jane A. Chato[a], Cape Caryl R. Cuevas[a], Justine Shaira N. Tangpuz[a], Luis K. Cabatingan[a,*], Alchris W. Go[a,c,*], Yi-Hsu Ju[b]

[a]*Department of Chemical Engineering, University of San Carlos, Talamban, Cebu City 6000, Philippines*
[b]*Graduate Institute of Applied Science and Technology, National Taiwan University of Science and Technology, Keelung Road, Taipei City, Taiwan*
[c]*Visiting Foreign Researcher, National Taiwan University of Science and Technology, Keelung Road, Taipei City, Taiwan*
**Corresponding author(s): Telefax +63 32 344 6783, Email:* awgo@usc.edu.ph or lkcabatingan@usc.edu.ph
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- Direct dilute acid hydrolysis of copra cake without the prior removal of residual lipids to produce sugar rich hydrolysates (33 g reducing sugar/L).
- Lipid-dense post-hydrolysis residues with lipid content up to ~30 %w/w, twice that of the original copra cake.
- Savings on energy and solvent required for lipid recovery may reach as much as 44 % by adopting direct hydrolysis of lipid-containing copra cake.

Abstract

This study investigated an alternative to that approach in the processing of copra cake by employing no lipid extraction prior to hydrolysis and yet maximizing sugar recovery and retention of lipid in the biomass. This alternative approach of employing direct hydrolysis of non-delipidated copra cake consequently produces not only sugar-rich hydrolysates but also lipid-dense cake residues. Expressed in dry lipid-free basis, carbohydrate content of non-delipidated copra cake was determined to be ~50 %w/w, which was comparable to that of the delipidated copra cake (~48-50 %w/w). Dilute acid hydrolysis of non-delipidated copra cake was carried out using five different concentrations of sulfuric acid (1-5 %v/v H_2SO_4) and seven hydrolysis time settings (5-300 minutes), while the solvent-to-solid ratio (SSR) and temperature were kept constant at 8 mL/g and 95 °C, respectively. Hydrolysis done using 4 %v/v H_2SO_4 over a hydrolysis time of 3 hours resulted in a good balance between the sugar yield and concentration responses. Hydrolysate obtained at this condition had a sugar concentration of ~33 g/L and furan concentration of ~0.36 g/L, which corresponds to a sugar recovery of ~50 %. Lipids were apparently retained in the biomass matrix after hydrolysis (~102 % recovery), resulting to a lipid-dense post-hydrolysis residue (PHR) having a lipid content twice that of the copra cake prior to hydrolysis. Preliminary mass and energy balance analysis