

Conversion of Sweet Sorghum Bagasse to Sugars for Succinic Acid Production

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Abstract : Succinic acid is a compound used for manufacturing lacquers, resins, and other coating chemicals. It is also used in the food and beverage industry as a flavor additive. It is predominantly manufactured from petrochemicals, but it can also be produced by fermentation of sugars from renewable feedstocks, such as plant biomass. Bio-based succinic acid has great potential in becoming a platform chemical (building block) for commodity and high-value chemicals. In this study, the production of bio-based succinic acid from sweet sorghum was investigated. Sweet sorghum has high fermentable sugar content and can be cultivated in a variety of climates. In order to avoid competition with food feedstocks, its non-edible 'bagasse' (the fiber part after extracting the juice) was targeted. Initially, various conditions of pretreating sweet sorghum bagasse (SSB) were studied in an effort to remove most of the non-fermentable components and expose the cellulosic fiber containing the fermentable sugars (glucose). Concentrated (83%) phosphoric acid was utilized at temperatures 50-80 oC for 30-60 min at various SSB loadings (10-15%), coupled with enzymatic hydrolysis using commercial cellulase (Ctec2, Novozymes) enzyme, to identify the conditions that lead to the highest glucose yields for subsequent fermentation to succinic acid. As the pretreatment temperature and duration increased, the bagasse color changed from light brown to dark brown-black, indicating decomposition, which ranged from 15% to 72%, while the theoretical glucose yield is 91%. With Minitab software statistical analysis, a model was built to identify the optimal pretreatment condition for maximum glucose released. The projected theoretical bio-based succinic acid production is 23g per 100g of SSB, which will be confirmed with fermentation experiments using the bacterium *Actinobacillus succinogenes*.

Keywords : biomass, cellulose, enzymatic hydrolysis, fermentation, pretreatment, succinic acid

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