Lignocellulosic ethanol production from cassava stems using Saccharomyces cerevisiae TISTR 5048 via batch fermentation

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Cassava stems is one of the abundant lignocellulosic waste materials in Thailand. Its predominantly contains cellulose, hemicelluloses and lignin. Therefore, the cassava stems could be used to the raw materials for converting to reducing sugars in lignocellulosic ethanol production. The aim of this research was to study lignocellulosic ethanol production from cassava stems using *Saccharomyces cerevisiae* TISTR 5048 via batch fermentation. The main components in cassava stems were monitored by a differential/thermal gravimetric analyzer (DTG/TGA). Seperation of cellulose from fats and oils, hemicelluloses and lignin of cassava stems was done from modified Technical Association of the pulp and Paper Industrials T203 (TAPPI T203). All samples were finally achieved and characterized by FT-IR technique. After that, the cellulose was hydrolyzed to produce reducing sugars with 0.4% (v/v) sulfuric acid using an electrical autoclave at 121^0C, 15 psi for 90 min. Total reducing sugars were determined with dinitrosalicylic (DNS) acid method using spectrophotometric method. The compositions of reducing sugars was identified by silylation method using a gas chromatograph couple with a flame ionization detector (GC-FID). Hydrolyzed solutions were fermented to produce lignocellulosic ethanol using *Saccharomyces cerevisiae* TISTR 5048 at 30^0C on a rotary shaker for 48 hrs. The quantity of lignocellulosic ethanol was determined by GC-FID. The results showed that the main components in cassava stems consist of 6.99% moisture content, 43.90% cellulose, 4.20% hemicelluloses and 17.04% lignin. FT-IR spectras of removable fats and oils, lignin and hemicelluloses from cassava stems could disappears at 1733 cm^{-1}(C=O ester in fats and oils), 1440 cm^{-1} and 1270 cm^{-1} (C-O stretching of phenol in lignin's structure), 1161 cm^{-1} and 1181 cm^{-1} (C-O-C vibration of arabinose in hemicellulose's structure). The maximum of total reducing sugars in hydrolyzed solution was 0.30 g/g substrates. Identification of reducing sugars by GC-FID technique was found that glucose and xylose are major components. However, galactose and mannose were still detected as minor component of all hydrolyzed solution as well. The average ethanol yield obtained was 0.32 g/g of glucose sample with a theoretical ethanol yield

to be 62.74%.

keywords : Lignocellulosic ethanol, Cassava stems, batch fermentation, silylation method, glucose