

# Produksi bio-asam suksinat dari tandan kosong kelapa sawit menggunakan imobilat bakteri dari rumen sapi melalui semi simultaneous saccharification and fermentation = Production of bio-succinic acid from oil palm empty fruit bunches using immobilates bacteria from cow rumen by semi simultaneous saccharification and fermentation

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## Abstrak

Fermentasi asam suksinat dari tandan kosong kelapa sawit (TKKS) menggunakan bakteri amobil dari rumen sapi saat ini sedand diteliti. TKKS adalah salah satu bahan baku yang dapat digunakan untuk produksi asam suksinat karena memiliki kandungan glukosa, harga rendah, serta tersedia banyak di alam. Asam suksinat dapat diproduksi dengan beberapa metode seperti fermentasi yang dianggap lebih ramah lingkungan karena mengkonsumsi CO<sub>2</sub> selama prosesnya sehingga berkontribusi pada pengurangan emisi CO<sub>2</sub>. Bakteri yang digunakan dalam percobaan ini diisolasi dari rumen sapi dan akan diimobilisasi sebelum masuk ke proses produksi asam suksinat.

Fermentasi dilakukan dengan teknik Semi Simurrentous Saccharification and Fermentation (SSSF).

Hidrolisis dilakukan dengan menggunakan enzim selulase selama 2 - 6 jam sebelum fermentasi terjadi.

*Yeast extract* sebagai sumber nitrogen dan MgCO<sub>3</sub> sebagai zat pengatur pH divariasikan kemudian akan hasil fermentasi berupa konsentrasi asam suksinat, yield, dan produktivitas akan dibandingkan. Fermentasi dilakukan selama 48 jam dalam water bath shaker dan suhunya dijaga pada suhu 37<sup>o</sup>C. Produk fermentasi akan dianalisis menggunakan HPLC untuk mengetahui kandungan asam suksinat.

Kondisi fermentasi optimal untuk produksi asam suksinat didapatkan saat: waktu hidrolisis - 6 jam, sumber pH awal - 20 g/L, konsentrasi agen pengatur pH awal - 20 g/L. Pada kondisi yang dioptimalkan ini, produksi maksimum asam suksinat ditemukan menjadi 1,43 g/L dengan hasil asam suksinat dengan konsentrasi glukosa awal dan 0,0297 g/L. produktivitas.

.....The fermentation of succinic acid from oil palm empty fruit bunches (EFB) using immobilized bacteria from cow rumen were investigated. EFB is one of raw material that can be used for succinic acid production due to its cellulose content, low prices, and availability. Succinic acid can be produced effectively by several methods, one of them is fermentation which considered more environmentally friendly due to CO<sub>2</sub> consumed during the process, thereby potentially contributing to reduction of CO<sub>2</sub> emission. Bacteria used in this experiment were isolated from cow rumen which must be immobilized before getting into succinic acid production process.

Fermentation is done by Semi Simultaneous Saccharification and Fermentation (SSSF) technique.

Saccharification was carried out using cellulase enzyme for 2 – 6 hours before fermentation occurs. Yeast extract as nitrogen sources and MgCO<sub>3</sub> as pH regulating agent were varied and compared in terms of product concentration, yield, and productivity. Fermentation was carried out for 48 hours in shaker water bath and the temperature maintained at 37<sup>o</sup>C. Fermentation product was then examined using HPLC to find out the succinic acid content.

The optimum fermentation conditions for succinic acid production were found to be: saccharification time – 2 hours, initial nitrogen sources concentration – 20 g/L, initial pH regulating agent concentration – 20 g/L. At these optimized condition, the maximum production of succinic acid was found to be 1.47 g/L with 19.64 g/g yield of succinic acid to initial glucose concentration and 0.03 g/L.h productivity.