Produksi Asam Suksinat dari Tandan Kosong Kelapa Sawit menggunakan Isolat Bakteri dari Rumen Sapi melalui Metode Semi Simultaneous Saccharification and Fermentation = Production of Succinic Acid from Oil Palm Empty Fruit Bunch using Bacteria Isolated from Cattle Rumen through Semi Simultaneous Saccharification and Fermentation

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Abstrak

Asam suksinat dapat diproduksi dari tandan kosong kelapa sawit (TKKS) melalui proses fermentasi. Pada penelitian ini, produksi asam suksinat dilakukan menggunakan isolat bakteri dari rumen sapi melalui metode Semi Simultaneous Saccharification and Fermentation (SSSF). Isolat bakteri dari cairan rumen sapi diperoleh dengan melakukan tahap isolasi terlebih dahulu. Tahapan isolasi dilakukan dengan melakukan enrichment, subkultur, isolasi, dan fermentasi bakteri. TKKS sebagai sumber karbon, juga dilakukan tahap pretreatment terlebih dahulu menggunakan larutan peracetic acid dan alkaline peroxide serta tahap prehidrolisis menggunakan enzim selulase untuk menghasilkan glukosa. Tahap SSSF dilakukan dengan konsentrasi awal glukosa yang berbeda, yaitu 0,45; 0,48; dan 0,61 g/L.
Berdasarkan hasil yang diperoleh, konsentrasi, yield, dan produktivitas asam suksinat tertinggi sebesar 3,12 g/L, 0,312 g/g TKKS, dan 0,13 g/L/jam, secara berurutan, diperoleh pada konsentrasi awal glukosa sebesar 0,61 g/L. Selain itu, berat kering bakteri dan konversi glukosa tertinggi sebesar 0,0775 gr dan 73,61 %, secara berurutan, juga diperoleh pada konsentrasi awal glukosa sebesar 0,61 g/L. Estimasi parameter kinetika pertumbuhan bakteri juga dilakukan dalam penelitian ini. Berdasarkan perhitungan, laju pertumbuhan spesifik tertinggi sebesar 0,051 jam⁻¹ diperoleh pada konsentrasi awal glukosa sebesar 0,61 g/L.
.....Succinic acid can be produced from oil palm empty fruit bunches (OPEFB) through a fermentation process. In this study, succinic acid production was carried out using bacteria isolated from cattle rumen through the Semi Simultaneous Saccharification and Fermentation (SSSF) method. Bacteria were isolated from cattle rumen fluid by doing the isolation stage first. The stages of isolation were carried out by doing enrichment, subculture, isolation, and fermentation of bacteria originated. OPEFB as a carbon source, were pretreated through pretreatment stage using peracetic acid and alkaline peroxide solution and then continue to the prehydrolysis stage using cellulase enzymes in order to produce glucose. The SSSF stage was carried out with different initial glucose concentrations, which are 0.45; 0.48; and 0.61 g/L.
Based on the results obtained, the highest concentration, yield, and productivity of succinic acid of 3.12 g/L, 0,312 g/g EFB, and 0.13 g/L/h, respectively, were obtained at the initial glucose concentration of 0.61 g/L. In addition, the highest dry weight of bacteria and glucose conversion were 0.0775 gr and 73.61 %, respectively, were also obtained at the initial glucose concentration of 0.61 g/L. Estimation of bacterial growth kinetics parameters was also carried out in this study. Based on calculations, the highest specific growth rate of 0.051 h⁻¹ was obtained at the initial glucose concentration of 0.61 g/L.