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Case Study for a Palm Biomass Biorefinery Utilizing Renewable Sugars from Oil Palm Frond for the Production of Poly(3-hydroxybutyrate) Bioplastic

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Abstract

In this paper, we assess the economic viability of renewable sugars from oil palm frond (OPF) as fermentation feedstock for the production of the bioplastic poly(3-hydroxybutyrate), P(3HB) within an integrated palm biomass biorefinery. The production cost of P(3HB) is estimated based on 9,600 dry tonnes per annum of the potential amount of renewable sugars that can be produced from OPF in a typical palm oil mill in Malaysia. Based on the case study, approximately 96,000 tonnes per annum of renewable sugars could be produced from 10 neighbouring palm oil mills, each with the capacity to process on average 200,000 tonnes per annum of fresh fruit bunch. With 20,000 tonnes of P(3HB) production per annum, the production cost of P(3HB) using renewable sugars from OPF is estimated at USD 3.31/kg P(3HB), which is 43% lower compared to that produced from commercial glucose. This finding shows that renewable sugars from OPF is economically viable to be used as fermentation feedstock for the production of P(3HB). In overall, it shows that renewable sugars from OPF has potential to be utilized as a sustainable and cheap fermentation feedstock for a sustainable biorefinery to support the biotechnology industries in the long term.

Keywords: *Biorefinery; Oil palm frond; Poly(3-hydroxybutyrate); Renewable sugars; Oil palm biomass*