Development of an Efficient Non-edible Biomass Fermentation Process Using a Novel Microbial Platform, Vibrio sp. dhg

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Most microorganisms including industrial host strains were not able to efficiently utilize non-preferred carbon sources contained in non-edible biomass, such as alginate, xylose, and arabinose. Due to a broad spectrum of sugar utilization and genetic tractability, Vibrio sp. dhg was studied as a platform strain for the processes using non-edible biomass as a feedstock; brown-macroalgae and lignocellulose in this study. In order to efficiently utilize brown macroalgae as a feedstock, Vibrio sp. dhg capable of catabolizing alginate was isolated. After genome sequencing, genetic engineering tools were established. The production strains for ethanol, 2,3-butanediol, and lycopene demonstrated unprecedented productivities from brown macroalgae-derived carbon sources (alginate and mannitol). In order to efficiently utilize lignocellulose as a feedstock, Vibrio sp. dhg was rationally and evolutionary engineered for improved xylose catabolism and removal of carbon catabolite repression (CCR). Lactate-producing strain was constructed based on previously engineered strain and showed high productivity from lignocellulose-derived sugars (glucose, arabinose, and xylose).