Metabolically Engineered Escherichia coli for Production of 1,3-Diaminopropane: A Linear C3 Diamine

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For sustainable chemical industry, it is important to produce bio-based chemical compounds. In this study, metabolically engineered Escherichia coli produced 1,3-diaminopropane (1,3-DAP), which is polyamide monomer. In silico flux analysis showed that the C4 pathway employing Acinetobacter baumannii dat and ddc genes, encoding 2-ketoglutarate 4-aminotransferase and L-2,4-diaminobutanolate decarboxylase, is more efficient than heterologous pathways of C4 and C5 for producing 1,3-DAP. Also, by applying 128 of synthetic small RNAs, we found that pfkA gene knock out resulted in increased 1,3-DAP production. After deleting pfkA gene, we overexpressed the ppc and aspC genes and it made 1,3-DAP production even higher. The final 1,3-DAP producing E. coli strain was went through fed-batch fermentation in a minimal medium with glucose producing 13 g/L of 1,3-DAP. [This work was supported by the Technology Development Program to Solve Climate Changes on Systems Metabolic Engineering for Biorefineries from the Ministry of Science, ICT and Future Planning (MSIP) through the National Research Foundation (NRF) of Korea (NRF-2012-C1AAA001-2012M1A2A2026556).]