

Production of fumaric acid in *E. coli* through re-designed TCA cycle송찬우, 김동인, 최솔, 장재원, 이상엽[†]

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Fumaric acid producing *E. coli* was developed by rational metabolic engineering strategies in this study. Firstly, the *iclR* gene was deleted to redirect the carbon flux through the glyoxylate shunt. In addition, the three known fumarase genes (*fumA*, *fumB* and *fumC*) were also deleted to enhance fumaric acid formation. This base strain was further engineered by plasmid-based overexpression of the native *ppc* gene. And then, the *arcA* and *ptsG* genes were sequentially deleted to reinforce the oxidative TCA cycle flux, and the *aspA* gene was deleted to block the conversion of fumaric acid into L-aspartic acid. Since it is desirable to avoid the use of inducer, the *lacI* gene was also deleted. The native promoter of the *galP* gene was replaced with the strong *trc* promoter to increase glucose uptake rate and fumaric acid productivity. Fed-batch culture of the final strain CWF812 allowed production of 28.2 g/L fumaric acid in 63 h with the overall yield and productivity of 0.389 g fumaric acid/g glucose and 0.448 g/L/h. (Development of systems metabolic engineering platform technologies for biorefineries; NRF-2012-C1AAA001-2012M1A2A2026556) funded by the Ministry of Education, Science and Technology)