Engineering a Ferulic acid overproduction strain

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Abstract

Many successful metabolic pathways have been engineered and expressed to produce high-value chemicals in microbial hosts. Optimizing the yield of the final compound is still challenging due to the imbalanced metabolism, inefficient use of resources and bottlenecks. Despite the recorded success by using intelligent biosynthetic circuits design, there remain plenty of potential methods to explore for better yields.
Here, we propose to engineer a biosynthetic pathway overproducing Ferulic acid in *Escherichia coli. This compound is a key intermediate in the vanillin pathway and shows several interesting characteristics such as the antioxidant and the UV-absorption effects. Ferulic acid is 3 steps away from Tyrosine and the pathway involves a P450 and a methyl-transferase enzyme hard to express in E. coli. The pathway was designed as one operon, and a library of 24 constructs was built by varying genes sequences sourced from different organisms at every step. After screening for the best producing constructs, further improvements by changing the ribosome binding site strengths of the rate-limiting step are ongoing.*
Using this approach of plugging genes from different species allows the selection of the best sequences and the required expression levels that maintain E. coli fitness as well as improve the compound yield without optimizing the enzymes efficiencies.

Keywords: Ferulic acid pathway, metabolic engineering, gene library

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