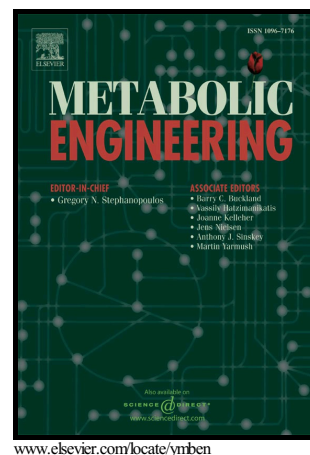


Author's Accepted Manuscript

Engineering the Production of Dipicolinic Acid in
E. coli

Maria K. McClintock, Grant W. Fahnhorst,
Thomas R. Hoyer, Kechun Zhang



PII: S1096-7176(18)30114-9
DOI: <https://doi.org/10.1016/j.ymben.2018.05.009>
Reference: YMBEN1407

To appear in: *Metabolic Engineering*

Received date: 12 March 2018
Revised date: 9 May 2018
Accepted date: 16 May 2018

Cite this article as: Maria K. McClintock, Grant W. Fahnhorst, Thomas R. Hoyer and Kechun Zhang, Engineering the Production of Dipicolinic Acid in *E. coli*, *Metabolic Engineering*, <https://doi.org/10.1016/j.ymben.2018.05.009>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Engineering the Production of Dipicolinic Acid in *E. coli*

Maria K. McClintock^a, Grant W. Fahnhorst^b, Thomas R. Hoyer^b, Kechun Zhang^{a,*}

^aDepartment of Chemical Engineering and Materials Science, University of Minnesota, 421 Washington Ave. SE, Minneapolis, MN 55455 USA

^bDepartment of Chemistry, University of Minnesota, 207 Pleasant St. SE, Minneapolis, MN 55455 USA

Abstract

Dicarboxylic acids, such as the phthalic acids and their derivatives, are monomeric components in several important polyesters and polyamides. In most cases, these compounds are derived from fossil fuels and are not easily biodegradable. Dipicolinic acid (DPA) is a biologically derived aromatic di-acid that has a similar structure to isophthalic acid. Furthermore, DPA has been shown to make polyesters, is readily biodegradable, and is non-toxic. DPA is naturally produced by *Bacillus* and *Clostridium* species during sporulation and can comprise up to 15 % of the dry weight. In this paper we demonstrate the first heterologous production of dipicolinic acid and identify the genes appropriate for gram-scale production in the industrial workhorse organism, *E. coli*. First, several genetic constructs were designed to identify the genes necessary for recombinant production in *E. coli* from the aspartate pre-cursor. The *in vitro* activity of dipicolinate synthase was then compared between *Bacillus subtilis* and *Clostridium perfringens*. Next, in order to improve DPA production from glucose an optimized strain was created containing the elimination of several genes resulting in 5.21 g/L DPA when 5 g/L of aspartate was supplied. Then, several aspartate kinases and dipicolinate synthases were screened for optimal activity in *E. coli*. The optimal genes were combined with the overexpression of phosphoenolpyruvate carboxylase, developing a full biosynthetic pathway capable of producing

Download English Version:

<https://daneshyari.com/en/article/6494050>

Download Persian Version:

<https://daneshyari.com/article/6494050>

[Daneshyari.com](https://daneshyari.com)