Construction of efficient gamma-aminobutyric acid producing recombinant Escherichia coli by introduction of synthetic protein complex

홍순호*, 노선영, Tam Dinh Le Vo
울산대학교
(shhong@mail.ulsan.ac.kr*)

Gamma-aminobutyric acid (GABA) is a precursor of one of the most promising heat-resistant biopolymers, Nylon-4, and can be produced by the decarboxylation of monosodium glutamate (MSG). In this study, a synthetic protein scaffold was applied to improve the GABA conversion in engineered Escherichia coli. Scaffolds were constructed by assembling a single protein-protein interaction domain SH3 to the glutamate decarboxylase (GadA and GadB) and attaching a cognate peptide ligand to the glutamate/GABA antiporter (GadC) at the N-terminus, C-terminus, and the 233rd amino acid residue. When GadA and GadC were co-overexpressed via the C-terminus scaffold, a GABA concentration of 5.65 g/L was obtained from 10 g/L MSG, which corresponds to a GABA yield of 93%. A significant increase of the GABA productivity was also observed where the GABA productivity increased 2.5 fold in the early culture period due to the introduction of the synthetic protein scaffold. The GABA pathway efficiency and GABA productivity were enhanced by the introduction of the scaffold between glutamate decarboxylase and glutamate/GABA antiporter. This work was supported by a grant from the Next-Generation BioGreen 21 Program (SSAC, grant number: PJ00954904) by RDA, and Basic Science Research Program by the MEST (2011-0022392).