Development and evaluation of various recombinant *Escherichia coli* strains for 3-HP production

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Previously, we studied the production of 3-hydroxypropionic acid (3-HP) from glycerol using the recombinant Escherichia coli expressing glycerol dehydratase (dhaB1, dhaB2, and dhaB3) and aldehyde dehydrogenase (aldH). The present study aims to improve the ability of the recombinant E. coli. In order to do so, the recombinant strains were further developed to contain the genes gdrAB, which encode the glycerol dehydratase reactivase, and the gene KGSADH-I (a-ketoglutaric semialdehyde dehydrogenase) in place of aldH, under two different vectors. When induced with IPTG, the specific activi ties of DhaB at co-expressed conditions decreased drastically than expressing it individually. But, the specific activities of AldH and KGSADH-I were shown a slight difference, at the co-expression conditions. The crude cell activity of KGSADH-I exhibited 2-fold higher specific activity than that of AldH. When the recombinants harboring the gene aldH or KGSADH-I with dhaB and gdrAB grown on a glycerol medium, the maximum titer of 3-HP was 14.9 mmol l-1 with AldH construct, and 31 mmol l-1 with KGSADH-I construct. Here, we demonstrate enhanced production of 3-HP under shake flask conditions was closely related to the enzyme characteristics of the biocatalyst.