Limonene Production from Acetate and Ethanol to Enhance Carbon Flow into the Mevalonate Pathway using Recombinant Saccharomyces cerevisiae

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Biological production of limonene using microorganisms has been actively studied because it can replace hazardous organic solvents in chemical industry. In this study, we developed a bioconversion process from acetate and ethanol to limonene using *Saccharomyces cerevisiae*. Acetate and ethanol can be directly converted to acetyl-CoA not pyruvate providing, which has the advantage of solving the problems of carbon loss. To produce limonene from acetate and ethanol, we introduced limonene synthase(LS) gene from *Mentha spicata* which converts geranyl pyrophosphate(GPP) or neryl pyrophosphate(NPP) to limonene with GPP synthase(GPPS) from *Abies grandis* or NPP synthase(NDPS) from *Solanum lycopersicum* to *S. cerevisiae* using modified pESC-TRP vector. To improve the production of limonene, we optimized the mevalonate pathway by over-expression of acetyl-CoA thiolase, 3-hydroxy-3-methyl glutaryl-CoA(HMG-CoA) reductase, mevalonate kinase and IPP delta-isomerase which are the main bottle-neck of GPP synthesis using modified pESC-LEU and pESC-HIS vector.