Towards the industrial scale production of important flavonoids with microorganisms

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Abstract

Flavonoids are a group of important phytochemicals that have extensive applications. They could be regarded as the derivatives from naringeine or pinocembrin by a series of enzyme modifications. Production of flavonoids by microorganisms has been extensively investigated in last several decades. Almost all of the common derivative enzymes for flavonoids have been reported, and some of them were applied for the metabolic engineering of microorganisms for the production of complciated flavonoids. Besides, along with the development of metabolic engineering and synthetic biology tools, the titer and the yield of flavonids production by microorganisms are keeping increasing. Mining of more enzymes from plants and assembly of the more comlicated pathways in microorganisms faciliate the production of more flavonids with higher titer and yield. In order to achieve the efficient biosynthesis of more flavonoids in microorganisms, different modification enzymes from plants that could efficient accumulate corresponding flavonoids with spefici modifications have been either chemical synthesized according to transcriptomics data or PCR amplifed from cDNA of the plants. These modification enzymes include glycotransferase, hydroxylase, methyltransferase, prenyltransferase, isoflavonoid synthease, et al. By assembling these enzymes with suitable promoters and insered into the genome of *Saccharomyces cerevisiae* engineered for the enhanced supply of flavonoid precursors *p*-coumaric acid and malonyl-CoA, production of common flavonids with ideal titer could be achieved. Collection and modification of more enzymes could finally achieve the production of flavonoids by microorganisms on industrial scale.

Brief Biography

Jingwen Zhou received his Ph.D in Fermentation Engineering, at Jiangnan University in 2009, his M.S. in Microbiology at Huazhong Agricultural University in 2006 and a B.A. in Food Science and Technology at Huazhong Agricultural University in 2003. He is a Professor of Lab of Biosystems and Bioprocess Engineering in the School of Biotechnology at Jiangnan University. His research areas include: metabolic engineering of microorganisms for the efficient production of keto acids (pyruvic acid and α-ketoglutaric acid) and plant natural products (flavonoids and L-ascorbic acid), development of strategies related to carbon-nitrogen balance regulation, fine-tuning of metabolic pathway and high-throughput screening. He has over 60 peer reviewed publications and invited reviews, and awarded with National Award for Technological Invention 2nd Prize, WIPO-SIPO Award for Chinese Outstanding Patented Invention, and ACS membership award.

Brief CV

Jingwen Zhou, Ph.D.

National Engineering Laboratory for Cereal Fermentation Technology, Jiangnan University

Education:

BSc Food Science and Engineering, Huazhong Agricultural University, China, 2003

MSc Microbiology, Huazhong Agricultural University, China, 2006

PhD Fermentation Engineering, Jiangnan University, China, 2009

Professional Career:

2009 – 2014 Associate Professor, School of Biotechnology, Jiangnan University.

2012 – 2013 PostDoc, Department of Chemistry and Chemical Biology, Harvard University.

2014 – now Professor, School of Biotechnology/ National Engineering Laboratory for Cereal Fermentation Technology, Jiangnan University.

Research Interests:

1. Metabolic engineering of microorganisms to produce phenylpropanoids and vitamin C
2. Metabolic engineering and synthetic biology
3. Process optimization and control

Selected publications

1. Lv, Y. et al., ***Green Chem***. 2019, 2019, 21, 1660-1667
2. Zhou S. et al., ***Biotechnol Bioeng***. 2019, 116(6): 1392-1404.
3. Zhao et al, ***Metab Eng***, 2018, 47:254-262.
4. Zhang et al, ***Microbiol Mol Biol Rev***, 2018, 82(1). e00040-17
5. Lv et al, ***Plant J***, 2017. 92(6): 995-1004.
6. Lv et al, ***Biotechnol Bioeng***, 2017. 114(9): 2066-2074.
7. Zhou et al, ***ACS Synth Biol***, 2017. 6(6): 1065-1075.
8. Gao L. et al, ***Metab Eng***. 2014, 24: 30–37.
9. Zhou et al, ***Curr Opin Biotechnol***. 2014. 25: 17-23.
10. Wu et al, ***Metab Eng***. 2013. 16:48-55.