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Metabolic Engineering of Ginsenosides Pathway in *Saccharomyces Cerevisiae* for Producing Bioactive Compounds of *Panax Ginseng*

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Extended Abstract

Natural products obtained from various plants have been used for medicinal purpose such as an antibiotics, anticancer, immunodepression, antidiabetic, and antihyperpoesia. Ginsenosides, which are the active natural steroid glycosides and triterpene saponins of Ginseng, have been used for thousands of years to modulate multiple physiological activities. Protopanaxadiol and protopanaxatriol are basic aglycons of ginsenosides componants, which have therapeutic activity such as anticancer. Ginsenosides and its derivatives pathway for producing protopanaxadiol and protopanaxatriol were constructed in *Saccharomyces cerevisiae* by introducing dammarenediol-II synthase, protopanaxadiol synthase, protopanaxatriol synthase, and NADPH-cytochrome P450 reductase from *Panax ginseng* and *Arabidopsis thaliana*. For enhanced supply of squalene and 2,3-oxidosqualene which are the intermediates for synthesis of ginsenosides components, truncated 3-hydroxyl-3-methylglutaryl-CoA reductase, squalene synthase, and 2,3-oxidosqualene synthase were overexpressed. Peroxisome which is highly dynamic microorganelle is able to adjust size and number, called peroxisome proliferation. The peroxisome proliferation technique was applied to increase the farnesyl pyrophosphate supply, led to 2.5-fold increase of aglycon production. In this study, the ginsenosides and its derivatives, which are industrially valuable and easy to re-organization of each genes involved ginsenosides biosynthesis pathway, was efficiently produced by artificially engineered microorganelle and metabolically engineered *S. cerevisiae.*