Microbial production of astilbin, a bioactive rhamnosylated flavanone, from taxifolin

Flavonoids are plant-based polyphenolic biomolecules with a wide range of biological activities. Glycosylated flavonoids have drawn special attention in the industries as it improves solubility, stability, and bioactivity. Herein, we report the production of astilbin (ATN) from taxifolin (TFN) in genetically-engineered Escherichia coli BL21(DE3). The exogenously supplied TFN was converted to ATN by 3-O-rhamnosylation utilizing the endogenous TDP-l-rhamnose in presence of UDP-glycosyltransferase (ArGT3, Gene Bank accession number: At1g30530) from Arabidopsis thaliana. Upon improving the intracellular TDP-l-rhamnose pool by knocking out the chromosomal glucose phosphate isomerase (pgi) and d-glucose-6-phosphate dehydrogenase (zwf) deletion along with the overexpression of rhamnose biosynthetic pathway increases the biotransformation product, ATN with total conversion of similar to 49.5 +/- 1.67% from 100 μM of taxifolin.

In addition, the cytotoxic effect of taxifolin-3-O-rhamnoside on PANC-1 and A-549 cancer cell lines was assessed for establishing ATN as potent antitumor compound.

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