International Conference on Bioprocess-2013
Fermentation Technology, Bioprocess and Cell Culture
October 28-30, 2013 Kansas City, USA

Genetic engineering of yeast for L-ascorbic acid (Vitamin C) production by fermentation process

Júlio César C. Rosa

Universidade Federal de Viçosa (UFV), Brazil

Abstract

The enediol ascorbate or L-ascorbic acid (L-AA), known as Vitamin C, it is an important metabolite in many organisms. The L-AA is naturally synthesized in plants from D-glucose by 10 steps pathway. The epimerization of D to L-substrates, which is rare in nature, is a crucial step to generate the galactose enantiomer in the L-AA pathway. Budding yeast produces a 5-carbon analogue, Dehydro-D-arabinono 1.4-lactone (D-DAL), which is synthesized from D-arabinose. The structural enzymes motifs involved in D-DAL biosynthetic pathway resemble those of the L-AA pathway in plants. Yeasts are able to synthesize L-AA only if it is cultivated in the presence of some of its precursors. *Kluyveromyces lactis* is one of the most important non-Saccharomyces yeast species used as eukaryotic model and tool for biotechnological applications including an alternative host for heterologous gene expression. *K. lactis* has the ability of growing, by respiration, on a wide range of substrates, including lactose with low glucose repression. To avoid feeding the yeast culture with the L-AA precursors, we have engineered *K. lactis* with L-AA pathway genes from plant. The recombinant yeasts were capable to produce about 30 $mg.L^{-1}$ of L-AA in 48 hours of incubation when cultured on rich medium with 2% (w/v) D-galactose. We also evaluated the L-AA production culturing recombinant recombinant strains in cheese whey, a waste product during cheese production, as an alternative source of lactose. This work is the first attempt of engineering *K. lactis* cells for L-AA biosynthesis by fermentation taking advantage of its natural ability to grow on lactose and without any exogenously addition of its precursors in the growth medium.

Biography

Júlio César C. Rosa is graduated in Biological Sciences and he holds a Master's degree in Agricultural Microbiology. He completed his PhD at the age of 28 years from Universidade Federal de Viçosa (UFV) with a focus on a survey of the biotechnological potential of yeast for production of a variety of compounds such as second generation ethanol, biopolymers, hydrolytic enzymes, primary and secondary metabolites, peptides and vaccine. He worked at Flanders Institute for Biotechnology (VIB) from Katholieke Universiteit Leuven, Belgium. Currently, he is postdoctoral researcher from Universidade Federal de Minas Gerais, Belo Horizonte, Brazil.