ascenion Technology transfer for academic research
A company of the LifeScience Foundation

REFERENCE NUMBER
TO 10-00125

CONSOLIDATED BIOPROCESSING OF COMPLEX CARBOHYDRATES TO D-ERYTHRO-ISOCITRIC ACID USING A FUNGUS

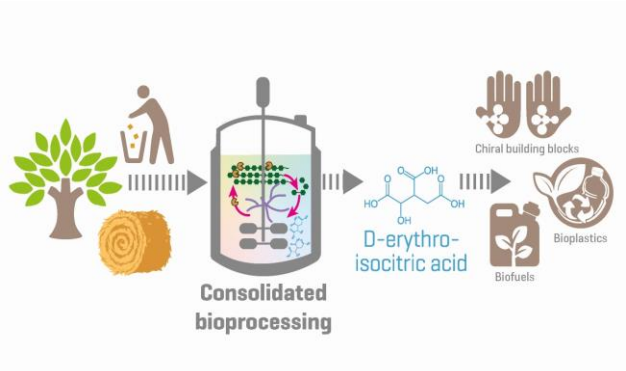
Keywords: consolidated bioprocessing, isocitric acid, cellulase, *Penicillium*, *Talaromyces*, sustainable chemistry, renewable

INVENTION NOVELTY

This invention provides a method for the one-step bioproduction of enantiomer-pure D-erythro-isocitric acid as a platform fine chemical from complex carbohydrate substrates such as cellulose using a natural fungus from the genus *Talaromyces*. This method enables direct conversion without the need for genetically modified organisms (GMOs), presenting a significant advancement in the field of bioprocessing and sustainable chemical production resulting in the most favorable substrate cost-to-product ratio.

VALUE PROPOSITION

The traditional processes for converting lignocellulosic materials into valuable chemicals involve multiple steps such as a separate production of cellulase enzymes, conversion of the pretreated cellulose substrate into sugar mono- and oligomers, and finally fermentation into the product of interest. The three separate processes require three separate bioreactors and peripheral equipment, which is costly and results in a decreased space-time yield compared to a consolidated bioprocess (CBP), in which pretreated cellulose substrate is directly converted into the target product within a single bioreactor. The only CBP strategies that reached relevant product quantities are co-cultures as well as native cellulolytic approaches with GMOs, the use of which can be costly and complex. Thus, in the context of the fossil resources transition to a circular economy, new methods for a sustainable production of chemical building blocks as well as carriers of energy are urgently needed.



Production of D-erythro-isocitric acid from cellulose via consolidated bioprocessing. © Schlembach et al.

TECHNOLOGY DESCRIPTION

The offered technology simplifies the process by using a natural, non-GMO fungal strain capable of directly converting cellulose into D-erythro-isocitric acid. This offers a cost-effective, sustainable, and scalable solution for producing high-value chemicals from renewable resources. The invention involves cultivating a suitable fungus in a medium containing complex carbohydrate under specific conditions, like cultivation at temperatures ranging from 25° to 40°C, and a pH of the culture maintained ideally around 5.5. Additionally, nitrogen limitation in the medium is crucial to induce the production of isocitric acid. This method achieves the direct production of D-erythro-isocitric acid from cheap agricultural residues like straw with high purity and yield, providing a viable alternative to traditional multi-step processes.

COMMERCIAL OPPORTUNITY

The production of D-erythro-isocitric acid directly from cellulose offers a sustainable and economical approach to chemical production. Isocitric acid's properties can be highly beneficial for i.a. pharmaceutical and cosmetic applications. The technology and a proprietary *Talaromyces*-production strain are offered for licensing.

DEVELOPMENT STATUS

The method has undergone extensive laboratory validation, demonstrating its efficacy in producing high yields of D-erythro-isocitric acid from cellulose. Current research focuses on optimizing the process parameters and industrial up-scaling.

PATENT SITUATION

An international patent application has been filed on March 7, 2024 (PCT/EP2024/056067).

FURTHER READING

Ivan Schlembach, et al., (2024) ACS Sustainable Chemistry & Engineering 12 (9), 3408-3418.

LEIBNIZ-HKI

Ascenion GmbH
Herzogstraße 64
D-80803 München
info@ascenion.de
www.ascenion.de

Licensing Contact
Dr. Sabina Heim
Senior Technology Manager
T: +49 531 6181-2090
heim@ascenion.de