



Biotechnology | Production of Food and Natural Substances | Technology Offer

Efficient, low-cost production method for the natural sweetener 5-Ketofructose (5-KF)

Application area

According to a recent study by the Robert Koch Institute over 50 % of all Germans suffer from overweight; obesity-related diseases have doubled worldwide since 1980. This high body-mass-index is also associated with an increased risk of type 2 diabetes. Especially teenagers and young adults are increasingly affected. Sweeteners have no calories that are digested by the human body and their sweetness factor is high without affecting insulin levels. Therefore, they are of particular interest to people with diabetes. Moreover, they are considered appropriate for low-sugar diets. However, most of the sugar substitutes are produced synthetically and not all of them can be consumed without side effects.

Currently, there is no natural sweetener without undesired aftertaste that is available at affordable prices. 5-Ketofructose (5-KF) has all of these qualities. With a new fermentation method, substrates (e.g. sucrose, glucose or starch), that are inexpensive and available in large amounts, can be used for the direct production of 5-KF.

State of the art

There are only a few natural sugar substitutes available on the market. The comparatively expensive sweetener Stevia has a high sweetening power, but it also has a slightly bitter aftertaste. Plus, the production conditions in Asia are not well controlled; no crucial breakthrough has been reported so far. 5-KF is not yet available on the market as its production used to be either complicated or inefficient – and definitely costly. As 5-KF is ideally suited as a sweetener and global demand is expected to rise in the future, it is more crucial than ever to provide an efficient and low-cost production method.

Innovation

The method developed by scientists at RWTH Aachen University, the University of Bonn and Forschungszentrum Jülich is based on the use of recombinant *Gluconobacter oxydans* strains, enabling low-cost production of 5-KF. And that is not all. In a fed-batch process with a highly concentrated solution of fructose it is possible to produce 5-KF in a single step, because fructose dehydrogenase (FDH) is overexpressed in the strain. Product yield and concentration are much higher compared to conventional methods. Process efficiency and product purity can be optimized even further through additional measures. The use of mixed cultures will allow users to adjust the process to different substrates through the expression of necessary enzymes during the process. Methods for purification of the product are currently under development.

Patent portfolio

EP and PCT applications (WO2018/229161A1) pending.

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Your advantages at a glance

- ✓ Natural sweetener from readily available, renewable resources
- ✓ No unpleasant aftertaste
- ✓ Very effective single-stage process
- ✓ Product yield > 90%
- ✓ High product concentrations
- ✓ Procedure can be adapted to various carbohydrate substrates
- ✓ Low-cost, natural sweetener

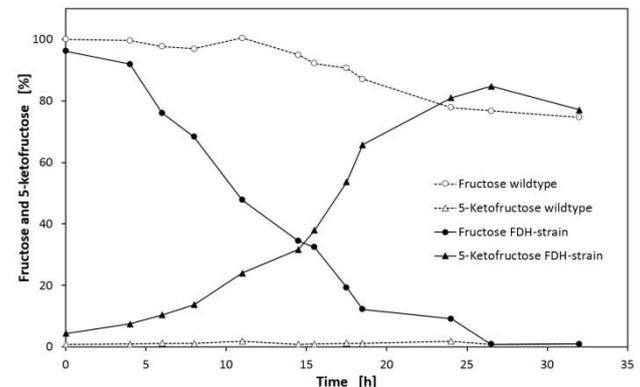


Figure: The comparison with the wild type (white symbols) is an impressive proof of how the conversion of fructose to 5-KF can be significantly enhanced in the recombinant strain (black symbols) through the addition of FDH.

Technology transfer

TLB GmbH manages inventions until they are marketable and offers companies opportunities for license and collaboration agreements.

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