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**Metabolic engineering approaches to
improve the production of organic acids**

Why organic acids?

important substance class with multiple applications:

- food & feed additives
- cleaning products
- building block chemicals



Metabolic engineering of cell factories to enable and improve production.

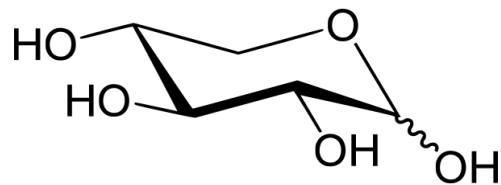
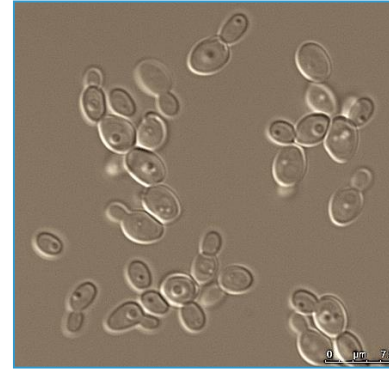
- L-lactic acid
- *cis*-aconitic acid

Sugiyamaella lignohabitans



University of Natural Resources
and Life Sciences, Vienna
Department of Biotechnology

- ✓ Non-conventional yeast, belonging to the *Sugiyamaella* clade
- ✓ Isolated from a decayed tree (*Kurtzman, 2007*)
- ✓ No member of the CTG-clade (serine instead of leucine)
- ✓ Natural capability to convert xylose



pH tolerance: a comparison

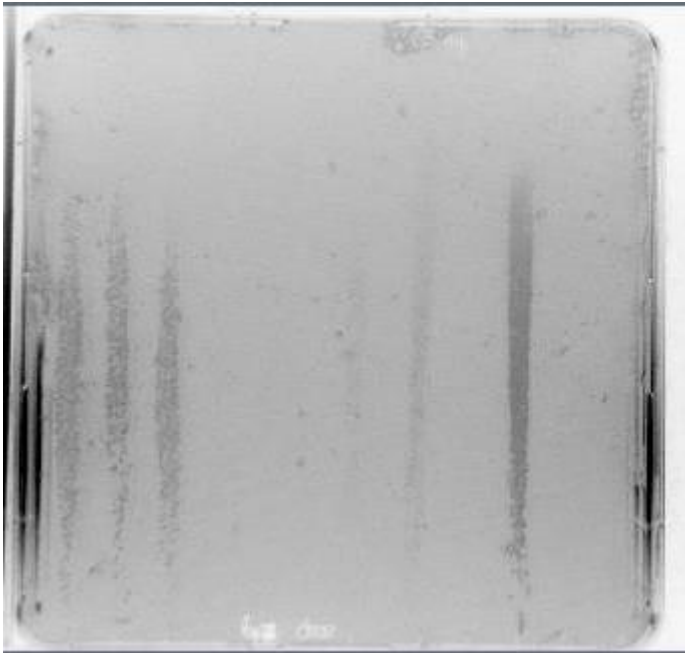


pH 1,5



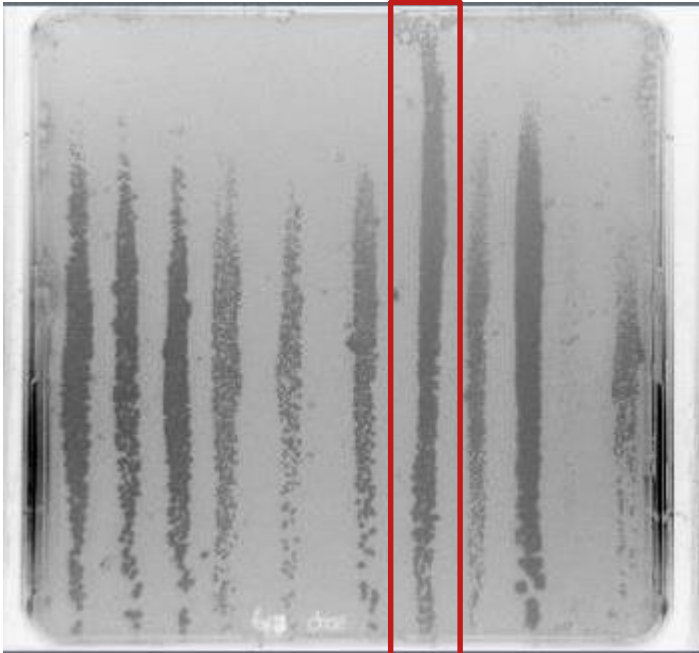
pH 9

24 h



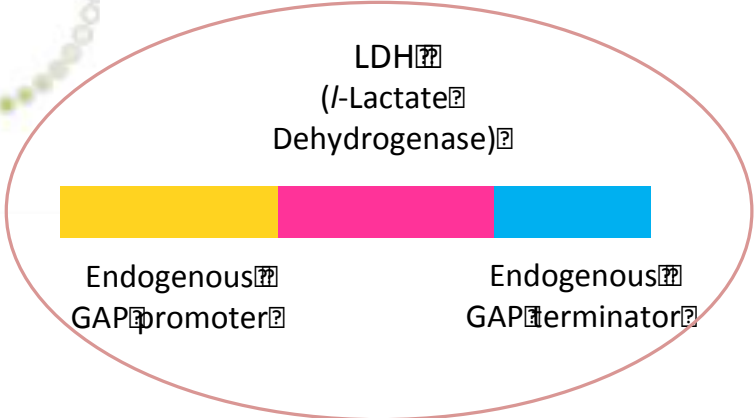
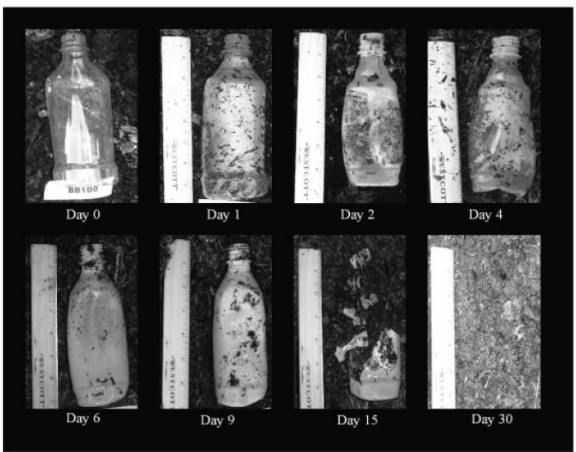
- S. cerevisiae* CBS 7962
- S. cerevisiae* CBS 7961
- S. cerevisiae* CBS 7960
- S. cerevisiae* CBS 6006
- S. cerevisiae* CBS 429
- S. cerevisiae* CEN PK
- S. lignohabitans* CBS 10342
- C. lignosa* CBS 4705
- K. marxianus* CBS 6397
- C. shehatae* CBS 4410
- P. pastoris* X33

48 h



- S. cerevisiae* CBS 7962
- S. cerevisiae* CBS 7961
- S. cerevisiae* CBS 7960
- S. cerevisiae* CBS 6006
- S. cerevisiae* CBS 429
- S. cerevisiae* CEN PK
- S. lignohabitans* CBS 10342
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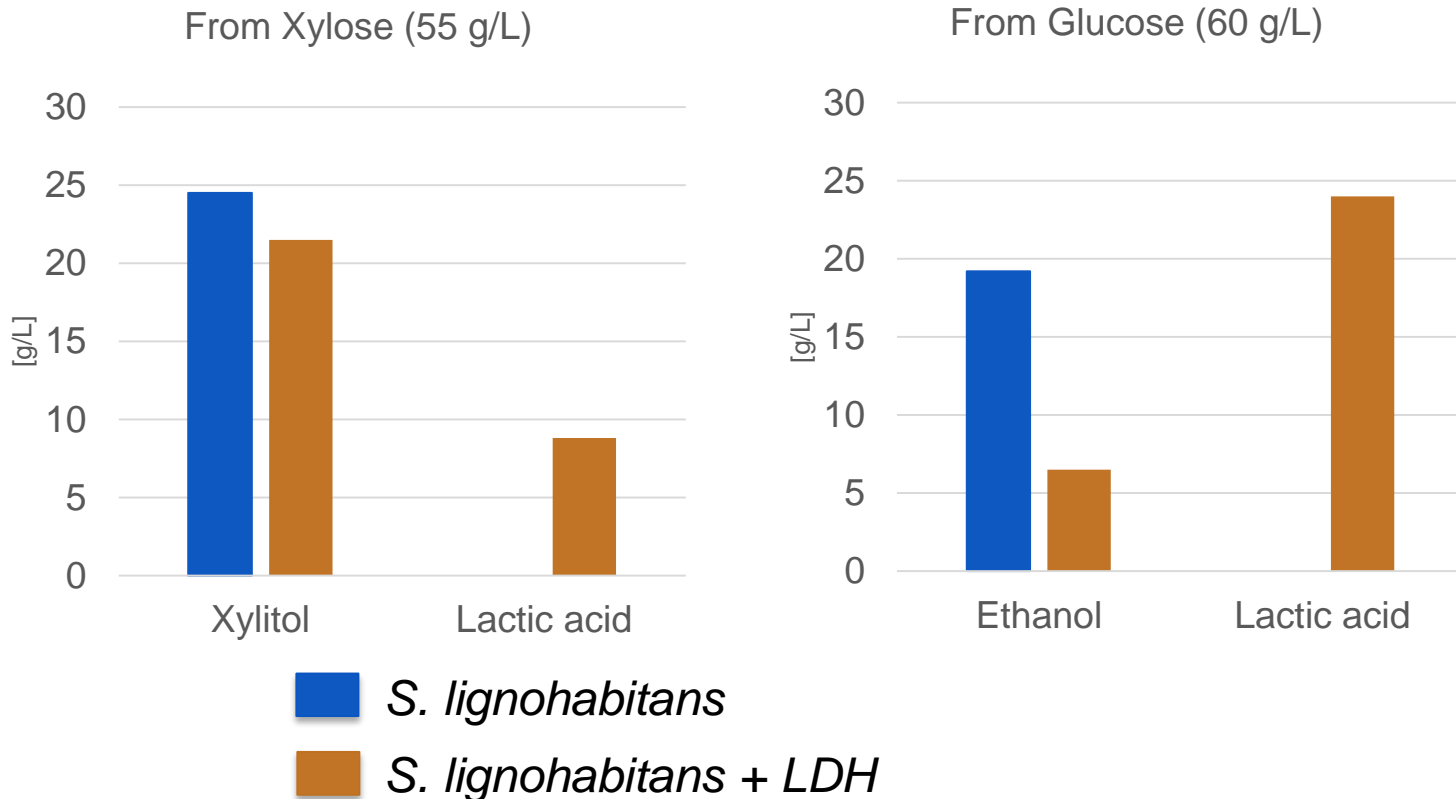
Lactic acid production for PLA



L-LDH *Lactobacillus plantarum* ATCC 8014

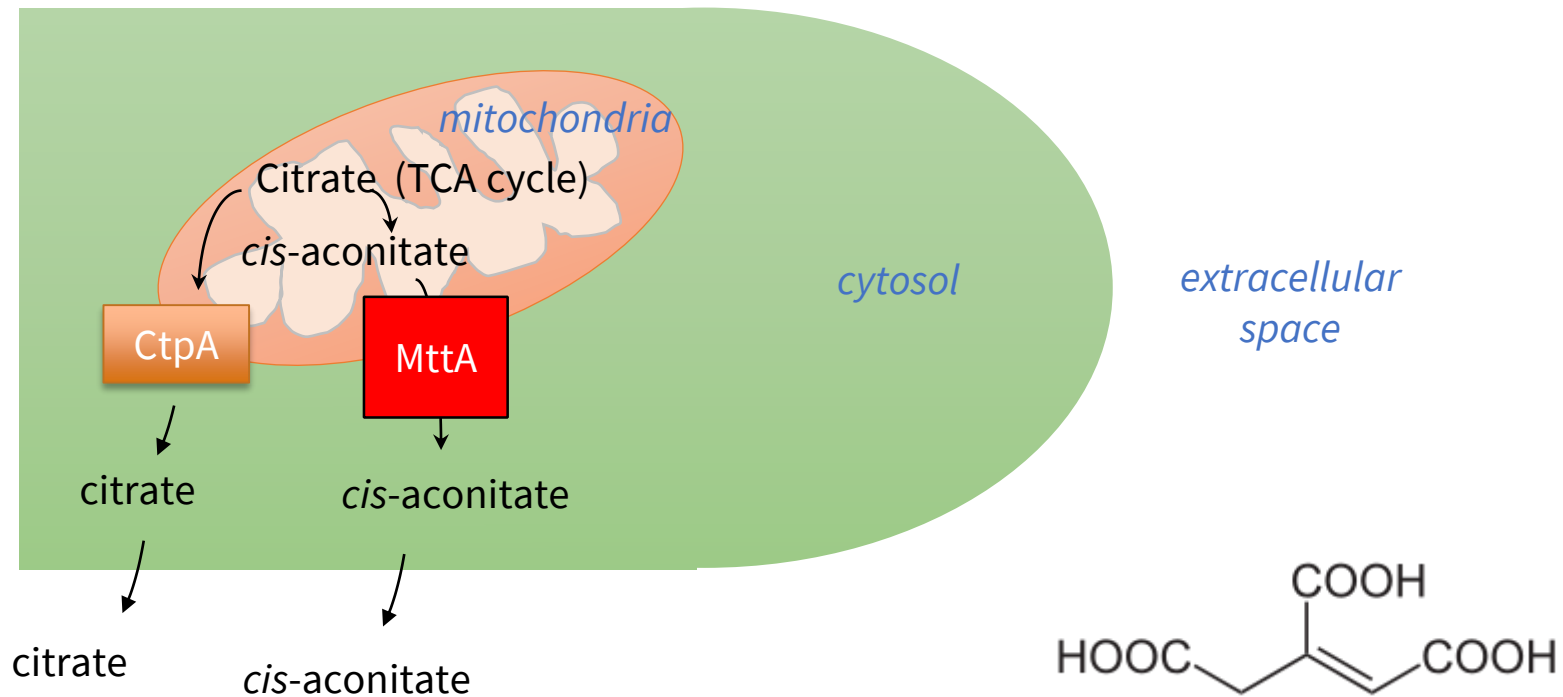
Lactic acid

- Engineering of metabolic pathway
- Introducing a lactate dehydrogenase (*ldh*) from *Lactobacillus plantarum*
- Cultivation under microaerobic conditions



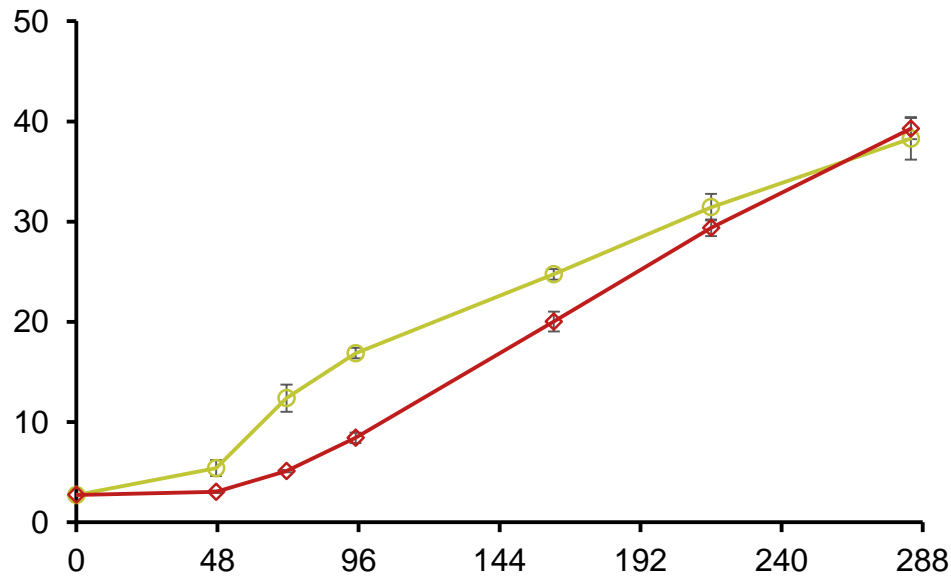
Aspergillus niger

- Production host citric acid production
- Changing the product pattern by engineering a mitochondrial transporter

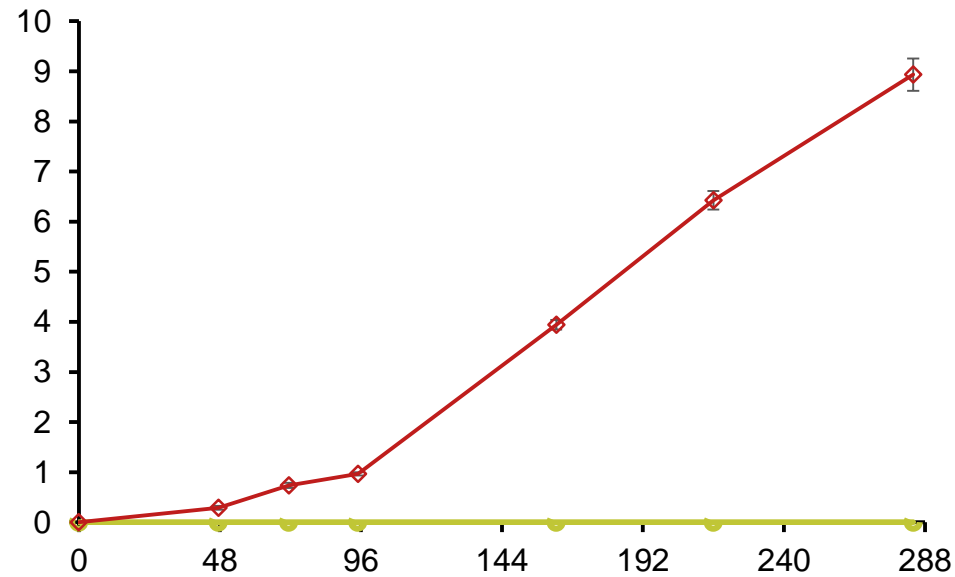


Aspergillus niger

Citric acid [g/L]



Aconitic acid [g/L]

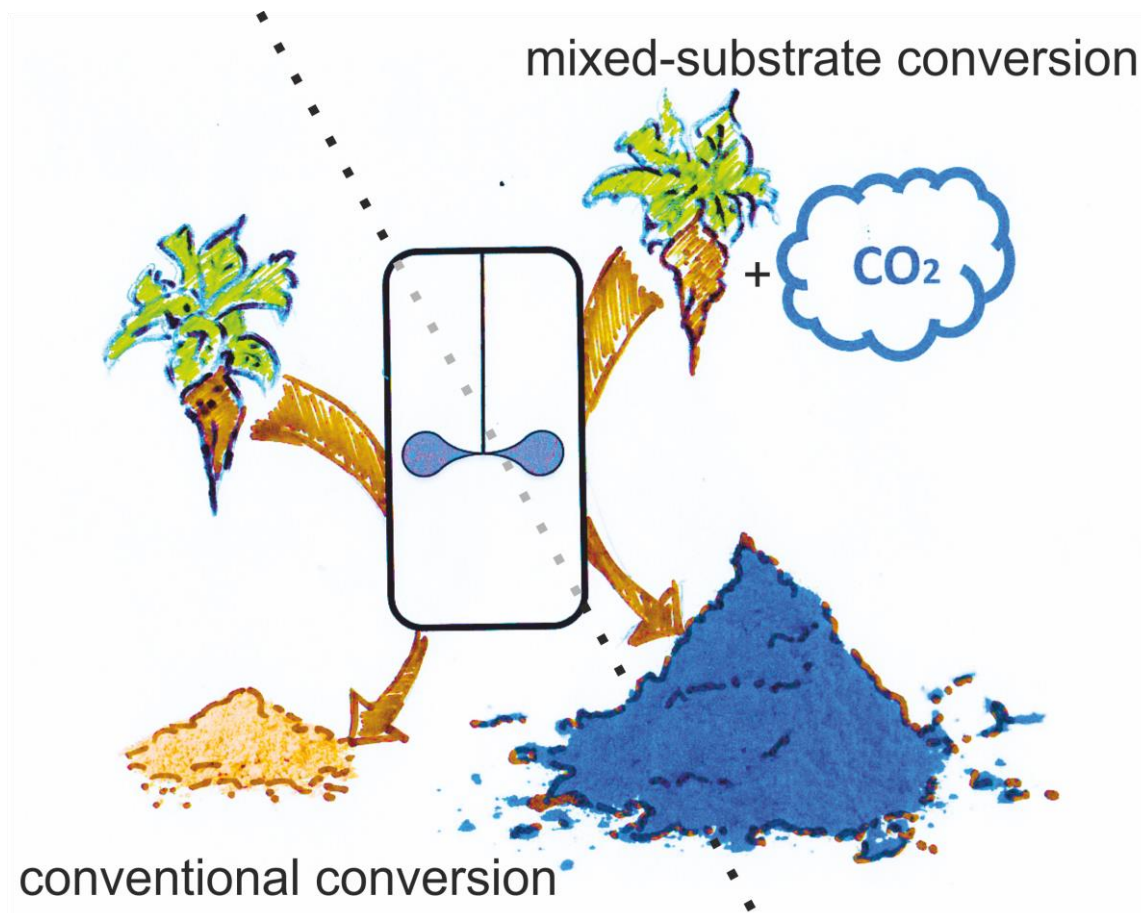


Aspergillus niger ATCC1015

Aspergillus niger ATCC1015 + *teton::mttA*

Sarkari et al. 2017 *Bioresour Technol*
Steiger et al. 2016 *Metab. Engineering*

Outlook: Production of organic acids to fix carbon dioxide



Martina Bellasio

Parveen Sarkari

Thank you!

Hans Marx

Michael Sauer

Diethard Mattanovich

AG Microbial Biotechnology



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