

## DIVING INTO

# YEAST'S SUGAR DIET

Yeast, the single-cell micro-organism mostly known for its role in the production of beer and bread, harvests an enormous potential to convert organic resources into a myriad of chemical building blocks and biofuels. In a joint research project, Andreas Gombert from the University of Campinas, Brazil, and Aljoscha Wahl from Delft University of Technology, the Netherlands, investigated how yeast grows on sucrose and glucose, in order to understand why and how the yeast sometimes grows faster using one or the other sugar.

Brazil is a major producer of sugarcane. This crop is not only used for the production of sugar, but also as a feedstock for ethanol production. Yeasts can be used to transform the sugar into alcohols like ethanol. Though sucrose is a more complicated sugar than glucose, yeasts are sometimes able to convert sucrose faster than glucose. Until now, it is not understood why this is the case. In their joint project funded by the BE-BASIC consortium, by FAPESP and by the dual degree program of Delft University of Technology, Andreas Gombert and Aljoscha Wahl aimed to solve this mystery by investigating the mechanisms of metabolic regulation and the associated metabolite concentrations and fluxes involved with sucrose fermentation by yeasts.

'We want to understand how nature works to engineer efficient new types of yeasts and achieve a transition in the way we produce our chemicals and fuels,' Wahl explains the motivation for the research. 'We can only do that when we know down to the molecular level how yeast metabolizes sucrose and glucose,' Gombert adds. 'For this project, Aljoscha and I complement each other in a nice way: I have ample expertise in the biology and physiology of yeasts, and Aljoscha knows more about mathematical modelling and the use of -omics data, like metabolomics and fluxomics' (fluxomics describes rates and speeds of metabolism, whereas metabolomics describes which metabolites are involved – ed). The two researchers, who have known each other since

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**Aljoscha Wahl**  
Delft University of Technology

Gombert held a research position at TU Delft from 2006-2009, hired a joint PhD student from Brazil. Carla Soares Rodrigues performed experiments at both Unicamp and at TU Delft, and is currently writing up her thesis.

### COMPARING DIFFERENT YEAST STRAINS

'A lot of knowhow about yeast is based on only a handful of different strains,' Gombert says. But in nature, over 1,500 of different species are known to exist. Since different strains display different behavior, the more diverse strains you study, the more options you discover to engineer new strains to fit your purpose. Wahl: 'Carla compared different strains to see which properties are universal and which are distinctive. The idea was that we would find some interesting features when we would study the different strains under varying conditions. Surprisingly, there was no clear metabolic or proteomic difference found.' Gombert: 'Indeed, we have not been able to identify the cause for the difference in speed of metabolization between glucose and sucrose. But we did rule out some of the possible answers. These types of negative results also advance science, though perhaps in a somewhat less visible way than in case of a positive result.'

**ENRICHING EXPERIENCE**

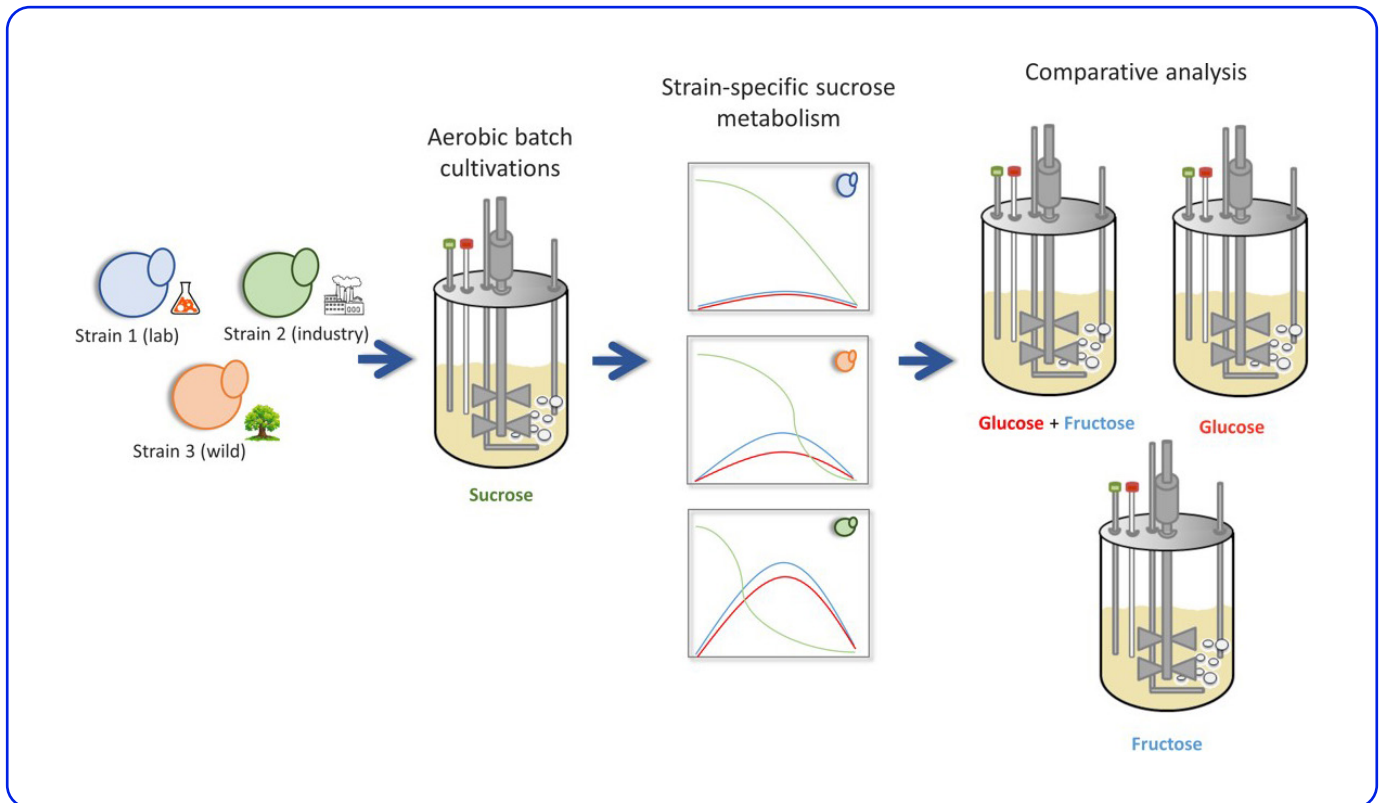
Even though the research did not lead to the outcome they hoped for, Gombert and Wahl valued the collaboration. Sure, it is much easier to collaborate locally, they say. ‘With international cooperation, bureaucracy is three times higher. It would help if funding agencies would decrease the bureaucratic hurdles. For example, with the dual degree program, the PhD student needs to fulfill rules of both universities in terms of reports, education, formal talks and forms to be filled in. At least it was agreed that she only has to do one defense,’ they laugh.

Still, both would highly recommend their colleagues to search for opportunities to cooperate across the continents. ‘Working with people who think differently is fundamental to science,’ Gombert says. ‘Besides, it has been demonstrated more than once that articles published with international collaborators get cited more often. That is true for any of the involved

countries.’ Wahl: ‘Science is about finding solutions to fundamental questions. It is enriching to see how other people would solve a puzzle, and to discuss data from different angles.’

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**Andreas Gombert**  
University of Campinas



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