Contribution of the interaction between environment and genotype to flavour and aroma in *Saccharomyces uvarum*

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Non-traditional yeast with interesting properties for industry and academic research.

Saccharomyces uvarum MTF3098

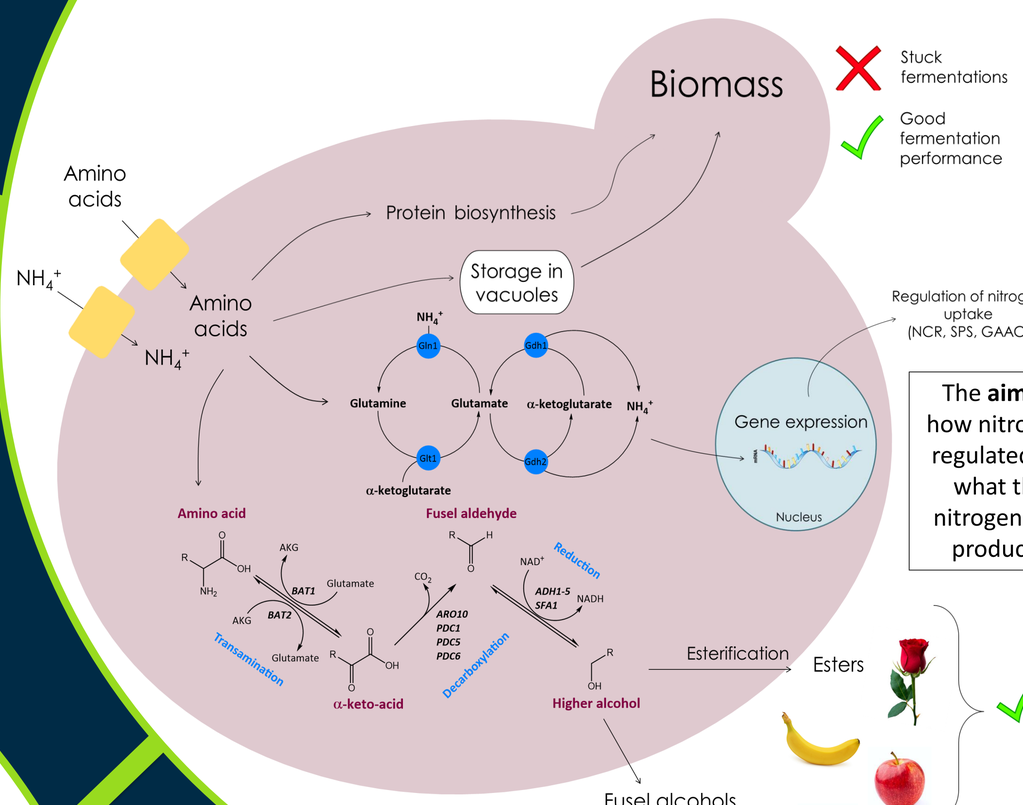
Cryotolerant yeast: Good fermentation performance at 12°C to 20°C

High production of flavour and aroma compounds like esters and higher alcohols

Used for wine and cider fermentations: Low ethanol and high glycerol production

Why nitrogen is important in fermented beverage yeast

- Nitrogen assimilation affects fermentation rate (biomass)
- Growth rate and gene expression strongly depend on the nitrogen source
- Some amino acids are precursors of aroma compounds



The **aim** is to understand how nitrogen metabolism is regulated in S. uvarum and what the effects of the nitrogen source are on the production of volatiles.

Nitrogen preference of *S. uvarum* and comparison with *S. cerevisiae*

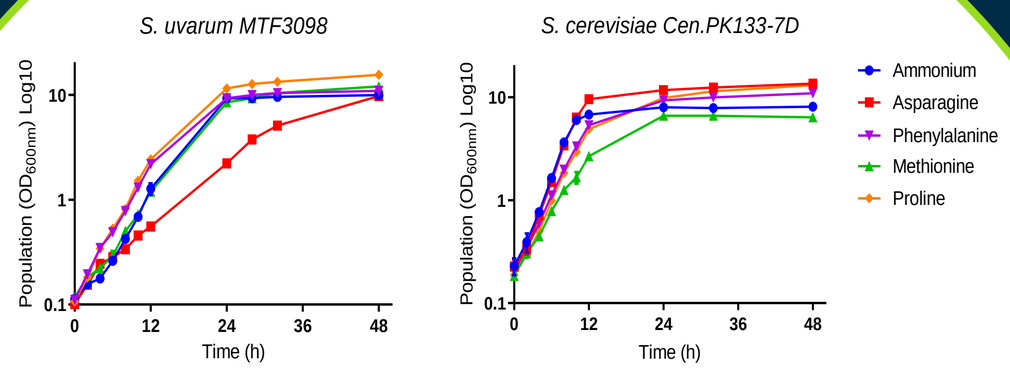


FIG 1 Growth of *S. uvarum* and *S. cerevisiae* during 48 hours. Fermentations carried out on Minimal Media containing 20 g/L glucose and 5g/L nitrogen. Mean values were calculated from triplicates.

Nitrogen preference based on the Maximum specific growth rate μ_{max} in each condition

The most important difference is asparagine, which gives the highest μ_{max} in *S. cerevisiae* but the lowest in *S. uvarum*

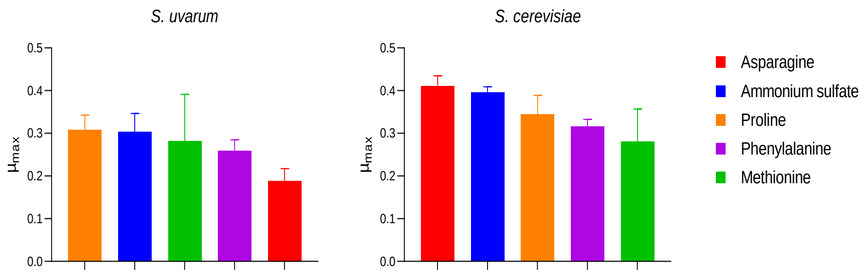


FIG 2 Maximum specific growth rates of *S. uvarum MTF3098* and *S. cerevisiae Cen.PK133-7D* in five different nitrogen sources.

Nitrogen consumption of *S. uvarum* in synthetic wine

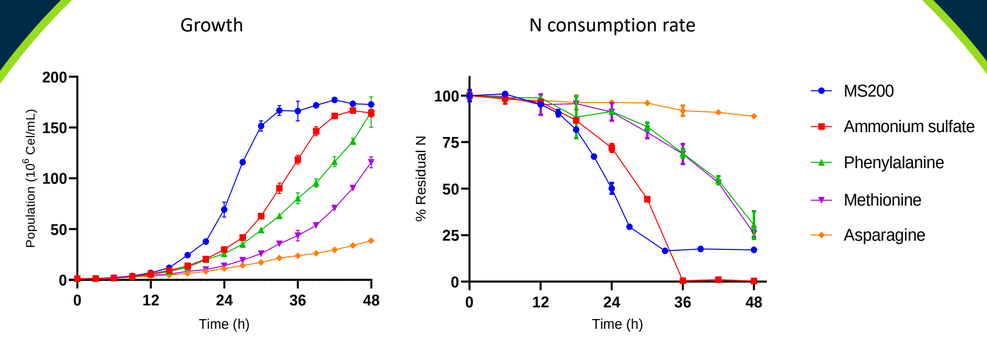


FIG 3 Growth and consumption of Nitrogen of *S. uvarum MTF3098* in Synthetic Must during 48 hours. Mean values were calculated from duplicates.

Nitrogen preference of *S. uvarum* in synthetic wine showed a similar pattern to minimal medium. Moreover, the highest biomass formation and the fastest nitrogen consumption was observed in MS200 medium, that mimics a typical grape juice (18 amino acids and ammonium chloride). Figure 4 shows the consumption of all the nitrogen compounds in MS200 over time, allowing to discriminate the amino acids according to their order of uptake.

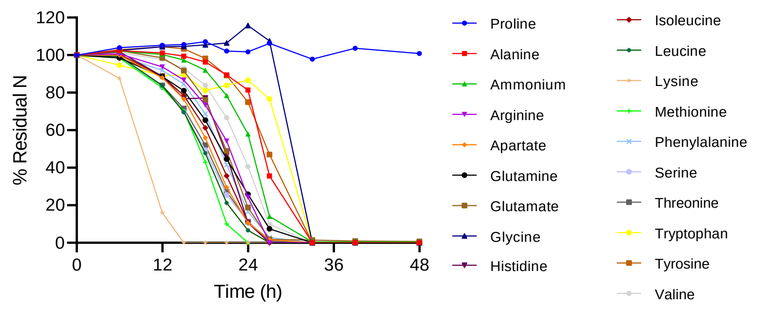


FIG 4 Consumption of ammonium and amino acids by *S. uvarum MTF3098* during 48 hours of fermentation in Synthetic Must (MS200).

Developing fermentation conditions for comparative transcriptome analysis

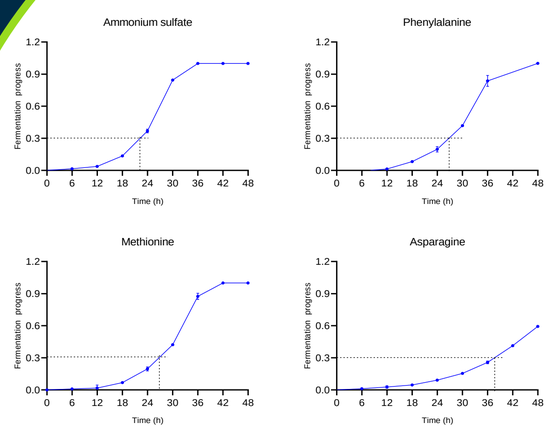
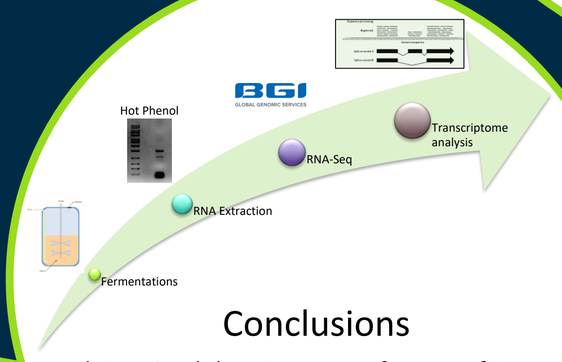


FIG 5 Fermentation progress Vs time for fermentations done with *S. uvarum MTF3098* in MM during 48 hours. Mean values were calculated from duplicates.

Time required by the strain to reach 0.3 fermentation progress, where the cell physiology is the same in the four nitrogen sources. Cultures in the same stages of growth allow meaningful comparison between the nitrogen conditions.

RNASeq - Analysis of the expression of genes involved in:

- specific catabolic genes of amino acids
- nitrogen transport into the cell
- nitrogen regulation mechanisms
- the Ehrlich pathway



Conclusions

We determined the nitrogen preference of *S. uvarum* and compare it with *S. cerevisiae.* Moreover, we developed fermentation conditions for comparative transcriptome analysis in four different nitrogen sources. The transcriptome analysis is still on going.

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