



HAL
open science

Differences in the volatile fingerprints and fermentation performances of non-Saccharomyces and Saccharomyces wine yeasts

Guillaume Bergler, Carole Camarasa, Anne Ortiz-Julien, Benoît Colonna-Ceccaldi, Audrey Bloem

► To cite this version:

Guillaume Bergler, Carole Camarasa, Anne Ortiz-Julien, Benoît Colonna-Ceccaldi, Audrey Bloem. Differences in the volatile fingerprints and fermentation performances of non-Saccharomyces and Saccharomyces wine yeasts. Macrowine 2018, May 2018, Zaragoza, Spain. hal-02958582

HAL Id: hal-02958582

<https://hal.science/hal-02958582>

Submitted on 7 Oct 2020

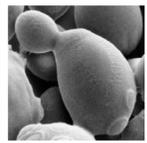
HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Introduction

During alcoholic fermentation, wine yeasts are able to produce a large variety of volatile metabolites that have an impact on wine character. Some of them are widely studied and well-known : higher alcohols, acetate esters, ethyl esters, among other molecules contributing to the aromatic profile of wines. But other molecules, despite the interest of their sensory properties, remain less characterised, in particular at the level of the metabolic pathways involved in their production. These unusual aromas belong to different chemical groups : terpen derivatives (noted T), benzene derivatives (BD), lactones (LAC), norisoprenoids or thiols. The aim of this project was to investigate the ability of wine yeasts to produce these different classes of molecules during fermentation and to establish their volatile fingerprint for unconventional aromas. The fermentation performances of these strains were also assessed, for their further use during winemaking to improve the ranges of aromas in wines.

Experimental conditions



41 strains (duplicates) :

- 12 non-Saccharomyces strains
- 29 Saccharomyces strains

Alcoholic fermentation in natural musts (24°C)



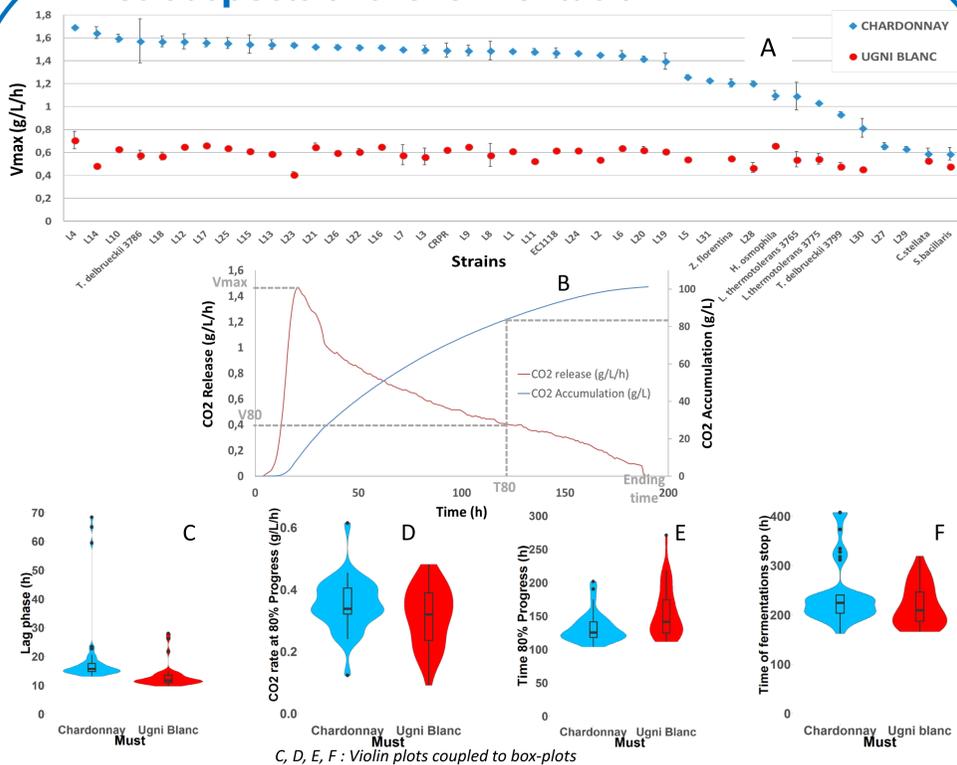
Must	Sugars (g/L)	Total Acidity (g/L H ₂ SO ₄)	pH	Malic Acid (g/L)	Tartaric Acid (g/L)	Assimilable Nitrogen (mgN/L)	NTU
Ugni Blanc 2016	160.5	4.8	2.95	3.54	4.76	92	1150
Chardonnay 2016	227.5	2.8	3.42	2.16	2.15	192	20 (adjusted to reach 5mg/L of phytosterols)

Kinetic parameters

Quantification of metabolites:

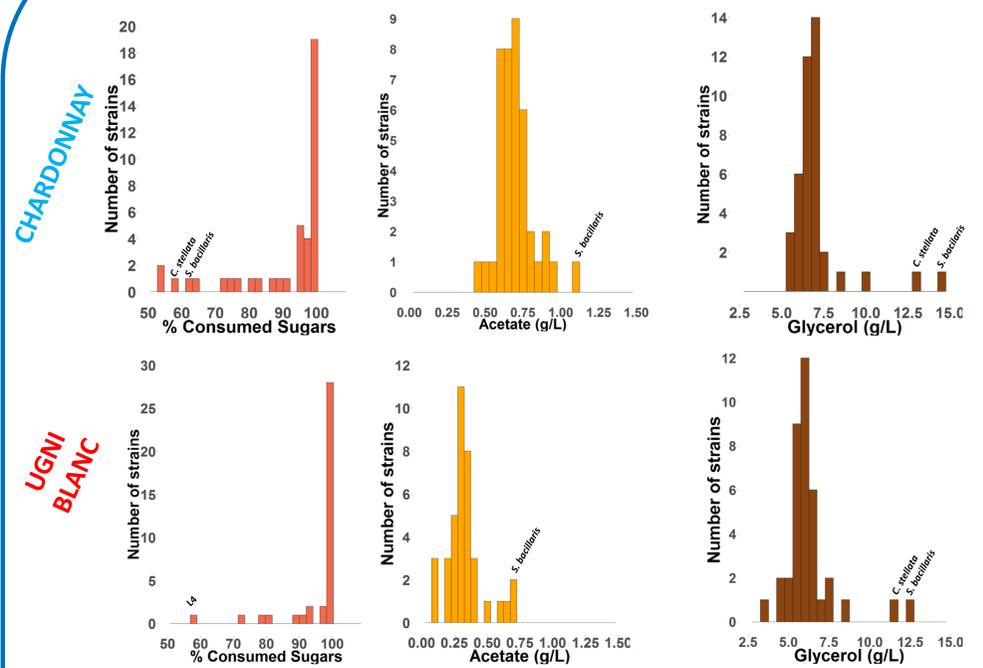
- HPLC : glycerol, acetate, succinate, ethanol, glucose, fructose
- GC/MS : Unusual aromas

Kinetic aspects of the fermentation



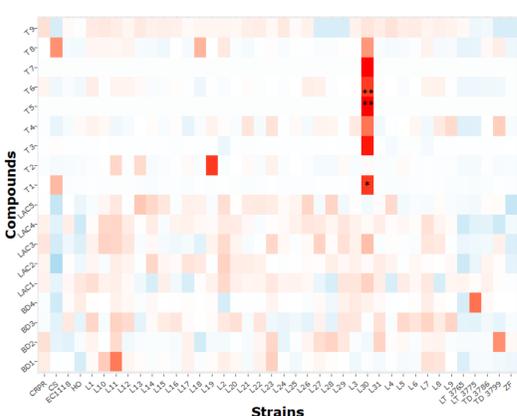
- ✓ Impact of both the strain and the medium composition on kinetic variables
- ✓ Significant interaction strain / medium, with a more pronounced strain effect on Chardonnay

Study of the Central Carbon Metabolism (CCM)



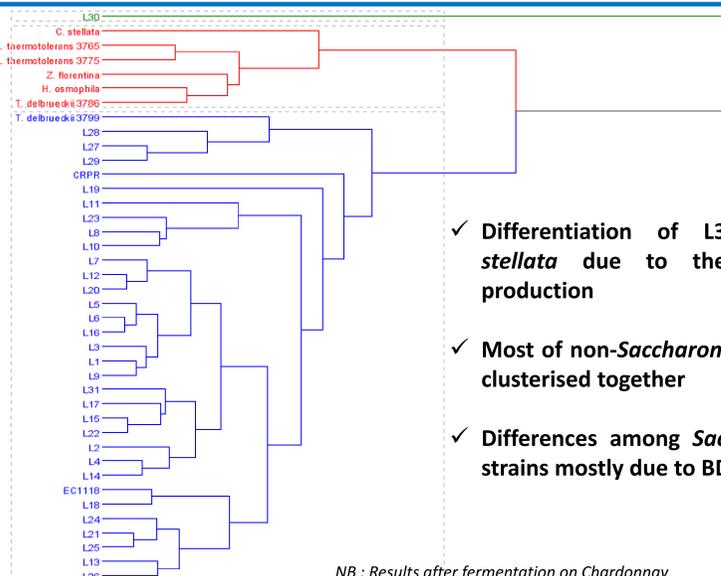
- ✓ More strains able to complete the fermentation on Ugni Blanc
- ✓ Important production of glycerol on both cultivars by *C. stellata* and *S. bacillaris*, despite a limited glucose consumption on Chardonnay
- ✓ Similarity of production profiles of CCM metabolites between Chardonnay and Ugni B

Production of unusual aromas



- ✓ High production of terpen (except T2) by L30
- ✓ High production of T1 and T8 by *C. stellata* but limited formation of other compounds
- ✓ Important diversity between strains for BD, with the highest production by L11
- ✓ Significant diversity between strains in lactones production, but in a lesser extent : 3-8 µg/L

NB : No detection of the studied norisoprenoids or thiols
* Value divided by 10 ; ** Value divided by 50



- ✓ Differentiation of L30 and *C. stellata* due to their terpene production
- ✓ Most of non-Saccharomyces strains clustered together
- ✓ Differences among Saccharomyces strains mostly due to BD and LAC

NB : Results after fermentation on Chardonnay

Conclusion and perspectives

These data provide a wide picture of the diversity of the fermentation performances of 41 enological strains, and their ability to produce some unusual aromas. It could be interesting to compare these production with those obtained using synthetic medium, in order to remove all the potential precursors present in the natural grape must. This will allow to assess the intrinsic ability of wine yeasts to produce unusual aromas. Furthermore, the characterization of the other fermentative aromas (higher alcohols, esters and fatty acids) will provide an overview of the volatile profile of yeasts after fermentation. This knowledge will be further exploited to control the aroma fingerprint of wines.

