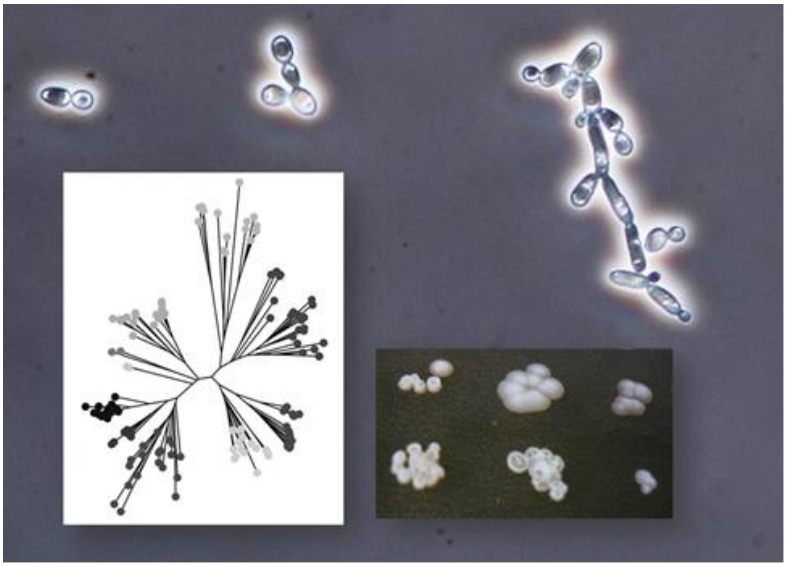
Collaboration with Bordeaux researchers to explore genotypic and phenotypic diversity of *Lachancea thermotolerans* - a promising non-*Saccharomyces* for winemaking



FINAL REPORT TO
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Research Organisation: **University of Adelaide and ISVV, Bordeaux**
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Collaboration with Bordeaux researchers to explore genotypic and phenotypic diversity of *Lachancea thermotolerans* - a promising non-*Saccharomyces* for winemaking

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Abstract

This travel grant provided University of Adelaide PhD student, Ana Hranilovic, support during a research stay at the ISVV, University of Bordeaux. The ISVV is one of the world's most reputable institutions in wine and vine research, with cutting-edge work done on non-*Saccharomyces* yeasts. Non-*Saccharomyce*s yeasts naturally occur in the wine-related environment, but are far less studied compared to the 'conventional' wine yeast, *Saccharomyces cerevisiae*. One such yeast is *Lachancea thermotolerans,* a species of remarkable oenological potential. Its association with *S. cerevisiae* can lead to wine acidification, lower ethanol content and an increased aromatic complexity. The study undertaken examined the genetic and phenotypic diversity of a large set of *L. thermotolerans* isolates sourced from a variety of habitats worldwide, revealing a grouping based on the geographic localisation and the isolation substrate.

Executive summary

The *Lachancea thermotolerans* diversity study was undertaken at The Institute of Vine and Wines Sciences (ISVV) in Bordeaux, France. It is a research avenue of my PhD project, focusing on selection and characterisation of non-*Saccharomyces* yeasts to modulate wine composition and quality. The contribution by Wine Australia ($2,500) was to offset travel and living expenses during my stay in Bordeaux (July – December, 2016). The remaining expenses were covered through the ARC Training Centre for Innovative Wine Production Stipend (i.e. personal funds). The collaboration was initiated during a sabbatical stay at the ISVV in 2015 by my PhD supervisor, Professor Vladimir Jiranek. The study at the ISVV's Oenology Research Unit, Grape and Wine Microbiology Group, was carried out under the supervision of Drs Warren Albertin, Isabelle Masneuf-Pomarède and Marina Bely. This prolific team delivers cutting edge research exploring non-*Saccharomyces* diversity, and has thus far been focusing on a number of species of oenological relevance, such as *Brettanomyces bruxellensis*, *Torulaspora delbrueckii*, *Candida zemplinina*, *Hanseniaspora uvarum* and *Metschnikowia pulcherrima*.

The focus of this study was *Lachancea thermotolerans*, a species with several valuable oenological traits. These include wine acidification, due to lactic acid production, and the potential to decrease final wine ethanol concentration in co-fermentation with *S. cerevisiae*. The targeted use of *L. thermotolerans* to (partially) conduct the fermentation can therefore be used to obtain wines of an increased quality, stability and marketability, whilst reducing inputs related to grape processing (e.g. tartaric acid, dealcoholisation). This is of particular interest in the context of viticultural and oenological practices, underlined by observed and/or projected climate warming, leading to higher pH levels and excess sugar accumulation at harvest. A pre-requirement for the wider implementation of *L. thermotolerans* in industry is, however, a thorough characterisation of the species to gain an understanding of its ecophysiology and evolution.

To accomplish this, we have sourced a large set of *Lachancea* isolates (~200) from different habitats (grapes, forest material, insects, etc.), covering a large geographic span. First, we developed and optimised 14 microsatellite markers to conduct a population genetics study aimed at assessing the proximity and the divergence of isolates.

Thereafter, we tested the phenotypic performance of isolates, conducting growth assays using different substrates and physicochemical conditions. The results are still forthcoming, but indicate grouping of isolates based on geographic localisation and substrate, supported both at the genetic and the phenotypic level. Future studies will provide in-depth characterisation of strains in an oenological context, further testing the genotype-phenotype inter-relationship observations, while aiming to select novel strains for industry.

Based on the planned outputs, we can thus far identify the following deliverables:

- *L. thermotolerans* diversity study
    - Data acquisition and, to a large extent, analysis has been completed and will result in a peer-reviewed publication (target date Feb 2017)
- Industry journal publication
    - Upon peer-reviewed publication submission, an industry journal article targeting a wider audience will be prepared and submitted to a relevant journal (target date Mar 2017)
- Seminars/talks
    - Presentation at the ISVV Grape and Wine Microbiology Group meeting (Bordeaux, 08.11.2016)
    - Presentation to the Biolaffort group (Bordeaux, 13.12.2016)
    - Seminar for the Department of Food and Wine Science, ARC-Training Centre for Innovative Wine Production and WIC colleagues (Adelaide, TBA)
- Extended networks with wine research community and industry stakeholders
    - 'Vins et Science du Futur' post-graduate symposium attendance (ISVV, Bordeaux, 10.11.2016)
    - 'Vinitech – Sifel 2016' Trade Show attendance (Bordeaux, 27-29.11.2016)