Harnessing New Zealand natural yeasts to make wine

What yeast can do for wine – The Centre for Microbial Innovation (CMI)

New Zealand produces less than 0.1% of the world's wine, but with ~ $1 Bn p.a. in exports we capture around 10% of the global premium market. With a global oversupply of wine, the market is fiercely competitive and thus NZ needs to innovate to keep ahead of the competition. There are many opportunities to add value along the wine production chain, and the fermentation step is one of the more promising.

The conversion of grape juice into wine is neither a magical nor an industrial process, it is a biological one. The single celled fungus **Saccharomyces cerevisiae** and its close relatives (or simply yeasts) are the organisms that consume sugars and other nutrients in the juice and excrete ethanol and a host of other compounds that significantly contribute to wine aroma and flavour. In fact, about half of the 'volatiles' in wine (the compounds that give a wine its flavour and aroma) derive from yeasts during fermentation. Different types of yeast produce different compounds and thus different styles of wine. Surprisingly, we know relatively little about the process of fermentation from an ecological perspective. The Goddard lab at The University of Auckland are interested in gaining a better understanding of this process. Such work not only provides fundamental insights into the ecological and evolutionary process, but also provides winemakers with information relevant to product reliability and distinctiveness.

The Goddard lab is uncovering and characterising the yeasts that are naturally associated with winemaking in NZ and the interactions between them. Goddard has found that NZ harbours a distinct population of yeast. Currently most wine is made using overseas commercial strains but the use of NZ yeasts to make NZ wine may provide opportunities to create different wine styles that recreate the French sense of terroir in the NZ environment.

**Mat Goddard’s research aims to seamlessly span fundamental and applied aspects of ecology, evolution and population biology using an experimental approach; especially as applied to wine yeast in relation to diversity, distribution and effect on wine aroma, flavour and general quality. The beauty of using yeasts for such research is they are model research organisms. As such we have an enormous understanding of the molecular genetics of these organisms. One can use experimental populations of yeast to test fundamental biological questions. The output of such experiments with yeast is wine; thus an understanding of yeast biology, genetics, population biology and ecology also provides a greater understanding of the process of making wine.**
Mat Goddard’s lab has recently discovered a strain of yeast naturally associated with winemaking in NZ that may add distinctiveness to wines. Importantly, this is a species of yeast (*Pichia kluyveri*) that by itself cannot make wine – it does not ferment well. In order to use this yeast, one must co-inoculate it along with a strain of *S. cerevisiae*. Work in the Goddard lab shows that when such co-ferments are conducted the outcome is not simply the sum of the two yeasts. Rather it seems that the two species interact to produce unexpected types and amounts of compounds that contribute to wine flavour, aroma and complexity. This strain is currently undergoing assessment for commercialisation.

Mat Goddard is one of the researchers involved in the Centre for Microbial Innovation (CMI), a unique cross disciplinary environment for theoretical and practical research and problem solving. The CMI brings together University of Auckland researchers with a range of expertise centred on the ecology and function of microbial systems and a broad group of associates from The University of Auckland whose research involves the practical application of microbial systems and processes. The expertise of the researchers involved in the CMI is supported by leading edge technical facilities in genomics and proteomics, metabolomics, transcriptomics, bioinformatics and microfabrication.

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**Case study**

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Contact
foodandhealth@auckland.ac.nz

Auckland UniServices Limited
Level 10, UniServices House
70 Symonds Street, Auckland
Private Bag 92019 AMC
Auckland 1142, New Zealand

☎ +64 9 373 7522 www.uniservices.co.nz