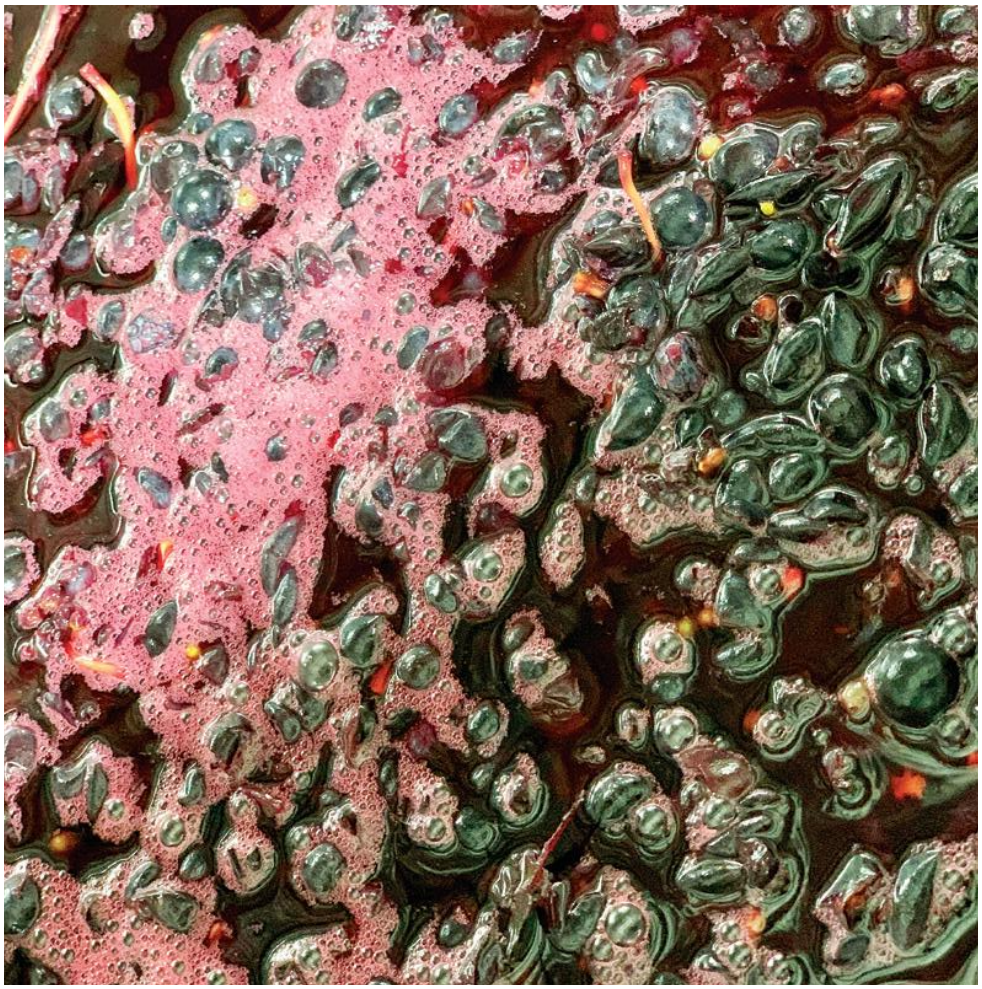
# *Torulaspora delbrueckii* - An ancient yeast creating new wines

*Torulaspora delbrueckii* is an indigenous non-*Saccharomyces* wine yeast often found in uninoculated ferments, both today and as far back as Roman times. Despite its long history, pure commercial strains of this yeast have only been available for little over a decade. In this article, AWRI Oenologist Ben Cordingley addresses some of the reasons winemakers are choosing to inoculate ferments with *T. delbrueckii*.



### *Why trial Torulaspora delbrueckii?*

Winemakers have been experimenting with *T. delbrueckii* for its influence on wine flavour, aiming to mimic flavours created through natural ferments, and/or for its bioprotection qualities, potentially allowing less sulfur dioxide use in winemaking or lower concentrations of acetic acid to be produced during a ferment.

### *How does Torulaspora delbrueckii influence wine character?*

There is significant diversity within the *T. delbrueckii* species, and the fermentation characteristics and potential benefits of commercial strains can vary. *T. delbrueckii* strains are available by themselves or in combination with other non-*Saccharomyces* yeasts in products that are described as giving improved mouth-feel and a fuller body from a higher release of yeast polysaccharides than most *Saccharomyces cerevisiae* yeast strains. Different and/or increased concentrations of wine ester aromas, increased varietal thiols in white wines, and increased lactones in both red and white wines have been reported (Benito 2018). Most commercial *T. delbrueckii* strains are very low producers of acetic acid in high sugar musts due to their high tolerance of osmotic pressure. A sequential inoculation with *S. cerevisiae* can result in much lower acetic acid, as the initial sugar consumption by *T. delbrueckii* is often enough to reduce the osmotic stress placed on a *S. cerevisiae* culture that can lead to excessive acetic acid production.

### *How is Torulaspora delbrueckii used?*

Most *T. delbrueckii* strains can only ferment up to about 10% alcohol; thus, they are almost always used in conjunction with a *S. cerevisiae* yeast to complete fermentation. Fermentation kinetics are slower than most *S. cerevisiae* strains, while nutrient consumption has been found to be similar. *T. delbrueckii* can be inoculated into juice or must followed by a *S. cerevisiae* yeast strain sometime after the initial *T. delbrueckii* inoculation, or coinoculated by pitching both yeasts together. *S. cerevisiae* almost always becomes the dominant yeast species in coinoculations due to its strong fermentation kinetics and ethanol tolerance; thus, a sequential inoculation strategy may allow for a greater wine influence by *T. delbrueckii* (Taillandier *et al.* 2014). Fermentation temperature roughly determines the recommended timing between the *T. delbrueckii* and *S. cerevisiae* inoculations, with times of 24 hours for warm ferments (red wines) and 48 hours for cooler ferments (white wines) listed as a guide for most available strains. Sequential inoculations will slightly extend the overall fermentation duration.

### *Does Torulaspora delbrueckii mimic a natural fermentation?*

In a natural ferment a succession of

various non-*Saccharomyces* species occurs, with *T. delbrueckii* often active up to the mid-stage of fermentation. *T. delbrueckii*, however, is just one of many non-*Saccharomyces* yeasts present in a natural ferment. There is a decrease in the diversity of the microbial community as fermentation progresses, with many non-*Saccharomyces* yeasts active in the early stages before a more ethanol-tolerant *Saccharomyces* species completes fermentation (Varela and Borneman 2017). The contribution of non-*Saccharomyces* yeasts to natural fermentations can be unpredictable and can depend on the yeast types present on grapes or on winery equipment, as well as juice or must parameters. Even in *S. cerevisiae* inoculated ferments, there can be significant growth of non-*Saccharomyces* strains in the early stages of alcoholic fermentation that can influence wine character. An initial *T. delbrueckii* inoculation allows for a large reliable implantation of this yeast in the early stages of fermentation and subsequently a greater potential influence on wine character. Wines fermented with a cultured *T. delbrueckii* yeast are thus likely to be different from both natural ferment wines and those only inoculated with a *S. cerevisiae* strain.

### *How does **T. delbrueckii** provide bioprotection?*

Bioprotection is an alternative strategy to adding $SO_2$ to grape musts to inhibit unwanted microbiological growth before primary fermentation. Specific bioprotection formulations can include a selected *T. delbrueckii* strain often combined with another non-*Saccharomyces* yeast such as *Metschnikowia pulcherrima* (Coulon *et al.* 2019). Such formulations are used at lower inoculation rates than for fermentation and inhibit the growth of undesirable spoilage organisms by one or more possible mechanisms that could include the production of active compounds, competition for essential nutrients, or direct cell-cell contact inhibition (Ciani and Comitini 2015). *T. delbrueckii* strains can survive at low temperatures, which makes them suited to the protection of red grapes during a pre-fermentation cold soak. This can reduce sulfur dioxide requirements and result in a shorter fermentation lag phase. Bioprotective *T. delbrueckii* strains can also be added to unprocessed grapes to allow for longer durations between harvesting and processing, reducing the growth of spoilage organisms. The protection of harvested grapes can increase flexibility of intake and processing windows (Coulon *et al.* 2019).

For further information on *T. delbrueckii* or any other technical winemaking or viticulture question, contact the AWRI helpdesk on (08) 8313 6600 or helpdesk@awri.com.au

## References


Benito, S. 2018. The impact of *Torulaspora delbrueckii* yeast in winemaking. *Appl. Microbiol. Biotechnol.* 102(7): 3081-3094.

Ciani, M., Comitini, F. 2015. Yeast interactions in multi-starter wine fermentation. *Curr. Opin. Food Sci.* 1: 1-6.

Coulon, J., Nazaris, B., Seabrook, A. 2019. Low SO2 winemaking: Bio-protection for microbial control pre-fermentation. *Wine Vitic. J.* 34(3): 23-26.

Taillandier, P., Lai, Q.P., Julien-Ortiz, A., Brandam, C. 2014. Interactions between *Torulaspora delbrueckii* and *Saccharomyces cerevisiae* in wine fermentation: influence of inoculation and nitrogen content. *World J. Microbiol. Biotechnol.* 30(7): 1959-1967.

Varela, C., Borneman, A.R. 2017. Yeasts found in vineyards and wineries. *Yeast* 34(3): 111-128.


GW