KUMEU RIVER

Wild Yeast Study

We have been using indigenous (wild) yeasts to ferment our red wines since 1984, and white wines since 1986. Why? Quite simply, because it works. It concerned me that the commercially available selected yeasts that we were typically using in the early 1980s were having a disproportionate influence on the final wine characteristics. When I tasted the wine at the end of fermentation, it seemed much easier to identify the yeast strain used than it was to identify the grape variety or the vineyard. That is not the way it should be.

I was able to gain some experience with wild yeast fermentation in France in 1983, and we started using the same methods at Kumeu River in 1984. The typically "estery" yeast strain fingerprint characteristic was immediately eliminated, and the fermentation characters generally more muted, thereby revealing better varietal and regional expression. We had no problems with the progress of the fermentations, and there were no off-characters either. The wines smelled wonderful and tasted even better, so we continued with this fermentation style for the reds in the following vintage. We extended the use of wild yeasts to our whites in 1986, with great success, and have continued with this technique ever since.

Keeping an open mind on the subject, we also experimented in the mid 1990s with a few barrel fermentations using some of the newer yeast strains that had recently become commercially available, particularly from France. In every case we still preferred our typical wild ferments, especially in terms of the weight and character they produced on the palate, and so continued with the indigenous yeasts.

In more recent years, we have been cooperating with the Wine Science Department at the University of Auckland to investigate our wild fermentations, and to learn more about what is really happening. I am very grateful to the University of Auckland, and particularly Dr. Mat Goddard and Dr. Richard Gardner, for being able to share the results of this work.

The wild yeast ecology of our Mate's Vineyard has been the subject of two studies by post-graduate students, and further work is ongoing.

Richard Warren's 2004 study looked at the population characteristics of wild yeast fermentation in four New Zealand wineries. He found nine different species:

1. Saccharomyces cerevisiae
2. Pichia fermentans
3. Hanseniaspora uvarum
4. Candida zemplinina
5. Issatchenkia orientalis
6. Issatchenkia terricola
7. Zygosaccharomyces affinity bailii
8. Hanseniaspora affinity occidentalis
9. Unknown species SCH-47

He found that S. cerevisiae quickly became the dominant species in wild ferments and was always the only yeast found at the end of ferments. Other species were only found in the vineyard, juice and early ferment samples. The wineries that regularly used commercial preparations of S. cerevisiae actually had commercial strains dominating their "wild" ferments.

This did not occur at Kumeu River, however, because we have not used commercial strains for many years. In fact, the Kumeu River strains of S. cerevisiae showed high diversity within most fermentations with up to 12 strains detected in a single ferment, and all appear to be wild strains of S. cerevisiae because they were not related to the commercial database. He found that these strains seem to be from the same family of S. cerevisiae, located at the winery, and which are interbreeding with each other.

The other three wineries had relatively low diversity with no more than two strains in a ferment, and these were all either commercial strains, or most likely closely related to commercial strains.

During the 2005 vintage, Casey Jun conducted another survey looking once again at the wild fermentations in Mate's Vineyard Chardonnay. Casey's findings are in agreement with Richard Warren's in terms of the number and diversity of species in the early stages, and in addition, her work emphasized the following points:

1. Saccharomyces cerevisiae was initially very rare.
2. Non-Saccharomyces are at relatively high numbers early in the ferment, and appear to contribute significantly at that stage.
3. The diversity of yeast species collapses at mid-ferment, after which Saccharomyces cerevisiae dominates right through to the end of ferment.

The dynamics of the various yeast species during the ferment is due to the fact that S. cerevisiae is better adapted than the other species to the ecological conditions found in the ferment. Firstly, S. cerevisiae is significantly better adapted to grow in juice because of natural resistance to low pH and the osmotic pressure due to sugar concentration. Secondly, S. cerevisiae's competitive advantage is amplified once ethanol levels rise. This is an elegant example of ecological niche construction — an organism modifies the environment to its advantage — in this case it allows Saccharomyces cerevisiae to out-compete the various other microbes.

Compared to Richard's earlier study, Casey also found a much greater diversity of strains within the S. cerevisiae yeasts that performed the major part of the fermentation. Genetic fingerprinting technology found at least 80 strains of S. cerevisiae present in the four barrels sampled.

This is a very high level of diversity.

Furthermore, by comparison with the international database, it was shown that the Kumeu River population of S. cerevisiae is significantly genetically differentiated from strains collected from various places around the world. This is evidence of a localized indigenous Kumeu River S. cerevisiae population.

As such it may, perhaps, be considered part of our terroir?

Our uniquely individual collection of yeast strains most certainly contributes to the special character of our wines. They do this not by producing dominant aromas or flavors that indelibly mark the wine, but by simply revealing the true aromatic expression of the vineyard and grape variety, while building a lovely textural quality on the palate that is rarely found otherwise.

Michael Brajkovich, MW
Winemaker

WILSON DANIELS SINCE 1978