What does the latest research say about barrel sanitation against Brett?

When acetic acid bacteria or *Brettanomyces* yeast grow in a wine during barrel maturation, the AWRI helpdesk is often asked if the barrel can be adequately sanitised and reused without the risk of cross contamination or reinfection. **Geoff Cowey** covers some of the specific factors that should be considered, including outcomes from recent research on this topic.

How many barrels are affected?

If a single barrel is affected, the simplest answer is often to decommission or repurpose the barrel. If there are several barrels, however, and they are not very old, this can become costly and sanitation treatments may be worth investigating.

What part of the barrel is being sanitised?

Microorganisms typically grow in the wine liquid in the barrel, often at the wine/air interface, with increased risk in ullaged barrels or barrels that have not been regularly adjusted to maintain adequate sulfur dioxide levels. Microorganisms can also migrate up to 8mm into the barrel wood as wine soaks into the wood. This makes it more difficult to completely sanitise a barrel than an inert vessel such as a stainless steel tank. For this reason, barrels must be rigorously cleaned prior to sanitation to remove any gross solids as well as colour or tartrate coatings on the surface of the barrel that may impede any sanitation treatments reaching into the barrel wood.

How do I clean used barrels?

Once emptied of wine, barrels should be inverted to near the 6 o'clock position, drained and then rinsed with high pressure (100-3000psi) cold water for three minutes using a barrel washer with a rotating spray head. Rinsing helps to loosen and remove the gross sediment, which generally consists of yeast lees, pigments, proteins, polysaccharides and tartrates. Hot water rinsing at 60-82°C for three to five minutes may then be required to remove persistent colour or tartrate coatings on the internal barrel surface, with tartrate much more soluble in hot water than cold. Visual inspection of the cleaning efforts can be made via the bunghole with the aid of a light. Harder persistent tartrate deposits may require higher temperatures, steaming or alternative treatments.

Are there any suitable chemical cleaning options for barrels?

Chemical treatments are preferably avoided. Citric acid (5g/L) can help dissolve tartrate deposits but may react with cellulose of the wood and possibly compromise staves over time. Sodium carbonate, potassium carbonate or sodium peroxycarbonate (2g/L) can leach out oak flavour. Chlorine solutions should be avoided due to the risk of forming chlorophenol and chloroanisole taints. Chitosan has been adopted by some winemakers to reduce *Brettanomyces* cell numbers in affected wines but no information is available on its ability to treat affected barrels.

What about sanitation using steam?

In recent research on barrel sanitation (Barata *et al*. 2013), steam was successful in removing yeast from the cleaned internal surface of a barrel and up to 2mm into staves, but none of the treatments tested, including high pressure hot water, steam, ozone, SO_2 dissolved in water or SO_2 gas were successful in guaranteeing yeast deactivation in grooves or up to 8mm depth in the staves. More recently, Solis (2018) found steaming was required for at least 10 minutes to achieve temperatures >57.5°C at a depth of 8mm within a barrel, which was the temperature required to kill *Brettanomyces* in this study.

Can I achieve sanitation using hot water?

Treating barrel wood with hot water (at least 85°C) for 20 minutes has been shown to be successful in eliminating viable acetic acid bacteria from barrel wood, with the water found to be at about 60°C at the end of the 20 minutes (Wilker and Dharmadhikari 1997). This led to the development of the AWRI's advice for barrel sanitation in cases of *Brettanomyces* infection, which is to fill barrels with hot water at ~85°C and leave the water in the barrel for 15 minutes. A recent study confirmed hot water treatment as an effective option, finding that holding water at 70°C for 30 minutes or 80°C for 20 minutes was able to eliminate *Brettanomyces* yeast from barrel wood at wood depths of up to 5-9mm (Edwards and Cartwright 2019).

These temperatures can be achieved by filling barrels with 70°C hot water, the typical temperature achieved from a hot water system, and increasing the temperature by inserting the nozzle from a hot water pressure cleaner. Minimal drop in water temperature occurs over an hour such that the water can be re-used three or four times before re-heating. Transfer of hot water between barrels could compromise pump impeller integrity, with syphoning an alternative, using a large diameter hose with a metal swan-neck fitting in the top barrel in order to prevent the hose from flattening due to the heat.

What about the specialist treatments that are available?

Shaving and refiring of barrels has been considered an option in the past, however Pollnitz (2000) found that this was not effective in removing all viable *Brettanomyces* yeast due to the deeper penetration of yeast cells within the wood. Additionally, both shaving and other physical techniques such as dry ice blasting require removal of a head stave, or deconstruction of the barrel, which is a much more involved process than the other sanitation regimes.

High pressure ultrasound treatment of barrels filled with hot water has been reported to be effective in treating *Brettanomyces* in barrel wood, but requires access to specialised equipment. Ozone and microwaving treatments also require specialised equipment but have not been pursued as viable barrel treatment options in research published in the last 10 years.

How can I tell if a barrel sanitation treatment has been successful?

Testing barrels after sanitation can be achieved in wineries by adding 4L of sterile water or preservative-free filtered wine to a sanitised barrel, rolling the barrel from side to side and then leaving it for 24 hours. The liquid can then be sampled and tested for viable microorganisms.

For more information on barrels or any other grapegrowing and winemaking technical matters, contact the AWRI helpdesk on helpdesk@awri.com.au or 08 8313 6600.

References

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