Visualisation of Effects on Lees from Novel Methods to Induce Autolysis in Sparkling Winemaking

Gail Gnoinski¹, Karsten Goemann², Terry Pinfold³, Simon Schmidt⁴, Dugald Close¹ and Fiona Kerslake¹

¹Horticulture Centre, Tasmanian Institute of Agriculture, Prospect & Hobart, Tasmania 7000
²Central Science Laboratory, University of Tasmania, Sandy Bay, Tasmania 7001
³Menzies Institute for Medical Research, University of Tasmania, Hobart, Tasmania 7000
⁴The Australian Wine Research Institute, Glen Osmond, South Australia 5064
Email: gail.gnoinski@utas.edu.au, http://orcid.org/0000-0002-9434-5581

Introduction

• Sparkling wine complexity is influenced by viticultural practices, base wine composition, winemaking practices and wine maturation
• Post secondary fermentation, the wine develops an ‘autolytic character’ thought to be attributed to proteolytic processes during prolonged ageing on lees, with impact on sensory characteristics.
• The mechanisms of autolysis during ageing are not currently well understood, distinguished or agreed upon
• Priority to develop alternative methods to manipulate autolysis in traditional sparkling winemaking

Aims

• Visualise the natural process of autolysis (standard tirage 15°C) for Chardonnay sparkling wines with ageing on lees
• Evaluate the progress of autolysis following application of microwave, ultrasound or β-glucanase enzyme treatments to weaken the Saccharomyces cerevisiae yeast structure
• Qualify and quantify autolysis after secondary fermentation and elucidate processes that may accelerate yeast lysis to develop ‘autolytic’ character quicker

Results

• Adjuvant used in tirage impedes clear visualisation of yeast cell surfaces (B1, D2, D3, E1)
• Primary growth like cell budding features were observed for all wine ageing stages. However, younger lees exhibited smoother, uniform cell appearances (A1, A2, C1) compared to older lees (B3, B4, C3, C4, D, E2, E3)
• Similar impact features are displayed across the treatments. However, cavitation features observed for younger microwave lees (C1) were displayed on progressively older (B2, C2, B3, B4) lees from wine stored at 25°C.
• Yeast cells exhibit modifications like cavitation (C1, B3, C2), indentation (C1, C3, D4) and breakage (C3, E2).
• Lees from enzyme treatment showed an increase in porosity with ageing (E2, E3, E4). Similar features were observed on older microwave lees (C4) and on older lees from wine stored at 25°C (B4).

Conclusions

• Treatments to incur damaged to yeast and hasten autolysis show similar impact features. However, some modifications from microwave and enzyme treatments observed on younger lees were observed on older lees from 25°C storage conditions

Manipulation of autolysis produced impact features on lees. Similarities in features manifest in young lees and observed in older lees, provide evidence of accelerated ageing. Work is in progress to quantify the extent

Plate 1. Scanning electron microscope images of Saccharomyces cerevisiae lees exhibiting growth features and modifications from damage following application of novel treatments (microwave, ultrasound or enzyme) compared to standard tirage storage temperatures of 15°C and 25°C over wine ageing periods