Winemaker Trial

Dobbes Family Estate Winemaker Tests β-Glucosidase Use on Riesling to Release Bound Terpenes

Andy McVay wanted to see if enzyme use and skin contact during the fermentation process would release the bound terpenes innate to this grape variety, thereby creating a wine with a more complex aroma and flavor profile.

ANDY MCVAY HAS BEEN with the Dobbes Family Estate since 2008, originally hired as the winery's cellarmaster. He transitioned to assistant winemaker in 2010 then associate winemaker of custom crush wines in 2015. He began his current position as winemaker of Dobbes Family Estate in 2017. McVay's site-specific approach to winemaking, along with his passion for art, science and agriculture, allows him to craft wines that are complex, diverse and reflect the personality of the vineyards, while setting the stage for new world innovation.

TRIAL OBJECTIVE: To improve, or at least vary, Riesling aroma with β-Glucosidase to release bound terpenes during the fermentation process by using varying levels of skin contact.

TRIAL DESCRIPTION: Riesling was fermented three different ways: pressed juice, pressed juice with 6 percent whole berries included, and whole-cluster carbonic maceration for three weeks followed by whole-cluster pressing and yeast fermentation. At the completion of primary fermentation, the wines were sulfited and Lafazym Arom was added at 3 g/hL to volume, separate from a volume with no enzyme added. Following a four- to six-week waiting period, allowing for enzyme release of bound terpenes, wines were evaluated by sensory analysis, and samples were submitted for quantitative analyses of terpenes.

LOT 1: Pressed juice with no berries, no enzyme added.

LOT 2: Pressed juice with no berries, enzyme added.

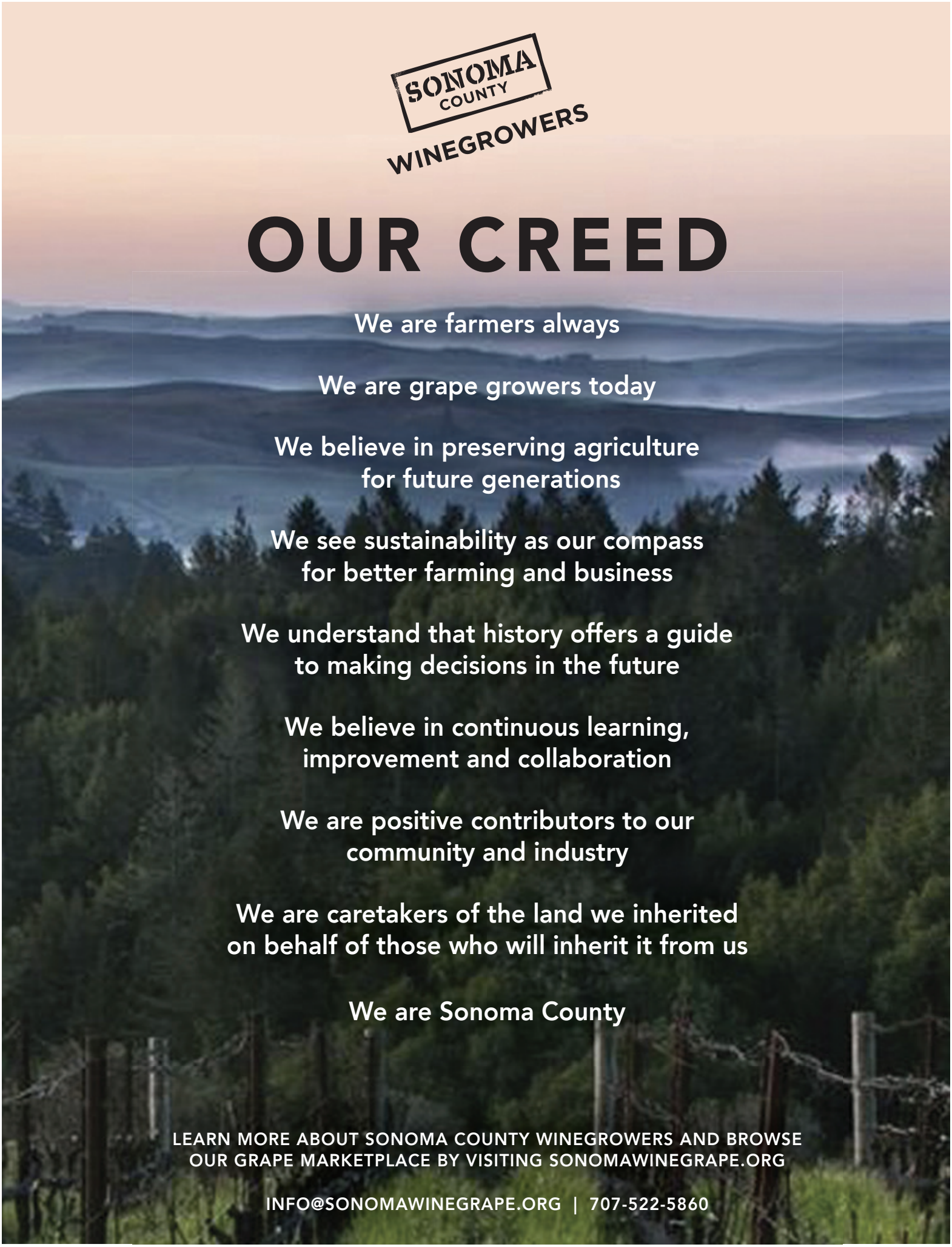
LOT 3: Pressed juice fermented with whole berries added, enzyme added.

LOT 4: Pressed juice fermented with whole berries added, no enzyme added. This is the control for the fermentations with whole berries.

TRIAL CONCLUSION: Blind sensory analyses showed aromatic variation between the whole-berry skin contact ferment and the control, with additional variation in the wines with enzyme added. Wines treated with enzyme showed increased aromatic intensity, particularly in floral and citrus complexity. The carbonic-macerated clusters were in excellent condition after three weeks, with low volatile acidity levels and no Botrytis. Pressed juice for the carbonic clusters showed a 4° Brix decrease compared to the control juice. The pressed carbonic juice YAN was adjusted in the same method as the control juice; but during fermentation, the carbonic juice developed significant sulfides that did not improve through copper and ascorbic trials. This trial follows three vintages of β-Glucosidase application, varying between Pinot Gris, Grenache Blanc, Rosé and Grenache Noir. Results have been subtle, but positive and beneficial. Future trials will test the limit of terpene expression on grapes with YAN, measuring between 250 and 300 ppm, with extraction using pectolytic enzymes in the press as compared to carbonic maceration of whole clusters.

ANALYSIS NAME	LOT 1	LOT 2	LOT 3	LOT 4	UNITS
free sulfur dioxide	13	17	15	13	mg/L
molecular sulfur dioxide	0.77	0.93	0.89	0.79	mg/L
total sulfur dioxide	61	69	69	63	mg/L
titratable acidity	7.7	7.8	7.5	7.5	g/L
pH	3.01	3.05	3.01	3	
volatile acidity (acetic)	0.12	0.12	0.11	0.11	g/L
L-malic acid	2.54	2.56	2.58	2.54	g/L
glucose + fructose	0.2	0.5	0.7	0.3	g/L
ethanol at 20° C	12.9	12.89	12.77	12.77	% vol
ethanol at 60° F	12.86	12.85	12.73	12.73	% vol

ETS LABORATORIES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Winemaker's Post-Mortem

Why were you interested in studying the effects of β-Glucosidase on Riesling specifically? What effect did you predict this would have?

McVay: I like drinking Riesling, but I haven't worked with it enough to understand what can make it great. I find plenty of "ok" Riesling, but the best examples are rare. My favorite Rieslings are very aromatic, and I wanted to trial non-traditional techniques of varying aromatics.

I had already worked with plenty of Grenache Blanc, Viognier, Chardonnay, Pinot Gris and Pinot Blanc. Over three years of enzyme trials that yielded subtle results, I imagined Riesling would have higher levels of terpenes to release when using enzymes, with a better potential to improve aromatics.

Briefly describe how you set up this trial.

McVay: We harvested 1.7 tons of Riesling in good weather conditions with no Botrytis. The majority was pressed, and all juice went to one container to be settled, racked and divided into fermenters. There were 240 pounds that were not pressed; instead, those whole clusters were divided equally between three 15-gallon fermenters and gassed with CO_2 for carbonic maceration. A small amount was destemmed in order to add the whole berries to the juice placed in the three 15-gallon fermenters. The fermenters were split between 4, 6 and 8 percent whole-berry inclusion. All fermentations were inoculated with X16 yeast and fermented at the same temperature (around 15° C/60° F) until dry. Once dry and sulfited, each variable was divided into control, and the enzyme was added.

Did you encounter any complications during the course of the trial? If so, how did you overcome those obstacles?

McVay: I've used carbonic maceration on Riesling in 2018 (for five days with no non-carbonic control for reference) and 2019 (for 21 days with a control). In both vintages, once the clusters were pressed and inoculated, the fermentations developed sulfides. We adjusted YAN to between 250 and 300 ppm, with two additions using organic and supplemental sources of nitrogen because both vintages had low YAN levels (below 60 ppm). The 2019 fermentations with YAN adjustment, but without carbonic maceration, did not develop sulfides. A future trial will use Pinot Gris with acceptable YAN levels without the need to adjust; that should provide the control to help understand if YAN or carbonic maceration is the more significant variable tied to sulfide production.

Because it was hard to draw a trend from the sensory results, we pursued quantitative terpene analyses; and after finding no readily available wine industry options, we hired a local cannabis lab. The GC-MS threshold was not sensitive enough to detect terpenes at wine concentration.

Describe the sensory analyses you observed at the conclusion of the trial.

McVay: The trial was reviewed blind several times by between three and five people. We did find differences but weren't able to consistently identify the wines with enzyme added. The differences between the just juice fermentation control and the variables of whole-berry addition and enzyme additions were subtle. I expected subtle results between the control and control with enzyme, but I thought the whole-berry additions would have been more

significant. We didn't even find significant differences between the varying percentage of added whole berry. Of the non-carbonic components, there was not a consistent favorite although all were appreciated and good. The carbonic-treated lot was dramatically different from the true control, and the enzyme addition was consistently identified—not for increased terpene character but, instead, a different interpretation of sulfides.

Given the results of the wine, do you intend to adjust any of your current winemaking practices?

McVay: Based on trials from previous years and varieties, I've already routinely applied β-Glucosidase to Pinot Gris and Grenache Blanc. I have not applied the enzyme to Chardonnay or Rosé due to no improvement found in trials. I think the whole-berry addition is intriguing and worth continued trials, but it adds a logistics hurdle of separating the whole berries after fermentation to press and recover the juice. From three vintages of enzyme use, we've found that enzyme activity can likely be tracked by an increase in residual sugar. Even when sensory results are subtle, the RS levels appear to be impacted.

Do you plan to re-test the results of this experiment in the future?

McVay: Riesling is not scheduled for our 2020 production, but I always look forward to another set of data to draw a stronger average from and test outliers with.

You said you've conducted similar trials with other varieties. Do you plan to test on any additional varieties in the future?

McVay: The 2018 trial with Grenache Noir in barrel was enlightening because the enzyme improved aromatics and revealed some hidden smoke taint. After digging into that reaction, I found several commercial tests with smoke taint using B-glucosidase. I've had very little issue with smoke taint, but I would use B-glucosidase to help identify hidden problems in future vintages. Following up on the 2018 Grenache Noir, in 2019 I trialed nine different lots of Pinot Noir that are still in progress. Alongside the Riesling trial, we're participating in an ROC review of five commercial β-Glucosidases applied to 2019 Pinot Gris. I've taken the most significant two enzymes from that trial and applied them to Viognier, Muscat and Gewürztraminer from 2019, with the first sensory review planned for April 2020. Also in 2019, I added pressed Riesling skins to Pinot Noir Rosé fermentations followed by enzyme trials. The results were subtle and insignificant, and future Rosé trials with Riesling skins in Rosé juice would need to be more extreme to see significant results.

What are some of the winemaking lessons you learned during the course of this experiment?

McVay: Carbonic maceration on white grapes is broadly untested and, so far, challenging to apply.

Improving the aroma in white wines can be addressed in many ways, and I think these extraction methods balance tradition and innovation in a new way. Even though I didn't get the result I was hoping for, I'm happy to be able to share the results for critical review. **WBM**