Comparison of effect of four commercial pectolytic enzyme preparations in Muscat Gordo

Wine industry research looks at the vital role played by pectinases and how they increase free-run juice yields and aid clarification and settling of juice in the winemaking process.

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Introduction

Enzymes are now commonly used in wineries around the world to perform a range of tasks but the most common type used in winemaking is pectinase. There are many different brands of pectinases available, but which performs the best in the winery?

A major Riverland winery ran production-scale trials to compare their current pectinase enzymes with three competitors. The results of these trials are presented later in this article to help other winemakers make the best choice for their operation. But firstly, let's look at where pectin comes from and how pectinase enzymes work.

Where does pectin come from?

Figure 1 illustrates the composition of grape skin, showing the middle lamella that mainly consists of pectin.

How do pectinases work?

Pectinase enzymes degrade pectin in grapes to:

- increase free-run juice yields, and
- aid clarification and settling of juice.

They can improve filtration by decreasing the juice's viscosity and by promoting the agglomeration of small particles in both settling and flotation systems. Figure 2 illustrates the various cleaving points of pectin lyase, pectin methylesterase and polygalacturonase on a pectin chain.

Pectin levels in grapes vary significantly and depend on the cultivar, ranging from 0.6 to 2.6 grams per litre (Amerine and Joslyn, 1951). The Muscat Gordo cultivar typically has high pectin levels, so presents a significant challenge for pectolytic enzymes. It was for this very reason that a major Riverland winery chose that cultivar for their 2012 production-scale trials. (The winery crushes more than 130,000 tonnes each vintage, with some 10,000 tonnes of this being Muscat Gordo.)

Results from this trial are outlined below to illustrate the performance between different pectin enzyme preparations currently available. The winery conducted all trials and results independently in their laboratory.

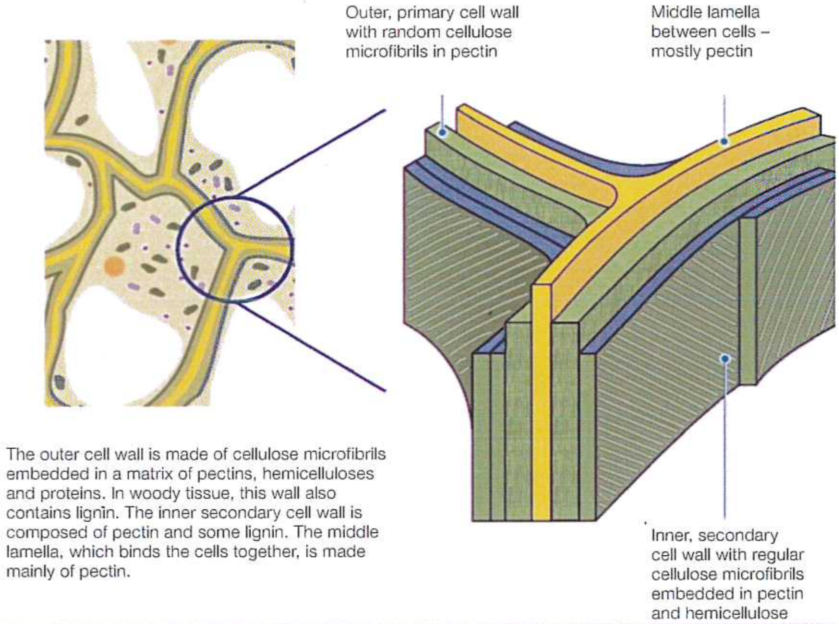

Figure 1. Enzymes in Juice Production, D.Madden, 'In a jam and out of juice', 2001.

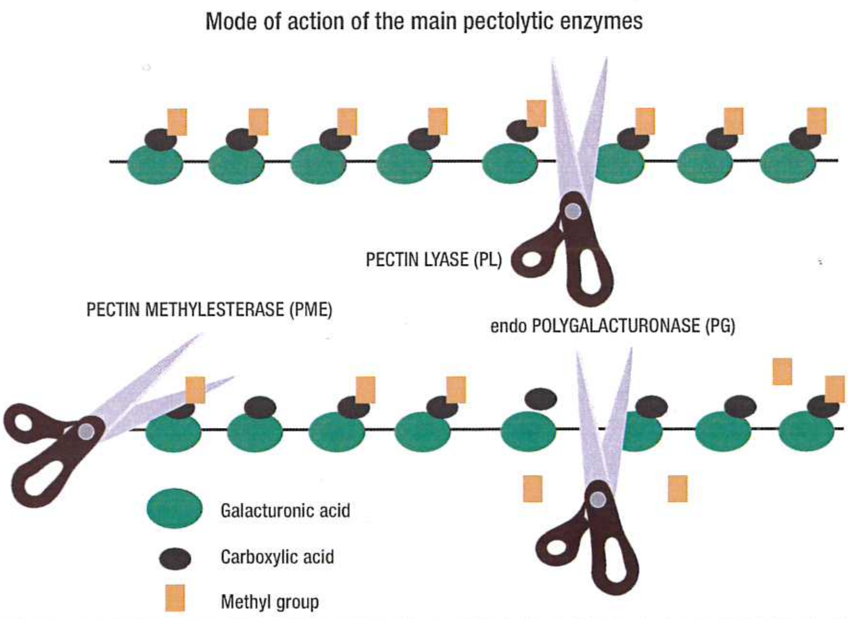

Figure 2. 'Enzymes in winemaking', K. Lourens, *Wineland*, South Africa, 2004.

2012 Muscat Gordo Trial results

The winery compared four different enzyme preparations as follows:

- Optivin 5XL Plus (supplied by E.E. Muir & Sons)
- Pectin Enzyme B
- Pectin Enzyme C
- Current pectinase enzyme

The aim was to determine the difference in performance in two core areas by each of these enzyme preparations: namely yield per tonne of fruit and time taken to reach a pectin negative lab result. Free run and pressing volumes were added together to give the total yield per tonne of each enzyme. Typical lab results for both free run and pressings of all 2012 fruit are presented in Figure 3.

Figure 3 - Average 2012 Muscat Gordo analysis from this winery.

	Temp	Be	pH	FSO2	TSO2
Average free run analysis	16	14	3.90	15	60
Average pressings analysis	18	14	4.05	5	40

Extraction rates between enzyme preparations

All enzymes were applied to juice at the manufacturer's recommended rate, and were added at the crusher via a dosing pump. Figure 4 illustrates the yield differences between the four different enzyme preparations.

Pectinase enzyme B had the lowest yield and was therefore used

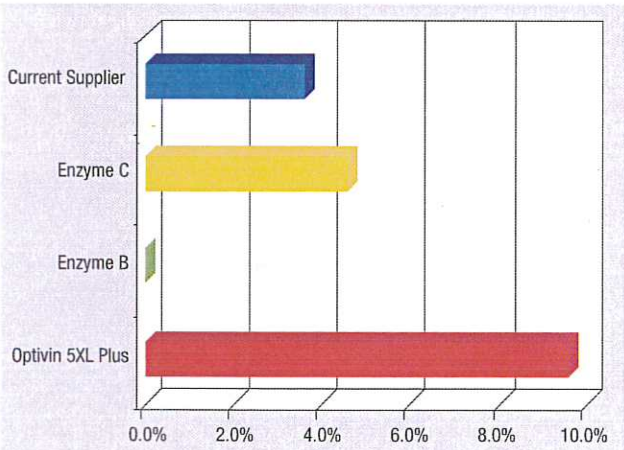

Figure 4. Percentage change in juice yield of Muscat Gordo fruit.

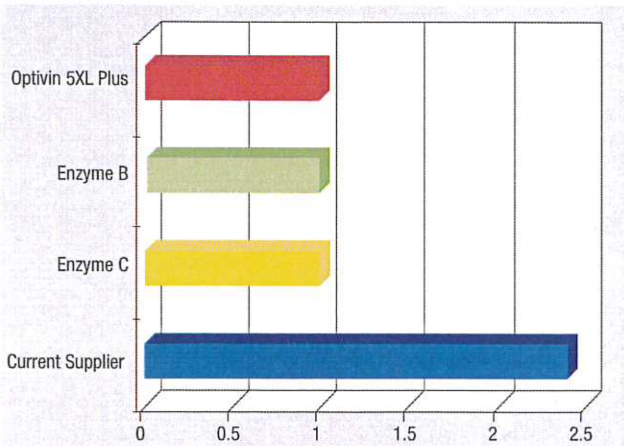

Figure 5. Free run pectin negative result times (hours).

as the base point for this comparison. The current supplier's enzyme and pectinase enzyme C produced 3-4% more juice than Enzyme B but the Optivin ®5XL Plus produced yield increases of 9% compared to the lowest yielding enzyme.

Pectin stability comparison between enzyme preparations

Pectin-stability tests were used to measure the time taken to stabilise batches of juice with the four different enzyme preparations. Tests were performed on both the free run and the more difficult-to-stabilise pressing fraction. The pectin-stability test involves mixing five millilitres of juice with 10ml of 80% ethanol; the lab assigned a pass result when a juice sample flocculated, leaving a clear solution at that hour. The times illustrated in the tables are the average times taken to achieve this stability. Figure 5 illustrates the difference in free run pectin negative results, while Figure 6 illustrates the difference in pressing results.

Significant variation in the free run results were observed between the current enzyme and the three other enzyme preparations tested. The current enzyme took twice as long to generate a pass result with the free-run juice. More differences were observed in the pressing results. The current enzyme took around 2.5 hours, Enzymes B and C took between 1.5 and two hours, while Optivin 5XL Plus only took an hour to achieve a pass result. GW

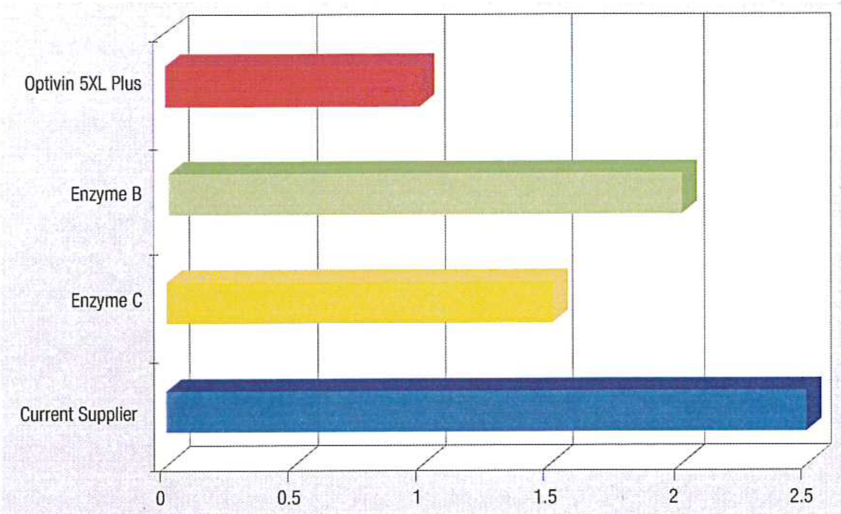

Figure 6. Pressings pectin negative result times (hours).

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