viticulture tech data
UPDATE
XylPhi-PD® Bactericide for use in grapevines.

Economics of Using XylPhi-PD® in a Riparian Buffer Zone for Control of Pierce's Disease

Pierce's Disease (PD), caused by *Xylella fastidiosa* (*Xf*) bacteria, is a challenging disease to control for vineyard managers, especially in riparian areas that harbor sharpshooter insect vectors. The disease decreases a vines output until it ultimately it dies, and thus imposes significant economic damages via reduced and/or lost productivity and costs associated with vine replacements and labor/overhead. Historically, only limited means have been available for control of PD, such as roguing infected vines, and spraying insecticides to mitigate sharpshooters. XylPhi-PD®, an organic biological bactericide for grapevines, is a new product that has been shown to act as a preventative and a curative for early stage PD.[1]

One popular management strategy for using XylPhi-PD is to apply the product in the riparian 'buffer zone' area of a vineyard, where sharpshooters are most likely to frequent (a common buffer zone size is 3-5% of the vineyard). Buffer zone treatment thus helps prevent the spread of *Xf* and resulting PD from moving further into the plot or block.

Methods

An extensive economic analysis[2] examined the impact of 3 different strategies for managing PD in a riparian buffer zone:

- non-intervention (replant full buffer zone when ≥50% vines are symptomatic);
- ongoing roguing and replanting;
- ongoing use of XylPhi-PD.

Key Points

- An extensive 20-year economic analysis examined the potential impact of different strategies for managing Pierce's Disease (PD) in riparian buffer zones of vineyards.
- XylPhi-PD reduced cumulative PD economic losses by $105K and $35K, respectively, compared to no intervention or roguing/replanting at a high-tier Cabernet Sauvignon vineyard when PD spread 10%/year. XylPhi-PD saved $21K in a mid-tier Sauvignon Blanc vineyard vs no intervention.
- Roguing/replanting was the more economical approach when only moderate (4%) PD rates were modeled.
- A break-even analysis revealed that use of XylPhi-PD in the buffer zone was more economical than roguing/replanting if PD spread in the rest of the vineyard was ≥1.0% to ≥5.5%/year, depending on vineyard value and buffer zone PD rate.

In addition, high PD pressure (10% spread/year) and moderate PD pressure (4% spread/year) with alternative grape-value conditions were considered. Annual operating losses and returns were calculated for a high-tier Cabernet Sauvignon vineyard in Napa County, CA (sales price $8,800/ton, 4 tons yield/acre, 7'x4'=1555 plants/acre), as well as for a medium-tier Sauvignon Blanc vineyard in Sonoma County (sales price $2,500/ton, 6 tons yield/acre, 8'x5'=1089 plants/acre). Long-term operating returns (total revenue minus

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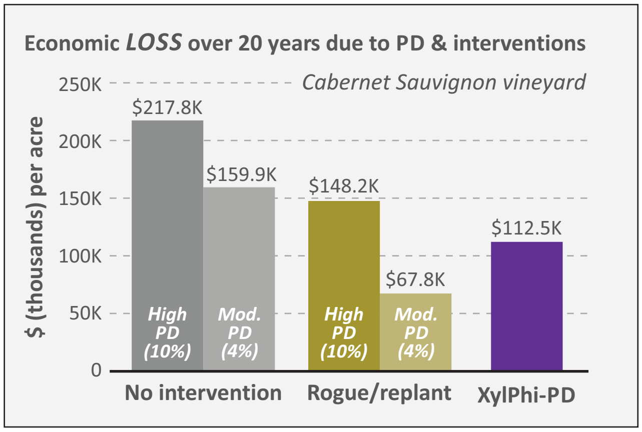

FIGURE 1: Cumulative estimated losses due to PD under various disease and intervention scenarios in riparian area at a high-tier Cabernet Sauvignon vineyard in Napa ($8,800/ton value) during 20 production seasons.

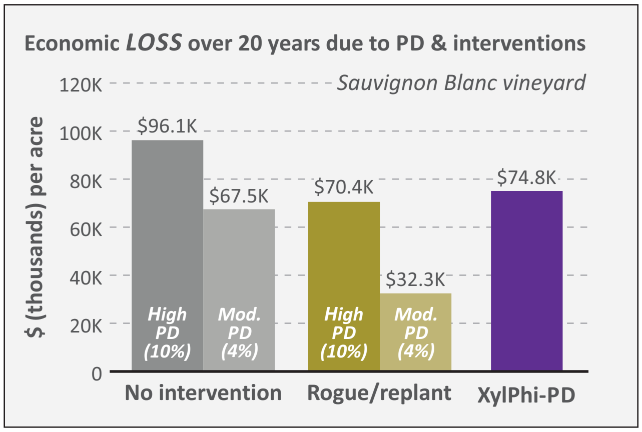

FIGURE 2: Cumulative estimated losses due to PD under various disease and intervention scenarios in riparian area at a mid-tier Sauvignon Blanc vineyard in Sonoma ($2,500/ton value) during 20 production seasons.

cash operating costs) were calculated for the 3 management strategies for each PD-pressure and grape-value scenario using typical production inputs based on 2024 variable costs (fixed costs excluded, as they would not vary in a given vineyard). A net present value (NPV) analysis (common in viticulture economic evaluations) was used to compare economic impacts over 20 years for each scenario, compared to operating returns for a vineyard free of PD.

Several specific assumptions were included in the analysis. For the non-intervention strategy, the model assumed the buffer zone would be replanted when 50% of the vines were symptomatic or dead, which would occur in year 8 if PD spread was at 10% annual infection, and at year 19 if the rate of spread was 4%. The roguing/replant strategy had to include costs associated with new stock, plants that require 4 years to reach full production.

The XylPhi-PD scenario assumed 2 annual applications (an application=2 injections in the cordons, 2 injections in the trunk) of each vine in the buffer zone, requiring an annual cost of $4.76/vine for product and labor. Based on previous research results,[3] the model assumed treated vines would not develop symptoms and would maintain full production (yield of infected vines improves, vines stay clean, no need to rogue, PD-symptomatic vines at 0% starting in year 4).

Results

Outcomes INSIDE the buffer zone

Figure 1 summarizes 20-year operating losses (per-acre basis) of a high-tier Cabernet Sauvignon vineyard buffer zone managed by the various scenarios compared to a mature vineyard with no PD. The worst outcome was non-intervention under conditions of high PD pressure (10% spread/year), which would render a net loss of $217.8K/acre over the 2 decades. At this high rate of infection, 50% of the vines would be impacted with PD every 8 years, so the vineyard would need to be replanted and productivity greatly compromised. While a roguing strategy improved the situation, use of XylPhi-PD delivered, by far, the greatest degree of loss reductions, providing a ***48% improvement*** compared to no intervention. If PD pressure was lower at only 4%/year, roguing was the most economical scenario for this high-value vineyard. Still, use of XylPhi-PD provided the second-best economic outcome under such a lower PD rate, which was notable since the luxury of only low or moderate PD pressure cannot be reliably presumed for 20 sequential production seasons.

Results for a mid-tier Sauvignon Blanc vineyard (Figure 2) further demonstrated the substantial economic impact of PD, with 10% annual PD spread costing $96.1K/acre over the 20 years in the absence of any intervention. Roguing or

TABLE 1: XYLPHI-PD ECONOMIC BENEFIT (loss) vs no intervention or roguing/replanting during 20 production seasons ($/acre).

Vineyard	*NO INTERVENTION*		*ROGUE/REPLANT*	
	High PD (10%)	Moderate PD (4%)	High PD (10%)	Moderate PD (4%)
High-tier (Cabernet Sauvignon, Napa CA)	$105,325	$47,373	$35,715	($44,676)
Mid-tier (Sauvignon Blanc, Sonoma CA)	$21,243	($7,349)	($4,403)	($42,572)

the use of XylPhi-PD provided similar economic benefits vs the non-intervention strategy at a 10% PD spread rate. Though revenue-generating potential was lower for a mid-tier vineyard operation, use of XylPhi-PD as a PD control method still provided notable financial advantages compared to no intervention.

The overall economic benefit of XylPhi-PD for each management and PD-pressure scenario is summarized in Table 1. XylPhi-PD produced net PD-control benefits ranging from ***$21.2K to $105.3K/acre*** across 4 of the 8 scenarios. For prudent managers compelled to prepare for the more challenging 10% rates of long-term PD spread, XylPhi-PD offered the most cost-effective strategy for limiting adverse financial impacts of PD (though roguing was similar to XylPhi-PD in mid-tier vineyards).

Implications BEYOND the buffer zone

Additional benefits of XylPhi-PD use were identified by considering the fact that *PD spreads beyond a buffer zone* and further encroaches into a vineyard. Outcomes presented thus far focused only on costs and losses on acreages *within* a buffer zone. However, if PD escaped the buffer zone and spread across the rest of the vineyard block (a common occurrence with non-intervention and roguing strategies), greater adverse economic impacts could be suffered. Conversely, *use of XylPhi-PD in the buffer zone helps protect the rest of the vineyard block/plot from further PD pressure.*

This concept was considered in a break-even analysis.

- For a *high-tier* vineyard, XylPhi-PD was previously identified as the most economical 20-year, buffer zone strategy for every scenario except when PD spread was limited to a moderate rate of just 4%, a circumstance when roguing proved more economical. However, even under these lower-pressure conditions, roguing was *no longer* the most economical buffer zone option if PD subsequently moved across the rest of the vineyard block at *only ≥5.5%*/year (Table 2). Such circumstances outside the buffer zone would again distinguish XylPhi-PD use within the buffer zone as the most cost-effective strategy.
- For a *mid-tier* vineyard, roguing was previously identified as the slightly more economical control method even if a high-pressure 10% rate of PD spread was encountered in the buffer zone. However, use of XylPhi-PD in the buffer zone provided the *most economical overall 20-year benefit* if most any movement of PD occurred across the rest of the vineyard, even at a very slow rate of *just ≥1.0%/year* (Table 2).

TABLE 2: BREAK-EVEN FOR XYLPHI-PD. Full-vineyard PD spread rate needed for use of XylPhi-PD in the buffer zone to be more economical than roguing/replanting in the buffer zone.

Vineyard / Buffer zone PD rate	*BREAK-EVEN PD SPREAD in rest of vineyard*
High-tier (Cabernet Sauvignon, Napa CA), Moderate PD (4%) in buffer zone	PD ≥ ***5.5%*** per year
Mid-tier (Sauvignon Blanc, Sonoma CA), High PD (10%) in buffer zone	PD ≥ ***1.0%*** per year

Clearly, the economic rationale for use of XylPhi-PD becomes even more substantive when the potential for PD intrusion into more of a vineyard (not just in the buffer zone) is considered.

Conclusions

Consistent application of XylPhi-PD to grapevines populating a riparian buffer zone offers an aggressive and proactive PD-control strategy because every vine in the area of greatest risk is treated, thus helping protect the wider plot/block. Use of XylPhi-PD or a roguing/replant PD-control strategy provided economic savings over non-intervention approaches. For vineyards with high PD infection rates, use of XylPhi-PD was identified as the most economical control strategy. At lower or moderate infection rates, roguing was the more cost effective strategy for mid-tier-valued vineyards, but this approach does not protect the rest of the block and XylPhi-PD can again emerge as the better strategy if PD penetrates into the vineyard beyond the buffer zone. In short, the higher the value of the fruit, the more likely that use of XylPhi-PD provides the most economical method for PD management.

References

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