

XylPhi-PD[®]

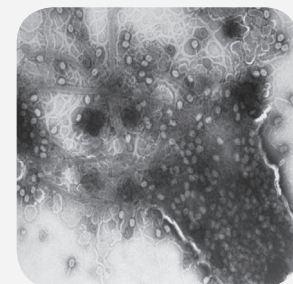
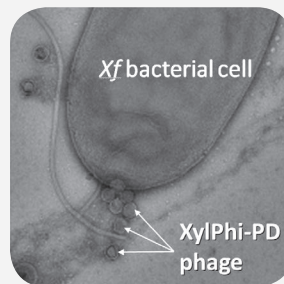
Bactericide for use in grapevines.



For **BIOLOGICALLY BASED** reduction of Pierce's Disease (PD) in grapevines.



- A cocktail of viral **bacteriophages** (phages) that enter, attack, and kill *Xylella fastidiosa* (*Xf*) bacteria, the cause of PD.
- Uses the selective biological activity of phages to destroy targeted bacteria in treated grapevines.
- Apply as a **treatment** when early stage disease symptoms appear, or as a **preventative** to protect growing vines.



Viral bacteriophage particles of XylPhi-PD[®] precisely targeting a bacterial host.

Death and rupture of a bacterial cell, releasing newly created phage particles to seek and destroy more *Xf* cells.

How to apply

- XylPhi-PD[®] is applied by **injection** into the vascular system (xylem) of grapevines.
- The Pulse Xyleject[™] pressurized injection device (from Pulse Biotech) is used for precise injection of XylPhi-PD[®].
- Training is available for vineyard staff.



Effectiveness of XylPhi-PD®

► Commercial Grower Results

2022 — Dry Creek Valley, Healdsburg, CA¹

- Typical incoming infection pressure was about 5% new infections/year.
- 400 vines *without* symptoms of PD were treated.

100%

of vines remained **SYMPTOM-FREE** by harvest

2022 — Russian River Valley, Guerneville, CA¹

- 4500 Chardonnay vines (replanted in 2019, so 3 years old).
- Vines treated along riparian area for 3 years in a row.

100%

of vines remained **DISEASE-FREE** by 2022 harvest

2019-21 — North Coast, CA¹

- 4 vineyards with high-PD hotspots.
- 200 vines treated for 3 years, and 200 treated for 2 years.

55%

reduction of **DETECTABLE Xf** for all vines (including chronic/advanced cases)

84%

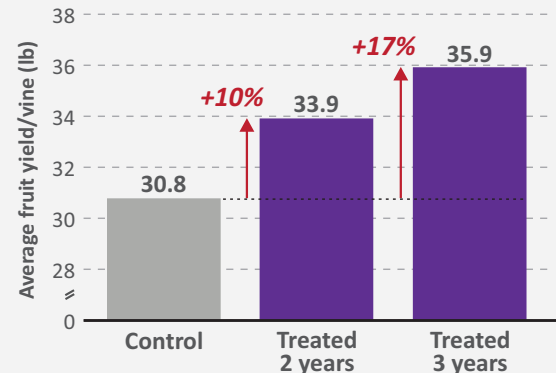
PREVENTION efficacy, with no new PD cases in the 3-year treated group, only 1 case in 2-year treated group

10-17%

average increase in **FRUIT YIELD/VINE** for groups treated 2 years and 3 years

2021 Fruit Yield — Sonoma County, CA¹

- 8-10-year-old Chardonnay average fruit yield/vine measured.
- Vines treated for 2 or 3 years in a row.



► University Research

2015 — Texas A&M greenhouse study²

- Vines inoculated with *Xf*.
- Treated vines compared to non-treated controls.

87%

reduction in **SYMPTOMS** of PD

2017 — California university field trial³

- Vines in a vineyard inoculated with *Xf*.
- Treated vines compared to non-treated controls.

80%

reduction in **SYMPTOMS** of PD at 7 weeks after 3rd application

2022 — UC Davis biocontrol study⁴

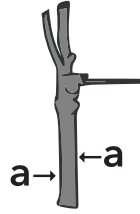
- Vines inoculated with *Xf*.
- **Severe challenge infection**, with 37% of foliage showing symptoms.

53%

reduction in **SYMPTOMS** of PD under extraordinarily severe infection conditions

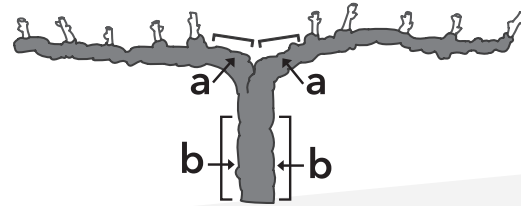
Where to inject the vine

▶ Replants and young vines



- 2 injections in opposite sides of the trunk (a)

▶ Mature vines



- 1 injection in each cordon (a)
- 2 injections in the trunk (b)

When to apply Make 2 or 3 applications of XylPhi-PD® per season, at 4- to 6-week intervals.

Application #1



- At or near flowering

4-6 weeks later

Application #2



- A total of **2 seasonal applications** for areas with low/moderate PD pressure (less than 30% historical infection rate) or vectors like the blue-green sharpshooter
- Examples: Sonoma/Napa CA

4-6 weeks later

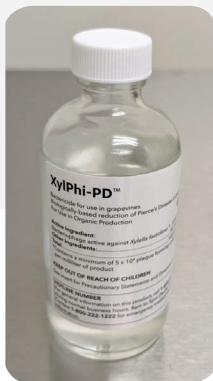
Application #3



- **3 applications** recommended for 30% or higher historical PD incidence or presence of aggressive vectors like the glassy-winged sharpshooter
- Examples: Central coast, Santa Barbara, Temecula CA

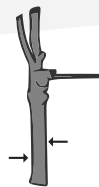
How much to apply

1



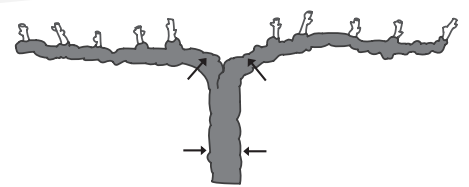
~600 replants/young vines

=



or

~300 mature vines



- A 100-mL vial of XylPhi-PD® treats about **600 replanted vines** or **300 mature vines** per application.
 - One **replant** vine application = two 0.08-mL injections/vine (0.16 mL total/application)
 - One **mature** vine application = four 0.08-mL injections/vine (0.32 mL total/application)
- Apply at least twice per season.

| Volume used per application: | Trunk injections | Cordon injections | mL/ injection | mL/ app/vine | Vines/ vial/app |
|------------------------------|------------------|-------------------|---------------|--------------|-----------------|
| Replants / new vines | 2 | | 0.08 | 0.16 | 625 |
| Mature vines | 2 | 2 | 0.08 | 0.32 | 313 |



PD-infected vine



Vine protected by XylPhi-PD®

Industry reception

- Over 30 commercial sites currently using XylPhi-PD®
- Over 10 sites starting 4th year of use
- Growers have reported:
 - reductions in replants;
 - recovery of yields in mildly symptomatic vines;
 - reductions in visual symptoms of PD;
 - increased PD incidence in untreated areas.

XylPhi-PD®

- The proven treatment and prevention for symptoms of Pierce's Disease.
- Alternative to costly rogueing and replacement of grapevines.
- Maintains production, efficiency, and uniformity in the block.
- Flexible application timing with durable injection system.
- No REI, minimal PPE.
- OMRI-listed for use in organic production.
- No phytotoxicity.

XylPhi-PD®, the phage-based system, is a biologically based treatment for PD-causing bacteria that helps to preserve the health and productivity of your vines.

Contact your local representative for more information on XylPhi-PD®.

For information only. Not a label. Prior to use, always read and follow the product label directions. Registered by California DPR and US-EPA; not registered in all states. EPA Reg. No. 93909-1. Operators of injector must undergo training and be certified by Pulse, and must follow instructions in device manual.
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1. Data on file. A&P Inphatec.
2. Texas A&M Research Progress Report, 2015. Data on file.
3. Regulatory filings to CDPR: Otsuka - OPC-821 Submission to DPR - Oct 31 2018.pdf.
4. Project 00-032-V, Innovative technologies for Pierce's Disease field day, <https://agceuoonline.com/299/course/Innovative-Technologies-for-Pierces-Disease-2023>.



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