

GRAPEVINE TRUNK DISEASES : THE DESTRUCTIVE AND COSTLY CYCLE



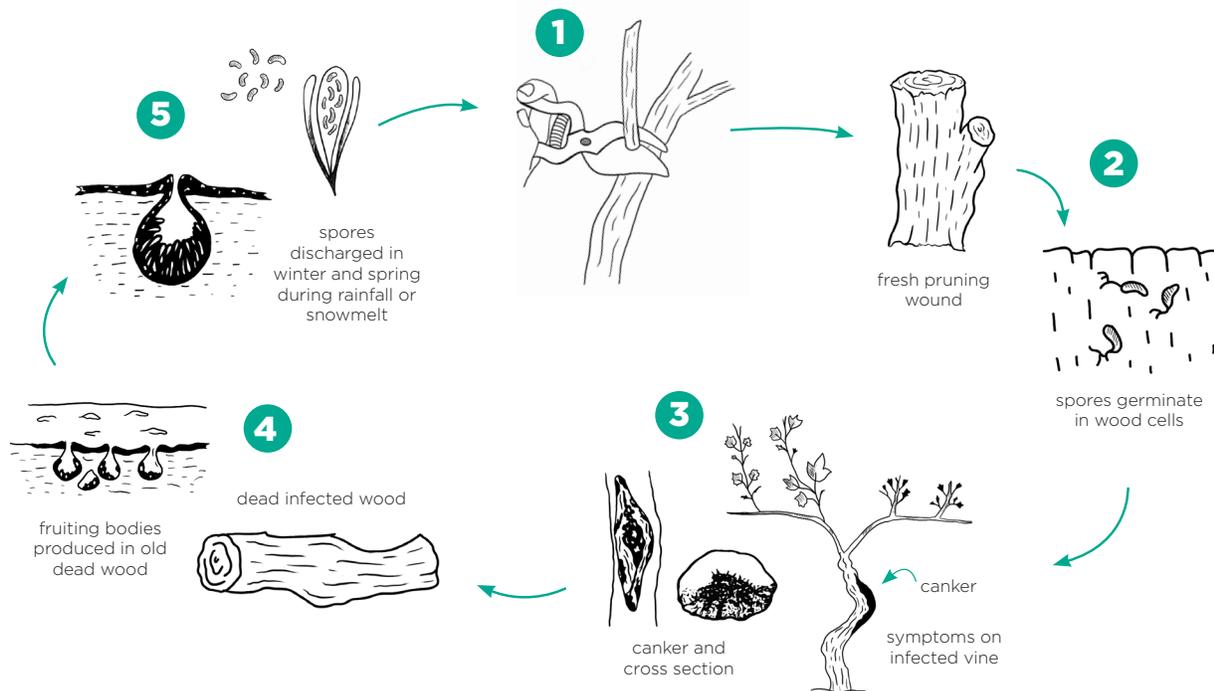
Grapevine trunk diseases (GTD) are the most destructive disease complex in grapes, causing significant economic losses related to reduced yields, vine replacement and management costs. Worldwide estimates for the replacement cost of grapevines exceed \$1.5 billion per year. GTD are not caused by a single fungus, but by a complex of unrelated fungal pathogens that cause wood rot, cankers and plugging of the plant's vascular system.

STAGGERING LOSSES*

- Experts estimate more than 80% of the grapevines in California are impacted by GTD.
- Yield losses can reach 94% in severely symptomatic vineyards.
- Yields can drop 70% by the time an infected vineyard is 15 years old, necessitating replanting.
- GTD often causes death of the grapevine within 20 years, shortening a vineyard's typical productive lifespan of 25-30 years.

HOW IT HAPPENS IN FIVE STEPS

- 1 PRUNING OR HARVEST INJURY**
More than 95% of trunk disease infections are associated with pruning or other cultural practices, such as mechanical harvesting.
- 2 OPEN WOUNDS, OPEN FOR INFECTION**
These practices can leave wounds exposed and open to infection by pathogens. The spread of the pathogens usually happens during rain events.
- 3 PATHOGENS GROW IN THE VINE**
These fungal pathogens grow and decay the xylem and phloem, slowly killing vines.
- 4 DEAD VINES PRODUCE SPORES**
Spore-producing bodies grow in dead vine wood.
- 5 SPORES SPREAD TO NEW VINES**
In the presence of water, spores are released and dispersed by wind to infect fresh pruning wounds.



TIMELINE OF DESTRUCTION

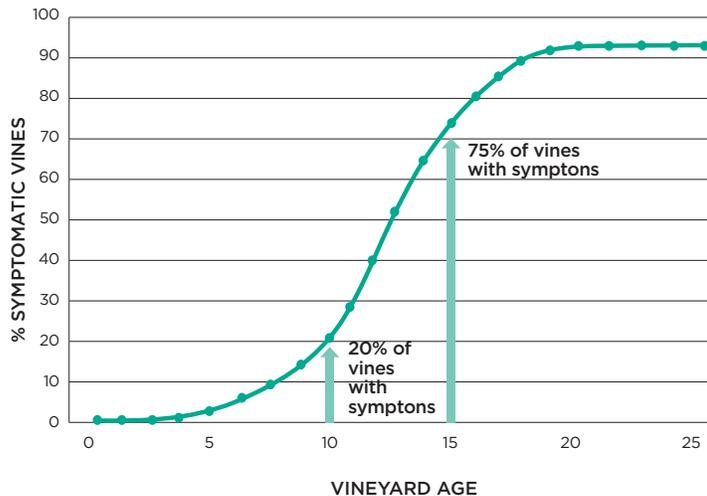
0 YRS.	5 YRS.	10 YRS.	15 YRS.	20 YRS.	30 YRS.
New vines planted.	By year six, vines reach peak yields, 6 tons/A in this example.	By year 10, yields have dropped 20% from the peak.	Vineyard yields have fallen 70%, to less than 2 tons/A.**	Vines impacted by GTD likely dead.	Potential productive lifespan.

* Dr. Akif Eskalen, University of California Davis Extension Research

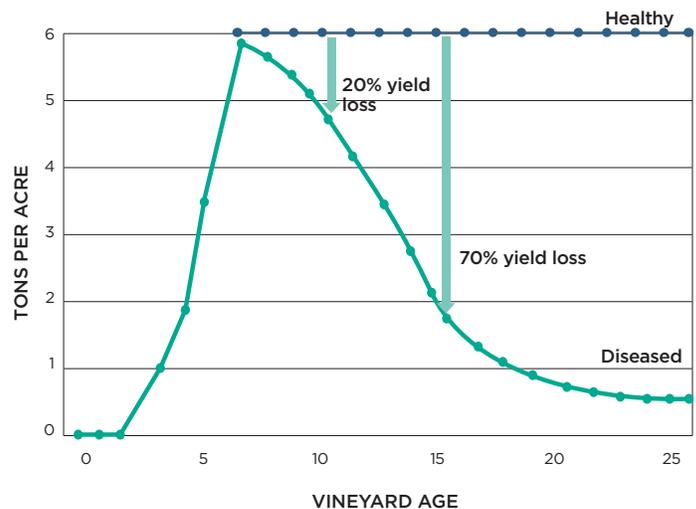
**This timeline represents the estimated yield reduction caused by GTD. Estimates are based on industry research and assumes a peak yield of 6 tons/A.

DISEASE INCIDENCE WITH VINE AGE¹

(% OF VINES WITH DEAD SPURS, STUNTED SHOOTS, SYMPTOMATIC LEAVES)



YIELD IMPACT OF TRUNK DISEASES²



SIMPLE, COST-EFFECTIVE, INSIDE-OUT PROTECTION

THE DRIP APPLICATION ADVANTAGE

Rhyme[®] fungicide will redefine GTD control following the issue of a 2(ee) recommendation for management of wood disease complex on grapes and tree nuts in California. Flutriafol, the active ingredient in Rhyme fungicide, the most systemic and longest lasting triazole on the market, is taken up by the roots and moves completely throughout the plant to provide both internal and foliar disease control. Rhyme fungicide is the only fungicide labeled for application through the drip to control two of the costliest diseases of grapes: powdery mildew and GTD. An application by drip irrigation can save growers \$25-\$30 per acre for each foliar application eliminated.

BACKED BY TRIAL DATA

Recent trials by the University of California and FMC have found Rhyme fungicide, when applied via drip, controls a complex of pathogens responsible for destruction of the xylem tissue, which leads to grapevine decline and eventual death.

Trials show that Rhyme fungicide applied via drip provides significantly better control of *Botryosphaeria* pathogens than a tank-mix foliar treatment of Topsin[®] M and Rally[®] fungicides in both young and established vineyards. It also provided better control of *Phomopsis* and canker.

REDUCED COSTS

Drip applications of Rhyme fungicide reduce application and labor costs while providing long-lasting residual protection that matches the extended spore dispersal of wood disease pathogens. With the protection of Rhyme fungicide via drip application, there is no need to double prune, a labor savings of around \$500-\$700 per acre. Growers can avoid the labor costs of hand-painting compounds on pruning wounds, about \$100 per acre. The residual inside-out protection of Rhyme fungicide stops disease progression and preserves yield potential, earning growers more dollars per acre. It potentially adds years of productive life to infected vineyards, delaying expensive replant costs of about \$22,000 per acre.

¹Munkvold, G.P. Duthie, A. Marois, J.J. 1994. Reductions in yield and vegetative growth of grapevines due to Eutypa dieback. *Phytopathology* 84, 186-192.

²This lifespan is consistent with Alston et al. (2013), Alston et al. (2014), and others, as well as with the lifespans as reported in the UCCE Cost and Return Studies.

To learn more about Rhyme fungicide, talk to your local FMC representative or visit FMCAGUS.COM/RHYME.

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