

Sudden Vine Collapse: Current Understanding of a Disease Complex

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Background: Within the last 10 years, throughout the San Joaquin Delta, Central Valley, and Coastal Counties of California, grape growers have reported Sudden Vine Collapse (SVC), in which patches of vines within the vineyard, especially the ones on virus-sensitive rootstocks (Freedom, O39-16 and 101-14, among others), quickly die with no apparent cause (Fig. 1, Fig. 4A). In some cases, patches are so large that they can be seen via satellite images on Google Earth, with levels of loss that have caused growers to remove entire vineyards.

Symptoms: Early in the season, stunted shoot growth or dead arms (Fig. 2A). Later, during the summer, entire vines start dying quickly in patches within the vineyard. In some cases, death is so fast that the leaves and berries remain dry on the plant (Fig. 2B). Examined vines show a clear lack of feeder roots, with grayish-purple discolorations inside the bark of scaffold roots (Fig. 3A). At the graft union level, the scion portion often appear swollen (Fig. 3B), with a necrotic line on the phloem area. In many cases, rootstocks showed internal wedge-shaped cankers which were absent in the scion (Fig. 3C-D). Fruiting body (pycnidia) of grapevine trunk diseases (GTD) were also observed on the trunk of declining vines (Fig. 3E). Furthermore, mealybugs which are known vector of leafroll virus, and vitiviruses were observed in all affected vines (Fig. 3F).

Synergy between grapevine viruses: Vines infected with a single viral species usually show mild to strong symptoms, and the yield is significantly reduced but the vine will not collapse. However, mixed infections with grapevine leafroll viruses and vitiviruses can exacerbate symptoms and lead to vine decline (Golino, 1993; Rieger, 2019).

Grapevine trunk diseases role: Characteristic trunk diseases such as esca, dieback, canker and/or black foot could be present in affected vines with SVC, however no single fungal pathogen was consistently associated.

Hypothesis

SVC is not caused by a single pathogen, but the result of a disease complex in which vines grafted on virus-sensitive rootstocks are predisposed to root stress due to co-infection by a leafroll virus (*Grapevine leafroll-associated virus 3*), vitiviruses (*Grapevine virus A*, *Grapevine virus F*), and possibly others. Consequently, infected vines rapidly die by an additional infestation of fungal pathogens associated with grapevine trunk diseases and black foot.

Management

Management for this emerging disease should include test to confirm co-infection of the viruses, removal of infected grapevines, vector control, and in the case of replanting, farmers may want to start thinking about changing to less-sensitive rootstocks when replanting



Figure 1. Sudden vine collapse in Paso Robles, CA (A). Patches of collapsed vines during summer 2019 in Lodi, CA (B).

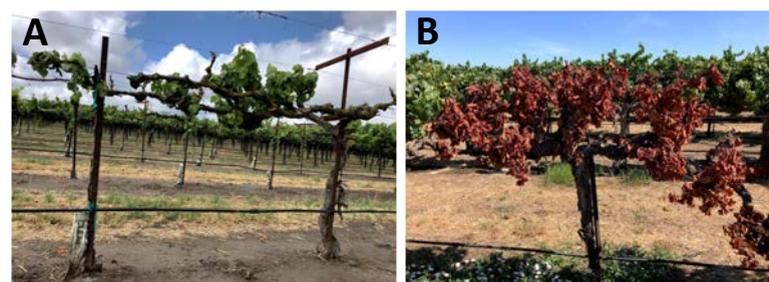


Figure 2. Stunted shoot growth and dead arms early in the season (A). Quick death of vines during the summer (B).

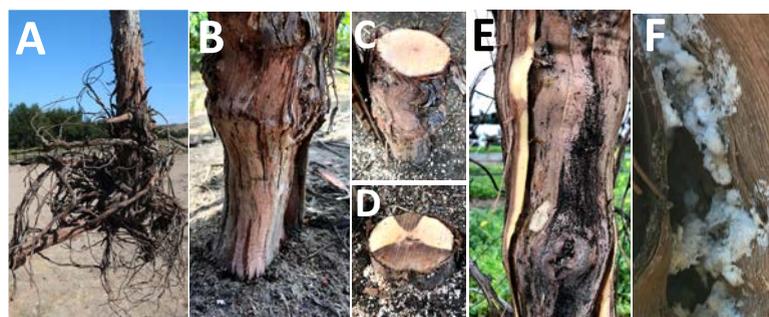


Figure 3. Lack of feeder roots (A). Swelling and cracking on graft union bark (B). Scion cut with asymptomatic wood (C). Rootstock cut with cankered wood (D). Reproductive structures (pycnidia) of *Neofusicoccum parvum* on the bark, serving as inoculum source of the trunk diseases *Botryosphaeria* canker and dieback (E), Large colonies of mealybugs under the rootstock bark observed in all collapsed vines (F).



Figure 4. SVC on vines grafted on Freedom but not on 5C rootstocks.

Free Access Literature

- Golino, D.A. 1993. Potential interactions between rootstocks and grapevine latent viruses. *American Journal of Enology and Viticulture* 44: 148-152.
- Rieger, T. 2019, October 7th. Sudden vine collapse may be associated with combination of virus pathogens. *Wine Business Daily News*. Retrieved from <https://www.winebusiness.com/news/?go=getArticle&datald=220522>.

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