



Grapevine Trunk Diseases incidence: literature review and data

Botryosphaeria dieback, and important GTD, causes yield losses between 36 to 48% in Chilean 'Cabernet Sauvignon' vineyards located in O'Higgins and Maule regions, with average yield losses estimated to be 5,800 kg ha⁻¹ (Torres et al., 2017; Larach et al., 2020).

For instance, EC incidence has reached up to 80% in some vineyards of southern Italy (Romanazzi et al. 2009). In France, 12% of vineyards are currently estimated to be economically unviable, due primarily to EC, with an annual estimated loss of 1 billion Euros (Lorch 2014). In California (US), economic losses of at least USD\$ 260 million per year have been attributed to trunk diseases (Siebert 2001), and it was estimated that 64 and 55% of Sauvignon Blanc and Chardonnay are infected by BD, respectively (Gubler et al. 2005). In British Columbia (Canada), low incidence of EC (0.2 %) and young vine decline (8%) were reported (Úrbez-Torres et al. 2014). In New Zealand, an analysis of 43 vineyards distributed over six wine regions showed that 88% of plants were affected by BD fungi, with *Neofusicoccum luteum* and *N. parvum* being prevalent (Baskarathevan et al. 2012). In Australia, BD and ED were ranked in the top five priority diseases for the wine grape industry in 2010 (Scholefield and Morison 2010). Yield losses of 1,500 kg per ha were estimated when 47% Shiraz vines were affected by ED, leading to 2,800 AUD\$ losses per ha in South Australia (Wicks and Davies 1999). An overall yield loss of 3–8%, with as high as 30–50% or even 100% yield loss in extreme cases, due to BD has been reported across the grape growing regions surveyed incubation period (Bertsch et al. 2013), the presence of affected, but asymptomatic, plants lead to an underestimation of the actual disease incidence in the vineyard at any given time (Mondello et al. 2018).

Grapevine (*Vitis vinifera* L.) is an important cultivated crop, with a worldwide vineyard area of 6.73 million ha (FAOSTAT, 2021), mainly grown for wine and table grape production. Reports have increased of diseases caused by grapevine trunk diseases (GTDs) associated fungi causing severe economic and yield losses as a result of reduced grape quality and early plant death.

Grapevine trunk diseases are severely destructive in Europe and Mediterranean countries (Guerin-Dubrana et al., 2019), representing major threats to vineyard productivity. Several factors, including climate change and rapid expansion and industrialization of viticulture, are related to increased incidence and severity of GTDs (Graniti et al., 2000; Surico et al., 2004). Up to 133 pathogens belonging to nine families have been associated with GTDs (Luque et al., 2009; Carlucci et al., 2015; Gramaje et al., 2018; Mondello et al., 2018). These xylem-colonizing fungi are predominantly found in the grapevine framework (spurs, cordons, and trunk), but also in root (Gramaje et al., 2018).



Grapevine trunk diseases (GTDs) are among the biggest threats to the sustainability of vineyards and are widespread in all wine-producing countries (Songy et al., 2019). As no curative treatment is available, infected grapevine plants must be replaced, resulting in a financial loss of ≈\$1.5 billion annually worldwide (Fischer et al., 2019). In the Czech Republic, the damage caused by GTDs is estimated at CZK 150 million (approximately € 6 million) per year (Baránek et al., 2017). In the 2000s, GTDs reduced potential wine production in France by 13% (Bruez et al., 2013). Worldwide, 133 species of fungi belonging to 34 genera have been associated with GTDs and thus represent the largest group of pathogenic fungi that infect a plant (Gramaje et al., 2018). GTDs involve six diseases, including ESCA complex, Eutypa dieback, Botryosphaeria dieback, and Phomopsis dieback, occurring especially in mature vineyards. Petri disease and black foot disease are present in young grapevines (Fussler et al., 2008; Bertsch et al., 2009; Hofstetter et al., 2012; Fontaine et al., 2016; Gramaje et al., 2018; Mondello et al., 2018a). Effective management of GTDs is very difficult, especially after sodium arsenite was banned, due to its toxicity towards humans and animals (Mondello et al., 2018b). Because complete eradication is not possible, GTD control is primarily focused on disease prevention and alleviation (Úrbez-Torres, 2011).

GTDs cause untenable economic losses to the grapevine industry worldwide. For example, they are considered a 'national crisis' in France, where it has been estimated that 12% of the vineyards are currently economically nonviable due to these maladies causing losses of about €1 billion (Lorch, 2014). Because GTDs are chronic and there is currently no option to eradicate the infections, unproductive vineyards must be replanted, at a worldwide annual cost estimate of €1132 billion (Hofstetter et al., 2012). The establishment, progress, severity and spread of GTDs have been associated with (i) drought, (ii) limited availability of effective fungicides, (iii) pressure to increase yields, (iv) lack of pruning wound protection due to cost of labour, and/or (v) poor low-quality propagation material (Gramaje 2016).

Updated in August 2023 by:

Dr. Enrico Battiston - viti@oiv.int
OIV | Head of Unit Viticulture

Information provided by:

Prof. Laura Mugnai – laura.mugnai@unifi.it
University of Florence | Full Professor in plant pathology
Co-Founder of the International Council on Grapevine Trunk Diseases