

# Etiology and epidemiology of pathogens causing grapevine trunk diseases in vineyards under climatic conditions of Quebec, Canada.



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## Introduction

Grapevine trunk diseases (GTD) are very damaging for the sustainability of the vineyard heritage in all major wine regions of the world. A multitude of fungi are responsible for these diseases and attack the perennial organs of the vine, which causes the death of the plant in the short or medium term. GTD can affect young plantations as well as aging vineyards. In both cases, the risk of contamination by these diseases is increasing in Quebec vineyards, as many of them are more than 20 years old, and many producers plan to expand. However, the presence and distribution of GTD is unknown in Quebec. Moreover, climate change can promote the spread of these diseases, including higher temperatures and heavy rainfall. Knowledge of the etiology and epidemiology of GTD is necessary to develop control methods against these diseases. Knowledge of infection times in combination with the development of management strategies using appropriate cultural practices, such as 'replacement surgery', and the application of fungicides or biological control agents to pruning wounds (when registered) are needed to control MBV in vineyards (Bertsch et al. 2013; Gramaje et al. 2018).

**The objective was to acquire knowledge on the etiology and epidemiology of grapevine trunk diseases in the vineyards of Quebec, Canada, according to different criteria, such as region, grape varieties and age of the vineyards.**

## Method

Five GTD were targeted: Esca (Petri disease) (*Phaeomoniella chlamydospora*, *Phaeoacremonium aleophilum*), Eutypa dieback (*Eutypa lata*, *Eutypa armeniacae*), Botryosphaeria dieback (*Botryosphaeriaceae* spp.), Excoriosis (*Diaporthe ampelina*), Black foot (*Cylindrocarpon*-like asexual morphs.).

In 2021, 40 samples (108 samples) from 24 different vineyards were received and qPCR analysis were performed to detect GTD (analysis in progress for some fungi). For each grapevine sampled, three sections were sent: the trunk, the spur and the canker.

The age distribution of the plots concerned is 26 fields older than 9 years (older plots) and 14 plots younger than 8 years (younger plots). This distribution aligns with the initial target proportion of 40% young vineyards and 60% older vineyards. In addition, 75% of the vineyards are under conventional management and 25% under organic control, which is also reported by the Quebec industry. Twenty-two grape varieties were sampled, including 11 of the 12 main grape varieties in Quebec, mainly cold-hardy hybrids such as Frontenac, Marquette, and Seyval

## References

Bertsch, C., Ramírez-Suero, M., Magnin-Robert et al. (2013). Grapevine trunk diseases: complex and still poorly understood. *Plant Pathology*, 62(2), 243-265.  
Gramaje, D., Urbez-Torres, J. R., & Sosnowski, M. R. (2018). Managing grapevine trunk diseases with respect to etiology and epidemiology: current strategies and future prospects. *Plant disease*, 102(1), 12-39.

## Results and discussion

- Results showed the presence of these diseases in Quebec vineyards, mainly *Botryosphaeria dieback* (Tab. 1).
- Black dead arm was present in the samples received in the summer of 2021 since at least one of the pathogens causing this disease was found in 28% of the samples analyzed. The fungus *D. seriata* was dominant, as only one vineyard tested positive for *B. dothidae*.
- On the other hand, eutypiosis was found in 10% of the samples analyzed.
- It is interesting to note that the fungus *E. lata* was mostly detected in vineyards located on the north shore of the St. Lawrence River while *D. seriata* was mostly found in vineyards on the south coast (Figure 1).
- In the case of the two diseases examined, neither the grape variety nor the tissue explained their distribution pattern in the different vineyards that participated in the study (Kruskal-Wallis,  $p > 0.48$ ).
- The knowledge gained from this project will allow us to establish a portrait of GTDs in Quebec vineyards, allowing us to study the epidemiology of these diseases and evaluate cultural practices to limit their spread.

Table 1: Number of positive samples for two of the five diseases tested.

Diseases	Species	Threshold of detection	Number of positive samples	# Young vineyard	# Old vineyard
Eutypiose	<i>Eutypa lata</i>	10 <sup>3</sup>	11 (10%)	2	9
	<i>Eutypa armeniacae</i>				
Black dead arm	<i>Diplodia seriata</i>	10 <sup>1</sup>	29 (27%)	11	18
	<i>Diplodia corticola</i>				
	<i>Botryosphaeria dothidae</i>				

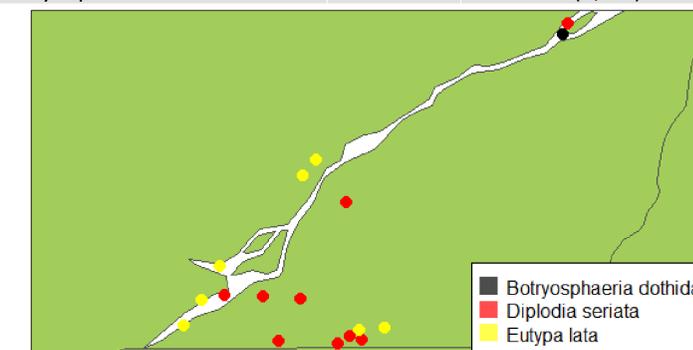


Figure 1: Geographical map showing the distribution of positive samples for two of the five diseases tested.

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