# The influence of viral presence on the disease-causing potential of *P. cinnamomi* in tree hosts

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## Introduction

Members of genus *Phytophthora* are oomycetes belonging to the kingdom *Straminipila* (Beakes et al., 2012; Thines and Choi, 2016). *Phytophthora* species are serious pathogens of forest trees worldwide. One of the most notorious species is *P. cinnamomi*, a soilborne pathogen which nowadays has a worldwide distribution. *P. cinnamomi* harbour multiple viral infections and certain type of viruses seem to be very bound to their hosts (Botella et al. 2020; Botella and Jung, 2021). Since many mycoviruses are capable to cause hypovirulence, a reduction of virulence, of pathogenic fungi and oomycetes, these viruses can be potentially used as biocontrol agents (BCAs) (Milgroom and Cortesi, 2004).

*Quercus ilex* is a large tree species widespread across the Mediterranean, Balkan regions of Europe, Turkey and North Africa. *Q. ilex* is under numerous low to medium impact threats, especially ruthless collection for domestic uses and for trade, fungal infections, climate change etc. (The IUCN Red List of Threatened Species, 2017). *C. sativa* is one of the most ecologically and economically important tree species from the *Fagaceae* family that is autochthonous in Southern Europe and in Asia Minor. It is endangered by two major disease threats, chestnut blight and ink disease. Ink disease is caused by the pathogens from the genus *Phytophthora*, causing significant economic and ecological losses in chestnut forests (Beakes et al., 2015).


Fig. 1

## Methodology

The samples used for this project were samples that have already been confirmed to host various viruses by Dr. Leticia Botella's team. Particular naturally virus-infected and virus-free *P. cinnamomi* isolates, together with isogenic virus-infected and isogenic virus-free isolates were obtained from our previous experiment (IGA project IGA-FFWT-23-IP-033). Two species were selected for the experiment, *Q. ilex* and *C. sativa*, which were grown in a greenhouse with controlled conditions (Fig.1). After 6 months, the plants were inoculated with a pre-prepared suspension of *P. cinnamomi* zoospores.

## Results

An in vivo experiment conducted on two selected species, *Castanea sativa* and *Quercus ilex*, showed that *C. sativa* plants showed more obvious signs of infection in the form of leaf spots and root lesions than *Q. ilex* plants. For both species, the highest plant mortality was observed in the case of inoculation with samples KA 399 and BD 298, naturally virus-infected isolates. On the other hand, the lowest mortality was recorded in plants inoculated with KA 399 C15, a sample partially virus-free by cycloheximide treatment. Figure 2 shows the percentage of dead plants from each group inoculated with the different samples and a comparison of these groups within the species *C. sativa* (C) and *Q. ilex* (Q).

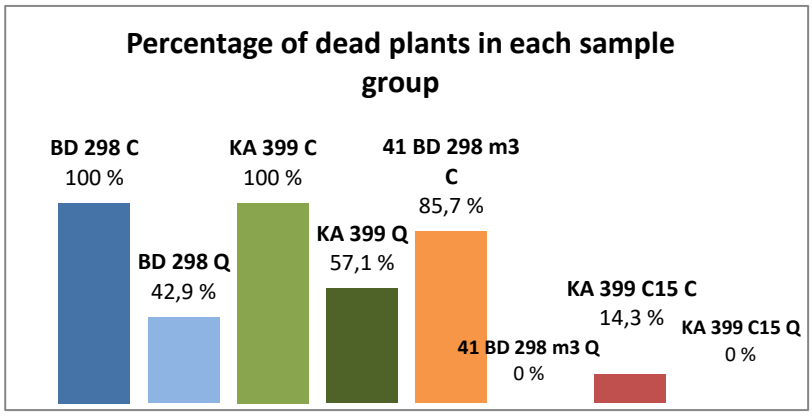


Fig. 2

## Conclusion

An in vivo experiment showed that *Castanea sativa* is more susceptible to infection by *P. cinnamomi* than *Quercus ilex*. This species showed a higher mortality rate than *Q. ilex*, and also showed more symptoms of infection. It was also found that plants inoculated with samples KA 399 and BD 298 caused the highest mortality, on the other hand, plants inoculated with sample KA 399 C15 showed the lowest mortality. These results suggest that the presence of viruses might enhance the virulence of *P. cinnamomi*.

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