Facilitative and synergistic interactions between fungal and plant viruses in mixed infections

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Purpose: To investigated the infectivity of cryphonectria hypovirus 1 (CHV1, genus Hypovirus), a capsidless, positive ssRNA mycovirus in a model plant, Nicotiana tabacum.

Methods: Mechanical inoculation of viral RNAs and fungal inoculation

Results: By mechanical inoculation of viral RNAs, CHV1 replicates in inoculated leaves but does not spread to the upper leaves. Co-inoculation with a plant virus such as tobacco mosaic virus (TMV), potato virus Y and cucumber mosaic virus enables CHV1 to systemically infect the whole plants. Likewise, CHV1 systemically infects the transgenic plants expressing TMV movement protein and co-infection with TMV further enhances CHV1 accumulation in this transgenic plants. In the fungal inoculation experiment using a plant pathogenic fungus, Fusarium graminearum, we demonstrated that TMV infection in the plant enables the horizontal transfer of CHV1 from the fungus to plant. Moreover, the presence of CHV1 promotes TMV accumulations in the fungal host.

Conclusion: Our results demonstrate that the plant virus infection could facilitate the cross-kingdom infection of a mycovirus from the fungus to plant.