

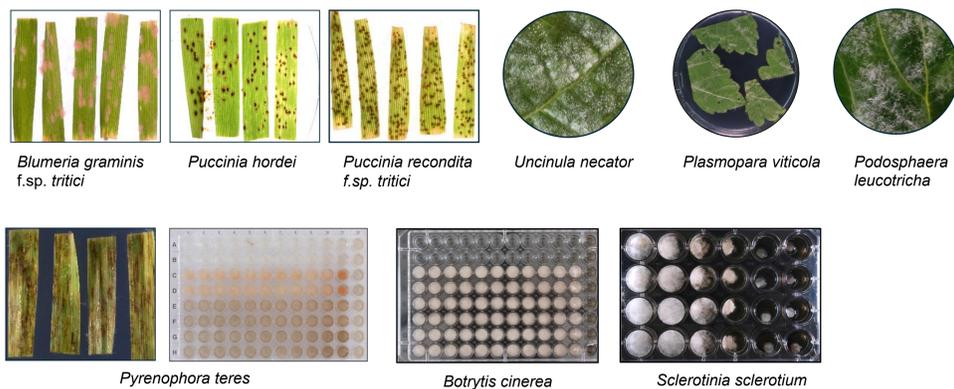
# STANDARDISED METHODS TO SCREEN THE EFFICACY OF A NOVEL BIOLOGICAL CONTROL FUNGICIDE AGAINST FUNGAL PATHOGENS *IN VIVO* AND *IN VITRO*

Faten Mansouri, Carlos Agius, Stefano Nadalini, and Gijs Manneveld

## Introduction

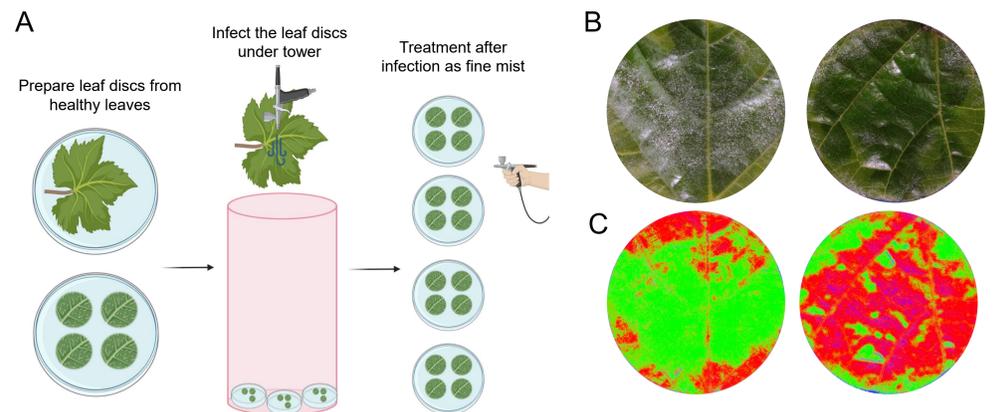
Plant pathogens cause great losses to agricultural production with important economic and environmental impact. Chemical fungicides have been largely used in crop protection to combat and reduce the damage caused by pathogens. However, concerns raised towards the reduction of the use of these conventional crop protection methods due to long-term risks on human and animal health and their impact on the environment (Lahlali et al., 2022). As a result, biological control is a promising alternative to conventional disease management; a wide range of biocontrol agents and products derived from natural plant extracts have been developed and studied by researchers to contain fungal and bacterial diseases (Bonaterra et al., 2022). In this context, effective, fast, accurate, repeatable and cheap screening methods of biological control products have become an important tool in plant pathology. In this study, we present standardised *in vitro* and *in vivo* tests for screening a potential biological plant protection product against multiple fungal pathogens. These standardised tests will help expedite the development of the biological product and help understanding its mode of action while potentially setting a benchmark in fungicide resistance monitoring for biological fungicides.

## Pathogens tested



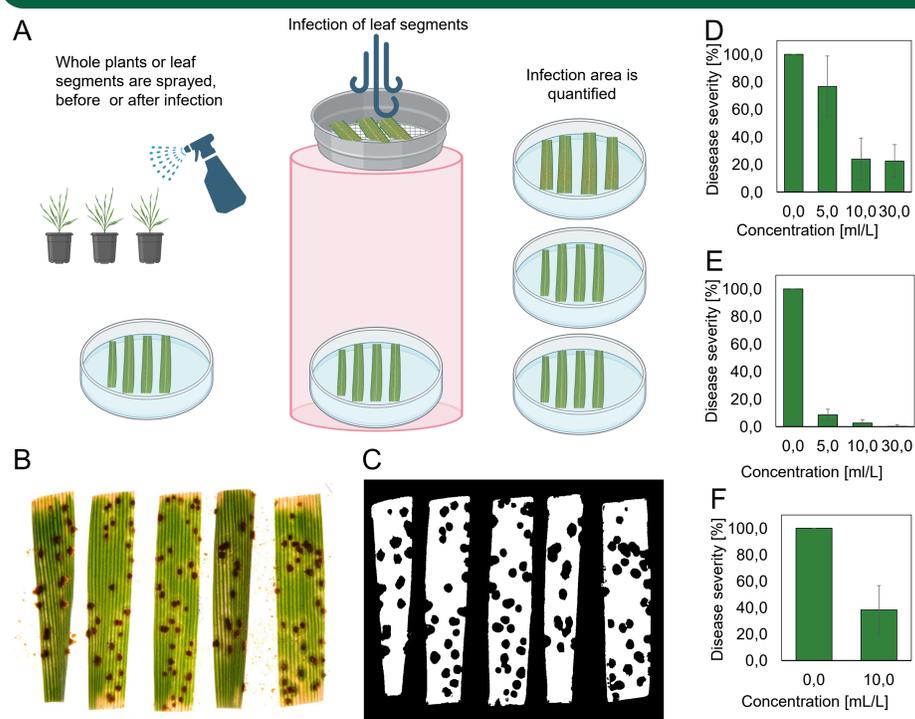
(A) Illustration showing the pathogens tested and the assay (*in vivo* and *in vitro*) against the plant extract.

## Grape powdery mildew



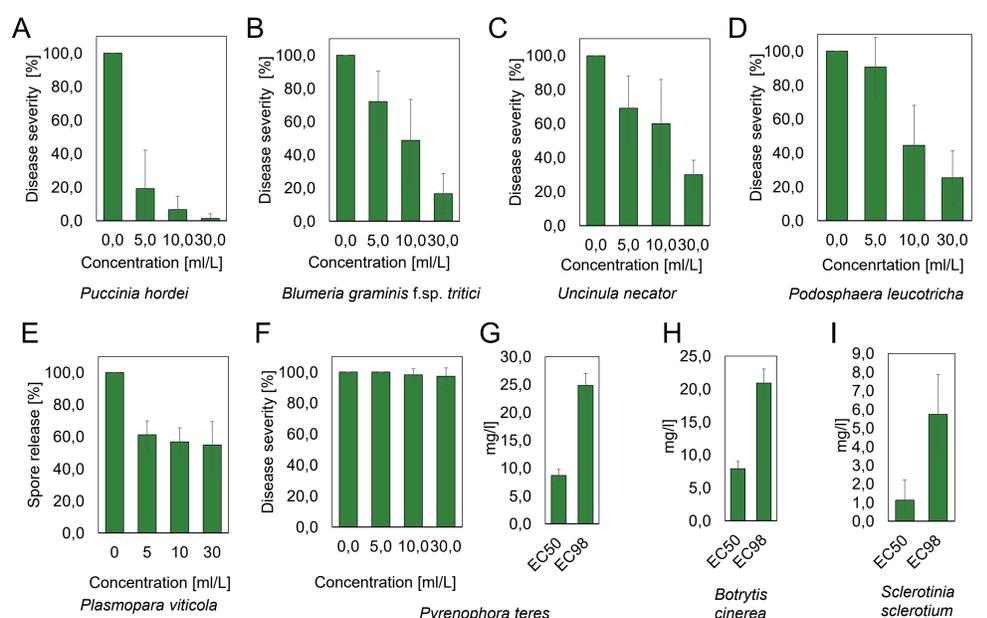
(A) Illustration showing the method for grape powdery mildew infection and fungicide treatment. (B) Photograph of grape leaf discs after infection with grape powdery mildew. (C) Infection area calculation, upper pane shows images before pixel segmentation, lower images show detection of powdery mildew (green) and not infected area (red).

## Wheat brown rust



(A) Illustration showing the assay for wheat brown rust and fungicide treatment. (B) Photograph of wheat leaf segments infected with brown rust. (C) Infection area calculation, brown rust postules (black) and not infected area (white). (D-F) Example bar chart showing the effect of a plant extract against wheat brown rust and the effect of fungicide application timing on infection reduction. Treatment before infection (D), after infection (E) and before and after infection (F)

## Results



The efficacy of the plant extract when treated against (A) *Puccinia hordei*, after infection, leaf segment assay. (B) *Blumeria graminis* f.sp. *tritici*, after infection, leaf segment assay. (C) *Uncinula necator*, after infection, leaf segment assay. (D) *Podosphaera leucotricha*, after infection, leaf segment assay. (E) *Plasmopara viticola*, spore release assay. (F) *Pyrenophora teres*, after infection, leaf segment assay. (G) *Pyrenophora teres*, microtitre, *in vitro*. (H) *Botrytis cinerea*, microtitre, *in vitro*. (I) *Sclerotinia sclerotium*, *in vitro*

## References

- Lahlali, R., Ezrari, S., Radouane, N., Kenfaoui, J., Esmael, Q., El Hamss, H., Belabess, Z., & Barka, E. A. (2022). Biological Control of Plant Pathogens: A Global Perspective. *Microorganisms*, 10(3), 596. <https://doi.org/10.3390/microorganisms10030596>
- Bonaterra, A., Badosa, E., Daranas, N., Francés, J., Roselló, G., & Montesinos, E. (2022). Bacteria as biological control agents of plant diseases. *Microorganisms*, 10(9), 1759. <https://doi.org/10.3390/microorganisms10091759>.

\*EpiLogic GmbH, Hohenbachernstr. 19 – 21, 85354 Freising, Germany - +49 8161499080 - [info-epilogic@epilogic.de](mailto:info-epilogic@epilogic.de)

EPILOGIC®

A Tentamus Company