

Assessment of Entomopathogenic Fungi (EPF) as a biocontrol agent against green leafhopper in Douro vineyards

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INTRODUCTION

The green leafhopper (*Hemiptera: Cicadellidae*) is a major pest in Portuguese vineyards, causing significant damage by feeding on vine foliage and reducing plant vigor and productivity [1,2]. To mitigate the environmental and resistance risks associated with chemical insecticides, this study aimed to evaluate the pathogenic potential of four EPF strains: *Metarhizium robertsii* (M1 and M2) and *Beauveria bassiana* (B1 and B2) against green leafhopper.

MATERIALS AND METHODS

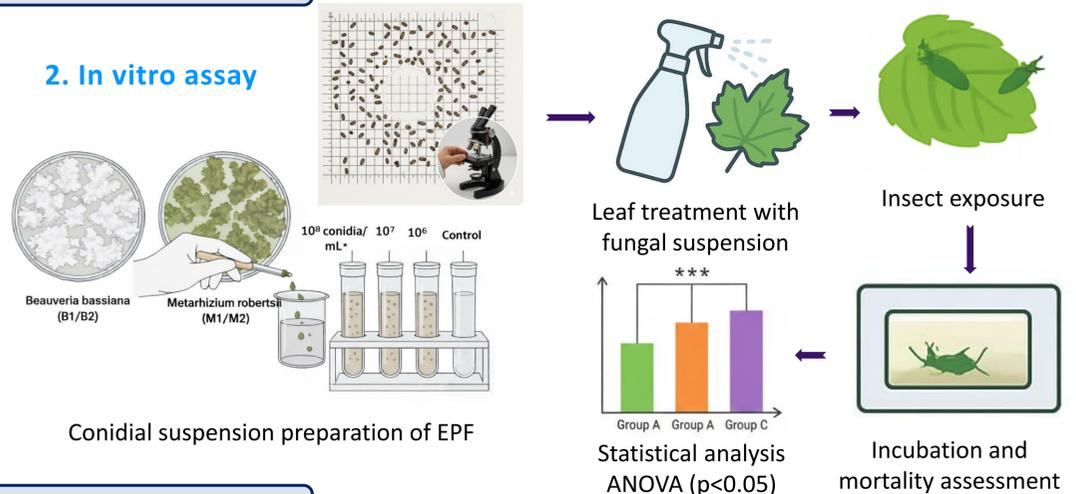
1. EPF strain selection

⇒ The EPF strains (M1, M2, B1, B2) used in this study were previously isolated from vineyard soils in the Douro region using the insect-bait technique with *Tenebrio molitor* larvae.

⇒ The strains were identified based on morphological characteristics and molecular sequencing of the ITS region and the TEF1 gene.



2. In vitro assay



RESULTS

1. Pathogenesis and infection cycle of *M. robertsii* and *B. bassiana*

⇒ Under laboratory conditions after fungal treatment green leafhoppers effectively established the fungal colonization and sporulation (Figure 1)

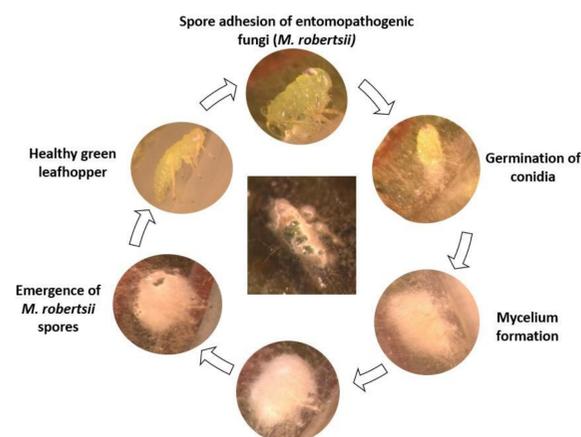


Figure 1. Infection process of entomopathogenic fungi (*M. robertsii*) on green leafhopper

2. Pathogenicity of *M. robertsii* and *B. bassiana*

⇒ *Metarhizium* and *Beauveria* strains were virulent to green leafhoppers, and their virulence varied significantly among days.

⇒ M2 exhibited the highest mortality (63%) by day 1, which reached peak mortality of approximately (96%) by day 3 at a concentration of 10^8 conidia mL^{-1} (Figure 2a).

⇒ B2 exhibited initial mortality of (39%) by day 1, which achieved peak mortality of (80%) by day 3 at a concentration of 10^6 conidia mL^{-1} (Figure 2b)

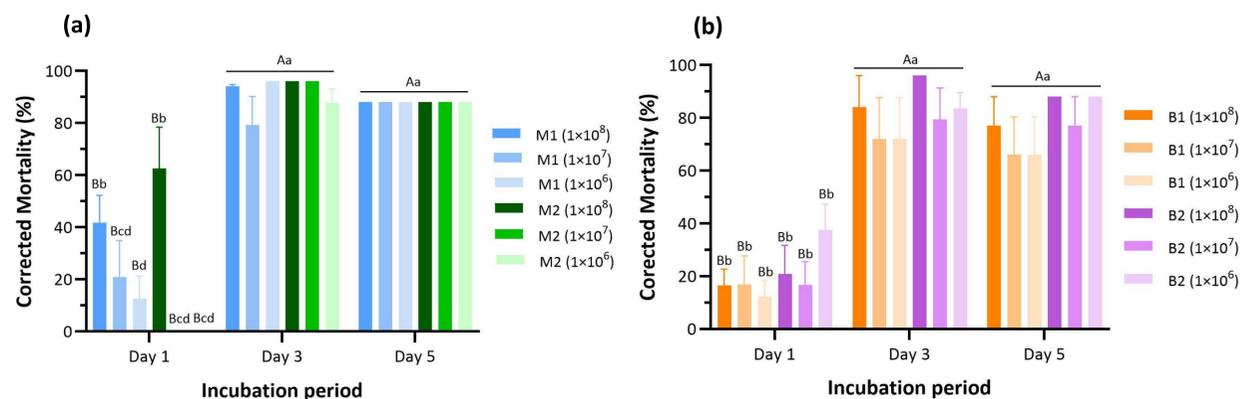


Figure 2. Corrected mortality (%) of green leafhoppers with M1, M2 (a), B1, B2 (b). Values represent mean \pm SE. Different uppercase letters (A, B) indicate significant differences over time for a specific treatment ($P < 0.05$). Different lowercase letters (a, b) indicate significant differences between strains and concentrations within the same day ($P < 0.05$)

3. Mean lethal time (LT50) of *M. robertsii* and *B. bassiana*

Table 1. Mean lethal time (LT50) of *Metarhizium* (M1, M2) and *Beauveria* (B1, B2) at three different concentrations against green leafhoppers under Laboratory conditions

Strain	Concentration (Conidia mL^{-1})	LT50 (Days)	Slope (m)	Y intercept (c)	Linear Equation
M1	10^8	0.86	65.36	54.32	$y = 65.36x + 54.32$
	10^7	1.63	98.79	29.09	$y = 98.79x + 29.09$
	10^6	1.90	123.0	15.70	$y = 123.0x + 15.70$
M2	10^8	0.21	34.33	73.42	$y = 34.33x + 73.42$
	10^7	1.71	124.3	21.04	$y = 124.3x + 21.04$
	10^6	2.04	135.2	8.176	$y = 135.2x + 8.176$
B1	10^8	1.53	82.16	34.94	$y = 82.16x + 34.94$
	10^7	2.56	84.15	15.58	$y = 84.15x + 15.58$
	10^6	2.74	93.27	9.238	$y = 93.27x + 9.238$
B2	10^8	1.66	106.9	26.58	$y = 106.9x + 26.58$
	10^7	2.20	101.5	15.19	$y = 101.5x + 15.19$
	10^6	1.46	83.25	36.43	$y = 83.25x + 36.43$

CONCLUSION

⇒ Based on the corrected mortality and LT50 values, **M2** at (10^8 conidia mL^{-1}) and **B2** (10^6 conidia mL^{-1}) are the most effective candidates for the biological control of green leafhoppers.

⇒ They can offer a safe alternative to chemical insecticides and should be incorporated into Integrated Pest Management (IPM) programs.

REFERENCES



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