

Evaluation of Biological Activity of *Pyricularia* Cell-free Filtrates for Applications as Biocontrol Agents

Jetsadapon Thaworn* and Boonsom Bussaban

Department of Biology, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

*E-mail: jetsadapon_thaworn@cmu.ac.th

Abstract

This study aims to evaluate the efficacy of cell-free filtrates (CFFs) from *Pyricularia* on the germination of selected weeds and rices. Two strains of *Pyricularia* isolated from grass, were cultured in potato dextrose broth (PDB) and a modified half-strength PDB medium supplemented with potato powder and sodium nitrate (PP). The fungal cultures were incubated on an orbital shaker at room temperature (25–30°C) for 7 days. Subsequently, a 5 mL aliquot was transferred into a 1 L Erlenmeyer flask containing 500 mL of the same culture medium. The first flask was incubated for an additional 7 days, while the second flask was incubated for 14 days. The cultures were then filtered to separate the fungal mycelia from the culture filtrates. The obtained CFFs were tested for their effects on the seed germination of four plant species: *Bidens pilosa* L. (beggarticks), *Chrysopogon orientalis* (giant spear grass), Jasmine rice, and Sanpatong rice, using a modified between-paper method. It was hypothesized that the cell-free culture filtrates would inhibit the germination of weed seeds while having minimal impact on rice seed germination. Furthermore, the CFFs were evaluated for their antimicrobial efficacy against five phytopathogenic fungal isolates, including the two *Pyricularia* isolates used in this study, *Colletotrichum* sp., *Collophorina* sp., and *Gonatophragmium* sp., using the agar well diffusion method. It was anticipated that the CFFs would exhibit inhibitory effects on the growth of certain fungal pathogens.

Introduction

Weed infestation is a major obstacle to agricultural crop production worldwide. While synthetic chemical herbicides provide rapid and effective weed control, they also pose significant environmental risks, including contamination of soil, water, and air. The use of chemical pesticides also affects the health of farmers, consumers, and various other living organisms. Consequently, there has been a growing emphasis on developing more environmentally friendly pest control methods.

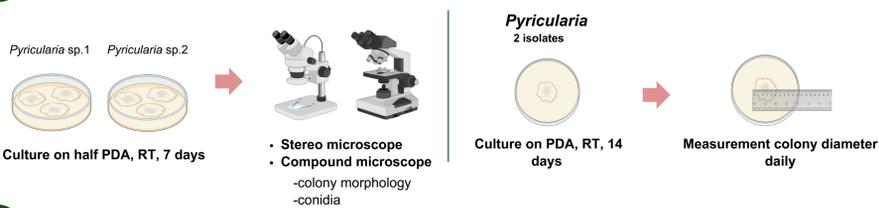
The fungus *Pyricularia* is a major causal agent of blast disease in various plants, particularly rice, leading to significant agricultural yield losses. Understanding the pathogenic mechanisms of this fungus is crucial for developing effective disease control strategies. In the context of microbiology, CFFs refer to the liquid fraction obtained after filtering or centrifuging a microbial culture to remove all cells and cellular components. This filtrate still contains bioactive compounds produced by microorganisms during their growth or interactions with the environment.

Objectives

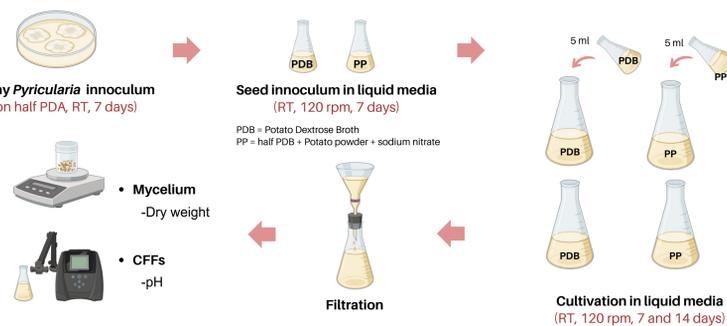
- To examine the effects of CFFs from *Pyricularia* on the germination of selected weeds and rices species.
- To evaluate the efficacy of CFFs from *Pyricularia* in controlling the growth of phytopathogens.

Materials and method

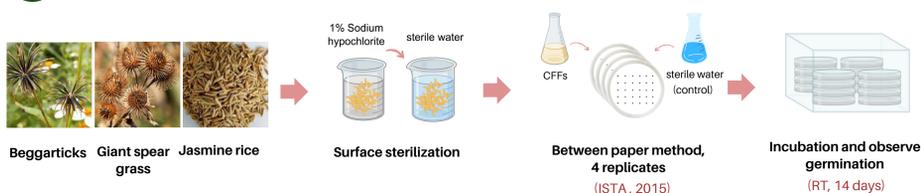
01 Morphology and growth studies of *Pyricularia*



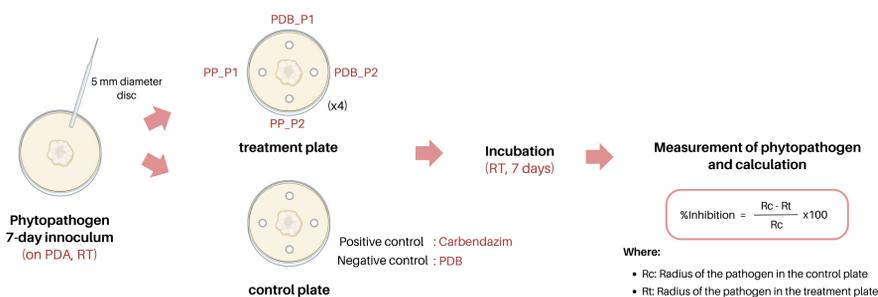
02 *Pyricularia* CFFs preparation



03 Effects of *Pyricularia* CFFs on germination of weeds and rices



04 Antifungal activity of *Pyricularia* CFFs on phytopathogens



Results

Morphology and growth of *Pyricularia*

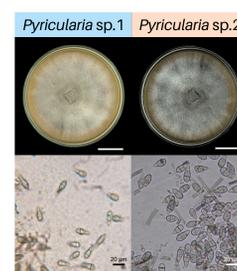


Figure 1 Morphology of *Pyricularia* on PDA for 7 days

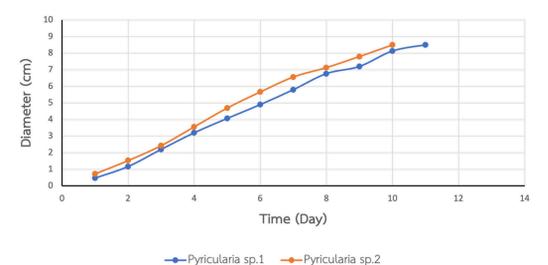


Figure 2 Growth of *Pyricularia* on PDA, RT

Effects of *Pyricularia* CFFs on germination of weeds and rice

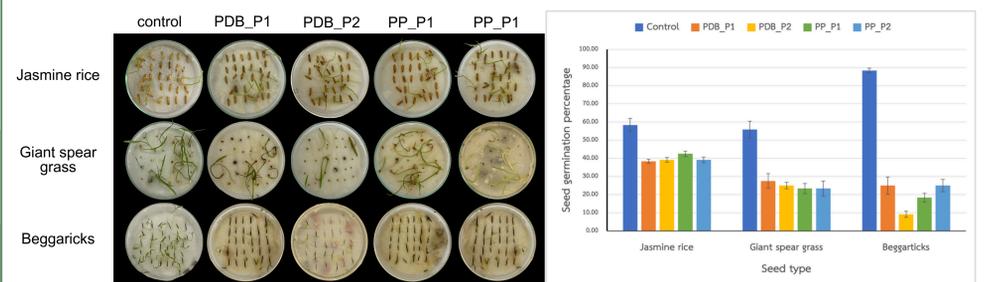


Figure 3 Germination test of seeds treated with 7-day *Pyricularia* CFFs.

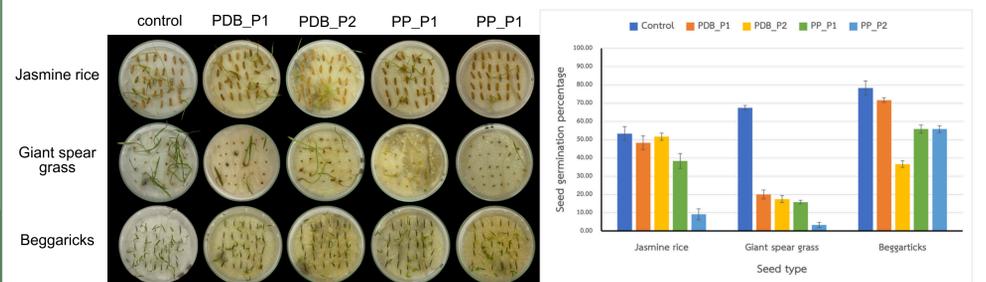


Figure 4 Germination test of seeds treated with 14-day *Pyricularia* CFFs.

Conclusion

- CFFs from *Pyricularia* reduced the seed germination rate in all tested groups.
- CFFs from PP medium exhibited a stronger inhibitory effect on seed germination compared to those from PDB medium. The percentage of seed germination in groups treated with CFFs from PP medium tended to decrease.

Acknowledgement

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References

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- Zorrilla, J. G., Masi, M., Clement, S., Cimmino, A., & Meyer, S. (2023). Production of (10S,11S)-(–)-*epi*-pyriculol and Its HPLC quantification in liquid cultures of *Pyricularia grisea*, a potential mycoherbicide for the control of buffelgrass (*Cenchrus ciliaris*). *Journal of Fungi*, 9(3), 316.