

## 学業及び研究等の進捗状況等報告書

## Report of Research Progress and Future Research Plan

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## 1. 研究テーマ名 Research proposal

Isoprothiolane resistance in the rice blast fungus in Indonesia: Field survey of its impact and molecular analysis of the mutations

## 2. 研究等の進捗状況等 Research progress, etc.

研究の概要、独創性、状況等を含めて具体的に記入のこと。

※研究成果の発表・公表実績がある場合については学会名、掲載紙等の情報を含め詳細を記載すること

In detail, including the outline, originality and so on.

 1) Summary of 3<sup>rd</sup> year research result

*Magnaporthe oryzae* isoprothiolane resistance-related (*MoIRR*) and *Magnaporthe oryzae* Velvet Family B (*MoVelB*) have been identified as responsible genes for the resistance of lab-generated mutants of rice blast fungus, *Pyricularia oryzae* (syn. *Magnaporthe oryzae*), to isoprothiolane (IPT) fungicide. 14 field isolates from a blast endemic area in West Java, Indonesia were tested, and isolates 1-6 were identified as mutant candidates based on their capacity to grow on media amended with 10-fold higher concentrations. Mutant isolates 1, 4, and 6 exhibit a single base shift and insertion, leading to amino acid alteration at the *MoIRR* gene. Mutant isolate 2 possesses an insertion at the *MoVelB*

gene leading to amino acid changes followed by a stop codon. These mechanisms are in different sites from those previously reported lab-generated mutants explaining *P. oryzae* has multiple mutation mechanisms in response to IPT. Meanwhile, no mutations were identified for isolates 3 and 5 suggesting other undiscovered genes involved in achieving the resistance in these two isolates. This is the first report on the natural mutations of isoprothiolane resistance in *P. oryzae* from Indonesia. The discovery of an *in vitro* mutant from a Japanese isolate (SectorIna) with resistance to IPT but no mutation at either *MoIRR* or *MoVelB* genes necessitated research to investigate other genes responsible for IPT resistance. SectorIna exhibiting fitness penalty in challenging environments (poor nutrients medium or IPT exposure). The behavior and performance of both field and *in vitro* mutants could be considered in redesigning fungicide application tactics for long-term blast disease management.

## 2) Presentation

The 6<sup>th</sup> International Rice Congress, Manila, Philippines October 16-19, 2023

## 3) Wandervogel Study VI

Bogor Agricultural University (IPB University), Indonesia, November 2-29

## 4) Thesis Defense

August 7, 2024

## 5) Publications

- Khairani HS, Abe A, Sone T. 2024. Rice blast field assessment in three regencies underlies the importance of fungicide resistance study in West Java, Indonesia. *Indonesian J Phytopathol.* 20(4):165-173. DOI: <https://doi.org/10.14692/jfi.20.4.165-173>
- The 2<sup>nd</sup> manuscript is being considered to feature in the Journal of General Plant Pathology

## 3. 今後の研究計画等 Future research plan

現在までの進捗状況等を踏まえ、今後の研究発表等を含めて具体的に記入のこと。

I'll be returning to Indonesia and planning to:

- Present my Ph.D. thesis result at The 3<sup>rd</sup> Southeast Asia Plant Protection Conference (SEAPPRO), Bogor, Indonesia, November 1-2 (2024)
- Preparing the documents to proceed with the assistant professorship (2025)
- Continue the research on fungicide resistance in plant pathogens and start the research on the emergence of phytoparasitic algae (*Cephaleuros* spp) in Indonesia (2025)
- Find some opportunities to do postdoctoral research (2030)