

Plant growth-promoting abilities and biocontrol efficacy of *Streptomyces* sp. UPMRS4 against *Pyricularia oryzae*

ABSTRACT

The *Streptomyces* strain UPMRS4 was selected as a potential biocontrol agent for rice blast disease based on its strong antagonistic activity against *Pyricularia oryzae* strain UPMPo in vitro. It was further identified as a novel *Streptomyces* sp. through 16S ribosomal DNA sequence analysis. Biochemical characterization indicated that UPMRS4 was positive for ammonia, urea and siderophore production, as well as amylase, protease and lipase enzymatic tests. Treatment with UPMRS4 was able to reduce 67.9% of disease severity compared with other treatments and able to increase shoot height (15.13%), shoot dry weight (45.75%), leaf surface area (44.6%), root length (48.93), root dry weight (63.25%), number of tillers (42.26%), yield (36.96%), panicle length (15.4%) and the number of spikelet/panicles (29.39%) compared to the control plants at three months after inoculation. The transcript level of chitinase (Cht-1), glucanase (Gns1), pathogenesis-related gene (OsPR1a) and salicylic acid-responsive gene (Oswrky45) were up-regulated during early rice-UPMRS4 interactions. These results suggest that UPMRS4 is a very promising antagonist candidate against *P. oryzae* which could be developed for sustainable rice blast disease management. To our best knowledge, this is the first study related to the effects of an actinomycete on rice blast disease and plant growth in Malaysia.

Keyword: Rice blast; *Streptomyces*; Gene expression; Chitinase; Glucanase