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In vitro antagonism of *Phytophthora capsici* and *Fusarium solani* by bacterial isolates from Sarawak

Mohd Farith Kota*, Awang Ahmad Sallehin Awang Husaini, Samuel Lihan, Mohd Hasnain Md. Hussain and Hairul Azman Roslan

Department of Molecular Biology, Faculty of Resource Science and Technology,
Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia.
*Email: farith@live.com.my

ABSTRACT

Aims: *Phytophthora capsici* and *Fusarium solani* are common fungal pathogens causing severe diseases that lead to economic loss in pepper industry, especially in Sarawak. In response to the infections, chemical approach is more common; nevertheless, biological control is more favorable to control fungal pathogens. Biological control approach greatly reduces the problems associated with chemical applications and it restores balance of the natural environment. Here we present the ongoing work to study the action of antagonistic bacteria, *Bacillus* sp. and *Pseudomonas* sp., that produce volatile and non-volatile antifungal compounds against *P. capsici* and *F. solani* on pepper plants.
Methodology and results: A total of seven bacterial candidates were isolated from different locations and tested for their antagonistic properties against *P. capsici* and *F. solani* in a dual culture assay and extracellular metabolite test. Extracellular hydrolytic enzymes production was also monitored and followed by genotypic indentification. Preliminary antagonism tests indicated that bacterial isolate Pep3 and Pep4 inhibit up to 50% of the growth of *P. capsici* and *F. solani* as compared to the control. Subsequent investigation on extracellular hydrolytic enzyme production revealed that both bacterial isolates are capable of secreting hydrolytic enzymes. Microscopic and genotypic analyses identified the bacterial isolates Pep3 as *Bacillus amyloliquefaciens* (KJ461444) and Pep4 as *Pseudomonas pachastrellae* (KM460937).
Conclusion, significance and impact of study: *B. Amyloliquefaciens* (KJ461444) and *P. pachastrellae* (KM460937) inhibited the growth of *P. capsici* and *F. solani* thus reflecting the potential of the produced metabolites to be purified and used in combating plant pathogenic fungi.

Keywords: antagonism, *Fusarium solani*, *Phytophthora capsici*

INTRODUCTION

Piper nigrum, or generally known as pepper, is one of the major export products from Sarawak and mainly used as a spice and flavoring ingredient in food. According to the report published by the State Planning Unit, Chief Minister's Department of Sarawak, a total of 24, 000 tonnes of pepper (white and black) was produced from 14,000 hectares of planted area. Even with the large pepper production, the pepper plantations/farmers are continuously faced with the threat of infections from pathogens. *Phytophthora capsici* and *Fusarium solani* are common fungal pathogens that cause severe infections leading to economic loss in the pepper industry. Infection by *P. capsici* in the nursery may result in either wilting of the pepper cuttings or rotting of tender leaves, and *F. solani* causes yellow disease on pepper. To control these pathogens, farmers opted for chemical based fungicides as they are effective despite of the high price. Continuous application of chemical products and improper disposal of them has become a threat to human health. Biological control methods have emerged as an important alternative in managing soil borne plant diseases in recent years with the added advantage of being more environmental friendly. Therefore, this research was initiated to identify and characterize suitable biological control agent/s to be used in controlling pathogenic fungus.

MATERIALS AND METHODS

Preparation of inoculums

Plant pathogenic fungi, *P. capsici* and *F. solani,* were obtained from Malaysian Pepper Board (MPB) and maintained on malt extract agar (MEA) plates at 28 °C for 7 days before being used as the working culture. Seven unidentified bacterial cultures, coded Pep1 to Pep7, isolated from various sources including soil and seawater, were used in this experiment. Working stock of each bacterial culture was prepared prior to usage by overnight incubation in Luria Bertani broth at 37 °C.

***Corresponding author**

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