ABSTRACT

RATDIANA. Screening and Characterization of Bacterial Antagonists as Potential Agents for the Biological Control of the Chrysanthemum White Rust Disease. Supervised by ARIS TRI WAHYUDI and GIYANTO

White rust disease caused by Puccinia horiana (Basidiomycetes: Uredinales) is the major problem on chrysanthemum plantation and caused yield lost until 100%. Biocontrol is an alternative way to control this disease. Therefore, the aims of this study are to obtain antagonist bacterial as biocontrol agents of chrysanthemum white rust disease, to identify the potential isolate and their biocontrol character, characterized their biocontrol mechanism, and to know the role of their chitinolytic activity on germination of teliospore. The methods used in this study are selection of antagonistic bacteria which are able to control this disease in-vitro, characterized of potential antagonist bacteria with polymerase chain reaction of a 16S rRNA gene and physiology and biochemical character, characterized the mechanism of inhibition teliospore germination, and the role of chitinolytic activity in antagonism activity using transposon mutagenesis. The result showed that out of 29 bacterial isolates, 12 isolates had chitinolytic activity. The twelve isolates were the potential antagonist agents to control teliospore germination with percentage above 90%. Isolate K2 was the most potential antagonist bacteria to control this disease. This isolate could inhibit the germination up to 98% and had the highest chitinolytic activity among the isolates. Based on 16S rRNA gene partial sequences analysis and physiology and biochemical characters, this isolate was identified as Chromobacterium sp. The major mechanism was antibiosis. It is showed from the biocontrol activity which are bacteria’s cell colonization, lytic activity, and disintegrated of protoplasm. This bacteria produced cyanide acid (HCN) and phenazine beside chitinolytic enzyme. Chitinolytic activity was not a single factor in the mechanism of antibiosis but other secondary metabolic compounds produced by this bacteria also come into play. It is showed on the results of mutagenesis that transconjugants which had no chitinolytic activity was still able to inhibit germination of teliospora, whereas transconjugants which still had an activity equal to or smaller than wild type bacteria, the inhibitory were lower. It was indicated that chitinase was not the most important compound that inhibited the germination of teliospore. There was another compound have the bigger role such as hydrogen cyanide, phenazine, or other substances produced by Chromobacterium sp..

Keyword: Chrysanthemum white rust disease, biocontrol mechanism, Chromobacterium sp.