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ORIGINAL PAPER

Sclerotia degradation by *Trichoderma*-mycoparasitic; an effective and sustainable trend in the drop lettuce disease control caused by *Sclerotinia sclerotiorum*

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Abstract

Controlling the hazard of sclerotia produced by the *Sclerotinia sclerotiorum* is very complex, and it is urgent to adopt an effective method that is harmonious environmentally to control the disease. Among the six isolates isolated from the rhizosphere of lettuce, the isolate HZA84 demonstrated a high activity in its antagonism towards *Sclerotinia sclerotiorum* in vitro, and produces siderophore. By amplification of internal transcribed spacer (ITS), translation elongation factor 1-alpha (*TEF1-α*), and RNA polymerase II subunit (*RPB2*) genes, the isolate HZA84 was identified as *Trichoderma asperellum*, which was confirmed by analysis of phylogenetic tree. The Scanning electron microscope monitoring detected that the isolate HZA84 spread over the sclerotial surface, thus, damaging, decomposing, and distorting the globular cells of the outer cortex of the sclerotia. The Real-time polymerase chain reaction (RT-qPCR) analysis disclosed the overexpression of two genes (*chit33* and *chit37*) encoding the endochitinase in addition to one gene (*prb1*) encoding the proteinase during 4 and 8 days of the parasitism behavior of isolate HZA84 on the sclerotia surface. These enzymes aligned together in the sclerotia destruction by hyperparasitism. On the other hand, the pots trial revealed that spraying of isolate HZA84 reduced the drop disease symptoms of lettuce. The disease severity was decreased by 19.33 and the biocontrol efficiency was increased by 80.67% within the fourth week of inoculation. These findings magnify the unique role of *Trichoderma* in disrupting the development of plant diseases in sustainable ways.

Keywords *Trichoderma asperellum* · Mycoparasitic · RT-qPCR · Sclerotia · Sustainable

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