
Potential of *Trichoderma asperellum* as a bio-control agent against citrus diseases caused by *Penicillium digitatum* and *Colletotrichum gloeosporioides*

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Vu, T. X., Soyotong, K., Tran, T. B., Hoang, C. Q., Nguyen, H. T., Do, L. M., Dinh, M. T., Thai, D. H. and Tran, T. V. (2021). Potential of *Trichoderma asperellum* as a bio-control agent against citrus diseases caused by *Penicillium digitatum* and *Colletotrichum gloeosporioides*. International Journal of Agricultural Technology 17(5):xxx-xxx

Abstract *Colletotrichum gloeosporioides* is the main cause of citrus post-bloom and pre-harvest fruit drops, resulting in up to 65% and 22% of citrus crop loss, respectively, while *Penicillium digitatum* primarily causes green mold on postharvest citrus fruits accounting for 90% of total citrus fruit loss due to postharvest decay. Biocontrol agents are considered as eco-friendly and bio-safe alternatives of fungicides, and hence, being actively seeking. Previously, several *T. asperellum* strains have been demonstrated to be effectively inhibit either *P. digitatum* or *C. gloeosporioides* growths. We, therefore, wondered whether our *Trichoderma* isolates could simultaneously inactivate *P. digitatum* and *C. gloeosporioides* *in vitro* and protect citrus crops from green mold and anthracnose. Here, we defined three *T. asperellum* strains, which inhibited *P. digitatum* and *C. gloeosporioides* extension by around 99% and 77%, respectively. Single factor experiments showed that a medium containing 2% of sucrose and 1% of peptone on rice husks cultivated at 28°C for 15 days was the best condition for these strains to produce conidia. Additionally, supplement of conidial suspension with 10% glycerol, 0.2% CMC, and 0.3% Tween 80 preserved spore viability by 80% after 2 months of storage. The development of citrus green mold and anthracnose was also inhibited in the presence of *T. asperellum* formulated conidia. Overall, these data indicated a potential application of the formulated conidia as a biocontrol agent in preventing citrus crop loss caused by both preharvest and postharvest diseases.

Keywords: Anthracnose, Bio-control, *Colletotrichum gloeosporioides*, Green mold, *Penicillium digitatum*, *Trichoderma asperellum*.

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