

Pengujian kemampuan antagonistik khamir *Rhodotorula* spp. asal kebun raya Cibodas dan potensi *Rhodotorula* sp. UICC Y-381 sebagai agen biokontrol *Aspergillus ochraceus* pada tomat pascapanen = Study on the antagonistic ability of *Rhodotorula* spp. of Cibodas botanical Garden and the potential of *Rhodotorula* spp. UICC Y-381 as a biocontrol agent of *Aspergillus ochraceus* on postharvest tomatoes

Anggita Rahmi Hafsari, author

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Abstrak

ABSTRACT

Biological control of postharvest diseases of fruits and vegetables by antagonistic microorganism seems increasingly promising to replace the use of synthetic fungicides which are subjected to some limitation due to development of fungicides-resistant strain of the pathogens and risk for consumers and the environment (Lima et al, 1999). Several species of yeast have been reported to reduce postharvest fungal decay on fruits. One of the antagonistic yeast that has been use as commercial biocontrol is *Metchnikowia fructicola* in Sherm product (Vero et al., 2002) Yeast *Rhodotorula* has been studied for the postharvest biological control various mould pathogens on various fruit (Castoria et al., 1997). University of Indonesia Culture Collection (UICC) have *Rhodotorula* spp. strains from plants of Cibodas Botanical Garden, and moulds from postharvest decayed-tomatoes and plants. The ability of these yeast strains as biocontrol agents against has not been reported.

This thesis consists of two parts. Part 1 is entitled The antagonistic Activity of *Rhodotorula* spp. from Cibodas Botanical Garden Against Tomato Plant Infected-Causing Moulds. Part 2 is entitled The Potential of *Rhodotorula* sp. UICC Y-381 as Biocontrol Agent of *Aspergillus ochraceus* on Postharvest Tomatoes. The objectives of this research are to obtain a potential *Rhodotorula* sp. with antagonistic activity against tomato infected-causing moulds, and to obtain information on the ability of *Rhodotorula* sp. UICC Y-381 as a biocontrol agent in reducing the severity of decay by *Aspergillus ochraceus*. The research was carried out in Laboratory of Microbiology, Department of Biology, and Center of Excellence Indigenous Biological Resources-Genome Studies (CoE IBR-GS), Faculty of Mathematics and Natural Sciences, from July 2008-July 2009.

Yeast Malt Agar (YMA) was used for yeast growth medium, and Potato Dextrose Agar (PDA) was used for maintenance of fungi. The media PDA and Potato Dextrose Agar (PDB) were used for antagonistic test.

Six strains of *Rhodotorula* spp. (*Rhodotorula* sp. UICC Y-318, *Rhodotorula* sp. UICC Y-325, *Rhodotorula* sp. UICC Y-332, *Rhodotorula* sp. UICC Y-381, *Rhodotorula* sp. UICC Y-384, and *Rhodotorula* sp. UICC Y-386) were investigated as antagonistic yeasts against *Aspergillus ochraceus* D1.2.2.SSM3, *A. terreus* D2.2.MC, and *Drechslera* sp. D1.3.MC. The yeasts were obtained from plants of Cibodas Botanical Garden, and the moulds were obtained from decayed tomatoes and infected plants, belonging to the University of Indonesia Culture Collection (UICC). Antagonistic test

by strip method was carried out by using concentration of yeast cells at $(1.2-5.2) \times 10^6$ CFU/ml, and *A. ochraceus* D1.2.2.SSM3 at 4.7×10^7 CFU/ml, *A. terreus* D2.2.Mc at 3.2×10^6 CFU/ml, and *Drechslera* sp. D1.3.MC at 5.2×10^7 CFU/ml. Inoculation of the yeast cells on PDA was carried out 4 hours earlier before inoculation of mould spores on petri dishes. Results showed that highest percentage reduction of mould colonies was shown by *Rhodotorula* sp. UICC Y-325 against *Drechslera* sp. (28.12%-72.14%), followed by *Rhodotorufa* sp. UICC Y-381 against *A. ochraeus* (54.28%-72.46%), and *Rhodotoruta* sp. Y-318 against *A. terreus* (21.76% - 58.10%) during 6-day incubation. Antagonistic test by co-culture method was carried out by using concentration of yeast cells at $(1.58-5.59) \times 10^6$ CFU/ml, and *Aspergillus ochraceus* D1.2.2.SSM3 at 7×10^7 cFU/ml, *A. terreus* D2.2.MC at 1.5×10^7 CFU/ml. Inoculation of the yeast cells on PDB was carried out 8 hours earlier before inoculation of mould spores on broth medium. Results showed that highest percentage reduction of conidial heads and hyphal width was shown by *Rhodotorula* sp. UICC Y-381 against *A. ochraceus* (9.45% and 12.43%; 7.10% and 7.51 %, after 2- and 3-day incubation, respectively). *Rhodotorula* sp. UICC Y-332 reduced conidial heads of *A. terreus* (10.17% and 9.60% after 2- and 3-day incubation) but, was not able to reduce hyphal width of *A. terreus*. Microscopic observation by slide culture method on PDA showed that there was attachment of *Rhodotorula* spp. cells to the hyphae of *Drechslera* sp., however, *Rhodotorula* spp. UICC Y-386 attached more intensively and colonized the hyphae.

The ability of *Rhodotorula* sp. UICC Y-381, which was isolated from plant leaves, as a biocontrol agent against postharvest tomato fruit decay- causing mould *Aspergillus ochraceus* D1.2.2.SSM3 was evaluated. Observation was carried out for 15 days at 25°C - 27°C. Results showed that *Rhodotorula* sp. UICC Y-381 was able to reduce the severity of decay by *A.ochraceus* with 100% reduction until day-12, when compared to control. The synthetic fungicide Dithane M-45 at a concentration of 0.08% reduced the severity of decay to 100% until 15-day incubation.