UNIVERSITI TEKNOLOGI MARA

Trichoderma asperellum AS BIOLOGICAL CONTROL AGENT FOR CONTROLLING BLACK ROT DISEASE OF PINEAPPLE VAR. MD2 IN MALAYSIA

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MSc

November 2021

AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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Date	:	November 2021

ABSTRACT

Malaysia has been on the list of the top 20 pineapple producing countries in the world. The success of MD2 variety in meeting the high demand in local and international markets has hastened the government to focus on fresh fruits production. However, postharvest losses of fresh fruits are common problems in developing countries, including Malaysia. One of several factors that contribute to the postharvest losses of fresh fruits is pathological disorders caused by pathogenic microorganisms. Black rot disease of pineapple is a postharvest disease caused by a facultative parasitic fungus known as *Ceratocystis paradoxa* (Dade) C. Moreau. This pathogen could tremendously shorten the shelf-life of MD2 pineapple during transportation and storage by making the flesh disintegrated, watery rot and eventually causing severe damage. To date, the role of chemical pesticides in controlling postharvest disease has been the subject of controversial debate. In this study, biological control agent plays a major role as a promising alternative method to control black rot disease of pineapple. A total of 17 isolates consisted of 13 different isolates of fungi, and four different isolates of bacteria were isolated from asymptomatic MD2 pineapple leaves and fruits. The antagonistic activities of 17 isolates against *C. paradoxa* were evaluated using a dual culture test. The most promising isolate with Percentage Inhibition of Radial Growth (PIRG) value of 97.5% was confirmed as *Trichoderma asperellum* (JX913783.1) using ITS rRNA gene. The assessment of disease severity index and disease progression analysis of MD2 pineapples were evaluated within ten days in the laboratory at room temperature, 25°C. After ten days, pineapples inoculated with *C. paradoxa* alone (positive control, T1) exhibited (100% severity index, 7.66 AUDPC units^2, and 0% disease reduction), pineapples dipped in sterile distilled water (control, T2) exhibited (0% severity index, 0 AUDPC units^2, and 100% disease reduction), pineapples dipped in 10^9 cfu/mL spore suspension of *T. asperellum* alone (negative control, T3) exhibited (0% severity index, 0 AUDPC units^2, and 100% disease reduction), pineapples inoculated with *C. paradoxa*, followed by dipping in 10^9 cfu/mL spore suspension of *T. asperellum* after 4 hours (curative, T4) exhibited (100% severity index, 6.22 AUDPC units^2, and 18.83% disease reduction) and pineapples dipped in 10^9 cfu/mL spore suspension of *T. asperellum*, followed by the inoculation of *C. paradoxa* after 4 hours (preventive, T5) exhibited (66.70% severity index, 4.56 AUDPC units^2, and 40.57% disease reduction). The findings revealed the application of 10^9 cfu/mL spore suspension of *T. asperellum* 4 hours prior to pathogen inoculation (T5) was effective in preventing black rot disease in MD2 pineapples. This suggested the application of biological control agents prior to disease infection increases its effectiveness against postharvest pathogen(s).

ACKNOWLEDGEMENT

Alhamdulillah. All praise to Allah for everything.

Dear my supervisor,
Ts. Dr Zaiton binti Sapak, thank you for being patient with my annoyance. I love you and hate you at the same time.

Dear my co-supervisor,
Dr Jamaliah binti Laham, thank you very much.

Dear true friends,
Matahari and Kupu-kupu, thank you for being with me at my worst time.
Dear Cairel, Fiq, Ina, Puteh and Gary...
You are always in my prayers and not forgetting, the imaginary friends. I am blessed.

Dear Encik Pie, thanks for the help during the lab work. I am thankful.

Lastly, it all started with the sperm and an ovum, good job dear parents and thank you to all my family members. I am grateful.

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