



UNIVERSITI PUTRA MALAYSIA

**ANTIFUNGAL ACTIVITIES OF SELECTED MEDICINAL PLANT
CRUDE EXTRACTS ON PATHOGENIC FUNGI, *Colletotrichum
capsici* AND *Colletotrichum gloeosporioides***

**LUCY JOHNNY
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Colletotrichum capsici AND *Colletotrichum gloeosporioides***

By

LUCY JOHNNY

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Chair: Professor Umi Kalsom Yusuf, PhD

Faculty: Science

The antifungal activities of the leaves extract of 15 selected medicinal plants; *Alpinia galanga* (L.) Willd., *Alstonia spatulata* Blume., *Annona muricata* L., *Blechnum orientale* L., *Blumea balsamifera* L., *Centella asiatica* L., *Dicranopteris linearis* (Burm. f.) Underw., *Dillenia suffruticosa* (Griff ex Hook.f. & Thomson) Martelli, *Litsea garciae* Vidal., *Melastoma malabathricum* L., *Momordica charantia* L., *Nephrolepis biserrata* (Sw.), *Pangium edule* Reinw., *Piper betle* L., and *Polygonum minus* Huds., were evaluated on plant pathogenic fungi; *C. capsici* and *C. gloeosporioides*. *C. capsici* was isolated from chili, and *C. gloeosporioides* was isolated from mango. Different antifungal assays were employed in this study viz Agar-disc dilution assay to determine the inhibition of radial growth, dry mycelial weight assay to determine the inhibition of aerial growth, determination of Minimum Inhibition Concentration (MIC), and the rate of sporulation assay. The antifungal assays were carried out in five different treatments; which were distilled water as negative control, crude extract of leaves in methanol, chloroform, acetone and Kocide 101 and Benomyl as positive control. Seven species namely *P. betle*, *A.*

galanga, *C. asiatica*, *M. charantia*, *B. balsamifera*, *P. minus*, and *D. suffruticosa* were effective in inhibiting the growth of *C. capsici* at various concentrations. The methanol, chloroform and acetone leaf crude extracts of *P. betle* in all concentration were found to be the most effective in inhibiting the radial growth, aerial growth, and sporulation of *C. capsici*. Overall, the methanol leaf crude extract of *P. betle* in 10 µg/mL showed the highest percentage in inhibiting the radial growth (85.25%), aerial growth (82.21%), and sporulation (80.93%) of *C. capsici*. The exact concentrations of *P. betle* that fully inhibited the growth of *C. capsici* (MICs) were 12.50 mg/mL in methanol, 17.50 mg/mL in chloroform, and 15.00 mg/mL in acetone. On the other hand, 4 species namely *A. galanga*, *P. betle*, *M. malabathricum*, and *B. balsamifera* were effective in inhibiting the growth of *C. gloeosporioides* at various concentrations. The methanol, chloroform and acetone leaf crude extracts of *A. galanga* in all concentration (except for 0.01 µg/mL of chloroform and acetone extracts) were found to be the most effective in inhibiting the radial growth, aerial growth, and sporulation of *C. gloeosporioides*. Overall, the methanol leaf crude extract of *A. galanga* in 10 µg/mL showed the highest percentage in inhibiting the radial growth (66.39%), aerial growth (68.21%), and sporulation (68.89%) of *C. gloeosporioides*. The exact concentrations of *A. galanga* that fully inhibited the growth of *C. gloeosporioides* (MICs) were 15.00 mg/mL in methanol, 17.50 mg/mL in chloroform, and 17.50 mg/mL in acetone. As a conclusion, the leaf crude extracts that exhibited effectiveness by showing more than 50% inhibition against *C. capsici* and *C. gloeosporioides* should be considered for further evaluation; with *P. betle* and *A. galanga* leaf crude extracts being the most effective in inhibiting the fungi respectively and thus, exhibited highest potential as new leading biofungicides in agriculture.

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AKTIVITI ANTIKULAT BAGI EKSTRAK TUMBUH-TUMBUHAN UBATAN TERPILIH KE ATAS KULAT PATOGEN, *Colletotrichum capsici* DAN *Colletotrichum gloeosporioides*

Oleh

LUCY JOHNNY

Mac 2011

Pengerusi: Profesor Umi Kalsom Yusuf, PhD

Fakulti: Sains

Aktiviti antifungal bagi ekstrak daun dari 15 spesies tumbuh-tumbuhan ubatan terpilih iaitu *Alpinia galanga* (L.) Willd., *Alstonia spatulata* Blume., *Annona muricata* L., *Blechnum orientale* L., *Blumea balsamifera* L., *Centella asiatica* L., *Dicranopteris linearis* (Burm. f.) Underw., *Dillenia suffruticosa* (Griff ex Hook.f. & Thomson) Martelli, *Litsea garciae* Vidal., *Melastoma malabathricum* L., *Momordica charantia* L., *Nephrolepis biserrata* (Sw.), *Pangium edule* Reinw., *Piper betle* L., dan *Polygonum minus* Huds., diuji ke atas kulat patogenik terhadap tumbuhan; *C. capsici* yang dipencilkan daripada cili dan *C. gloeosporioides* daripada mangga. Ujian antikulat yang berlainan diaplikasikan di dalam kajian ini iaitu ujian 'agar-disc dilution' sebagai ujian untuk menentukan perencatan pertumbuhan jejari, diikuti dengan ujian 'dry mycelial weight' untuk menentukan perencatan pertumbuhan secara aerial, penentuan 'Minimum Inhibition Concentration (MIC)', dan ujian sprorulasi. Ujian antikulat dilakukan ke atas lima set rawatan yang berbeza iaitu air suling sebagai kawalan negatif, ekstrak asli daun dalam metanol, kloroform, aseton dan Kocide 101 dan Benomyl sebagai kawalan positif. Tujuh spesies iaitu *P. betle*, *A.*

galanga, *C. asiatica*, *M. charantia*, *B. balsamifera*, *P. minus*, dan *D. suffruticosa* didapati berkesan dalam merencat pertumbuhan *C. capsici* pada pelbagai kepekatan. Ekstrak daun *P. betle* dalam metanol, kloroform, dan aseton pada semua kepekatan didapati berkesan dalam merencat pertumbuhan jejari, pertumbuhan aerial, dan sporulasi *C. capsici*. Secara keseluruhan, ekstrak metanol daun *P. betle* pada kepekatan 10 µg/mL telah menunjukkan perencatan tertinggi bagi pertumbuhan jejari (85.25%), pertumbuhan aerial (82.21%), dan sporulasi (80.93%) *C. capsici*. Kepekatan spesifik bagi ekstrak daun *P. betle* yang merencat sepenuhnya pertumbuhan *C. capsici* (MICs) ialah 12.50 mg/mL dalam metanol, 17.50 mg/mL dalam kloroform, dan 15.00 mg/mL dalam aseton. Di samping itu, 4 spesies iaitu *A. galanga*, *P. betle*, *M. malabathricum*, dan *B. balsamifera* didapati berkesan dalam merencat pertumbuhan *C. gloeosporioides* pada pelbagai kepekatan. Ekstrak daun *A. galanga* dalam methanol, kloroform, dan aseton pada semua kepekatan (kecuali ekstrak kloroform dan acetone pada kepekatan 0.01 µg/mL) didapati berkesan dalam merencat pertumbuhan jejari, pertumbuhan aerial, dan sporulasi *C. gloeosporioides*. Secara keseluruhan, ekstrak metanol daun *A. galanga* pada kepekatan 10 µg/mL telah menunjukkan perencatan tertinggi bagi pertumbuhan jejari (66.39%), pertumbuhan aerial (68.21%), dan sporulasi (68.89%) *C. gloeosporioides*. Kepekatan spesifik bagi ekstrak daun *A. galanga* yang merencat sepenuhnya pertumbuhan *C. gloeosporioides* (MICs) ialah 15.00 mg/mL dalam metanol, 17.50 mg/mL dalam kloroform, dan 17.50 mg/mL dalam aseton. Sebagai kesimpulan, ekstrak daun yang menunjukkan keberkesanan lebih daripada 50% perencatan ke atas *C. capsici* dan *C. gloeosporioides* harus dipertimbangkan untuk ujian selanjutnya; dengan ekstrak daun *P. betle* dan *A. galanga* sebagai ekstrak yang paling berkesan dalam merencatkan

pertumbuhan kulat-kulat tersebut dan mempunyai potensi paling tinggi sebagai peneraju biofungisida dalam bidang pertanian.



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I certify that a Thesis Examination Committee has met on 10 March 2011 to conduct the final examination of Lucy Johnny on her thesis entitled “Antifungal Activities of Selected Medicinal Plant Crude Extracts on Pathogenic Fungi, *Colletotrichum capsici* and *Colletotrichum gloeosporioides*” in accordance with the Universities and University College Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

Members of the Examination Committee were as follows:

Rusea Go, PhD

Associate Professor
Faculty of Science
Universiti Putra Malaysia
(Chairman)

Hishamuddin bin Omar, PhD

Lecturer
Faculty of Science
Universiti Putra Malaysia
(Internal Examiner)

Shamarina binti Shohaimi, PhD

Senior Lecturer
Faculty of Science
Universiti Putra Malaysia
(Internal Examiner)

Latifah binti Zakaria, PhD

Lecturer
School of Biological Science
Universiti Sains Malaysia
(External Examiner)

NORITAH OMAR, PhD

Associate Professor and Deputy Dean
School of Graduate Studies
Universiti Putra Malaysia

Date: 24 May 2011

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of **Master of Science**. The members of the Supervisory Committee were as follows:

Umi Kalsom Yusuf, PhD

Professor
Faculty of Science
Universiti Putra Malaysia
(Chairman)

Rosimah Nulit, PhD

Senior Lecturer
Faculty of Science
Universiti Putra Malaysia
(Member)



HASANAH MOHD GHAZALI, PhD

Professor and Dean
School of Graduate Studies
Universiti Putra Malaysia

Date:

DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institution.

LUCY JOHNNY

Date: 10 March 2011

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