ANTIFUNGAL ACTIVITY OF *Pennisetum purpureum* EXTRACT ON ANTHRACNOSE PATHOGEN, *Colletotrichum gloeosporioides* OF MANGO FRUIT

SUDAU A/P EH TEET

MASTER OF SCIENCE

UNIVERSITI MALAYSIA TERENGGANU

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Thesis Submitted in Fulfillment of the Requirement for the Degree of Master of Science in the Faculty of Agrotechnology and Food Science Universiti Malaysia Terengganu

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To my beloved family, friends and to those who had been involved in making this thesis a success.

Abstract of thesis presented to the Senate of Universiti Malaysia Terengganu in fulfillment of the requirement for the degree of Master of Science

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Main Supervisor : **Associate Professor Chuah Tse Seng, Ph.D.**

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Faculty : **Agrotechnology and Food Science**

This study was done to determine the effectiveness of *Pennisetum purpureum* Schumach. crude extract as antifungal agent in inhibiting the growth of anthracnose pathogen, *Colletotrichum gloeosporioides* Penz. of mango fruit. Extracts from leaves and stems of *P. purpureum* were extracted by using solvents of hexane, ethyl acetate and methanol to obtain the crude extracts. *In vitro* assay was performed using agar well diffusion method to determine the antifungal activity of the crude extracts of weed against the *C. gloeosporioides*. After 48 hours of the incubation period, the diameters of inhibition zones were measured. Crude extracts from methanolic fraction of *P. purpureum* had the most active antifungal activity with an average minimum inhibitory concentration value of 3.13 mg/ml while exhibiting the highest total activity at 5.28 ml/g. *In vivo* study was conducted to determine the effective post-harvest treatment of *P. purpureum* extract on control of *C.*

gloeosporioides on mango fruits. The fruits were coated before being inoculated with spore suspension of *C. gloeosporioides*. The fruits were subjected to sodium alginate coating with or without incorporation of methanolic crude extract of *P. purpureum* at a concentration of 9 or 18 g/L while the fruits dipped with distilled water were acted as negative control. The fruits were stored for 16 days at 25°C in sealed containers and physico-chemical analyses were conducted. There were no significant differences in total soluble solid, total titratable acidity, pH, vitamin C content, disease incidence, chroma and hue angle of mangoes among all coating treatments on day 16 after storage. However, coated fruits with incorporated weed extract at a concentration of 18 g/L were more effective in retaining fruit firmness as compared to those coated with sodium alginate alone. In addition, the mangoes coated with this concentration also had the smallest size lesion in diameter (0.34 cm). These results have revealed that coating solution incorporated with *P. purpureum* extract has good antifungal property for suppression of anthracnose pathogen even on day 16 after storage. Subsequent phytochemical assay, thin layer chromatography profiling and antioxidant assay have demonstrated that the methanolic crude extract of *P. purpureum* consists of phenolics, tannins, alkaloids, flavonoids and antioxidants which are valuable targets for the development of natural fungicide.

Abstrak tesis yang dikemukan kepada Senat Universiti Malaysia Terengganu sebagai memenuhi keperluan untuk ijazah Master Sains.

AKTIVITI ANTIFUNGUS OLEH EKSTRAK *Pennisetum purpureum* KEPADA PATOGEN ANTRAKNOS, *Colletotrichum gloeosporioides* PADA BUAH MANGGA

SUDAU A/P EH TEET

September 2013

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Kajian ini telah dijalankan untuk menentukan keberkesanan estrak kasar *Pennisetum purpureum* Schumach sebagai agen anti kulat dalam merencat patogen antraknos, *Colletotrichum gloeosporioides* Penz. untuk buah mangga. Daun dan batang *P. purpureum* diekstrak dengan menggunakan pelarut heksana, etil asetat dan metanol untuk mendapatkan ekstrak kasar. Pengasaian *in vitro* dijalankan dengan kaedah peresapan telaga agar untuk menentukan aktiviti anti kulat daripada ekstrak kasar *P. purpureum* terhadap *C. gloeosporioides*. Selepas 48 jam pengeraman, diameter zon perencatan diukur. Ekstrak kasar daripada fraksi metanol *P. purpureum* mempunyai aktiviti antikulat yang paling kuat dengan nilai purata kepekatan minimum perencatan sebanyak 3.13 mg/ml dan menunjukan jumlah aktiviti tertinggi dengan nilai 5.28 ml/g. Kajian *in vivo* dijalankan untuk menentukan rawatan lepas tuai yang berkesan dengan menggunakan ekstrak *P. purpureum* untuk

mengawal *C. gloeosporioides* pada buah mangga. Buah mangga disalutkan sebelum diinokulasi dengan ampaian spora *C. gloeosporioides*. Buah mangga diperlakukan dengan salutan natrium alginat yang mengandungi ekstrak kasar metanol pada kepekatan 9 atau 18 g/L atau tanpa penambahan ekstrak kasar manakala buah yang dicelup dalam air suling bertindak sebagai kawalan negatif. Buah disimpan selama 16 hari pada 25°C dalam bekas yang tertutup rapat, seterusnya analisis fizikal dan kimia dijalankan. Tiada perbezaan yang signifikan dalam jumlah pepejal terlarut, jumlah keasidan tertitrat, pH, kandungan vitamin C, insiden penyakit, kroma dan sudut warna di antara semua mangga yang diperlakukan dengan salutan pada hari ke 16 selepas tempoh penyimpanan. Namun, buah yang diberi salutan yang mengandungi ekstrak kasar pada kepekatan 18 g/L adalah lebih berkesan dalam mengekalkan ketegangan buah berbanding dengan buah yang diberi salutan tanpa penambahan ekstrak kasar. Tambahan pula, mangga yang disalutkan dengan kepekatan ini juga mempunyai saiz luka yang terkecil (0.34 cm diameter). Hasil kajian ini telah memdedahkan bahawa salutan yang mengandungi ekstrak *P. purpureum* mempunyai ciri-ciri anti kulat yang baik untuk merencat patogen antraknos walaupun pada hari ke 16 selepas penyimpanan. Pengasaian fitokimia, profil kromatografi lapisan nipis (TLC), dan pengasaian antioksidan yang selanjutnya membuktikan bahawa ekstrak kasar metanol *P. purpureum* mengandungi sebatian fenolik, tanin, alkaloid, flavonoid dan antioksidan yang merupakan sasaran berharga untuk dibangunkan sebagai racun kulat semulajadi.