UNIVERSITI PUTRA MALAYSIA

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By

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A project report submitted to Faculty of Agriculture, Universiti Putra Malaysia, in fulfillment of the requirement of the requirement of PRT 4999 (Final Year Project) for the award of the degree of Bachelor of Agricultural Science.

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ENDORSEMENT

This project paper entitled RESPONSE OF *Diaphorina citri* Kuwayama to *Citrus suhuensis* ESSENTIAL OIL, is prepared by HADHINAH BINTI ABD. HAFIDZ and submitted to Faculty of Agriculture in fulfillment of the requirement of PRT 4999 (Final Year Project) for the award of degree of the Bachelor of Agricultural Science.

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ABBREVIATIONS

FAO	Food and Agriculture Organization
HLB	Huanglongbing
IPM	Integrated Pest Management
MARDI	Malaysian Agriculture Research Development Institure
OEPP/EPPO	European and Mediterranean Plant Protection Organization
UNCTAD	United Nations Conference on Trade and Development
UPM	Universiti Putra Malaysia

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ABSTRACT

Diaphorina citri Kuwayama (Hemiptera: Psyllidae) is an important worldwide pest of citrus, because of its ability to transmit phloem-limited bacteria in the genus *Candidatus* Liberibacter, that cause citrus greening disease or huanglongbing (HLB). *D. citri* was first reported in the Americas in Brazil during 1940s. Citrus greening disease has been reported in Malaysia since 1970. Besides, a recent report also showed that most of the cultivated citrus varieties in Peninsular Malaysia, Sabah and Sarawak have been infected with citrus greening disease. The occurance of huanglongbing disease is still little available information regarding this disease in Malaysia. Until now, there is no successful treatment either by using pesticides or antibiotics, therefore to avoid and destruct of infected trees are the only practical method applied today to prevent disease spread in the orchards.

This experiment was conducted to examine the response of *D. citri* towards ten different combination of treatment consist of control, 12.5µl, 25µl, 50µl, and 100µl of *C. suhuensis* essential oil by using Y- tube olfactometer. Distilled water were used as a control in this experiment. 10 replication for both male and female were prepared in order to observe the responses of *D. citri* toward different combination of treatmentsAmong these volume of treatments, both male and female gave positive responses towards the 12.5µl treatment and this suggest that *D. citri* were able to be attracted even at a lower volume of olfactory stimuli. The result were discussed in term of mean response time and percentage of responding between male and female *D. citri.*

Based on the result obtained, female *D. citri* showed vigorous responses over male *D. citri*.

ABSTRAK

Diphorina citri Kuwayama (Hemiptera: Psyllidae) merupakan perosak sitrus yang penting di seluruh dunia oleh kerana keupayaannya sebagai pembawabakteria *Candidatus* Liberibacter, yang boleh menyebabkan penyakit 'Citrus greening' atau juga dikenali sebagai Huanglongbing (HLB). Kewujudan *D. citri* pertama kalinya dilaporkan di Amerika di Brazil pada tahun 1940an. Di Malaysia, penyakit 'Citrus greening' ini telah dilaporkan sejak tahun 1970. Selain itu, laporan terkini melaporkan bahawa kebanyakan jenis pokok sitrus yang ditanam di Semananjung Malaysia, Sabah dan Sarawak telah dijangkiti penyakit ini. Walau bagaimanapun, maklumat berkaitan penyakit 'Citrus greening' di Malaysia masih sedikit dan belum meluas. Sehingga kini, masih tiada lagi rawatan yang efisien yang berjaya digunakan sama ada menggunakan racun serangga mahupun antibiotik. Oleh iu, bagi mengelak daripada kerosakan yang disebabkan oleh penyakit ini daripada tersebar, kini hanya kaedah praktikal digunakam dengan mengamalkan amalan ladang yang baik.

Kajian ini dijalankan untuk melihat tindak balas *D. citri* terhadap sepuluh kombinasi rawatan yang mempunyai isipadu pengekstrakan daun *Citrus suhuensis* yang berbaza, iaitu 12.5µl, 25µl, 50µl dan 100µl. Air suling digunakan sebagai rawatan kawalan di dalam kajian ini. 10 replikaasi berbeza daripada jantan dan betina telah disediakan bagi melihat tindak balas *D. Citri* terhadap bauan yang dikeluarkan oleh ekstrak *C. Suhuensis* dengan menggunakan 'Y-tube'. Keputusan menunjukkan bahawa kedua-dua jantina *D. citri* memberikan respon yang positif terhadap ekstrak *C. suhuensis* denagn isipadu yang minima, iaitu 12.5µl. Hal ini menunjukkan bahawa *D. citri* boleh

memberi respon yang positif walaupun terhadap isipadu yang sedikt. Keputusan tindak balas antara *D. citri* ini dibincangkan merujuk kepada perbezaan purata masa *D. citri* untuk bertindak balas dan peratusan *D. citri* yang memberi tindak balas dengan mengambil kira perbezaan jantina. Keputusan mendapati *D. citri* betina lebih menunjukkan tindak balas yang agresif berbanding jantan

CHAPTER 1

INTRODUCTION

Current citrus production in Southeast Asia is low due to lower than average yields, high production and marketing cost and problem with pest and disease infestation. One of the most destructive disease of citrus isHuanglongbing (HLB; syn. citrus greening) that cause the ultimate limitations on production in every citrus productionenterprise (Bové, 2006) and is transmitted by citrus psyllids *Diaphorina citri*.The Asian citrus psyllid, *D. citri* is an important and destructive pest of citrus as it transmits phloem-limited bacteria (*Candidatus* liberibacter). It is the vector responsible for the citrus greening disease (Hall, 2008)and can cause the destruction of entire citrus plants especially the fruits which can be commercialized.

In Malaysia, the presence of citrus greening disease have been detected all over the country included Sabah and Sarawak (Azizah and Zazali, 2005). The occurance of citrus greening disease at Kelantan and Terengganu recorded the highest mean percentage of disease incidence (Ahmad *et al.*, 2008). However, until now information available regarding to this diseases in Malaysia is still little.

According to Hung*et al.*(2004), a successful management of *D. citri* and citrus greening disease is achievable by using clean nursery stock, quick removal of inoculum sources and application of aggressive pesticide sprays against the psyllid. Despite of using chemical pesticide, it is advisable to use natural control

method as it can reduce the cost of prevention and it is also environmentally friendly.Application of synthetic insecticides of broad spectrum activity has been the main approach used by farmers to reduce the population level of the pest and avoid spread of the disease. Heavy use of chemical pesticides can cause serious problems to human health and environmental contamination (Ribas and Matsumura, 2009) besides overuse of pesticides also cause the selection of resistant pests to the main active ingredients (Tiwari *et al.*, 2011).

The uses of harmful pesticide can be reduced by substituting it with natural insect attractant or repellant as suggestedin integrated pest management programs (IPM). Having the information and understanding about the interaction of those factors to the development of the pest population will provide a way in developing reliable strategy for pest management decision. The discovery about volatile chemical as attractants of pest allow for the development of new monitoring and management strategies (Wenniger *et al.*, 2009; Sule *et al.*, 2012). Volatile chemical cues play an important role in host finding and selection process by *D. citri* (Wenniger *et al.*, 2009).

The objective of this study isto explore the interactionof the *D. citri* with it host plants, *Citrus suhuensis*, through the following specific objectives:

1. To observe the response of *D. citri*towards volatiles emitted by the host plant, *C. suhuensis*.
2. To study different responses between male and female *D. citri* towards the volatiles emitted by the *C. suhuensis.*

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