



**UNIVERSITI PUTRA MALAYSIA**

***MANAGEMENT OF OIL PALM BUNCH MOTH (*Tirathaba mundella walker*)  
IN YOUNG MATURE OIL PALM PLANTATION ON PEAT SOIL IN  
SARAWAK, MALAYSIA***

**SU CHONG MING**

**FSPM 2016 3**



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SARAWAK, MALAYSIA**

By

**SU CHONG MING**

**Thesis Submitted to the School of Graduate Studies, Universiti Putra  
Malaysia, in Fulfilment of the Requirements for the Degree of Master of  
Science**

**February 2016**

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirements for the degree of Master of Science

**MANAGEMENT OF OIL PALM BUNCH MOTH (*Tirathaba mundella* Walker)  
IN YOUNG MATURE OIL PALM PLANTATION ON PEAT IN SARAWAK,  
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**SU CHONG MING**

February 2016

**Chairman : Associate Professor Joseph Bong Choon Fah, PhD**  
**Faculty : Agriculture and Food Sciences, (Bintulu)**

The oil palm bunch moth, *Tirathaba mundella* is one of the most important pests for oil palm planted in peat. Chronic outbreak of this pest is getting more pronounced in recent years when more peat lands were being cleared for oil palm in Sarawak. When proper control measures were not in place, the outbreak would cause a significant reduction on oil palm early yield. The results of three rounds field ablation demonstrated that percentages of new infested bunches in ablated fields were significantly higher (41.63%, 13.24%, 7.68%) than non ablated fields (17.21%, 4.78%, 4.55%), which is the control at week 20, week 28 and week 36 respectively. This suggested that it is not justifiable for oil palm growers to carry out field ablation as cultural control practice against oil palm bunch moth, *T. mundella* in young mature oil palm plantation as commonly believed. Further studies were being conducted to evaluate the effectiveness of seven insecticides namely *Bacillus thuringiensis*, Flubendiamide, Chlorantraniliprole, Pyridalyl, Fipronil, Cypermethrin and Flufenoxuron on controlling oil palm bunch moth, *T. mundella* in a young mature oil palm plantation. Two insecticides namely Chlorantraniliprole and Flubendiamide outweighed the other conventional and biological insecticides in controlling oil palm bunch moth, *T. mundella* with significantly higher percentages of uninfested bunches with their effectiveness stretching to six months after treatment. These treatments also showed significantly lower percentages of new infested bunches, old infested bunches and number of larvae count within the monitoring period. The effect of controlling *T. mundella* using biological insecticide, *Bacillus thuringiensis*, which was the conventional practice in the oil palm plantation were inconsistent and fluctuated across all the parameters studied. This study also assessed the detrimental effects of selected insecticides on oil palm natural pollinators, *Elaeidobius kamerunicus*. Out of eight insecticides namely Flubendiamide, Chlorantraniliprole, Dinotefuran, Fipronil, Cypermethrin, Flufenoxuron, Pyridalyl and Indoxacarb which were selected for the study, only three insecticides were found to have

detrimental effects on *E. kamerunicus*. The mean number of newly emerged adult *E. kamerunicus* obtained from male inflorescences treated with Dinotefuran, Fipronil and Cypermethrin were only 0.58, 4.74 and 6.05 respectively. This is significantly lower as compared to other insecticides namely *Bacillus thuringiensis* (56.31), Flubendiamide (19.72), Chlorantraniliprole (23.61), Flufenoxuron (36.96), Pyridalyl (30.93), Indoxacarb (38.16) and control (43.06). The effectiveness of the six *E. kamerunicus* friendly insecticides on controlling oil palm bunch moth, *T. mundella* were then evaluated in the follow-up study where one round of field ablation was incorporated before the insecticides treatment. The results of the study suggested that there were no additional benefit in conducting one round of field ablation before the insecticide application in controlling *T. mundella*. Among the six insecticides which were found to be safe for oil palm pollinators, Chlorantraniliprole and Flubendiamide demonstrated the best control results throughout the six months monitoring period with only two rounds of spraying at 14 days interval. From these studies, it is recommended that young mature oil palm fields with severe *T. mundella* infestation can be controlled most effectively with two rounds of Chlorantraniliprole at 14 days interval. These should be followed by two rounds of Flufenoxuron at 14 days interval, after 3 months of the second spraying of Chlorantraniliprole. With these practice, the control of oil palm bunch moth can be effectively sustained for six months without affecting the survival of oil palm pollinators. This is very crucial to achieve sustainability of oil palm production for young mature plantation.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia  
sebagai memenuhi keperluan ijazah Sarjana Sains

**PENGURUSAN KUPU-KUPU TANDAN BUAH KELAPA SAWIT (*Tirathaba mundella* Walker) DI LADANG KELAPA SAWIT BERTANAH GAMBUT DI SARAWAK, MALAYSIA**

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Kupu-kupu tandan buah kelapa sawit, *Tirathaba mundella* merupakan salah satu serangga perosak yang utama bagi tanaman kelapa sawit di kawasan tanah gambut. Serangan kronik perosak ini menjadi semakin ketara sejak kebelakangan ini apabila semakin banyak kawasan tanah gambut dimajukan untuk tanaman kelapa sawit di negeri Sarawak. Tanpa kawalan perosak yang baik, hasil tanaman kelapa sawit akan menurun secara signifikan. Hasil kajian lapangan daripada tiga pusingan pelepasan atau pengembirian pada pokok kelapa sawit mendapati bahawa peratusan tandan kelapa sawit dengan serangan baru *T. mundella* di kawasan yang dilelaskan adalah sebanyak 41.63%, 13.24% dan 7.68%, iaitu adalah lebih tinggi berbanding dengan kawasan kawalan yang hanya 17.21%, 4.78% dan 4.55% sahaja pada minggu ke-20, 28 dan 36 masing-masing. Keputusan ini mencadangkan bahawa adalah sukar dijustifikasikan bagi pengusaha-pengusaha tanaman kelapa sawit untuk menjalankan pelepasan sebagai langkah kawalan yang efektif sepertimana yang dipercayai selama ini. Kajian selanjutnya dijalankan untuk menilai keberkesanan tujuh jenis racun serangga perosak iaitu *Bacillus thuringiensis*, Flubendiamide, Chlorantraniliprole, Pyridalyl, Fipronil, Cypermethrin dan Flufenoxuron terhadap penggorek tandan buah kelapa sawit, *T. mundella* di ladang kelapa sawit matang muda. Kajian mendapati dua jenis racun perosak iaitu Chlorantraniliprole dan Flubendiamide adalah lebih baik daripada racun perosak konvensional dan biologi dalam mengawal serangan kupu-kupu tandan buah kelapa sawit, *T. mundella*, di mana jumlah peratusan tandan buah kelapa sawit tanpa serangan perosak adalah lebih tinggi secara signifikan dalam tempoh enam bulan selepas rawatan. Kedua-dua rawatan ini juga menunjukkan jumlah peratusan buah kelapa sawit dengan kesan serangan baru, kesan serangan lama dan kepadatan larva penggorek tandan buah kelapa sawit adalah lebih rendah secara signifikan daripada kawalan dalam tempoh pemerhatian. Kesan rawatan dengan menggunakan racun serangga biologi, *Bacillus thuringiensis* yang merupakan amalan biasa

pengusaha ladang kelapa sawit menunjukkan keputusan yang tidak konsisten dalam semua parameter yang dikaji. Dalam kajian ini juga dilakukan penilaian kesan mudarat racun serangga yang dipilih ke atas agen pendebungaan kelapa sawit, *E. kamerunicus*. Daripada lapan jenis racun perosak yang dipilih dalam kajian ini iaitu Flubendiamide, Chlorantraniliprole, Dinotefuran, Fipronil, Cypermethrin, Flufenoxuron, Pyridalyl dan Indoxacarb, hanya tiga jenis racun serangga yang didapati mempunyai kesan mudarat kepada *E. kamerunicus*. Purata serangga *Elaeidobius kamerunicus* dewasa yang dijumpai di bunga jantan yang telah dirawat dengan Dinotefuran, Fipronil dan Cypermethrin adalah sekadar 0.58, 4.74 dan 6.05 sahaja masing-masing. Jumlah ini adalah secara signifikan apabila dibandingkan dengan racun serangga yang lain seperti Bt (56.31), Flubendiamide (19.72), Chlorantraniliprole (23.61), Flufenoxuron (36.96), Pyridalyl (30.93), Indoxacarb (38.16) dan kawalan (43.06). Ini menunjukkan bahawa Dinotefuran, Fipronil dan Cypermethrin bukan merupakan racun serangga yang sesuai untuk mengawal *T. mundella* memandangkan kesan mudaratnya kepada *E. kamerunicus*. Keberkesanan enam jenis racun serangga yang mesra *E. kamerunicus* dalam kawalan terhadap *T. mundella* dikaji dengan selanjutnya di mana satu pusingan pelelasan dilakukan sebelum rawatan. Hasil kajian mendapati tidak ada kelebihan tambahan dalam mengawal *T. mundella* dengan melakukan pelelasan sebelum rawatan racun serangga. Antara enam racun perosak yang didapati selamat terhadap agen pendebungaan kelapa sawit, Chlorantraniliprole dan Flubendiamide menunjukkan hasil kawalan yang paling baik sepanjang enam bulan tempoh pemerhatian, dengan hanya dua pusingan rawatan pada selangan 14 hari. Daripada hasil kajian ini, adalah dicadangkan bahawa ladang kelapa sawit matang muda yang diserang oleh *T. mundella* dapat dikawal dengan paling berkesan dengan melakukan dua pusingan rawatan Chlorantraniliprole pada selangan 14 hari. Ini diikuti oleh dua pusingan rawatan Flufenoxuron pada selangan 14 hari, selepas 3 bulan dari pusingan rawatan kedua Chlorantraniliprole. Dengan cara rawatan ini, kawalan serangga penggoerek buah dapat dikawal dengan berkesan selama enam bulan tanpa mendatangkan kesan negative kepada kemandirian ajen pendebungaan kelapa sawit. Ini adalah sangat penting untuk mencapai kelestarian dalam penghasilan kelapa sawit bagi ladang kelapa sawit matang muda.

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I certify that a Thesis Examination Committee has met on 5<sup>th</sup> February 2016 to conduct the final examination of Su Chong Ming on his thesis entitled "Management of Oil Palm Bunch Moth (Insecta: Lepidoptera) in Young Mature Oil Palm Plantation On Peat Soil in Sarawak, Malaysia" in accordance with the Universities and University Colleges 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 in Entomology.

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## LIST OF ABBREVIATIONS

%	Percentage
Ha	Hectare
Bt	<i>Bacillus thuringiensis</i>
CPO	Crude palm oil
SAS	Statistical analysis variance
ANOVA	Analysis of variance
WG	Water dispersible granule
EC	Emulsifiable concentrate
ES	Emulsified soluble

## CHAPTER 1

### INTRODUCTION

In South East Asia, particularly Malaysia and Indonesia, oil palm cultivation has rapidly expanded into degraded peat soils. Currently it is estimated that there are about 5,392,235 ha of land in Malaysia that have been developed for oil palm cultivation and this include 1,263,391 ha in Sarawak, 2,617,334 ha in Peninsular and 1,511,510 ha in Sabah (MPOB Statistic, 2014). Such a large area converted from heterogeneous climatic climax vegetation into a mono species crop as oil palm had indirectly upset the natural biological balances between hosts, pests and natural enemies of pests, which have been built up over the millennia. Therefore, for oil palm cultivated on peat, pests such as termites, nettle caterpillars, bagworms, bunch moth, rhinoceros beetles and rats have become problematic. Among these common pests, *Tirathaba mundella* Walker (Pyralidae), commonly known as the oil palm bunch moth is becoming a very important bunch feeding pest of oil palm planted on peat soil.

More severe outbreaks of *Tirathaba mundella* can occur on young plantings particularly in peat areas planted with oil palms for the first time. Bunch abortion could occur when the attack is severe and no proper control is in place (Mohd Tayeb, 2005). Continuous chronic outbreaks of *Tirathaba mundella* infestation often occur in the first two years of harvesting and estimated crop losses can be as high as 50 per cent (Lim, 2012).

The oil palm bunch moth, *Tirathaba mundella* infested both male inflorescences and various stages of bunch formation of the oil palm. Severe infestation on the male inflorescences would required chemical treatment at fortnightly interval in order to control the pest more effectively. It is understood that the natural oil palm pollinator, *Elaeidobius kamerunicus*, completed its full life cycle on the spikelets of the oil palm male inflorescences. Therefore, it poses a threat for the industry to impose chemical treatments in a large scale to control *Tirathaba mundella* outbreak, especially for oil palm planted on peat under Sarawak conditions. Nonetheless, there is a marked lack of published information on the management of *Tirathaba mundella* either through field ablation or chemical control using insecticides as well as the detrimental effects of these chemicals on the survival of oil palm poolinators, *Elaeidobius kamerunicus*.

Therefore, the present study was undertaken with the following objectives:

1. To determine the effects of field ablation as cultural control for oil palm bunch moth, *T. mundella* in young mature oil palm.

2. To assess the effect of eight different novel insecticides in the control of oil palm bunch moth, *T. mundella* in young mature oil palm.
3. To study the survival of the oil palm pollinators, *Elaeidobius kamerunicus* after treatment with novel insecticides used for controlling oil palm bunch moth, *Tirathaba mundella*.
4. To investigate the combination effects of one round field ablation followed by two rounds of insecticides treatment on the control of oil palm bunch moth, *T. Mundella* in young mature oil palm.





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## BIODATA OF STUDENT

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## PUBLICATION

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