



**UNIVERSITI PUTRA MALAYSIA**

***TOXICITY OF SELECTED CONVENTIONAL INSECTICIDES  
AGAINST ELAEIDOBIOUS KAMERUNICUS FAUST  
(COLEOPTERA: CURCULIONIDAE)***

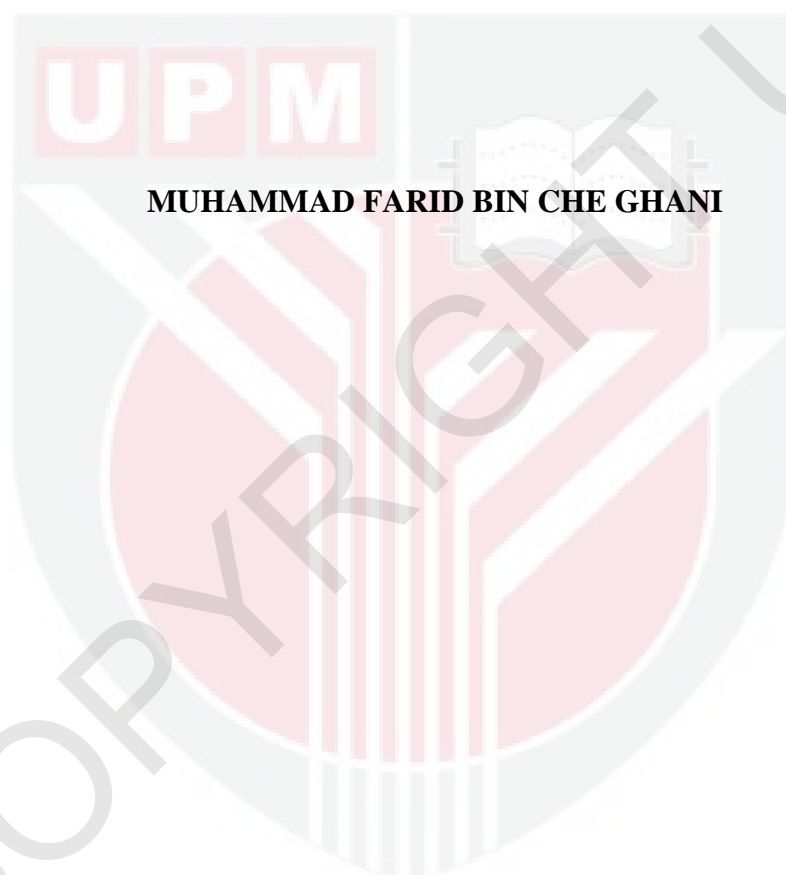
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**AGAINST *ELAEIDOBIOUS KAMERUNICUS FAUST***

**(COLEOPTERA: CURCULIONIDAE)**

**BY**

**MUHAMMAD FARID BIN CHE GHANI**

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fulfilment of the requirement of PRT 4999 (Final Year Project)  
for the award of the degree of Bachelor of Agricultural Science**

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## CERTIFICATION

This project title is “Toxicity Of Selected Conventional Insecticides Against The Oil Palm Pollinating Weevil, *Elaeidobius kamerunicus* Faust” prepared by Muhammad Farid bin Che Ghani and submitted to the Faculty of Agriculture in fulfillment of the requirement of PRT4999 for the award of the Degree of Bachelor of Agriculture Science.

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## ABSTRACT

*Elaeidobius kamerunicus* Faust (Coleoptera: Curculionidae), the pollinating weevil, is the most efficient insect pollinator of oil palm, *Elaeis guineensis* Jacq. (Arecales: Arecaceae). In Malaysia, it was first introduced in Sabah to assist the pollination of oil palm plantation. The assisted pollination has proven to significantly improve the fruit set development as well as giving the higher yield. In this study, the toxicity of insecticides was evaluated against *E.kamerunicus* as a non-target insect. The adult weevils were exposed to dry residue at the recommended field rate for 2 hours and the immediate effect of insecticides was observed. Then for the survivorship observation, the adult weevils were left for 2 days period to observe their recovery and mortality rate. Four insecticides were used namely cypermethrin, carbaryl, trichlorfon and *Bacillus thuringiensis*. The lethality index (0-100) was used as a measurement to compare immediate effect and longer term effects of insecticide exposure on *E.kamerunicus*. The high value indicates the high degree of immediate mortality and low recovery rate of *E.kamerunicus* from insecticide exposure. Among four insecticides, cypermethrin, carbaryl and trichlorfon showed a moderate initial efficacy ( $10\% < E_0 < 90\%$ ), while *B.thuringiensis* was low in initial efficacy ( $E_0 \leq 10\%$ ). All evaluated insecticides showed increasing efficacy where the percentage of moribund and dead larvae increased by  $>10\%$  after 2 days. The lethality index for carbaryl was 70.5%, followed by cypermethrin, 67.7%, then trichlorfon with 49.4% and *B.thuringiensis* 11.6%. Consequently, carbaryl shows the highest toxicity on adult of *E.kamerunicus* compared with other insecticides.

## ABSTRAK

*Elaeidobius kamerunicus* Faust (Coleoptera: Curculionidae), kumbang pendebungaan, adalah serangga pendebunga yang paling berkesan untuk tanaman kelapa sawit, *Elaeis guineensis* Jacq. (Arecales: Arecaceae). Di Malaysia, ia mula diperkenalkan di Sabah untuk membantu pendebungaan kelapa sawit di ladang. Pendebungaan berbantu telah terbukti dalam meningkatkan penghasilan buah sawit serta memberi hasil yang lebih tinggi. Dalam kajian ini, ketoksikan racun serangga telah dinilai terhadap *E. kamerunicus* sebagai serangga bukan sasaran. Kumbang dewasa telah didedahkan pada sisa racun yang kering pada kadar yang disyorkan untuk 2 jam dan kesan serta-merta racun perosak akan dikaji. Kemudian untuk pemerhatian kemandirian, kumbang dewasa dibiarkan untuk tempoh 2 hari untuk melihat pemulihan dan kadar kematian. Empat racun serangga yang digunakan dinamakan cypermethrin, carbaryl, trichlorfon dan *Bacillus thuringiensis*. Indeks kematian (0-100) digunakan sebagai ukuran untuk membandingkan kesan jangka pendek dan kesan jangka panjang hasil pendedahan kepada racun serangga pada *E. kamerunicus*. Nilai yang tinggi akan menunjukkan tahap kematian yang tinggi dan kadar pemulihan rendah *E. kamerunicus* yang rendah. Antara empat racun serangga, cypermethrin, carbaryl dan trichlorfon menunjukkan keberkesanan awal sederhana di mana  $10\% < E_0 < 90\%$ , manakala *B. thuringiensis* adalah rendah dalam keberkesanan permulaan ( $E_0 \leq 10\%$ ). Semua racun serangga menunjukkan peningkatan keberkesanan di mana peratusan moribund dan larva mati meningkat  $> 10\%$  selepas 2 hari. Indeks kematian untuk carbaryl adalah 70.5%, diikuti oleh cypermethrin, 67.7%, trichlorfon dengan 49.4% dan *B. thuringiensis* 11.6%. Oleh itu, carbaryl menunjukkan ketoksikan tertinggi pada *E. kamerunicus* dewasa berbanding dengan racun serangga lain.

## CHAPTER 1

### INTRODUCTION

*Elaeidobius kamerunicus* Faust (Coleoptera: Curculionidae), the pollinating weevil, is the most efficient insect pollinator of oil palm, *Elaeis guineensis* Jacq. (Arecales: Arecaceae). *Elaeidobius kamerunicus* was considered the most suitable insect for introduction into Malaysia and other areas where pollination of oil palms is inadequate (Syed, 1979). Of the various species of this genus studied in Cameroon, *E. kamerunicus* was the most abundant in both wet and dry seasons in coastal areas of the country. It carries more pollen than other species and has a fairly good searching ability. Since the introduction of the pollinating weevils in oil palm plantation in Malaysia on 1981, the weevil has become the most important pollinator in the industry. Yield increases following the introduction of *E. kamerunicus* into Malaysia were greater from the Tenera palm variety, than from the Dura variety. Weevil pollination greatly improved fruit set, which led to the production of larger, heavier and more compact bunches and an increase in the oil to bunch ratio from under 19 to 23-25%, mostly from trees 4-10 years old. A less efficient existing pollinator, *Thrips hawaiiensis* was not apparently displaced by *E. kamerunicus*.

The expansion of oil palm sector in Malaysia has brought significant advancements in the industry (Syed, 1979). As many other commodities, the oil palm trees also have their natural enemies in affecting them to give optimum yield such as bagworm (*Metisa plana*), nettle caterpillar and rhinoceros beetle. These insect pests have their own natural enemies but farmers tend to use chemical control in controlling these insect pests more efficiently to prevent the outbreaks and yield decline.

The problem of using the chemicals is the active ingredient in the insecticide can also affects and kills the natural enemies of oil palm insect pests. This situation can cause pest outbreak if it is not managed properly. The natural enemy of the pest will decline and the pest cannot be controlled naturally anymore. The insecticides applied will also affect the pollinator weevils either by suppressing their ability to pollinate the oil palm pollen or by killing them accidentally. This situation can also lead to the declining of the oil palm yield because oil palm needs insects as its primary pollinator. Further study should be conducted to observe the effect of insecticides commonly applied in oil palm towards the pollinator weevils (Syed, 1979).

To control pest population while preserving the pollinator insects of oil palm, the correct usage of insecticides must be employed by the farmers. The correct pesticide must give a minimum mortality towards the pollinator insects. Owing to increasing insect pest problems, the farmers are provoked to take up control measures by using synthetic insecticides. When these chemicals are sprayed indiscriminately, mortality of the weevils is observed resulting in poor pollination. Hence, the criteria for timing and mode of application of insecticides in the oil palm gardens will be useful in conserving this weevil (International, 2015)

Therefore, the aims of this study were to: 1) To determine the immediate effects of conventional insecticides to the adults of *E.kamerunicus*, 2) To determine the recovery and mortality rates of individuals over a 2 day period, and 3) To establish the relative efficacy of all the tested insecticides based on these two above properties. This study will help us to identify the suitable conventional insecticides that could be used in the field, while avoiding the high mortality of beneficial insect, *E.kamerunicus*.

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