AINATUN NADRAH ZULKEFLI MASTER OF SCIENCE 2016

FOOD CONSUMPTION, DEVELOPMENTAL TIME AND PROTEIN PROFILE OF THE DIGESTIVE SYSTEM OF THE RED PALM WEEVIL *RHYNCHOPHORUS FERRUGINEUS* LARVAE (COLEOPTERA: DRYOPHTHORIDAE)

AINATUN NADRAH BINTI ZULKEFLI

MASTER OF SCIENCE
UNIVERSITI MALAYSIA TERENGGANU

2016

DEDICATION

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

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May 2016

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The red palm weevil (RPW), *Rhynchophorus ferrugineus* (Coleoptera: Dryophthoridae) is the most dangerous pest of major cultivated palms including coconut, oil palm and sago. The larvae are the main stage for the destruction of the palms as it destroys the heart of the palm cabbage which it is the food source. In this study, the larvae were given three different food diets; coconut cabbage, oil palm cabbage and sago stem under laboratory conditions for food consumption and developmental time experiment, and also to determine the protein profile of the digestive system.

The coconut diet was the most consumed and more nutritious for the RPW larvae compared to oil palm and sago diets. However, oil palm gave shorter developmental growth of larvae probably due to the high vitamin content such as vitamin E and K that can enhance the insect growth. Proteins profiling of eight 2-DE gel protein spots that range 50-20 kDa were identified by mass spectrometry sequence analysis. Based on the Matrix Science Software, the most dominant protein was cationic

trypsin. However, based on the NCBI BLAST tool, aminopeptidase N is the most dominant enzyme. Trypsin enzyme is responsible for the digestion of proteins that catalyse the breakdown of proteins to generate free amino acids for insect growth and development. In addition, aminopeptidase N serves as a defensive enzyme in the insect midgut. This finding can lead to the development of pest control strategies based on the anti-nutritional protease inhibitors as potential biocontrol agents. Besides, an alarm should be taken seriously as the potential oil palm can be another host for the RPW after the coconut palms. Thus, it is hoped that quick, cost-effective and accurate information using proteomics analysis can be achieved for future effective formulation to control this coconut pest weevil in Malaysia.

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

PENGAMBILAN MAKANAN, TEMPOH PERKEMBANGAN DAN PROFIL PROTEIN SISTEM PENCERNAAN LARVA KUMBANG PALMA MERAH *RHYNCHOPHORUS FERRUGINEUS* (COLEOPTERA: DRYOPHTHORIDAE)

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Pusat Pengajian : Pusat Pengajian Sains Marin dan Sekitaran

Kumbang palma merah, *Rhynchophorus ferrugineus* adalah perosak yang berbahaya kepada tanaman utama palma termasuk kelapa, kelapa sawit dan sagu. Larva adalah peringkat utama kepada pemusnahan pohon palma yang mana ia merosakkan umbut palma yang merupakan sumber makanan kepada larva tersebut. Dalam kajian ini, larva diberi makan tiga jenis diet makanan yang berbeza; umbut kelapa, umbut sawit dan batang sagu dalam keadaan makmal untuk menentukan eksperimen pengambilan makanan dan tempoh perkembangan larva, dan juga profil protein daripada sistem pencernaan.

Kelapa adalah makanan yang paling banyak dimakan dan berkhasiat untuk larva RPW berbanding sawit dan sagu. Walaubagaimanapun, kelapa sawit menunjukkan tempoh perkembangan tumbesaran yang pendek kemungkinan disebabkan oleh kandungan vitamin yang tinggi seperti vitamin E dan K yang boleh meningkatkan tumbesaran serangga. Lapan titik protein daripada protein profil 2D gel yang dikenalpasti menggunakan analisa jujukan mass spektrometri dan berada dalam

lingkungan 50-20 kDa berat molekul. Berdasarkan Matrix Science Software, protein paling dominan adalah ‘cationic trypsin’. Namun berdasarkan NCBI BLAST tool, ia dikenalpasti sebagai aminopeptidase N. Enzim tripsin bertanggungjawab dalam pencernaan protein yang menguraikan protein untuk menghasilkan amino asid yang bebas untuk tumbesaran larva. Tambahan pula, aminopeptidase bertindak sebagai enzim pertahanan dalam perut tengah serangga. Hasil penemuan ini boleh digunakan dalam strategi pengawalan berdasarkan anti-pemakanan perencat protease sebagai agen kawalan biologi. Satu tanda amaran perlu dipandang serius yang mana pokok kelapa sawit berpotensi untuk dijadikan sebagai perumah oleh RPW selepas pokok kelapa. Adalah diharapkan semoga informasi yang tepat, kos efektif and lebih cepat menggunakan analisis proteomic dapat dicapai untuk formulasi masa hadapan bagi mengawal kumbang perosak kelapa di Malaysia.