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THE EFFECT OF TF NANOEMULSION FORMULATION ON *Pomacea maculata*, PEST OF RICE

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THE EFFECT OF TF NANOEMULSION FORMULATION ON *Pomacea maculata*, PEST OF RICE

BY

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A project report submitted to Faculty of agriculture, Universiti Putra Malaysia, in fulfillment of requirement of PRT4999 (Final Year Project) for the award of degree of Bachelor of Agriculture Science

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DECLARATION

This project entitled The Effect of TF Nanoemulsion Formulation on *Pomacea maculata*, Pest of Rice is prepared by Shahira Husna Binti Jamaludin and submitted to the Faculty of Agriculture in fulfillment of requirement of PRT4999 (Final Year Project) for the award of the degree of Bachelor of Agriculture Science.

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ABSTRACT

Apple snails, *Pomacea maculata* had been recognized as the major pest in paddy field quite some time ago in Malaysia. It had given a bigger impact towards the production of rice. Botanical molluscicide which extracted directly from the plant that contains saponin as bioactive compound might be able to help in controlling apple snails. It also appears to be safe for human and the environment since it does not gives toxic residues instead of using chemical mollusicicides. Therefore, this study was conducted to measure the efficacy of TF nanoemulsion formulation towards *P. maculata* which is the mortality bioassay. Five different concentration of eight of TF nanoemulsion formulation against niclosamide was used in bioassay experiment. 1-2cm of five snails was immersed in each of the treatment and replicated for four times. Mortality of apple snails was recorded for every 30 minutes until all snails were died. LT_{50} were determined by using Probit analysis. Among all concentration and formulations, TF6 nanoemulsion formulation with 10000 ppm had the lowest value of LT_{50} which is 164 minutes to achieve 50% mortality of *P. maculata*. Whereas, LT_{50} value for niclosamide (positive control) is 114 minutes. Therefore, from this study, TF6 nanoemulsion formulation could be a potential botanical molluscicide in controlling population of apple snail because it was comparable with niclosamide. Eventhough niclosamide gave 100% mortality effect towards apple snail but it would give negative impact for human's health and environment.

ABSTRAK

Sudah agak lama, siput gondang, *Pomacea maculata* dikenali sebagai perosak utama sawah padi di Malaysia. Ia telah memberi kesan yang teruk kepada pengeluaran beras. Racun moluska botani yang diekstrak daripada tumbuhan yang mengandungi saponin sebagai bahan bioaktif mungkin dapat membantu mengawal siput gondang. Ia juga selamat untuk manusia dan alam sekitar kerana ia tidak menghasilkan sisa-sisa toksik berbanding penggunaan racun moluska kimia. Oleh itu, kajian ini dijalankan untuk mengkaji keberkesanan formulasi TF nanoemulsion terhadap *P. maculata* melalui bioesei. Lima kepekatan yang berbeza daripada lapan formulasi TF nanoemulsion melawan niclosamide telah digunakan dalam eksperimen ini. Lima siput bersaiz 1-2cm direndam dalam setiap rawatan dan direplikasi sebanyak empat kali. Kematian siput gondang dicatatkan pada setiap 30 minit sehingga semua siput mati. LT_{50} ditentukan dengan menggunakan analisis PROBIT. Di antara semua konsentrasi dan formulasi, formulasi TF6 nanoemulsion dengan kepekatan 10000 ppm mempunyai nilai LT_{50} yang paling rendah iaitu 164 minit untuk mencapai 50% kematian *P. maculata*. Manakala, nilai LT_{50} untuk niclosamide (kawalan positif) adalah 114 minit. Oleh itu, daripada kajian ini, formulai TF6 nanoemulsion berpotensi untuk menjadi racun moluska botani bagi mengawal populasi siput gondang kerana ia setanding dengan niclosamide. Walaupun niclosamide memberi kesan 100% kematian terhadap siput gondang tetapi ia memberi impak negatif kepada kesihatan manusia dan alam sekitar.

CHAPTER 1

INTRODUCTION

Rice (*Oryza* sativa) is a staple food for a large part of the world's human population. Calories from rice are particularly important in Asia and Asia accounts for over 90% of the world's rice production. The domestic consumption of rice is projected to increase as a result of population increase. In Malaysia, the increase in production is targeted to come from higher productivity in the existing granary areas since there is no plan to increase the area under rice cultivation in the Fifth Malaysia Plan. Rice production thus far had satisfied the government policy of obtaining 71.4 percent self-sufficiency (Chamhuri *et. al,* 2014). However, the low income and poor quality from rice production needs to be improved. This issue happens because this crop is always under constant attack by pest and disease. There are many type of pest but the most destructive pest towards rice production is apple snail.

Apple snail is a freshwater snails belonging to the Ampullariidae family, of genus *Pomacea*. There are two species of apple snail in Malaysia which are *Pomacea maculata* and *Pomacea canaliculata* (Arfan *et. al,* 2014). The apple snails feed on wide range of plants such as algae, azolla, weed, young rice seedlings, and other succulent leafy plants. However, apple snails prefer young plants that are soft because it feeds by scraping plant surface with its rough tongue (Dela *et al.*, 2001). Apple snails can even consume the young plants in a whole paddy in one night. According to Agro Food Statistic (2004), apple snail had destroyed paddy growth in Kemasin Sarawak whereby the yield was only reduced to 3.0 metric ton per hectare in 2006 and 2.489 metric ton per hectare in 2007.

Several studies had been conducted in order to control the population of apple snail. The methods that had been used to control this population are biological, mechanical, cultural and chemical control. Biological, mechanical and cultural controls are less effective and require high labor intensive practices (Ricardo *et. al*, 2008). The most popular and widely used method to control population of apple snail is chemical control. Many farmers resort to the massive use of synthetic molluscicides that are fast and very effective in killing population of apple snail in paddy field (Dela *et al.*, 2001). However, synthetic molluscicides have a broad spectrum that will affect non-target organism including human beings and environment. Many countries have banned the use of any chemical form in agricultural activities because it is extremely harmful. Moreover, farmers had misuse the chemical form in agricultural activities without considering the hazardous effect towards them. Therefore, new methods that are environmentally sound are needed for the control of the population of apple snails.

Plant containing chemical compound which is saponin had shown promising application as botanical molluscicide (Ricardo *et. al*, 2008). Saponin can cause apoptosis towards cold-blooded species. According to National Center for Biotechnology Information (2012), apoptosis is an event that leads to cell change and uncontrolled death of cells that will cause mortality to the apple snails.

Therefore, the aim of this study is to investigate the effects of TF nanoemulsion mollusicicide contain saponin as bioactive ingredient on apple snail. It can be achieved primarily through these objectives which are:

1. To observe the effect of TF nanoemulsion formulation on the mortality of *P. maculata*.
2. To calculate the LT_{50} of TF nanoemulsion formulation on *P. maculata.*

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