UNIVERSITI PUTRA MALAYSIA

APPLICATION OF TF NANOEMULSION FORMULATION FOR CONTROL OF *Pomacea maculata*, PEST OF RICE

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APPLICATION OF TF NANOEMULSION FORMULATION FOR CONTROL OF *Pomacea maculata*, PEST OF RICE

BY

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

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Project report entitled “Application of TF Nanoemulsion formulation for control of Pomacea maculata, Pest of Rice” was prepared by Muhammad Riduwan bin Ibrahim and submitted to the Faculty of Agriculture in fulfilment of requirement for the PRT 4999 (Final Year Project) subject for the award of the degree of Bachelor of Agriculture Science.

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ABSTRACT

Rice is the staple food for Malaysian. However, there are many pest and disease that attack rice. One of them is Apple snail (*Pomacea* spp.) which was categorized as one of the major pest on young rice seedlings. Use of chemical molluscicides by the rice farmers is a normal practice. Even though the effect of these synthetic molluscicides are quick and better, however they are not good for health as well as harmful to environment and human consumption. Saponin is a natural glycoside that can be found in most plants and it can be applied as a biomolluscicide which has lesser detrimental effects on human and the environment. TF nanoemulsion formulation containing saponin as bioactive ingredient was tested in this experiment on *Pomacea maculata,* to determine the efficacy of TF nanoemulsion formulation to control their population in rice field. The experiment was conducted in a paddy field located in Penang with four treatments. Two different concentrations of TF nanoemulsion formulation (10000 ppm and 20000 ppm) was used against water and niclosamide as control. The TF nanoemulsion formulation was applied before transplanting (with 5cm water level approximately). The mortality and rice damage assessment will be observed until all the snails died. Each treatment will be replicated ten times in $1m^2$ plot. Ten snails of 1 to 2 cm size will be used for each treatment in this experiment. Total snails used are 400. MR219 rice variety was used. Each plot was planted with 15 gram of paddy seedling and total of six kilograms rice seeds was used. RCBD was used as the experimental design. The data analyzed using Probit Analysis and Analysis of Variance (ANOVA). The result is TF nanoemulsion formulation has potential to function as new safer alternative molluscicide to control the *P. maculata* population in rice field.

ABSTRAK

Nasi merupakan makanan ruji rakyat Malaysia. Namun, terdapat pelbagai penyakit dan perosak yang selalu menyerang tanaman ini. Salah satunya ialah siput gondang hitam ataupun *Pomacea maculata* yang menyerang padi muda. Penggunaan racun kimia sintetik merupakan amalan biasa dalam kalangan para petani di Malaysia. Walaupun kesan racun ini lebih cepat dan berkesan, tetapi kesan sampingan ditinggalkan racun ini amat berbahaya kepada manusia dan alam sekitar. Saponin merupakan bahan glikosida semualajadi yang terdapat di dalam tumbuhan dan mampu mengawal perosak ini. Formulasi TF nanoemulsion yang mengandungi saponin sebagai bahan aktif telah diuji dalam ekpserimen ini. Kajian ini dijalankan di kawasan sawah di Pulau Pinang. Terdapat empat rawatan yang berbeza. Formulasi TF nanoemulsion digunakan di dalam dua konsentrasi berbeza iaitu 10000 ppm dan 20000 ppm berlawanan dengan pemalar iaitu niclosamida dan air. Setiap rawatan diulang sebanyak 10 replikasi di dalam 1m x 1m plot. Terdapat 40 plot kesemuanya. Siput digunakan berukuran satu hingga dua sentimeter. Setiap plot menggunakan 10 ekor siput. Keseluruhan siput yang digunakan ialah 400 ekor. Varieti padi yang digunakan ialah MR219. Setiap plot menggunakan 15 gram benih padi dan jumlah keseluruhan anak benih yang digunakan ialah enam kilogram. Eksperimen ini menggunakan kaedah RCBD. Anak benih padi yang tumbuh sebelum dan selepas eksperimen direkod. Setelah seminggu, anak padi mula membesar dan eksperimen dijalankan. Siput dimasukkan ke dalam semua plot. Data dianalisis menggunakan Probit Analysis dan Analysis of Variance (ANOVA). Keputusannya ialah Formulasi TF nanoemulsion mampu bertindak sebagai racun semulajadi.

CHAPTER 1

INTRODUCTION

Rice or *Oryza sativa* is cultivated all over the world and Asia is the number one consumer of rice. Rice is very easy to cultivate and can survive under many soil conditions. As we know, Malaysia is a tropical country which has favorable environment for this grain to grow and local demand always shows an uprising pattern every single year. However, according to data produced by Federal Agricultural and Marketing Authority (FAMA) in 2015, the countries local farmers can only meet 70% of the demand, whereas the rest is imported from Thailand and Vietnam. Many barriers caused this situation and one of the critical issues that need to be tackled is disease and pest which includes attacks of apple snail.

Apple snail or *Pomacea maculata*, is one the major pest of rice. This mollucs is not a new pest to the local rice planters. They were primarily brought in from other countries for protein supply and as aquarium pets. However later on being considered as not valuable; the snails were discarded to the local environment. The apple snails have been a serious problem and local planters have suffered the consequences for more than a decade ago.

This snail is belong to the family of Ampullariidae and has a flexibility in its' dietary on macrophytes. This snail has a very outstanding way of surviving even in the harsh condition, thus enabling it to survive in many environmental conditions. There are several obvious signs if the rice area has been infested by snails; for example, missing hills and floating rice fragment in the area. Food and Agricultural Organisation (2012)

reported that the estimated total annual loss caused by these snails to the rice production in Thailand and Vietnam was RM 319.85 million, based on the average gross production value of rice over the last 10 years.

According to Yahaya *et al*. (2006), it is estimated that more than 17, 300 hectare of rice fields are currently infested by the apple snails. The invasions of apple snails have become more serious in Malaysia as direct seeding is practiced by majority of farmers to offset labor constraints. This practice makes the rice seedlings vulnerable to apple snail attacks.

Many control mechanisms have been developed to prevent the snail infestation on the rice field including mechanical, cultural, biological and chemical control. Although the best control is chemical control, synthetic molluscicide can also cause unnecessary side effect to the environment as well as human. According to Halwart (1994), control is still dominated by the use of pesticides, which are often extremely harmful to the environmental and human health. Although the farmers have been tried out the other three control methods, but they still rely on chemical control as the other control methods to curb this problem is low and success is unsure. As the last resort, the farmers have to use chemical control method like niclosamide, endosulphan, metaldehyde and copper sulphate because they are proven to be efficient, easy and fast although it is costly.

As an alternative to this problem, botanical molluscicde can play an important role. Botanical molluscicide is cheaper and more environmental friendly. Based on the research done by Huang *et al.* (2003), it was found that *Sapindus mukorossi* Gaertn

(Sapindacea) exhibited molluscicidal effects against golden apple snails. This genus has been reported to contain water-soluble mondesmosidic saponins. Saponin has been shown to possess haemolytic, anti-inflammatory, anti-fungal, anti-bacterial, antiparasitic, antiviral, cytotoxicity and molluscicides for apple snail.

Therefore, the main objective of this study is to investigate the effectiveness of botanical molluscicide TF nanoemulsion formulation application on *P. maculata* and it can be achieved through these sub-objectives:

1. To evaluate the efficacy of TF nanoemulsion formulation on *P. maculata*
2. To evaluate the feeding deterrent activity of the TF nanoemulsion in the field against *P. maculata*

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