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ANALYSIS OF LETHALITY OF CYPERMETHRIN, IMIDACLOPRID AND CHLORANTRANILIPROLE ON *Chrysoperla nipponensis* (NEUROPTERA: CHRYSOPIDAE)

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BY

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A project report submitted to Faculty of Agriculture, Universiti Putra Malaysia, in fulfillment 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 report entitled Analysis of Lethality of Cypermethrin, Imidacloprid and Chlorantraniliprole on *Chrysoperla nipponensis* (Neuroptera: Chrysopidae) is prepared by Nur Shamsinar Binti Mohd Tajudin and submitted to the Faculty of Agriculture in fulfillment of the requirement of PRT 4999 (Final Year Project) for the award of the degree of Bachelor of Agriculture Science.

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ABSTRACT

The conservation of natural enemies can help in the effort to improve biological control. Selection of the appropriate insecticide is necessary in controlling pest populations to ensure the least side effects on non-target insects. In this study, the insecticide efficacy (E_t), initial versus final efficacy (E_0 *vs.* E_5), insecticide efficacy change over time and lethality index of cypermethrin, imidacloprid and chlorantraniliprole were evaluated against the larvae of green lacewings, *Chrysoperla nipponensis* (Neuroptera: Chrysopidae), a general predator of insect pests. The third instar larvae were exposed to dry residue at the label recommended field rate for 2 hours. The immediate impact of insecticides and the recovery and mortality rates of individual larvae over a 5 days period were observed. Among three insecticide, cypermethrin showed a moderate initial efficacy where 10% < E_0 < 90%, while imidacloprid and chlorantraniliprole were 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 5 days. The lethality index for cypermethrin was 72.7% and followed by imidacloprid, 32.5%, and chlorantraniliprole, 11.2%. Consequently, cypermethrin showed the highest toxicity on larvae of *C. nipponensis* compared with other insecticides.

ABSTRAK

Pemuliharaan musuh semulajadi dapat membantu dalam usaha untuk meningkatkan kawalan biologi. Pemilihan racun serangga yang bersesuai adalah perlu dalam pengawalan populasi perosak bagi memastikan kurangnya kesan sampingan terhadap serangga bukan sasaran. Dalam kajian ini, keberkesanan racun serangga (E_t), perbandingan keberkesanan racun awal dan akhir (E_0 vs. E_5), perubahan keberkesanan racun serangga dari masa ke masa dan indek kematian adalah ukuran digunakan untuk menilai kesan tiga racun serangga konvensional: cypermethrin, imidacloprid dan chlorantraniliprole pada larva Chrysoperla nipponensis (Neuroptera: Chrysopidae), pemangsa am bagi populasi serangga perosak. Larva didedahkan kepada sisa racun yang disyorkan selama 2 jam. Kesan racun serangga terhadap larva serta-merta dan pemulihan dan kematian kadar individu larva dalam tempoh 5 hari diperhatikan. Kemudian, indek kematian digunakan bagi membandingkan racun serangga dengan mempertimbangkan keadaan perubahan larva. Antara ketiga-tiga racun serangga, cypermethrin telah menunjukkan keberkesanan permulaan yang serdahana ($10\% < E_0 < 90\%$), manakala imidacloprid dan chlorantraniliprole mempunyai keberkesanan permulaan rendah ($E_0 \leq 10\%$). Semua racun serangga menunjukkan pertingkatan keberkesanan di mana peratusan larva hampir mati dan mati telah meningkat sebanyak >10% selepas penilaian 5 hari. Indek kematian untuk cypermethrin ialah 72.7% dan diikuti oleh imidacloprid 32.5%, manakala chlorantraniliprole hanya 11.2%. Oleh yang demikian, cypermethrin yang ditunjukkan adalah sangat toksik pada larva berbanding racun serangga lain.

CHAPTER 1

INTRODUCTION

The green lacewing or scientifically known as *Chrysoperla nipponensis* (Neuroptera: Chrysopidae) is an economically important predator. The green lacewings are classified as predator because they are good in controlling the population of pest especially aphids. It is not dangerous because it will not harm people, plant and also animals. The larvae of *C. nipponensis* plays the important role in controlling the pest population. It helps in suppressing the population of prey by attacking them using the sucking jaws. It will inject the paralyzing poison. Then, the larvae will suck the body fluids of the pest. The example of pest population that can be suppressed by *C. nipponensis* are aphids, whiteflies, leaf miner, mealy bugs, thrips, mites, armyworms and other insect pests.

In horticultural crops such as vegetables, fruits and ornamental, the *C. nipponensis* population can be easily found. Besides that, *C. nipponensis* also can be found in the agricultural crop such as in tea plantation. However, most of farmer have little exposure to the benefit of beneficial insects. Therefore, they always use the conventional insecticide in order to control the pest in their farms or plantations. An example of the popular conventional insecticide use worldwide by the farmers in their field crops is imidacloprid. This is due to its low toxicity to human and systemic mode of action (Nauen and Denholm, 2005).

The use of insecticides in the agricultural production gives high impact on the non-target organisms. The insecticides could cause death as well as reducing the

fecundity of non-target organisms. High exposure to the insecticide may also shortened life span, change in development times and cause deformity.

Most of conventional insecticides are harmful to the environment when they leave residues for a long period of time. The main aim of a farmer using insecticide is to control or suppress the pest population. They do not know that it also may affect the population of beneficial insects and their habitat. Lehnert (2012) stated that the beneficial insects like green lacewings will be affected when the insecticide was applied in the fruit orchard area. This is not to the advantage to the farmer because the natural enemies are good in controlling the pest population in the field. Therefore, the farmer must conserve the habitat of beneficial insects in order to maintain the population of these beneficial insects.

In order to control population of pest, while conserving the population of beneficial insects by, the farmers must choose the correct insecticide to apply in the field. The correct insecticide must give little mortality to the predator population. Bonizzoni et al. (2006) claimed that the conventional insecticide like imidacloprid that affect non-target insects such as honey bee must not be used. Besides that, the cost of production is also increased due to the excessive use of insecticide and it also becomes wasteful.

Therefore, the aims of this study were to: 1) To determine the immediate effects of conventional insecticides to the larvae of *C. nipponensis*, 2) To determine the recovery and mortality rates of individuals over a 5 day period, and 3) To establish the relative efficacy of all tested insecticides based on these two above properties. This study will help us to identify the suitable conventional insecticide that can be used in the field, while avoiding the high mortality of beneficial insect, *C. nipponensis*.

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