Development of resistance in the mirids *Helopeltis theivora* Waterhouse

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Key words: Development of resistance, *Helopeltis theivora*

Introduction

Helopeltis theivora is a serious pest of cocoa and tea in Malaysia. This mirid feeds predominantly on cocoa cherelles and pods and cause serious crop damage or loss during cherelle stage (1), yield losses around 50% are not uncommon (2). On tea, the insect feeds on young tea shoots, which after one feeding lesion could caused dieback of the shoots. Severe damage on young tea plants could cause stunting of plant growth. Tea production could virtually stop ('Blackout') (3). The use of insecticides remains the most popular method for mirid control and continuous use of insecticides could cause some problems, such as resistance to insecticides. Dzolkhifli *et al.*, (4) has shown various degree of tolerance between different populations of cocoa mired and possible development of resistance to γ-HCH. Insecticide resistance in agricultural pests is conferred by a limited number of clearly defined mechanisms. Several mechanisms of insecticide resistance have been proposed. Among them, detoxification was shown to play a major role (5). Microsomal monooxygenase, esterases and gluthatione s-transferases are enzymes cited involved in the enhanced metabolism of resistance. The objective of this study is to investigate the role of metabolic enzymes in the development of resistance in *H. theivora.*

Materials and Methods

The cocoa mirids were collected from the cocoa population of Serdang, Selangor and Sungai Tekam, Pahang and tea population of Banting, Selangor and cultured using the technique described by Muhamad and Khoo (6). Ten of fourth and fifth instar nymphs were used in the experiment. Technical grade of deltamethrin (99.5% a.i.), cypermethrin (50% a.i.), γ-HCH (99% a.i) and chlopyrifos (99%a.i) were used to prepare stock solution. The synergist used were piperonyl butoxide (PBO), maleic acid diethyl ether (MADE) and s,s,s-tributyl phosphorotrithioate (DEF). The insecticides were applied topically at 0.6 µl/nymph and the mortality of the insects was recorded. Estimates of LD_{50} value and their 95% fiducial limit (FL) were obtained using a probit analysis.

Results and Discussion

Based on the LD_{50} values, the toxicity of the insecticide tested for the Serdang and Sungai Tekam populations were chlopyrifos > γ-HCH > cypermethrin > deltamethrin, for the Banting population was: γ-HCH > cypermethrin > chlorpyrifos > deltamethrin. The most toxic insecticide was chlopyrifos with LD_{50} value of 3.028×10^{-2} mg/L for the Sungai Tekam population, followed by γ-HCH. The synergism of PBO on cypermethrin was higher compared to other insecticides tested. Cypermethrin showed synergistic values of 13-fold followed by γ-HCH and chlorpyrifos with synergistic values of 7 and 6-fold, respectively for Sungai Tekam population. The DEF gave a synergistic value of 4-fold for all population tested while MADE gave a synergistic value of 6-fold against Sungai Tekam population. These results showed that monooxygenases were very active in the Sungai Tekam population for cypermethrin based on synergistic value. The increase in enzyme activities of esterases indicated that this enzyme played a role in metabolism of chlorpyrifos, cypermethrin and deltamethrin for all the population tested. The resistance ratio of 25-fold for cypermethrin in the Banting population and 13-fold for chlopyrifos in the Sungai Tekam population were observed higher when compared to Serdang population . The Sungai Tekam population showed increasing tolerance towards the insecticides tested compared with the Banting and Serdang populations.

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Conclusions

Results indicated the impending resistance in the mirids, formulation of chemical management in necessary to be integrated into pest management of the mirid. Efforts to minimise the possibility of the increasing resistance problems in the future, insecticides management such as spray rotation of different groups of insecticides, the use of insecticides only when the population reaches the economic threshold and the use of proper insecticide application techniques should be encouraged in the tea and cocoa growing areas.

Benefits from the stud

Formulation of chemical management, minimizes the possibility of increasing resistance problems

Patent(s), if applicable:

Nil

Stage of Commercialization, if applicable:

Nil

Project Publications in Refereed Journals

1.Omar,D., R, Muhamad., and V.K. Liew., (1998). Status on the resistance of the cocoa mirids to gamma HCH, cypermethrin and deltamethrin. *Malaysian Applied Biology* 27 (1&2); 83-85.

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Graduate Research

Name of Graduate	Research Topic	Field of Expertise	Degree Awarded	Graduation Year
Ismail Yusa	Resistance development in the cocoa mirid	Entomology	M. Agric. Sc	2002

IRPA Project number 01-02-04-0321
UPM Research Cluster: AFF