ISBCW 2019
2nd INTERNATIONAL STINGLESS BEES CONFERENCE & WORKSHOP
INTERNATIONAL INSTITUTE OF PLANTATION MANAGEMENT

UNIVERSITI TEKNOLOGI MARA

TOXICITY OF RESIDUAL EXPOSURE OF PYRETHROID INSECTICIDES TO STINGLESS BEE *HETEROTRIGONA ITAMA*

NOOR ALBANNIA NATASYA BINTI JABI

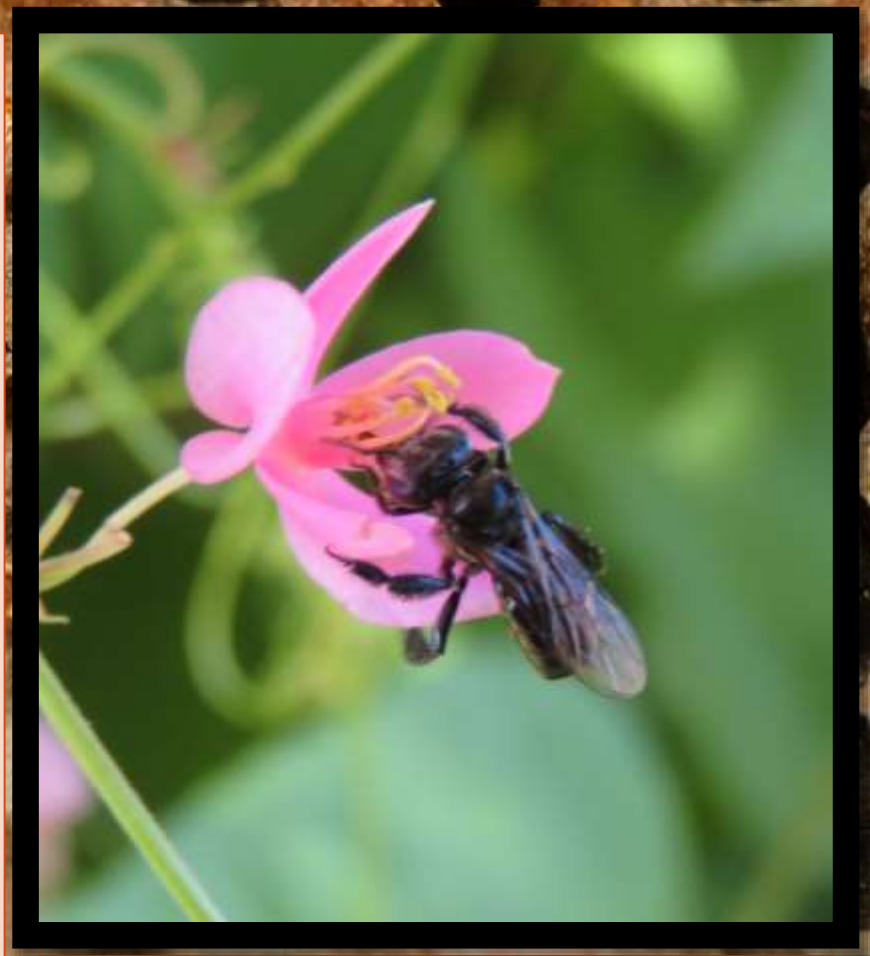
UiTM Shah Alam

Supervised by;

Mr. Hazmi Awg. Damit (UiTM)
Ts Dr. Hendry Joseph (UiTM)
Mr Jinius Jipanin (ARS)

INTRODUCTION

- *Heterotrigona itama* is one of the actively reared bee species in Malaysia (Meliponoculture)
- Products : Honey, pollen, propolis
- Usually integrated with its food sources
- The greatest alternative crop pollinator



Forager of *Heterotrigona itama*

HOW TOXICITY HAPPEN?

- Insecticides are substance to kill insect pest
- *H. itama* exposed to post-insecticide treatment.
- Pyrethroids are insecticides that are synthetic modifications of natural pyrethrins, extracts from the flowers of some Chrysanthemum species which found in many modern insecticide
- Toxicity cause harm and death to the stingless bee

OBJECTIVE

To identify the **median lethal concentration (LC50)** of selected Pyrethroid insecticides through residual exposure to the *H. itama.*

SIGNIFICANCE OF STUDY

- Contributes of new knowledge for stingless bee species *H. itama.*
- To exposed the toxicity effect of insecticide to the beneficial insect.
- Open up room of new finding.
- Increase the awareness of toxicity effect.

METHODOLOGY

Experimental location

- Experimental laboratory, Agricultural Research Station Tenom, Sabah.
- Temperature of 27±2°C and 70% RH.

Materials

- (450) foragers of *H.itama*
- Pyrethroid insecticides

  1.DELTAMETHRIN

  2.CYPERMETHRIN

TOXICITY ASSAY PROCESS

THE TOXICITY PROCEDURES

Step 1

Each concentrations were diluted with 500ml of distilled water.
Labelled as: C5,C4,C3,C2,C1

Concentration	Deltamethrin	Cypermethrin
C1	1.65 ml	2.00 ml
C2	1.40 ml	1.00 ml
C3*	1.10 ml*	0.50 ml*
C4	0.83 ml	0.25 ml
C5	0.56 ml	0.125 ml
C6	0	0 ml

C3*: Recommended dosage
C6 : Control (distilled water)

Step 2

The dilution was coated inside the glass jar, by rotating the glass jar several times. Left to dried at room temperature for at least 3 hours

Step 3

H.itama foragers were freshly caught using sweeping net & directly transferred to the laboratory

Step 4

10 selected stingless bees from the anaesthetised procedure (*chilling for 50 seconds at 3 ° C)*

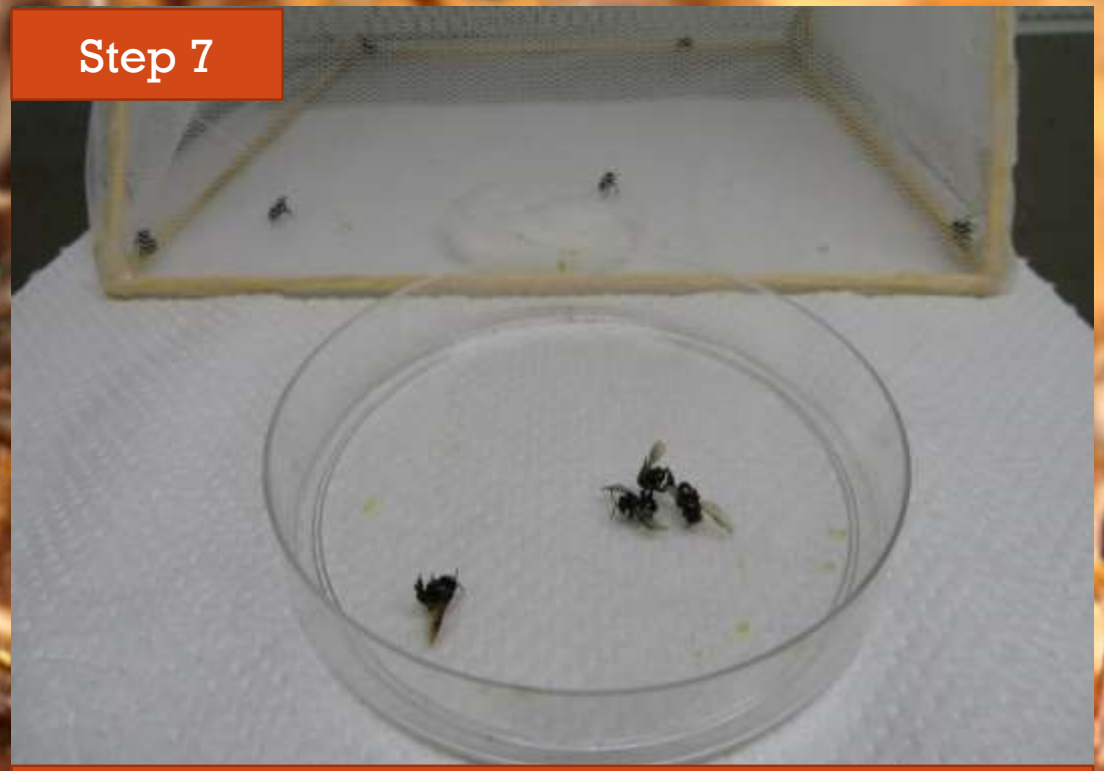
Step 5

Tested *H.itama* were introduced in contaminated jar for 1 hour

Step 6

The treated organism were transferred into the post cage for 24 hours, and supplied with 50% sucrose solution diet.

Step 7



Mortality was observed after 24 hours

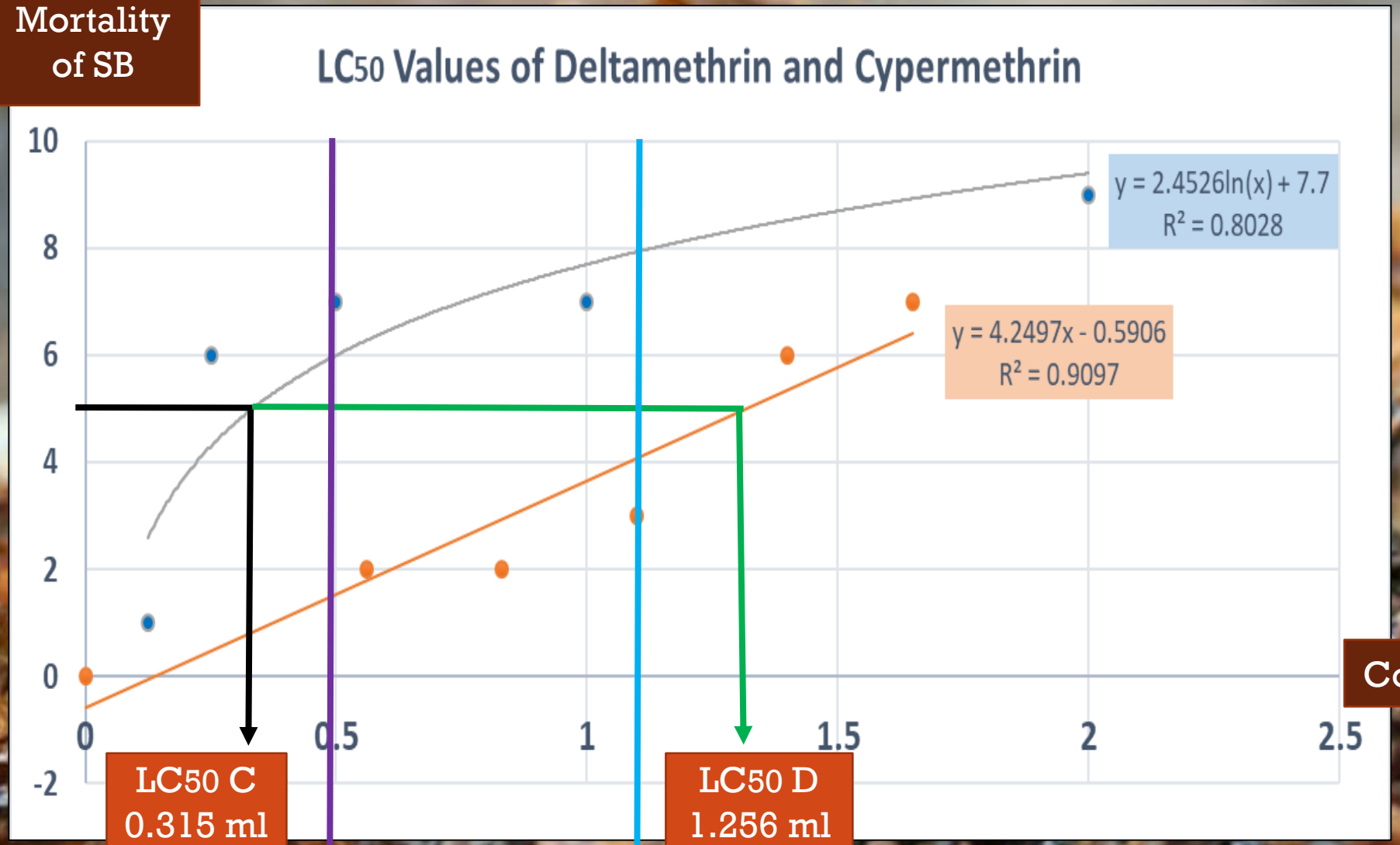
All steps were replicated 3 times for each different concentration

STATISTIC ANALYSIS

- Mortality data obtained from the bioassay tests of residual exposure were analysed using Probit Analysis (SPSS Statistic 21) to calculate the LC50 values.

RESULT

Mortality of SB



Concentration

LC50 C
0.315 ml

LC50 D
1.256 ml

Recommended concentration of C

Recommended concentration of D

LC50 value of cypermethrin was below the recommended dosage meanwhile the value for deltamethrin was above the recommended.

RESULT

Table 1. The value of LC50 for deltamethrin and cypermethrin

Insecticides	No. of Foragers per replication	Time (hr)	Recommended dosages (ml)	LC_{50} (ml)	Mortality mean On recommended dosage
Deltamethrin	10	24	1.10	1.256 (0.978 – 2.022)	3
Cypermethrin	10	24	0.50	0.315 (0.189 – 0.568	7

DISCUSSION

- Pyrethroids toxicity via residual exposure is possible as a study showed.
- Residual exposure of cypermethrin is more harmful than deltamethrin on recommended dose.
- Recommended dose of deltamethrin (killed 30% of tested population) and cypermethrin (killed 70%)

RECOMMENDATION

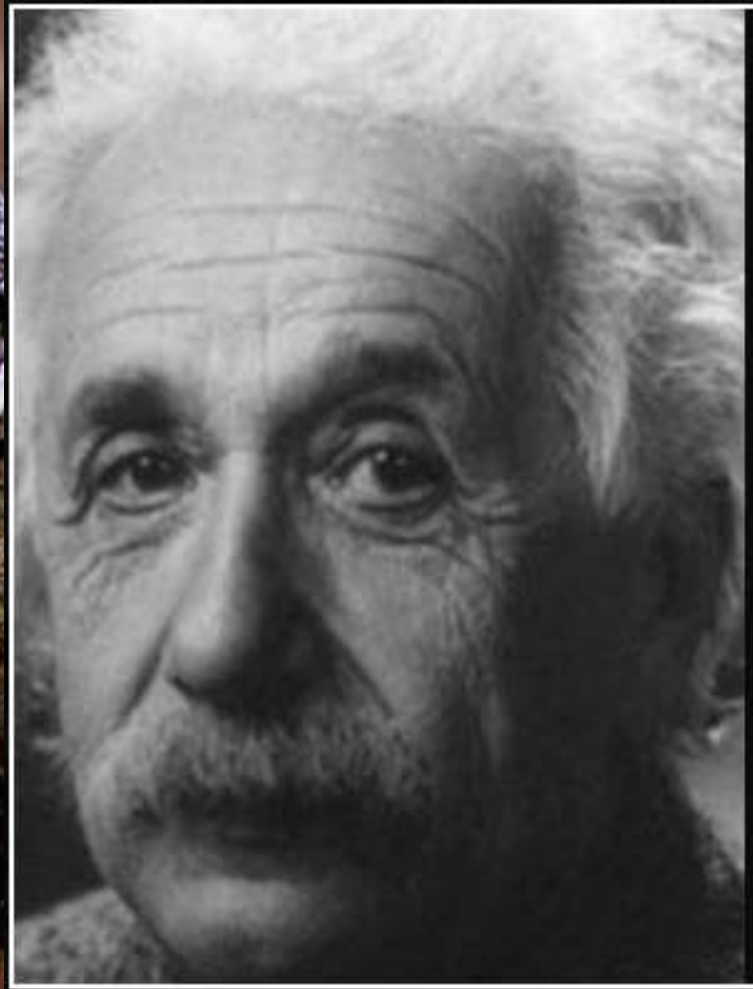
- Time of insecticide application : Evening application
- Granular insecticides are less hazardous
- Do not treat fields in bloom
- Choose short residual materials and low-hazard formulations if insecticides
- Apply insecticides when bees are not foraging

CONCLUSION

- Toxicity effect is a serious issue
- *H. itama* was proved to be susceptible to pyrethroid insecticides for residues exposure.
- Suggested that new analyses of the lethal and sublethal effects of pesticides recommended for use in bee attracting crops be carried out on stingless bee species through both field and semi-field experiments
- Susceptibility in agricultural areas depends on other circumstances, including abiotic factors, pesticide degradation rates and bee behaviours (Gradish et al. 2012).

ACKNOWLEDGEMENT

Thanks to Universiti Teknologi MARA (UiTM) for the opportunity to run this research and Agriculture Research Station, Tenom for the research facilities and guidance.



If the bee disappeared off the surface of the globe, then man would have only four years of life left. No more bees, no more pollination, no more plants, no more animals, no more man.

— Albert Einstein —

AZ QUOTES

If I die, we all die

REFERENCE LIST

Aljedani, D. M. (2017). Effects of abamectin and deltamethrin to the foragers honeybee workers of Apis mellifera jemenatica (Hymenoptera: Apidae) under laboratory conditions. Saudi Journal of Biological Sciences, 24(5), 1007–1015.

Delabie, J., Bos, C., Fonta, C., & Masson, C. (1985). Toxic and repellent effects of cypermethrin on the honeybee: Laboratory, glasshouse and field experiments. Pesticide Science, 16(4), 409–415.

Hasibur, R., Al Thbiani, A., Shalini, S., Zahid, K.A., Anand, M., and Abid, A.A., (2014) Systematic review on pyrethroid toxicity with special reference to deltamethrin. Journal of Entomology and Zoology Studies 2014; 2 (6): 60-70

Mohd Fahimee, J., and Rosliza, J., (2016). Diversity of Stingless Bees in Malaysia: Agro biodiversity and Environment Research Centre, MARDI. Retrieved from http://ap.fftc.agnet.org/ap_db.php?id=721&print=1

Piccolomini, A. M., Whiten, S. R., Flenniken, M. L., O'Neill, K. M., & Peterson, R. K. D. (2018). Acute Toxicity of Permethrin, Deltamethrin, and Etofenprox to the Alfalfa Leafcutting Bee. Journal of Economic Entomology, 111(3), 1001–1005.

Sanchez-Bayo, F., & Goka, K. (2014). Pesticide Residues and Bees – A Risk Assessment. PLoS ONE, 9(4), e94482.

Sarto, M.C., Oliveira, E., Guedes, R.N., and Campos, L.A., (2014) Differential insecticide susceptibility of the Neotropical stingless bee M. quadrifasciata and Apis melifera. Apidologie 45:626-636.

THANK YOU