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The Residual Effect of Some Insecticides on *Plutella xylostella* (L) Larvae in the Greenhouse

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RINGKASAN

Kesan sisa lima racun serangga ke atas larva Plutella xylostella *(L) telah ditaksirkan di dalam makmal dengan menggunakan* Brassica rapa. *Acephate telah didapati sungguh berkekalan dan menyebabkan sekurang-kurang 80% kematian ke atas larva lapan hari selepas rawatan. Bendiocarb,* Bacillus thuringiensis, *dan methamidophos menyebabkan 50% kematian keatas larva enam hari selepas rawatan. Diflubenzuron terbukti kurang berkesan – kematian ke atas larva ialah 20% pada setiap masa.*

SUMMARY

The residual effect of five insecticides on Plutella xylostella *(L) larvae was measured on* Brassica rapa *in the laboratory. Acephate was the most persistent and gave at least 80% larval mortality eight days after application. Bendiocarb,* Bacillus thuringiensis, *and methamidophos gave 50% larval mortality six days after treatment. Diflubenzuron demonstrated poor insecticidal activity – the larval mortality was 20% at all times.*

INTRODUCTION

Persistency of toxicity is an important attribute of an insecticide and as the mode of action of insecticides may be contact, stomach or fumigant, the persistency of an insecticide in a given environment will determine the frequency of sprays required.

Studies have been conducted using analytical methods to determine the amount of insecticide residue (Belal *et al.*, 1978; Seller *et al.*, 1976; and Kadoum and La Hue, 1976). Work has also been done to determine physical factors that enhance or reduce insecticidal activities (Harris, 1972). However, when considering persistency of an insecticide in relation to the control of a pest, it is generally believed that the longevity of the insecticide should be evaluated by exposing the pest species concerned to the particular insecticide.

It is normally recommended that insecticide application in the field should be repeated after 10-14 days. However, little information is available in Malaysia as to whether the chemical remains effective against the pest during the period pending reapplication. This paper presents the results of an investigation into the persistency of five insecticides in relation to *Plutella xylostella* (L) larvae. A bioassay test was used and the experiment was conducted at the Universiti Pertanian Malaysia.

MATERIALS AND METHODS

Laboratory Insect Culture – Plutella xylostella (L) larvae were obtained from cabbage plants, *Brassica oleracea,* growing in the farm of the Universiti Pertanian Malaysia and cultured in the laboratory at a temperature of 28°C and relative humidity of 90 percent. The cages for rearing larvae were wooden frames 65cm square by 80 cm covered with muslin cloth. Larvae were given fresh *Brassica rapa* leaves daily. Adults that emerged in these cages were transferred into smaller cages of 40cm square by 50cm. The adults were fed distilled water and 2 per cent sucrose solution.

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Brassica rapa plants were introduced daily into these cages for oviposition. To obtain larvae of the same age plants with one-day old eggs were transferred daily into new cages for hatching. Test animals used were second – instar larvae. Such larvae were between 2.0 to 2.3mm in length and greyish-green in colour (Cheong 1978). *Insecticide Treatments*: Plants of *Brassica rapa* were used in the test. Seeds of *B. rapa* were sown directly into clay pots of 22.8cm diameter containing *muck* soil. The soil was enriched with compound fertilizer (NPK 15:15:15) at the rate of 3g/pot one week before sowing. Two weeks after sowing the seedlings were thinned out to 1 plant/pot. The fertilizer was again applied at the third and fifth weeks after sowing at the rate of 6g/plant at each application. The plants were watered twice daily. Five plants made up one replicate.

Five-week old plants were sprayed with the following insecticides and concentrations: acephate (Orthene 75SP®), bendiocarb (Garvox WP®), methamidophos (Monitor 60EC®) all at 0.1 per cent a.i., diflubenzuron (Dimilin 25WP®) at 0.027 per cent a.i., and *Bacillus thuringiensis* Berliner var. Kurstaki (Thuricide HP 3.2%®) at 1g/l.

A randomised block design with four replicates was used for the experiment. Five plants made up one replicate. Plastic screens were erected between treatments at the time of spraying to prevent spray drift. The sprayed plants were left for 24, 48, 96, and 192 hours and then one leaf was taken at random from each plant for the bioassay.

In the laboratory the leaves were wrapped in cotton wool at the petiole and placed in glass vials (2.5cm by 7.5cm) filled with water. These were then placed in plastic cylinders (12cm by 24cm) each with a muslin-covered ventilation window. The cylinders were closed at the top and bottom with petri-dishes. The bottom petri-dishes were lined with white filter paper to facilitate counting of dead larvae. Ten second-instar larvae were exposed to each of the treated leaf. Larval mortality was recorded at 24, 48, and 72 hours after exposure to each treatment. Adjustments for natural mortality were made using Abbot's formula (Abbot, 1925).

RESULTS AND CONCLUSION

All insecticides tested gave a negative correlation of larval mortality in relation to time through the test period, indicating that persistency decreases with time (Fig. 1). With the exception of acephate, all the insecticides showed a sharp decline in toxicity from the day of spray through eight days later. Acephate remained effective eight days after treatment when it still gave more than 80 per cent larval mortality.

Figure 1. Residual Persistency of Insecticidal Treatments on P. xylostella (L) larvae.

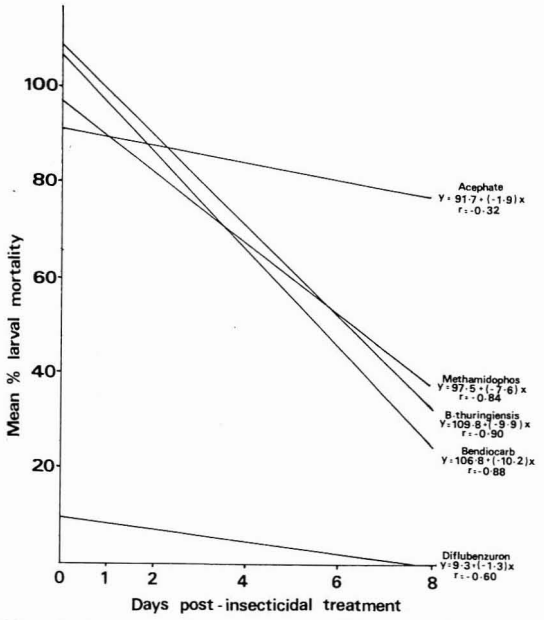

Fig. 1. Residual Persistency of Insecticidal Treatments on P. xylostella *(L) larvae.*

Bendiocarb, *B. thuringiensis*, and methamidophos gave about 50 per cent mortality six days after treatment. Although diflubenzuron treatment gave a highly significant correlation with residual persistency, it showed poor insecticidal activity since mortality recorded throughout the test period was less than 50 per cent. Flint and Smith (1977) reported a similar observation on pink bollworm when they detected only 25 per cent larval mortality after baiting with high concentration (10,000 ppm) of diflubenzuron.

Pree *et al.* (1976) when working with persistency of foliar residues of several insecticides on apple manggot observed that 50 per cent larval mortality was obtained between 0.7 to 30.7 days depending on the rate of spray. Higher rates frequently resulted in higher concentrations of acephate residue (Lindquist and Krueger, 1975). Tappan *et al.* (1975) suggested that the elevated temperature during curing was probably responsible for the loss of insecticide residues

from field treated tobacco leaves. Furthermore, persistency also depends on leaf expansion rate as elaborated by McWhorter *et al.* (1976). In our study the above mentioned factors could have effected the concentration of the insecticide on the leaf surface, and thus influenced the amount of insecticide consumed as evidently demonstrated by the mean percent larval mortality.

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