Field evaluation of cypermethrin and cyfluthrin against dengue vectors in a housing estate in Malaysia

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ABSTRACT: Cynoff 25ULV® (cypermethrin 25 g/l) and Solfac UL015® (cyfluthrin 1.5% w/v) were evaluated against the sentinel sugar-fed adults and 4º-instar larvae of Aedes aegypti in a housing estate endemic of dengue in Malaysia. The impact of both pyrethroids on field populations of Aedes albopictus and Aedes aegypti larvae was monitored weekly using bottle containers. Both Cynoff 25ULV® and Solfac UL015® showed adulticidal effects and larvicidal effects. This field trial using Cynoff 25ULV® against dengue vectors showed its potential for use in dengue vector control programs. Journal of Vector Ecology 27(2): 230-234. 2002.

Keyword Index: Cynoff 25ULV®, Solfac UL015®, Aedes albopictus, Aedes aegypti, ULV spraying, dengue vector control.

INTRODUCTION

Aedes aegypti (L.) is the primary vector of dengue viruses in Southeast Asia with Aedes albopictus (Skuse) serving as secondary vector (Russell et al. 1969, Chan et al. 1971, Jumali et al. 1979, Harinasuta 1984). Nonetheless, Ae. albopictus can transmit virus that causes dengue haemorrhagic fever (DHF) and dengue shock syndrome (DSS) (Jumali et al. 1979). Gratzi (1991) reported that properly applied and timed ultra-low-volume (ULV) insecticide application could be effective in suppressing dengue vectors at the time of an epidemic. Kilpatrick et al. (1970) conducted a series of field trials of ULV insecticide applications for determination of efficiency in rapid control of Ae. aegypti in Thailand. A rapid reduction in natural mosquito population occurred at an application of 438 ml/ha. Sulaiman et al. (1998) evaluated cyfluthrin and malathion 96TG ULV application on the dengue vectors at high-rise apartment buildings in Kuala Lumpur, both insecticides showed adulticidal effects but cyfluthrin showed more significant larvicidal effect than malathion 96TG. Sulaiman et al. (2000) also evaluated deltamethrin/s-bioallethrin/piperonyl butoxide and cyfluthrin against dengue vectors at high-rise apartment buildings in Malaysia. Both insecticides also showed adulticidal and larvicidal effects.

The objective of this study was to compare the efficacy of cypermethrin and cyfluthrin applied as ULV treatments against the dengue vectors in a housing estate endemic of dengue/dengue haemorrhagic fever.

MATERIALS AND METHODS

A housing estate in Bandar Tun Razak, approximately 10km from the center of Kuala Lumpur, was chosen for this study. The housing estate is composed of single-storey, brick-walled linked houses. The houses were divided into 3 sectors with 10 houses chosen at random from each sector. One sector was assigned to receive one pyrethroid spray application, a second sector the other pyrethroid, with the third sector sprayed with diesel only, served as the control. Cynoff 25ULV® (containing cypermethrin 25g/l), provided by FMC APG-Specialty Products PT Bina Guna Kimia, Jakarta, Indonesia and Solfac UL015® (containing cyfluthrin 15g/l), supplied by Bayer (M) Sdn. Bhd., were diluted in diesel at a concentration of 6 gm a.i. at a volume of 21. Each pyrethroid was sprayed 5 times over a 2-3 month interval at 1800 h each time. A LECO/Model 1600 cold aerosol generator mounted on a vehicle was used for spraying. The flow rate of ULV application was 104 ml/min (3.5 fl oz/min) and vehicle velocity of 6 km/hr...
Table 1. Overall knockdown and mortality effects of ULV spraying with Cynoff 25ULV® and Solfac UL015® against sentinel *Aedes albopictus* adults and larvae inside and outside houses.

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<thead>
<tr>
<th></th>
<th>Adults</th>
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<th>Larvae</th>
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<tbody>
<tr>
<td></td>
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<td>Mean 24-h Mortality(%)</td>
<td>Mean 1-h Knockdown(%)</td>
<td>Mean 24-h Mortality (%)</td>
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<tr>
<td></td>
<td>Outside houses</td>
<td>Inside houses</td>
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<tr>
<td>Treatment</td>
<td></td>
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<td>55.9a</td>
<td>96.6a</td>
<td>97.1a</td>
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<tr>
<td>Solfac UL015®</td>
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<td>64.2a</td>
<td>96.3a</td>
<td>97.2a</td>
</tr>
<tr>
<td>Control</td>
<td>14.2b</td>
<td>14.7b</td>
<td>12.7b</td>
<td>12.6b</td>
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</tbody>
</table>

Means within a column followed by the same letter are not significantly different (P>0.05; least significant difference).
Figure 1. Field populations of *Aedes aegypti* and *Ae. albopictus* larvae before and after ULV spraying with Cynoff 25 ULV® and Solfac UL015®.
Knockdown and mortality of caged four-day-old sugar-fed *Aedes albopictus* were used to evaluate the efficiency of the two insecticides. Cylindrical screened sentinel cages (26 cm long x 18 cm diam.) were filled with 25 sugar-fed female *Ae. albopictus* and the cages were hung inside a room in each house and outside at 1.5 m above the floor. A sugar cube was placed on top of each cage for *ad lib* feeding. In addition, bottle containers (5.7 cm high x 6.5 cm diam.), each containing 25 4th-instar *Ae. albopictus* larvae in water, were placed on the floor against the wall inside and outside each house. Both the screened cages and the bottle containers were left at their placement sites 24h after ULV spray application.

In order to monitor *Aedes* field populations, bottles containing water were placed inside and outside each house six weeks before ULV spraying to serve as breeding sites for wild mosquitoes. Each week the number of larvae in the bottle containers was counted and removed. Data analysis used the least significant different test (Choi 1978).

**RESULTS AND DISCUSSION**

Both cypermethrin and cyfluthrin were significantly different from the control in causing adult knockdown one hour after spraying both outside and inside houses ($P<0.0005$) (Table 1). There was no significant difference between cypermethrin and cyfluthrin in causing adult knockdown inside and outside houses ($P>0.05$). There was no significant difference between cypermethrin and cyfluthrin in causing adult mortality both inside and outside houses ($P>0.05$), but there was a significant difference between both pyrethroids and the control both inside and outside houses ($P<0.0005$). These results indicate that both cypermethrin and cyfluthrin had adulticidal and knockdown effects on *Ae. albopictus*.

Both cypermethrin and cyfluthrin were significantly different from the control in causing larval mortality both outside and inside houses ($P<0.0005$) (Table 1). Cyfluthrin had a slightly higher mortality effect on the larvae than did cypermethrin. However, both pyrethroids caused a very low level of larval knockdown after 1hr of ULV spraying. These results indicate that both cypermethrin and cyfluthrin were effective in controlling the adult populations of *Ae. albopictus*. Both pyrethroids also caused *Ae. albopictus* larval mortality. Cyfluthrin was shown to be effective pyrethroid for *Ae. aegypti* control in the field in our earlier studies (Sulaiman et al. 1998, 2000). The present study showed that cypermethrin also showed a potential and promising insecticide with both adulticidal and larvicidal effect on the dengue vector *Ae. albopictus* in the housing estate.

Figure 1 shows the larval populations of *Ae. albopictus* and *Aedes aegypti* in field containers before and after ULV spraying with cypermethrin and cyfluthrin. A reduction of larval population occurred immediately after ULV spraying with both pyrethroids. Generally the *Aedes* population in the control sector was higher than the sectors sprayed with cypermethrin and cyfluthrin. This study showed that both pyrethroids were effective in suppressing the field larval populations of *Aedes* species. Similar reductions in field populations, as a result of the impact of ULV applications of fenitrothion for controlling *Ae. aegypti* in Bangkok, Thailand, indicated immediate killing of adult mosquitoes and some larvicidal effect interrupted oviposition and delayed the recovery of the mosquito population (Pant et al. 1973). Sulaiman et al. (1999) using Sumithion L-40S® (fenitrothion 40% w/w+ tetramethrin 1%w/w) also showed adulticidal and larvicidal effects on dengue vectors in Malaysia.

In conclusion, cyfluthrin is currently utilized for dengue vector control in Malaysia, cypermethrin (Cynoff 25ULV®), another new generation pyrethroid, may now be considered as a promising product for inclusion in dengue vector control operations.

Acknowledgments

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