The Susceptibility of an Adult Damselfly, Ischnura Verticalis, to Selected Insecticides

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Adult Ischnura verticalis females were given topical applications of selected insecticides (fenthion, malathion, propoxur and allethrin). Mortality was recorded after 12 hours. On a weight basis, adult Ischnura approximate the susceptibility of adult mosquitoes for these insecticides.

MATERIALS AND METHODS

Adult insects were collected at Battelle Lake, West Jefferson, Ohio on the day of each experiment. The insects were transported from the collection site in 1 ft³ screened, metal cages, and were treated immediately upon return to the laboratory.

The insecticides, at least 90% pure, were prepared as acetone solutions: fenthion, 0,0-dimethyl 0-[4-(methylthio)-m-tolyl] phosphorothioate; malathion, diethyl mercaptosuccinate, S-ester with 0,0-dimethyl phosphorodithioate; propoxur, o-isopropoxyphenyl methylcarbamate; allethrin, 2,2-dimethyl-3-(2-methylpropenyl) cyclopropane carbonyl oxide ester with 2-allyl-4-hydroxy-3-methyl-2-cyclopenten-1-one. New insecticide solutions were prepared for each experiment.

Insects were dosed without anesthesia by placing 1 μl of solution upon the mesonotum with an electric microapplicator (Isco.). Circular, plastic holding dishes, 6" x 114", were divided into three compartments with paper inserts and fitted with screen lids. Treated
insects were held, one per compartment, at 25=1°C. Each experiment was comprised of at least 3-5 different doses; the number of insects/dose varied between 9 and 24.

Mortality was recorded after 12 hours, corrected for control mortality (Abbott 1925), then plotted on logarithmic-normal graph paper. The best line was fitted by eye to pooled data of replicate experiments and the regression coefficients and LD_{50} values were determined by inspection.

RESULTS AND DISCUSSION

All LD_{50} values were within a fairly close interval of 1.0 to 4.6 μg/g. Except for allethrin, the regression coefficients (slopes) were generally low (table 1).

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>12 hr LD_{50}, μg/g</th>
<th>Regression coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>fenthion (2)*</td>
<td>1.3</td>
<td>2.4</td>
</tr>
<tr>
<td>malathion (2)</td>
<td>1.7</td>
<td>1.4</td>
</tr>
<tr>
<td>propoxur (3)</td>
<td>1.0</td>
<td>3.1</td>
</tr>
<tr>
<td>allethrin (3)</td>
<td>4.6</td>
<td>4.5</td>
</tr>
</tbody>
</table>

*Number of experiments.

Preliminary experiments with both sexes revealed high mortality in the acetone controls after 24 hours. Female mortality in untreated checks and acetone checks was consistently reduced to 7-12% by shortening the observation period to 18 or 12 hours. The shortest time period was adopted as standard on the basis of these data.

The adult stage of damselflies lasts 1 to 4 weeks, depending upon species, sex, mating activity and environmental conditions (Corbet 1962). It appears that adults of this species, especially males, are very sensitive to collection, handling and experimentation. Moreover, insects in this order are aggressive, voracious predators. Treated insects had to be confined separately for observation to avoid death by predation. Otherwise, control mortality exceeded 50%.

Females of the genus *Ischnura* are dimorphic, the heterochromatic females with orange markings being more common than the homeochromatic females with light green markings (Usinger 1968).

The average weights of males and both types of females, calculated from 34 individual weights in each group were (mg±S.D.): homeochromatic females, 19.2±2.1; heterochromatic females, 13.1±1.9; males, 15.1±1.6. The heavier homeochromatic females predominated in our population. In general, heavier insects of the same species will tolerate larger doses of insecticides. Thus, these toxicity data represent the response of the most tolerant form of this species.

Topical application data for other adult aquatic insects are scarce, but a few values were located for comparison with *Ischnura* (LD_{50} values in μg/g): *Culex pipiens quinquefasciatus*, fenthion (1.1) (Georghiou and Metcalf 1961); *Anopheles quadrinaculatus* (avg wt, 2.3 mg/insect) (Jeffery 1956), malathrin (3.5), malathion (4.2) (Ludvik 1953); *Aedes aegypti* (avg wt, 2.0 mg/insect) (Fisk 1950), fenthion (2.1), malathion (4.0), propoxur (3.7) (World Health Organization 1968). Adult *Ischnura* are apparently as susceptible to insecticides as adult mosquitoes on a weight basis, although the LD_{50} values of *Ischnura* in μg/insect are higher due to weight differences.

Acknowledgments. We thank Battelle Memorial Institute, Columbus, Ohio, for permission to collect insects at the lake. Mr. Robert Restifo, Department of Entomology, Ohio State University, identified the species for us. P. F. Federle was supported by trainee funds from FWQA Grant 900130, WP-210004 and 5 Ti WP-210-03.

REFERENCES CITED


