different insecticides for use in delaying resistance to DDT and dieldrin by Indonesia's primary malaria vectors.

Acknowledgments. The authors would like to thank the numerous personnel of the West Java WHO AID Special Study Team and the members of the Malaria Institute for their help in construction of the test panels, in obtaining test mosquitoes and in performing the monthly panel tests, respectively.

Literature Cited


LABORATORY EVALUATION OF MATERIALS AS LARVICIDES AGAINST MOSQUITOES IN NEVADA

H. C. CHAPMAN


Agricultural chemicals are not extensively used in Nevada and the direct use of these materials against mosquitoes is even less common. The State possesses no organized mosquito abatement districts. Foggery and spraying operations are sometimes conducted by various urban and military groups in an attempt to provide temporary relief against the hordes of Aedes mosquitoes that are often produced by flooded situations. Practically all of these efforts are directed against adult mosquitoes. The public clamor for some form of control measure against mosquitoes fluctuates with the amount of water available for irrigation during the growing season and has recently largely subsided because of 3 consecutive years of drought (1959-61).

The following studies were conducted

1 In cooperation with the Nevada Agricultural Experiment Station, Reno, Nevada.

in 1960 to obtain baseline data on the toxicity of some commonly used larvicides against several of the more important pest species.

Methods. Fourth instar larvae of Aedes dorsalis (Meigen), A. melanomelas Dyar, A. nigromaculis (Ludlow), Culiseta inornata (Williston), Culex erythrothorax Dyar, and Culex tarsalis Coquillett were collected in the field and carefully transported to the laboratory. The test procedure consisted of placing 25 larvae in 400-ml glass jars containing 250 ml of acetone-distilled water suspension of the various toxicants. Mortality counts were taken after 24 hours, the criterion for mortality being the inability of the larvae to surface. Those pupating were not included in the counts. Controls (distilled water) were included in the counts. Tests were conducted at approximate 75°F. The data are based on 4 to 5 replications with each compound.
### TABLE 1.—Dosages expressed in parts per million of various larvicides required to obtain 50 and 90 percent 24 hour mortality in six mosquito species

(25 larvae per test—4-to 10 replications)

<table>
<thead>
<tr>
<th>Mosquito species</th>
<th>Area</th>
<th>Lindane</th>
<th>DDT</th>
<th>Malathion</th>
<th>Parathion</th>
<th>Bayer 29193</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LC-50</td>
<td>LC-90</td>
<td>LC-50</td>
<td>LC-90</td>
<td>LC-50</td>
<td>LC-90</td>
</tr>
<tr>
<td>Aedes dorsalis</td>
<td>Fallon</td>
<td>0.0076</td>
<td>0.015</td>
<td>0.0078</td>
<td>0.022</td>
<td>0.023</td>
</tr>
<tr>
<td></td>
<td>Yerington</td>
<td>0.0072</td>
<td>0.0086</td>
<td>0.0098</td>
<td>0.0375</td>
<td>0.0225</td>
</tr>
<tr>
<td>nigromaculatus</td>
<td>Fallon</td>
<td>0.0043</td>
<td>0.0084</td>
<td>0.007</td>
<td>0.0155</td>
<td>0.012</td>
</tr>
<tr>
<td>Coquilima inornata</td>
<td>Pernley</td>
<td>0.035</td>
<td>0.14</td>
<td>0.047</td>
<td>0.11</td>
<td>0.09</td>
</tr>
<tr>
<td>Culex tarsali</td>
<td>Reno</td>
<td>0.008</td>
<td>0.032</td>
<td>0.014</td>
<td>0.041</td>
<td>0.02</td>
</tr>
<tr>
<td>erythrahorax</td>
<td>Hazen</td>
<td>..</td>
<td>..</td>
<td>0.028</td>
<td>0.048</td>
<td>0.022</td>
</tr>
</tbody>
</table>
RESULTS AND DISCUSSION. The results of the tests are presented in Table 1. A comparison of the LC-50’s and LC-90’s obtained with the various materials and species indicated that parathion was the most toxic insecticide, followed by lindane, DDT, and malathion, respectively. Bayer 29403 (o-o-dimethyl o-[4-(methylthio)-m-tolyl] phosphorothioate) was tested against Culex tarsalis and Culiseta inornata only; the results were comparable with those obtained with parathion.

Larvae of Culiseta inornata were the most difficult to kill, followed by those of Culex erythrothorax, C. tarsalis, and the Aedes spp., respectively. Aedes nigromaculis was slightly more sensitive to all of the toxicants than A. dorsalis and A. melanomachus. There were no clear-cut differences in susceptibility indicated between these last two species.

Differences in laboratory techniques, laboratory temperatures, and sources of larvae (whether obtained as eggs, first, or fourth instar) probably vitiate any valid comparison with results obtained from untreated areas, such as those in California in the early and mid-1950’s. It is, however, interesting to note that the results obtained in Nevada generally fell within or below the ranges reported by various writers for the same materials from uncontrolled areas in California. As an example, the following LC-50 ranges were reported for Culex tarsalis larvae by Gjullin and Peters (1952) and Gjullin and Isaka (1957): DDT 0.0003–0.0054 p.p.m.; lindane, 0.0118–0.0 p.p.m.; malathion, 0.02–0.035 p.p.m.; and parathion, 0.003–0.0052 p.p.m. It can be concluded from this study that resistance to insecticides appears to be no immediate problem in the mosquitoes of Nevada.

Literature Cited


TRAPPING OVERWINTERING ADULTS OF THE MOSQUITOE CULEX TARSA LIS AND ANOPHELES FREEBORNII

ROBERT P. HAVOOD 1

INTRODUCTION. There continues to be considerable interest in finding natural overwintering sites of Culex tarsalis Coq. This is desirable in order to determine definitely whether the viruses of western equine and St. Louis encephalitis survive through the winter in this mosquito. As C. tarsalis is involved in summer maintenance and transmission of these viruses, it is also desirable to know when the mosquito emerges from winter diapause, and how large a population has successfully overwintered. The findings related here are primarily directed towards these latter problems. Observations on Anopheles freebornii Aitken are included since this mosquito was frequently encountered in overwintering quarters.

STUDY AREA AND METHODS. The investigations took place in the U. S. Fish and Wildlife Service’s Columbia Wildlife Refuge north of Othello, Washington. The refuge lies approximately twenty mil

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1 Associate Entomologist, Washington State University. This study was supported by a grant (E-3253) from the National Institutes of Health, U. S. Public Health Service. Washington Agricultural Experiment Stations Scientific Paper 2169, conducted under Project 1434.