FIELD TESTS ON THE PERSISTENCE OF MOSQUITO LARVICIDES IN ALKALINE WATER IN CALIFORNIA

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INTRODUCTION. The frequency of application of mosquito larvicides in control programs in certain areas of California is in part on the persistence of the pesticide in waters which are highly alkaline. When chlorinated hydrocarbon pesticides were used prior to the development of resistance, one larvicidal application often remained effective for several years (Robinson, 1945). Miles (1950) reported on the residual effectiveness of several chlorinated hydrocarbons for 2 to 3 years against floodwater mosquitoes. Residue problems on agricultural crops and the development of physiological resistance have precluded the use of chlorinated hydrocarbons for mosquito larvicides in most California abatement districts; as a consequence organophosphorus compounds have become widely used in mosquito control programs.

Organophosphorus compounds vary considerably in the rate at which they are hydrolyzed by alkaline water. Easily hydrolyzed insecticides frequently are not effective in the field even at high dosage rates, and under certain conditions they remain toxic to mosquitoes for only a few hours. To plan the most effective frequency of applications, the stability of organophosphorus compounds and other mosquito larvicides must be evaluated under field conditions.

METHODS AND MATERIALS. Since irrigated pastures were not suitable for field studies, a pilot study area was provided at Traver with the cooperation of the United States Department of Agriculture, the Delta Mosquito Abatement District, and the Kaweah Delta Gun Club of Traver.

In these 10' x 13'6" (1/32 acre) test plots, variables such as depth of water and movement of water from one plot to another were controlled. A natural cover of...
Table 1.—24 hr. percent mortality of 4th instar *Culex tarsalis* after specific time interval.

<table>
<thead>
<tr>
<th>Compound</th>
<th>Application (lb./acre)</th>
<th>Immed. aft.</th>
<th>4 hrs.</th>
<th>8 hrs.</th>
<th>24 hrs.</th>
<th>48 hrs.</th>
<th>72 hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDT E.C.</td>
<td>1.0</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>71</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Malathion E.C.</td>
<td>0.5</td>
<td>100</td>
<td>80</td>
<td>45</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Malathion bentonite 20/30 mesh granules</td>
<td>0.5</td>
<td>72</td>
<td>...</td>
<td>...</td>
<td>37</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Hercules 7522 E.C.</td>
<td>0.75</td>
<td>89</td>
<td>...</td>
<td>...</td>
<td>5</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Dimethrin</td>
<td>0.3</td>
<td>88</td>
<td>43</td>
<td>32</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Parathion E.C.</td>
<td>0.4</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>20</td>
<td>2</td>
<td>...</td>
</tr>
<tr>
<td>Parathion 30 mesh sand core granules</td>
<td>0.4</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>90</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Baytex® E.C.</td>
<td>0.1</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>3</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Baytex® 30 mesh sand core granules</td>
<td>0.1</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>55</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Cymene® E.C.</td>
<td>0.1</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>80</td>
<td>61</td>
<td>...</td>
</tr>
<tr>
<td>Methyl Trithon® E.C.</td>
<td>0.25</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>70</td>
<td>36</td>
<td>99</td>
</tr>
<tr>
<td>Trithon® E.C.</td>
<td>0.4</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>99</td>
</tr>
</tbody>
</table>

* Emulsion concentrate.

Grasses, weeds, and sedges developed on the sides and bottom of each plot. The plots were filled with water to a depth of about six inches before the application of insecticides and records of water temperature and pH were kept.

Emulsion concentrate sprays were diluted with one-half gallon of water and applied with a one-gallon B and G compression sprayer fitted with a 3004 Teejet nozzle on the wand. Granules were applied with a horn seeder (Raley, 1961).

Immediately after treatment of each plot, fourth instar *Culex tarsalis* Coquillett larvae were placed within the confines of a floating basket (tea strainer). An untreated plot with larvae in floating baskets served as a control. Negligible mortality was observed in the control baskets. Four baskets with 25 larvac in each were placed at random in each plot. At various intervals after treatment, fresh larvac were placed in other baskets set into the plots to determine if the water was still toxic. Mortality counts were made after 24 hours on all sequence tests. Results of the tests are presented in Table 1. Each figure represents the average of three replications. The chemical compositions of the tested compounds are given in Table 2.

Restrict. The study extended from March into the first week of June, 1961. During this period the water temperatures varied little; the mean temperature was 50°F. The average pH was 8.8. Drastic changes in temperature and pH may affect the residual activity of insecticides, noted by Muller and Axelrod (1960).

Under the test conditions DDT, malathion (both granular and emulsion concentrate), Hercules 7522, and dimethrin were rapidly hydrolyzed. Trithon® emulsion concentrate at 0.5 lb/acre was tested.

Table 2.—Chemical composition of tested compounds.

<table>
<thead>
<tr>
<th>Compound</th>
<th>Chemical Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDT</td>
<td>1,1,1-trichloro-2,2-bis(2,4-diethylphenyl) ethane</td>
</tr>
<tr>
<td>Parathion</td>
<td>O,O-diethyl O-p-nitrophenyl phosphorothioate</td>
</tr>
<tr>
<td>Malathion</td>
<td>S-[1,2-bis(ethoxy)-benzyl]ethyl]O,O-methyl phosphorodithioate</td>
</tr>
<tr>
<td>Hercules 7522</td>
<td>O,O-dimethyl 2-chloro-3,5-isopropylphenyl N-methylcarbamate</td>
</tr>
<tr>
<td>Baytex®</td>
<td>O,O-dimethyl 4-[4-(methylthio)-m-tolyl] phosphorothioate</td>
</tr>
<tr>
<td>Methyl Trithon®</td>
<td>O,O-dimethyl S-p-chlorophenyl thiomethyl phosphate</td>
</tr>
<tr>
<td>Trithon®</td>
<td>S(1-p-chlorophenyl methyl)O,O-diethyl phosphorothioate</td>
</tr>
<tr>
<td>Cymene®</td>
<td>O,O-diethyl O-(2-pyrazinyl) phosphorothioate</td>
</tr>
<tr>
<td>Dimethrin</td>
<td>3,4-dimethylbenzyl chloryl</td>
</tr>
</tbody>
</table>
ost persistent material tested. Parathion
10-mesh sand core granules persisted
lightly longer than the emulsion concen-
trate applied at the same rate. On the
other hand, Baytex® emulsion concentrate
persisted slightly longer than 30-mesh
and core granules applied at the same
tate.
These results indicate that both the
emulsion of insecticide and the chemi-
ical nature of the compound affect residual
itivity. Furthermore, the rate of hydroly-
sis in the field may be an important factor
persistence.

MOSQUITOES AND OTHER ARTHROPODS FOUND IN
Baggage compartments of International Aircraft

B. R. EVANS, C. R. JOYCE, and J. E. PORTER

Introduction. The potential hazard of
aircraft introducing an exotic arthropod-
borne disease into the United
States has long been recognized. Routine
arthropod surveillance of airports and ap-
propriate control measures on aircraft en-
tering the United States from foreign
countries are applied by the entomological
division of the Division of Foreign Quarantine,
U. S. Public Health Service.
While there have been numerous re-
ports in the literature (Welch, 1939; Whit
feld, 1939; Denning et al., 1947; Miller et al.,
1947; Hughes, 1949; Aird, 1951; Hughes et al.,
1956; and Porter, 1958) of arthropods recovered
from aircraft, little has been published
with reference to the comparative signifi-
cance of the various compartments. The
purpose of this study made in 1960 and
1961 was to evaluate the importance of the
baggage compartments as a carrier of
arthropods, especially mosquitoes, in inter-
national traffic entering New Orleans,
Louisiana; Honolulu, Hawaii; and Miami,
Florida.
Griffith and Griffiths (1931) found that
the front baggage compartments of the
Sikorsky amphibian aircraft were ideal for
harboring mosquitoes. The majority of mosquitos recovered by these authors
were from this part of the airplane. In
inspections of aircraft at Khartoum, Sudan,
from 1935 to 1936, Whitfield (1939) found
most of the insects in the main
cabin, but reported that occasionally speci-
cmens were collected from the baggage
compartment.
Methods. The baggage compartments
and cabins of 210 aircraft were inspected
for arthropods at the Moisant International
Airport in New Orleans. These planes
were all four-motored propeller-type aircr
each with two baggage compartments.

A total of 89 aircraft was inspected at
the Honolulu International Airport. All
of these planes were four-motored jet-type
aircraft, each with two baggage compart
ments.

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1 Scientist, Scientist Director, and Scientist Di-
rector respectively at the New Orleans Quarantine
Station, Honolulu Quarantine Station, and Miami
Quarantine Station, Public Health Service, De-
partment of Health, Education, and Welfare.