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## EFFECTIVENESS OF SIX PROMISING INSECTICIDES FOR MOSQUITO CONTROL<sup>1</sup>

G. A. MOUNT, N. W. PIERCE AND K. F. BALDWIN

Entomology Research Division, Agr. Res. Serv., USDA, Gainesville, Fla. 32601

**ABSTRACT.** Six chemicals were evaluated in the laboratory for their effectiveness against larvae of *Anopheles quadrimaculatus* Say and adults of *Aedes taeniorhynchus* (Wiedemann). Chevron RE-11775 (*m*-sec-butylphenyl methyl(phenylthio) carbamate) and Plant Protection PP 511 (*O*-[2-(diethylamino)-6-methyl-4-primidiny] *O,O*-dimethyl phosphorothioate) were the only compounds that showed promise against mosquito larvae. Fisons NC-6897 (2,3-(isopropylidenedioxy)phenyl methylcarbamate) and Chevron

RE-11775 were the most effective of the six against adult mosquitoes. Of the other four, Geigy GS-13006 (*O,O*-diethylphosphorodithioate *S*-ester with 4-(mercaptomethyl)-2-methoxy- $\Delta^2$ -1,3,4-thiadiazolin-5-one), Sandoz 52,115 (1-ethyl-1-methyl-2-propynyl crotonate dimethyl phosphate), and Sandoz 52,097 (isopropyl (*E*)-3-hydroxy-crotonate methyl propylphosphoramidate) were slightly more effective and Plant Protection PP 511 was slightly less effective than malathion against the adults.

The evaluation of candidate chemicals against larval *Anopheles quadrimaculatus* Say and adult *Aedes taeniorhynchus* (Wiedemann) is an essential part of the effort of the Insects Affecting Man Investigations Laboratory at Gainesville, Fla. This paper reports the results obtained with six new chemicals in laboratory tests.

**TESTING TECHNIQUE.** Larval susceptibility tests were conducted by placing groups of

25 fourth instar larvae of *A. quadrimaculatus* in glass jars containing 250 ml of distilled water that had been treated with various concentrations of the insecticides in acetone solution. Larvae not exposed to chemicals showed no mortality. Duplicate jars were used at each concentration, and three tests were made with each concentration of each insecticide.

Adult susceptibility tests were conducted by exposing groups of 25 adult female *A. taeniorhynchus* to contact sprays containing a range of concentrations of each insecticide in a wind tunnel. A description of the wind tunnel and procedures used is

<sup>1</sup> This paper reports the results of research. Mention of a pesticide in this paper does not constitute a recommendation of this product by the U. S. Dept. of Agriculture.

TABLE I.—Effectiveness of six insecticides in laboratory tests against larval and adult mosquitoes.

| Insecticides  | <i>Anopheles quadrimaculatus</i> larvae   |   |  | <i>Aedes taeniorhynchus</i> adults      |  |  | Mammalian toxicity <sup>b</sup><br>(oral LD <sub>50</sub><br>in mg/kg) |
|---|---|---|--|---|--|--|--|
|   | 24-hour kill<br>(LC <sub>50</sub> in ppm) | LC <sub>50</sub> reciprocal<br>ratio to Abate® <sup>a</sup> | 1-hour<br>knockdown<br>(KC <sub>50</sub> in %) | 24-hour kill<br>(LC <sub>50</sub> in %) | LC <sub>50</sub> re-<br>ciprocal ratio<br>to malathion | LC <sub>50</sub> re-<br>ciprocal ratio<br>to malathion |  |
| Fisons NC-6897 (2,3<br>(isopropylidenedioxy)phenyl<br>methylcarbamate) (ENT-27695)  | 1.0                                       | 0.006   | 0.0066   | 0.0066                                  | 4.85   | 4.85   | 80   |
| Chevron RE-11775<br>( <i>m-sec</i> -butylphenyl methyl<br>(phenylthio)carbamate) (ENT-27704-X)  | .016                                      | .375  | .020   | .016                                    | 2.0  | 2.0  | 131  |
| Geigy GS-13006 ( <i>O,O</i> -diethylphos-<br>phorodithioate S-ester with 4-<br>(mercaptomethyl)-2-methoxy- $\Delta^2$ -<br>1,3,4-thiadiazolin-5-one)<br>(ENT-27707) | .22                                       | .027  | .086   | .023                                    | 1.39   | 1.39   | 25-54  |
| Sandoz 52,114 (1-ethyl-1-<br>methyl-2-propynyl crotonate<br>dimethyl phosphate) (ENT-27754)   | .54                                       | .011  | .031   | .025                                    | 1.28   | 1.28   | 41-55  |
| Sandoz 52,097 (isopropyl (E)-<br>3-hydroxycrotonate methyl<br>propylphosphoramidate) (ENT-27753)  | 1.5                                       | .004  | .039   | .030                                    | 1.07   | 1.07   | 60-73  |
| Plant Protection PP-511 ( <i>O</i> -[2-<br>(diethylamino)-6-methyl-<br>4-pyrimidinyl][ <i>O,O</i> -dimethyl<br>phosphorothioate) (ENT-27699)                        | .027                                      | .222  | .32  | .035                                    | .91  | .91  | >2,000   |

<sup>a</sup> Abate (*O,O'*-(thiodo-*p*-phenylene)*O,O',O'*-tetramethyl) phosphorothioate.

<sup>b</sup> Data on female rats supplied by manufacturers.

given by Mount *et al.* (1970). Knockdown and mortality counts were taken 1 and 24 hours after exposure, respectively. Adult female mosquitoes not exposed to chemicals showed no mortality. Three duplicate-cage tests were made with each concentration of each insecticide.

**RESULTS AND DISCUSSION.** The most effective insecticides against larvae of *A. quadrimaculatus* were Chevron RE-11775 and PP 511 with LC<sub>90</sub> reciprocal ratios to Abate of 0.375 and 0.222, respectively (see Table 1). The other compounds were from 37 to 250 times less toxic than the Abate standard and, therefore, are much less promising as mosquito larvicides.

The most effective compound against adults of *A. taeniorhynchus* was Fisons NC-6897 which was about five times as effective as the malathion standard at the LC<sub>90</sub>. Chevron RE-11775 was twice as effective as malathion. Geigy GS-13006, Sandoz 52,114, and Sandoz 52,097 were slightly more effective and PP 511 was slightly less effective than malathion.

Relatively quick knockdown is a desirable characteristic of mosquito adulticides. Thus the KC<sub>90</sub> values given in Table 1

indicate that Fisons NC-6897, Chevron RE-11775, Sandoz 52,114, and Sandoz 52,097 produced 90 percent knockdown within the first hour after exposure to concentrations that were either about the same or only slightly higher than their respective LC<sub>90</sub>'s. Geigy GS-13006 and PP 511 gave relatively poor knockdown.

The acute oral toxicity (Table 1) for rats given by the manufacturers of the test compounds indicate that only PP 511 had about the same value as the malathion and Abate standards. However, Chevron RE-11775 is reported to be somewhat less toxic to rats than the other compounds and appears to be promising for use in mosquito control programs against organophosphorus-resistant mosquitoes (Schaefer and Wilder 1970).

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