Table 1. Biological activity of IGRs against *C. variipennis* larvae.

Conc. (ppm)	Percent Inhibition of Emergence					
	Dimilin	Methoprene	R–20458	Mon–858	RO–20–3600	HE–24108
0.005	7					
0.01	7	0	15			
0.05	35	42	11	0		
0.1	66	47	16	1	0	
0.5	90	76	33	2	6	
1.0		91	66	12	12	0
5.0			94	33	28	21
10.0			100	88	40	44

Application of 10 ppm of these IGRs resulted in less than 45% inhibition of emergence. In view of the low levels of susceptibility manifested by the *Culicoides* larvae tested relative to other Diptera such as mosquitoes (Mulla 1974a, Schaefer and Wilder 1973, Schaefer et al. 1974), it appears that these IGR compounds may be of no practical use against *Culicoides* species. It should be noted, however, that our results may not accurately reflect the intrinsic susceptibility of *C. variipennis* to these chemicals, since the calculation of percent inhibition of emergence did not include dead adults. Significant post emergent mosquito mortalities have been reported for methoprene (Schaefer and Wilder 1973) and Dimilin (Arias and Mulla 1975) treatments of 4th instars. The work of Hsieh and Steelman (1974) indicates that related species may vary widely in susceptibility to IGRs. Certainly, additional species must be tested before the usefulness of IGRs against Ceratopogonidae can be fully assessed.

Literature Cited

Apperson, C. S. 1975. Biological activity of insecticides against *Culicoides variipennis* Coquillett. Proc. Calif. Mosquito Contr. Assoc. 43:118–9.

Arias, J. R. and M. S. Mulla. 1975. Post emergence effects of two insect growth regulators on the mosquito *Culex tarsalis* (Diptera: Culicidae). J. Med. Entomol. 12:317–22.

Hsieh, M.-Y. G. and C. D. Steelman. 1974. Susceptibility of selected mosquito species to five chemicals which inhibit insect development. Mosquito News 34:278–282.

Jakob, W. L. 1973. Developmental inhibition of mosquitoes and the house fly by urea analogs. J. Med. Entomol. 10:452–55.

Mulla, M. S., R. L. Norland, T. Ikeshoji and W. L. Kramer. 1974a. Insect growth regulators for the control of aquatic midges. J. Econ. Entomol. 67:165–70.

Mulla, M. S., H. A. Darwazeh and R. L. Norland. 1974b. Insect growth regulators: evaluation procedures and activity against mosquitoes. J. Econ. Entomol. 67:329–32.

Mulla, M. S., D. R. Barnard and R. L. Norland. 1975. Chironomid midges and their control in Spring Valley Lake, California. Mosquito News 35:389–95.

Sacher, R. M. 1971. A mosquito larvicide with favorable environmental properties. Mosquito News 31:513–16.

Schaefer, C. H. and W. H. Wilder. 1972. Insect developmental inhibitors: a practical evaluation of mosquito control agents. J. Econ. Entomol. 65:1066–71.

Schaefer, C. H. and W. H. Wilder. 1973. Insect developmental inhibitors. 2. Effects on target mosquito species. J. Econ. Entomol. 66:913–16.

Schaefer, C. H., W. H. Wilder, F. S. Mulligan and E. F. Dupras. 1974. Insect developmental inhibitors: Effects of Altosid®, TH–6040 and HE–24108 against mosquitoes (Diptera: Culicidae). Proc. Calif. Mosquito Contr. Assoc. 42:137–39.

2467 9

TESTS OF RESMETHRIN WITH SEVERAL SYNERGISTS IN A LABORATORY WIND TUNNEL AGAINST CAGED ADULT MOSQUITOES

C. B. RATHBURN, JR. AND A. H. BOIKE, JR.

West Florida Arthropod Research Laboratory, Panama City, Florida 32401

The following research was conducted with resmethrin (SBP–1382) alone and synergized 1:3 with hexanediol, omite, sulfoxide or piperonyl butoxide to determine the effects of the various synergists on the control of adult mosquitoes. The technical resmethrin was a 40% concentrate, and the technical synergized compounds were formulated to contain 15g. of resmethrin plus 45g. of synergist per 100 ml. All compounds were supplied by S. B. Penick and Company.

The testing procedure consisted of exposing

Table 1. Laboratory tests of resmethrin (SBP–1382) alone and with various synergists against caged adult *Aedes taeniorhynchus* (Wied.) and *Culex nigripalpus* Theob.

Synergist	Ratio	Test year	Milligrams a.i. per milliliter			
			Aedes		*Culex*	
			LC_{50}	LC_{90}	LC_{50}	LC_{90}
None	...	1971	0.370	1.33	0.0425	0.142
None	...	1975	0.445	1.50	0.0420	0.150
Hexanediol	1:3	1975	0.405	1.03	0.0360	0.150
Omite	1:3	1975	0.341	1.10	0.0245	0.0975
Sulfoxide	1:3	1975	0.0475	0.170	0.0153	0.0780
Piperonyl butoxide	1.3	1975	0.0355	0.108	0.0155	0.0473

6-in. diameter screen cages, each containing ca. 25 female *Aedes taeniorhynchus* or *Culex nigripalpus,* to .5 ml of an acetone solution of each dosage of each toxicant sprayed at 15 psi in a wind tunnel at an air velocity of 3 mph. Eight to ten replications or cages were exposed individually to 4 or 5 concentrations of each toxicant plus a check of acetone only. The LC_{50} and LC_{90} dosages were obtained from curves of the average percent mortality at each concentration corrected for check mortality which averaged 1% for *A. taeniorhynchus* and 2% for *C. nigripalpus.*

As shown in Table 1, there was no difference between the results of tests of resmethrin without synergist conducted in 1975 and those conducted in 1971. Resmethrin-hexanediol (1:3) was no better than resmethrin alone against either mosquito species. Resmethrin-omite (1:3) was only slightly better than resmethrin alone against *C. nigripalpus,* but no better against *A. taeniorhynchus.* Resmethrin-sulfoxide (1:3) and resmethrin-piperonyl butoxide (1:3) were about 10 times more effective than resmethrin alone against *A. taeniorhynchus* and 2 to 3 times against *C. nigripalpus.* In general, resmethrin alone and with any of the synergists was more effective against *C. nigripalpus* than against *A. taeniorhynchus,* but the addition of piperonyl butoxide or sulfoxide greatly increased its toxicity to *A. taeniorhynchus.*

2468 9

A LIGHT TRAP FOR COLLECTING AQUATIC ORGANISMS

CHARLES S. APPERSON AND DENNIS G. YOWS

Lake County Mosquito Abatement District,
Lakeport, CA 95453

Light traps have been used for sampling aquatic organisms from the littoral areas of lentic habitats. Various trap designs have been utilized (Baylor and Smith, 1953, Bertram et al. 1970, Espinosa and Clark 1972, Erwin and Haines 1972, Hungerford et al. 1955, Husbands 1967, Washino and Hokama 1968, Zismann 1969); however, these have been either too large for sampling in shallow water or expensive to construct since some require special tools or materials. To sample aquatic organisms in shallow pond or lake habitats, we have developed a simple and inexpensive light trap which contains some features of published designs (Baylor and Smith 1953, Hungerford et al. 1955, Husbands 1967).

Dimensions of the trap (fig. 1) can be varied as to need. The sample container consists of a glass quart jar. A polyethelene funnel (O.D., top, 80 mm) is held in the jar mouth by a brass screw ring. Sides of the jar are painted black so that light is oriented down through the funnel. A plastic bowl, with a circular hole in the bottom, is used to anchor the flashlight to a styrofoam float (30 x 30 cm). When the collection jar is placed in the float the flashlight is forced upward against the bowl. Wire hooks attached to the float are fitted over the rim of the brass ring holding the entire unit firmly together. After sampling, the trap is removed and a brass canning lid is used to seal the sampling jar. If the float is not desired, the wire hooks can be attached directly to the plastic bowl. The trap can then be suspended from a wooden or metal pole pounded into the lake bottom.

We have collected a variety of organisms with