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RESULTS OF INSECTICIDE RESISTANCE TESTS AGAINST LARVAE OF *CULEX PIFIENS QUINQUEFASCIATUS* SAY IN BRITISH GUIANA

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The six insecticides in the World Health Organization kit for determining susceptibility or resistance of mosquito larvae to insecticides were tested against 3rd and 4th instar larvae of *Culex pipiens quinquefasciatus* in Georgetown, British Guiana, using the standard procedure (Brown, 1958). The larvae were obtained from pit

latrines in Newtown, Kitty, on the outskirts of Georgetown. Stock solutions provided with the kit were diluted so as to give solutions of 0.0008, 0.004, 0.02, 0.1, 0.5, and 2.5 p.p.m. of DDT, dieldrin, BHC, diazinon, malathion, and Baytex. Each test bowl contained 25 larvae in natural water, and two control bowls accompanied each complete test, of which there were five replicates. Mortality readings were taken at varying intervals up to 24 hours following introduction of the larvae. The figures for dead and mori-

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bund larvae were combined, the latter being those which showed slight movement and total inability to surface on being prodded with a needle.

RESULTS. Considerable variation was noted in the 0.0008 and 0.004 p.p.m. solutions. Dilutions from 0.02 through 2.5 p.p.m. gave more consistent mortalities in the repeated tests. All control larvae remained normal and unaffected during all of the tests. The average mortality at each concentration is shown in Table 1.

percent at 0.1 p.p.m., and 0 percent at 0.02 p.p.m.; also, the larvae showed a greater resistance to DDT and a lower one to diazinon, malathion, and BHC (lindane). Tonn's results were similar to those in the present findings. Ramakrishnan *et al.* (1960) found in field tests against *Culex fatigans* that Baytex at 0.05, 0.1, 0.3, and 0.06 lb. per acre yielded residual control, and the persistence of toxicity to larvae increased with increase in the dosage. Saliternik *et al.* (1962) found that under

TABLE 1.—Average mortality (dead plus moribund) among batches of 25 *Culex pipiens quinquefasciatus* 3rd and 4th instar larvae after 24 hours in insecticidal solutions varying from 0.0008 to 2.5 p.p.m. (5 replications).

P.p.m.	DDT	Dieldrin	BHC	Malathion	Diazinon	Baytex
0.0008	0	1	0	8	12	18
0.004	1	2	1	11	17	23
0.02	1	4	1	24	23	23
0.1	4	6	15	25	25	25
0.5	25	25	25	25	25	25
2.5	25	25	25	25	25	25

During the 24-hour observation period, at any hour selected for counting comparative mortality, and at any of the dilutions, Baytex consistently yielded the greatest percentage of dead and dying larvae. Baytex proved to be the most potent larvicide used, 0.0008 p.p.m. causing an average of 72.0 percent mortality, and 0.004 p.p.m. causing an average of 92.0 percent mortality after 24 hours. At these dilutions diazinon was next in effectiveness, giving 48.0 and 68.0 percent mortality, respectively. At 0.02 p.p.m., Baytex, diazinon, and malathion were about equally effective (92.0 to 96.0 percent), and at 0.1 p.p.m. all three gave 100 percent mortality. DDT, dieldrin, and BHC did not yield 100 percent mortality until the 0.5 p.p.m. dilution, and at this dilution all six insecticides gave 100 percent control.

DISCUSSION. The effectiveness of Baytex (Bayer 29493) against larvae of *Culex pipiens quinquefasciatus* has also been reported by Mulla *et al.* (1961) and Mulla (1961). Tonn (1963) found in Puerto Rico that Baytex produced 100 percent mortality in this species at 0.5 p.p.m., 72

certain difficult field conditions, Baytex, dieldrin, and DDT were ineffective against larvae of *Culex pipiens molestus*, but that semimonthly spraying of 2.5 percent of malathion in Malariol plus a weekly drip of 0.1 to 0.4 p.p.m. of parathion gave excellent results against all larval stages.

Rai and Lewallen (1960) found that malathion applied at the rate of 100 lbs./acre, using the paper cup and residual techniques in the laboratory, was toxic to *Culex pipiens quinquefasciatus* for about 17 days; when applied at 1 and 10 lbs./acre, malathion was effective for only 3 days. Chow and Thevasagayam (1957) determined dieldrin and BHC to be the best larvicides against *Culex pipiens fatigans* in Ceylon, at the rate of 3 to 4 lbs. per acre, but weekly applications were necessary to ensure continued control. As regards DDT, the World Health Organization (1960) indicated that *C. p. quinquefasciatus* is naturally resistant to this insecticide, therefore the dosage of DDT and other hydrocarbon insecticides may have to be increased two to three times to obtain satisfactory mortalities. Using the

W.H.O. larval resistance test kit, Hedeem and Allen (1961) obtained 46 percent mortality of *Culex pipiens* larvae when using 0.25 p.p.m. of DDT, 75.5 percent mortality at 0.5 p.p.m., and 100 percent mortality at 2.5 p.p.m.

SUMMARY. Six insecticides were tested in concentrations from 0.0008 to 2.5 p.p.m. against 3rd and 4th instar larvae of *Culex pipiens quinquefasciatus* in British Guiana, using the W.H.O. kit for testing larval resistance or susceptibility. The most effective insecticide was found to be Baytex (Bayer 29493), followed by diazinon, malathion, BHC, dieldrin, and DDT. At 0.5 and 2.5 p.p.m., 100 percent control was obtained with all six insecticides within 24 hours. At 0.0008 p.p.m. Baytex produced an average of 72.0 percent mortality, and at 0.004 p.p.m. it gave 92.0 mortality after 24 hours. At 0.02 p.p.m. Baytex, diazinon, and malathion were about equally effective (92.0 to 96.0 percent), and at 0.1 p.p.m. all three gave 100 percent mortality.

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(CONTENTS continued from Front Cover)

	PAGE
EDITORIAL	345
ASSOCIATION NEWS: Dr. Robert Douglass Glasgow	346
NEWS AND NOTES.....	349
BIBLIOGRAPHY	355
ADVERTISING RATES	XV
LIST OF ADVERTISERS.....	354