

## EFFECTIVENESS OF VARIOUS DOSAGES OF DICHLORVOS-RESIN AGAINST *CULEX PIPIENS QUINQUEFASCIATUS*<sup>1</sup>

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Preliminary field tests at Savannah, Georgia, in 1962 revealed the potentialities of residual fumigants for the control of *Culex pipiens quinquefasciatus* Say in catch basins (Brooks *et al.*, 1963). Solid and liquid formulations of dichlorvos were used in these early tests at dosages of 30, 50, and 100 grams of technical dichlorvos per treated basin. This work describes studies on the length of residual action at varying dosages of a 20 percent formulation of dichlorvos in resin-plastic dispensers.<sup>2, 3</sup>

**MATERIAL AND METHODS.** Thirty catch basins known to sustain heavy *Culex* breeding were selected from a 48-square-block area in the southern part of the city. The basins of this area were primarily of brick, cylindrical in shape and ranging from 26 to 36 inches in diameter. With the exception of three, all basin drains were of the open type described by Maddock *et al.* (1963). Water levels within the study basins varied from 14 to 39 inches below street level, manifesting air volumes of from 6.0 to 18.9 cubic feet.

Treatments were made with dispenser units 3/16 by 2½ inches in 4-, 6-, 8-, 10-, and 12-inch lengths and containing 8, 12, 16, 20, and 24 grams of technical dichlorvos, respectively. Five basins were treated with each dosage; three dispensers were suspended in the basin above the water level, while the remaining two were mounted submersed in the water. Five basins scattered throughout the test area were left as untreated checks. Dispensers were hung by a length of number 12

coated copper wire from the front support rod of the basin top.

With only slight variation, the evaluation of the effectiveness of treatment was based on the method used by Brooks *et al.* (1963). After preliminary tests to establish the efficacy of the 3-hour exposure, this period was adopted for the entire test series. All test cages were suspended in the basin by means of a portable bar which permitted individual adjustment to the varying water levels.

Maximum and minimum air and water temperatures were recorded biweekly in representative basins. The levels of ambient temperature and humidity were taken at the beginning and end of each test period.

**RESULTS.** Mosquito larvae were markedly reduced after all treatments, reappearing at a low level in week 4 (Fig. 1). Although the intensity and occurrence of immature infestations in all treated basins remained at low levels, the counts were of such magnitude as to intimate the same cyclic pattern expressed in the control basin data. Recovery of larval activity to pre-treatment levels occurred after the 17th week following the normal seasonal trends for the test species.

Three-hour exposures of caged adults resulted in satisfactory female mortalities of 70 percent or higher from 3 to 15 weeks, depending upon the dosage (Fig. 2). Dispenser units containing 8 and 12 grams of technical dichlorvos sustained effective control for 3.7 and 5.8 weeks, respectively. Dosages of 16, 20, and 24 grams each averaged 14.7 weeks. Tests during weeks 3, 4, 8, and 12 were lost due to heavy rainfall during the test period. As anticipated, mounts within the water gave little or no adult kill. Effective weeks of control by basin are shown in Table 1.

Air temperatures in the basins during this test series ranged from 62° F. to 106° F. These extremes occurred during the

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<sup>3</sup> Use of commercial products in this study does not constitute endorsement by the Public Health Service.

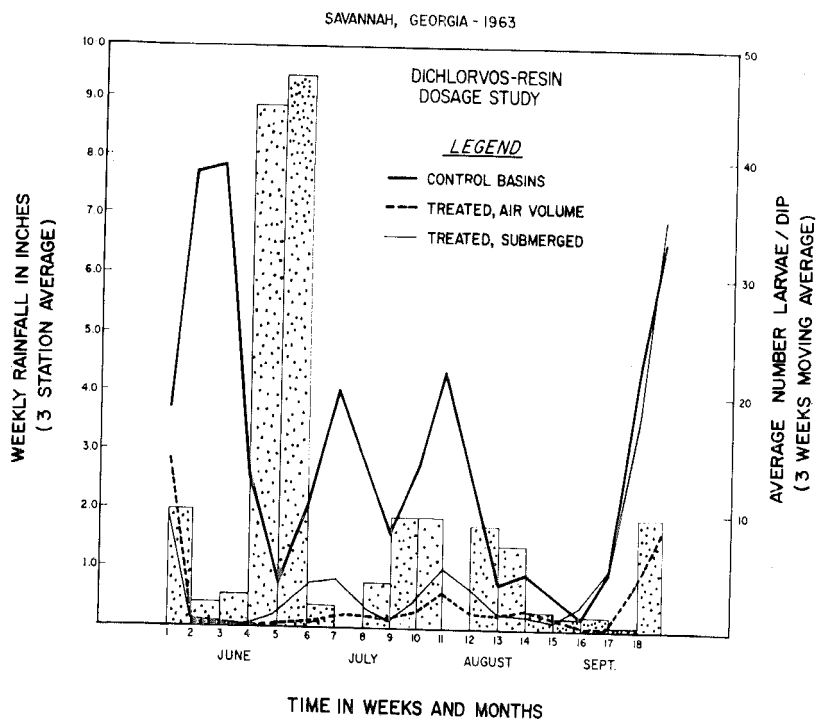


FIG. 1.—Seasonal distribution of rainfall vs. *Culex pipiens quinquefasciatus* breeding in catch basins.

TABLE 1.—Average weeks of 70 percent kill of adult female *Culex pipiens quinquefasciatus* Say in catch basins—1963.

| Dichlorvos dosage | Basin number | No. weeks control |                  | Average weeks Control/Dosage |
|-------------------|--------------|-------------------|------------------|------------------------------|
|                   |              | First treatment   | Second treatment |                              |
| 8 g.              | 1            | 3                 | 2                | 3.7                          |
|                   | 2            | 6                 | 5                |                              |
|                   | 3            | 3                 | 3                |                              |
| 12 g.             | 1            | 8                 | 7                | 5.8                          |
|                   | 2            | 6                 | 6                |                              |
|                   | 3            | 4                 | 4                |                              |
| 16 g.             | 1            | 11                | ..               | 14.7                         |
|                   | 2            | 15                | ..               |                              |
|                   | 3            | 18                | ..               |                              |
| 20 g.             | 1            | 13                | ..               | 14.7                         |
|                   | 2            | 16                | ..               |                              |
|                   | 3            | 15                | ..               |                              |
| 24 g.             | 1            | 16                | ..               | 14.7                         |
|                   | 2            | 18                | ..               |                              |
|                   | 3            | 10                | ..               |                              |

## SAVANNAH, GEORGIA -1963

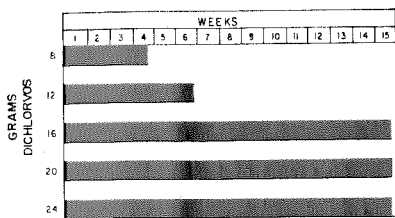


FIG. 2.—Average number of weeks effective kill of adult female *Culex pipiens quinquefasciatus* in catch basins.

18th and 6th week, respectively. Water temperatures of 69° F. to 78° F. were registered through this same period. The average ambient temperatures and humidities recorded for individual tests ranged from 71.0° F. to 91.7° F. and 51 to 77 percent.

**DISCUSSION.** Differences in the length of residual action at the two lower dosages, compared to the remaining three, may be explained as a function of dispenser design. Assuming the rate of vaporization of all units to be proportional to the surface area and the rate of leaching through the substrate to be reasonably uniform, the failure to sustain further mortalities at the lower treatment levels was due to the inability of the short dispensers to sustain the production of lethal concentrations of vapor for the air volume concerned. Kills with the 16-, 20-, and 24-gram treatment indicated the presence of ample surface area to maintain adequate vapor concentrations for nearly 15 weeks. For field applications the 16-gram dosage (8-inch length) offers as much promise as the higher dosages with this dispenser design based on the vaporization surface.

The data on larval production in this study indicate a cyclic brood production of approximately 3- to 4-week intervals. Limited records of past mosquito production

in the catch basins of the area tend to support this conclusion. Further investigations on this point might enable the prediction of seasonal *Culex* activity in this area.

**SUMMARY.** At Savannah, Georgia, satisfactory mortalities of caged adult female *C. p. quinquefasciatus* were attained for periods of 3 to 15 weeks at dosage levels of 8, 12, 16, 20, and 24 grams technical dichlorvos formulated at a 20 percent concentration in resin strips. The 16-, 20-, and 24-gram dosages yielded an average period of kill of 14.7 weeks, whereas the 8- and 12-gram treatment gave 3.7 and 5.8, respectively. The 8-inch strip containing 16 g. of dichlorvos was as effective as the 10- and 12-inch strip containing 20 and 24 g. of toxicant, respectively. Larval infestations dropped sharply in magnitude and frequency after treatment and remained low through the 16th week of testing. The weekly average number of larvae per dip for the test period was 2.8 in the treated basins against 14.7 in the controls.

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