THE EFFICACY OF MALATHION ULV SPRAYING FOR URBAN *CULEX* CONTROL IN SOUTH BEND, INDIANA[1]

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Ground applications of ultra-low volume (ULV) malathion have been used for adult mosquito control since 1968 (Mount et al. 1968). Since this technique is currently recommended for *Culex* control during St. Louis encephalitis outbreaks (Sinsko, personal communication), it is important to know its ability to suppress vector populations. One method for evaluating its effectiveness is to determine the mortality of caged adult mosquitoes as a function of distance from the point of ULV release (Mount et al. 1968, Taylor and Schoof 1971). In open field tests, mortality of caged adults is usually high and decreases with distance (Moseley et al. 1977), but mortality is substantially lower when cages are placed in wooded areas (Taylor and Schoof 1971). An alternative method is to monitor the *Culex* oviposition rate before and after spraying in treated and untreated areas (Strickman 1979). In an urban area in Decatur, Illinois, a 50% decrease in oviposition was shown after only 1 of 3 treatments. Little else is known of the ability of ground applications of ULV malathion to suppress urban *Culex* populations. This report describes a method for monitoring urban *Culex* populations during control programs, and tests the efficiency of ground applied ULV malathion in urban situations.

METHODS

The mosquito populations in 2 similar residential areas, each 1.6 sq km, in South Bend, Indiana were monitored over a 5 wk period. During this time, one area received 3 ground applied ULV malathion treatments and the other served as an untreated control site. Ten manure ovitraps (Hoban 1980) were placed along the alleys in each area and monitored daily for *Culex* egg rafts from 1 August to 5 September 1981. Each trap consisted of a 5 liter plastic bucket with the lid propped open to allow entry of *Culex* females. A weighted bag containing 250 ml. of fresh cow manure was placed inside as an attractant. Traps were filled ¾ full of water and an Altosid® (Zoecon Corp.) minipill containing methoprene was added to ensure that any hatched *Culex* larvae would not emerge as adults. The ovitraps were aged one wk prior to use. In addition to counting the egg rafts, once a week a random sample of 5 egg rafts from one trap in each area was hatched in the laboratory and first instar larvae were identified.

To measure more precisely the effect of ULV malathion on adult mosquitoes, 10 cylindrical, screen mesh cages containing 15 adult *Culex restuans* Theobald were suspended 90 cm from the ground in selected locations in both areas 1 hr before each treatment. Honey soaked cotton was added to each cage as a moisture and nutritive source. These cages were collected before 0800 hr the morning after each treatment and the percent mortality was determined.

On August 12, the efficacy of the malathion on caged mosquitoes was tested in an open field. Cages containing 15 *Cx. restuans* were placed at 4.5 m intervals in a transect at a 45° angle to the path of the truck. Speed and flow rate was the same as that used in the urban treatment area.

In the urban areas, Cythion® (American Cyanamid Co.) brand malathion was applied with a Leco ULV aerosol generator mounted on a pick-up truck. The area to be treated was covered by first spraying on all streets running in a north-south direction, followed by those running east-west. No alleys were sprayed. A flow rate of between 3.4 and 4.0 fl oz (100.6 and 118 ml) of malathion per min. was delivered at 10 mph (16.1 kph). Droplet size was checked before treatment and found to be within the manufacturer's recommended mass median diameter of 17 microns. Weather conditions were within manufacturer's recommendations for ULV application of malathion. Applications were made from 1900 to 2130 hrs on 13, 17 and 20 August 1981.

RESULTS AND DISCUSSION

The mean number of egg rafts for treatment and control areas did not differ significantly on 70% (9/13) of the days prior to treatment (*t*-test, $P < 0.05$), indicating that the 2 areas contained comparable *Culex* populations (Fig. 1).

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Low temperatures and rainfall adversely affected egg deposition in both areas (Fig. 1). After 2 of the 3 treatments, the mean number of egg rafts from the treated area was significantly less than the number in the control area (t-test, $P < 0.05$). Significantly low numbers of egg rafts in the treated area persisted on the second day after the first treatment, and from the second through 5th day after the final treatment. By the 3rd day after the first treatment and the 6th day after the final treatment, egg raft deposition in the 2 areas did not differ significantly. The 2nd treatment had no significant effect on egg raft numbers. Identification of egg rafts over the 5-wk period indicated that 67% were *Cx. restuans* and 33% were *Cx. pipiens* Linn.

In the open field test of caged adults, mortality was 100% in all cages within 1 hr after treatment. The mean mortality of caged mosquitoes in the urban area did not exceed 26% in the treatment area, and was less than 9% in the control area. While mortality was highest in cages placed 10 m from the street, there was little mortality in cages placed in vegetation along alleys, a distance of about 115 m.

Although our coverage of all streets in the area exceeded manufacturer's recommendations, low mortality of caged adults indicates that the spray did not adequately penetrate the treatment area. Only the last of 3 treatments had a long term effect on the *Culex* population. Our results show that under these particular test conditions in 2 urban residential areas situated in South Bend, IN, ground applied ULV malathion was not a consistently effective method for control of adult *Cx. restuans* and *Cx. pipiens* populations.

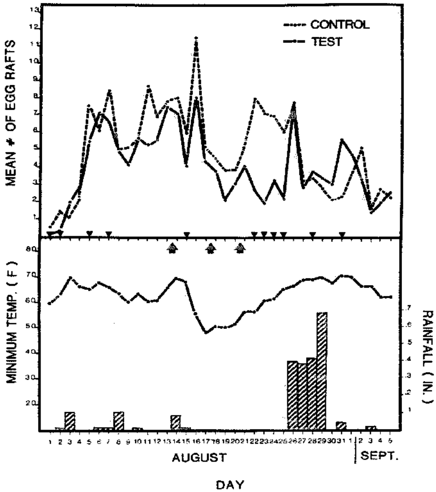

Fig. 1. The mean number of egg rafts deposited in manure ovitraps in treated and control areas. Arrows indicate treatment with ground applied ULV malathion. Triangles indicate statistically significant differences in the number of egg rafts between the control and treated areas. (t-test, P 0.0537

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