

EFFECTIVENESS OF ALTERNATIVE LARVICIDING AND ADULTICIDING METHODS TO REDUCE *CULEX* POPULATIONS IN MARION COUNTY, INDIANA

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In Marion County, Indiana, *Culex pipiens* Linn. and *Culex restuans* Theobald have repeated peaks of emergence separated by about 14 days. We decided to use this observation to schedule our adulticiding and larviciding operations, as a means of improving *Culex* control.

Female mosquitoes are not as susceptible to insecticides after they have taken a blood meal (Hadaway and Barlow 1956). The reason may be because the mosquito's enzyme rates may be increased.¹ It takes approximately 2-5 days between the time a female mosquito takes a blood meal and the time it is ready for oviposition. Due to this gonotrophic cycle, there should be several days between peaks when adulticiding is most effective. We would like to be adulticiding at the time, or just before, the females would be taking a blood meal. If we know the date of a peak in oviposition and we can estimate the duration of the larval stage, we should be able to maximize the effects of both larvicides and adulticides.

Gravid female traps (Reiter 1983) were set up and collected at four separate locations to be tested. The oviposition attractant was prepared as described by Reiter (1983), and 1 gal of this medium was placed in each tub. Each trap was set up on Monday and was returned to the office on Friday. Collecting nets on the gravid traps were replaced Tuesday through Thursday and brought back to the office each afternoon in order to count the adults collected. The number was recorded according to the trap location. Gravid traps at both the Placing Road and Brunswick Road sites were set up by shrubbery in the rear yard of private residences. The Fall Creek trap was placed in a wooded section of a park, while the Meridian Street trap location was in a tree line at the back of a junkyard. The sites were chosen at random from high *Culex* population areas throughout the county (Fig. 1).

The Placing Road test area was treated with a larvicide and an adulticide, Fall Creek with

just an adulticide and Brunswick with just a larvicide. Meridian Street was designated as the control area and was treated on a "normal" basis. Each of the treatment methods was performed on a regular schedule depending on the initial *Culex* peaks in May. A list was made of all the possible *Culex* breeding sites in a 0.5 mile radius in two of the test areas. The larviciding technicians checked each site from the list on the fourth day following a peak. They treated the sites that were breeding approximately once every two weeks with a liquid oil-base larvicide. A peak designates the time the *Culex* females are ovipositing their eggs. By the fourth day, the larvae should be between the second and fourth instar. The fourth day checking system was adjusted when the larviciding treatment fell on a weekend or holiday.

The adulticiding at Placing Road and Fall Creek was conducted on the 11th and 12th days following a peak. A truck mounted ultra low volume (ULV) sprayer was used with 91% technical grade malathion as the primary adulticide chemical at a flow rate of 4.3 ounces per minute. The 13th, 14th and 15th days after a peak were not chosen because the females would be gravid during this period.

Some of the test methods used in the experiment proved to be impractical for our program. We were not able to adulticide on consecutive nights. Even though we were limited to a single night application of adulticide in the test areas, the larvicide was applied one to two times more often than normal. The combination of larviciding on the fourth day following a peak and adulticiding during the "prime" times improved our control of *Culex pipiens* and *Cx. restuans* in the test areas.

Only two of the three test areas will be considered because the gravid trap monitor at Fall Creek had to be moved in 1987. The site at Placing Road collected 5,382 *Culex* spp. mosquitoes in 1986 and 3,091 in 1987. This is a difference of 2,291 and a 43% reduction. Brunswick Road counts dropped to 1,206 in 1987 from 2,381 in 1986. A difference of 1,175 and a 49% reduction in *Culex* spp. mosquitoes. The Meridian Street gravid trap that was used as the control collected 2,323 adult *Culex* mosquitoes in 1986 and 1,981 in 1987. This is a difference of 342

¹ Paul Reiter, Field trials on the susceptibility of mosquitoes to U.L.V. (First Joint Meeting: Ohio Mosquito Control Association and Indiana Vector Control Association and American Mosquito Control Association—Interim Board Meeting, October 20-22, 1985).

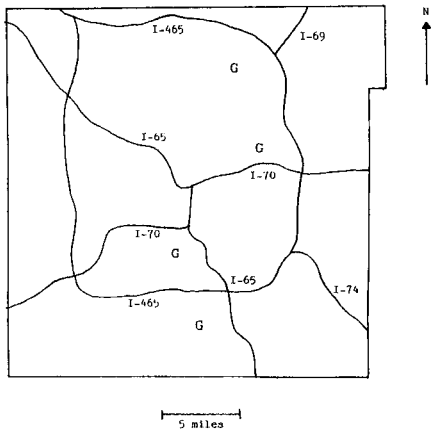


Fig. 1. Locations of monitoring equipment in Marion County, Indiana, 1986 and 1987. G, gravid trap.

Table 1. Total *Culex* spp. mosquitoes collected from gravid traps in Marion County, Indiana

Location	Month				Totals
	May	June	July	Aug.	
Placing					
1986	1,978	1,541	1,083	780	5,382
1987	427	1,359	878	427	3,091
Brunswick					
1986	491	626	968	296	2,381
1987	140	431	153	482	1,206
Meridian					
1986	589	658	483	593	2,323
1987	129	781	538	533	1,981

Table 2. Counts of 50 or more *Culex* spp. mosquitoes collected from gravid traps in Marion County, Indiana.

Location	Month				Totals
	May	June	July	Aug.	
Placing					
1986	9	8	10	5	32
1987	4	11	4	2	21
Brunswick					
1986	7	4	5	1	17
1987	0	1	1	2	4
Meridian					
1986	6	4	1	5	16
1987	0	7	3	5	15

and a 15% reduction in mosquitoes (Table 1). Comparing the Placing Road test area percentage to the Meridian Street control area percentage, we have a difference of 28%, while the Brunswick area mosquito counts dropped 34% from 1986 to 1987. Thus, the control methods used in the test areas were more effective at reducing the adult *Culex* spp. population than our "normal" treatment/spraying methods.

High peaks of *Culex* spp. populations, for our purposes, are considered to be 50 or more collected in a gravid trap overnight. Counts of 50 or more were recorded at Placing 32 times in 1986 between May and August and 21 times in 1987. A decrease in peaks of 34% was achieved. Brunswick recorded 17 peaks in 1986 and 4 peaks in 1987. This is a 76% decrease in counts of 50 or more from May through August. The Meridian Street control produced 16 peaks in 1986 and 15 peaks in 1987; this represents a 6% decrease. Using the Meridian Street control for comparison, we find that the Placing Road peaks dropped 28% and the Brunswick Road peaks decreased by 70% (Table 2).

The test areas and comparisons have shown that the larviciding and adulticiding methods employed were very effective in reducing the number of total adult *Culex* spp. mosquitoes and the number of times the mosquitoes had high counts. While these methods are not suggested

for entire mosquito control districts, due to funds, personnel, etc., they are very beneficial for controlling mosquitoes at *Culex* specific sites (waste lagoons, septic failures and large tire piles). The main objective for this experiment was to improve our control of *Culex* mosquitoes. By achieving this goal, we are reducing the potential for disease transmission in Marion County.

REFERENCES CITED

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 Reiter, P. 1983. A portable, battery-powered trap for collecting gravid *Culex* mosquitoes. *Mosq. News* 43:496-498.