# FIELD TESTS OF METHOPRENE (ALTOSID® SR-10) AND AN EXPERIMENTAL WETTABLE POWDER (ZPA-1019) AGAINST *CULEX QUINQUEFASCIATUS* IN SEPTIC DITCHES

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ABSTRACT. Tests were conducted to compare the effectiveness of methoprene (Altosid® SR-10) as a water solution with an experimental wettable powder, ZPA-1019 containing 10% Altosid, against *Culex quinquefasciatus* Say in septic ditches. Both formulations were evaluated at rates of 0.011, 0.022, and 0.038 kg AI/ha. Results indicated that the 0.011 and 0.022 kg AI/ha rates were too low for both formulations to effectively control *Cx. quinquefasciatus* in septic ditches.

Mortality of larvae exposed to ZPA-1019 at 0.038 kg AI/ha was 63% after 8 days. This decreased to 37% on the 10th day. Mortality of larvae exposed to Altosid® SR-10 at 0.038 kg AI/ha ranged from 100–89.5% up to 12 days after treatment.

## INTRODUCTION

*Culex quinquefasciatus* Say, the southern house mosquito, is a persistent problem in southern Louisiana. It breeds in areas high in organic matter such as catch basins and septic ditches, and readily enters houses, bothering man and often spreading diseases such as St. Louis encephalitis (Chamberlain et al. 1959) and dog heartworm, *Dirofilaria immitis* Say, (Villavaso and Steelman 1968). St. Tammany Parish has approximately 110 miles of septic ditches, therefore control of this mosquito species is one of our major concerns. For the past 2 years, more money and manpower have been used on control of *Cx. quinquefasciatus* than any other species.

Presently, we use #2 diesel fuel as our primary larvicide. It is very effective against mosquito larvae and pupae, however, it has very little residual activity. Therefore, oil is quite expensive for extensive larval control. With the constant threat of St. Louis encephalitis to south Louisiana and the possible development of chemical tolerance to organophosphate insecticides, it has become increasingly important to evaluate newer compounds which may be both economical and effective against *Cx. quinquefasciatus*.

The effectiveness of Methoprene (Altosid®) as a formulated sand mixture and a water solution against floodwater mosquitoes is well documented with the achievement of high levels of control at labeled rates (Steelman et al. 1975, and Rogers et al. 1976). Lately investigations seem to indicate that Altosid may be of use against permanent water mosquitoes. Case and Washino (1978) applied Altosid aerially to a California rice field to evaluate its effectiveness against *Cx. tarsalis* in emergence cages. The level of concontrol at 0.1 lb. AI/acre was approximately 50% non-emergence. This decreased to 10–30% by the 4th day after spraying. Self et al. (1978) reported a 52% non-emergence in *Culex quinquefasciatus* 35 days after treatment when exposed to a 1 ppm concentrate of Altosid in septic ditches.

Last year, St. Tammany Parish Mosquito Control conducted field trials of Altosid SR-10 as a water solution and a sand mixture to determine its effectiveness against *Cx. quinquefasciatus* in septic ditches. Mortality was 95.6% 11 days post-treatment and 72% 13 days post-treatment using a water solution at 0.060 kg AI/ha (0.054 lb. AI/acre). At 0.030 kg AI/ha (0.027 lb. AI/acre), mortality was less than 50% after 7 days.

The objective of this study was to compare the effectiveness of Altosid SR-10 as

a water solution with an experimental wettable powder, ZPA-1019 containing 10% Altosid. Both formulations were evaluated at rates of 0.011, 0.022 and 0.038 kg AI/ha.

## METHODS AND MATERIALS

Six mosquito breeding ditches were pre-selected for testing. Each ditch was measured to determine the area to be sprayed and the pH and the depth was determined. Two hundred pupae were then collected from each ditch for use as a control. The appropriate solutions were pre-mixed in the laboratory and then applied evenly to the ditches using a pressurized hand-tank.

To evaluate the effectiveness of these formulations, 200 pupae were collected from each ditch every other day until it appeared there was no longer any control. The pupae were then transported to the lab and transferred to glass beakers. The beakers were then placed into cages constructed from 3.785 liter ice cream cartons. Raisins were placed on top of each cage for adult nourishment, and a piece of water-soaked cellucotton was placed on top of the raisins to maintain humidity. Mortality was then recorded as dead-pupae, dead-adults, or pupal-adult intermediates.

## RESULTS AND DISCUSSION

Table 1 compares the effects of ZPA-1019 and Altosid SR-10 against *Cx. quinquefasciatus* at 0.011 kg AI/ha (0.010 lb. AI/acre), (½ the labeled rate). There does not appear to be a significant difference in the total effects of either formulation at this rate. After 2 days, mortality was 61% for ZPA-1019 and 58% for SR-10. After 4 days, mortality had fallen to 43% for ZPA-1010 and 31% for SR-10. Mortality in the control group was 12%. These results appear to indicate that this application rate is too low for both formulations to effectively control *Cs. quinquefasciatus* in septic ditches.

Table 2 illustrates the effects of ZPA-1019 and Altosid SR-10 at 0.022 kg AI/ha (0.020 lb. AI/acre) against *Cx. quinquefasciatus*. Mortality was approximately 92% 2 days after treatment with ZPA-1019. However, this dropped to 48% 4 days after, and to approximately 21% 6 days after. For the SR-10, mortality was 51.5% 2 days after treatment, dropping down to 31.5% 4 days after. Again, it appears that this application rate is too low to effectively control *Cx. p. quinquefasciatus* in septic ditches.

Table 3 depicts the effects of ZPA-1019 and Altosid SR-10 at 0.038 kg AI/ha (0.054 lb. AI/acre). Pupae were collected

Table 1. Effects of 2 formulations of Altosid at 0.011 kg AI/ha (0.010 lb. AI/acre) on *Culex quinquefasciatus* Say.

| Days post treatment | ZPA-1019 Percent Mortality | | | | SR-10 Percent Mortality | | | |
|---|---|---|---|---|---|---|---|---|
| | DA[1] | DP[2] | P-A[3] | Total | DA | DP | P-A | Total |
| 2 | 26.0 | 31.0 | 4.0 | 61.0 | 19.0 | 37.0 | 2.5 | 58.5 |
| 4 | 35.0 | 8.5 | 0 | 43.5 | 16.0 | 11.5 | 3.5 | 31.0 |
| 6 | 8.5 | 5.5 | 0 | 14.0 | 4.5 | 6.0 | 0 | 10.5 |
| 8 | 4.5 | 12.5 | 5.0 | 22.0 | 13.0 | 15.5 | 1.0 | 29.5 |
| 10 | 1.5 | 6.0 | 1.0 | 8.5 | 6.5 | 9.0 | 3.0 | 18.5 |
| 18.5 | | | | | | | | |
| 12 | 3.0 | 3.5 | 0.5 | 7.0 | 8.5 | 20.5 | 4.0 | 33.0 |
| 15 | 1.5 | 2.0 | 0.5 | 4.0 | 3.0 | 9.5 | 2.0 | 14.5 |
| Control | 8.0 | 4.0 | 0 | 12.0 | | | | |

[1] DA—Dead Adults.
[2] DP—Dead Pupae.
[3] P-A—Pupal Adult intermediates.

Table 2. Effects of 2 formulations of Altosid at 0.022 kg AI/ha (0.020 lb. AI/acre) on *Culex p. quinquefasciatus* Say.

| Days post treatment | ZPA-1019 Percent Mortality | | | | SR-10 Percent Mortality | | | |
|---|---|---|---|---|---|---|---|---|
| | DA[1] | DP[2] | P-A[3] | Total | DA | DP | P-A | Total |
| 2 | 21.5 | 70.2 | 0 | 91.7 | 28.5 | 22.5 | 0.5 | 51.5 |
| 4 | 15.7 | 28.3 | 4.3 | 48.3 | 24.0 | 7.5 | 0 | 31.5 |
| 6 | 7.7 | 11.2 | 1.8 | 20.7 | 6.0 | 10.0 | 3.0 | 19.0 |
| 8 | 15.7 | 22.5 | 3.0 | 41.2 | 14.5 | 9.0 | 0 | 23.5 |
| 10 | | | | | 8.5 | 10.0 | 2.5 | 21.0 |
| 12 | | | | | 3.5 | 3.0 | 2.0 | 8.5 |
| Control | 8.0 | 4.0 | 0 | 12.0 | | | | |

[1] DA—Dead Adults.
[2] DP—Dead Pupae.
[3] P-A—Pupal Adult Intermediates.

in these ditches up to 19 days after treatment. Two days after treatment, mortality was 96.5% for ZPA-1019. This dropped to 78.5% 4 days after treatment. Mortality was approximately 63% 8 days after treatment, however, after 10 days only 37% mortality was observed. On the 12th day, mortality went up to 52%, but it again dropped to 24% on the 15th day. SR-10 displayed very good results at 0.038 kg AI/ha. Mortality was as high as 89.5% 12 days after treatment. This rapidly decreased to 36% on the 15th day.

At 0.011 and 0.022 kg AI/ha, very few pupal-adult intermediates were observed for either formulation. However, there was a notable increase in these intermediates at 0.038 kg AI/ha, especially for ZPA-1019. Pupal-adult intermediates were observed on every collection day and the percentage ranged from 1.5 to 11%.

Figure 1 represents all the data recorded for both formulations at 0.011, 0.022 and 0.038 kg AI/ha. There was little difference among the results of SR-10 at 0.011 and 0.022 kg AI/ha, and ZPA-1019 at 0.011 kg AI/ha. Also, although mortality was initially high for ZPA-1019 at 0.022 kg AI/ha, it immedi-

Table 3. Effects of 2 formulations of Altosid at 0.038 kg AI/ha (0.054 lb. AI/acre) on *Culex p. quinquefasciatus* Say.

| Days post treatment | ZPA-1019 Percent Mortality | | | | SR-10 Percent Mortality | | | |
|---|---|---|---|---|---|---|---|---|
| | DA[1] | DP[2] | P-A[3] | Total | DA | DP | P-A | Total |
| 2 | 5.5 | 89.0 | 2.0 | 96.5 | 2.0 | 98.0 | 0 | 100.0 |
| 4 | 14.5 | 57.5 | 6.5 | 78.5 | 1.5 | 95.5 | 1.0 | 98.0 |
| 6 | 21.0 | 66.5 | 1.5 | 89.0 | 0.5 | 97.5 | 1.0 | 99.0 |
| 8 | 27.5 | 26.0 | 9.5 | 63.0 | 3.0 | 95.5 | 1.5 | 100.0 |
| 10 | 21.0 | 10.5 | 6.0 | 37.5 | 15.0 | 70.0 | 8.0 | 93.0 |
| 12 | 17.0 | 24.5 | 11.0 | 52.5 | 17.0 | 70.0 | 2.5 | 89.5 |
| 15 | 9.5 | 11.5 | 3.0 | 24.0 | 17.5 | 16.0 | 2.5 | 36.0 |
| 19 | 19.5 | 8.0 | 9.0 | 36.5 | 6.0 | 11.5 | 1.5 | 19.0 |
| Control | 8.0 | 4.0 | 0 | 12.0 | | | | |

[1] DA—Dead Adults.
[2] DP—Dead Pupae.
[3] P-A—Pupal Adult Intermediates.

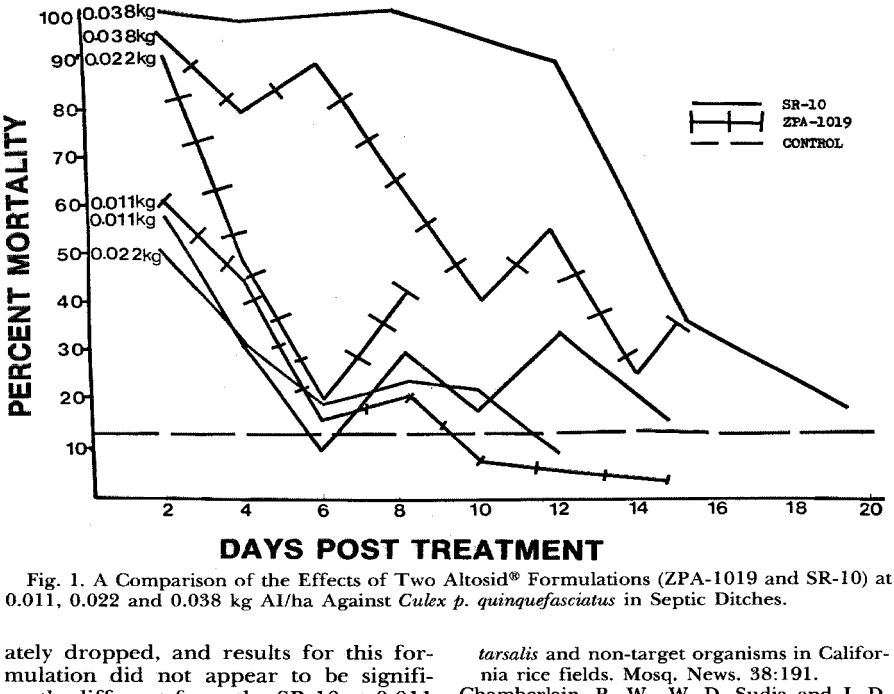


Fig. 1. A Comparison of the Effects of Two Altosid® Formulations (ZPA-1019 and SR-10) at 0.011, 0.022 and 0.038 kg AI/ha Against *Culex p. quinquefasciatus* in Septic Ditches.

ately dropped, and results for this formulation did not appear to be significantly different from the SR-10 at 0.011 and 0.022 kg AI/ha, or ZPA-1019 at 0.011 kg AI/ha. At 0.039 kg AI/ha, ZPA-1019 did effectively control *Cx. quinquefasciatus*, but only for a short time period. Mortality of mosquitoes exposed to SR-10 at 0.038 kg AI/ha was consistently high for 12 days.

These results have helped confirm the potential value of Altosid SR-10 for control of *Cx. quinquefasciatus* in septic ditches in the event an encephalitis epidemic occurred in Louisiana. Based upon current economics and the present application rates used in our district, the cost of using Altosid would be approximately 1/6 that of diesel oil to obtain comparable control levels.

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