SMALL PLOT FIELD TESTS OF AN OIL FORMULATION AGAINST MOSQUITO LARVAE AND NON-TARGET ORGANISMS

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ABSTRACT. Small plot field tests were conducted to evaluate the effectiveness of an oil formulation "Florida Mosquito Larvicide," against *Aedes taeniorhynchus* (Wiedemann) larvae and nontarget organisms. Third instar mosquito larvae and caged brackish water species of non-target organisms were placed in ponds and treated with a 37.4 liter/ha (4 gal/acre) surface treatment of the oil formulation. Excellent control of mosquito larvae was obtained and selected non-target organisms were not affected.

The increasing concern for the environment has limited the methods of permanent as well as temporary control available to mosquito control personnel. The purpose of this study was to evaluate the effectiveness of a mosquito larvicidal oil formulation and to determine its effect on selected non-target organisms.

MATERIALS AND METHODS

The oil formulation used in these tests is the "Florida Mosquito Larvicide," which is labelled for use in Florida only and consists of a mixture of 0.375% Triton^{R} X-207 and 1.0% 30W motor oil by volume in No. 2 diesel oil. The formulation was applied at the rate of 37.4 liter/ha (4 gal/acre) of water surface in specially constructed salt-water ponds described by Rathburn and Boike (1975).

To evaluate the effectiveness of the oil formulation against mosquito larvae, approximately 4000–6000 laboratory reared 3rd instar *Aedes taeniorhynchus* (Wiedemann) larvae were added to each of 6 plots. Ten dips per plot (5 along each long side) were taken during the pretreatment and posttreatment periods to assess larval populations. Dips were taken only where larvae were observed, except for posttreatment dips in treated plots when no larvae were observed. Posttreatment dips were taken 24 hr after treatment.

Various species of non-target organisms, which have been observed in brackish water marshes and substantiated by others (Zilberberg 1966, Wood 1967, Nixon and Oviatt 1973, Subrahmanyam and Drake 1975) were selected as indicator organisms. The only exception was the large shrimp which were selected because of their commercial importance. These organisms were collected by use of a minnow seine and dip net and kept in large holding cages until used for testing. The following organisms were selected for use in this study: (1) 20 marsh fish, including 10 each of sheepshead minnow, *Cyprinodon variegatus* Lacepede, and longnose killifish, *Fundulus similis,* (Baird and Girard); (2) 20 small shrimp, including grass shrimp, *Palaemonetes* sp., and other species of shrimp that occur on the shallow grass flats; (3) 6 large shrimp, *Penaeus* sp.; 6 small blue crabs, *Callinectes sapidus,* Rathbun.

Each of the 4 types of selected organisms were contained in a 3 mm mesh wire cage measuring 8 × 30 × 45 cm. The top side of the cage was suspended 2.5 cm under the water surface by attaching styrofoam floats on the outer edges of the cage. The 4 groups of organisms were placed in each of 6 plots that included 4 treated plots and 2 untreated plots. Ob-

servations for dead organisms were made 24 and 48 hr posttreatment.

Immediately prior to application, the length and width of the water surface of each plot was measured and the quantity of oil in ml at a 37.4 l/ha rate for each plot was calculated. The correct amount of oil for each plot was applied by hand, using a clothes sprinkler.

RESULTS

Table 1 shows the results of the treatments against *Ae. taeniorhynchus* larvae. Treatment I, applied September 30, 1976, resulted in a 100% reduction of mosquito larvae in the 4 replications of the oil treatment. The 2 replications of the untreated plots had an average reduction of 47.8%. The reduction in the untreated plots occurred when a strong wind caused all cages of non-target organisms and the mosquito larvae to concentrate in 1 corner of the plots just after treatment. The small fish and shrimp were observed eating mosquito larvae as they entered the cages. Treatment II was conducted on October 14, 1976 but no non-target organisms were included. This test showed a 100% reduction in mosquito larvae in the treated plots and no reduction in the untreated plots.

Table 2 shows the results of the applications of the oil formulation on non-target organisms. Although organisms were also checked 24 hr after treatment, only the 48 hr count is shown since the mortality data were the same for both periods. No fish or crab mortality occurred in the 4 treated replications or the 2 untreated replications. Slight mortality occurred in small shrimp but no treatment effect is indicated. The largest % mortality occurred in a control cage of large shrimp but consisted of only 2 dead shrimp. These large shrimp appeared to

Table 1. Results of the application of an oil formulation applied at 37.4 l/ha against *Aedes taeniorhynchus* larvae.

	Treatment I		Treatment II	
Averaged results of	treated	untreated	treated	untreated
Plot size—m²	18.0	—[2]	17.3	17.0
Water depth—cm	25.4	27.9	22.4	21.6
Water salinity—ppt	—[2]	24.1	—[2]	25.5
Water temp—°C	28.9	29.1	28.6	28.6
No. live larvae/dip—pre[1]	4.2	4.6	4.5	4.6
No. live larvae/dip—post[1]	0.0	2.4	0.0	4.7
% reduction	100.0	47.8	100.0	(+2.2)

[1] Average of 10 dips per plot.
[2] Not measured.

Table 2. Results of the applications of an oil formulation applied at 37.4 l/ha against non-target organism.

		48 hr posttreatment		
Test species	Treatment I	No. dead	No. alive	% mortality
Marsh fish	oil formulation	0	80	0
	control	0	40	0
Small shrimp	oil formulation	1	79	1
	control	1	39	3
Large shrimp	oil formulation	0	24	0
	control	2	10	17
Blue crabs	oil formulation	0	24	0
	control	0	12	0

go into shock easily when they were collected; therefore, some mortality was expected in this organism.

CONCLUSIONS

This study shows that the Florida Mosquito Larvicide was effective against *Ae. taeniorhynchus* and had no effect on the non-target orgamisms tested.

Literature Cited

Nixon, S. W. and C. A. Oviatt. 1973. Ecology of a New England salt marsh. Ecol. Monogr. 43:463–498.

Rathburn, C. B., Jr. and A. H. Boike, Jr. 1975. Laboratory and small plot field tests of Altosid[R] and Dimilin[R] for the control of *Aedes taeniorhynchus* and *Culex nigripalpus* larvae. Mosquito News 35(4):540–546.

Subrahmanyam, C. B. and S. H. Drake. 1975. Studies on the animal communities in two North Florida salt marshes, Part I. Fish Communities. Bull. Mar. Sci. 25(4):445–465.

Wood, C. E. 1967. Physioecology of the grass shrimp, *Palaemonetes pugio,* in the Galveston Bay Estuarine System. Contr. Mar. Sci. Univ. Tex. 12:49–79.

Zilberberg, M. H. 1966. Seasonal occurrence of fishes in a coastal marsh of Northwest Florida. Publs. Inst. Mar. Sci. Univ. Tex. 1:126–134.