(only after 24 hr) in 1st and 2nd stage larvae than that of later instars. Greater susceptibility to endotoxin of *B.t.i.* in earlier instars has been observed for other mosquito species (Anonymous 1982, Dame et al. 1981, Hembree et al. 1980, Mulla et al. 1980).

From both preliminary data and results discussed here we observed that there was a trend towards higher mortality 48 hr after treatment than that of 24 hr posttreatment. Garcia et al. (1982) found similar phenomena in their studies of *Ae. squamiger* in the San Francisco Bay area. They speculated that larvae were not being killed rapidly because of the cold water temperature which affected the feeding behavior of mosquitoes.

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EVALUATION OF AERIAL APPLICATION OF SCOURGE® AGAINST ADULT MOSQUITOES IN CALIFORNIA

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SCOURGE®, Penick Corporation's resmethrin synergized at the rate of 1 part with 3 parts piperonyl butoxide, is federally registered for ultra low volume application by portable backpack or truck-mounted equipment and has special local needs (SLN) registration in New Jersey for aerial application. The labelled dosage rate ranges from 0.0035 to 0.007 lb/acre actual resmethrin. The purpose of the evaluations reported here was to obtain data to support: (1) immediate SLN registration in California for aerial application of SCOURGE; and (2) eventual federal registration allowing aerial application.

The protocol was to treat test lines of caged mosquitoes by aerial application beginning at about 0.0035 lb/acre, then double or halve the dosage depending upon results, followed by field plot applications. Using the New Jersey SLN model, 1 part of SCOURGE was mixed with 4 parts of GB 1356, a proprietary petroleum oil mosquito larvicide produced by Witco Chemical Corporation. The combination mixed quickly and well. A sample of the mixture remained stable during 24 days of observation.

The application equipment was modified from that described by Dearman et al. (1965). It consisted of a CO_2 pressurized stainless steel tank feeding liquid into a polyvinylchloride pipe boom, equipped with 4 Spraying Systems nozzles fitted with 800067 flat fan tips directed straight down, taped to an existing aircraft boom. Two aircraft were used, a Grumman AgCat owned by the Butte County Mosquito Abatement District (California), and a Snow AgTractor under contract to the Sacramento County-Yolo County Mosquito Abatement District (California).

Tests were made during August and September, 1983. Each test line consisted of caged (Townzen and Natvig 1973) *Culex pipiens* Linn. atop 3-ft stakes at 33-ft intervals in a single row perpendicular to the flight path. Each test dosage was replicated 2 or 3 times. Field tests were made over plots containing *Aedes nigromaculis* (Ludlow). Wild populations were assessed by counting mosquitoes landing on one or more observers. Simple meteorological data were recorded for each trial. An attempt was made to assess droplet size with oil-sensitive paper (Ciba-Geigy; marketed by Spraying Systems Co.) but apparently few of the droplets were above the threshold of sensitivity of 30 microns, and so the technique was not useful. Untreated plots were not available for comparing most tests, and so the reductions are shown as pretreatment compared with posttreatment numbers.

Table 1 shows the results obtained from applications over test lines. Table 2 summarizes data from 3 field tests. While a dosage of just over 0.0035 lb/acre killed almost all of the caged mosquitoes over the assumed swath, a higher rate (0.006 lb/acre) was needed to adequately control field populations. Our data contrast

Table 1. Mortality of caged *Culex pipiens* treated with SCOURGE applied by Grumman AgCat aircraft. Airspeed 80 mph, assumed swath 132 feet, boom height 20 feet. Stations at 33-foot intervals.

Trial	Lb/acre	No. 800067 nozzles	Pressure (psi)	Station		Mortality (%)
A	0.0037	3	50	1		0
				2		32
	Notes: Average of 3 runs.			3		62
	Wind 3.5–6.3 mph			4		90
	perpendicular to			5	(cntr)	100
	test line.			6		98
	Temp. 93–97° F.			7		98
	Mortality determined			8		54
	at 10–11 hours			9		10
				Check		0
B	0.0018	2	30	1	(dwnwnd)	21
				2		26
	Notes: Average of 2 runs.			3		23
	Wind <1 mph			4		59
	parallel			5		61
	test line.			6		42
	Temp. 77° F.			7	(cntr)	18
	Mortality determined			8		6
	at 8.5 hours			9		0
				Check		0

Table 2. Mortality of wild *Aedes nigromaculis* treated with SCOURGE applied by aircraft. Pretreatment checks immediately before application, posttreatment checks at 1 hour.

Trial	Lb/acre	No. 800067 nozzles	Pressure (psi)	No. mosquitoes		Reduction (%)
				Pre-	Post-	
1[a]	0.0038	3	50	68	35	48
2[b]	0.0033	4	50	1835	705	62
3[c]	0.0060	4	49	1393	95	93

[a] Scott Munsen (Butte Co. MAD) data. Counts expressed as landing rates. Grumman AgCat airspeed 80 mph, swath width 130 ft., boom height 20 ft. Wind 2 mph, temp. 62° F.

[b] Total counts by 6 field observers. Snow AgTractor airspeed 110 mph, swath width 132 ft., boom height 20 ft. Wind 1 mph, temp. 55° F.

[c] Total counts by 4 field observers. Snow Agtractor airspeed 110 mph, swath width 66 ft., boom height 8 ft. Wind 2.5 mph, temp. 69° F.

with the findings of evaluators in New Jersey, who observed high mortality of *Ae. triseriatus* (Say) in cages under test line conditions at dosages as low as 0.00175 lb/acre resmethrin (Sutherland et al. 1982).

We were granted California SLN registration for SCOURGE to be applied by aircraft at a maximum dosage rate of 0.007 lb/acre. Good control was obtained at a dosage rate of 0.006 lb/acre. Under optimum conditions, satisfactory control could probably be achieved at a lower dosage rate.

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