Table 1. Mortality and pupation of mosquito larvae reared in miniature wells* at 25° C.

Mosquito species	Experiment number	Number of larvae per experiment	Percent live pupation	Day 50% or > of larvae pupated	Day last larvae pupated or died
Culex tarsalis	1	100	98	10	13
	2	200	95.5	10	15
	3	50	94	9	12
Culex pipiens	1	200	98	8	14
	2	100	97.5	7	12
	3	200	92.5	7	11
Aedes taeniorhynchus	1	100	93	7	17
	2	100	91	7	14
	3	100	91	7	11

* The tray holds 50 larvae (2 larvae/well; 25 wells/tray).

medium were larval motility, larval and pupal mortality, and time to pupation. Under the conditions of the experiments, there was low larval and pupal mortality (<10%), good larval motility, and a pupation rate and time comparable to the same species mass-reared in large containers with daily provision of an equivalent amount of the basic medium/larva in the insectary. Viable microbial counts of the fluid in the large containers and in the miniature wells showed that each system had a flora of ca. 10^8 bacteria/ml.

The pupae were not held for adult emergence in the experiments conducted in the minature well system.[3] However, relatively high emergence rates (>80%) occurred in pupae of the 3 species mass-reared in the insectary on the described medium. Adult survival was similar to that observed in the same species routinely reared in the insectary on the standard diet. Eggs were laid in quantities eqivalent to that of the regular laboratory colonies and the percentage hatch was high, indicating that the medium used in the miniature well system was nutritionally adequate for both immature and adult stages.

Literature Cited

Gerberg, E. J. 1970. Manual for mosquito rearing and experimental techniques. Amer. Mosquito Contr. Assoc. Bull. 5:1–109.

Ignoffo, C. M. and Boening, O. P. 1970. Compartmented disposable plastic trays for rearing insects. J. Econ. Entomol. 63:1696–1697.

[3] This was necessitated by the presence of arboviruses elsewhere in this Laboratory which presented a possibility of chance transmission by adult mosquitoes.

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RESPONSE OF *CULEX PIPIENS QUINQUEFASCIATUS* SAY EGGS, LARVAE, AND PUPAE TO ADDITIONS OF FLIT MLO TO THEIR BREEDING SITE WATER[1]

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One of the most promising insecticides of recent years for mosquito control is Flit MLO®. The usefulness of this material has been well established for safe mosquito control without danger to non-target fauna and flora after application. Many mosquitoes breed in stock watering ponds and troughs. A study was conducted to determine how effective Flit MLO may be for controlling mosquitoes in such bodies of water.

Aquatic stages of *C. p. quinquefasciatus* mosquitoes were found in ground pools and in barrels of standing water. The first tests were conducted in barrels of water which contained eggs, larvae and pupae. Temperature of the water was 26.7° C. Two barrels of water were used for each test. One was for the tests while the other was a control. Larvae were too numerous to count (TNTC). In addition to larvae, the waters contained 5–6 mosquito egg rafts per dip. One milliliter of Flit MLO was dripped onto the surface of the water in the barrels.

To permit an unobstructed view of the action

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Table 1. Effects of Flit MLO on *C. p. quinquefasciatus* eggs, larvae, and pupae in barrels of water.

Time Lapse	Barrel A (Treated)	Barrel B (Control)
15 seconds	Larvae and pupae detached from surface, larvae appear to be biting the end of their siphons; egg rafts beginning to get wet.	Larvae and pupae, no change; eggs, no change.
30 seconds	Some larvae and pupae rise to, but immediately withdraw when in contact with, the surface; eggs resting just below the water surface.	Larvae and pupae, no change; eggs, no change.
5 minutes	Larvae and pupae wriggling below water surface; eggs remain, just below the water surface.	Larvae and pupae, no change; eggs, no change.
20 minutes	Larvae and pupae dead; eggs, no further change.	Larvae and pupae, no change; eggs, no change.
48 hours	Larvae and pupae dead, eggs rotting and falling apart.	Pupae hatching; egg rafts hatched.

Table 2. Effects of Flit MLO on *C. p. quinquefasciatus* eggs, larvae, and pupae in beakers of water.

Time Lapse	Beaker A (Treated)	Beaker B (Control)
15 seconds	Larvae and pupae detached from surface; larvae appear to be biting the end of their siphons; egg rafts beginning to get wet.	Larvae and pupae, no change; eggs, no change.
30 seconds	Some larvae and pupae rise to the water surface but immediately sound when they touch it; eggs resting just below the water surface.	Larvae and pupae, no change; eggs, no change.
5 minutes	Larvae and pupae wriggling on beaker bottom; eggs remain just below the water surface.	Larvae and pupae, no change; eggs, no change.
20 minutes	Larvae and pupae dead; eggs no further change.	Larvae and pupae, no change; eggs, no change.
48 hours	Larvae and pupae dead; eggs rotting and falling apart.	Pupae hatching; larvae pupating; eggs hatched.

of the Flit MLO on the mosquitoes, eggs, larvae, and pupae, were brought into the laboratory and placed in 250 ml beakers containing 200 ml of water from the mosquito breeding sites. Each beaker contained 10 larvae, 10 pupae, and 6 egg rafts. After placing the mosquitoes in the water, 0.01 ml of Flit MLO was added to the test beaker. Tables 1 and 2 indicate the findings of these experiments.

Rapid dispersal of the Flit to the edges of the containers often caused death in as little as 2–3 minutes. None showed signs of life beyond 20 minutes after application of the Flit.

It was most interesting to note that as the Flit spread over the water surface, it also affected the egg rafts. Those egg rafts in the middle near the point of application in the barrel and beakers were affected first. Instead of the Flit going around the egg rafts, it spread across the water surface to the eggs. The egg rafts suddenly seemed to lose their hydrophobic properties and become progressively wetter. The wetting action of the egg rafts was similar to the movement of water in a dry paper napkin. When the entire egg raft became wet, it settled into the water just below the surface but did not sink deeper. This entire action was completed within 30 seconds after the Flit was applied to the water surface. Forty-eight hours after the Flit was applied to the water, the eggs were rotted and disintegrated with no hatching observed.

Many investigations have reported toxic action of Flit MLO on mosquito larvae and pupae, however, none are known to have noted the activity of this material on mosquito egg rafts. The findings of these experiments clearly indicate that Flit MLO, in addition to rapidly bringing mosquito larvae and pupae under control, also leads to the death of eggs due to its surfactant properties.