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INFLUENCE OF GRIDS ON MOSQUITO OVIPOSITION IN STEEL CEMETERY VASES[1]

LEYBURN F. LEWIS AND DARRELL M. CHRISTENSON

Agricultural Research Service, USDA[1]

Flower vases and urns in cemeteries can be prime sources of container-breeding mosquitoes (Shanafelt 1969). These vases and urns are of various sizes, but in the more modern cemeteries, by far the greater number are round, galvanized steel, slightly more than 6 inches deep, and slightly less than 4 inches in diameter. They are purchased with, and designed to fit into, galvanized steel casings within which they can also be stored in an inverted position when not in use. Since the casings can be installed flush with the terrain in soil or in concrete, they can be mowed over or driven over with rubber-tired vehicles when not in use without harming the casings or the vases or otherwise interfering with cemetery maintenance. If wilted or spent flowers are promptly discarded and the vases are inverted, mosquito production in cemeteries can be greatly lessened and in some instances even eliminated. But when the inverting process is neglected, mosquito production may result.

The wilting of natural flowers therefore indicates when the flowers should be discarded and the vases inverted. However, when artificial flowers are used, this built-in timetable disappears. Undoubtedly—and understandably—most caretakers are reluctant to arbitrarily discard well-preserved, expensive artificial flowers. Quite obviously, though artificial flowers need no moisture to prolong their attractiveness, rainfall or sprinklers may cause water to accumulate in the containers and thus cause the containers to become mosquito-producing habitats that may require periodic treatments with insecticides.

A very real problem, then, and the one to which this paper is addressed, is how to avoid mosquito production in the steel containers in cemeteries without the use of insecticides—and independent of the method of handling by caretakers—or without lessening their adequacy and availability for use with either natural or artificial flowers.

Our approach to the problem has been to divide the surfaces of the water into smaller segments with grids with various sized spacings. This approach was based on the assumption that under field conditions where some choice could be exercised, *Culex pipiens quinquefasciatus* Say, our target species, would not deposit egg masses on an extremely small surface. Indeed, in the absence of proof to the contrary, we would be reluctant to concede that *C. p. quinquefasciatus* would deposit egg masses in a container, however deep it

[1] Western Insects Affecting Man and Animals Laboratory, 5544 Air Terminal Drive, Fresno, California 93727.

might be, with a diameter that approached that of a small thimble. The problem, then, was to determine the minimum surface in a vase on which *C. p. quinquefasciatus* would oviposit.

MATERIALS AND METHODS. The tests reported here were performed with grids with spacings of ½ x ½ inch, ¾ x ¾ inch, and 1 x 1 inch. When assembled, overall grid lengths and widths corresponded to the inside dimensions of the vases (Fig. 1).

The same set of 24 vases, distributed in 3 rows of 8, was used to test the grids with the ½ x ½-inch and ¾ x ¾-inch spacings; a separate set of 18 vases, distributed in 3 rows of 6, was used to test the grids with 1 x 1-inch spacings. First the attractiveness of the vases to ovigerous females and the suitability of the selected site for obtaining data was determined by exposing the 24-vase set without grids for about 3 weeks. About 2 weeks elapsed before the vases attracted females in quantity. Grids were used in the 18-vase set from the outset, which, we believe, explains the relatively small number of masses obtained in them during the 17

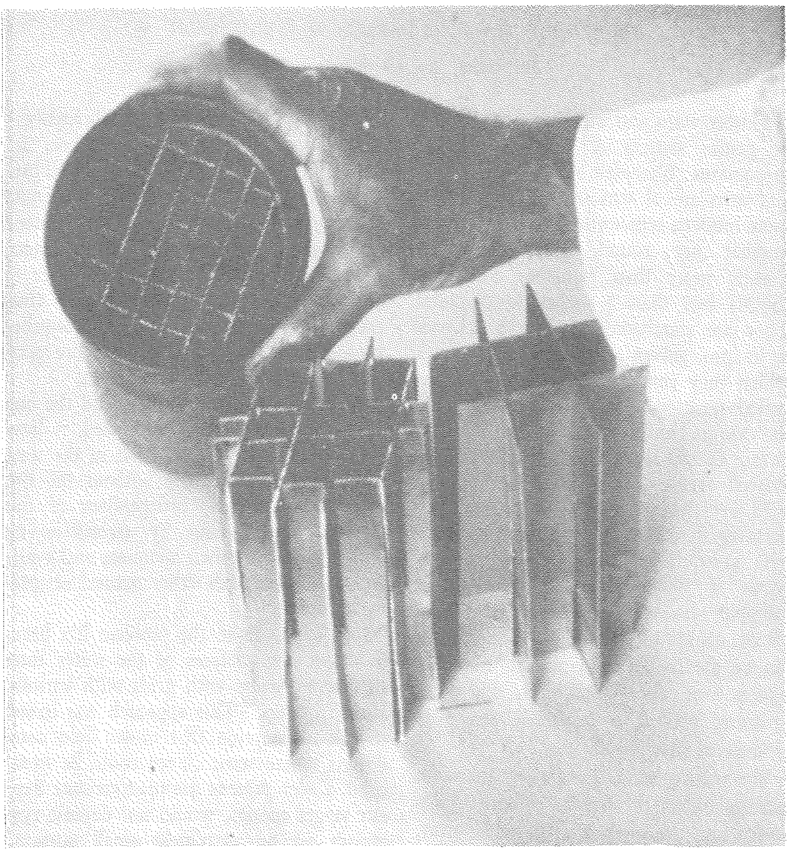

FIG. 1.—A metal casing containing a steel cemetery vase within which is an assembled grid with ½ x ½-inch spacings; also two additional assembled grids, one with ¾ x ¾-inch spacings, and the other with 1 x 1-inch spacings.

days they were in test. During the test, grids were placed in alternate vases within each row with the assignment for the first vase in each row determined by randomization.

The grids with ½ x ½-inch spacings were made from sheets of aluminum or sheets of plastic; the grids with other spacings were made from aluminum sheeting. The grids of plastic were formed with a table saw; the grids of aluminum were fashioned with tin snips or with a band saw equipped with a metal cutting blade. When assembled, the overall lengths and widths of the grids corresponded with the inside dimensions of the vases.

The test site was a small grassy plot (160 x 60 feet) at California State University at Fresno. The sward was watered with an automatic sprinkling system and maintained in lawnlike condition with a lawn mower. The galvanized steel vases and their casings were installed flush with the ground level and exposed to the normal watering and mowing schedules. Vases were washed before installation, but they were neither cleaned nor emptied during the test except that clogging amounts of grass clippings were removed—as the need arose—from individual containers. Water levels were maintained about 2 inches below the top rim of the vases, but only insignificant amounts of water were ever added or removed at any one time. Also considerable numbers of arthropods in various stages of maturity were trapped in the water, but none were removed. All egg masses were removed from the containers as they were counted. Swine, horse, and cattle barns, poultry houses, and pastures were adjacent to or near the test plot.

The data presented here for the grids with ½ x ½-inch spacings were obtained from August 16 through September 15; for the grids with ¾ x ¾-inch spacings from September 16 through October 16; and for the grids with 1 x 1-inch spacings from September 18 through October 5.

RESULTS AND DISCUSSION. Data are presented in Table 1. The results were promising and illustrated almost beyond question that the oviposition patterns of *C. p. quinquefasciatus* in steel vases can be strongly influenced by breaking up the total surface area of the water in a vase into appropriately sized, smaller segments. No masses were deposited in containers equipped with grids with ½ x ½-inch spacings; only 4.6 percent of the masses obtained in the test of grids with ¾ x ¾-inch spacing were deposited in vases containing grids; the 1 x 1-inch spacing appeared to be ineffective. However, the 15 egg masses recovered from vases equipped with the ¾ x ¾-inch grids—though only

TABLE 1.—Influence of grids[a] of various spacings within galvanized steel vases on egg deposition by *Culex pipiens quinquefasciatus* Say.

Grid spacing (inches)	Number of		Egg masses collected			% reduction in total egg mass
				Average per		
	Vases	Days in test	Total	Night	Vase	
			August 16 through September 15			
½ x ½	12	30	0	0	0	100
Control[b]	12	30	205	6.8	17.1	
			September 16 through October 15			
¾ x ¾	12	30	15	.5	1.3	95.4
Control[b]	12	30	310	10.3	25.8	
			September 18 through October 5			
1 x 1	9	17	19	1.1	2.1	0
Control[b]	9	17	15	.9	1.7	

[a] When assembled, overall grid lengths and widths corresponded to the inside dimensions of the vases.
[b] Galvanized steel vases without grids.

a small fraction of the total—probably represented a greater potential adult population of mosquitoes than mosquito control districts would consider tolerable. Future efforts in this respect will thus be confined to grids or other areas that are ½ x ½-inches or smaller in surface area. Smaller areas than those tested should be equally suitable for flowers.

We should add that we used grids with square spacings because we could readily overcome construction problems with available tools. Logically, round, triangular, hexagonal or other compact shapes should be equally effective and should be tested. Further, we used aluminum sheeting primarily because it was on hand; the suitability of other materials should be tested. Also, other types of man-made, water-holding devices including concrete flower vases and urns should of course be tested.

The owners of flower vases equipped with grids should find the uniformly sized and spaced openings an aid in flower arrangement. Thus the use of grids should meet with little public resistance if the grids were made available free or at nominal cost.

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