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CONSTRUCTION OF A FIELD TRAP FOR INITIATING AN OVIPOSITIONAL RESPONSE IN *AEDES TAENIORHYNCHUS*

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ABSTRACT. An oviposition trap was constructed for the black saltmarsh mosquito, *Aedes taeniorhynchus.* The trap consisted of a 50 × 60-cm piece of contaminated 100% cotton bath towel, saturated with 85% tap water, a container, and a cover of dried plant parts placed over the contaminated toweling. This combination initiated oviposition. Contamination of the toweling was due to populations of bacteria and fungi. The eggs recovered were free from soil and debris.

Bentley and Day (1989) stated: "A tremendous amount has been written concerning mosquito oviposition. A large proportion of the studies have dealt with laboratory investigations on mosquito response to chemical and physical aspects of the oviposition site; relatively few field studies have been attempted." The field studies conducted have largely employed either the removal of eggs from the soil with the use of some mechanical device (Horsfall 1956, Service 1968, Miura 1972, Trpis 1974) or placing the soil from oviposition sites in water and counting the number of larvae that hatch (Bradley and Travis 1942, Bidlingmayer and Schoof 1956, Elmore and Fay 1958). Service (1976) emphasized that egg sampling is more difficult and time consuming than larval surveys because of the problems encountered in extracting the eggs from the soil and debris.

In addition to numerous studies on laboratory investigations of chemicals as oviposition attractants, some studies have focused on the importance of bacteria as oviposition attractants. Gerhardt (1959) suggested that adult female mosquitoes were attracted to test plots by compounds resulting from the anaerobic decay of organic materials. Rockett (1987) demonstrated the ovipositional response of *Culex pipiens* Linn. to bacterial attractants. Hazard et. al. (1967) commented that gravid floodwater mosquitoes were no doubt attracted to odors produced by fermentation. In the laboratory they demonstrated the olfactory attraction of *Aedes aegypti* (Linn.) and *Culex quinquefasciatus* Say to chemicals produced by bacteria.

The purpose of this research was to develop an oviposition field trap for the black saltmarsh mosquito, *Aedes taeniorhynchus* (Wiedemann). The attractant consists of a 100% cotton towel contaminated with a microorganism population composed largely of bacteria and fungi. Other factors that proved to be important for initiating oviposition were a container, a high moisture percentage, and plant materials for covering the towels.

The study was conducted near the coast at Folly Beach, SC from July 11 to August 9, 1995. The site chosen was a high marsh inlet, open to tidal flushing. Water remains in the inlet basin for long periods of time due to poor drainage and an accumulation of rainwater. This circumstance has led to the accumulation of a layer of organic matter in the basin. The dominant vegetation along the embankment and in the basin is *Spartina alterniflora,* Loisel, *Salicornia virginica* Linn., *Iva frutescens* Linn., *Myrica cerifera* Linn., and *Fimbristylis spadicea* (Linn.).

The trap (Fig. 1) is simple in its construction. The design consists of an upper and lower MacCourt black plastic tub (purchased at Lowe's Home Centers) measuring 20 × 60 × 90 cm. The upper tub is supported at each corner by a 1.27 × 120-cm steel rebar rod. The rods are pushed into the ground approximately 80 cm allowing for a clearance of about 20 cm between the top and bottom tubs. The bottom tub contains the contaminated towel covered by plant materials.

A randomized block of 8 traps was arranged in 2 rows of 4 traps each in a 3 × 4-cm plot, near a sloping embankment of the inlet. Four traps were used as treatment traps and 4 as controls. Bath towels of 100% cotton containing approximately 60% tap water were contaminated by spores of airborne microorganisms over a period of 2–3 wk in the laboratory. Four pieces of contaminated toweling, which measured 50 × 60 cm, were saturated with tap water and weighed. Water was removed by squeezing until the difference in the amount of water at saturation and the amount removed was approximately 85% moisture. Four uncontaminated pieces of the same size and percentage of moisture served as controls. A piece of contaminated or uncontaminated toweling was placed, at random, in each tub. Each piece was covered by plant parts such as dried pine needles and bark, or leaves

Fig. 1. The oviposition trap with an upper rain shield consisting of a 20 × 60 × 90-cm MacCourt all-purpose tub supported by a 1.27 × 120-cm rebar in each corner, and a lower tub of the same type, containing the contaminated towel covered by wheat straw.

and stems of *Spartina alterniflora.* Later it was discovered that wheat straw was just as effective.

Following a 24-h test period both towels and plant materials were removed from the traps at the site, and transported to the laboratory. The plant material was placed in a 17 × 51 × 66 cm MacCourt tub and washed with a pressurized nozzle attached to a garden hose. The water in the tub was then passed through 45 and 100 mesh USA standard testing sieves. The contents in the 100 mesh sieve were washed into a white porcelain bowl for examination. The towels were draped over a 12 × 46 × 48-cm wire glassware drying rack. The rack was placed in a 17 × 51 × 66 cm MacCourt tub and the towels were treated using the same procedure for washing the plant material. All eggs recovered came from the towels.

Ten trials were conducted on each factor tested. The data for each trial were obtained by pooling the 4 experimental traps and repeating the same for the controls. Because the data were skewed, the nonparametric Mann–Whitney test was used in testing for significance.

The total number of eggs from the test on the contaminated towel was significantly greater ($P < 0.001$) than from the uncontaminated towel; the totals were 12,093 and 121, respectively. The use of a container yielded a total of 11,989 eggs, which was significantly greater ($P < 0.001$) than placing the towel directly on the ground, which yielded 1,178 eggs. The results from the test on cover were significantly greater ($P < 0.001$) than no cover, the totals being 6,619 eggs and 577 eggs, respectively (Table 1).

Following the completion of the testing period on August 9, 1995, 4 traps were monitored to gather preliminary information on the relationship between the adult population and the number of eggs recovered. It was during this time on September 21, 1995, that the heaviest oviposition occurred. The total number of eggs recovered from the 4 traps was 31,246.

Over a 2-wk period the trap was tested on *Aedes sollicitans* (Walker) at a spoil site on Charleston's Daniel Island. Eggs were recovered daily for 2 wk during which the highest count in a 24-h period was *ca.* 5,000 eggs in a single trap.

Table 1. Results from the oviposition response of *Aedes taeniorhynchus* to a contaminated 100% cotton bath towel, a container, and plant cover. A total of 10 trials was conducted, with each trial consisting of 4 treatments and 4 controls.

Test	Mean no. of eggs/ container	Range/container	Total no. eggs	*P* value
1. Contaminated towel	302	72–1,236	12,093	<0.001
Control	3	0–34	121	<0.001
2. Container	300	44–984	11,989	<0.001
Control	29	11–83	1,178	
3. Cover	165	59–532	6,619	<0.001
Control	14	9–47	577	

Other factors were tested, such a sulfides, 1% salt solution, and a slurry of ground plant parts, but those found to be significant in initiating oviposition were a combination of a container, a cover, approximately 85% moisture, and a contaminated 100% cotton towel.

The choice of the container was based on size and not color. It was felt that the larger the container the better would be the chance of recovering eggs. Later it was discovered that oviposition would take place in smaller containers. Eggs were recovered from red, white, and dark green containers and from different colored towels. Tests were conducted over a 24-h period. The heaviest oviposition occurred from dusk to dawn. A smaller number of eggs were recovered during the daytime. This information, coupled with the fact that the toweling was covered with plant materials, indicates that color does not play a significant role in initiating oviposition.

The selection of the type of cover was based on the observation of the material found at the oviposition site. It was felt that the natural odor of plant material would not interfere with the odor coming from the contaminated towels. Other materials may also work, but those selected were easy to acquire and proved to be effective.

Knight and Baker (1962), in a laboratory study on the role of substrate moisture, found that the optimum percentage was 65%. The information from that study was used in selecting the amount of moisture believed to be significant in initiating oviposition. It was observed in the field that very few eggs were recovered from saturated or dried toweling. The largest numbers of eggs were recovered from towels with 85% moisture content. In weighing the towels after a 24-h period, moisture decreased approximately 25%. This was the reason for choosing the 85% level rather than the 65% level reported by Knight and Baker (1962).

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