A TECHNIQUE FOR TESTING SUSPENSIONS IN SIMULATED STREAM TESTS FOR BLACKFLY LARVICIDES [1]

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A method for simulated stream testing of blackfly larvicides described by Wilton and Travis, (1965), offered a considerable improvement over previous methods. Many workers have tested blackfly larvicides directly in stream sectors (Gjullin *et al.*, 1949), but this involved a laborious procedure for the accurate determination of the stream flow at each new site. Furthermore, once a sector of the stream had been treated, it often could not be used again, and the test site had to be moved upstream. Perhaps the strongest objection to the stream-sector testing is the danger to the fauna as a result of adding experimental concentrations of toxic chemicals to the streams.

An alternate procedure employed by several workers (Muirhead-Thompson, 1957; Jamnback, 1962) involved exposing the larvae to chemicals in containers, such as jars. Although the jar technique eliminated many of the objections to the stream-sector tests, it created a still-water environment entirely foreign to the larvae. Results of such tests usually were not comparable to those under the more natural environment of moving water (Travis and Wilton, 1965). Not only do the larvae fail to orient themselves normally in the still water of the jar tests, but in running water the larvae will actually be exposed to more chemical as they are continuously washed with the pesticides.

The method developed by Wilton and Travis was to meter known concentrations of larvicides through 6-foot sheet metal V-troughs. The pesticides were metered into the troughs from 2-gallon plastic bottles. The troughs provided a running water environment for the test. In addition, the runoff insecticide was not returned to the stream, but first filtered into the soil, thus minimizing the contamination problem. The entire apparatus could be moved, thus tests could be conducted wherever larvae were accessible. As the pesticides did not directly enter the stream, a local larval population could be used for long series of tests.

In the course of the larvicide testing program of the summer of 1964, it was obvious that a more suitable method of mixing the larvicides in the metering bottles was needed (Travis and Wilton, 1965). During the early tests the metering bottles were agitated by swirling the bottles by hand during the 15-minute tests. With four metering bottles to keep agitated at one time, it was doubtful that there was an acceptable and a consistent mix.

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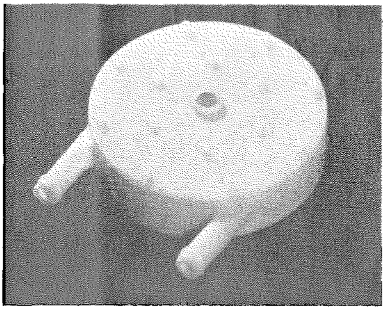

FIG. 1.—Plastic, magnetic stirrer.

Different types of electrical stirring devices were considered. Such equipment, including a generator would be too costly, would be difficult to move, and would present some danger of electrical shock. The stirrer selected was a hollow, plastic, disc-shaped device measuring 3 inches in diameter, ¾ inch in height and weighing a little over 100 grams (Figure 1). The disc was fitted with an intake and an outlet duct which opened into the space within the disc. In the disc is a magnetic propeller which is spun by a water current which enters and leaves the disc through the intake and outlet ducts. The magnetic propeller is sufficiently powerful to spin standard magnetic stirrer bars in containers placed above the stirrers.

A shelf for the metering bottles was made by nailing together two 1-inch pieces of marine plywood measuring 45 inches by 12 inches (Figure 2). Holes were cut into the top board to accommodate the stirrer discs so that the bottom of the metering bottle would be flush with the upper surface of the stirrer disc. Water pressure was provided each magnetic stirrer through a manifold made from a piece of 1-inch copper pipe 50 inches long, plugged at one end and fitted at the other end with a male garden hose coupling. A length of garden hose connected the manifold to the centrifugal pump used to supply the troughs with water. Four gas burner valves were welded into the manifold at intervals to coincide with the position of each of the stirrers. The stirrer manifold

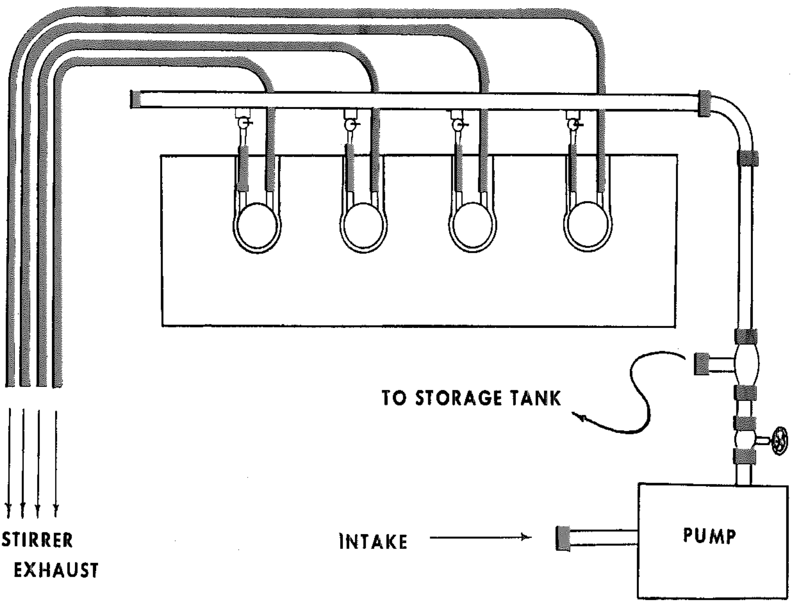

FIG. 2.—Schematic diagram of arrangement of hydraulic stirrers.

was clamped to the metering bottle shelf and rubber tubing was connected from each valve to an intake duct on the stirrer. A length of rubber tubing was connected to the outlet duct of the stirrer so that the outflow from the stirrer could be emptied away from the testing equipment. A 2-inch magnetic bar coated with teflon, inserted in the metering bottle, was rotated by the water-powered magnetic stirrer, which provided an adequate mix of the larvicide. The stopcock on the gas burner valves permitted the regulation of the flow of water to each stirrer and thus the speed of the stirrer could be controlled. Also the intake line from the pump to the stirrer manifold was provided with a valve to help control the water flow to the stirrer manifold.

The magnetic stirrers were made of two plastic halves. Occasionally there were leaks from the seam where the two halves were joined. This leak was stopped by pasting a ½-inch wide strip of cellulose acetate, 30 mils in thickness over the junction seam. A mixture of cellulose acetate and acetone was used for pasting the plastic strip.

The use of the plastic stirrers described above has decided advantages over other methods investigated. The stirrers, which can be purchased from the Chemical Rubber Company of Cleveland, Ohio for $9.95 each, are light and compact, can be operated without electricity, and being driven by running water are virtually impossible to overheat or burn out. It is likely therefore that they can be of value to other workers who have found the need for stirring chemicals under field conditions.

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