tegrated control option for mosquito larvae. If used in this way the fungus may be induced to kill part of the target larval population with the remainder being eliminated by methoprene. Sporulation on dead larvae killed by the fungus might then produce significant recycling against subsequent larval generations. However, before this objective could be realized, problems of storage of this fungus must be solved (Sweeney 1985) and formulations developed to give consistent results against mosquito populations in the field.

This paper is published with the approval of the Director General of Army Health Services. The investigation received financial support from the UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases and from the Australian National Health and Medical Research Council.

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A NEW METHOD FOR APPLYING AROSURF MSF (MONOMOLECULAR SURFACE FILM FORMULATIONS)

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The use of water as a carrier/diluent to facilitate application of low technical levels (i.e., 0.2–0.5 gal/acre) of the mosquito larvicide and pupicide Arosurf® MSF[1] to enhance vegetative/canopy penetration and/or prevent overdosing with conventional ground and aerial spray systems has been discussed by Levy et al. (1982). Levy et al. (1984a, 1984b) have also addressed the operational feasibility and techniques, as well as the difficulties associated with mixing Arosurf MSF, or formulations of Arosurf MSF and *Bacillus thuringiensis* var. *israelensis*, or Abate® 4–E (Temephos) in water for application of homogeneous water-base formulations.

Since Arosurf MSF is essentially insoluble in water (solubility < 2.5 ppm), tests were conducted to determine if an application system could be developed that would eliminate the need for high shear agitation while allowing effective ground and aerial application of label rates of the product in water. Preliminary studies by Hertlein et al. (unpublished data) and Levy et al. (1982) indicated that several Dema Liquid Chemical Injectors[2] could be used to meter precise quantities of chemical larvicides, biological control agents and monomolecular surface films into a stream of water for final application at recommended rates at high spray pressures and volumes without the need for tank agitation. In this system the main spray tank would contain only water, therefore eliminating major spray tank cleaning problems.

[1] Arosurf® MSF (= Arosurf® 66–E2 = ISA–20E) is manufactured by Sherex Chemical Co., Inc., Dublin, OH.

[2] Dema Engineering Company, St. Louis, MO.

The following is a continuation of this research and a report of an application system employing the use of Model #202C Dema injector (Fig. 1) designed to meter recommended levels of Arosurf MSF from a roadwide ditch truck used in standard larviciding/pupiciding operations at the Lee County Mosquito Control District.

Evaluations were conducted with a one ton truck containing a 550 gal spray tank filled with well water (Figs. 2 and 3). The spraying/pumping system was a John Bean (Model #R10) having a maximum of 500 psi and was powered by an 8 hp Kohler engine (Model #K1815). An FMC Bean spray gun (#785N) with a #7 orifice was used to dispense Arosurf MSF in water.

The Dema injector (Model #202C with #7 water nozzle bushing) was positioned on the pressure side of the pump (Fig. 4). Initial tests with the injector on the suction side of the pump produced poor results. Approximately 5–6 ft. of ¼ in diam suction line were connected to the injector. The in-line injector position and its distance from the pump is not important for proper functioning; however, constant line pressure is necessary to maintain the vacuum for proper application. Also, line pressure that is lost due to use of the spray gun has to be considered because if the pressure in the entire system drops below 150 psi, the injector will not function. Furthermore, the lower the working spray pressure, the smaller the injector size that can be used; however, less material will be delivered. The injector valve was equipped to the system with "quick-disconnects" to allow easy addition or removal from the truck system (Fig. 3). There are several Dema injector models available for use. The correct injector selection will depend upon operational line pressure and the quantity of material to be injected.

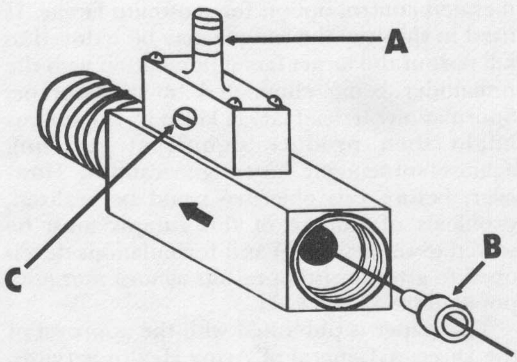

Fig. 1. Schematic representation of Dema Model #202C liquid chemical injector. A. Supply tubing fitting, B. Water nozzle bushing, C. Metering screw.

Arosurf MSF was dispensed at 0.3 gal/acre in water at 4.5 gal/min at 350 psi. Precise dosage adjustments were made by alteration of the metering screw on the injector valve. Gallons per acre film-water calibration were based on a truck speed of 10 mph and a spray swath of 10 ft. The hose was also equipped with airline quick-disconnects to permit easy removal of the

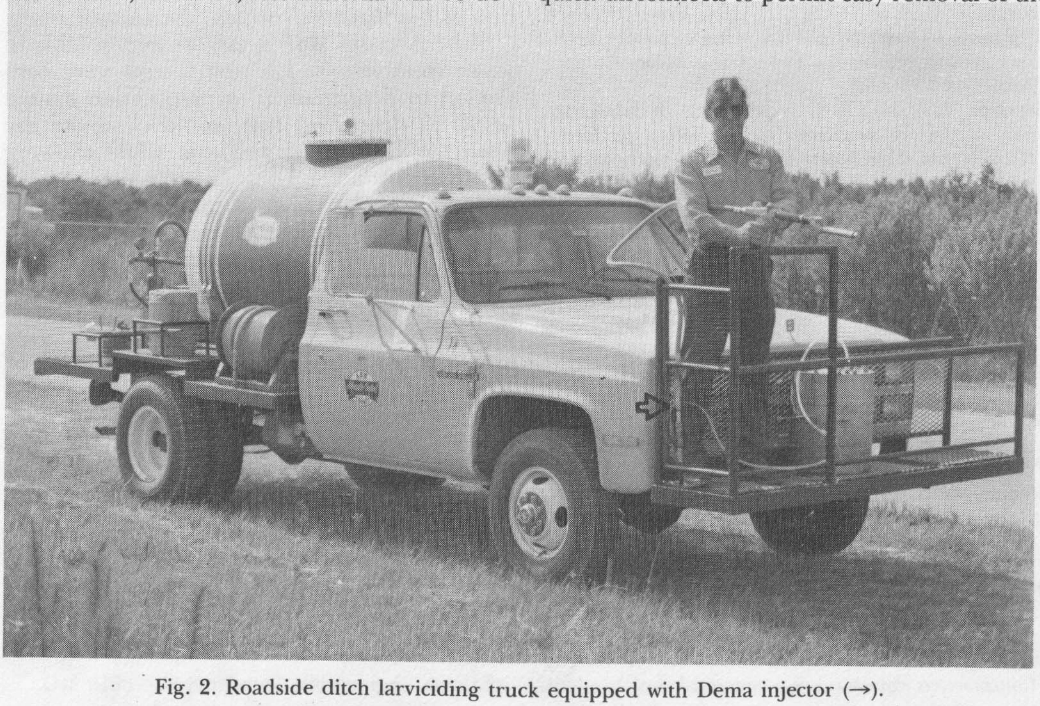

Fig. 2. Roadside ditch larviciding truck equipped with Dema injector (→).

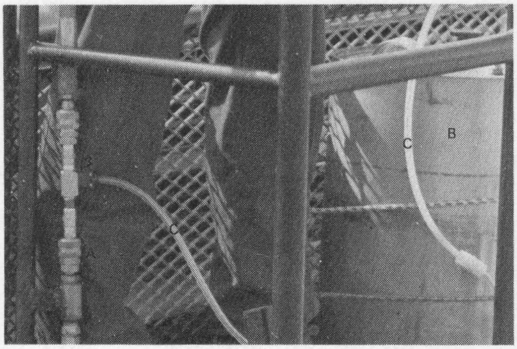

Fig. 3. Close-up of Dema injector (→) with quick-disconnects (A) and Arosurf MSF supply tank (B) with associated suction hose (C).

spray gun from the truck for repair or replacement. The airline "quick-disconnects" can be purchased from any automotive parts store.

Dema Model #202C injectors cost $31.50 each. Nozzle bushings are $2.35 each and there are 3 sizes available for this model. Airline "quick-disconnects" for the entire system cost $10.02. The truck was equipped with a 13 gal stainless steel ULV tank containing Arosurf that was mounted on the spray truck with elastic cords for easy removal and refilling. Plastic containers can also be used.

The injector system is currently being used on an experimental/semi-operational basis to dispense Arosurf MSF in water or Arosurf MSF into an Abate 4–E/water mixture. Investigations are also being conducted on the use of a two injector system that can be interchanged in and out of the system in the field. One injector would be used to apply technical insecticides such as Abate 4–E or commercial preparation

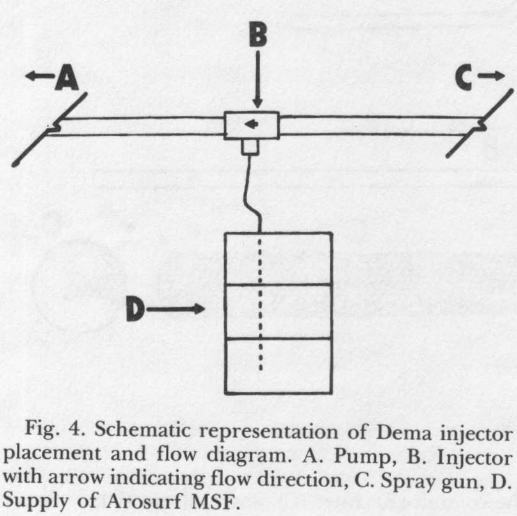

Fig. 4. Schematic representation of Dema injector placement and flow diagram. A. Pump, B. Injector with arrow indicating flow direction, C. Spray gun, D. Supply of Arosurf MSF.

of *Bacillus thuringiensis* var. *israelensis* for larviciding and the other injector would be used for application of Arosurf MSF for pupiciding. The use of computerized ULV flow controls are also being evaluated.

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DEVICES FOR SAMPLING AND SORTING IMMATURE *COQUILLETTIDIA PERTURBANS*[1]

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Coquillettidia perturbans (Walker) are major human and livestock pests and potential vectors of arboviral diseases. Although the adults can be controlled by chemical insecticides, the larvae, which spend much of their time attached to the submerged stems and roots of emergent vegetation in highly organic habitats, generally can not (Hagman 1953, Guille 1976, H. D. Newson, personal communication). The development of alternative larval control methods has been slowed in part by a lack of knowledge of the ethology and ecology of the immatures. This is a direct result of not having a simple, standardized, cost-effective and quantative larval detection method.

A number of methods have been used to collect *Coquillettidia* immatures (McNeel 1931, Bidlingmayer 1954, Barton 1964, Morozov

[1] This research was supported in part by a grant (no. 81–03–015) from the Florida Institute of Phosphate Research.