LOW COST, LOW PRESSURE SPRAY SYSTEM FOR LARVICIDING FROM A VEHICLE

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The Orange County Vector Control District and the Southeast Mosquito Abatement District have used an air compressor system powered by a vehicle engine in their community drainage spray vehicles for many years. In the past we have used right-hand drive Willys Jeep® DJ3, International Harvester Scout® 800A or Scout II for this purpose. Currently, we are using a Scout II with 6 cylinders, 258 CID, and V8-304 CID engine, short cab, automatic transmission with right-hand drive. To provide pressure we have used various types of air-cooled, water-cooled, engine-driven air compressors, such as, Bendix-Westinghouse,® Models 400, 500, and 600, air or water cooled; Wagner® Remote and Integral Dome Rotary, air or water cooled. This system has been described in Kimball and Thompson 1967.

Problems in the use of these different types of air compressor systems are as follows: increased coolant temperatures with water-cooled compressors, compressor lubrication, lack of space in engine compartment, and lack of pulley drives due to smog emission system required on present day engines, non-availability of brackets for installation of heavier automotive air compressors, difficulty in obtaining parts, and the fact that the Wagner rotary air compressor is no longer manufactured or repaired.

Southeast Mosquito Abatement District came up with the idea of using a 2-cylinder automotive air conditioner compressor to compress air for spraying operations. Orange County Vector Control District has adopted this system but with one added feature to make the system fully automatic. The 2-cylinder air conditioner compressor is installed by using the vehicle manufacturer's listed mounting brackets, pulleys, and drive belts. Availability of this equipment is generally good, and it costs less to purchase than to manufacture at your facility.

Each District has purchased these units from the local auto wreckers with friction drive pulley and hose fittings and miscellaneous hardware attached. York®, Fordco® and Tecumseh® 2-cylinder compressors have generally been used. Cost of Bendix-Westinghouse rebuilt models with an exchange is $110 to $140 per unit without drive pulley as compared to $25 per unit for a used automotive 2-cylinder air conditioner air compressor with friction drive clutch attached.

Modification of the compressor unit is accomplished by adapting an intake filter assembly on the air intake port of the compressor. A ⅜ inch galvanized pipe tee is connected into the air discharge line to the spray tank. A Penn®Air Pressure Switch, P/N 2232-3701 is fitted into one side of the ⅜ inch pipe tee. The Penn air pressure switch is normally a part of the Coleman® 12 V air pressure pump that maintains water pressure for recreation vehicle showers and restrooms and is available at your local recreational vehicle dealer. The Penn pressure switch has three adjustments and will allow the operator to adjust cut-in/cut-off and amount of pressure desired. A 2-position switch Cole-Hersee, P/N 5007, and Pilot Light, P/N PL-19-12V, are installed in the dash panel of the vehicle. Wiring circuit is connected from ignition/accessory circuit of vehicle to the 2-position switch and pilot light. Wiring is then connected from switch and pilot light to Penn air pressure switch then to the air compressor friction clutch wire connector.

Operation of the compressor is controlled by a 2-position switch. Pilot light indicates that system is on. Penn air pressure switch controls the amount of desired air pressure and automatically cuts on or off the operation of friction clutch of the air compressor.

Advantages of this type of system are: Operator can turn the compressor system on or off, compressor system automatically controlled by Penn air pressure switch, ease of installation and availability of ready made components for installation, and maintenance of compressor is simple.

This system has proven successful in pressurizing a 50-gal tank using Spraying Systems Company spray equipment and Flit MOL® at 40 psi regulated pressure for community spray operations. Compressor recovery time and pressure is maintained rapidly. However, there may be a problem if a continuous high volume of air pressure is needed. Sufficient air pressure is available for operation of granule gun spraying as described in Kimball and Thompson 1962.

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OBSERVATIONS OF PREDACIOUS ORGANISMS IN RELATION TO MOSQUITO OCCURRENCE IN THE FIELD.

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During the 1976 mosquito breeding season records were kept of known mosquito predators found in mosquito breeding sites and the mosquito densities associated with each. A random sample of 221 sites inspected had 1 or more of the following predators:

	No. Sites	No. Sites negative for mosquito larvae	No. Sites positive for for larvae	Average No. larvae per dip
Dytiscidae				
Predacious diving beetles	106	77	29	1.3
Notonectidae				
Back swimmers	65	49	16	1.9
Pleidae				
Pygmy back swimmers	8	8	0	0
Hydra	15	15	0	0
Planaria	27	20	7	0.6

The observations were recorded operationally without regard to relative densities, and are reported here to encourage field personnel to observe personally positive relationships which may exist between the presence of natural enemies and immature mosquitoes under field conditions in your area.

FURTHER THOUGHTS ON INDUSTRIALIZATION, URBANIZATION AND FILARIASIS

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Filariasis as a human disease has been recorded as early as 600 B.C. in India and Persia. The disease is on the increase and presently it can be estimated that in tropical and sub-tropical countries nearly 1/8th of the human population is either latently or actively suffering from this disease. Sinha (1968) made a review of "Global studies on filariasis" from 600 B.C. to 1967. It also included country-wide disease, parasite and endemicity rates. This review brought out the magnitude of the filariasis problem. Payne (1966) in the meeting of the WHO Expert Committee on Filariasis reported that filariasis is of great concern to many governments, particularly in the developing countries where rapid urbanization and population movements have greatly aggravated the problem.

The developing nations are gradually becoming industrialized. Urbanization goes hand in hand with industrialization. Industries break up the isolation of the peripheral villages which have a crucial role to play in stimulating a definite transition. The educated people, laborers, craftsmen and others migrate to industrial areas to seek employment and reap the benefits of amenities and security offered by industrial management. This brings about a migration from villages to growing cities. With the growth of communication between villages and towns, there is increased contact among people in peripheral and ring villages and mosquitoes infected with microfilariae. Thus there is urban-rural transmission of filariasis. Presently, the endemicity of filariasis is increasing in areas with new industries, urban and surrounding rural areas. Bancroftian filariasis spreads centrifugally from urban to the rural peripheries (Varma et al. 1961), and the recent filaria surveys have revealed that now filariasis is as much a rural problem as an urban problem.

Sinha (1974) outlined the factors which influence transmission potentials of filariasis in developing urban and semi-urban areas. The unplanned construction in and around developing industrial belts with no satisfactory disposition of the waste water and other residuals, creates large numbers of mosquito breeding places. Thus with the vector species prevalent and filaria positive persons present, favorable biotic conditions set in motion transmission. In developing countries where dressing habits are poor, and the use of mosquito curtains is the privilege of a few, the transmission potentials increase a hundred-fold. Intercommunication of the people spread this disease in all directions.

WHO (1974) in its "Third Report on Filariasis" has recommended emphasis on chemotherapy and vector elimination. Integration of control measures has yielded good results in the industrialized areas and towns, but new problems of vector resistance and manyfold changes in their behavior have appeared. The seminar has recommended research on different aspects of vectors and parasites to bridge the many gaps in the knowledge of filariasis. Such studies are being undertaken at several places.

Cheaper methods for the control of vectors and parasites of filaria have to be developed to meet the needs and challenges of the developing countries. Costly experiments are neither acceptable to the Government nor to the people. For effective control there is a need of moral coordination and personal contact between the program and people in the developing countries. People have to be educated about the magnitude of the filaria problem and the great economic loss and untold suffering which this disease brings to the country. A high degree of personal sanitation in homes and barns with removal of all stagnant water at regular intervals will go a long way to remove the scourge. The authorities must make proper ar-

rangements for sanitation, water management, and source reduction while planning any industrial establishment and township. Judicious use of insecticides is essential. Perfect maintenance of scout service to discover mosquito breeding, and filaria patients is of utmost importance. And above all, nature's role in controlling the vector population-density, transmission of the disease, parasite activities and other related problems have to be studied in depth.

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THE EASTERN MUD MINNOW, *UMBRA PYGMAEA* (DEKAY): A POTENTIAL CONTROL AGENT OF WOODLAND POOL *AEDES* SPP.

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Mosquito control agencies in the Northeast concentrate much of their efforts on the control of woodland pool *Aedes* spp. However, few attempts at the biological control of these species have been recorded.

The eastern mud minnow, *Umbra pygmaea* (DeKay), was selected as a potential control agent for the following reasons: (1) It inhabits sluggish woodland streams and ditches (Eddy 1957). (2) It feeds on crustacea and insect larvae (Hubbs and Sagler 1958). (3) The mud minnow is most active from early spring to early summer, the time of peak abundance of woodland pool *Aedes* larvae. (4) It has been taken from semi-permanent water conditions, a characteristic of most woodland pools (Westman 1941).

A related species, *U. limi* (Kirtland), consumed between 60 and 100 mosquito larvae per fish per day in the laboratory (Maw 1968). The author recorded similar results with *U. pygmaea* in the laboratory when late instar mosquito larvae were offered as the sole source of food.

Two woodland pools containing 1st to 3rd instars of *Ae. canadensis* were stocked at the rate of 1 minnow per m^2 of surface water. One pool supported large numbers of a variety of macro-invertebrates including isopods, amphipods, ostracods, copepods, and coleopterous and other dipterous larvae. Minnows in this pool were seined 1 and 2 weeks after stocking, and their gut contents were examined. Larval air tubes served as good indicators of the presence of larvae in the gut. The number of air tubes per minnow varied from 3 to 11 ($\bar{x} = 6.5$). When mosquito larvae were recovered reasonably whole, they consisted from 10 to 30 percent of the gut contents. By comparing the size of air tubes found in the gut with those of known instar larvae, it was determined that 90% of the larvae consumed were 3rd and 4th instars.

In the 2nd stocked pool, mosquito larvae and copepods were the only invertebrates observed. Emergence first occurred 9 weeks after the date of stocking. In a nearby control pool populated with larvae of the same age, emergence first occured after 5 weeks. The stocked pool dried up completely only 3 days after the first signs of emergence and it may have been that mosquitoes were able to reach the adult stage only because water in the pool was so shallow that predation was impeded.

The eastern mud minnow was reported to have survived despite the complete freezing of its habitat water (Westman 1941). Two woodland pools were stocked in the autumn with the hope that the minnows would survive and prey on the larvae as soon as the mosquito eggs hatched the following spring. The water in both pools froze completely but there was no indication that any mud minnows survived the winter.

Although *U. pygmaea* does not seem to have as voracious an appetite for mosquito larvae as certain other fish, such as *Gambusia*, the time woodland pool *Aedes* spp. spend in the immature stages (usually 4 to 10 weeks in New Jersey) may be long enough to permit effective predation.

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AN OPERATIONAL COMPARISON OF TWO GRANULE APPLICATORS

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The Seymour bucket seeder (Model 75-105 universal spreader) has become increasingly popular in re-