A FIELD EVALUATION OF ABATE BRIQUETTES IN WOODLAND POOLS [1]

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Control of mosquito larvae using DDT-lindane impregnated briquettes in breeding areas has been reported by Raley and Davis as early as 1949. Symes, Thompson and Busvine (1962) mention the effective use of small plaster of paris bricks containing 0.75 percent (by weight) lindane for control of mosquito larvae in rice paddies. During an extensive field test in the Tokelau Islands, Laird (1967) reported 100 percent larval mortality in every mosquito breeding site checked one day after dieldrin-impregnated cement briquettes were introduced. Such briquettes remained larvicidally effective for almost five years. Thus, briquettes treated with three different chlorinated hydrocarbon insecticides have produced excellent control of mosquito larvae in a variety of habitats.

The author, *et al.*, in laboratory experiments (1967) demonstrated excellent control of *Culex pipiens pipiens* Linnaeus larvae using casting plaster and other briquette media impregnated with Abate (0,0,0',0'-tetramethyl 0,0'-thiodi-*p*-phenylene phosphorothioate). This field test was conducted to evaluate the effectiveness of similar Abate briquettes against field populations of mosquito larvae in woodland pools.

METHODS AND MATERIALS. Briquettes made of casting plaster and tap water (2:1) were cast in plastic ice cube trays to afford a standard size for field use. Two methods were used to apply the insecticide to formed briquettes; first a topical application wherein 4 ml. of a 30 percent (v/v) acetone solution of Abate emulsifiable concentrate was pipetted upon each of the briquettes, while the second method entailed soaking formed briquettes

[1] The use of trade names is for identification purposes only and does not imply endorsement by the U. S. Army. "Abate" is a trademark of the American Cyanamid Company.

for 10 minutes in a 12 percent (v/v) acetone solution of Abate emulsifiable concentrate. Each briquette absorbed 13.1 ml. of the insecticidal solution using the latter process. Topically treated briquettes thus contained 0.583 g. actual Abate while the soaked briquettes contained 0.763 g. actual Abate.

The field evaluation was conducted using 34 selected woodland pools near a salvage yard at Edgewood Arsenal, Maryland, where *Aedes canadensis* Theobald had been abundant in past years. A pretreatment survey was made in all test pools immediately prior to introduction of treated briquettes wherein larval density, species and stage, pH and approximate volume of water contained in each pool, and relative density of non-target organisms were recorded on data cards.

Initial treatments entailed placing topically treated Abate briquettes into 29 pools at the rate of one briquette per 10 cubic feet of water (approximate). Five sites remained untreated as controls. Post treatment larval counts were made at scheduled intervals to determine control effectiveness. Pools were examined grossly to determine deleterious effects upon non-target organisms. Twenty-three sites were retreated with immersed briquettes on day 57 of the test when larval density suddenly increased. Heavy rains caused test pools to fill to capacity the previous week, a factor which may have influenced the apparent control failure. Six pools received no retreatment since larval counts remained low from the initial treatment. Pools were retreated at the original dosage based upon changed water volume in each pool. Climatic data for the period of the evaluation was supplied by the U. S. Army Meteorological Team, Edgewood Arsenal, Maryland.

RESULTS. The dominant mosquito larvae collected from the pool sites during the 176 day test period were identified as *A. canadensis* T., *Aedes cantator* Coquillett, *Culex restuans* Theobald, and *Aedes vexans* Meigen. Water in the pools ranged in volume from 9 to 120 cu. ft. (Av. 36 cu. ft.) while pH varied between 4.0 and 7.3 (Av. 5.01). Figure 1 shows that excellent larval control was obtained for the 6 initially treated sites and 23 retreated sites.

DISCUSSION. Data obtained during this field evaluation demonstrate the potential use of insecticidal briquettes as a long-term control measure against mosquitoes breeding in intermittent pools. The pools treated in this study intermittently contained water from early March, when the initial pretreatment surveys were made, until mid-September 1967. *A. canadensis* T. is usually the first mosquito to emerge from such sites, followed chronologically by *A. cantator* C., *C. restuans* T., and *A. vexans* M. The evaluation reported in this paper covered a period when all of the above species were present at one time or another in the control pool sites.

Initial treatments began in late March when all pool sites contained *A. canadensis* T. larvae in the first through third instar. It appears that a period of 4 to 18 days' post treatment is required before a toxic level of Abate is attained in pools of the size used in this evaluation. The larvae in treated pools showed symptoms of inhibited development before death. Exposed larvae reached only the third instar while larvae in the control sites showed normal development and had progressed to the fourth instar and pupal stage. Thus, while a period of time was required to reach a toxic level producing mortality, development was arrested in exposed larvae.

Egg rafts of *C. restuans* T. were collected from treated pools in early May and brought into the laboratory for rearing. These egg rafts were halved, one half being placed into tap water while the other was placed into water from the treated site. Hatch from the former halved rafts was poor, yet approximately 10 percent of the larvae which emerged lived through to the pupal stage, while the halved rafts placed in treated water produced no liv-

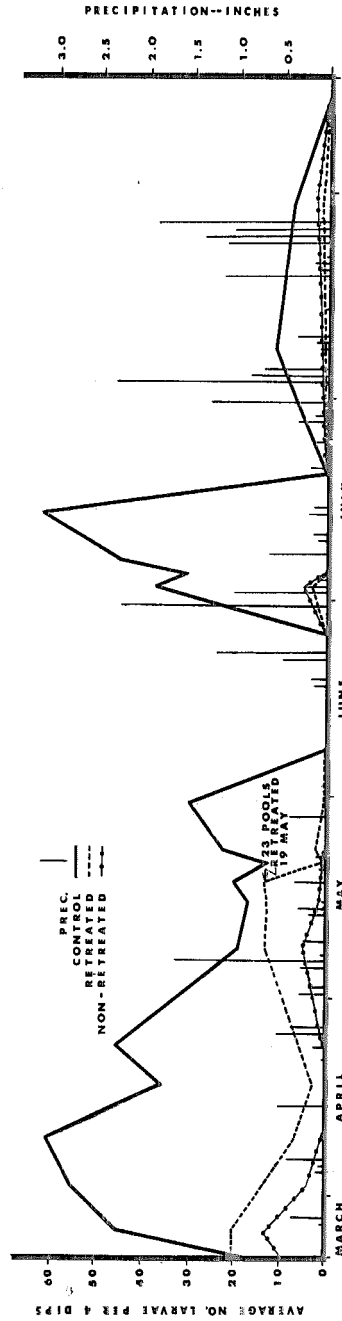

FIG. 1.—Precipitation data and larval index of 5 control woodland pools and 29 woodland pools treated with plaster of paris briquettes impregnated with Abate.

ing larvae 24 hours after hatch. Close microscopic examination of egg rafts collected from treated pools revealed considerable mortality in first stage larvae, yet remaining partially emerged from the egg case.

In retrospect, retreatment may not have been required to attain satisfactory control. Six pools which were not retreated showed excellent larval control for the entire test period. Close examination of the 23 retreated pools revealed a predominance of newly hatched *C. restuans* T. larvae. Such larvae died within 24 hours when transported to the laboratory in pool water for observation. Thus dilution of treated pools by heavy rains coupled with heavy oviposition and subsequent hatch of *C. restuans* T. may have prompted an unnecessary retreatment.

No detectable deleterious effects were noted upon other aquatic organisms, e.g., copepods, ostracods, snails, etc. Contrarily, the population of other aquatic life appeared greater in treated pools than in the controls.

Such briquettes may demonstrate promising results in other intermittent pool sites where long-ranged control is desired with a minimum hazard to wildlife and lower food-chain organisms.

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