

OUTDOOR RESIDUAL TREATMENTS OF PREMISES FOR CONTROL OF SALT-MARSH MOSQUITOES¹

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INTRODUCTION. Along most of the Atlantic and Gulf coasts of the United States, the salt-marsh mosquitoes, *Aedes taeniorhynchus* (Wiedemann) and *Aedes sollicitans* (Walker) are the principal pest mosquitoes causing annoyance to man both at night and during the day. While considerable effort is directed towards community control of these pests in certain areas, such activities frequently are not feasible in many rural or sparsely populated areas.

Therefore, the need existed for a method of mosquito control which could be used by the individual. The efficacy of residual treatments on vegetation for controlling adult mosquitoes had been studied by Madden, *et al.* (1947), who reported that DDT applications in jungle plots would definitely reduce the numbers of *A. taeniorhynchus* for several weeks when applied at a dosage of 2 pounds of DDT per acre.

In attempts to evaluate the potential of outdoor residual treatments for use around homes, emphasis was placed on destroying the mosquitoes that rested in the immediate vicinity of homes during the daytime

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period. Based on the observation that adult mosquitoes do not move extensively during the day, it was assumed that the elimination of the adult population within the immediate periphery of a dwelling would afford the householder relief from daytime mosquito annoyance. Such reduction was not expected to have any effect after dusk when mosquitoes infiltrated from the surrounding untreated areas in search of a blood meal.

METHODS. Outdoor residual applications of DDT, dieldrin, BHC, and lindane were made at individual premises near Savannah, Georgia, during 1952, 1953, and 1954. Treatment extended from the foundations of the house outward for approximately 100 feet, the total coverage being about 1 acre. The insecticides were applied to the lawn, shrubbery, flower beds, lower tree trunks, and also to the foundations of the house and outbuildings.

Paired premises were selected in close proximity to each other (usually in adjacent lots) and as similar as possible in amount of vegetation and sunlight, and in type of foundation of the house, that is, whether it was on piers or on a solid foundation. One of the properties in each pair was treated, and the other served as a check.

DDT was formulated as an emulsion from a stock concentrate which consisted of 25 percent DDT, 10 percent rosin, 2 percent Triton X-155, and xylene. In 1954 the rosin was omitted in one series of DDT treatments. Application rates were 2.5, 5, and 10 pounds of DDT per acre.

Dieldrin was employed as an emulsion and as a suspension. The stock concentrate for the dieldrin emulsion was composed of 25 percent dieldrin, 2 percent Triton X-155, and xylene. The emulsion was applied at the rates of 1, 2, and 4 pounds of dieldrin per acre. The suspension treatments were derived from a 50 percent water wettable dieldrin and from an experimental water wettable formulation ("Supona" dieldrin) containing 50

percent dieldrin. Both formulations were sprayed at the rate of 1.5 pounds of dieldrin per acre.

The stock concentrate for BHC consisted of 15 percent BHC, 2 percent Triton X-155, and xylene. Because of the relatively low solubility of technical BHC in xylene, BHC products containing higher gamma isomer content (36 to 41.5 percent) were used for the higher applications to reduce the amount of xylene in the finished formulation and thus decrease the risk of burning ornamental vegetation. BHC was applied at the rate of 0.3, 0.5, 0.6, and 1.3 pounds of gamma isomer per acre.

The lindane concentrate consisted of 12 percent lindane, 2 percent Triton X-155, and xylene. The rate of application of lindane was 0.5 lb. of toxicant per acre.

Each property received treatment with 50 gallons of the finished formulation, the proper acreage dosage being obtained by varying the strength of the formulation. The insecticide was applied at approximately 100 psi with a power sprayer equipped with orchard-type applicators.

The effectiveness of the treatments was evaluated by a comparison of the landing rate indices for the treated and untreated premises. During 1952 and 1953 a 3-minute landing rate was taken daily at one station per premises with an aspirator or with an adult mosquito sampler (Klock and Bidlingmayer, 1953) whenever large numbers of mosquitoes were present. During 1954 the indices were based on 3-minute landing rates at three stations per premises 3 days per week.

During 1952 and 1953 a treated property arbitrarily was considered under control as long as its weekly index was less than one-fourth of the index of the untreated property or was less than 10 mosquitoes. In 1954 the same criteria were employed except that the level was less than six mosquitoes per week.

RESULTS. In 1952, treatments of DDT-emulsion at 5 (three replicates) and 10 (two replicates) pounds of DDT per acre provided an average of 4 and 9 weeks of

effectiveness, respectively, as compared to an average of 2 weeks control in three replicates at a dosage of 2.5 pounds of DDT per acre. The applications of 10 pounds per acre gave excellent results, no mosquitoes being recorded for 6 weeks after the treatment even though indices at the untreated premises for the last 5 weeks were 30 to 73 mosquitoes. Three replicates each of BHC emulsion at 0.3, 0.6, and 1.3 pounds of gamma isomer per acre yielded an average of 2, 0, and 2 weeks reduction of mosquito densities, respectively. Treatments of dieldrin emulsion (three replicates each) at 1.0, 2.0, and 4.0 pounds of dieldrin per acre were least effective, only 1 week of reduced mosquito densities being evident and that was at the maximum dosage.

The 1953 tests which involved five replicates each of DDT emulsion at dosages of 5 and 10 pounds of DDT per acre yielded only 1 and 2 weeks effective reduction in mosquito indices, the latter being achieved with the higher poundage.

In 1954, three replicates each of DDT emulsions with or without rosin applied at a rate of 5 pounds of DDT per acre provided 6 weeks of effective relief from daytime annoyance by salt-marsh mosquitoes. Weekly indices for the treated premises were between 0 and 7 specimens in comparison to the levels of 55 to 302 adults for the untreated adjacent premises. However, neither emulsions of BHC and lindane (three replicates each at 0.5 pound of gamma isomer per acre) nor suspensions of dieldrin (five replicates) at 1.5 pounds of dieldrin per acre, gave more than 1 week of control.

DISCUSSION. From the data it is apparent that limited DDT residual applications around a property can provide a successful means of freeing the occupants from daytime salt-marsh mosquito annoyance

for extended periods. Four to six weeks of relief from daytime mosquito annoyance are possible from a single treatment of 5 pounds of DDT per acre. In the Savannah, Georgia, area where both species of salt-marsh mosquitoes are susceptible to DDT, this insecticide markedly surpassed both dieldrin and lindane in efficacy. However, the disappointing results of 1953 indicated that even the DDT applications are not effective for prolonged periods under all conditions. During 1953 general mosquito annoyance and rainfall were much greater than in 1954 and these factors are presumed to have been responsible for the reduced efficacy of the 1953 treatment.

SUMMARY. Residual treatments of DDT to the vegetation and lower portions of outbuildings within a radius of 100 feet from the house were superior to similar applications of dieldrin, lindane, and BHC in providing inhabitants with relief from daytime annoyance by salt-marsh mosquitoes in the Savannah, Georgia, area. Under moderate conditions of mosquito infestation, application of DDT at 5 and 10 pounds per acre produced effective reductions in mosquito densities for 4 to 6 and 9 weeks respectively. Under conditions of repeated heavy mosquito infestations, effective control with either dosage did not exceed 2 weeks. Protection afforded by treatments of dieldrin (1.0 to 4.0 lbs./acre), BHC (0.3 to 1.3 lbs. gamma isomer/acre), and lindane (0.5 lb./acre) ranged from 0 to 2 weeks.

Bibliography

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