IMPORTANCE OF ORGANIC PHOSPHORUS INSECTICIDES IN MOSQUITO CONTROL IN CALIFORNIA

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The mosquito problem in the Central Valley of California, associated in large part with the use of water for agricultural purposes, is one that has not been easily resolved. In an area such as this, where agriculture is a major source of income, the use of land for the production of crops is of prime importance, taking precedence over most other activities. Problems created by such use or activity are secondary, even though they may be of considerable concern to a majority of the population. Because mosquito control must be secondary to the production of crops, and because, for economic reasons, it is not always possible to provide the facilities and cultural practices that will produce crops without producing mosquitoes, we find it necessary and essential to carry on our larviciding practices.

In regions of agricultural economy it appears that mosquito larviciding will be a requirement in attaining reasonable control of mosquitoes, particularly where lands are being brought into production, or where older producing lands need improvement as well as cultural practices. As such improvements are, to a great extent, dependent upon economic factors and education, they are being approached on a long range basis.

By 1952 such a high level of resistance to all the chlorinated hydrocarbons had been reached that they were no longer of practical value for mosquito control in extensive areas of the Central Valley. When confronted with the inability to control mosquitoes with insecticides of the chlorinated hydrocarbon family, we found ourselves in an untenable and rather critical position. Abatement districts were expending considerable sums of public monies, yet mosquitoes were abundant, and the public quite unhappy. Urgency was the order of the day, and, to fill the breach, so to speak, came the phosphate insecticides, first in the form of EPN, then Chlorthion, and later malathion and parathion. As these materials came into use, highly effective control resulted, and at a reasonable cost. It is difficult to predict what might have happened to mosquito control in the Central Valley had we not been able to substitute the phosphates for the chlorinated hydrocarbons. It seems that one thing is sure, we would not be experiencing good mosquito control without phosphate insecticides.

By 1954, malathion, and, to a lesser extent, parathion, were being used as the insecticides of choice by ten districts in the state. The use of both of these phosphates has increased until at the present time, approximately one half of the 55 districts in the state are using one or both of these materials to some degree. Because it is much less hazardous, malathion is the one preferred by most districts, yet considerably more acreage is treated with parathion, which is used as a principal insecticide by eight or more districts.

Malathion is used primarily as an emulsifiable concentrate applied as a spray by hand, power and airplane at an average rate of .4 to .5 pounds per acre. Some use is made of the granular form and of aerosols for adulticiding. At .5 pound per acre, the insecticide cost amounts to 92 cents per acre. Parathion is used exclusively as an emulsifiable concentrate applied as a spray by hand, power and airplane at an average of .1 pound per acre. At this rate, the cost for this material is 30 cents per acre.

No special precautions are taken for the handling of malathion. In the case of parathion, because of its extremely high mammalian toxicity, special procedures

have been adopted and are rigidly followed. I will not attempt to review in detail all the features of these commonly practiced handling procedures. This information has been published, along with a great deal of additional data concerning insecticides used for mosquito control. This was prepared by a committee of the California Mosquito Control Association and published in July of 1956 in a booklet entitled "A Guide and Recommendations for the Use of Insecticides in California Mosquito Control." Copies of this informative booklet are available from Ed Washburn, Turlock, California.

At this time, I think it will suffice to point out three general precautions to be followed when handling parathion: (1) Make sure every practical step is taken to prevent contamination of handlers with the concentrate solution; (2) no dilution stronger than one half of one percent should be used as a spray by hand or power applicator; (3) it seems wise to establish a base cholinesterase level on everyone handling parathion. Most districts in California are doing this by determining a blood level on all operators on a monthly basis, or at least three times a year—pre-season, mid-season and post-season. With the establishment of a base cholinesterase, it is always simple to check anyone who might be suspected of having had an exposure, or to determine the degree of toxic reaction in the case of a known accidental exposure.

As previously pointed out, we began using phosphates in 1952—initially, EPN and Chlorthion; then malathion and parathion—these latter two insecticides quite commonly during and since 1954. For the three years, 1954 through 1956, incomplete reporting shows that the districts have used 123,436 pounds of malathion, treating approximately 301,686 acres; and 98,636 pounds of parathion, treating some 992,893 acres. During this time, there have been three or four recognized accidental exposures resulting in reduced cholinesterase levels, but in only one case was any treatment required. This was an instance where an operator had repeatedly sprayed his lower trouser legs, over a period of a week or so, with a dilute parathion solution to repel mosquitoes. Standard atropine sulphate treatment was instituted with recovery that was rapid and complete. To our knowledge, no known toxicological reactions other than to the operators just mentioned have occurred.

Most districts in California using parathion have found it a wise procedure to contact one or more local physicians to familiarize them with the district's program, the symptoms and treatment for parathion poisoning. Since very often the average physician will have had no experience with the diagnosis and treatment for parathion poisoning, this is just sound insurance which, fortunately, has been needed very little to date.

From our experiences in using the phosphates, it appears that there is little hazard associated with residue on feed or forage crops. To my knowledge, our use of malathion at .5 pound per acre and parathion at .1 pound per acre during the past three years has not resulted in any damage or toxic reactions in man, domestic animals, wildlife or fish.

You may have received the impression from this presentation that parathion is a material too hazardous to be used for mosquito control purposes or hardly worth the trouble. If so, I would like to correct that impression. Those who have used parathion for mosquito control purposes in California are extremely well pleased with it. To them, it has proven to be as effective as DDT, possibly more so when first used, and it is very easily handled when proper procedures are made a part of the control agency's program. Most districts have experienced no exposure problems, and the few that have developed have not been serious. We cannot, of course, overlook the economies of using parathion—a cost of 30 cents per acre for the insecticide.