PRELIMINARY RESULTS OF INSECTICIDAL RESIDUE TESTS OF POTABLE GROUND WATER

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INTRODUCTION

The ever increasing population and the industrial growth of the Los Angeles County Metropolitan area have resulted in the need for increased water supplies. In a semi-arid area, such as this, rainfall contributes only a portion of the water required. Primary contributor to the Basin's water needs is water that is imported into the area by aqueducts from Northern California and the Colorado River. Another source of water is reclaimed sewage water. At the present time, this is the smallest source, 15,000,000 gallons daily, but in the future could be one of considerable importance in the order of 300 to 500 million gallons daily.

Since it is impractical to store all these supplies above ground, considerable amounts are stored in underground basins. As this underground water is depleted, it is continually replaced by percolation into the ground-water aquifers by the use of spreading basins. These basins are designed and maintained solely for the recharging of the underground water supplies. At the present time, the Los Angeles County Flood Control District has 1,800 acres of these basins located within or adjacent to the boundaries of the Southeast Mosquito Abatement District. In this report, we are concerned primarily with the basins located near the Whittier Narrows Dam area.

Various insect problems have resulted because of the almost year-round operation of these basins. Of these, the breeding of chironomid midges and mosquitoes is of the greatest concern. The control of chironomid midges in the Whittier Narrows area was investigated by Anderson, Bay, and Ingram 1964(1) and by Bay and Anderson 1965(3). The measures recommended consisted of the rotational use of basins, bio-control with carp and goldfish and chemical treatment. The spreading operations, rotational use of basins and predatory fish (*Gambusia* sp. and carp) have provided about 95 percent of the control of midges and mosquitoes. The remaining 5 percent of control work is done by chemical treatment.

To insure that the safest and most efficient chemical treatment is rendered, the Los Angeles County Flood Control District contracts with the Southeast Mosquito Abatement District to perform any chemical control necessary at the spreading basins. This contract specifies the use of 2 percent sand-coated parathion granules applied at a rate not to exceed 1# of toxicant/acre for the control of chironomid midges. In addition to parathion, the Southeast Mosquito Abatement District uses Baytex (fenthion) almost exclusively in its routine mosquito control program. The fate of parathion and various other pesticides in soil and water has been discussed by several investigators (2, 4, 5, 6, 7, 8, 9). Reactions of fenthion are at present imperfectly understood. This, coupled with a recent report of parathion being found in deep well water, prompted the initiation of these tests. Tests were designed to determine if the currently used insecticides (parathion and fenthion) are capable of being transported through the soil and into the potable water supply. Procedure used involved bioassay of treated and untreated water with 2nd instar *Culex peus* larvae.

MATERIALS AND METHODS. Mosquito larvae used in these tests were obtained from egg rafts collected from the San Gabriel River in the El Monte area of Los Angeles County. These rafts were placed individually in 5" x 8" white enamel pans containing tap water and two dog meal pellets. Immediately after attaining 2nd instar, the larvae were placed in 4 ounce paper cups containing tap water only and held there until the time of testing. Several larvae from each raft were reared to the 4th instar for species determination. All larvae used in the tests were *Culex peus*.

The test site was the Whittier Narrows test basin. This test basin is located north of the Whittier Narrows dam in the dam reservoir area. The basin is 50 feet by 70 feet with 2-foot levees and a basin bottom grade of 210.50 feet. A sampling well is located at the center of the basin and access is provided from the levee to the well by a 2-foot high and a 4-foot wide wooden bridge. A schematic of the sampling pan well is shown in Figure 1 and a geologic soil profile is given in Table 1. The basin receives undiluted effluent from the Whittier Narrows water reclamation plant. The percolation rate at the time of testing was 1.55 cu. ft./wetted A.

On the test day, the basin was flooded to a depth of 2.0 feet. A control sample was taken prior to treatment. Test samples were taken at the 2-foot sampling pan with sampling continued for 27 hours after treatment. Two random samples were taken from surface water. All samples were placed in 1-quart mason jars and delivered to the laboratory in an ice chest cooled to 42° F. Twenty larvae were transferred from the tap water to 4-oz. paper cups with 100 ml. of test material and replicated 5 times. Mortality counts were taken after 24 hours of exposure and compared to a standard previously established. The results are shown in Tables 2 and 3.

DISCUSSION. Based on the results obtained from the foregoing tests, it appears that these insecticides are not carried past the 2-foot level in an amount detectable by this procedure. The exact fate of the insecticides was not determined. This testing method reflects insecticidal activity, and not the possibility of a change into a new or related compound which might possess toxic properties mammalian or otherwise. Continued testing with various soil types and the inclusion of a definitive chemical analysis are necessary to provide accurate and safe insect control measures in potable water supplies.

SUMMARY. Second instar larvae of *Culex peus* were used as test organisms to determine if two insecticides (parathion and fenthion) would percolate into the underground water system. A standard index of susceptibility was established for 2nd instar *Culex peus*. Control samples taken prior to treatment of the test basin showed no mortality. In samples from

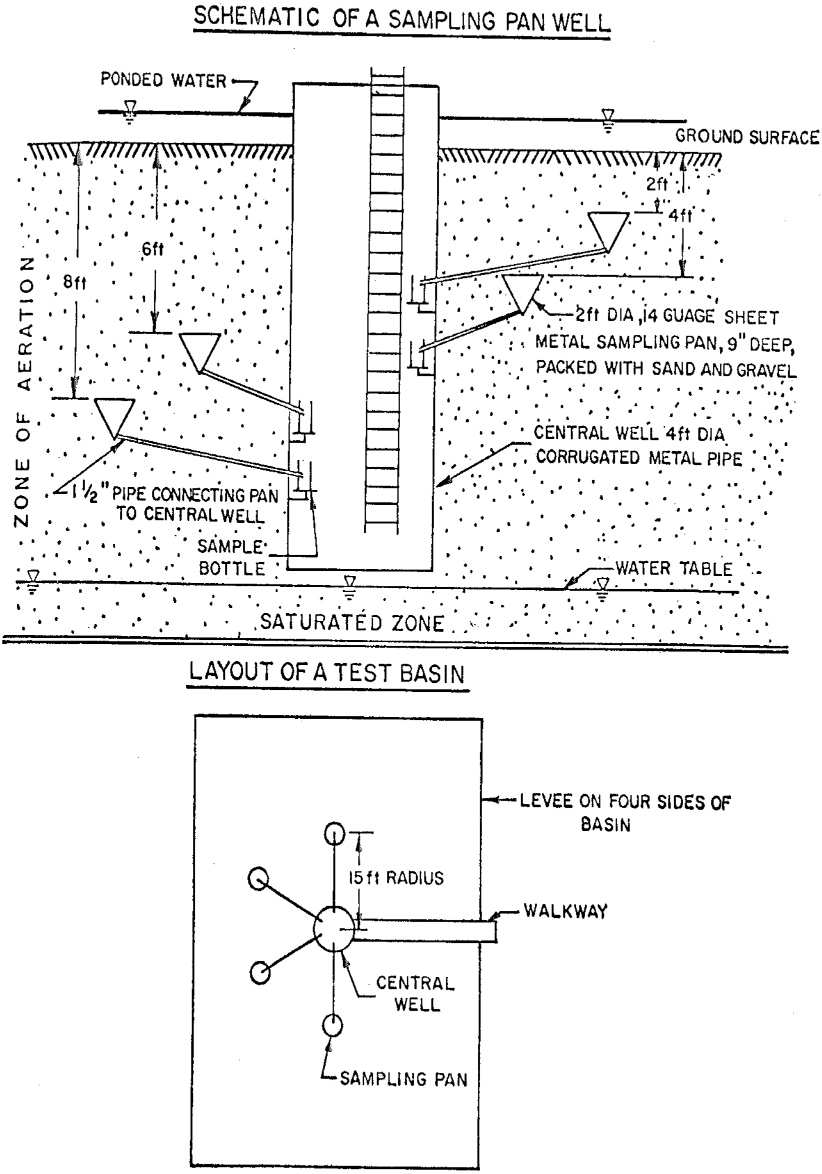

FIG. 1.—Schematic diagrams of a sampling pan well.

TABLE 1.—Geologic soil profile at the Whittier Narrows Test Basin *

Depth below surface (feet)	Unit thickness	From	To	At	Description
0	1 ft. 10 in.	0	1 ft. 10 in.	0	Dark brown very fine to medium silty sand and soil.
2	2 ft. 2 in.	1 ft. 10 in.	4 ft.	1 ft. 10 in.	Light brown to tan fine to medium sand with lenses of gray fine sand. Moist, oxidized, orange fine sand streaks are common in tan portion.
4	1 ft. 6 in.	4 ft.	5 ft. 6 in.	4 ft.	Wood fragments up to 3 in. long in dark brown to black medium to fine sand. Sand is highly micaceous.
6	2 ft. 2 in.	5 ft. 6 in.	7 ft. 8 in.	5 ft. 6 in.	Tan fine to medium soft, micaceous sand, with gray fine sand lenses. Tan portions commonly show orange streaks of oxidized fine sand.
8	4 in.	7 ft. 8 in.	8 ft.	7 ft. 8 in.	Dark brown to black micaceous fine sandy silt stringer.
10	1 ft. 6 in.	8 ft.	9 ft. 6 in.	8 ft. 8 ft. 6 in.	Gray medium to coarse sand. Gray medium to coarse sand and "pea gravel" with occasional gravels to ⅜ in.

* Soil profile taken on 27 December 1962. Information supplied by the Los Angeles County Flood Control District.

surface water after treatment, 100 percent mortality occurred. In all samples taken at the two (2) foot level below the surface there was no mortality.

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TABLE 2.—Test number 2. Results of bioassay after treatment of Whittier Narrows Test Basin with 2 percent sand coated granules Whittier, California, 1966.[a]

Time sample taken after treatment	Location of sample	24-hour percent mortality
4 hr.	2 ft. below surface	0
6 hr.	"	0
8 hr.	"	0
10 hr.	"	0
16 hr.	"	0
27 hr.[b]	"	0
Control [c]	Surface	0
8 hr.	"	100
27 hr.[b]	"	100

[a] Rate of 1#/A ft. 2 percent Durathion H.R. granules, Durham Chem. Co.
[b] Basin refilled after 24 hr.
[c] Sample taken prior to treatment, pH 7.5.

TABLE 3.—Test number 2. Results of bioassay after treatment of Whittier Narrows Test Basin with Baytex (Fenthion) E. C. Whittier, California, 1966.[a]

Time sample taken after treatment	Location of sample	24-hour percent mortality
4 hr.	2 ft. below surface	0
6 hr.	"	0
8 hr.	"	0
10 hr.	"	0
16 hr.	"	0
27 hr.[b]	"	0
Control [c]	Surface	0
8 hr.	"	100
27 hr.[b]	"	0

[a] Rate of 0.1#/A., Baytex 46 percent E. C., Chemagro Corp.
[b] Basin refilled after 24 hrs.
[c] Sample taken prior to treatment, pH 7.9.

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