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OBSERVATIONS ON THE USE OF TOXIC BRIQUETTES FOR MOSQUITO CONTROL

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While the idea or theory of mosquito control by utilizing fixed dispensers or briquettes impregnated with insecticides is not new, there has been little investigation of this method of mosquito control carried on in the San Joaquin Valley of California. This paper will relate the experiences and observations gathered by the Consolidated Mosquito Abatement District, Fresno County, California, where extensive experimental work was conducted with briquettes for larval control during the 1948 hatching season. Several styles of briquettes were used in the test work; no attempt, however, is made to compare one with the other. Instead, a general discussion relative to work performed with briquettes is set forth.

The desirability for some method of larval control other than spraying, either hand or power, became apparent soon after the formation of the district in 1946. Included in the 1000 square mile area that must be regularly patrolled for mosquito sources are a vast number of small but prolific larval hatching areas that must be constantly watched. Many of these sources take little time to treat for larvae; their great number, however, requires much of the operator's time that could be used to better advantage on larger problems. While many of the sources have been entirely eliminated and others will

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be, there are still numerous ones that must be inspected and treated regularly for effective mosquito control. The larval sources that are troublesome where impregnated briquettes can be used include irrigation standpipes, artificial containers, household drains, reservoirs, dairy drains, etc. Figure 1 shows a household drain being treated by an operator with a power spray rig. As will be noted, this drain is covered with a so-called "lid"; this covering, however, is not tight enough to prevent the entrance of adult mosquitoes. Drains of this type, if not regularly treated, invariably produce large numbers of mosquitoes. Since much of the soil throughout the District is a heavy clay loam, this problem is constant during the active mosquito breeding season.

The prime purpose governing our experiments with briquettes for mosquito control was to find some means of obtaining satisfactory control that would be effective over a long period of time. Several of the new insecticides are highly toxic to mosquito larvae and have good residual properties. Some method of dispensing these materials in proper amounts, at the right time, seemed to be the best approach to the problem at hand. Combining suitable materials to achieve this result presented many difficulties and many combinations of ingredients and methods were tested before satisfactory results were achieved.

In our first trial with dispensers, several important lessons were learned. The original work was done with straight casting plaster and 25% emulsible DDT, putting this mix in a small-mouth coffee jar, letting it become semi-hard, then placing it in the larval source. It was noted, on close observation, that the percentage of kill was less a few feet from the submerged jar than directly over it. Indications pointed to the possibility that DDT was not being released rapidly enough, due to the very slow breakdown of the mixture in the jar. In this particular instance, the water in the larval source was practically motionless. Upon moving the dispenser to another location, within the source, good kills were again registered directly above the dispenser but were not extended over a very wide area. This fact led to our second means of dispensing the toxic agent: namely, the perforated coffee can, shown in Figure 2.

The principle involved in this style of dispenser was to bring the releasing agent in more direct contact with the water, thereby using the water to help break down the material within the can. The mixture used in this dispenser was a casting plaster, sawdust, and DDT-gamma BHC combination, formed into a briquette and placed in the can. By using the can or container to surround the toxic agent, it not only protects the briquette from being coated with suspended solids, but it also gives reasonable protection in the event animals or children get curious. This dispenser was found to be very useful where situations necessitated the toxic agent being carried out into a pond or stream. By placing several of these at or near the incoming water, the water would force the material through the holes in the can and carry it over a wide area. Further experiments indicated that if the briquette, without the guard, was used in similar situations, the washing would dissolve the material at such a rapid rate that only short period control was accomplished. One fault with the can dispenser, observation revealed, is the plugging of the holes when it is used in sources containing heavy organic matter.

From experience gained in working with the briquette of sawdust, casting plaster, and insecticides, it was found that if the guard was eliminated the breakdown would be sufficient to give satisfactory control in quiet water. The briquette suspended on wire, (Fig. 2) is composed of the same mixture as was utilized in the can. As shown in Fig. 2, the briquette on extreme left is the original size, 3½ inches wide, 3 inches thick. The briquette second from left gave effectual control for a 3½-month period and, as will be noted, has dissolved to about one-fourth its origi-

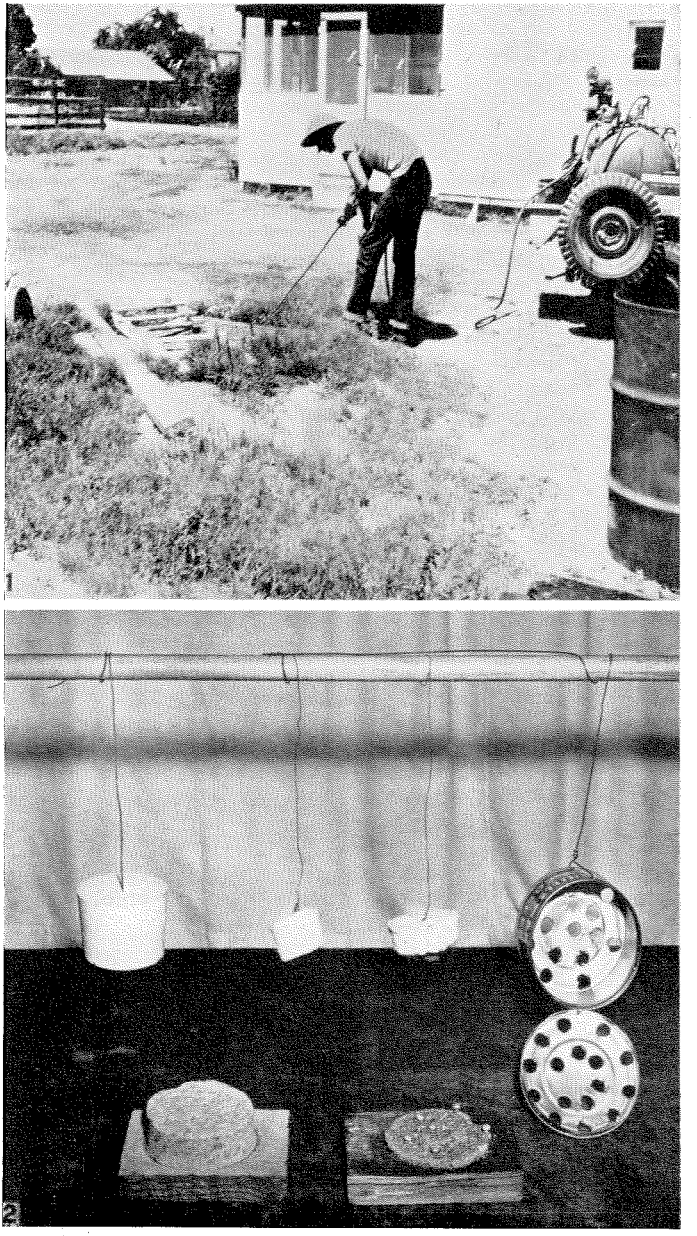

FIG. 1. Spraying household drain with power spray rig.
FIG. 2. Briquettes before and after use.

nal size. This dispenser was in a very prolific mosquito source that had required treating at least every seven days. After the briquette was placed in this source, no further treatment was necessary. The briquette third from left gave very effective control for three months in a heavily producing mosquito source; as shown in Figure 2, however, the bottom half is the only part that shows much dissolution, due to the fluctuation of the water level within the source. If placed in a more or less permanent position within the source, any fluctuation of the water may defeat the purpose of a fixed dispenser. In several instances the water level dropped below the briquette, and larvae were observed a few days later. To correct this condition, the briquette molded on the wooden block (foreground, Fig. 2) was prepared.

By substituting the wood float for the wire, the briquette will fluctuate with the water. The briquette with float (Fig. 2, foreground left) in its original size, is 4 inches in diameter, 1½ inches in thickness. The float briquette on right (Fig. 2, foreground) gave effective control for a three-month period, and as shown, has worn to a thickness of one-fourth inch. The control obtained in the situation where this particular float was used definitely demonstrated the merits of utilizing briquettes for mosquito control. The source area was approximately 16 square feet with dense weed growth and debris. Upon initially placing the float, it was thought, due to the surface obstruction, not enough toxic agent would be released for effective control. Since the float was able to move about in the pond, however, the material was released over the entire area. This advantage was not possible where the briquette suspended on wire was used. If the movement of water in the larvae source is quite active, and control is attempted by this means, the float should be limited in its ability to move about by some restriction, possibly an anchor. This will prevent the float from becoming lodged and losing its full effectiveness.

The construction of the several briquettes mentioned in this paper is simple, and they can be prepared without skilled labor or elaborate equipment. In mixing the various briquettes described, equal parts of casting plaster and shavings were used. This, of course, can be varied depending on the speed of breakdown desired. The size of the briquette can be determined by the use for which it is intended. The toxic agents used in most of the work are standard insecticides, DDT and gamma isomer of BHC. Other materials were tried, such as Parathion, Dianisyl Trichlorethane, DDD, but at this time insufficient work has been done with these chemicals impregnated into briquettes to make possible and recommendations as to their effectiveness.

In the wire-suspended briquette and wood-float briquette, forms were used to obtain the final shape. After mixing the plaster, wood shavings, DDT and gamma BHC together, the water is added to make a putty-like mixture, which is poured into the mold for hardening. The float briquette is prepared by fixing several large-headed tacks or screws into a block of wood, placing a mold around these, and adding the mixture for hardening. In every case, except the glass jar used in the first experiment, the same mixture was utilized. The formula of this is given below:

200 grams casting plaster
1 cup wood shavings
20 grams gamma isomer (Isotox), 25% W/P
50 grams DDT (50% W/P)
200 CC H_2O

The formula will, of course, vary with the work to be performed or type of briquette desired, and the one given above is intended only as a guide.

From the information gathered during the 1948 mosquito season relative to the use of briquettes for mosquito control, extensive use will be made of this method in many parts of this District.