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STYRENE DIBROMIDE: A SUBSTITUTE FOR PYRETHRUM IN INSECTICIDAL OIL USED
FOR CONTROL OF EARWORMS IN SWEET CORN

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A widely used method of control¹ of the corn earworm in sweet corn is the mineral oil treatment (1).¹ As usually recommended, this method consists of applying about $\frac{3}{4}$ cubic centimeter of highly refined mineral oil, ranging from 100 to 150 seconds Saybolt viscosity at 100° F. and containing 0.2 percent of pyrethrins, to the tips of ears about one week after silking, or at a time when the silks have withered or their tips have become brown. Scarcity of pyrethrum for use as an insecticide on cultivated crops, owing to war conditions, has stimulated search for a satisfactory substitute for use in mineral oil.

Among many chemicals that have been tested as substitutes for pyrethrum in oil, styrene dibromide (alpha-beta-dibromomethyl-benzene) has been found to be the most satisfactory. This chemical has been tested in New Jersey and Texas by Barber (2), in Ohio by Davidson (3), and in California by Wilcox.²

Styrene dibromide is a colorless, crystalline chemical having a mild naphthalenelike odor. It is soluble in and imparts no color to mineral oil. At concentrations of from 0.5 to 1.5 grams per 100 cc. of white oil the mixture kills earworms by contact, but they succumb more slowly than when oil containing 0.2 percent of pyrethrins is used. Half-grown rabbits ate the silks and tips of the cobs of several ears treated with $\frac{3}{4}$ cc. of oil-styrene dibromide mixture daily without observable effect.

The chemical was studied by Barber at concentrations ranging from 0.5 to 1.5 grams per 100 cc. of oil, by Davidson at a concentration of 1 gram per 100 cc. of oil, and by Wilcox at concentrations of 1, 2, and 3 grams per 100 cc. of oil. The average results of applying oil containing 1 percent of styrene dibromide or oil containing 0.2 percent of pyrethrins to ears of sweet corn were, in percentage of protected ears, 64.6 and 64.0 percent respectively, in New Jersey in 1941; 78.7 percent for each material in Texas in 1942; 91.7 and 81.6 percent, respectively, in Ohio in 1943; and 77.1 and 90.8 percent, respectively, in California in 1943. These results showed that oil containing 1 percent of styrene dibromide gave practically the same protection to sweet corn against earworms, on an average, as was obtained by use of oil containing 0.2 percent of pyrethrins.

¹/ Underscored numbers in parentheses refer to Literature Cited, p. 3.
²/ Wilcox, J. Unpublished data from experiments in California during 1943.

Although a mild odor of styrene dibromide may be detected in the silks of treated ears at roasting-ear harvest, tests have shown that no residue that can be detected either by taste or odor occurs on the kernels. The mixture caused no discoloration of any part of the ears and does not cause an increase in the length of the undeveloped tip beyond that caused by the oil containing other insecticides.

Styrene dibromide is more satisfactory than dichloroethyl ether (which has been recommended at a concentration of 2 percent in oil) because it does not present the hazard of leaving a detectable residue on the tips of treated ears, such as may be deposited by oil-dichloroethyl ether when the temperature of the interval between treatment and harvest is not sufficiently high to cause evaporation of the dichloroethyl ether from them.

Small quantities of styrene dibromide will be available in 1944 for use in mineral oil for earworm control in commercial plantings or Victory gardens, and this mixture is being prepared for sale by several concerns dealing in insecticides. It should be applied to the tips of ears not earlier than 1 week after the silks have been exposed, at a dosage of $1/2$ to $3/4$ cubic centimeter per ear, as described in Circular 657, copies of which may be obtained from the U. S. Department of Agriculture.

In victory gardens, when force oilers which are used to make accurately measured applications in commercial fields are not obtainable, the ears of small plantings of sweet corn may be treated by use of ordinary medicine droppers, the capacity of which usually is 1 cubic centimeter. The level of oil in the medicine dropper should be marked when it contains 20 drops ($1/2$ cubic centimeter) or 30 drops ($3/4$ cubic centimeter), that is, when it is approximately one-half or three-fourths full. These are the proper amounts of oil containing styrene dibromide for application to small or large sweet-corn ears, respectively.

In a sweet-corn ear having a husk extension of about 2 inches at the time of roasting ear harvest, the $1/2$ -cc. dosage will usually result in a barely perceptible increase in the number of undeveloped kernels at the tip of the cob. Larger dosages per ear or applications to ears having a shorter husk extension will often cause a small increase in length of the undeveloped tip of a half inch or more. Although a moderate increase in the undeveloped tip of the cob does not affect the marketability of the crop, this loss may be avoided by choosing a sweet-corn variety that has a uniform husk extension of at least 2 inches, and by not applying more than $1/2$ to $3/4$ cubic centimeter of the oil containing styrene dibromide per ear, depending on whether the ears of the variety used are small or large. An ear, of course, should never be oiled more than once.

The rate of control obtained has been found to depend on several factors, among which a vigorous, regular growth of the plants is the most important. Consequently, the plants should be given sufficient plant food and frequent watering in order that they may reach their greatest perfection. In well-watered and fertilized fields when every ear is attacked by several earworms, an average of about 90 percent of the ears have been protected by application of the mineral-oil treatment. In proportion as the fields are less well fertilized or suffer from drought, the rate of control is progressively less.

LITERATURE CITED

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