WIREWORM CONTROL EXPERIMENTS ON POTATOES AND CORN IN SOUTH FLORIDA [1]

D. O. WOLFENBARGER[2]
Sub-Tropical Experiment Station, Homestead, Fla.

Wireworms became a very serious problem on potatoes in south Florida, beginning about 1940 and they remained serious until the use of chlordane began about 1949. Chlordane, aldrin, and heptachlor were used successfully for about a decade on the species *Melanotus communis* Gyll. Now, however, these insecticides are not as effective as in previous years. A *Conoderus* sp., possibly *C. falli* Lane, is currently present in the shallower marl and rockland soils, and may be spreading to the deeper soils. More complete drainage of the area and a series of seasons with less than average rainfall may have changed conditions to permit the *Conoderus* sp. to live and develop in the deeper marl soils. Where *Conoderus* sp. is involved it is not unexpected that a control problem exists since Reid and Cuthbert (1956) and Norris (1957) reported the species was resistant to the chlorinated hydrocarbons.

The Perrine marl soils which are used for potato production are very finely divided calcareous particles, and range in depth from a few inches to several feet. They overlie oolitic limestone and range in pH from about 7.8 to 8.3. Such high alkalinity may accelerate decomposition of many otherwise effective insecticides.

PREVIOUS WORK

Experiments initiated in 1946-47 (Wolfenbarger, unpublished data) indicated that 65 pounds of DDT per acre gave 50% reduction of wireworm injuries. The soil fumigants D-D and EDB gave less than 60% control. Benzene hexachloride offered promise of control but contaminated the tubers. In 1947-48, chlordane and lindane were first tested; also, cleanly cultivated plots, and plots planted to sesbania, velvet bean, buckwheat, and sesbania mixed with velvet beans as cover crops gave measures of control. Chlordane and aldrin (the latter first used in 1948-49), however, gave the most effective results. Preplanting soil treatments were more effective than post-harvest (spring) applications. It was found that although fertilizer-insecticide combinations were effective, broadcast methods were more effective. These recommendations were practiced by growers who reported few or no wireworm injuries until 1961. In 1962, 1963, and 1964, wireworm injuries again reduced the grade of some lots of potatoes.

Some differences are recognized in control of wireworms affecting corn and potatoes. Wireworms begin feeding on sprouted corn, and within a few days to a month after planting have killed or damaged the plants. Although wireworms damage sprouting potatoes and feed on the seed-pieces, the most damaging part of the feeding is on the new potatoes. Such feeding is done on developing tubers and extends until harvest. Control

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TABLE 1.—EFFECTS OF INSECTICIDAL TREATMENTS ON WIREWORM INJURY TO POTATOES, 1963-1964.

Material	Formulation lbs./A	Method of application	Injured tubers, %
Phorate, 10G*	30	With tubers at planting*	5.1 a**
Geigy GS-13005, 5G	60	In row	36.5 b
Di-Syston, 10G	20	In row	60.9 c
Bayer 37289, 10G	30	Broadcast	61.3 cd
Aldrin, 5G	80	Broadcast	63.9 cd
Phorate, 10G	20	Broadcast	65.1 cd
Heptachlor, 10G	40	Broadcast	66.0 cd
Diazinon, 10G	20	In row	67.9 cd
Chlordane, 40G	12½	Broadcast	72.1 cd
Kepone, 2% on cornmeal	150	Broadcast	73.4 cd
R-2788, 4E	1 qt.	Drench	75.3 cd
Parathion, 10G	20	In row	76.3 cd
N-2790, 4E	1 qt.	Drench	77.8 d
Check	—	—	75.5 cd

* Results were obtained from four samples obtained from grower-treated areas near the test plots.

** Values followed by the same letter are not significantly different at the 5% level according to Duncan's Multiple Range Test.

TABLE 2.—WIREWORM CONTROL MEASURED IN TERMS OF LIVING CORN PLANTS.

Material	Formulation lbs./A	Method of application	No. plants/100 feet of row
Phorate, 10G	20	In row	134.8 a
Kepone, 2G	100	Broadcast	123.3 a
Geigy GS-13005, 5G	40	In row	122.3 ab
Di-Syston, 10G	20	In row	119.0 ab
Di-Syston, 6E	2 qts.	Drench, over row	118.0 ab
Bayer 38156, 10G	20	In row	115.8 ab
Diazinon, 10G	20	In row	112.5 ab
Shell SD 8530, 5G	50	In row	110.3 ab
Phorate, 10G	10	In row	110.3 ab
Stauffer N-2790, 10G	20	In row	107.5 ab
Stauffer N-2788, 4E	2 qts.	Drench	105.3 ab
Stauffer N-2790, 4E	2 qts.	Drench	99.5 ab
Diazinon, 4E	2 qts.	Drench	99.0 ab
Bayer 37289, 10G	30	In row	87.5 ab
Check	—	—	73.5 b

of wireworms on corn must occur before or immediately after the seed is planted. Control of wireworms affecting potatoes need not begin until a few weeks after planting and protection must be maintained until harvest. Corn is not planted as deeply as potatoes and may be protected by shallow application as contrasted with potatoes.

Methods and Materials

Tests were made usually in commercial plantings in cooperation with growers. Plots ranged in size from single rows 100 feet long to four rows each 25 feet long. There were four replications of each treatment. In the broadcast method, insecticides were scattered by hand over the plots, then worked in the top 2½ inches of soil with disk or tiller. Granulated materials applied in the row were placed in a furrow about 2½ inches wide and 2 inches deep, and covered. By the drench method, emulsion or wettable powder formulations were applied in 1 foot wide bands with a sprinkling can with water at the rate of 500 gallons per acre. Seed was planted the next day or soon thereafter in the above methods. Phorate was omitted from the Experiment Station tests because it was used by the grower all around the test plots. The grower applied granulated phorate with the seed pieces at planting time. Planting was done in November or early December by the grower. Cultivating and spraying were done according to grower practices and were the same over all plots. Sample tubers, 100 or more from each plot, were harvested by hand digging in February or March, and washed for examination. Corn plants were counted periodically to a month after planting, although the data presented in Table 2 were taken a month after planting.

Proprietary materials used in the tests are as follows:

Geigy GS-13005 — O,O-dimethyl-S-[5-methoxy-1,3,4-thiadiazol-2(3H)-on-3-yl-methyl] dithiophosphate
Di-Syston®—O,O-diethyl S-[2-(ethylthio)ethyl] phosphorodithioate
Bayer 37289—O-ethyl 0-2,4,5-trichlorophenyl ethylphosphonothioate
Stauffer R-2788—O-ethyl-S-p-tolyl-ethylphosphonodithioate
Stauffer N-2790—O-ethyl-S-phenylethylphosphonodithioate
Kepone®—decachlorooctahydro-1,3,4-mentheno-2H-cyclobuta [*cd*] pentalen-2-one
Shell SD 8530—3,4,5-trimethylphenyl methylcarbamate
Isolan®—1-isopropyl-3-methyl-5-pyrazolyl dimethylcarbamate
Telodrin®—1,3,4,5,6,7,8,8-octachloro-1,3,3a,4,7,7a-hexahydro-4,7-methanoisobenzofuran.

Results

In the 1962-63 season, broadcast and in-the-row applications gave results indicating no or indefinite control. Broadcast and disked-in applications of the following amounts per acre gave results which were little different from the checks: diazinon, 10G, 40 lb.; phorate, 10G, 30 lb.; heptachlor, 4E, 1 gal.; Di-Syston 10G, 30 lb.; Kepone, 5% on corn meal, 50 lb.; parathion, 10G, 20 lb.; aldrin, 4E, 1 gal.; Isolan 2½G, 160 lb.; and Telodrin 5G, 120 lb. Chlordane formulations of 40W, 40G, and 8E applied to give 6 lb. technical material per acre gave mean values of control that were essentially equal, and were significantly less than the check mean.

Fewer broadcast treatments and more in-the-row treatments were made in the 1963-64 season. Results of wireworm tests on potatoes are given in Table 1.

Thirty pounds of 10G phorate per acre, applied in the furrow with the seed pieces, gave the most satisfactory control. Aldrin, chlordane, and heptachlor, previously satisfactory in control, were comparatively ineffective, and are unsatisfactory in grower practices.

Parathion never controlled wireworms in the experiments, possibly because it was decomposed by the highly alkaline soils.

Results of wireworm control on corn are given in Table 2. More corn plants grew in soil treated with phorate and Kepone than with any other treatment, although there were no significant differences between treatments. Chemically treated plots had more plants than the untreated ones.

Summary

The chlorinated hydrocarbons aldrin, chlordane, dieldrin, and heptachlor are ineffective, so other insecticides are needed for control of wireworms. Phorate, an approved material at 3 pounds technical material per acre on potatoes and 1 pound on corn (although more material would give better control), is currently recommended for wireworm control. In order to be effective, however, it must be placed in the furrows with the seed or seed pieces.

Literature Cited

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