Laboratory Screening Tests of Insecticides for Control of the Beet Webworm[1]

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With the growth of the livestock industry, sugar beet tops are being utilized more for livestock feed. Thus, pesticide residues on beet foliage have become an important problem. Considerable work is being done in an effort to find materials that will control the beet webworm (*Loxostege sticticalis* (L.)) without leaving harmful or illegal residues on the foliage. Hagen (1)[4] found that carbaryl and endosulfan gave as good control as endrin under field conditions. McDonald (2) found trichlorfon to be the most effective of 17 compounds tested in the laboratory and field for beet webworm control. In 1962, laboratory screening tests of many new materials were started at Twin Falls, Idaho. This is a report of these tests and not a recommendation of any of the materials mentioned.

Experimental Procedure

Beet webworm adults were collected in black light traps and the healthy ones transferred to a cylindrical cage, 16 inches high and 8 inches in diameter, made of 8-mesh galvanized screen wire. The top contained a 1-inch hole for inserting the moths, and the bottom was placed in a 10-inch diameter tray containing 1½ inches of moist sand. These adults were fed a 5% sugar solution, dripped by gravity flow onto toweling placed on the top of the cage. Eggs were deposited by the moths on white paper toweling tightly wrapped around the outside of the cage and secured with masking tape.

As the eggs hatched, the larvae were collected by placing leaves of sugar beets or lambsquarters (*Chenopodium album* L.) around the upper edge of the cage. They were then transferred to ice cream cartons covered with cheesecloth and fed fresh lambsquarters daily. When they were in the third and fourth instar, they were used for the insecticide screening tests.

Small sugar beet plants were used in evaluating the insecticides. The beet seed was sprouted in a light sandy soil and single, uniformly vigorous seedlings were transplanted to 4-inch flower pots. When the beets were in the 6- to 8-leaf stage, foliar sprays

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[2] Entomology Research Division, Agricultural Research Service, USDA, Twin Falls, Idaho.

[3] Robert D. Berard, temporary Research Helper, assisted in some of these tests.

[4] Numbers in parentheses refer to literature cited.

were applied to individual plants as they revolved on a turntable. All materials were tested at the rates of ¼, ½, 1, and 2 pounds of toxicant in 35 gallons of water. The plants were sprayed with a DeVilbiss®[5] spray gun at 10 psi, with 5 cc of spray per plant, which is approximately 35 gallons per acre. Four plants treated with each of the four concentrations of each material and four untreated plants constituted a test, and each test was replicated twice.

One day and again 1 week after spraying, five third to fourth-instar beet webworm larvae were caged on each plant. Larval mortality counts were made 4, 8, 24, 48, and 72 hours after larvae were placed on the plants.

There were 33 materials tested, of which 17 were proprietary products, as follows:

Bayer 25141	—*O,O*-diethyl *o* [p-(methylsulfinyl)phenyl] phosphorothioate
Bayer 37289	—*O*-ethyl *O*-2,4,5-trichlorophenyl ethylphosphonothioate
Bayer 38156	—*O*-ethyl *S*-*p*-tolyl ethylphosphonodithiote
Bayer 41831	—*O,O*-dimethyl *O*-4-nitro-*m*-tolyl phosphorothioate
Bidrin®	—3-hydroxy-*N,N*-dimethyl-*cis*-crotonamide dimethyl phosphate
Ciodrin®	—*alpha*-methylbenzyl 3-hydroxycrotonate dimethyl phosphate
EPN	—*O*-ethyl *O*-*p*-nitrophenyl phenylphosphonothioate
Ethyl Guthion®	—*O,O*-diethyl *S*-(4-oxo-1,2,3-benzotriazin-3(4*H*)-ylmethyl) phosphorodithioate
Guthion®	—*O,O*-dimethyl *S*-(4-oxo-1,2,3-benzotriazin-3(4*H*)-ylmethyl) phosphorodithioate
Perthane®	—a mixture of 1, 1-dichloro-2,2-bis(*p*-ethylphenyl) ethane (95%) and related reaction products (5%)
Shell SD-8280	—2-chloro-1-(2,4-dichlorophenyl)vinyl dimethyl phosphate
Shell SD-8436	—2-chloro-1-(2,4-dibromophenyl)vinyl dimethyl phosphate
Shell SD-8447	—2-chloro-1-(2,4,5-trichlorophenyl)vinyl dimethyl phosphate
Shell SD-8448	—2-chloro-1-(2,4,5-trichlorophenyl)vinyl diethyl phosphate

[5] Mention of this proprietary product does not necessarily imply endorsement by the USDA.

Telodrin® —1,3,4,5,6,7,8,8-octachloro-1,3,3a,4,7,7a-hexahydro-4,7-methanoisobenzofuran
Zectran® —4-dimethylamino-3,5-xylyl methylcarbamate
Zinophos —*0,0*-diethyl *0*-2-pyrazinyl phosphorothioate

Table 1.—Materials, minimum dosages that gave the best control, and the mortality of the beet webworm in 48[a] hours when the larvae were caged on the plants 1 day and 1 week after spraying. Twin Falls, Idaho, 1963.

Material	Larvae caged on plants			
	1 day after spraying		1 week after spraying	
	Toxicant per acre	Mortality	Toxicant per acre	Mortality
	Pounds	Percent	Pounds	Percent
Bayer 25141	.50	100	.50	98
Bayer 37289	.25	100	1.00	100
Bayer 38156	1.00	95	2.00	70
Bayer 41831	.50	100	2.00	85
Bidrin	.25	100	2.00	100
Diazinon	1.00[b]	100	2.00[b]	95
Dimethoate	1.00	100	1.00	100
EPN	.25	100	.50	100
Guthion	2.00[b]	100	2.00[b]	93
Guthion-Ethyl Guthion	.25	100	2.00	95
Mevinphos	.50	100	2.00	85
Naled	1.00	100	2.00[b]	20
Phosphamidon	1.00	95	2.00	40
Shell SD-8280	.25	100	2.00	100
Shell SD-8436	.25	100	.25	100
Shell SD-8447	.50	100	2.00	100
Shell SD-8448	.25	95	.25	100
Telodrin	.25	100	.50	100
Trichlorfon	.25	95	2.00	93
Zinophos	.25	100	2.00	98
Untreated check	—	1	—	1
DDT	2.00	95	2.00	95
Endrin	.25	100	1.00	100

[a] Forty-eight hours seemed to be the optimum time to use. In many cases the larvae were moribund but not dead in 24 hours; and if they lived more than 48 hours, they did considerable feeding.

[b] The materials at these dosages caused plant burning.

Discussion of Results

The materials that gave as good control of the beet webworm as DDT and endrin, which were used as standards, are shown in Table 1.

Several materials gave 100-percent mortality with as little as 0.25 pound per acre 1 day and also 1 week after the beets were sprayed. The quickest kills were obtained with Shell SD-8436 and EPN. They gave good control in 8 hours. Bayer 37289, Bidrin, mevinphos, naled, Shell SD-8436, and Telodrin gave very good control in 24 hours.

Materials that gave the best control in these tests and that have been registered for use on sugar beet tops to be used for feed are naled, phosphamidon, and trichlorfon. Materials that gave only fair control but are registered for use on sugar beet tops are carbaryl, carbophenothion, and parathion.

Malathion, menazon, phorate, schradan, and *Bacillus thuringiensis* var *thuringiensis* Berliner were ineffective in these tests.

Literature Cited

(1) HAGEN, ARTHUR F. 1961. Evaluation of Thiodan and sevin for control of webworms in sugar beets. J. Econ. Ent. 54 (4) : 799-800.

(2) MCDONALD, S. 1963. Chemical control of the beet webworm on sugar beets in southern Alberta. J. Econ. Ent. 56 (3) : 248-51.