Insecticide Tests for Control of the Sugar Beet Root Maggot in Southern Idaho[1]

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The sugar beet root maggot (*Tetanops myopaeformis* (Röder)) was described by von Röder in 1881 from specimens collected at Sacramento, California. It was first reported as a pest of sugar beets in Utah by Hawley (3)[3]. He also said that the species had been collected at Burns, Oregon, and Moscow, Idaho, and that it was apparently a native insect that had fed for many years on lambsquarters (*Chenopodium album* L.), red root (*Amaranthus retroflexos* L.), prostrate pigweed (*A. blitoides* S. Wats.), and black nightshade (*Solanium nigrum* L.). Since then, it has been reported as causing serious injury to sugar beets in Alberta, Canada; Colorado, California, Idaho, Montana, Wyoming, North Dakota, Minnesota, and Utah.

Life history and nature of injury.—The adult of the sugar beet root maggot is a blackish-to-coal-black, comparatively slow-moving fly, slightly larger than a house fly (*Musca domestica* L.). The wings have a smoky patch on the margin about one-third the distance from the base and lie parallel to and flat on the back when the flies are at rest. The abdomen of the female is pointed and usually protrudes beyond the tip of the wings. These flies begin emerging from pupae in the soil about May 10 and start laying eggs on the beets at the soil level about May 20. The eggs hatch in a few days, and the tiny maggots crawl down the beets where they feed, by rasping, on the tap and small side roots. As the maggots approach maturity, many disperse through the soil, which allows the beets to recover quickly. Thus, it is very difficult to prove that light infestations cause any reduction in yield. However, severe infestations sever the tap roots, which causes many beets to wilt and die about thinning time or soon after. Damage is, therefore, manifested primarily as a reduction in stand though later feeding on larger beets may also reduce yields.

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[3] Numbers in parentheses refer to literature cited.

Previous work.—Thorne and Jensen (6) and Jensen and Parrish (4) used ethylene dibromide for control of the sugar beet root maggot. Jones *et al.* (5) compared seed and soil treatments with fumigants and found that only soil or seed treatments with aldrin, dieldrin, or heptachlor gave increases in yield and equalled fumigation with ethylene dibromide.

Gojmerac and Callenbach (1) reported that aldrin, dieldrin, and heptachlor mixed with fertilizers gave marked increases in yield. Harper *et al.* (2) reported that heptachlor in the drill row gave better control than Dylox (trichlorfon), Guthion (azinphos-methyl), or Di-Syston (disulfoton) and that the latter was highly phytotoxic.

From 1962 to 1964, inclusive, Kenneth E. Gibson, Entomology Research Division, Agricultural Research Service, U. S. Department of Agriculture; Arch Richards, Utah-Idaho Sugar Company; and Charles E. Stanger, The Amalgamated Sugar Company, used 19 materials as slurry or pelleted seed treatments or granules applied to the soil at seeding time for control of the sugar beet root maggot. None of the materials significantly increased the yield, but granular insecticides applied to the soil at seeding time were the most practical and offered the most promise.

Work in 1965.—The problem of sugar beet root maggots became acute in southern Idaho by 1965. Therefore, experiments were planned in cooperation with The Amalgamated and Utah-Idaho Sugar companies to test insecticides and methods of application that had previously shown the most promise.

When safety, reduction of maggots, and yields obtained in previous tests were considered, it was decided to use carbophenothion, ethion, phorate, and Shell SD-9098 (Phosphorodithioic acid, 0-(2-chloro-1-(2,5-dichlorophenyl)vinyl) 0,0-diethyl ester) and to compare the results with heptachlor as a standard. These 5 materials were applied in granular form to the drill rows at planting time, and in other plots they were applied to the top of the rows when the adult flies emerged. The insecticides applied at planting time were placed over the seed, with a thin layer of soil separating the seed from the insecticide. The topical applications were made by placing the insecticide in a 2-inch band directly over the row. Results were compared with untreated checks. These 12 treatments were replicated 6 times in each of 7 fields. Each plot was 8 rows wide and 48 feet long, with a 2-foot border at each end. All data were based on the 4 center rows; thus a 2-row buffer was left on both sides.

Prethinning counts were made in 5 feet of row on each of these 4 center rows to determine phytotoxicity. Postthinning counts were made in the same rows by counting all beets in each row.

Counts of maggots were made by digging up a beet and the soil around it to a depth of 11 inches, each sample was sifted, and the maggots were counted. Ten such samples were taken from each plot in 4 of the most heavily infested fields—a total of 240 samples for each treatment. The samples were taken in early July while the maggots were clustered around the beets and after they were too large to go through a 20-mesh screen.

Yield records were obtained by harvesting all the beets on the 4 center rows and counting and weighing separately the beets from each row.

Results.—Two fields were abandoned because of nematode infestations and poor stands, but the data gathered from the remaining 5 fields are summarized in Table 1. The plant count and yield data are the average from the 5 fields (30 replications) ,and the values on maggot infestations are the average from 4 fields (24 replications). The fifth field was not sampled for populations because the infestation was so light. Since the data from prethinning plant counts gave no additional information, it is excluded from the table.

Table 1.—Summary of results obtained from field plots of sugar beets treated with various insecticides for control of the sugar beet root maggot. Rupert, Idaho, 1965.

Treatment	Toxicant per acre	Postthinning plant counts per 48 feet (30 rep.)	Maggot data - average of 24 replications: Infested beets	Maggots per 10 beets	Control	Average yield (30 rep.)
In drill row:	Pounds	Number	Percent	Number	Percent	Tons
Carbophenothion	1	48.2	79	53.3	40.8	25.1
Ethion	2	48.6	78	59.0	34.4	26.1
Heptachlor	2	44.9	64	36.9	58.9	24.9
Phorate	1	11.5	....	......	.....	12.3
Shell SD-9098	1	44.0	84	69.7	22.4	23.5
Untreated check	..	48.2	88	89.9	......	24.5
Topical:						
Carbophenothion	1	48.7	88	76.3	16.2	25.3
Ethion	2	48.8	80	75.1	17.5	25.3
Heptachlor	2	48.6	76	64.8	28.8	26.4
Phorate	1	48.0	74	69.5	23.7	25.5
Shell SD-9098	1	48.5	83	83.7	8.1	25.4
Untreated check	......	48.0	88	91.0	......	24.1
Difference required for significance		2.5	8.7	29.0	......	1.2

Stand count data in Table 1 show that phorate, Shell SD-9098 and heptachlor at the rates used were toxic to the plants when they were applied to the drill row. Phorate was so toxic there were not enough beets left to sample for maggot counts. Data in Table 1 also show that 88 percent of the beets in the untreated check plots were infested with maggots and that maggot populations were significantly reduced when carbophenothion, ethion, and heptachlor were applied to the drill row or when heptachlor and phorate were applied as topical applications. However, these reductions were not good enough since the best control was only 59 percent.

Of the materials applied to the drill row, only ethion significantly increased the yield, but the increase was only 0.4 ton above the untreated check plus the standard deviation, which is not enough to justify the application. All the topical applications significantly increased the yield but not enough to justify the trouble and expense.

All drill row treatments gave better maggot control than the same materials applied topically; however, with the exception of ethion, yields were all a little better for the topical treatments, which indicates all materials except ethion had some toxic effect when they were applied to the drill row.

Literature Cited

(1) GOJMERAC, W. L. and J. A. CALLENBACH. 1956. Sugar beet root maggot. Bimonthly Bull. N. Dak. Agr. Expt. Sta., XVIII (4): 115-20.

(2) HARPER, A. M., C. E. LILLY and P. BERGEN. 1961. An evaluation of insecticides for control of the sugar beet root maggot in southern Alberta. J. Am. Soc. Sugar Beet Technol. 11 (6): 485-490.

(3) HAWLEY, I. M. 1922. The sugar-beet root maggot (*Tetanops aldrichi* Hendel), a new pest of sugar beets. J. Econ. Entomol., 15 (6): 388-391.

(4) JENSEN, V. and C. P. PARRISH. 1950. Soil fumigation of sugar beets for the control of the sugar beet root maggot. Proc. Am. Soc. Sugar Beet Technol., 6: 478.

(5) JONES, E. W., J. R. DOUGLASS, C. P. PARRISH and V. JENSEN. 1952. Experiments on control of the sugar beet root maggot. Proc. Am. Soc. Sugar Beet Technol., 7: 490-496.

(6) THORNE, G., and V. JENSEN. 1948. Soil fumigation work in 1947. Proc. Am. Soc. Sugar Beet Technol., 5: 506-508.