

Sugar Beet Nematode (*Heterodera Schachtii*) Control Studies in Ontario

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The sugar beet nematode (*Heterodera Schachtii*) was first reported in Ontario in 1931 by Brown (1).² The infested area was located near Glencoe. This field was not planted again with sugar beets until 1941. Some nematode-infested spots were observed that year. In 1939 a heavy infestation of the nematode was observed in the Marl soil area near Sarnia. In 1940 there were 40 acres of sugar beets in this region infested with this microscopic, nematode.

This Marl soil region formerly was a lake bottom. It consists of approximately 15,000 acres. The principal crops are sugar beets and potatoes. In 1940 this area averaged 12.9 tons of sugar beets per acre. The Ontario average in 1945 was 9.3 tons per acre.

1944 Experiments

In the spring of 1944. Brown³, McKenzie¹, and Baker⁵ inaugurated a set of plots at Albert Leugs' farm, Blackwell, Ontario. This farm, according to the Dominion Department of Entomology survey conducted in 1939 and 1940, had the highest nematode population per acre of all the farms surveyed in the Marl soil district. The purposes of the plot studies were to note the effect of chloropicrin and dichloropropane-dichloropropylene mixture (commonly called D-D) on the growth of sugar beets and the depressing effect of these chemicals on the nematode activity. Fifteen plots, each consisting of 200 square feet, were installed at the Leugs farm. Five plots were selected at random and treated with 2 1/2 cc chloropicrin per square foot. Five plots selected at random were given 2 1/2 cc applications of the D-D mixture. A Larvejector was used to apply the chemicals into the soil. The results obtained from this experiment are listed in table 1.

The results from these experimental plots showed that the D-D mixture apparently had more promising nematocidal properties than chloropicrin.

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²Italic numbers in parentheses refer to literature cited.

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Table 1.—Sugar beet nematode control experiments, Blackwell, Ont., 1944. Plots treated May 26, planted June 8, harvested October 16. Seed used: Imperial No. 40. Fertilizer applied: 200 pounds acre 2-16-4.

Treatment	Ave. stand per plot	Mean yield (Tons per acre)
Control	20	6.72
Chloropicrin	40	1.06
D-D mixture	60	3.98

1945 Experiments

To study further the nematocidal properties of D-D mixture along with other soil fumigants was the basis of the 3945 experiments.

The area selected for these experiments was on the Leugs farm and adjacent to the 1944 plots. This area had been in sugar beets in 1944. It showed a high nematode (*Heterodera Schachtii*) cyst population of 2,529,500,000 per acre and an average cyst population of 837,000,000 per acre.

Chemicals Applied

Five compounds and mixtures of compounds were selected for the experiment.

1. Shell Oil Company's crude D-D mixture (2 parts 1-3 dichlorophopylene, 1 part 1-2 dichloropropane, 1 part 3-carbon-atom compounds of trichlorides and tetrachlorides).

This D-D mixture was applied at the rate of

- A. 4 cc per square foot
- B. 8 cc per square foot
- C. 12 cc per square foot
- D. 16 cc per square foot

2. Propylene dichloride 12 cc per square foot.

3. A mixture by weight consisting of 80 percent ethylene dichloride and 20 percent propylene dichloride applied at the rate of 12 cc per square foot.

4. 666-benzene hexachloride. Applied at the rate of 1 gram per square foot.

Each treatment was replicated five times. This made 40 plots in all. Each plot was 10 feet by 10 feet. Four-foot alleyways surrounded each plot. The plots for each type of treatment were chosen at random.

An unique technique for applying the liquid chemicals was devised. The Larvejector had not proved to be a very satisfactory instrument for applying fumigants to the soil. Considerable trouble was experienced with the tubes clogging and considerable "time was required to treat each plot. A continuous flow dispenser was made by equipping a 1,000-cc Florence flask with a small aperture delivery

tube and an air vent. Long handled hoes were used to make trenches 4 inches deep. Seven trenches were made in each plot. A large spike 8 inches long and 1 inch in diameter was used to punch a series of holes along the bottom of each trench. The quantity of liquid chemical necessary to treat the plot was measured into a graduated cylinder, poured into the Florence flask, and distributed evenly along the trenches. This gave 0 to 12 inches penetration of chemicals. After the treatments were applied, long handled hoes were used to scrape the soil back into the trenches.

The ordinary farming practices were carried on after the treatments were applied. These plots received the same cultural practices employed by Mr. Leugs throughout his entire sugar beet field. At harvest time the sugar beets in each plot were lifted with a spade, topped with a knife, cleaned free of soil, and weighed.

The data obtained are listed in table 2.

Table 2.—Sugar beet nematode control experiments, Blackwell, Ont., 1945. Plots treated May 31, planted June 20, harvested November 7. Seed used: U. S. 215-216 segmented. Fertilizer applied: 200 pounds per acre 2-10-6.

Treatment	Rate of treatment per square foot	Stand	Yields per acre	Sugar in beets	Coef. of purity	Gross sugar per acre
		Percentage	Tons	Percentage	Percentage	Pounds
Control		78	4.70	10.8	88.5	1,500
P	12 cc	68	3.88	16.8	85.1	1,304
PE	12 cc	71	5.40	16.4	83.0	1,771
006	1 gram	68	3.07	16.7	83.1	1,326
DD	4 cc	73	7.97	17.1	84.8	2,726
DD	8 cc	80	9.41	17.6	86.9	3,242
DD	12 cc	73	9.07	17.2	85.8	3,326
DD	16 cc	80	9.70	16.7	87.3	3,080

The field observations made throughout the season indicated that the D-D mixture would give the largest yields per acre. The D-D treated plots were prominently marked off by the effect of the nematodes on the sugar beets in the alleyways.

All sugar beets harvested in every plot had a large number of cysts adhering to the hair rootlets. No fumigant gave a complete kill of (*Heterodera Schachtii*). The D-D mixture when applied at the rate of 12 cc per square foot appeared to be the most favorable treatment for depressing the nematode activity and increasing the yield of sugar beets in the Marl soil district.

The experimental study is a joint investigation carried on by the Dominion Department of Entomology, Canadian Industries Limited, and Canada and Dominion Sugar Company.

Literature Cited

1. Brown, H. D. The Sugar Beet Nematode, *Heterodera Schachtii*—A New Parasite in Canada. *Scientific Agriculture*, 12(10). May 1932.