Evaluation of Telone and D-D in Relation to Planting Time and Fallowing for Control of Sugar Beet Nematode, Heterodera Schachtii Schmidt

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Introduction

During the past few years, experiments with soil fumigants were conducted at the Salt Lake City Nematology Field Station with the objective of developing more effective and less expensive chemical control of the sugar beet nematode. The effects of soil fumigation in relation to early planting and fallowing also were studied. This report summarizes these experiments.

The importance of planting date to beet production in sugar beet-nematode-infested fields was reported by Raski and Lear (1)[2]. Later, Raski and Johnson (2) re-emphasized the importance of early planting. They also reported that maximum activity of sugar beet nematode occurs at temperatures between 70° and 80° F. and that the minimum temperature requirement for the activity of sugar beet nematode larvae is near 70° F. Wallace (3) reported earlier that 77° F. was optimum for emergence of sugar beet nematode larvae, and he also noted that a higher rate of larval emergence occurred under fluctuating temperatures.

Description of Fumigation Experiments

In 1957, an experiment (Table 1) was conducted to compare dosage rates of two commercial nematocides containing 1,3-dichloropropene as the active ingredient. With a standard chisel applicator, the liquid materials were metered through a pressure orifice system and injected 8 inches deep in rows spaced 12 inches apart on a field of Welby fine sandy loam. The surface of the soil was sealed against rapid escape of the chemical by harrowing. The plots were 88 inches (4 rows of beets) wide by 75 feet long. Each treatment was replicated eight times in randomized block design. Date of application was April 17, 1957, and planting date May 3. The two center rows from the middle 25-foot section of each plot were harvested 165 days later.

Another experiment (Table 2) in 1957 in the same field consisted of broadcast treatments applied in strips running the 600-foot length of the field. The treatments were made in triplicate according to a randomized design. Method and time of application, and planting and harvest dates were the same.

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[1] Nematologists, Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, Salt Lake City, Utah, and Madison, Wisconsin, respectively.

[2] Numbers in parentheses refer to literature cited.

Table 1.—Average yields of sugar beets following soil treatments for control of sugar beet nematode in eight replications, 1957.

Material[3]	Rate per acre		Yield per acre
	Gallons		Tons
Telone[1]	15		22.19
Telone	20		26.61
Telone	25		27.56
D-D[2]	15		19.16
D-D	20		26.51
D-D	25		28.10
None (Control)	0		10.76
LSD 5%		3.28	
LSD 1%		4.37	

Table 2.—Average yields of sugar beets following soil treatments for control of sugar beet nematode in three replications, 1957.

Material	Rate per acre	Yield per acre
	Gallons	Tons
Telone	18	20.86
Telone	25	21.68
D-D	25	19.81
None (Control)	0	9.89

Two additional experiments, completed in 1959, were designed to evaluate the effects of reducing the rates of nematocides when beets were planted early. One of the tests (Table 3) was on a field fallowed during 1958. The treatments were applied in strips 22 feet wide and 600 feet long. Plots were randomized and each treatment was replicated three times. Applications were made in the fall of 1958 to allow the earliest possible planting date. The nematocides were metered through a pressure orifice into the furrow ahead of a plow at a depth of 10 inches. The surface of the soil was sealed against rapid escape of the chemicals by harrowing.

Early plantings were made March 26, 1959, and the late plantings May 22.

Soil and air temperatures were recorded on thermographs placed in the field April 11, 1959.

[1] Furnished by the Dow Chemical Company as a product containing over 90% 1, 3-dichloropropene.

[2] A mixture containing 1, 3-dichloropropene, 1, 2-dichloropropane, and other chlorinated hydrocarbons, furnished by the Shell Chemical Company.

[3] Mention of material and company name is for identification only and does not imply endorsement by U. S. Department of Agriculture.

The near 70° F temperatures reported by Raski and Johnson (1959) to be favorable for sugar beet nematode activity were reached in the plot area by mid-June. Temperatures above 75° were reached shortly thereafter and were sustained until early August. During some years, however, optimum temperatures may be reached earlier as evidenced by records of soil temperatures from a weather station 1½ miles from the test plots.

March planting allowed the beets to grow approximately 75 days before temperatures became optimum for sugar beet nematode activity and 190 days until harvest. Planting May 22, allowed essentially no time after emergence of the beets before favorable temperatures were reached, and only 135 days until harvest.

The second test (Table 4) was conducted in a neighboring field on the same farm. In this instance, there was only one planting date, March 26, 1959, and the field had not been fallowed. Otherwise, except for an additional replicate of each treatment, time, rates, and the method of application of the fumigants and harvest dates were the same.

Table 3.—Average sugar beet yields in date-of-planting and fallow tests from fumigated and unfumigated plots in three replications, 1959.

		Yield per acre		
		Fallowed plots	Nonfallowed plots	
Material	Rate per acre	planted March 26	Planted March 26	Planted May 22
	Gallons		Tons	
D-D	15	29.00	25.40	
D-D	25		25.80	16.02
Telone	15	28.17	23.88	
None (Control)	0	27.75	7.42	3.74
LSD 5%			3.59	

Table 4.—Average yields of sugar beets following soil treatment for control of sugar beet nematode in four replications, 1959.

Material	Rate per acre	Yield per acre
	Gallons	Tons
Telone	15	20.29
Telone	20	20.80
Telone	25	21.07
D-D	20	20.78
D-D	25	22.36
None (Control)	0	15.23

Discussion and Conclusions

The plots receiving the 15 gallon-per-acre rates yielded significantly less in 1957 than those receiving 20 or 25 gallons. The plots receiving 25 gallons per acre yielded more than those receiving 20 gallons, but the difference was not significant (Table 1). In 1959, the differences in yield shown in Table 4, between plots receiving reduced rates of fumigant and those receiving normal rates, were not significant. This was probably because of early planting, a lower level of fertility in the plot area, and a lower population level of the sugar beet nematode as evidenced by relatively high yields from the untreated control.

Highest yields were obtained in 1959 from plots which were fallowed the previous season, fumigated, and planted early (Table 3).

Yields from fallowed plots including the check were significantly higher than yields from nonfallowed plots which were otherwise similar. There was no significant difference in yield between treated and untreated fallowed plots, but it is not known whether this result can be consistently duplicated. However, these data suggest that in this experiment fallowing depressed sugar beet nematode populations and can be used under certain conditions as an aid in the control of sugar beet nematode.

Literature Cited

(1) RASKI, D. J. and LEAR, B. 1958. Control of sugar-beet nematode. Calif. Agr. 12: 8, 12.

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(3) WALLACE, H. R. 1955. Factors influencing the emergence of larvae from cysts of the beet eelworm, *Heterodera schachtii* Schmidt. J. of Helminthology. 29 (1-2) : 3-16.