Nematicides dramatically increased yields but not enough to justify costs at current sugar prices.

Nematicides improve sugar beet yields

Demetrios G. Kontaxis ■ Ivan J. Thomason ■ Will Crites ■ Harold Lembright ■ Robert W. Hagemann

The sugar beet cyst nematode, *Heterodera schachtii* Schmidt, is common in the Imperial Valley and constitutes an economically important problem to the local sugar beet industry. About 65,000 acres of sugar beets are grown annually in the Valley, and a three- to five-year rotation with nonhost crops is practiced to reduce nematode populations below economically damaging levels.

The work reported here was undertaken to evaluate the efficacy of various fumigant and granular nematicides applied singly or in certain combinations (see table). DD (1,3 dichloropropene, 1,2 dichloropropane mixture), Telone II (1,3 dichloropropene), Temik 15G (2-methyl) 2[methylthio] propionaldehyde 0-[methylcarbamoyl] oxime), and Furadan 10G (2,3-dihydro-2,2 dimethyl-7-benzo furamryl methyl-carbamate) were tested. This experiment was conducted in a field of Imperial silty clay soil that had been planted to sugar beets for three consecutive years and was heavily infested with the cyst nematode.

Methods

A tractor equipped with injector shanks was used to apply DD at the rate of 16 or 19 gallons per acre and Telone II at 9 or 12 gallons per acre. These amounts of the two chemicals provided equivalent rates of active ingredient. The chemicals were injected 12 to 13 inches deep, one shank per 42-inch bed at listing time (July 14), and the field was irrigated with sprinklers two weeks later. Beet seed (cultivar USH 10) was planted the first week of September 1975 and sprinkler irrigated the next week.

At planting time, one treatment received Temik 15G, at the rate of 13.5 pounds per acre, sidedressed 4 inches below the bed surface and 3 inches in from the furrow bottom, and an additional 13.5 pounds during the last week of February 1976. Furadan 10G at 40 pounds per acre was applied once at planting time the same way as the Temik application.

The experimental plots were 0.1 to 4.8 acres and were single 42-inch beds, with two rows of beets per bed. Each treatment was replicated four times except Furadan, which was replicated only three times.

On the day of fumigation the soil temperature was 91° F at a depth of 12 inches, and air temperature was 95° F. The soil at the 2-foot depth was rather moist, but the upper 10- to 12-inch zone was dry.

Soil samples (0- to 12-inch depth) were taken from the nontreated check plots (treatment 1) on September 17, 1975, and from nontreated and Telone II/Temik (treatment 6) plots on March 9, 1976 (midseason). Nematode populations in the samples were measured by counting viable eggs per 600 grams of dried soil.

Results and discussion

The stand of beets in all treated plots was good, whereas that in the nontreated plots was inferior. Many plants in the nontreated plots damped-off after emergence or collapsed later in the season, leaving many skips. The growth retardation was noticeable up to harvest time (fig. 1,2). Plant growth was good in plots treated with DD or Telone II in combination with Temik or Furadan.

The field was severely infested with weeds, particularly sowthistle, *Sonchus asper* Hill. The weeds were cut by hand the first week of April 1976. Weed regrowth was a serious problem later in the spring. Some competition between weeds and sugar beets for nutrients and light may have occurred.

On June 1 to 2, 1976, sugar beets were harvested from 50 feet of each plot

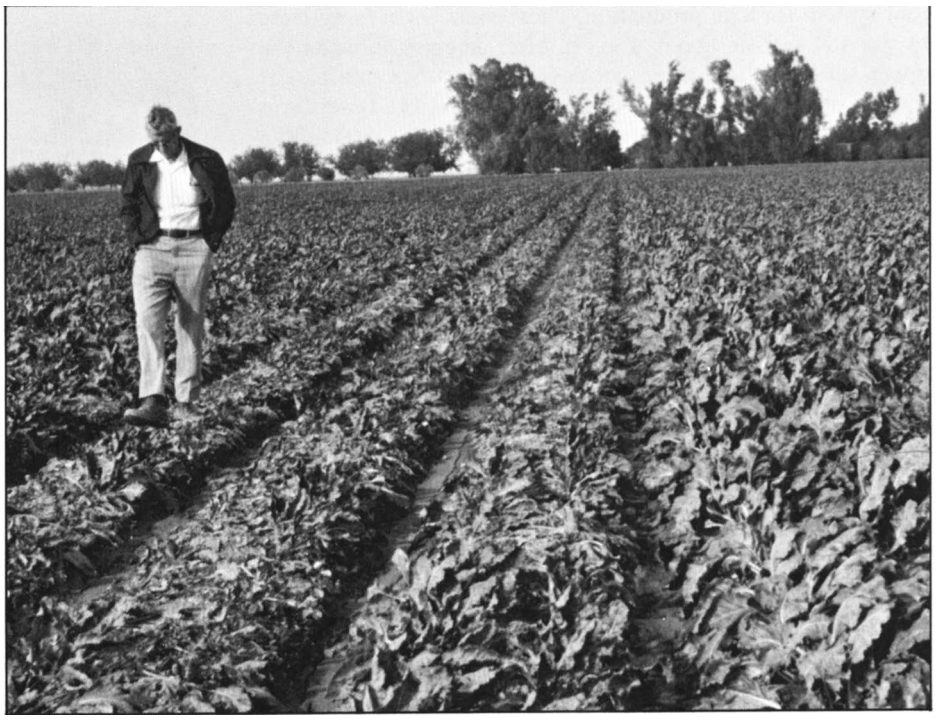

Fig. 1. Chemical control of cyst nematode on sugar beets. Note poor plant growth in four nontreated beds (left) and vigorous plant development in treated (DD/Temik 15G) beds (right).

(100 linear feet of plant row). The roots were weighed, and 12 roots, taken at random from each plot, were analyzed for sugar content by the laboratory of Holly Sugar Company in Brawley, California.

The table presents root yield, nematode population, and cost of materials used. Yields were significantly better in all treated plots than in nontreated plots. About 60 percent of the hand-harvested roots from the nontreated plots were estimated to be too small to be picked by machine. Furadan and Temik, used alone, were not as effective as the other treatments. There were no significant differences among the combination treatments, and Telone alone did as well as any of them.

The treatments had no significant effects on the sugar content of roots, which averaged 16.5 percent. The sugar content of beets from the nontreated plots was 16.4 percent.

By harvest time, the cyst nematode population level was about 10 times higher than that at the start of the experiment in both treated and nontreated plots. If treatment 6 and the check are indicative, by midseason the nematode population had reached the same level in treated and nontreated ground. The data suggest that effective protection of the sugar beet seedlings during their early development is important.

The average cost to produce sugar beets in the Imperial Valley, according to University of California Cooperative Extension estimates, was $666 per acre in 1975-76. Adding nematicide costs would bring the total per acre to about $758 to $774. The low sugar price that prevailed in the 1975-76 growing season would render chemical control of the cyst nematode unprofitable, despite the dramatic increase in beet tonnage.

Demetrios G. Kontaxis is Farm Advisor (Plant Pathology-Nematology), Cooperative Extension, Imperial County (Court House, El Centro, California 92243); Ivan J. Thomason is Assistant Director of Cooperative Extension and Professor, Department of Nematology, University of California, Riverside; Will Crites is Market/Development Specialist, Agricultural Chemicals, Shell Chemical Company, Walnut Creek, California; Harold Lembright is Field Research and Development Specialist, Dow Chemical Company, Walnut Creek; and Robert W. Hagemann is Farm Advisor (Agronomy), Cooperative Extension, Imperial County.

Fig. 2. Roots on left are from nontreated check plots and those on right from plots treated with a Telone II/Temik 15G combination. Photo was taken about 3½ months after plant emergence.

NEMATODE POPULATION AND SUGAR BEET PRODUCTION UNDER VARIOUS FUMIGANT AND GRANULAR NEMATICIDE TREATMENTS, 1975-76

Treatment*	Eggs per 600 grams of soil			Root yield†	Material cost
	Preplant (9/17/75)	Midseason (3/9/76)	Harvest (5/17/76)		
				tons/acre	*$/acre*
1. Nontreated (check)	2,300	9,800	22,400	10.9 Z	None
2. Furadan (40 lb/acre)			32,900	14.9	36.00
3. Temik (40 lb/acre)			14,000	20.8	48.50
4. Telone II (14 gpa)				29.7 Y	65.10
5. Telone II (9 gpa) plus Temik (27 lb/acre)			25,500	28.9 Y	90.35
6. Telone II (12 gpa) plus Temik (27 lb/acre)		11,400	19,600	25.4 Y	104.30
7. Telone II (12 gpa) plus Furadan (40 lb/acre)			21,400	29.0 Y	91.80
8. DD (16 gpa) plus Temik (27 lb/acre)			16,800	29.0 Y	98.90
9. DD (19 gpa) plus Temik (27 lb/acre)			16,700	28.3 Y	108.35
10. Telone II (14 gpa)‡			21,800	26.6 Y	95.85

* Gpa = gallons per acre.

† Average of four replications. Means with same letter are not significantly different at the 5 percent level according to Duncan's Multiple Range Test. Treatments 2 and 3 not included in the statistical analysis.

‡ Applied after bed shaping, 8/15/76.