INSECTICIDE APPLICATIONS TO SUGAR BEETS FOR CROWN BORER CONTROL

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Introduction

The sugar beet crown borer, *Heilstia undulatilla* (Clemens), is a periodic moth pest to seedling sugar beets grown in southwest Idaho and Malheur County, Oregon. In certain instances within Utah and Colorado, crown borer populations have been high enough to kill 30 to 50 percent of the sugar beet crop. Severe outbreaks of the borer have also occurred in the Central Valley California.

The crown borer attacks the crown area of different species of plants. On sugar beets they feed on the crowns of the young plants, on the leaf petioles near the ground, or even on leaves that touch the soil surface. The larvae move back and forth inside characteristic silken tubes which are often two to six inches long and radiate out from the beet roots just under the surface of the soil. The caterpillars feed primarily upon the crown area, and the feeding may be superficial or may cause a girdling of the roots. Partial girdling of the roots causes a weakened condition so that the plant often breaks off at the ground level.

Moths can lay up to 300 eggs singly on the petioles of the plants. The insect has two generations per year. At an average temperature of 76°F a complete life-cycle is completed in 34 to 39 days.

Dr. Ed Bechinski, University of Idaho, has established the economical threshold level for crown borer, when ten or more moths are found in a pheromone trap each day for seven consecutive days before the middle of May. The threshold level is the point where treatment is necessary to avoid economic loss to the sugar beet crop.

In this study, Temik and Counter granular formulated insecticides were applied as infurrow treatments during planting at the rate of 2.0 pounds active ingredient per acre. An additional treatment included Sevin XLR insecticide applied at weekly intervals over the Temik treated plots, at the rate of 0.5 lb ai/ac. Data obtained include plant populations during emergence and seedling growth, insect counts from traps, and harvest information including root yield, percent sucrose, percent extractable sugar, and estimated yields of recoverable sugar per acre.

Procedure

Soil in the trial area is a silt loam texture with 1.3 percent organic matter and a pH of 7.3. Wheat was the previous crop. Following wheat harvest the stubble was shredded with a steel flail beater, and the field was disked and irrigated. Fall tillage included chiseling the soil to a depth of 18 inches, moldboard plowing, and fall bedding. One hundred lb/ac of phosphate (P_2O_5) and 60 lb/ac of nitrogen (N) were broadcast applied before plowing.

In the spring the beds were harrowed using a spike-toothed bed-harrow. The beds were harrowed twice, and sugar beet seed of variety WS-PM9 and the insecticides (Temik and Counter) were planted and applied at the same time on April 26. Temik and Counter rates were 2 lb ai/ac. In-row applicators were calibrated to deliver 9 ounces of Temik and 6.7 ounces of Counter per 1000 feet of row. Beck planter with shoe openers were used. Ezee-flow granular applicators were mounted on the planter and the granular insecticides distributed in the planted row. The insecticide tube was located behind the disc-opener and in front of the press-wheel. Soil separated the sugar beet seeds from the insecticides, but a shallow layer of soil covered the insecticides. Sugar beet planting depth was 0.75 inches. Coated seed was used, and the planter was set to place seeds at 4 inches apart. Row spacing was 22 inches. Each plot was 8 rows wide by 50 feet long, treatments were replicated six times using a randomized complete block experimental design.

After planting, the rows were corrugated and furrow irrigated to assure enough soil moisture for uniform seed germination and seedling growth. Counts of emerged plants were taken on May 3, 5, 8, 12, 16, 24, and June 5. Average number of plants from 50 feet of 4 different rows in each plot of all replications were taken. The results are recorded in Table 1. Traps were set up by Steve Yungen, Amalgamated Sugar Company, to monitor moth populations of crown borer and fly populations of root maggot. Moth and fly catches were monitored routinely from May 24 to June 23. The numbers are reported in Table 2.

Postemergence applications of Sevin XLR were applied over Temik in one treatment at the rate of 0.5 lb ai/ac. Sevin XLR was applied on May 3, May 15, May 25, and June 5. Applications were made in 8-inch bands over the rows using a single bicycle wheel plot sprayer equipped with four Teejet fan nozzles on a spray boom. A single nozzle was centered over each row. Spray pressure was 42 psi, and water volume was 19.5 gal/ac. Weeds were controlled with postemergence applications of Betamix Progress, Upbeet, and Poast herbicides. Rates were 0.25, 0.0156, and 0.1 lb ai/ac. Herbicides were not tank-mixed with Sevin XLR but were applied using the same sprayer and procedures as used when applying Sevin.

Sugar beet plants were observed for crown borer damage during regular plant stand counts. No crown damage resulting in plant losses was observed. On June 6 the sugar beets were hand-thinned to an 8-inch spacing. On June 8 the trial area was sidedressed with 750 lb/ac of ammonium sulfate (150 lb/ac N). Irrigation furrows were made between each row of sugar beets, and all furrows were irrigated at regular intervals. A total of 80 lb/ac of powdered sulfur was applied as equal amounts by hand spreading on July 11 and aerial application on August 10 for control of powdery mildew.

Sugar beets were harvested on October 12. Roots from 4 rows, 50 feet long, were taken from each plot and weighed to determine root yield. Eight samples with each sample containing 8 sugar beet roots were taken from each plot. Sugar beet samples were analyzed at the Nyssa Amalgamated Sugar Factory tare laboratory for percent sucrose, conductivity readings, and root NO_3-N content. Percent extractable sugar and estimated recoverable sugar per acre and per ton of sugar beets were calculated. Individual treatments in all replications were harvested (Table 3).

Results

Crown borer populations were not high enough to cause sugar beet stand losses. No visible injury occurred, and moth populations recorded in traps were not high enough as outlined by Dr. Ed Bechinski, University of Idaho, to result in economic losses (Table 2). Moth densities must occur before mid-May in western Idaho to cause economic losses. Significant reduction in growing plants did occur in Counter plots because of Counter insecticide damage to germinating and emerging sugar beets but not from the crown borer insect. Plant counts in the Temik plots were equal to those in the untreated check. Plant counts in the Counter plots ranged from 5 to 11 percent less over the period of time from May 3 to June 5 when counts were taken (Table 1).

Although Counter insecticide reduced the number of emerged plants, the plant populations after thinning were comparable for all treatments, and insecticides had no detrimental effect on root or sugar yield per acre. Percent sucrose was significantly higher in the one Temik treatment but was not great enough to result in a significant increase in recoverable sugar per acre. For the grower, however, the higher percent sucrose reading would result in an increase in the per ton value of the sugar beets (Table 3).

Sevin XLR applied alone, not tank-mixed with Betamix Progress, showed no visible damage to the seedling sugar beets nor did it improve yield potential because of the lack of detrimental populations of both crown borer or root maggot to meet threshold levels.

Table 1. Effect of Temik, Temik + Sevin, and Counter insecticides on sugar beet stands when Temik and Counter were applied as infurrow treatments during planting and Sevin applied to emerged seedlings. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1995.

		Number of plants per 50 feet of row by date beginning at emergence													
Insecticide	Rate	May 3		May 5		May 8		May 12		May 16		May 24		June 5	
	lb ai/ac	no.	%	no.	%	no.	%	no.	%	no.	%	no.	%	no.	%
Temik	2.0	119	100.1	129	99.2	142	100.7	147	101.3	149	102.0	151	100.0	151	100.0
Temik + Sevin	2.0 + 0.5	122	103.4	131	100.7	139	98.6	144	99.3	147	100.7	150	99.3	150	99.3
Counter	2.0	105	88.9	117	90.0	126	89.4	133	91.7	138	94.5	144	95.4	144	95.4
Untreated check	–	118	100.0	130	100.0	141	100.0	145	100.0	146	100.0	151	100.0	151	100.0
Mean		116	–	127	–	137	–	142	–	145	–	149	–	149	–
LSD (0.05)		4	–	2	–	4	–	5	–	4	–	1	–	1	–
CV (%)		2.3	–	1.4	–	2.4	–	2.6	–	2.3	–	0.5	–	0.5	–

Table 2. Crown borer moth and root maggot fly counts from pherome traps set on each side of trial area. Steve Yungen, fieldman for Amalgamated Sugar Company, Nyssa, Oregon, 1995.

		Number of insects trapped on given dates									
Trap location	Insect	May 24	May 30	June 2	June 6	June 9	June 13	June 16	June 21	June 23	Total
North	Crown borer	1	8	5	10	3	14	1	2	0	44
South	Crown borer	0	2	2	11	1	11	5	0	1	33
OSU (94)	Crown borer	(2)	(2)	(37)	(4)	(7)	(5)	(3)	(2)	(8)	(74)
North	Root maggot	5	14	9	7	0	1	0	0	0	39
South	Root maggot	4	11	6	3	0	0	0	0	0	26
OSU (94)	Root maggot	(0)	(3)	(9)	(11)	(12)	(12)	(13)	(13)	(14)	(87)

Numbers in parenthesis are counts recorded from 1994 trapping in fields adjacent to where trials are located in 1995.

Table 3. Root yield, sugar yield, and root quality data from sugar beets treated with Temik, Counter, and Sevin insecticides for crown borer control. Malheur Experiment Station, Oregon State University, Ontario, Oregon, 1995.

		Sugar beet yield and quality						
Insecticides	Rate	Root yield	Sucrose	Conductivity	Root NO_3N	Extraction	Recoverable sugar	
	lb ai/ac	tons/ac	%	μ mho	ppm	%	lb/ac	lb/ton
Temik	2. 0	45.39	15.71	832	356	83.62	11,920	262.6
Temik + Sevin	2. 0 + 0.5	45.92	15.59	851	391	83.35	11,930	259.8
Counter	2. 0	45.59	15.39	842	416	83.43	11,710	256.8
Untreated check	–	45.45	15.46	840	385	83.46	11,730	258.1
Mean		45.59	15.54	841	387	83.47	11,820	259.4
LSD (0.05)		(ns)	.32	(ns)	50	(ns)	(ns)	2.7
CV (%)		2.3	2.5	6. 0	15.6	0.84	4.1	2.6