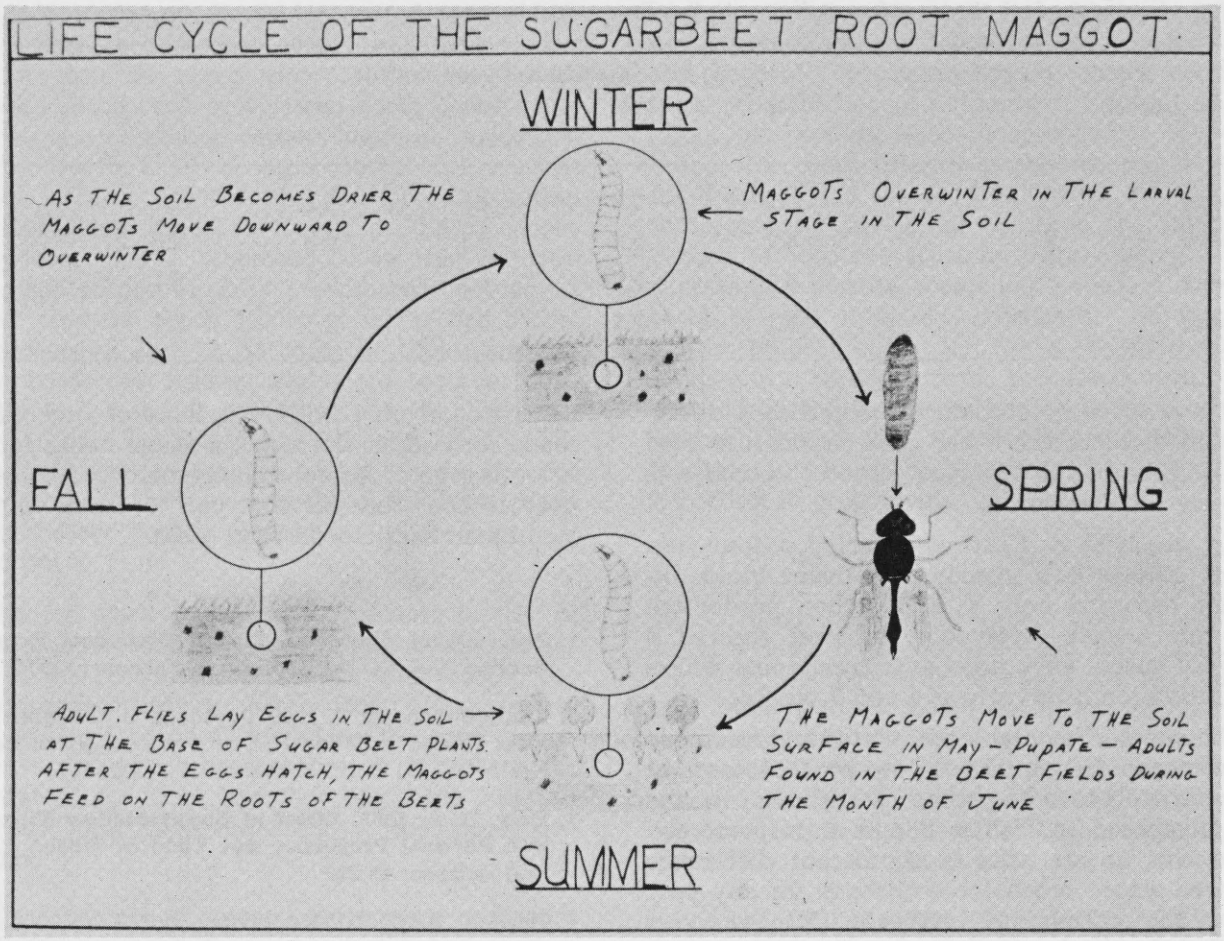

SUGARBEET ROOT MAGGOT CONTROL

R. D. Frye, J. A. Callenbach, A. W. Anderson and J. E. Lundquist

The sugarbeet root maggot, Tenanops myopaeformis, is a serious pest of sugarbeets in the Red River Valley, especially in lighter soils in the northern portion of the valley in North Dakota and in parts of Clay county, Minnesota. It is also a problem in many other sugarbeet production areas west of the Mississippi river in the United States and Canada.

Chemical insecticides which were effective against the maggot in past years can no longer be used because of suspected environmental contamination, or because the pest has developed resistance to them. In 1971 and 1972, several of the newer organic phosphate and carbamate insecticides were tested for maggot control in sugarbeets.

Investigations

In 1971, 34 treatments were utilized which included several rates of actual insecticide per acre and combinations of insecticide application times (before and/or after both beet and maggot fly emergence occurred). Treatments were replicated four times at each of three locations near St. Thomas, North Dakota. In 1972, the most promising and practical treatments from the 1971 tests, along with several additional treatments, were tested further in the St. Thomas area. Twenty-one insecticide treatments and an untreated control were replicated four times in randomized-complete block tests at each of two locations.

Experimental units in the plots consisted of six 100-foot rows. The four center rows in each experimental unit were treated. Insecticides were

Dr. Frye is associate professor, Dr. Callenbach is professor, Dr. Anderson is assistant professor, and Lundquist was technician, Department of Entomology

applied in seven-inch bands over the rows. Pre-emergence treatments were applied immediately after seeding. Post-emergence treatments were applied after beet and fly emergence. Insecticides were applied with modified electrically driven Noble applicators. Treatments were applied at a speed of three mph. with the machine shown in Figure 1. Drag chains with 1¾-inch links were used to lightly incorporate the insecticides in the soil. Treatments were evaluated on the basis of yields from 30 feet of row from the center of row three in each experimental unit.

Average yields from the insecticide plots are presented in Table 1.

All of the insecticide treatments (Table 1) increased sugarbeet yields in 1972. Increases ranged from one ton per acre with Furadan applied post-emergence at one pound actual insecticide per acre to 6.4 tons with Thimet at two pounds (uncleared) per acre applied pre-emergence. Of the cleared treatments, Dasanit, two pounds pre-emergence, Diazinon, two pounds pre- or post-emergence, Temik, 1½ pounds pre-or post-emergence, and Dyfonate, one pound pre-emergence, gave the best maggot control.

However, the statistical analysis indicates no significant differences among the first 17 treatments. Lack of significant differences in comparisons between higher and lower yields of that group are probably due to experimental and/or sampling error. In some cases, higher yields were recorded from plots treated with insecticides (Dyfonate and Furadan) applied at lower than at higher rates. Again, it is probable that this is due to error. It may indicate that the lower rate is adequate, or that there was some effect on the plant at the higher rate. Differences between Thimet 10G and Thimet 15G might be explained in the same way.

Table 1. Effectiveness of Insecticides, Sugarbeet Root Maggot Control, St. Thomas, North Dakota, 1972.

Treatment		Yield [1]	
Insecticide	Rate & Time [3] [4] of Application (Lbs. Actual/Acre)	Average [2] Tons/Acre	Tons Increase Over Check
Thimet 10G	2 pre[5]	20.6	6.4
Dasanit 14G	2 pre	20.2	6.0
Diazinon 14G	2 post	20.0	5.8
Dyfonate 20G	1 pre	19.4	5.2
Temik 10G	1½ post	19.3	5.1
Temik 15G	1½ pre	19.2	5.0
Diazinon 14G	2 pre	19.1	4.9
Temik 10G	1½ pre	18.7	4.5
Furadan 10G[5]	¾ pre	18.3	4.1
Dyfonate 20G	1½ pre	18.2	4.0
GA-447 S[5]	2 post	18.1	3.9
Dyfonate 10G	1 pre	17.9	3.7
Furadan 10G[5]	1 pre	17.9	3.7
Furadan 10G[5]	¾ post	16.8	2.6
Thimet 15G	1 post	16.6	2.4
Thimet 15G	2 post[5]	16.5	2.3
Dyfonate 10G	1½ pre	16.4	2.2
Dasanit 10G	2 post	16.3	2.1
Dyfonate 10G	1 post	16.2	2.0
Thimet 15G	1 pre	15.5	1.3
Furadan 10G	1 post	15.2	1.0
Untreated Control		14.2	—

[1] *Yields are based on averages from two locations (8 replications).*
[2] *Averages followed by the same line are not significantly different statistically at the .05 level of probability.*
[3] *Pre = pre-beet and fly emergence application.*
[4] *Post = post-beet and fly emergence application.*
[5] *Not approved by EPA for use in sugarbeet maggot control.*

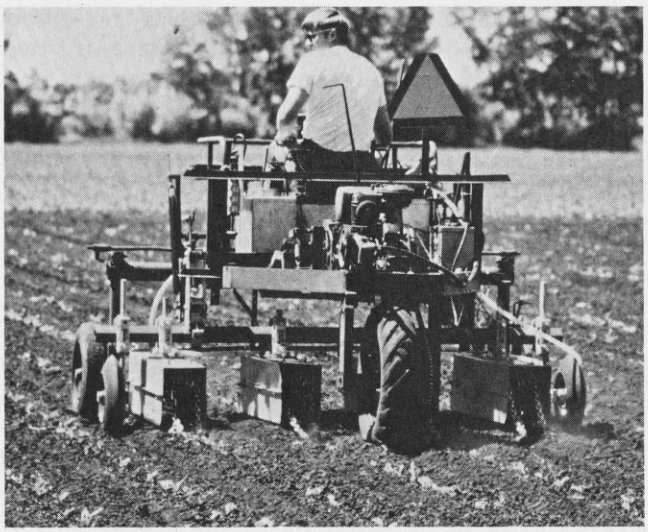

Figure 1. Applying Insecticides for Sugarbeet Root Maggot Control in the Research Plots near St. Thomas, North Dakota, 1972.

Beets in the experimental plot were planted relatively late, and there was a possibility of severe maggot damage to young beets. However, on the average, damage in the plots was in the middle to high part of the moderate range (on a scale of no, slight, moderate, heavy and severe damage). The average yield from the untreated check plots was good (Table 1). This may be partially explained by the good beet growing conditions during most of and especially later in the 1972 growing season.

Insecticides currently recommended for maggot control are listed in Table 2. These insecticide treatments have performed well consistently.

Several methods of incorporating Temik and Diazinon into the soil were tested in 1973 (Callenbach **et. al.,** 1973). They included drag chains, tines, rotary hoes and in furrow applications. A comparison of beet yields indicated that methods provided effective incorporation when compared to untreated checks.

The chains were consistently good and appeared to provide desirable light incorporation (in the vicinity where adults and young maggots are active). In-furrow incorporation was the least effective.

Several considerations are important when selecting an insecticide. These include current worth of the crop, cost of insecticide, formulations of insecticide available, toxicity of insecticide (to man, animals and plants), kind of application equipment available, performance of an insecticide under different weather conditions, compatability of an insecticide with other pesticides, other control methods available and seasonal history and development of the insect.

Summary and Conclusions

In 1971, various rates and combinations of application time of several insecticides were screened for effectiveness in sugarbeet root maggot control. In 1972, the most promising and practical treatments from the 1971 tests, along with several different treatments, were tested further. Insecticides which provided consistently good maggot control included granular formulations of Dasanit, Diazinon, Dyfonate and Temik. All of these are currently cleared for use in sugarbeets. The insecticides were applied in seven-inch bands over the beet rows, and were incorporated with drag chains. The chains provide desirable light incorporation into the soil in the vicinity of maggot activity near the beets.

Reference

Callenbach, J. A., R. D. Frye, A. W. Anderson, R. Dregseth and L. Klostermeyer. 1973. **Biology and Control of the Sugarbeet Root Maggot.** Ann. Prog. Rept., Department of Entomology, North Dakota State University.

Table 2. Insecticides for Sugarbeet Root Maggot Control, 1974.

Insecticide [1] [2]	Lbs. Actual Toxicant/Acre	Cost/Acre ($)	Remarks
Dasanit 10G	1 - 2	3.08- 6.16	Use lower rate in light soil, higher rate in heavy soil; apply in a 3 to 7-inch band over the row at planting.
Diazinon 14G	1½ - 2	6.30- 8.40	Apply in a 7-inch band over the row at planting or at post-emergence.
Dyfonate 10G or 20G	1 - 1½	2.85- 4.28	Apply in a 7-inch band over the row at planting.
Temik 10G	1½ - 2	14.40-21.60	Apply in a 7-inch band over the row at planting or at post-emergence.

[1] *Read and follow label directions carefully; do not place any of the material in contact with the seed.*
[2] *The use of trade names does not imply endorsement of one product over another.*